**Technical Memorandum**

# US 1 WIDENING AND RECONSTRUCTION TRAFFIC STUDY

August 2008

Delaware Valley Regional Planning Commission
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Philadelphia, PA 19106-1520

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.

DVRPC fully complies with Title VI of the Civil Rights Act of 1964 and related statutes and regulations in all programs and activities. DVRPC's website may be translated into Spanish, Russian, and Traditional Chinese online by visiting www.dvrpc.org. Publications and other public documents can be made available in alternative languages or formats, if requested. For more information, please call (215) 238-2871.

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# I. INTRODUCTION

This memo, requested by the Pennsylvania Department of Transportation (PENNDOT), documents 2015 and 2035 traffic forecasts for the US 1 Expressway in Bucks County, Pennsylvania. In preparation for projecting future traffic volumes, traffic counts throughout the study area were collected by 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 travel simulation model was focused on the corridor and used to prepare 2015 and 2035 traffic volume estimates for study area roadways under a No-Build and two Build alternatives.

A focused travel simulation was conducted using DVRPC's regional travel forecasting model. The traffic analysis 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 memo documents the existing characteristics of the study area, including current daily and AM and PM peak hour traffic volumes. Chapter III explains the travel forecasting methodology, including a description of the travel simulation model used to develop the traffic projections, as well as brief descriptions of the No-Build and Build alternatives. The study area's population and employment projections, which provide necessary inputs into the travel model, are also presented in this chapter. Chapter IV presents an analysis of the projected 2015 and 2035 daily traffic forecasts under each alternative. Conclusions drawn from the traffic study are listed in Chapter V. Detailed figures displaying the 2015 and 2035 AM and PM peak hour forecasts, are located in appendices A and B, respectively.

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# II. CHARACTERISTICS OF THE STUDY AREA

US 1 is a major north-south highway that traverses the entire east coast of the United States, from Key West, Florida to the Maine/Canada border. Within the Delaware Valley region, US 1 extends from the Maryland/Pennsylvania state line in Chester County, crosses the Delaware River into New Jersey, and continues through Mercer County to the Middlesex County line. It follows a northeastern path from Philadelphia as it enters Bucks County, Pennsylvania, and allows traffic to connect to other major regional facilities such as US 13, I-95, the Pennsylvania Turnpike (I-276), and PA 132 (Street Road).

This traffic study is primarily concerned with the six-mile segment of the US 1 Expressway known as the Lincoln Highway, which extends from the Philadelphia/Bucks county line to the I-95 Interchange in Middletown Township. Within the study area, US 1 is classified as a non-interstate urban freeway or expressway. From the Philadelphia County line to the PA Turnpike interchange, the US 1 Expressway is a six-lane facility. However, north of the Turnpike Interchange, US 1 drops to two lanes by direction. Adjacent land uses include residential, commercial, and industrial.

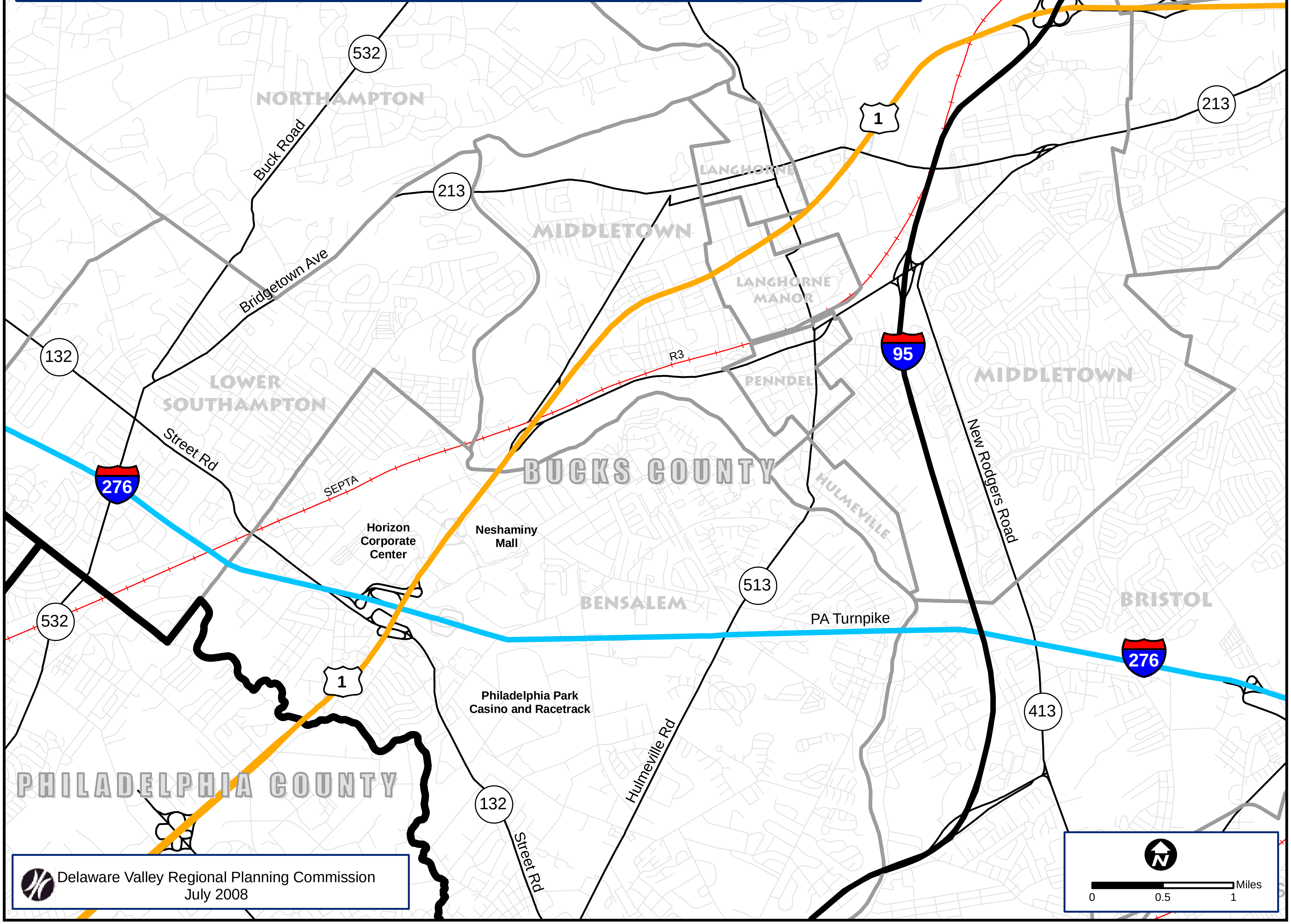
The study area for traffic forecasting purposes is defined as the municipalities of Bensalem, Bristol, Lower Southampton, and Middletown townships, and the boroughs of Hulmeville, Langhorne, Langhorne Manor, and Penndel in Bucks County. This area, along with its relationship to US 1, is shown in Figure 1.

## A. Current Average Daily Traffic Volumes

Figure 2 displays the current average annual daily traffic (AADT) volumes for US 1 and significant parallel and intersecting roadways within the study area. For this analysis, the “current year” is defined as 2008. Daily traffic volumes along US 1 range from 50,700 vehicles per day (vpd) to 81,700 vpd. The lowest volume occurs between PA 213 and the US 1 Expressway/I-95 interchange. The highest volume occurs between Rockhill Drive and the PA Turnpike interchange. Traