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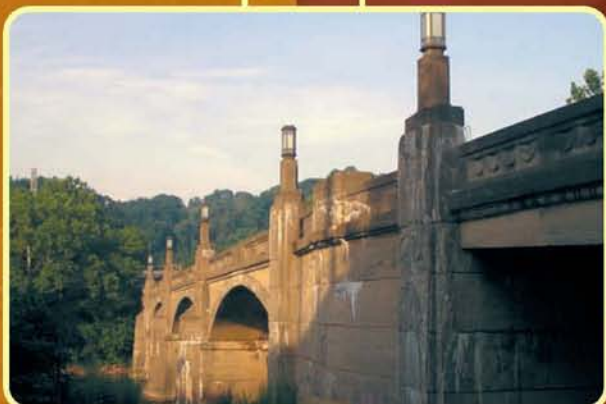

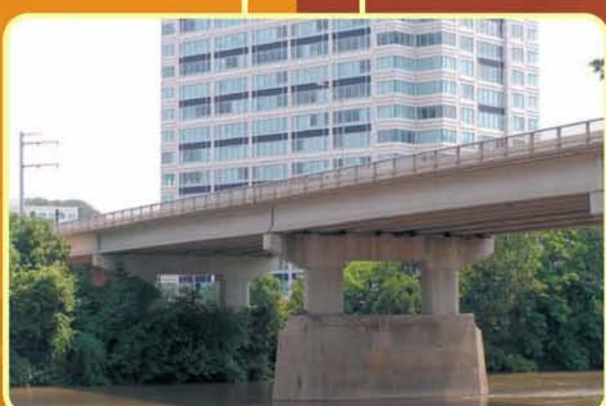

SCHUYLKILL CROSSINGS
traffic study

JANUARY 2008

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. The authors, however, are solely responsible for its findings and conclusions, which may not represent the official views or policies of the funding agencies.

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EXECUTIVE SUMMARY

The Conshohocken/Plymouth Meeting/Norristown/King of Prussia area is a unique and key location in the region. This area, which is bisected by the Schuylkill River, is home to over 250,000 residents and is the location of over 200,000 jobs. By 2030, the study area is projected to add 13,000 new residents and over 30,000 new jobs. A large number of commuters must cross the Schuylkill River on their journey to work. Although the Pennsylvania Turnpike, Interstate 476, and the US 422 Expressway serve cross-river trips, there is recurring congestion in both the AM and PM peak periods on the non-expressway bridges in the area, which include the Dannehower, DeKalb Street, Matsonford/Fayette Street, and Belmont Avenue/Green Lane bridges.

Together, these four bridges carry over 111,600 vehicles on an average day. Due to both population and employment growth in the study area, by 2030 bridge volumes will increase by an average of about 17 percent under the No-Build Alternative. This will result in even higher delays at the intersections on the bridge approaches.

Montgomery County's Comprehensive Plan and other planning efforts have recognized the need for additional Schuylkill River crossing capacity. Easing the river crossing bottleneck is necessary to continue the employment growth on reused brownfield sites located in this area, which is central to the region, rather than on greenfield sites at the region's edge.

This study, requested by the Montgomery County Planning Commission and the Schuylkill Valley Transportation Coalition, develops 2030 traffic forecasts for the Schuylkill River crossings and related facilities in this area. In preparation for projecting future traffic volumes, traffic counts and other data related to travel patterns in the study area were collected by the Delaware Valley Regional Planning Commission (DVRPC). DVRPC's regional travel simulation model was focused on the study area and used to simulate trip making patterns and traffic volumes for 2030 conditions, under a No-Build and two Build alternatives.

Two Build alternatives were evaluated for their ability to improve river crossing operations. Build Alternative 1 includes several previously proposed projects in the study area: widening and extending Lafayette Street to the Pennsylvania Turnpike, relocating PA 23, and widening the Matsonford/Fayette Street Bridge and Belmont Avenue in the vicinity of the Schuylkill Expressway interchange. Build Alternative 2 is designed to increase the capacity of the Schuylkill Expressway in the vicinity of its interchange with I-476, with the goal of preventing traffic from diverting to the Matsonford/Fayette Street bridge.

Build Alternative 1 decreases traffic volumes on the Dannehower and DeKalb Street bridges by diverting traffic to the Pennsylvania Turnpike. Although the magnitude of this diversion is not large, it does reduce delays at the intersections on either end of these bridges. Delays are especially reduced at the intersection of DeKalb and East Lafayette streets, due primarily to the widening of Lafayette Street. Build Alternative 1 increases traffic volumes on both the Matsonford/Fayette Street and Belmont Avenue/Green Lane bridges, by 1,700 and 1,000 vehicles per day, respectively. Nevertheless, the additional capacity associated with the widening facilities in this alternative still results in less average vehicle delay than the No-Build Alternative.

Build Alternative 2 has little effect on traffic volumes or intersection delays outside the Conshohocken/West Conshohocken portion of the study area. Within that area, it decreases traffic volumes on the Matsonford/Fayette Street bridge and reduces delays at the intersections on either side of the bridge in both the AM and PM peak hours.

I. INTRODUCTION

The Conshohocken/Plymouth Meeting/Norristown/King of Prussia area is a unique and key location in the region. It has a large and expanding concentration of employment centers and other attractions, such as retail, recreation, and government centers. This area, which is bisected by the Schuylkill River, is home to over 250,000 residents and the location of over 200,000 jobs. A large number of these commuters must cross the Schuylkill River on their journey to work. Many expressways, including US 422, I-76, I-276, and I-476 come together in this area. All except I-76 cross the Schuylkill River. However, the number of non-expressway river crossings is limited and all of these crossings experience recurring congestion in both the AM and PM peak periods.

Montgomery County's Comprehensive Plan and other planning efforts have recognized the need for additional Schuylkill River crossing capacity. Easing the river crossing bottleneck is necessary to continue the employment growth on reused brownfield sites located in this area, which is central to the region, rather than on greenfield sites at the region's edge.

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Chapter II of this report documents the existing characteristics of the study area including current daily and AM and PM peak hour traffic volumes, operating conditions at several key intersections in the area, and the results of a video license plate survey of bridge users. Chapter III describes the alternatives analyzed in the study. Chapter IV explains the travel forecasting methodology, including a description of the travel simulation model used to develop the traffic projections. The study area's population and employment projections, which provide necessary inputs into the travel model, are also presented in this chapter. Chapter V presents an analysis of the requested daily and peak hour traffic forecasts and 2030 operating conditions under each alternative. Finally, conclusions drawn from the traffic study are listed in Chapter VI.

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II. CHARACTERISTICS OF THE STUDY AREA

The study area is shown in Figure 1. It extends from Upper Merion Township to Lower Merion Township on the west side of the Schuylkill River and includes the boroughs of Bridgeport, West Conshohocken, and Narberth. On the east side of the river, the study area extends from West Norriton Township to the Manayunk and Roxborough area of Philadelphia. Included on the eastern side are the boroughs of Norristown and Conshohocken, as well as East Norriton, Plymouth, Whitemarsh, Whitpain, and Springfield townships.

Of particular concern in this study area are the non-expressway river crossings. They include the Dannehower (US 202 South) and DeKalb Street bridges between Norristown and Bridgeport boroughs, the Matsonford/Fayette Street Bridge connecting Conshohocken and West Conshohocken boroughs, and the Green Lane/Belmont Avenue Bridge between Lower Merion Township and Manayunk.

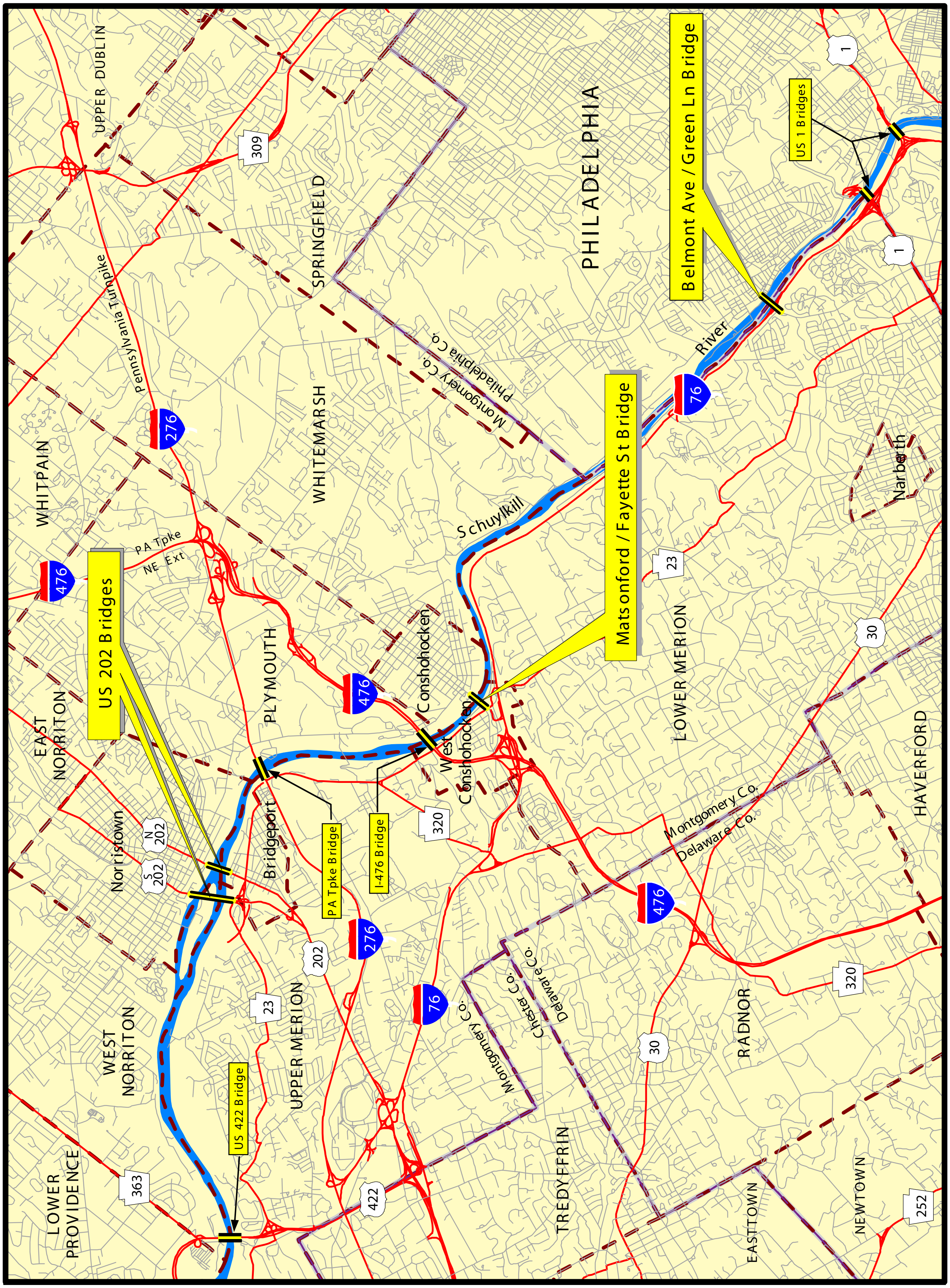
This chapter presents the current daily traffic volumes, AM and PM peak hour intersection turning volumes and levels of service, and the results from a survey of bridge users.

A. Current Average Daily Traffic Volumes

The Dannehower and DeKalb Street bridges are both designated as US 202. Although both serve two-way traffic, the Dannehower Bridge is designated US 202 South and the DeKalb Street Bridge is signed as US 202 North. Further east of the river, DeKalb Street becomes one-way northbound. The Dannehower Bridge is a four-lane principle arterial that connects DeKalb Pike in Upper Merion Township with Markley Street in Norristown Borough. From its intersection with DeKalb Street in Upper Merion Township, DeKalb Pike is a limited-access facility with an interchange with PA 23, and continues across the Schuylkill River on the Dannehower Bridge to a signalized intersection at Main Street. Within this area, DeKalb Street remains an at-grade facility, with intersections with several local roads.

Currently, the Dannehower Bridge carries about 28,900 vehicles across the Schuylkill River each day, while the daily volume on the DeKalb Street Bridge is about 19,600 vehicles per day (vpd). Nearby, the Pennsylvania Turnpike (I-276) also crosses the Schuylkill River, carrying over 66,000 vehicles on an average day. Other notable facilities in the Norristown/Bridgeport area include US 202 between Saulin Boulevard and the junction of the DeKalb Street and Dannehower bridge approaches, with an average daily traffic (ADT) volume of 36,400 vpd; Ridge Pike and Conshohocken Road north of I-276, with 28,500 and 17,200 vpd, respectively; PA 23, whose traffic varies from 9,700 to 12,200 vpd; and Main Street in Norristown, with 16,100 to 23,000 vpd.

Figure 1. Location of Schuylkill River Crossings within the Study Area



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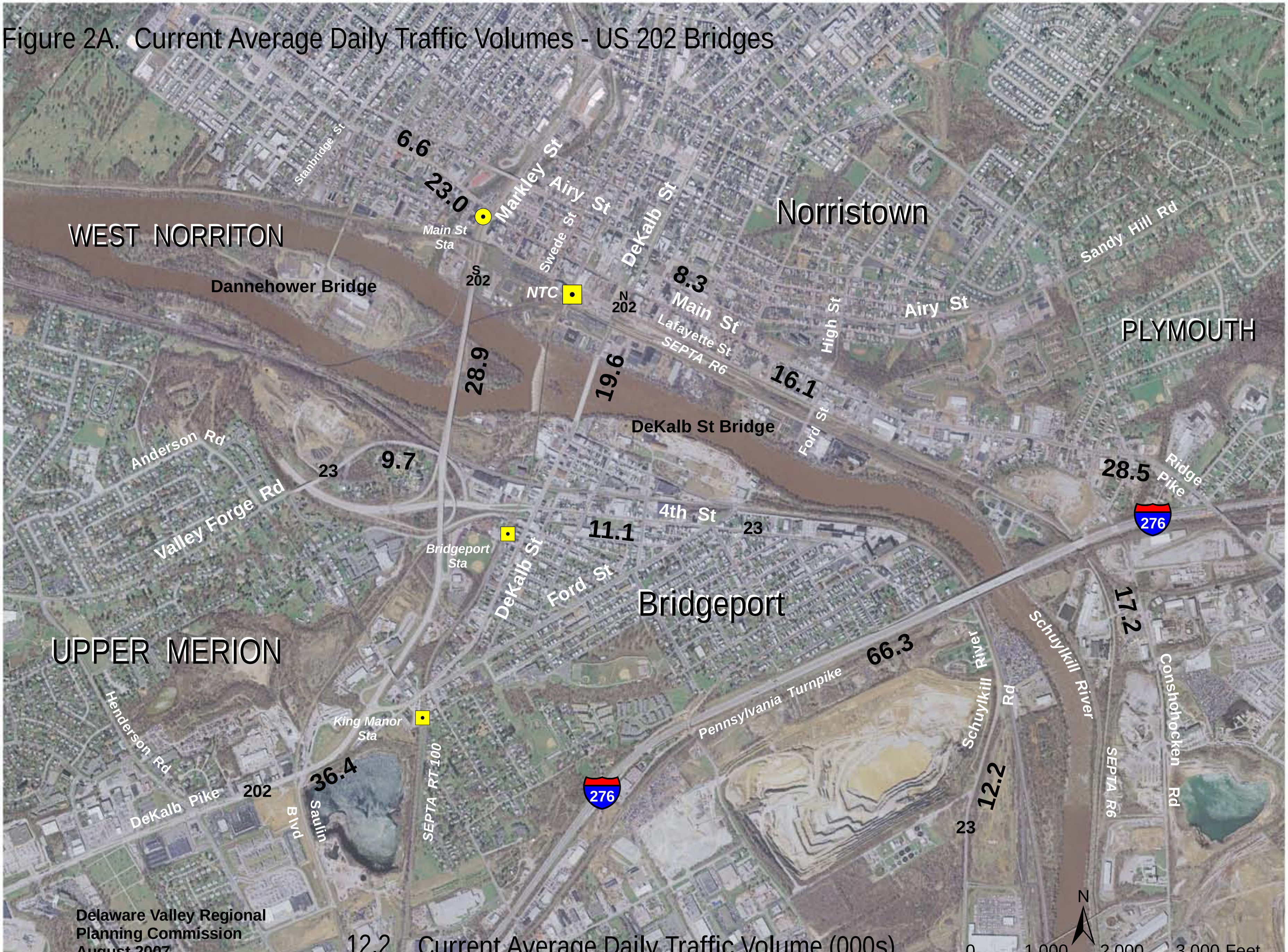
In the Conshohocken/West Conshohocken area, two facilities cross the Schuylkill River: Interstate 476, with an ADT of 113,400, and the Matsonford/Fayette Street Bridge, which carries 38,400 vpd. The latter is by far the highest volume of any non-expressway bridge in the study area. On the Conshohocken side of the river, Fayette Street carries 17,600 vpd and Elm Street 6,800 to 14,100 vpd. PA 23 also passes through the West Conshohocken portion of the study area, but with higher volumes than in the Norristown/Bridgeport area: 20,900 vpd between Balligomingo Road and Ford Street and 18,1000 vpd between the I-76 overpass and Arrowmink Road. Within West Conshohocken Borough, ramps from I-476 and I-76 converge onto Matsons Ford Road just west of the bridge, contributing to Matsons Ford Road's daily volume of 27,200 vpd. The Schuylkill Expressway (I-76) in this area carries 113,500 vpd in its four-lane cross-section, which is nearly equal to the volume carried by the six-lane section of I-476.

Further south, on either side of the Belmont Avenue/Green Lane interchange, the Schuylkill Expressway carries between 116,900 and 120,900 vpd. Its ramps at this interchange carry between 5,000 and 7,700 vpd, which contribute to the 24,800 vehicles per day that cross the Belmont Avenue/Green Lane Bridge. Main Street in Manayunk carries between 11,200 and 17,400 vpd, while Green Lane carries 10,300.

Figure 2A displays the current daily traffic volumes in the Dannehower and DeKalb Street bridge area; Figure 2B shows the current volumes in the vicinity of the Matsonford/Fayette Street Bridge; and Figure 2C provides daily volumes for the Belmont Avenue/Green Lane Bridge area.

Figure 2A. Current Average Daily Traffic Volumes - US 202 Bridges



12.2 Current Average Daily Traffic Volume (000s)

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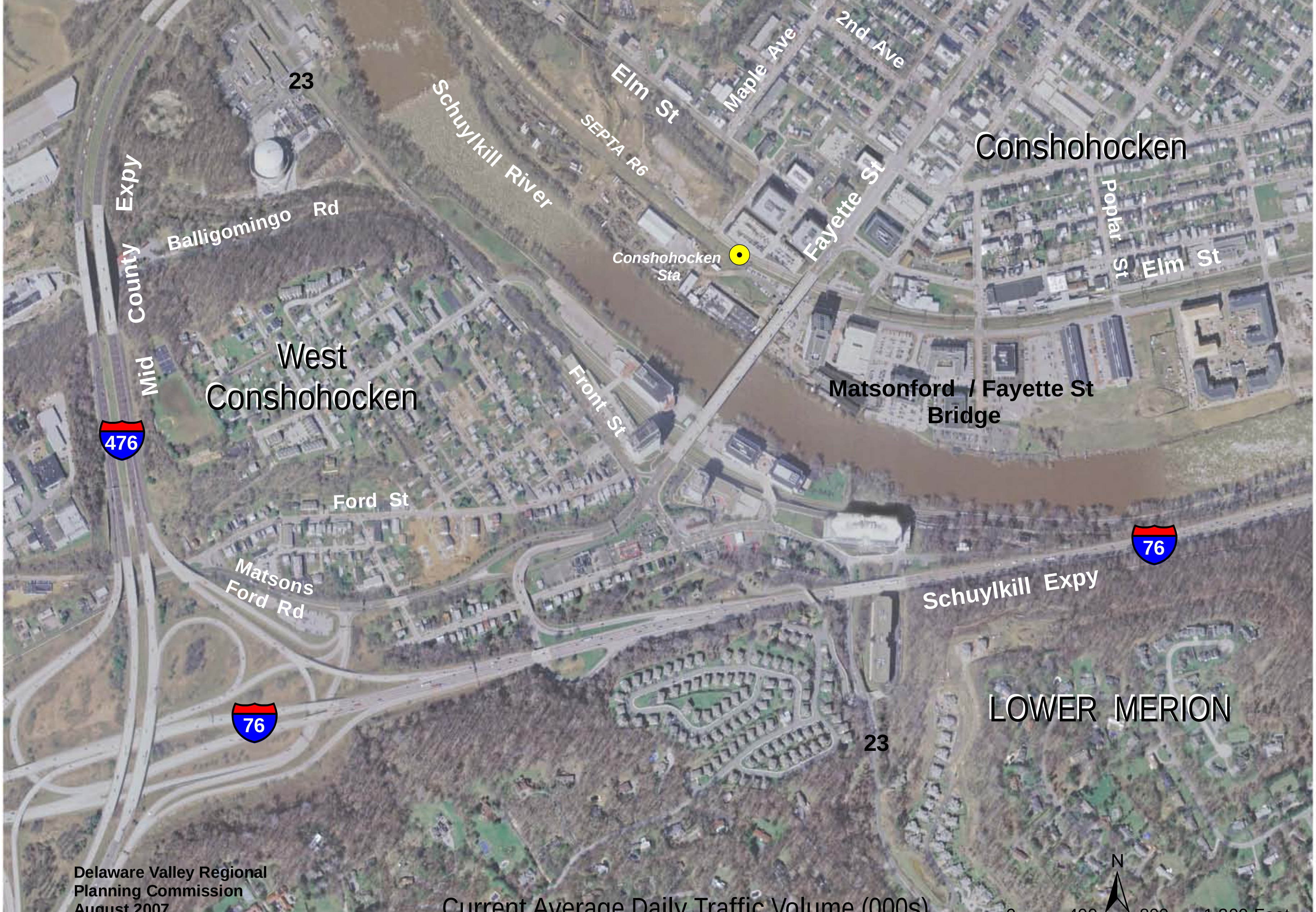
Figure 2B. Current Average Daily Traffic Volumes - Matsonford / Fayette St Bridge



Current Average Daily Traffic Volume (000s)

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Figure 2C. Current Average Daily Traffic Volumes - Belmont Avenue / Green Lane Bridge

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Current Average Daily Traffic Volume (000s)

B. Current Peak Hour Volumes and Levels of Service

AM and PM peak hour turning movement counts were collected at 11 key signalized intersections at the approaches to the Dannehower, DeKalb Street, Matsonford/Fayette Street, and Belmont Avenue/Green Lane bridges. The locations of these intersections are shown in Figure 3. These intersections represent the first signalized intersection at either end of each bridge. Additional intersections are also included when another signalized intersection is in close proximity and may affect the operations of one of the intersections at the foot of a bridge.

The average vehicle delay at each intersection was calculated using the methods prescribed in the *2000 Highway Capacity Manual* (HCM), and is expressed as overall intersection Level of Service (LOS). Level of Service is a qualitative measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six LOS are defined for each type of facility. Letter grades designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each LOS represents a range of operating conditions and the driver's perception of those conditions. For signalized intersections, LOS is a function of the delay associated with the traffic signal control and is determined via the following tabulation:

Average Control Delay per Vehicle (seconds)	Level-of-Service
0 - 10	A
10 - 20	B
20 - 35	C
35 - 55	D
55 - 80	E
80+	F

According to the HCM, control delay is the portion of the total delay attributed to traffic signal operation for signalized intersections. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay.

Although only the overall intersection LOS is reported in this chapter, it is important to note that a LOS can also be determined for each individual intersection approach and for each individual turning movement within an intersection. For example, a heavy left-turn movement may be subject to much greater delay, and hence a worse LOS, than the average experienced by all vehicles that pass through the intersection.

Figure 3. Intersection Locations for Turning Movement Volumes and Levels-of-Service

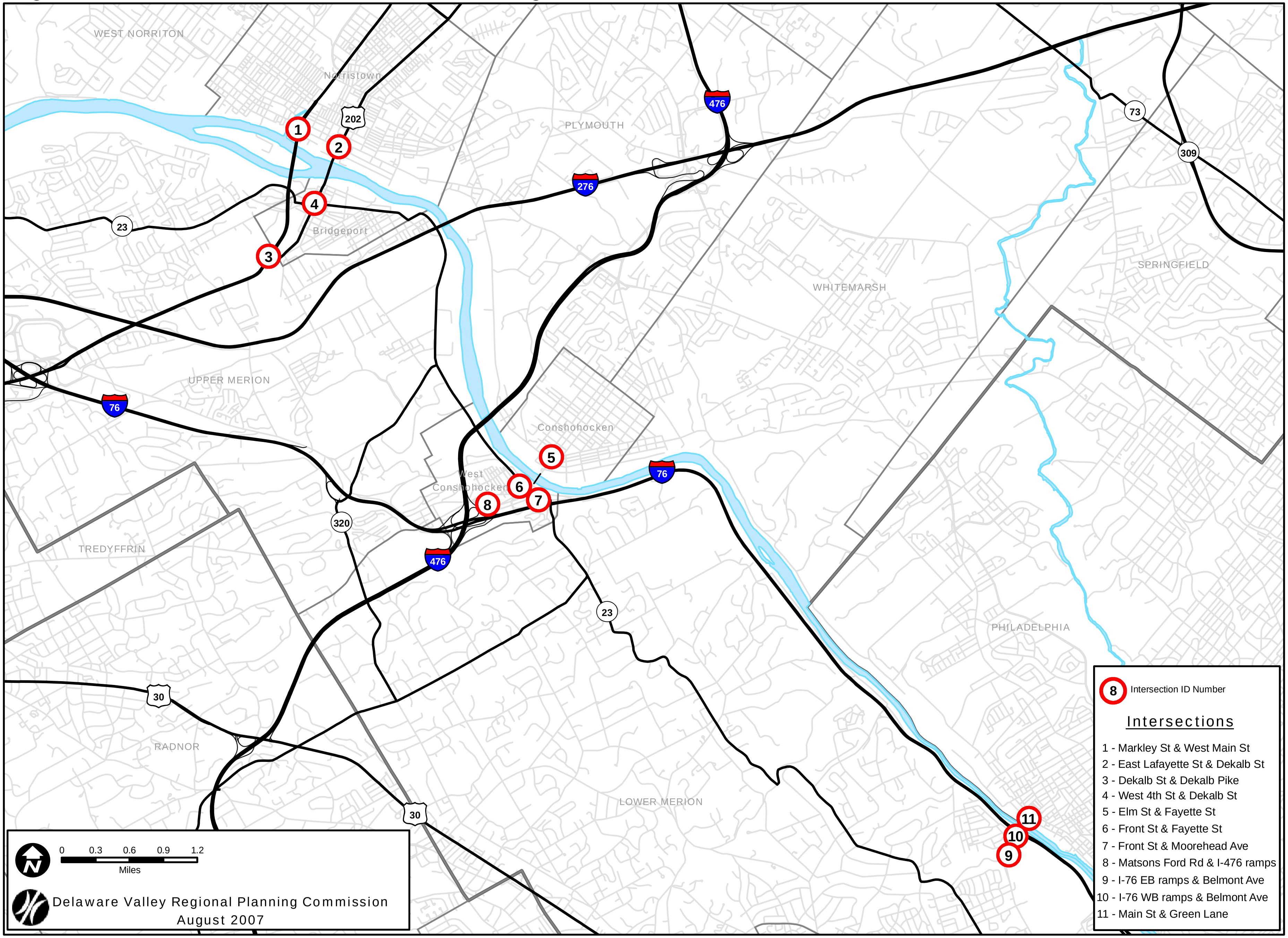

Figure 4 displays the current AM and PM peak hour intersection turning volumes, the time of day when each peak hour occurs, and the corresponding overall intersection level of service. Average delays and the level of service for the approaches to each intersection are provided in Appendix A.

The Norristown intersections at the ends of the Dannehower and DeKalb Street bridges both operate at LOS E in the AM peak hour and LOS F in the PM peak hour. There are very heavy left-turn movements from the Dannehower Bridge (Markley Street) to West Main Street in the PM peak hour (578 vehicles) and from East Lafayette Street onto the DeKalb Street Bridge in both the AM and PM peak hours (623 and 587 vehicles, respectively).

On the Bridgeport side of the river, the intersections on the Dannehower and DeKalb Street bridges operate with less delay, compared to the Norristown side. The DeKalb Pike/DeKalb Street intersection operates at LOS E and LOS D in the AM and PM peak hours, respectively, despite heavy left-turn volumes from DeKalb Street to DeKalb Pike in both peak hours. The DeKalb Street/West 4th Street/PA 23 intersection at the foot of the DeKalb Street Bridge experiences LOS C and B in the AM and PM peak hours, respectively. However, this intersection is sometimes affected by the queue from the East Lafayette Street intersection, which can back up the entire length of the bridge and spill back across 4th Street.

Within Conshohocken Borough, the intersection of Fayette Street and Elm Street operates at LOS C in the AM peak hour and LOS E in the PM peak hour. In the PM peak hour, nearly 3,000 vehicles flow across the Matsonford/Fayette Street Bridge into Conshohocken Borough, while an additional 1,500 exit Conshohocken via the bridge. At the other end of the bridge, in West Conshohocken Borough, the intersection of Fayette and Front streets operates at LOS F in both the AM and PM peak hours. This intersection has the highest delays of any in the study area. It not only carries traffic between the Matsonford/Fayette Street Bridge and interstates 76 and 476, but it also carries PA 23 traffic through West Conshohocken Borough. As a result, all four approaches have heavy left-turning volumes in both the AM and PM peak hours. In the AM peak, left-turn volumes range from 389 to 556 vehicles, while in the PM peak hour they range from 230 to 715 vehicles.

Immediately adjacent to this intersection is the Moorehead Avenue/Crawford Avenue/Front Street intersection. In the eastbound direction, PA 23 continues from Front Street to Crawford Avenue via a left turn. Even though the only heavy movements at this intersection are that left turn and the corresponding right turn in the westbound direction, the intersection operates at LOS D in both the AM and PM peak hours. In contrast, the intersection of Matsons Ford Road and ramps to and from I-476 operates at LOS C in both peak hours.

Figure 4A. Current AM & PM Peak Hour Intersection Turning Movement Counts and Levels of Service

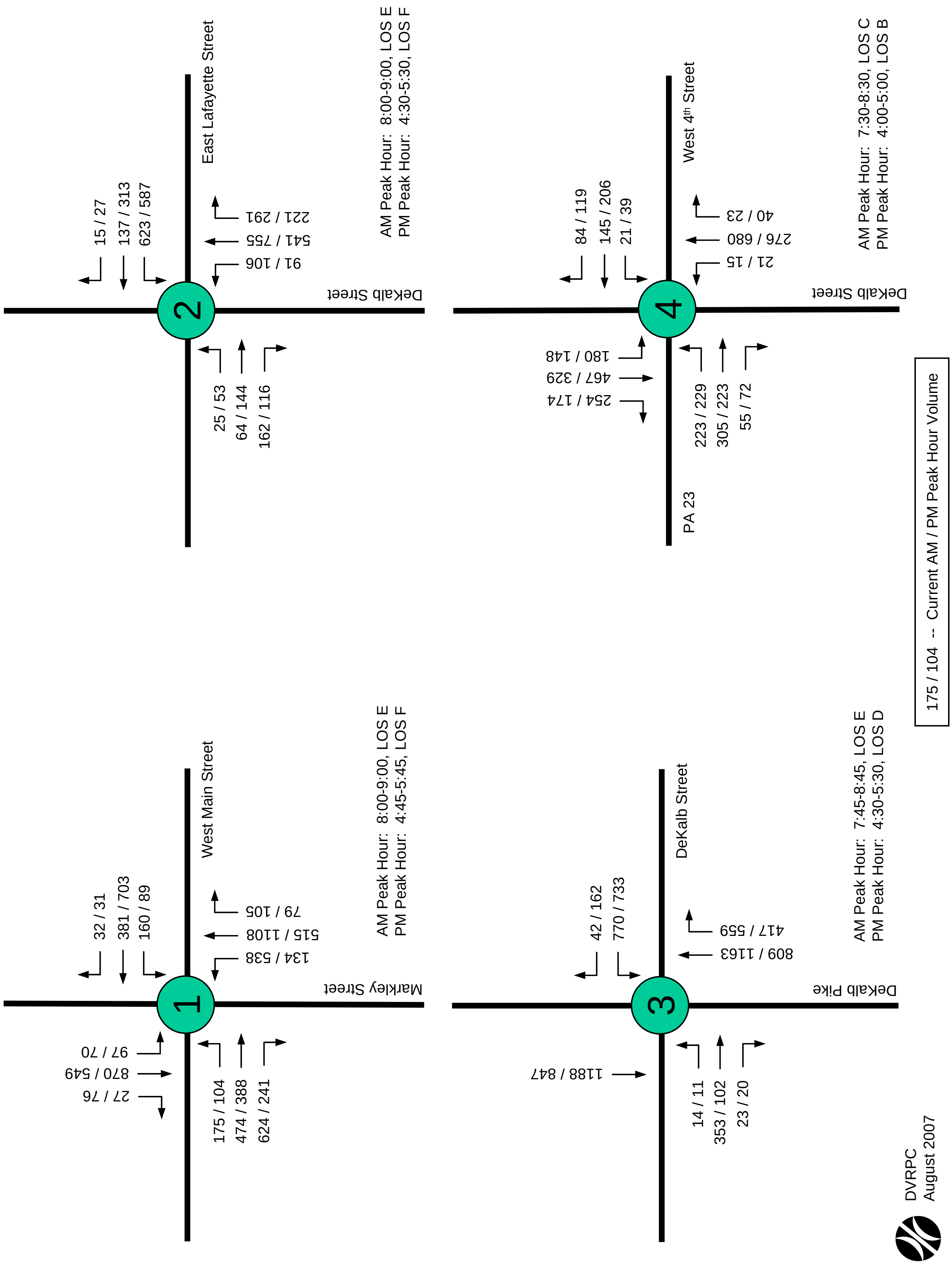

Figure 4B. Current AM & PM Peak Hour Intersection Turning Movement Counts and Levels of Service

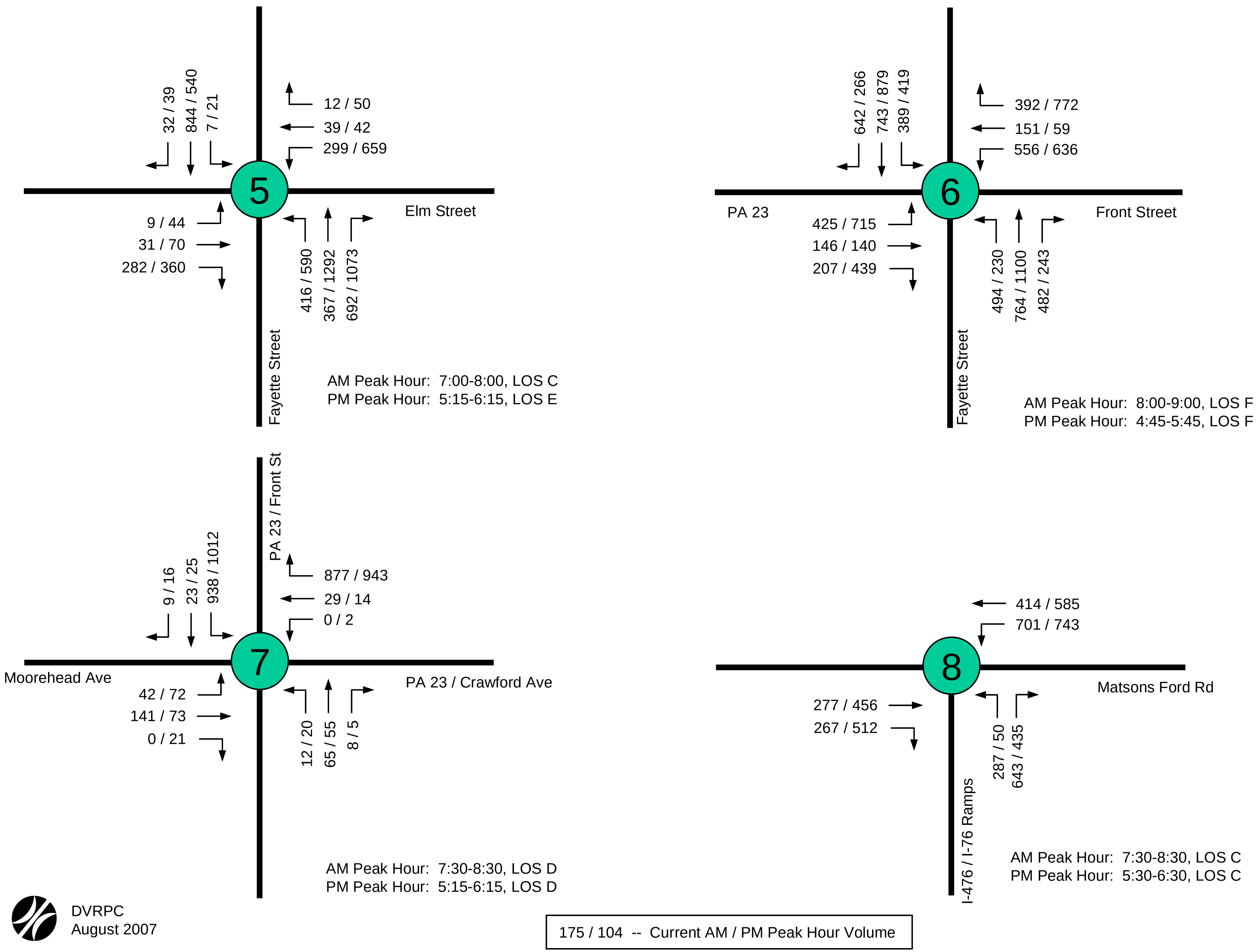

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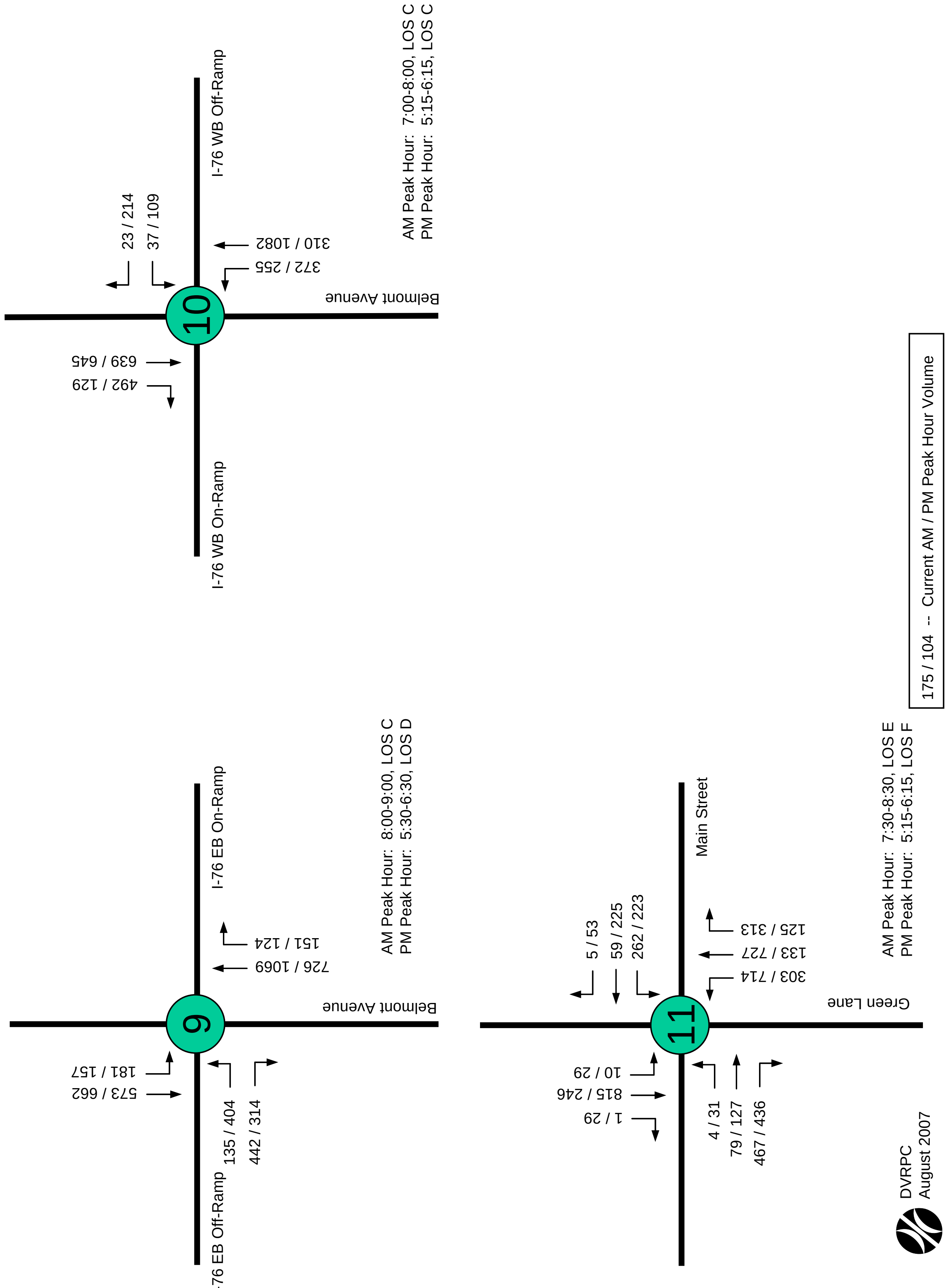
Figure 4C. Current AM & PM Peak Hour Intersection Turning Movement Counts and Levels of Service



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At the Lower Merion Township side of the Belmont Avenue/Green Lane Bridge, there are two closely spaced signalized intersections at the Schuylkill Expressway interchange. While both of these intersections operate at LOS C or D, their close proximity and short left-turn storage lengths often result in queues from one intersection spilling back and affecting traffic operations at the other intersection. On the Manayunk side of the bridge, the Green Lane/Main Street intersection operates at LOS E in the AM peak hour and LOS F in the PM peak hour. During the PM peak hour, there is an especially heavy left-turn volume of 714 vehicles from the bridge onto Main Street.

C. License Plate Survey

A video license plate survey was conducted in 2006 to determine the registered location of vehicles crossing the Dannehower, DeKalb Street, Matsonford/Fayette Street, and Belmont Avenue/Green Lane bridges during the AM and PM peak periods. Traffic crossing these bridges was videotaped, their license plates were recorded, and the address on the vehicle registration, which was provided by the Pennsylvania Department of Transportation, was geocoded and mapped. The purpose of the survey was to determine the relative proportions of local, regional, and long-distance traffic served by the non-expressway bridges in the study area and to identify "travel sheds" for each bridge by direction for the AM and PM peak periods.

Each bridge was videotaped from 7:00 to 9:00 AM and from 4:00 to 6:00 PM in each direction. A sample of license plates was selected to be geocoded. About 1,500 to 2,000 records were mapped for each bridge. The registered location for these bridge users is provided in Figure 5. The points in the figure are color-coded by bridge. Dannehower Bridge users are shown in red, DeKalb Street Bridge users in orange, Matsonford/Fayette Street Bridge users in blue, and Belmont Avenue/Green Lane Bridge users in green. Circles are used to represent AM peak period travel in the eastbound direction. Squares are used for eastbound, PM peak period travel. Westbound travel is represented by triangles in the AM peak period and by pentagons in the PM peak period. Similar maps for each individual bridge are provided in Appendix B.

An examination of Figure 5 shows that a large proportion of the traffic using each of the non-expressway bridges in the study area is local in nature. For example, there are large concentrations of Dannehower and DeKalb Street bridge users who reside in Norristown and Bridgeport boroughs. Similarly, there is a large concentration of Belmont Avenue/Green Lane Bridge users who live in the Manayunk and Roxborough areas of Philadelphia. The Matsonford/Fayette Street Bridge also exhibits concentrations of bridge users in Conshohocken and West Conshohocken boroughs; however, this bridge seems to attract travelers from a wider area than the others. This is likely due to two reasons: the dense concentration of office buildings near the ends of the bridge, which attract workers from throughout the region, and the proximity of the bridge interchanges for the heavily traveled 476 and 76 interstates.

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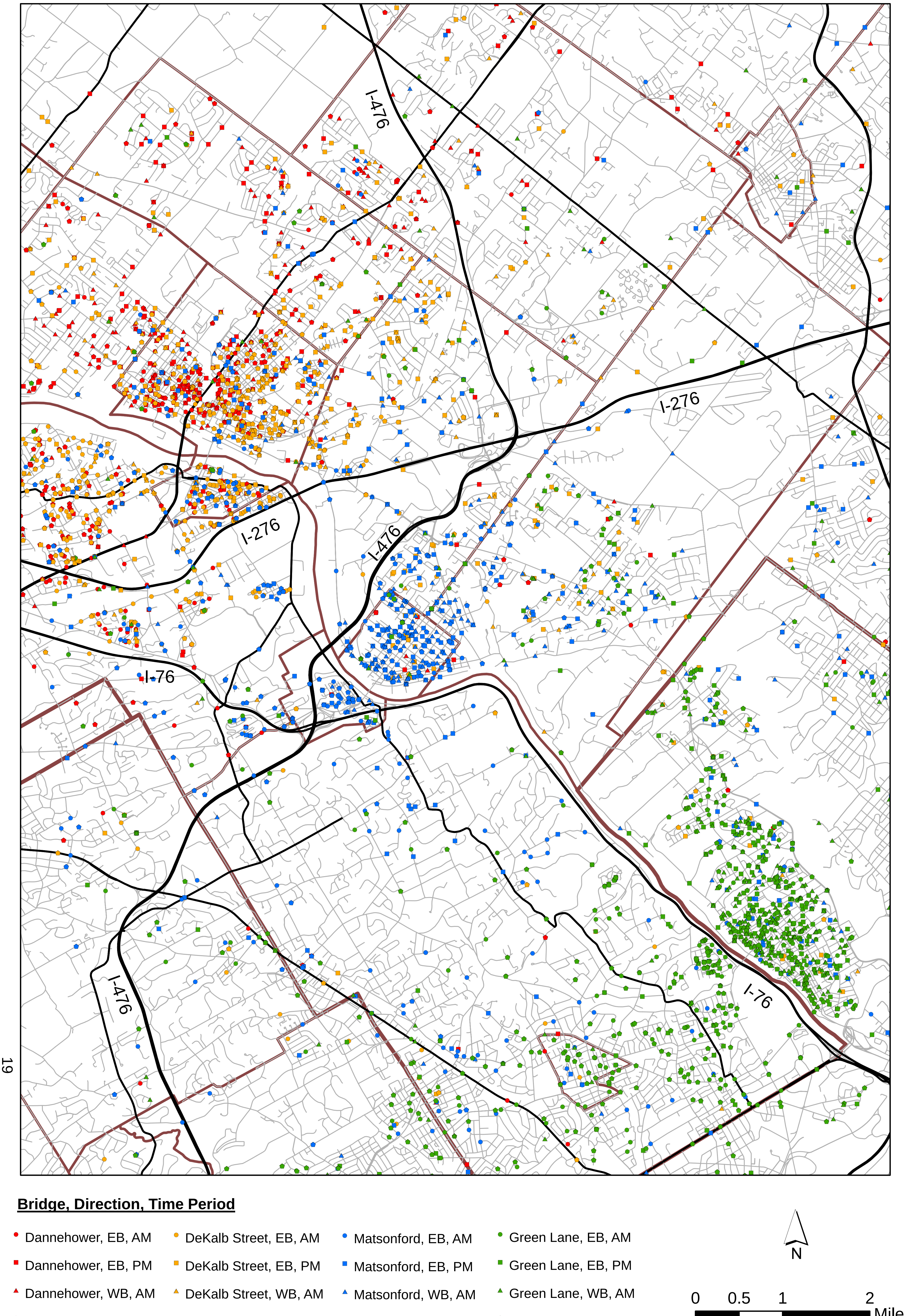
Figure 5. Registered Location of Bridge Users within the Study Area



DVRPC, September 2007

III. IMPROVEMENT ALTERNATIVES

Traffic forecasts are prepared and evaluated for the year 2030 under three different highway network alternatives: a No-Build and two Build alternatives. For each of these alternatives, DVRPC's travel simulation model is modified to reflect the alternative under consideration and is used to prepare travel forecasts representative of that scenario. The No-Build Alternative provides a useful future-year reference against which any impacts associated with the Build alternatives may be compared and quantified.

A. No-Build Alternative

The No-Build Alternative does not include any changes to the transportation network that directly impact the Dannehower, DeKalb Street, Matsonford/Fayette Street, or Belmont Avenue/Green Lane bridges. This alternative does, however, include improvements to other regional facilities that are included in DVRPC's Transportation Improvement Program (TIP) or Long Range Plan that are currently under construction or in design that may have an impact on travel patterns in the study area.

These TIP and Plan projects include the US 422 River Crossing Complex project, which will modernize the US 422/PA 23 and US 422/PA 363 interchanges, widen US 422 from US 202 through PA 363, and reopen the Betzwood Bridge to vehicular traffic and the widening of the Pennsylvania Turnpike between Valley Forge and Norristown. Also part of the No-Build Alternative are several improvements to US 202, including widening from Johnson Highway to Welsh Road and from the Exton Bypass to PA 401, as well as several closed-loop traffic signal projects.

B. Build Alternative 1

Build Alternative 1 is designed to analyze the impacts of several previously proposed projects in the study area that directly impact the non-expressway bridges. Elements of this alternative include the PA 23 Relocation project, which will construct a four-lane controlled-access highway approximately 3.5 miles in length between US 422 and its current interchange with US 202 just south of the Dannehower Bridge. An additional element that may also affect Dannehower Bridge traffic, as well as DeKalb Street Bridge traffic, is the Lafayette Street Extension project. This project involves constructing a partial interchange at the Dannehower Bridge/Lafayette Street intersection in Norristown, widening and extending Lafayette Street past its terminus at Ford Street to Conshohocken Road, and building a full slip-ramp interchange to connect Lafayette Street to the Pennsylvania Turnpike.

A third element of Alternative 1 is the widening of the Matsonford/Fayette Street Bridge and associated intersection improvements. This project would widen the bridge to provide additional turn-lane storage at Front Street and a second eastbound through lane at Elm Street; modify the existing intersection of Matsons Ford Road at the I-76 eastbound on- and westbound off-ramps by constructing a signalized “T” intersection; widen Matsons Ford Road to provide additional through and turn lanes at its intersection with the I-476 ramps; and improve the intersection of Front Street and Matsons Ford Road by providing a second right-turn lane from Front Street onto the Matsonford/Fayette Street Bridge.

The final element of Alternative 1 is the widening of Belmont Avenue from Rock Hill Road to its intersection with the I-76 eastbound on- and off-ramps and associated improvements at the intersections of Belmont Avenue/Rock Hill Road, Belmont Avenue/Old Belmont Avenue, and Rock Hill Road/Conshohocken State Road.

C. Build Alternative 2

Build Alternative 2 is designed to increase the capacity of the Schuylkill Expressway in the vicinity of its interchange with I-476, especially for the I-476 southbound to I-76 eastbound movement. The goal of this alternative is to prevent this traffic from diverting to the Matsonford/Fayette Street Bridge and accessing the Schuylkill Expressway from the Matsons Ford Road on-ramp. Currently, the combination of a left-hand merge from I-476 southbound followed by on-ramps from I-476 northbound and Matsons Ford Road, all feeding into the two-lane Schuylkill Expressway section, causes extensive delays on a recurring basis in this area that often extend back onto I-476 and affect southbound through traffic. Some motorists try to avoid this delay by diverting to the Matsonford/Fayette Street Bridge and merging onto I-76 eastbound at the front of the bottleneck.

Build Alternative 2 includes limited widening of I-76 in this area to allow the traffic from I-476 southbound to access I-76 eastbound in its own lane, rather than by merging with traffic in the left lane of I-76. This widening would continue for about one-half mile past the Matsons Ford Road interchange to ease the “turbulence” associated with traffic merging from I-476 northbound and from Matsons Ford Road.

Complimentary widening of I-76 in the westbound direction is also included in Build Alternative 2. This additional lane would more readily separate westbound through traffic from traffic exiting at Matsons Ford Road or to I-476 northbound, again reducing the turbulence associated with the lane changing and deceleration of exiting vehicles.

Finally, the I-476 southbound off-ramp to I-76 would be modified to provide two exiting lanes of traffic. This would provide additional storage, if needed, to ensure that any queues from the interchange would not affect the I-476 southbound mainline by blocking one or more travel lanes, which sometimes occurs now.

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. Socioeconomic 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 multistep, multisource 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 socioeconomic 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. Schuylkill Crossings Study Area Forecasts

As part of the Schuylkill Crossings 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. Based on this review, DVRPC developed 2030 municipal-level population and employment forecasts for use as inputs to the traffic simulation models. Table 1 summarizes the population and employment forecasts used in the study.

Between 2005 and 2030, the total population in the greater study area is projected to increase by 12,939 residents to 288,840. The municipalities that will have the greatest number of new residents include Whitpain and West Norriton townships, Conshohocken Borough, and the Roxborough/Manayunk area of Philadelphia. All of these areas are projected to add 1,700 or more new residents between 2005 and 2030.

The study area will also add over 30,000 new jobs between 2005 and 2030, an increase of 14 percent. Municipalities that are projected to add 3,000 or more new jobs include Conshohocken and Norristown boroughs, and Plymouth and Upper Merion townships.

Because the study area’s employment will grow much faster than its population between 2005 and 2030, there will be an increase in the proportion of workers who commute into the study area from the surrounding portions of the region.

Table 1. Population and Employment in the Study Area

Municipality	Population 2000	Population 2005	Population 2030	2005 - 2030 Change Absolute	2005 - 2030 Change Percent	Employment 2000	Employment 2005	Employment 2030	2005 - 2030 Change Absolute	2005 - 2030 Change Percent
Bridgeport Borough	4,371	4,428	5,300	872	19.7%	1,803	1,778	1,800	22	1.2%
Conshohocken Borough	7,589	7,757	9,500	1,743	22.5%	6,597	6,713	10,000	3,287	49.0%
East Norriton Township	13,211	13,594	13,500	-94	-0.7%	7,293	7,491	9,100	1,609	21.5%
Lower Merion Township	59,850	58,568	59,500	932	1.6%	43,287	43,975	44,450	475	1.1%
Narberth Borough	4,233	4,179	4,190	11	0.3%	1,542	1,551	1,500	-51	-3.3%
Norristown Borough	31,282	30,873	31,500	627	2.0%	15,053	15,118	18,200	3,082	20.4%
Plymouth Township	16,045	16,341	17,000	659	4.0%	20,845	21,169	30,300	9,131	43.1%
Springfield Township	19,533	19,412	19,320	-92	-0.5%	7,491	7,578	7,500	-78	-1.0%
Upper Merion Township	26,860	27,131	28,480	1,349	5.0%	52,424	54,144	62,400	8,256	15.2%
West Conshohocken Borough	1,446	1,521	1,500	-21	-1.4%	2,988	3,168	3,800	632	19.9%
West Norriton Township	14,901	14,931	16,720	1,789	12.0%	7,438	7,481	8,550	1,069	14.3%
Whitemarsh Township	16,702	17,259	18,330	1,071	6.2%	15,493	15,756	16,700	944	6.0%
Whitpain Township	18,562	19,019	21,000	1,981	10.4%	19,731	20,521	21,750	1,229	6.0%
Roxborough / Manayunk, Philadelphia	41,568	40,888	43,000	2,112	5.2%	12,013	12,196	13,116	920	7.5%
Study Area Totals	**276,153**	**275,901**	**288,840**	**12,939**	**4.7%**	**213,998**	**218,639**	**249,166**	**30,527**	**14.0%**

B. DVRPC's Travel Simulation Process

For the Schuylkill Crossings 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 onto 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 reexecutes 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 study area 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 6 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.

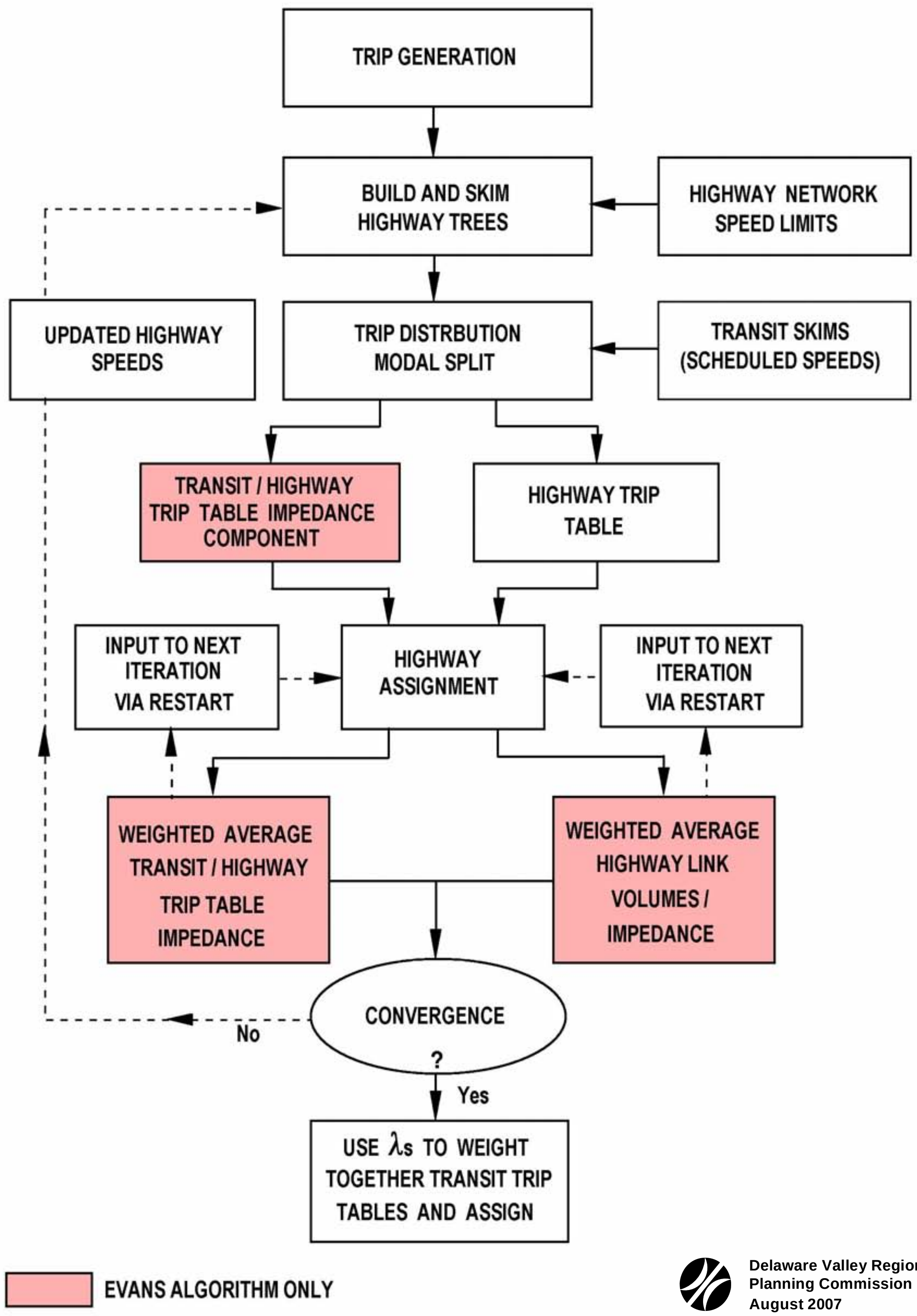
1. Trip Generation

Both internal trips (those made within the DVRPC region) and external trips (those that 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 that 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 nonwork 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 is 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 6. DVRPC's Travel Modeling Process



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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 trips, 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 each alternative. 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 tested. 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 socioeconomic and land use inputs reflective of 2030 conditions.

The following tabulation summarizes the aggregate error in the assigned daily traffic volumes. A total of 40 locations in the study area with available daily traffic counts were used for model validation. Ten of these locations are Schuylkill River crossings between US 422 and US 1; 11 are other facilities in the Norristown area, including approaches to the Dannehower and DeKalb Street bridges; nine are in the Conshohocken area; and ten are in the Manayunk area. The total assigned traffic on all facilities, 1.17 million vehicles, is within 2.8 percent of the total counted volume of 1.21 million vehicles, as shown below:

Facilities	Number of Locations	Counted Volume	Simulated Volume	Difference	Percent Difference
Schuylkill River Bridges	10	585,373	560,808	-24,565	-4.2 %
Norristown Area Roads	11	185,761	186,383	622	0.3 %
Conshohocken Area Roads	9	230,529	218,171	-12,358	-5.4 %
Manayunk Area Roads	10	204,725	206,838	2,113	1.0 %
All Facilities	**40**	**1,206,388**	**1,172,200**	**-34,188**	**-2.8 %**

V. PROJECTED TRAFFIC VOLUMES

Year 2030 projected traffic volumes are presented and analyzed in this chapter. For each alternative, a daily traffic forecast is prepared at each location where a current count was provided in Chapter II. In addition, AM and PM peak hour intersection turning movement forecasts are provided for each alternative at the intersections shown in Figure 3. AM and PM peak hour intersection operations, expressed as a Level of Service are also included for the turning movement forecasts.

A. Daily Traffic Forecasts

Figure 7 provides the 2030 average daily traffic volumes for the No-Build and Build alternatives. In the figure, No-Build volumes are shown in red, underneath the line representing the highway links. Daily traffic volumes for Build Alternatives 1 and 2 are shown above the line. Table 2 provides these same volumes, along with the current traffic counts, and comparisons between current and 2030 No-Build traffic volumes and between Build and No-Build volumes.

1. No-Build Alternative

Under the No-Build Alternative, 2030 volumes on the Dannehower and DeKalb Street bridges are projected to be 34,600 and 22,900 vehicles per day (vpd), respectively. These volumes represent increases of 5,700 and 3,300 daily vehicles, or 19.8 and 17.0 percent over current levels. The Pennsylvania Turnpike Bridge, which will be widened to six lanes in the future, has the largest increase of any facility in the study area under the No-Build Alternative: 14,200 vpd, or 21.5 percent, over existing volumes. Traffic volumes on the other Norristown area facilities will increase by 1,400 to 4,700 vpd. The largest of these occur on US 202 between Saulin Boulevard and the DeKalb Street intersection and on Main Street between Stanbridge Road and Markley Street.

The highest increase on facilities in the Conshohocken area occurs on I-476, which increases by 12,500 vpd to 125,900 vpd, and on I-76 which increases by 9,100 vpd to 122,600 vpd. These increases, however, represent only 11.0 and 8.0 percent over current volumes. The next highest increase occurs on the Matsonford/Fayette Street Bridge, which increases by 6,100 vpd, or 16.0 percent, to 44,500 vpd. All other Conshohocken area facilities increase by 970 to 3,600 vpd, with the smallest increases occurring on the Schuylkill Expressway ramps to and from Matsons Ford Road.

The Belmont Avenue/Green Lane Bridge increases by 13.4 percent, or by 3,300 daily vehicles to 28,100 vpd by 2030. Except for the Schuylkill Expressway, this is the highest increase of any of the Manayunk area facilities. The Schuylkill Expressway increases by 9,100 to 9,200 vpd in this area, which is about 7.5 to 7.9 percent above current volumes.

Figure 7A. 2030 Average Daily Traffic Volumes - US 202 Bridges

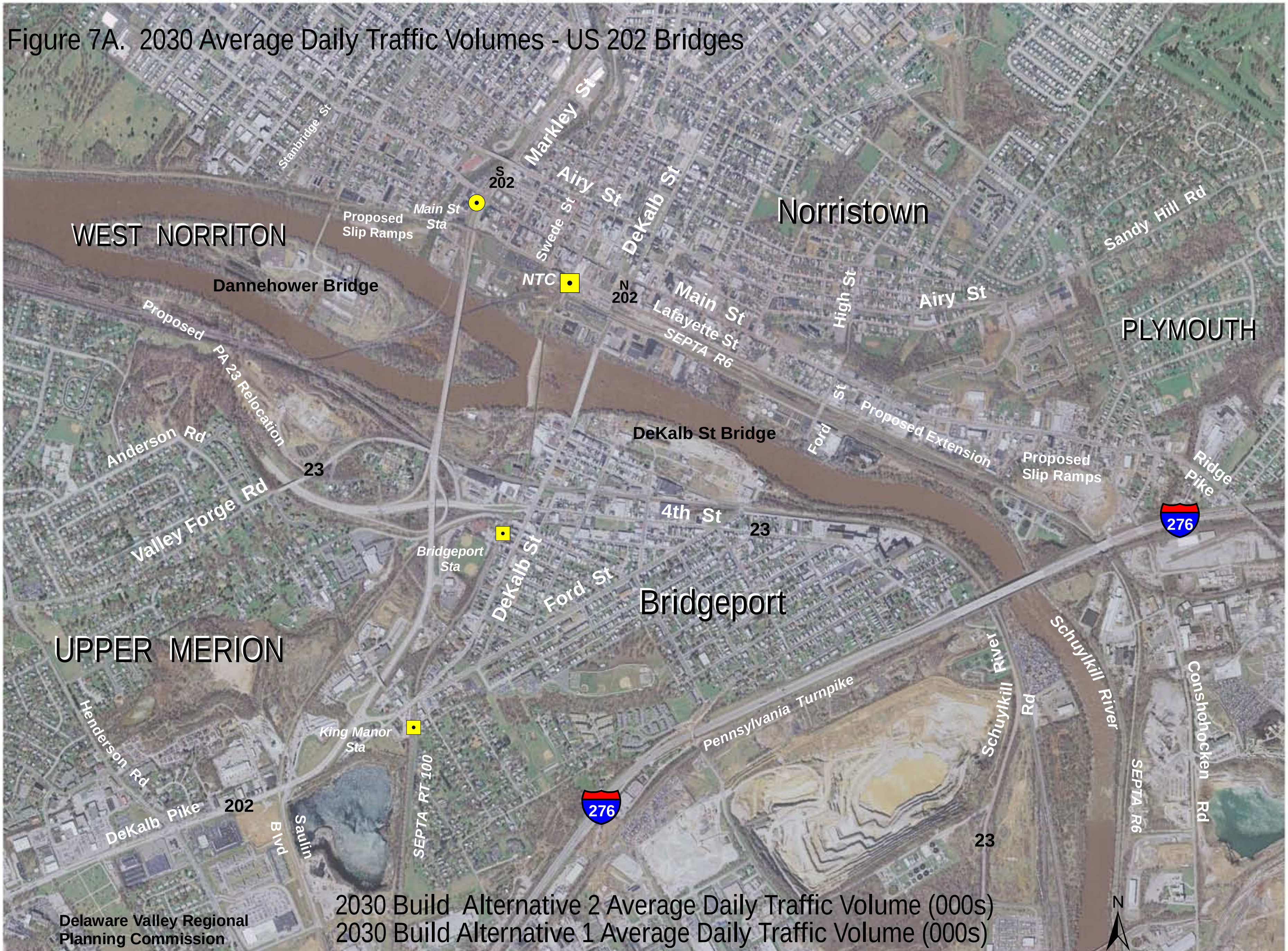


Figure 7B. 2030 Average Daily Traffic Volumes - Matsonford / Fayette St Bridge
Figure 7B. 2030 Average Daily Traffic Volumes - Matsonford / Fayette St Bridge
23
Schuylkill River
SEPTA R6
Elm St
Maple Ave
2nd Ave
Conshohocken
Conshohocken Sta
Fayette St
Poplar St
Elm St
Balligomingo Rd
Mid County Expy
476
West Conshohocken
Front St
Matsonford / Fayette St Bridge
Ford St
Matsons Ford Rd
76
Schuylkill Expy
76
LOWER MERION
23
2030 Build Alternative 2 Average Daily Traffic Volume (000s)
2030 Build Alternative 1 Average Daily Traffic Volumes (000s)
2030 No-Build Average Daily Traffic Volume (000s)
Delaware Valley Regional Planning Commission
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N
0 400 800 1,200 Feet

Figure 7C. 2030 Average Daily Traffic Volumes - Belmont Avenue / Green Lane Bridge

2030 No-Build Average Daily Traffic Volume (000s)

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Table 2. Current and 2030 Average Daily Traffic Volumes

Location	Current AADT	2030 No-Build AADT	Current to 2030 Difference	Current to 2030 Percent	2030 Build Alt 1 AADT	Build / No-Build Difference	Build / No-Build Percent	2030 Build Alt 2 AADT	Build / No-Build Difference	Build / No-Build Percent
Norristown Area Facilities										
US 202 North - Dannehower Bridge	28,870	34,600	5,730	19.8%	33,900	-700	-2.4%	34,500	-100	-0.3%
US 202 South - DeKalb St Bridge	19,581	22,900	3,319	17.0%	22,200	-700	-3.6%	23,000	100	0.5%
I-276 (PA Turnpike) - Valley Forge to Norristown	66,275	80,500	14,225	21.5%	83,300	2,800	4.2%	80,300	-200	-0.3%
US 202 - Saulin Blvd to DeKalb St Ramps	36,353	41,100	4,747	13.1%	40,700	-400	-1.1%	41,300	200	0.6%
PA 23 - Anderson Rd to PA 23 Overpass	9,714	11,300	1,586	16.3%	15,300	4,000	41.2%	10,900	-400	-4.1%
PA 23 - DeKalb St to Ford St	11,139	13,800	2,661	23.9%	14,100	300	2.7%	13,600	-200	-1.8%
PA 23 - PA Turnpike Overpass to PA 320 (Swedeland Rd)	12,167	15,100	2,933	24.1%	15,300	200	1.6%	14,900	-200	-1.6%
Main Street - Stanbridge Rd to Markley St	23,021	26,900	3,879	16.8%	29,100	2,200	9.6%	27,100	200	0.9%
Main Street - DeKalb St to Ford St / High St	16,114	18,800	2,686	16.7%	22,100	3,300	20.5%	19,100	300	1.9%
Airy Street - Stanbridge Rd to Markley St	6,630	8,200	1,570	23.7%	7,300	-900	-13.6%	8,100	-100	-1.5%
Airy Street - DeKalb St to High St	8,275	9,700	1,425	17.2%	9,300	-400	-4.8%	10,100	400	4.8%
Ridge Pike - Conshohocken Rd to I-276 Overpass	28,525	31,700	3,175	11.1%	28,900	-2,800	-9.8%	32,600	900	3.2%
Conshohocken Rd - Ridge Pike to I-276 Overpass	17,242	19,100	1,858	10.8%	19,600	500	2.9%	18,300	-800	-4.6%
Conshohocken Area Facilities										
I-476 Mid-County Expressway - Ridge Pike to I-76	113,394	125,900	12,506	11.0%	124,000	-1,900	-1.7%	128,700	2,800	2.5%
Matsonford / Fayette Street Bridge	38,373	44,500	6,127	16.0%	46,200	1,700	4.4%	43,700	-800	-2.1%
PA 23 - Balligomingo Rd to Ford St	20,936	23,500	2,564	12.2%	23,900	400	1.9%	22,900	-600	-2.9%
Matsons Ford Rd - I-476 NB Off-Ramp to I-76 Ramps Overpass	27,178	30,200	3,022	11.1%	31,000	800	2.9%	29,600	-600	-2.2%
I-76 EB On-Ramp - Matsons Ford Rd to I-76 EB	5,986	7,100	1,114	18.6%	7,500	400	6.7%	6,900	-200	-3.3%
I-76 WB Off-Ramp - I-76 WB to Matsons Ford Rd	6,331	7,300	969	15.3%	7,800	500	7.9%	7,200	-100	-1.6%
PA 23 - I-76 Overpass to Arrowmink Rd	18,052	20,500	2,448	13.6%	20,700	200	1.1%	20,200	-300	-1.7%
Elm Street - Maple Ave to Fayette St	6,788	8,200	1,412	20.8%	8,300	100	1.5%	8,000	-200	-2.9%
Elm Street - Fayette St to Poplar St	14,074	16,200	2,126	15.1%	16,500	300	2.1%	16,100	-100	-0.7%
Fayette Street - Elm St to 2nd Ave	17,641	21,200	3,559	20.2%	21,600	400	2.3%	20,500	-700	-4.0%
I-76 Schuylkill Expressway - PA 23 to Hollow Road	113,543	122,600	9,057	8.0%	123,100	500	0.4%	123,400	800	0.7%
Manayunk Area Facilities										
Belmont Ave / Green Lane Bridge	24,776	28,100	3,324	13.4%	29,200	1,100	4.4%	27,800	-300	-1.2%
I-76 Schuylkill Expressway - Hollow Road to Belmont Ave	120,881	130,000	9,119	7.5%	129,600	-400	-0.3%	130,500	500	0.4%
I-76 EB Off-Ramp - I-76 EB to Belmont Ave	7,069	8,200	1,131	16.0%	8,400	200	2.8%	8,300	100	1.4%
I-76 EB On-Ramp - Belmont Ave to I-76 EB	5,785	7,000	1,215	21.0%	7,500	500	8.6%	6,900	-100	-1.7%
I-76 WB Off-Ramp - I-76 WB to Belmont Ave	4,984	6,100	1,116	22.4%	6,500	400	8.0%	6,000	-100	-2.0%
I-76 WB On-Ramp - Belmont Ave to I-76 WB	7,716	8,800	1,084	14.0%	9,100	300	3.9%	8,800	0	0.0%
I-76 Schuylkill Expressway - Belmont Ave to US 1 (City Ave)	116,865	126,100	9,235	7.9%	126,100	0	0.0%	126,300	200	0.2%
Belmont Ave - Rock Hill Rd to I-76 EB Ramps	23,300	25,300	2,000	8.6%	28,100	2,800	12.0%	25,300	0	0.0%
Main Street - Leverington Ave to Green Lane	17,442	19,500	2,058	11.8%	19,700	200	1.1%	19,400	-100	-0.6%
Main Street - Green Lane to Grape St	11,237	12,600	1,363	12.1%	12,900	300	2.7%	12,800	200	1.8%
Green Lane - Main Street to Silverwood St	10,327	11,600	1,273	12.3%	11,900	300	2.9%	11,700	100	1.0%

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2. Build Alternative 1

In the Norristown area, under Build Alternative 1, daily traffic volumes crossing the Schuylkill River on the Pennsylvania Turnpike increase by 2,800 vpd, relative to the No-Build Alternative. The new interchange at the extension of Lafayette Street, under this alternative, allows traffic to use the Turnpike as an alternate to the Dannehower and DeKalb Street bridges to travel between the Norristown area and the King of Prussia area of Upper Merion Township. Much of the traffic using this interchange, however, is oriented to and from the east, as the volume on the Turnpike east of Lafayette Street is 6,600 vpd higher than the volume west of Lafayette Street (89,900 vs 83,300 vpd).

Traffic volumes on both the Dannehower and DeKalb Street bridges decrease by 700 vpd relative to the No-Build Alternative. The traffic reduction on the Dannehower Bridge is noteworthy because of the new partial interchange at Lafayette Street in Norristown and the improved nature of PA 23 on the other side of the river, both of which would tend to increase the attractiveness of this crossing and would result in higher volumes relative to the No-Build Alternative absent the new interchange at the Pennsylvania Turnpike. In fact, PA 23 carries an additional 4,000 vpd in the vicinity of the Dannehower Bridge.

Within the Conshohocken portion of the study area, the improvements made to the Matsons Ford Road approach to the Fayette Street Bridge tend to increase traffic volume on this bridge by 1,700 vpd. This represents an increase of only 4.4 percent over the No-Build Alternative, however. There is a corresponding reduction in traffic volume crossing the Schuylkill River on I-476 by 1,900 vpd. (The remaining 200 vpd reduction on I-476 is due to vehicles diverting to the Turnpike as a result of the new interchange at Lafayette Street). Other facilities in this portion of the study area experience very minor traffic volume increases relative to the No-Build Alternative, typically 500 vpd or less.

In the Manayunk area, the improvements to Belmont Avenue also increase the bridge volume by 4.4 percent, which in this case represents 1,100 vpd. A larger increase, 2,800 vpd, occurs on Belmont Avenue west of the Schuylkill Expressway. This increase in traffic between Belmont Avenue and I-76 is also evident in the increased traffic volumes on the I-76 on- and off-ramps at Belmont Avenue.

3. Build Alternative 2

Build Alternative 2 has only minor affects on traffic volumes outside of the Conshohocken portion of the study area. In the Norristown area, only Ridge Pike and Conshohocken Road experience more than a 400 vpd difference compared to the No-Build Alternative. Ridge Pike increases by 900 vpd and Conshohocken Road decreases by 800 vpd as traffic is diverted to the Ridge Pike interchange with I-476 in order to access the Schuylkill Expressway. In the Manayunk area, only the Schuylkill Expressway experiences more than a 200 vpd difference from the No-Build volume.

In contrast, traffic volumes on I-476 across the Schuylkill River increase by 2,800 vpd, to 128,700. About one-third of this increase is diverted from the Matsonford/Fayette Street Bridge. Matsons Ford Road, Fayette Street, and PA 23 all experience traffic volume reductions of 600 to 700 vpd relative to the No-Build Alternative. Smaller reductions in traffic volumes occur on numerous facilities spread throughout the entire study area. These include the Pennsylvania Turnpike, the Dannehower, and the Belmont Avenue/Green Lane bridges.

B. Peak Hour Forecasts and Levels of Service

This section discusses the AM and PM peak hour intersection turning movement forecasts, and the corresponding Levels of Service (LOS) for the No-Build and Build alternatives. For each future alternative, peak hour forecasts were developed for the intersections indicated in Figure 3. Signal timing plans and their resultant LOS were determined by using the optimization feature of the Highway Capacity Manual's signal timing software (HCS+).

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 2030 AM and PM peak hours 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, i.e., immediately before and after the peak hour.

1. No-Build Alternative

AM and PM peak hour intersection turning movement forecasts and overall intersection levels of service for the No-Build Alternative are provided in Figure 8. The levels of service provided in Figure 8 represent average values for the entire intersection. The delays and corresponding levels of service for the individual approaches for each intersection are contained in Appendix A.

Within Norristown Borough, the intersections of Markley and West Main streets and DeKalb and East Lafayette streets both operate at LOS F in the AM and PM peak hours. These intersections are characterized by heavy turning movements both onto and off of the Dannehower and DeKalb Street bridges. The Dannehower Bridge is forecasted to carry 940 vehicles into Norristown Borough and 1,830 vehicles out of Norristown during the 2030 AM peak hour. The corresponding volumes in the PM peak hour are 1,940 vehicles into Norristown and 1,040 vehicles from Norristown to Bridgeport Borough. Peak hour volumes on the DeKalb Street Bridge range from 810 to 1,340 vehicles per hour (vph), with the heaviest volume occurring during the PM peak hour in the northbound direction.

Figure 8A. No-Build Alternative Peak Hour Intersection Turning Movement Forecasts and Levels of Service

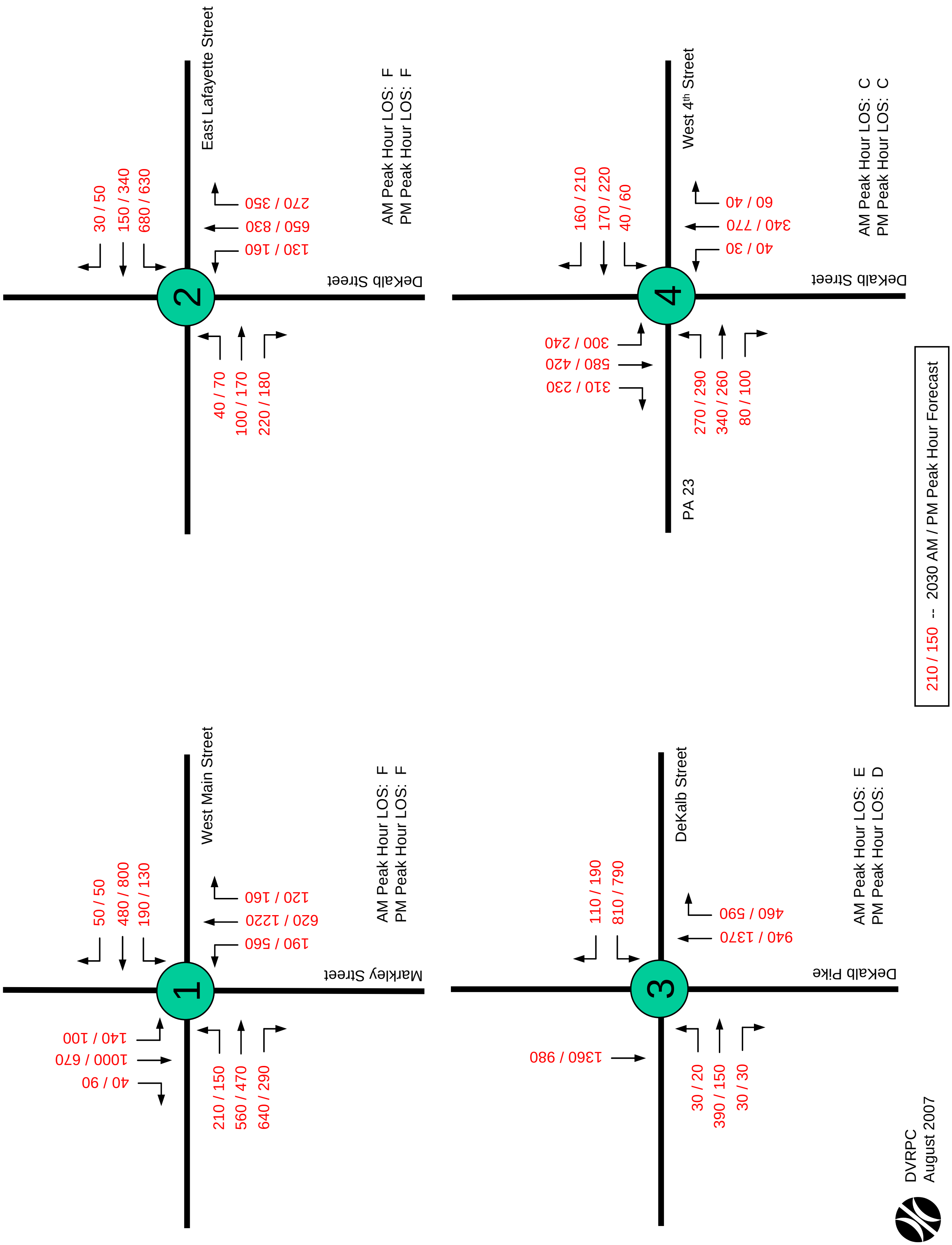

Figure 8B. No-Build Alternative Peak Hour Intersection Turning Movement Forecasts and Levels of Service

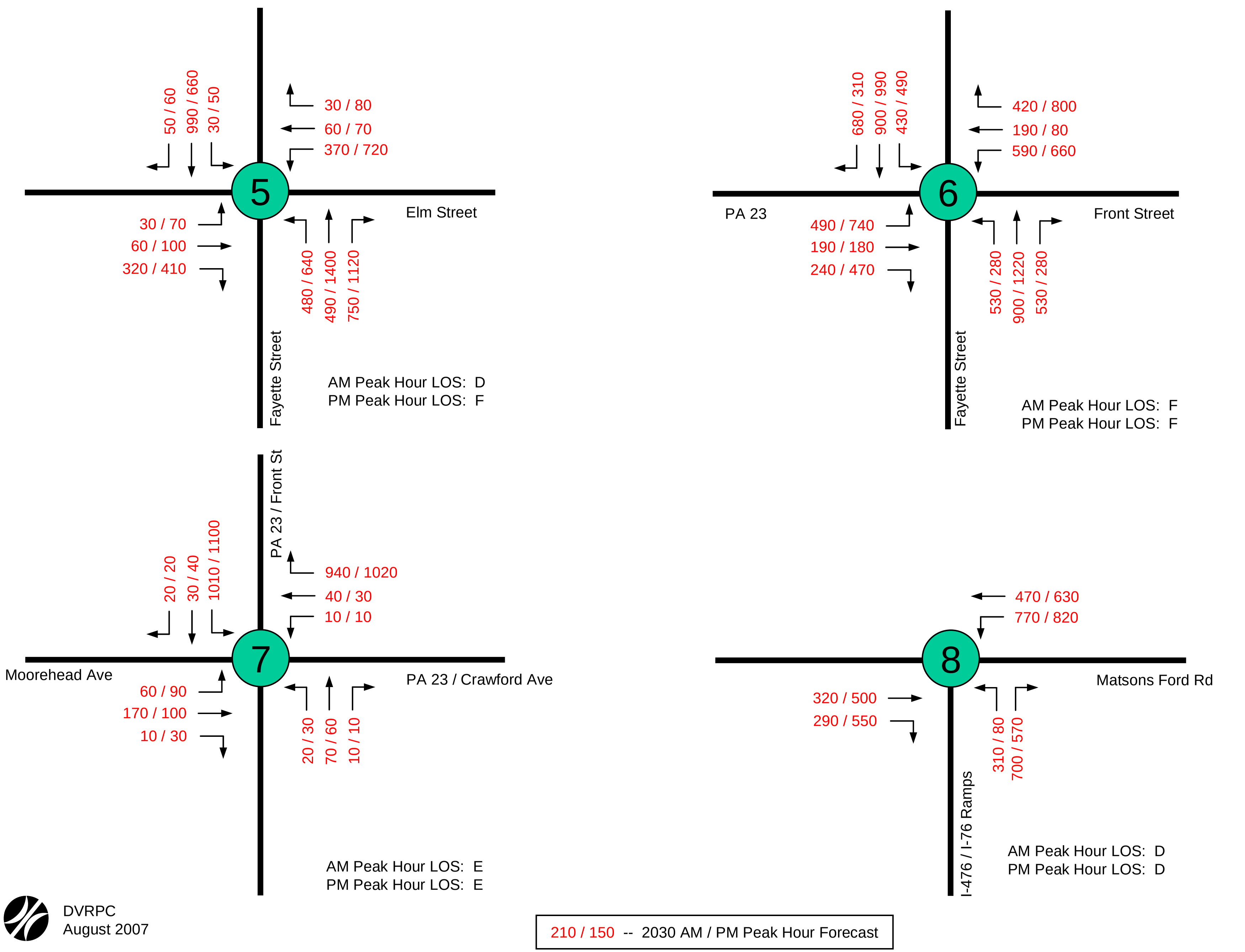

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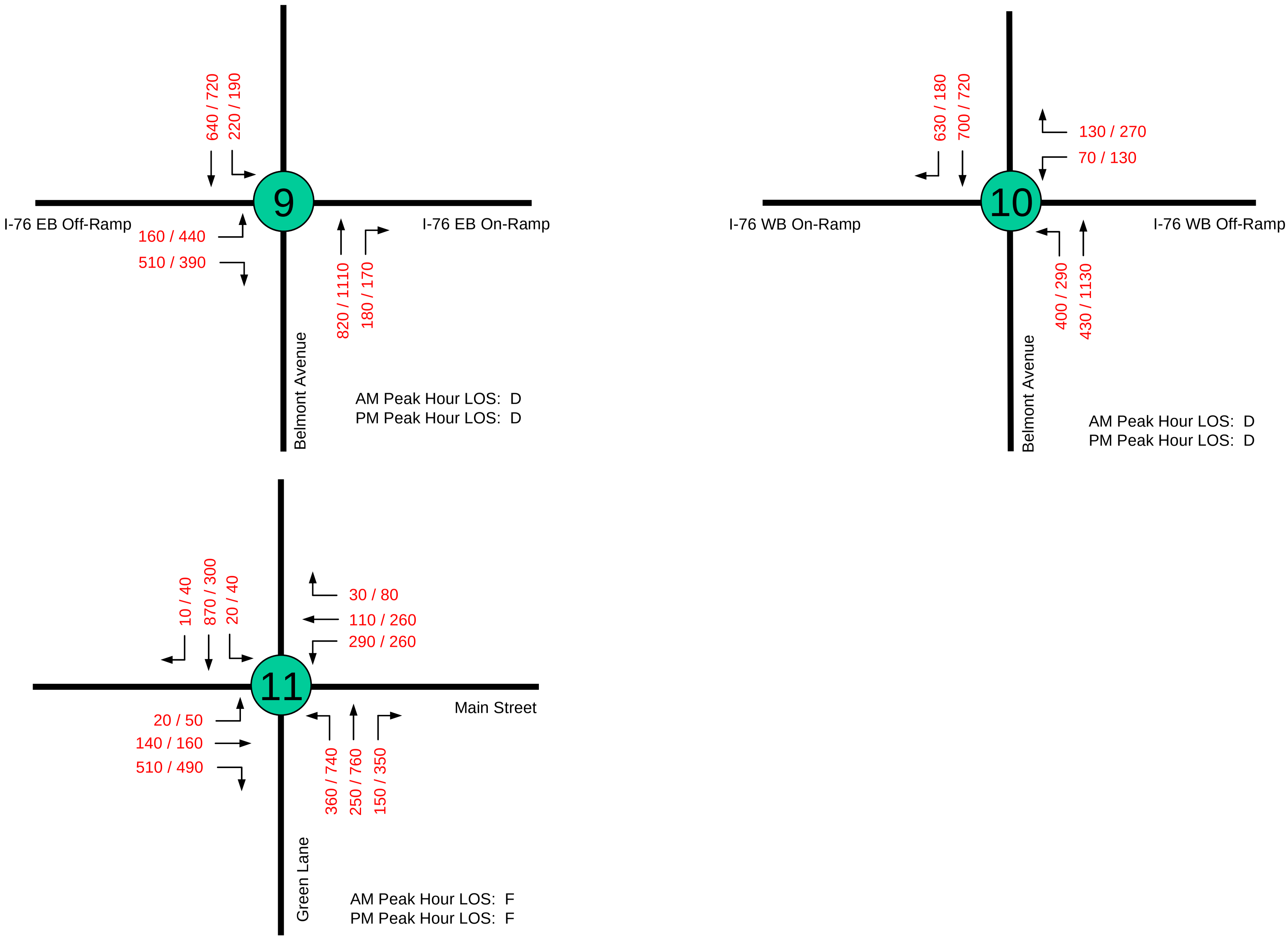
Figure 8C. No-Build Alternative Peak Hour Intersection Turning Movement Forecasts and Levels of Service



210 / 150 -- 2030 AM / PM Peak Hour Forecast

The intersections on the Bridgeport side of the river operate with less delay and better levels of service than those on the Norristown side. The DeKalb Pike/DeKalb Street intersection will continue to operate at LOS E in the AM peak hour and LOS D in the PM peak hour, albeit with more average delay than it currently experiences. The largest increases in peak hour volumes at this intersection occur on the through movements along DeKalb Pike, which are able to be served by a signalized intersection with less delay compared to turning movements, especially left-turning volumes.

Within Conshohocken Borough, Fayette Street experiences increases in traffic volumes entering and exiting the Matsonford/Fayette Street Bridge in both peak hours. In the AM peak hour, the bridge will carry 3,400 vehicles that will be approximately evenly divided between the northbound and southbound directions. During the PM peak hour, demand on the bridge will increase to nearly 5,000 vehicles, with 3,160 in the northbound direction. The heavy left turning volume from the bridge to Elm Street (640 vph), combined with the heavy left-turn movement from Elm Street onto the bridge (740 vph), will cause this intersection to operate at LOS F during the PM peak.

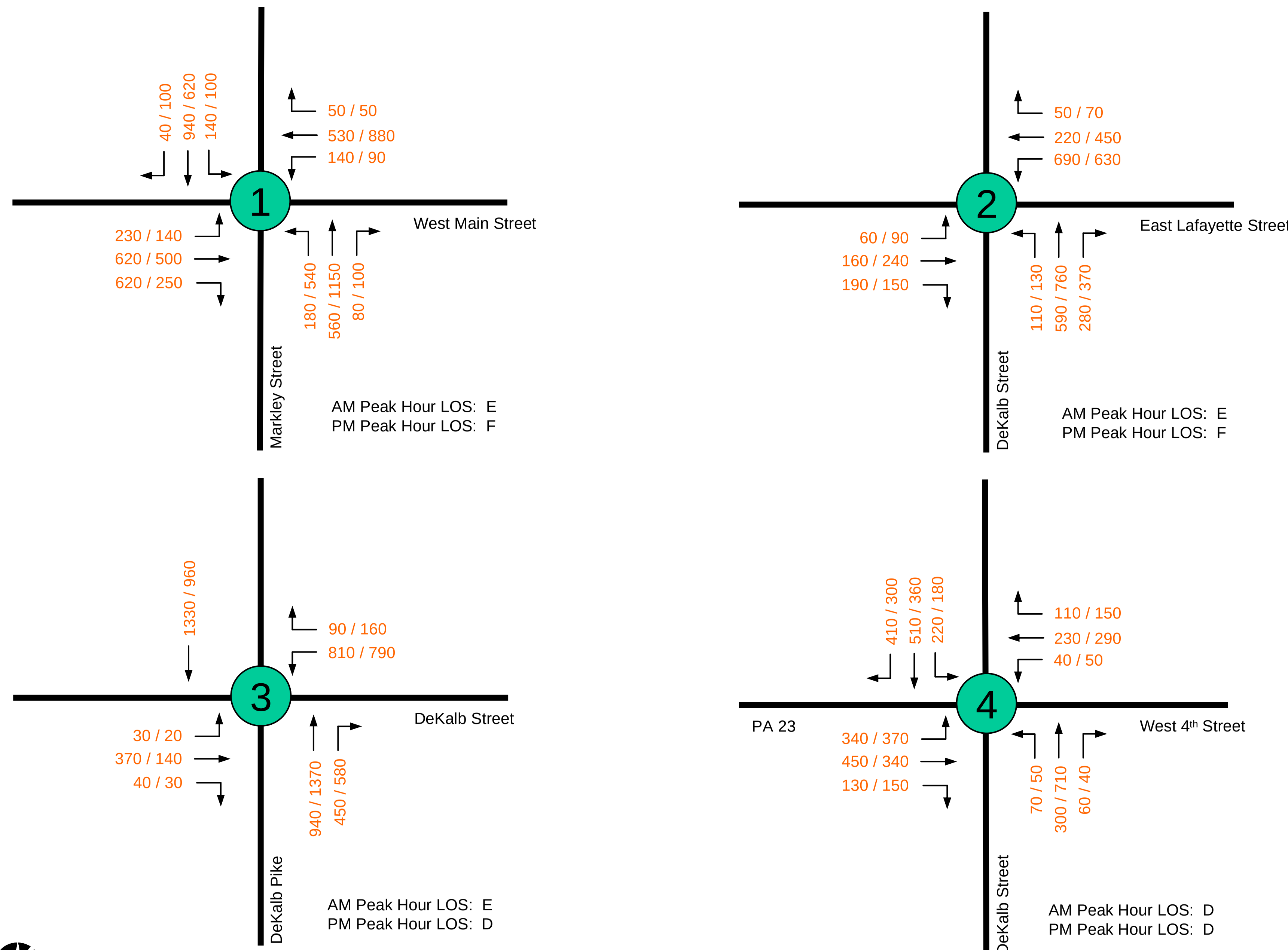
The Fayette/Front Street intersection in West Conshohocken Borough will continue to experience the highest delays of any intersection in the study area. In 2030, under the No-Build Alternative, delays at this intersection will increase by an additional 30 to 40 seconds per vehicle, compared to current conditions.

The largest increase in average delay over current conditions, however, will occur the Main Street/Green Lane intersection in Manayunk. Average AM peak hour delay will increase by about 66 seconds per vehicle, nearly doubling the current average of 75 seconds. Meanwhile, PM peak hour delays will increase by about 63 seconds per vehicle. These large increases in intersection delay occur despite relatively small increases in traffic volumes (typically less than 200 vph on each approach) and demonstrate how delays can grow quickly when an intersection is at or over capacity.

2. Build Alternative 1

Figure 9 displays the 2030 AM and PM peak hour intersection turning movement forecasts and overall intersection levels of service under Build Alternative 1. Under this alternative, traffic volumes are reduced on the Dannehower and DeKalb Street bridges compared to the No-Build Alternative. Although these reductions during the peak hours are only on the order of 100 to 200 vph per direction on each bridge, they result in significantly less delay at the Markley/West Main Street and DeKalb Street/East Lafayette Street intersections. Both of these intersections operate at LOS E during the 2030 AM peak hour under this alternative, compared to LOS F under the No-Build Alternative. Average vehicle delay at the DeKalb Street/East Lafayette Street intersection is reduced from 125 seconds to 60 seconds. Although both of the Norristown intersections operate at LOS F in the PM peak hour, delays are reduced by 40 seconds at the Dannehower Bridge intersection and by 155 seconds at the DeKalb Street Bridge.

Figure 9A. Alternative 1 Peak Hour Intersection Turning Movement Forecasts and Levels of Service



230 / 140 -- 2030 AM / PM Peak Hour Forecast

Figure 9B. Alternative 1 Peak Hour Intersection Turning Movement Forecasts and Levels of Service

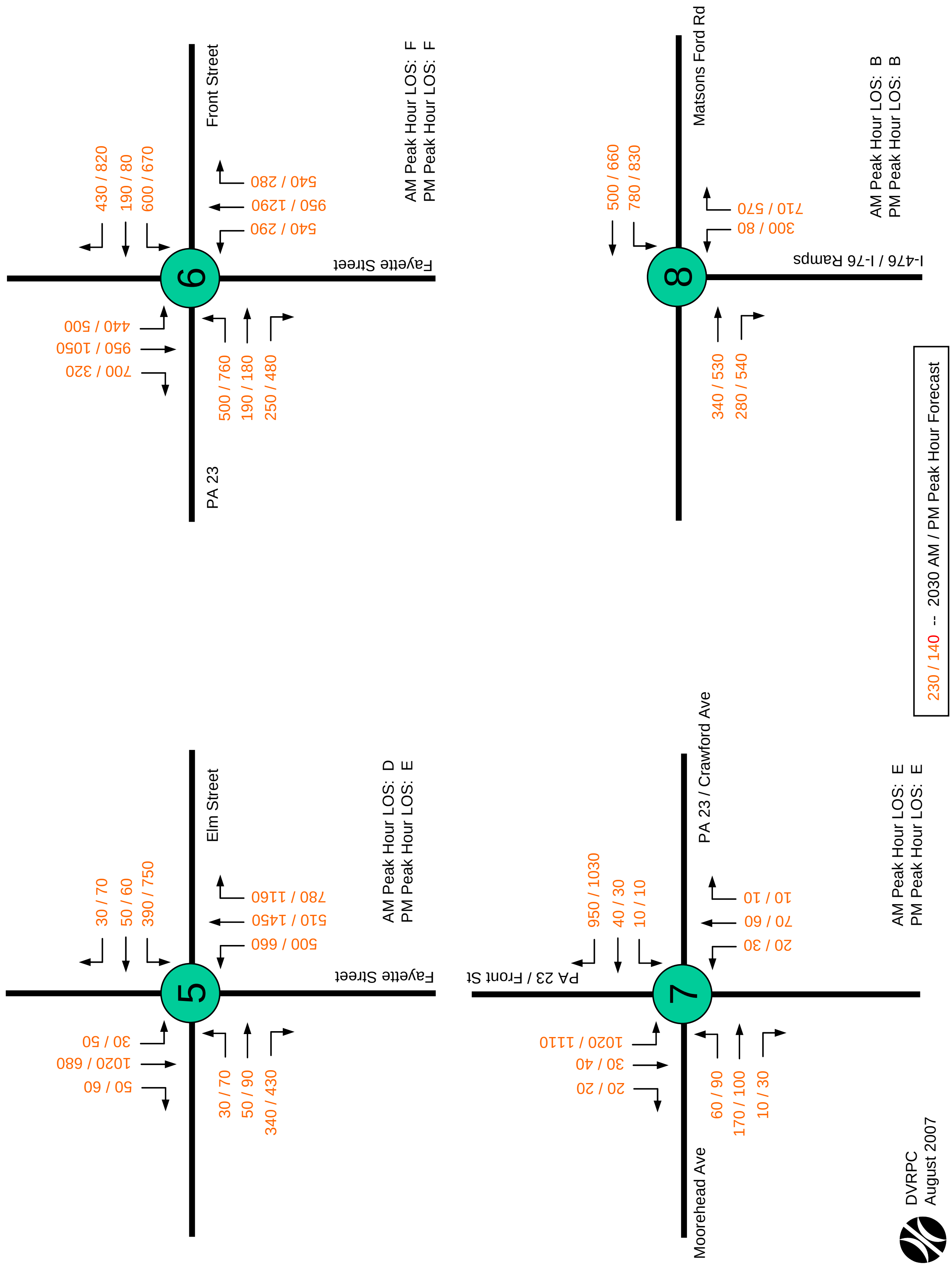
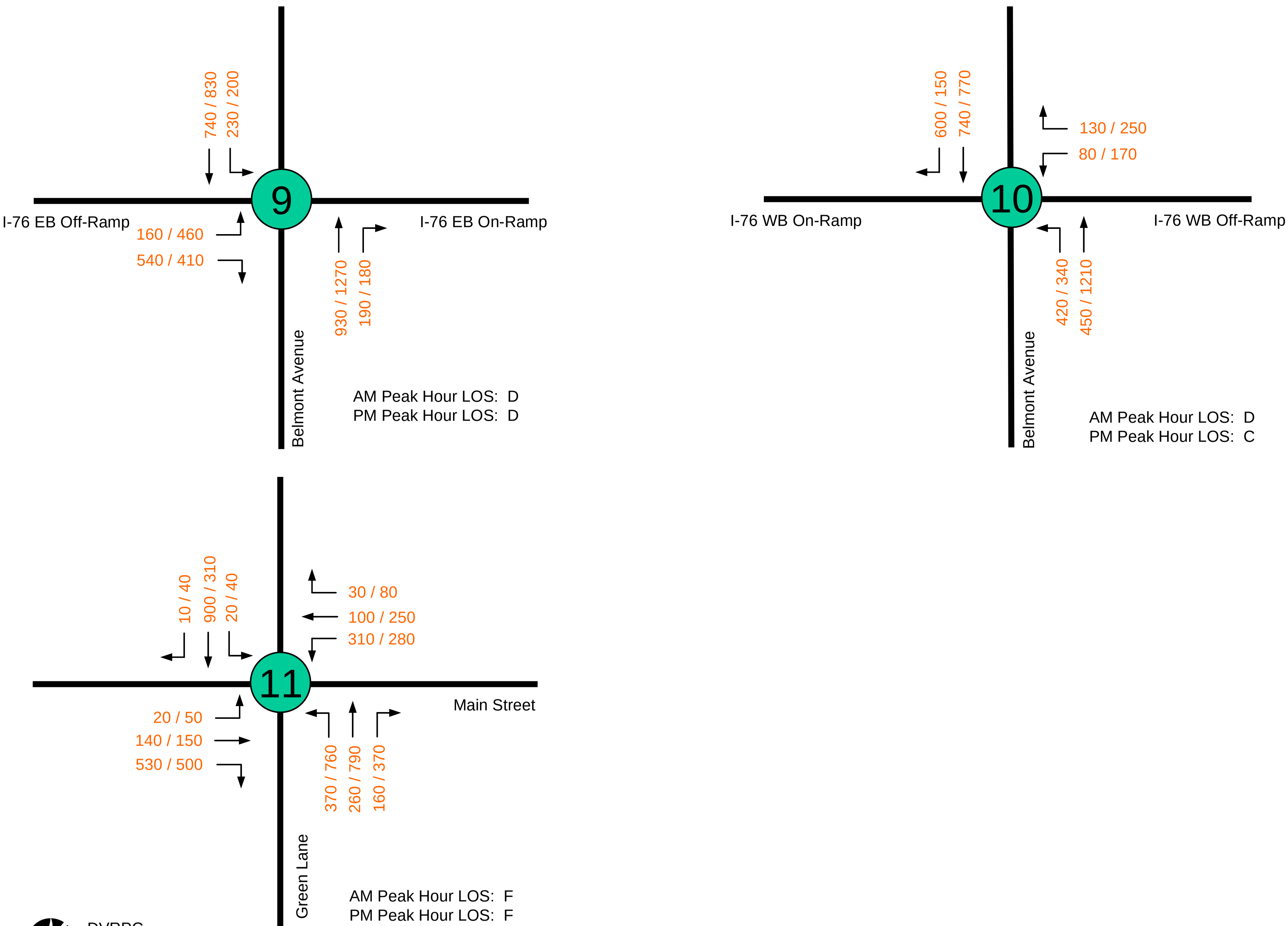


Figure 9C. Alternative 1 Peak Hour Intersection Turning Movement Forecasts and Levels of Service



230 / 140 -- 2030 AM / PM Peak Hour Forecast

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On the Bridgeport side of the Dannehower Bridge, traffic volumes are also slightly reduced relative to the No-Build Alternative. However, delays here are reduced by only a few seconds per vehicle because these intersections operated well below capacity under the No-Build Alternative.

Traffic volumes on the Bridgeport side of the DeKalb Street Bridge increase under Alternative 1 compared to the No-Build Alternative due to the PA 23 Relocation project, which feeds into this intersection. This intersection, which operates at LOS C in both peak hours under the No-Build Alternative, would operate at LOS D in the AM and PM peak hours under Alternative 1.

The Matsonford/Fayette Street Bridge volumes also increase under Alternative 1 relative to the No-Build Alternative, due to the increased capacity associated with the widening of this bridge. However, the delays on either end of this bridge are reduced. On the Conshohocken side, the intersection of Fayette and Elm streets still operates at LOS D in the AM peak hour, but with about 15 seconds less delay per vehicle. The reduction during the PM peak hour is only about 8 seconds per vehicle, but this is enough to improve operations from LOS F to LOS E.

On the West Conshohocken side, both peak hours operate at LOS F. However, average AM peak hour delay is reduced by 24 seconds compared to the No-Build Alternative and average PM peak hour delay is reduced by 54 seconds. The intersection of Matsons Ford Road and the I-476/I-76 ramps improves from LOS D to LOS B in both the AM and PM peak hours under Alternative 1.

In the Manayunk portion of the study area, peak hour traffic volumes at the Belmont Avenue intersections with the Schuylkill Expressway on- and off-ramps also increase from the No-Build volumes due to the additional capacity associated with the limited widening of Belmont Avenue. Nevertheless, the additional intersection capacity results in less average delay per vehicle than the No-Build Alternative.

The delay at the Belmont Avenue intersection with the I-76 eastbound ramps decreases in the AM peak hour by about 9 seconds per vehicle and decreases in the PM peak hour by about 12 seconds per vehicle. The delay reduction at the Belmont Avenue intersection with the I-76 westbound ramps is less in the AM, just 2 seconds, but more significant in the PM peak hour, 19 seconds per vehicle. This reduction is enough to change the LOS from D to C for this intersection.

The AM and PM peak hour traffic volumes at the Green Lane/Main Street intersection in Manayunk are slightly higher than the corresponding No-Build volumes. This results in higher delays at this intersection because there are no changes to the intersection under Build Alternative 1. As in the No-Build Alternative, this intersection operates at LOS F conditions in both peak hours, with average AM delays of over two minutes per vehicle and average PM delays of over three minutes per vehicle.

3. Build Alternative 2

Figure 10 displays the 2030 AM and PM peak hour intersection turning movement forecasts and overall intersection levels of service under Build Alternative 2. Under this alternative, AM and PM peak hour traffic volumes in the Norristown and Manayunk portions of the study area are largely unchanged from the No-Build Alternative. Within Norristown and Bridgeport boroughs, individual intersection turning movements are within 10 vph of the No-Build Alternative, except for the left turn from DeKalb Street to DeKalb Pike, which is 20 vph higher in both the AM and PM peak hours under Build Alternative 2. In the Manayunk/Lower Merion Township portion of the study area, all individual intersection turning movements are within plus or minus 10 vehicles per hour of the corresponding No-Build Alternative volume.

Consequently, all intersections in both the Norristown and Manayunk portions of the study area operate at the same level of service as the No-Build Alternative, with one exception. The Belmont Avenue intersection with the I-76 eastbound on- and off-ramps in the PM peak hour operates at LOS D under the No-Build Alternative, but LOS E under Build Alternative 2. However, the additional delay under Build Alternative 2 is only three seconds per vehicle higher than the No-Build delay. Most of the other intersections in these portions of the study area have average delays within two seconds of the No-Build Alternative.

Within the Conshohocken and West Conshohocken boroughs portion of the study area, peak hour traffic volumes for individual turning movements are the same as, or lower than, the corresponding No-Build volume. The largest reductions occur on movements to and from the Matsonford/Fayette Street Bridge.

The AM peak hour volume crossing from Conshohocken to West Conshohocken is reduced by about nine percent, from 1,680 to 1,530 vehicles. A little more than half of this reduction, or 80 vehicles, comes from the southbound through movement from Fayette Street onto the bridge. The remaining reduction is evenly split between the right and left turns from Elm Street onto the bridge. A similar reduction occurs during the PM peak hour. Again the southbound bridge volume is 150 vph less than the No-Build volume, which is an eight percent reduction from the No-Build volume of 1,790 vehicles. Northbound bridge volumes are also reduced relative to the No-Build volume, but only by 50 vehicles, or three percent, in the AM peak hour, and by 70 vehicles, or two percent, in the PM peak hour.

Average vehicle delays are also reduced at this intersection under Build Alternative 2, by 5.6 seconds in the AM peak hour and by 10.3 seconds in the PM peak hour, compared to the No-Build Alternative. The reduction in the PM peak hour is enough to improve operations from LOS F to LOS E. Larger reductions in average delay, 14.6 to 16.6 seconds, occur at the Matsons Ford Road/PA 23/Front Street intersection in West Conshohocken Borough. However, this intersection continues to operate at LOS F conditions in both peak hours. Delays average nearly three minutes in the AM peak hour and over 4 minutes in the PM peak hour.

Figure 10A. Alternative 2 Peak Hour Intersection Turning Movement Forecasts and Levels of Service

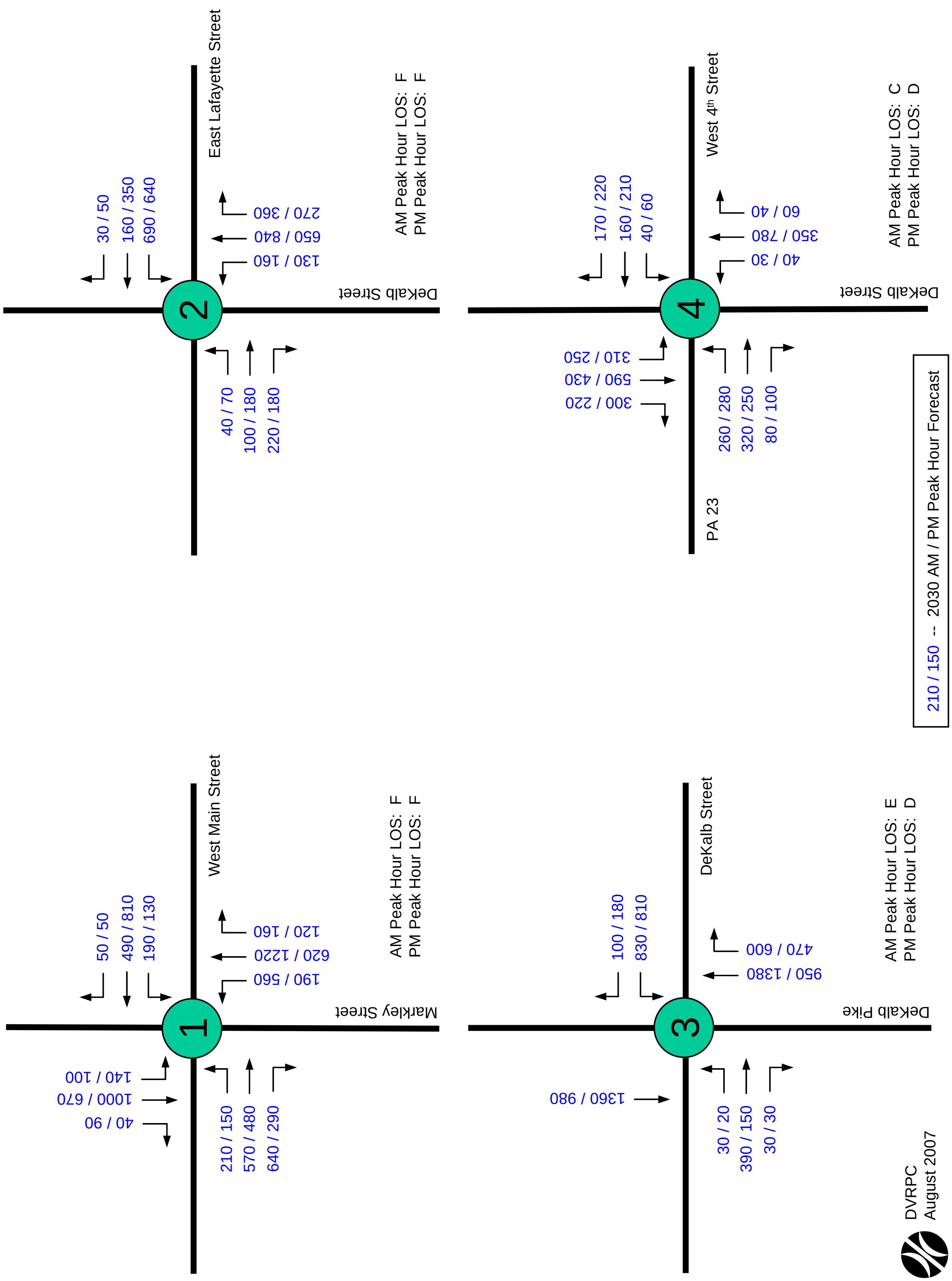

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Figure 10B. Alternative 2 Peak Hour Intersection Turning Movement Forecasts and Levels of Service

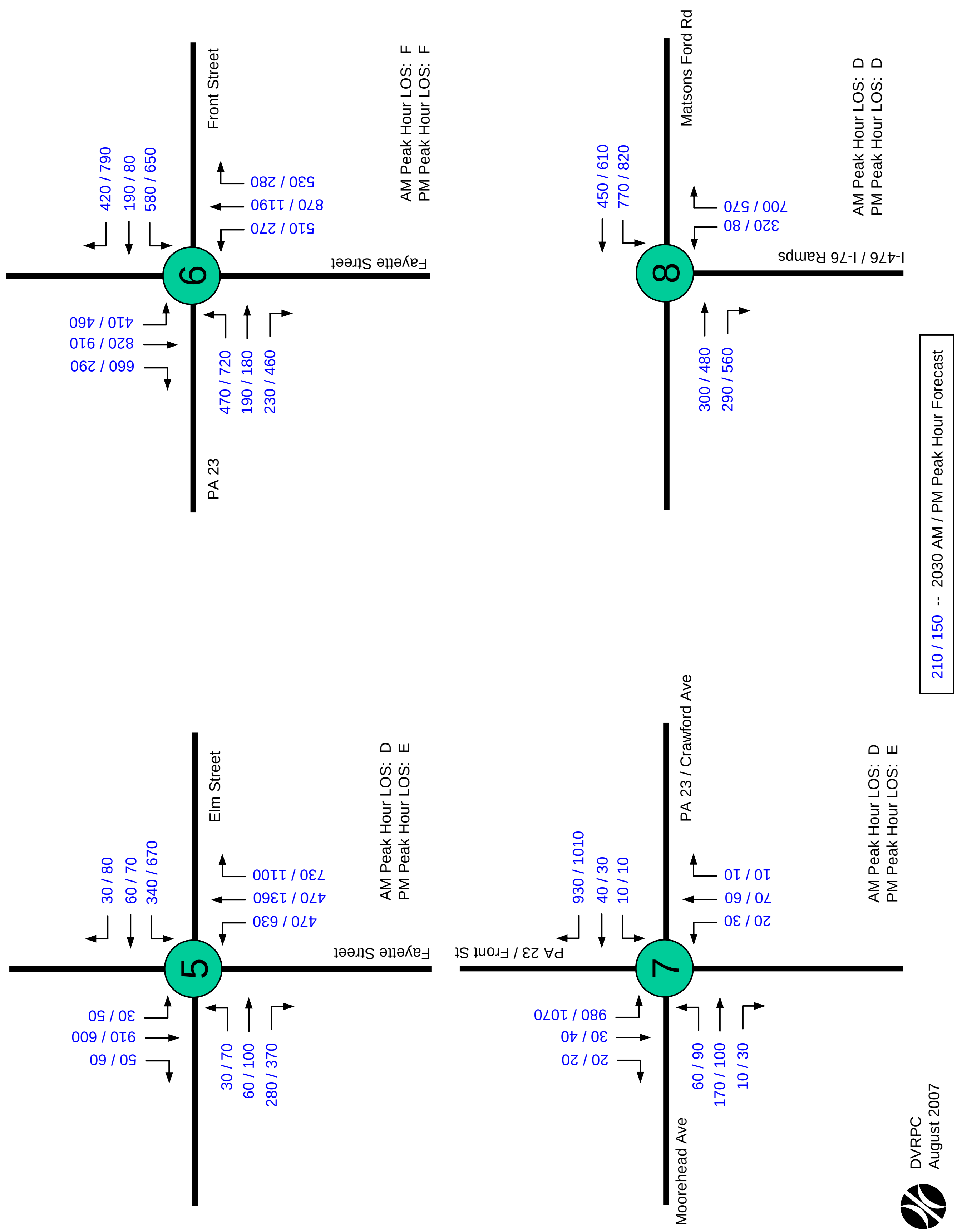

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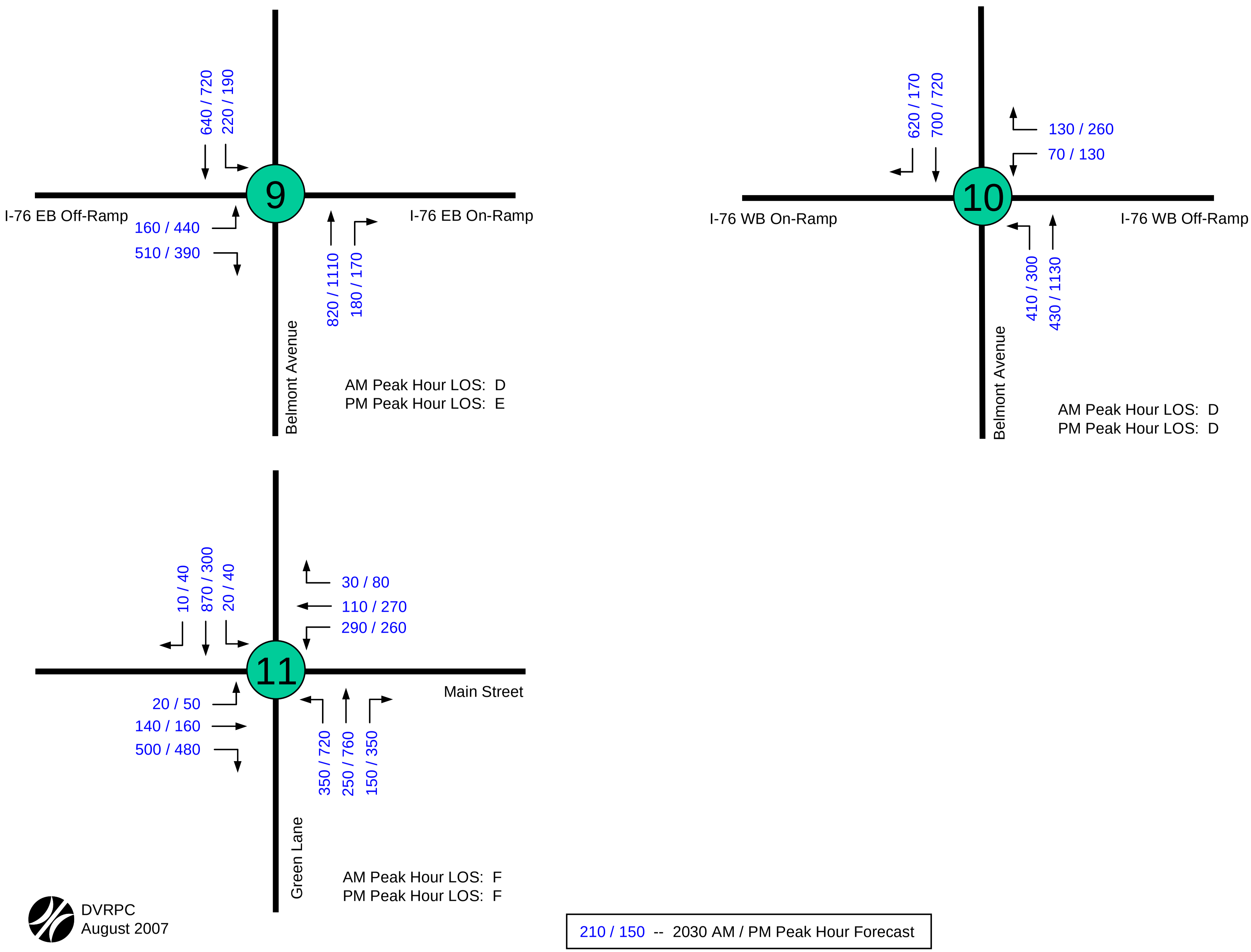
Figure 10C. Alternative 2 Peak Hour Intersection Turning Movement Forecasts and Levels of Service



VI. CONCLUSIONS

The Conshohocken/Plymouth Meeting/Norristown/King of Prussia area is home to a large and expanding concentration of employment centers and other attractions. The non-expressway river crossings, which include the Dannehower, DeKalb Street, Matsonford/Fayette Street, and Belmont Avenue/Green Lane bridges, serve a great deal of local traffic. All of these bridges experience recurring congestion in both the morning and afternoon peak periods.

Together, these four bridges carry over 111,600 vehicles on an average day. Due to both population and employment growth in the study area, by 2030 bridge volumes will increase by an average of about 17 percent under the No-Build Alternative. This will result in even higher delays at the intersections on the bridge approaches.

Two Build alternatives were evaluated for their ability to improve river crossing operations. Build Alternative 1 includes several previously proposed projects in the study area: widening and extending Lafayette Street to the Pennsylvania Turnpike, relocating PA 23, and widening the Matsonford/Fayette Street Bridge and Belmont Avenue in the vicinity of its Schuylkill Expressway interchange. Build Alternative 2 is designed to increase the capacity of the Schuylkill Expressway in the vicinity of its interchange with I-476, with the goal of preventing traffic from diverting to the Matsonford/Fayette Street bridge.

Build Alternative 1 decreases traffic volumes on the Dannehower and DeKalb Street bridges by diverting traffic to the Pennsylvania Turnpike. Although the magnitude of this diversion is not large, it does reduce delays at the intersections on either end of these bridges. Delays are especially reduced at the intersection of DeKalb and East Lafayette streets, due primarily to the widening of Lafayette Street. Build Alternative 1 increases traffic volumes on both the Matsonford/Fayette Street and Belmont Avenue/Green Lane bridges, by 1,700 and 1,000 vehicles per day, respectively. The additional capacity associated with the widened facilities in this alternative results in less average vehicle delay than the No-Build Alternative.

Build Alternative 2 has little effect on traffic volumes or intersection delays outside the Conshohocken/West Conshohocken portion of the study area. Within that area, it decreases traffic volumes on the Matsonford/Fayette Street Bridge and reduces delays at the intersections on either side of the bridge in both the AM and PM peak hours.

Both build alternatives would have some intersections operating at LOS F conditions in 2030. Although neither build alternative eliminates all the river crossing congestion in the study area, they each improve conditions relative to the No-Build Alternative. Additional measures to reduce delay at these locations may need to be considered in the future.

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Appendix A

Intersection Approach Delays and Levels of Service Tables

Current Intersection Delays and Levels-of-Service by Approach A-3

2030 No-Build Alternative Intersection Delays and Levels of Service by Approach . A-4

2030 Build Alternative 1 Intersection Delays and Levels of Service by Approach . . A-5

2030 Build Alternative 2 Intersection Delays and Levels of Service by Approach . . A-6

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Table A-1. Current Intersection Delays and Levels of Service by Approach

			AM Peak Hour Conditions									
Int.			Eastbound		Westbound		Northbound		Southbound		Overall	
No.	East/West Street	North/South Street	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
1	West Main Street	Markley Street	63.4	E	34.8	C	62.4	E	64.2	E	58.8	E
2	East Lafayette Street	DeKalb Street	82.1	F	76.3	E	67.6	E	-----	--	73.1	E
3	DeKalb Street	DeKalb Pike	93.2	F	76.7	E	40.6	D	66.9	E	63.0	E
4	PA 23 / West 4th Street	DeKalb Street	30.4	C	19.2	B	7.7	A	19.7	B	20.7	C
5	Elm Street	Fayette Street	27.0	C	71.5	E	12.0	B	50.4	D	31.6	C
6	PA 23 / Front Street	Fayette Street	175.1	F	215.9	F	115.7	F	100.6	F	139.7	F
7	PA 23 / Moorehead & Crawford Aves	PA 23 / Front Street	65.9	E	6.6	A	74.0	E	68.6	E	42.4	D
8	Matsons Ford Road	I-476 & I-76 Ramps	32.7	C	29.7	C	26.1	C	-----	--	29.1	C
9	I-76 EB Ramps	Belmont Avenue	48.2	D	-----	--	26.0	C	27.0	C	32.1	C
10	I-76 WB Ramps	Belmont Avenue	-----	--	37.2	D	17.9	B	44.5	D	34.6	C
11	Main Street	Green Lane	50.3	D	111.8	F	57.3	E	89.2	F	75.1	E

			PM Peak Hour Conditions									
Int.			Eastbound		Westbound		Northbound		Southbound		Overall	
No.	East/West Street	North/South Street	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
1	West Main Street	Markley Street	117.5	F	128.1	F	66.7	E	61.0	E	87.6	F
2	East Lafayette Street	DeKalb Street	104.5	F	233.3	F	169.2	F	-----	--	185.6	F
3	DeKalb Street	DeKalb Pike	76.0	E	36.9	D	39.0	D	24.3	C	36.4	D
4	PA 23 / West 4th Street	DeKalb Street	15.7	B	12.9	B	14.3	B	26.6	C	17.9	B
5	Elm Street	Fayette Street	55.3	E	148.8	F	30.2	C	98.0	F	59.8	E
6	PA 23 / Front Street	Fayette Street	416.7	F	296.8	F	216.4	F	132.1	F	258.0	F
7	PA 23 / Moorehead & Crawford Aves	PA 23 / Front Street	61.1	E	4.5	A	90.3	F	94.1	F	53.5	D
8	Matsons Ford Road	I-476 & I-76 Ramps	28.5	C	23.3	C	26.4	C	-----	--	25.6	C
9	I-76 EB Ramps	Belmont Avenue	39.4	D	-----	--	71.8	E	23.1	C	48.7	D
10	I-76 WB Ramps	Belmont Avenue	-----	--	48.4	D	28.5	C	25.0	C	30.0	C
11	Main Street	Green Lane	165.6	F	202.7	F	114.2	F	94.5	F	136.1	F

Table A-2. 2030 No-Build Alternative Intersection Delays and Levels of Service by Approach

AM Peak Hour Conditions

Int. No.	East/West Street	North/South Street	Eastbound Delay (sec)	Eastbound LOS	Westbound Delay (sec)	Westbound LOS	Northbound Delay (sec)	Northbound LOS	Southbound Delay (sec)	Southbound LOS	Overall Delay (sec)	Overall LOS
1	West Main Street	Markley Street	83.5	F	70.1	E	77.5	E	98.3	F	84.0	F
2	East Lafayette Street	DeKalb Street	73.2	E	144.6	F	126.2	F	-----	--	124.8	F
3	DeKalb Street	DeKalb Pike	240.9	F	86.9	F	27.1	C	71.3	E	78.2	E
4	PA 23 / West 4th Street	DeKalb Street	47.6	D	27.9	C	11.0	B	36.0	D	33.9	C
5	Elm Street	Fayette Street	42.1	D	71.9	E	44.1	D	58.2	E	51.5	D
6	PA 23 / Front Street	Fayette Street	234.7	F	307.5	F	129.4	F	120.5	F	177.5	F
7	PA 23 / Moorehead & Crawford Aves	PA 23 / Front Street	65.8	E	6.1	A	95.3	F	99.4	F	57.2	E
8	Matsons Ford Road	I-476 & I-76 Ramps	39.8	D	54.0	D	29.7	C	-----	--	42.4	D
9	I-76 EB Ramps	Belmont Avenue	100.2	F	-----	--	40.3	D	32.8	C	53.6	D
10	I-76 WB Ramps	Belmont Avenue	-----	--	73.9	E	41.9	D	35.3	D	40.9	D
11	Main Street	Green Lane	65.7	E	308.1	F	112.0	F	140.9	F	140.7	F

PM Peak Hour Conditions

Int. No.	East/West Street	North/South Street	Eastbound Delay (sec)	Eastbound LOS	Westbound Delay (sec)	Westbound LOS	Northbound Delay (sec)	Northbound LOS	Southbound Delay (sec)	Southbound LOS	Overall Delay (sec)	Overall LOS
1	West Main Street	Markley Street	183.8	F	220.4	F	77.5	E	80.9	F	128.6	F
2	East Lafayette Street	DeKalb Street	60.0	E	348.6	F	215.0	F	-----	--	240.6	F
3	DeKalb Street	DeKalb Pike	145.1	F	53.8	D	31.0	C	25.8	C	40.7	D
4	PA 23 / West 4th Street	DeKalb Street	45.0	D	19.2	B	14.4	B	44.1	D	31.3	C
5	Elm Street	Fayette Street	113.0	F	187.1	F	48.6	D	97.8	F	85.0	F
6	PA 23 / Front Street	Fayette Street	410.2	F	361.7	F	248.7	F	170.9	F	288.6	F
7	PA 23 / Moorehead & Crawford Aves	PA 23 / Front Street	65.9	E	5.8	A	98.0	F	137.6	F	74.8	E
8	Matsons Ford Road	I-476 & I-76 Ramps	67.9	E	23.8	C	22.3	C	-----	--	38.2	D
9	I-76 EB Ramps	Belmont Avenue	93.5	F	-----	--	46.3	D	30.8	C	54.6	D
10	I-76 WB Ramps	Belmont Avenue	-----	--	153.8	F	29.3	C	15.0	B	42.9	D
11	Main Street	Green Lane	210.5	F	431.7	F	136.0	F	119.6	F	199.3	F

Table A-3. 2030 Build Alternative 1 Intersection Delays and Levels of Service by Approach

AM Peak Hour Conditions

Int. No.	East/West Street	North/South Street	Eastbound Delay (sec)	Eastbound LOS	Westbound Delay (sec)	Westbound LOS	Northbound Delay (sec)	Northbound LOS	Southbound Delay (sec)	Southbound LOS	Overall Delay (sec)	Overall LOS
1	West Main Street	Markley Street	68.2	E	56.2	E	98.5	F	89.3	F	77.9	E
2	East Lafayette Street	DeKalb Street	72.4	E	56.8	E	58.5	E	-----	--	60.2	E
3	DeKalb Street	DeKalb Pike	221.5	F	86.5	F	27.7	C	68.5	E	75.0	E
4	PA 23 / West 4th Street	DeKalb Street	74.8	E	26.1	C	13.6	B	54.7	D	50.8	D
5	Elm Street	Fayette Street	58.9	E	64.0	E	22.6	C	39.9	D	36.8	D
6	PA 23 / Front Street	Fayette Street	179.8	F	259.0	F	123.8	F	109.2	F	153.6	F
7	PA 23 / Moorehead & Crawford Aves	PA 23 / Front Street	59.9	E	7.6	A	73.2	E	151.0	F	79.2	E
8	Matsons Ford Road	I-476 & I-76 Ramps	18.3	B	10.7	B	18.6	B	-----	--	15.1	B
9	I-76 EB Ramps	Belmont Avenue	70.1	E	-----	--	48.0	D	22.5	C	44.7	D
10	I-76 WB Ramps	Belmont Avenue	-----	--	63.8	E	41.4	D	40.8	D	43.0	D
11	Main Street	Green Lane	72.8	E	335.0	F	124.1	F	156.0	F	154.6	F

PM Peak Hour Conditions

Int. No.	East/West Street	North/South Street	Eastbound Delay (sec)	Eastbound LOS	Westbound Delay (sec)	Westbound LOS	Northbound Delay (sec)	Northbound LOS	Southbound Delay (sec)	Southbound LOS	Overall Delay (sec)	Overall LOS
1	West Main Street	Markley Street	51.6	D	191.8	F	60.1	E	64.0	E	88.9	F
2	East Lafayette Street	DeKalb Street	77.2	E	113.3	F	64.1	E	-----	--	85.9	F
3	DeKalb Street	DeKalb Pike	131.4	F	56.1	E	30.3	C	25.2	C	39.9	D
4	PA 23 / West 4th Street	DeKalb Street	54.5	D	18.1	B	24.5	C	42.3	D	37.1	D
5	Elm Street	Fayette Street	54.7	D	225.6	F	37.7	D	88.8	F	76.7	E
6	PA 23 / Front Street	Fayette Street	391.1	F	334.2	F	148.0	F	119.0	F	235.0	F
7	PA 23 / Moorehead & Crawford Aves	PA 23 / Front Street	117.0	F	7.9	A	81.2	F	95.7	F	60.3	E
8	Matsons Ford Road	I-476 & I-76 Ramps	16.8	B	6.8	A	18.4	B	-----	--	18.4	B
9	I-76 EB Ramps	Belmont Avenue	55.1	E	-----	--	32.5	C	48.0	D	43.0	D
10	I-76 WB Ramps	Belmont Avenue	-----	--	58.2	E	14.3	B	23.7	C	23.7	C
11	Main Street	Green Lane	210.6	F	453.8	F	150.0	F	124.9	F	210.2	F

Table A-4. 2030 Build Alternative 2 Intersection Delays and Levels of Service by Approach

AM Peak Hour Conditions

Int. No.	East/West Street	North/South Street	Eastbound Delay (sec)	Eastbound LOS	Westbound Delay (sec)	Westbound LOS	Northbound Delay (sec)	Northbound LOS	Southbound Delay (sec)	Southbound LOS	Overall Delay (sec)	Overall LOS
1	West Main Street	Markley Street	83.7	F	71.3	E	88.1	F	93.4	F	85.2	F
2	East Lafayette Street	DeKalb Street	74.4	E	157.3	F	124.4	F	-----	--	129.2	F
3	DeKalb Street	DeKalb Pike	240.9	F	95.5	F	27.3	C	71.3	E	80.0	E
4	PA 23 / West 4th Street	DeKalb Street	52.0	D	30.4	C	10.2	B	34.3	C	34.1	C
5	Elm Street	Fayette Street	42.1	D	98.7	F	13.8	B	77.4	E	45.9	D
6	PA 23 / Front Street	Fayette Street	217.4	F	296.9	F	117.1	F	99.1	F	162.9	F
7	PA 23 / Moorehead & Crawford Aves	PA 23 / Front Street	65.8	E	6.1	A	95.3	F	87.8	F	51.8	D
8	Matsons Ford Road	I-476 & I-76 Ramps	35.7	D	51.8	D	31.8	C	-----	--	41.2	D
9	I-76 EB Ramps	Belmont Avenue	100.2	F	-----	--	40.3	D	32.8	C	53.6	D
10	I-76 WB Ramps	Belmont Avenue	-----	--	73.9	E	45.0	D	34.7	C	41.7	D
11	Main Street	Green Lane	63.1	E	308.1	F	103.4	F	140.9	F	138.1	F

PM Peak Hour Conditions

Int. No.	East/West Street	North/South Street	Eastbound Delay (sec)	Eastbound LOS	Westbound Delay (sec)	Westbound LOS	Northbound Delay (sec)	Northbound LOS	Southbound Delay (sec)	Southbound LOS	Overall Delay (sec)	Overall LOS
1	West Main Street	Markley Street	185.2	F	229.4	F	77.5	E	78.5	E	130.7	F
2	East Lafayette Street	DeKalb Street	82.7	F	363.4	F	216.9	F	-----	--	250.3	F
3	DeKalb Street	DeKalb Pike	145.1	F	58.4	E	31.7	C	25.8	C	42.1	D
4	PA 23 / West 4th Street	DeKalb Street	48.8	D	21.5	C	14.1	B	59.5	E	37.2	D
5	Elm Street	Fayette Street	98.8	F	158.4	F	48.6	D	73.8	E	74.7	E
6	PA 23 / Front Street	Fayette Street	392.6	F	351.5	F	235.8	F	138.5	F	272.0	F
7	PA 23 / Moorehead & Crawford Aves	PA 23 / Front Street	65.9	E	5.8	A	98.0	F	124.5	F	68.4	E
8	Matsons Ford Road	I-476 & I-76 Ramps	63.2	E	31.4	C	22.3	C	-----	--	40.1	D
9	I-76 EB Ramps	Belmont Avenue	61.2	E	-----	--	67.9	E	40.2	D	57.7	E
10	I-76 WB Ramps	Belmont Avenue	-----	--	110.2	F	35.0	C	14.8	B	39.2	D
11	Main Street	Green Lane	214.4	F	447.1	F	130.5	F	119.6	F	200.9	F

Appendix B

License Plate Survey Maps for Individual Bridges

Registered Location of Dannehower Bridge Users B-3

Registered Location of DeKalb Street Bridge Users B-4

Registered Location of Matsonford Bridge Users B-5

Registered Location of Green Lane Bridge Users B-6

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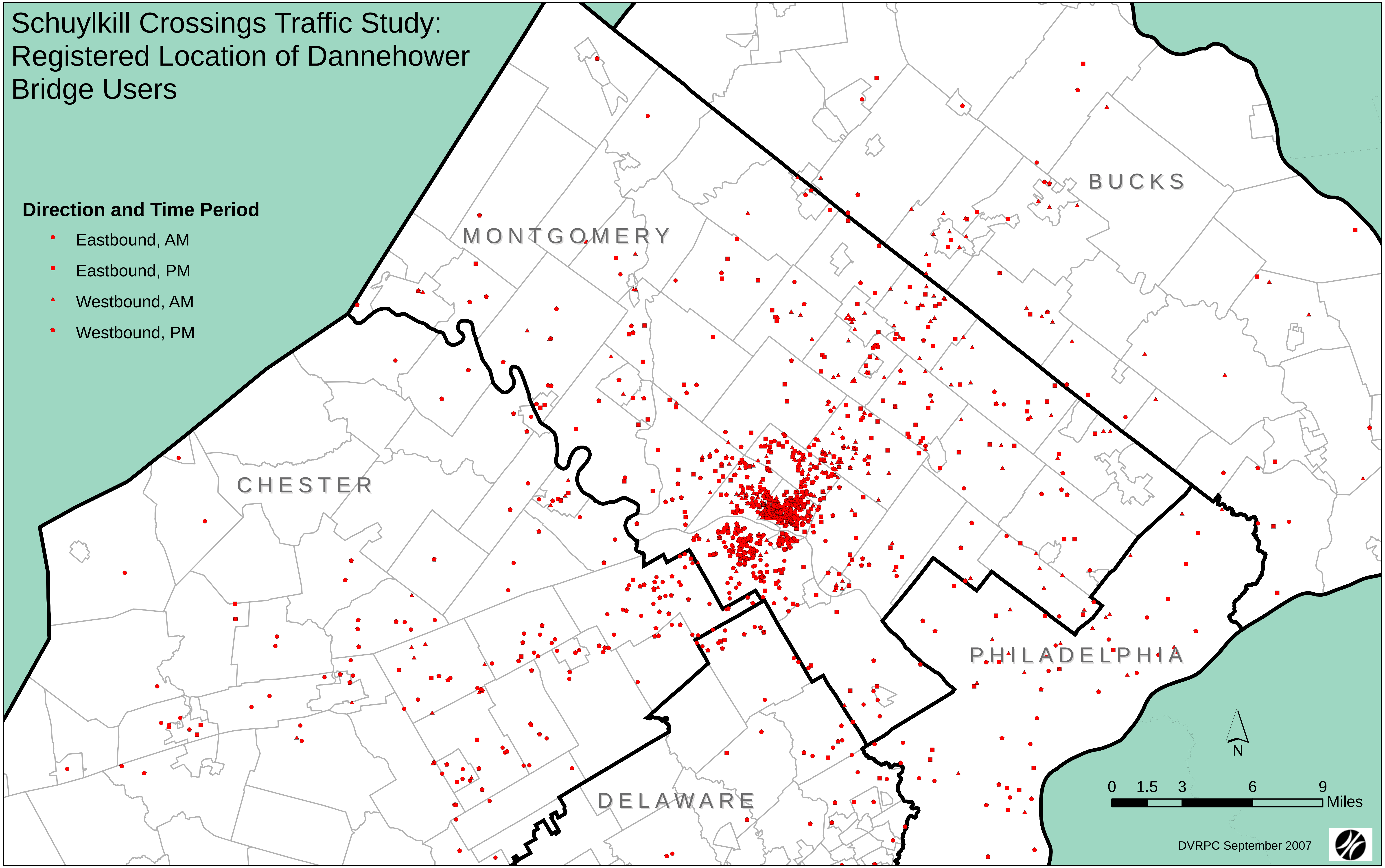
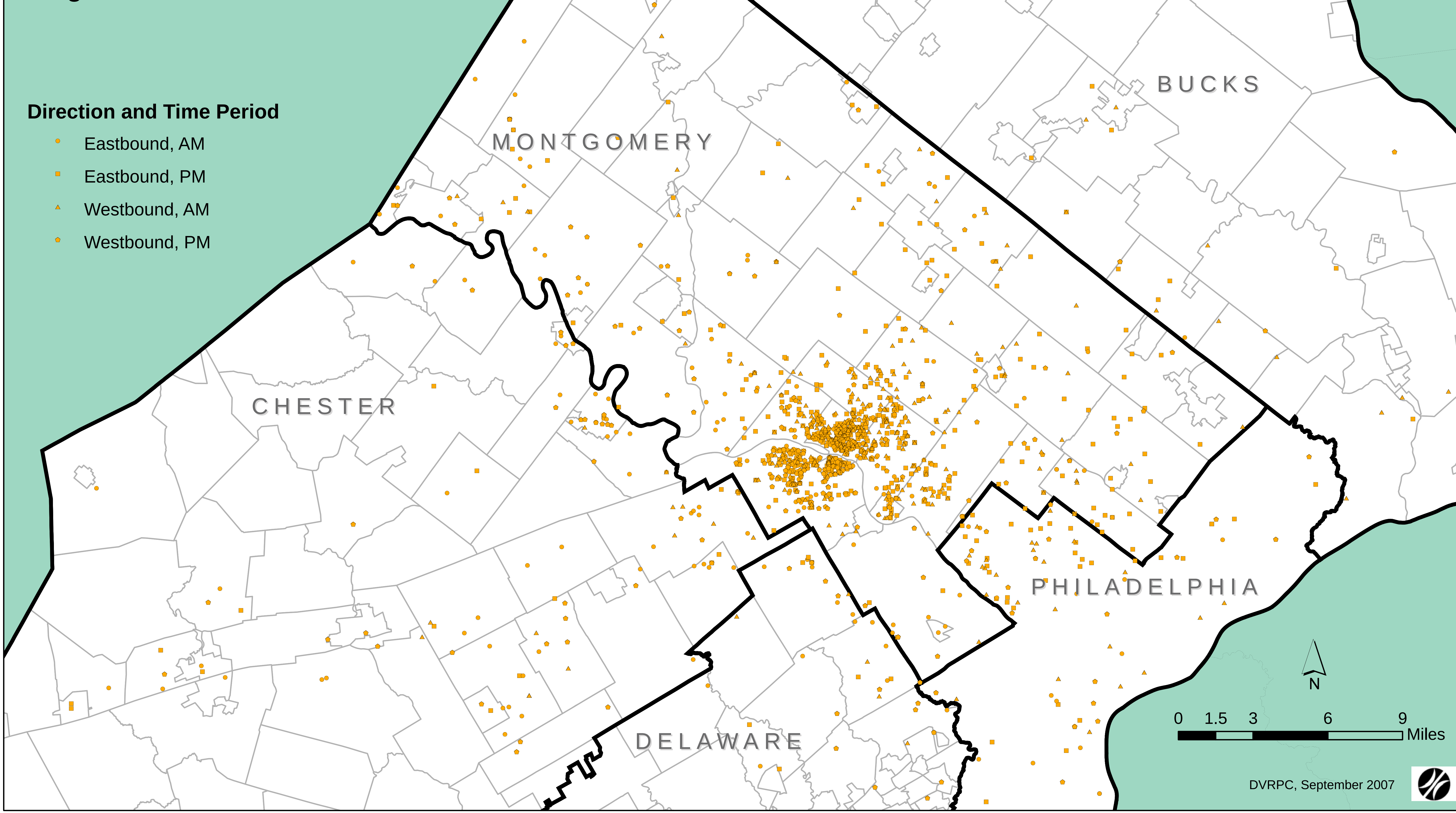
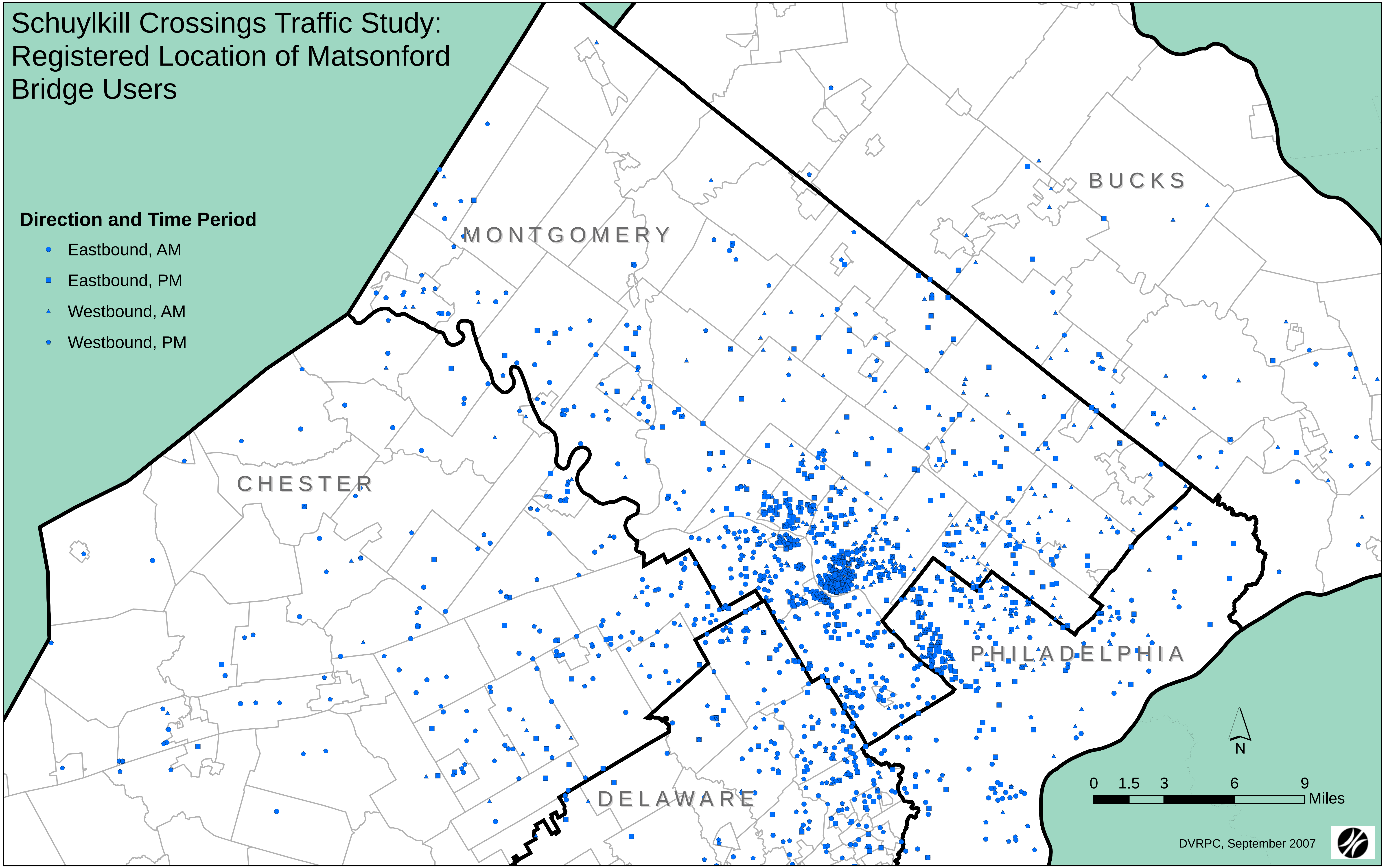
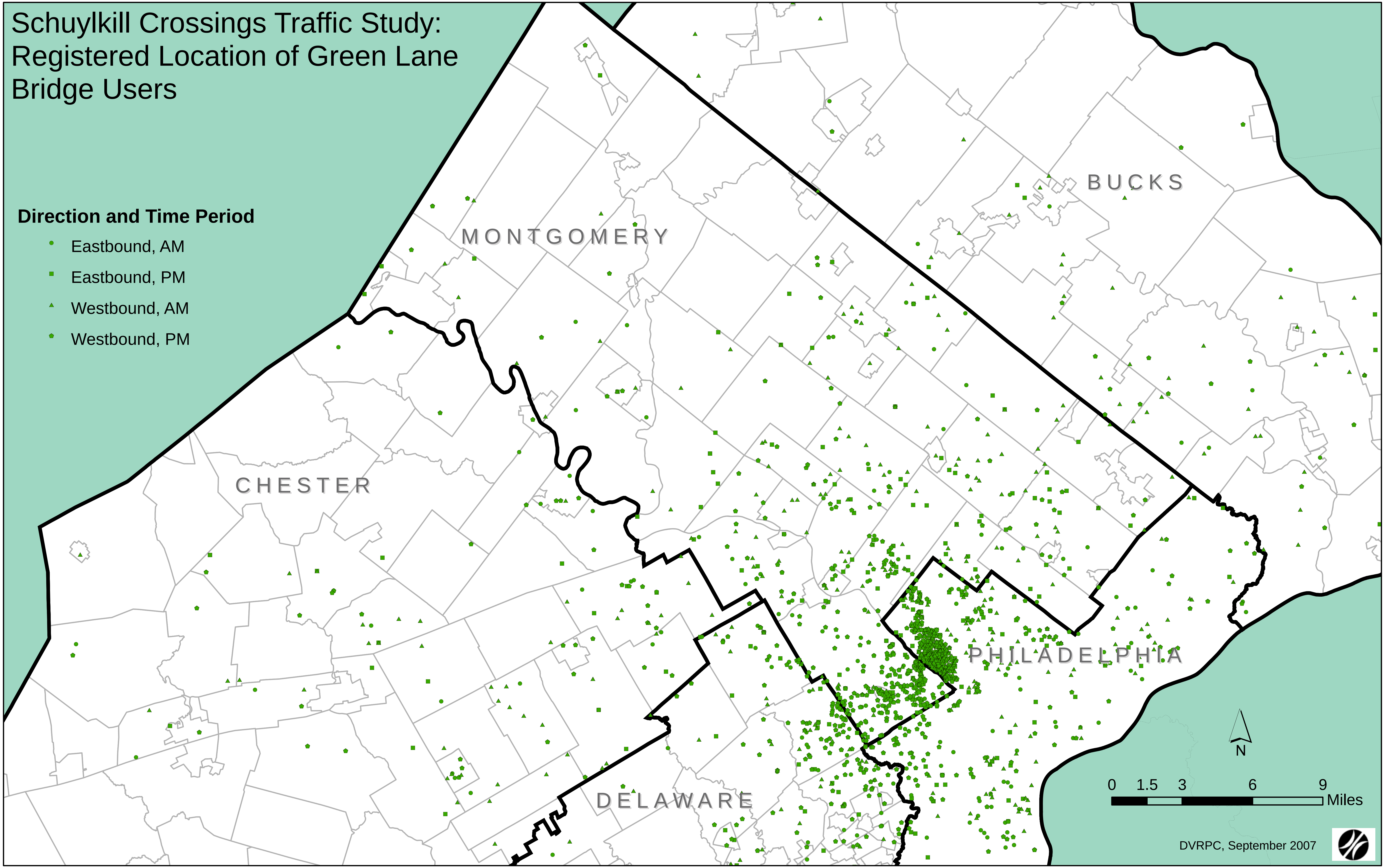

Schuylkill Crossings Traffic Study:
Registered Location of Dannehower
Bridge Users
Direction and Time Period
Eastbound, AM
Eastbound, PM
Westbound, AM
Westbound, PM
MONTGOMERY
BUCKS
CHESTER
DELAWARE
PHILADELPHIA
N
0 1.5 3 6 9
Miles
DVRPC September 2007

Schuylkill Crossings Traffic Study: Registered Location of DeKalb Street Bridge Users




Schuylkill Crossings Traffic Study: Registered Location of Matsonford Bridge Users
Direction and Time Period
Eastbound, AM
Eastbound, PM
Westbound, AM
Westbound, PM
MONTGOMERY
BUCKS
CHESTER
PHILADELPHIA
DELAWARE
N
0 1.5 3 6 9
Miles
DVRPC, September 2007


Schuylkill Crossings Traffic Study:
Registered Location of Green Lane
Bridge Users
Direction and Time Period
Eastbound, AM
Eastbound, PM
Westbound, AM
Westbound, PM
MONTGOMERY
BUCKS
CHESTER
PHILADELPHIA
DELAWARE
N
0 1.5 3 6 9
Miles
DVRPC, September 2007

Schuylkill Crossings Traffic Study

Publication Number: 07040

Date Published: January 2008

Geographic Area Covered: The municipalities of Bridgeport, Conshohocken, Narberth, Norristown, West Conshohocken boroughs and East Norriton, Lower Merion, Plymouth, Springfield, Upper Merion, West Norriton, Whitemarsh, and Whitpain Townships, in Montgomery County and the Manayunk/Roxborough area of Philadelphia City.

Key Words: Schuylkill River, Dannehower Bridge, DeKalb Street Bridge, Matsonford/Fayette Street Bridge, Belmont Avenue/Green Lane Bridge. Traffic Forecasts, Travel Simulation.

ABSTRACT

This report documents 2030 traffic forecasts for the Schuylkill River bridges in the Conshohocken, Plymouth Meeting, Norristown, King of Prussia area. Average daily and AM and PM peak hour forecasts are provided for a No-Build and two Build alternatives and compared to current volumes. Average peak hour intersection delays and levels-of-service are also provided for current and future conditions.

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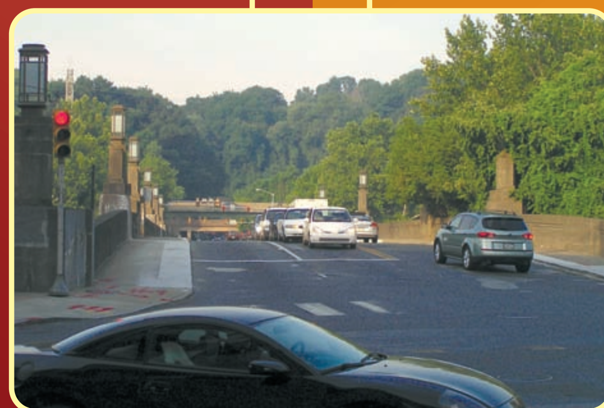

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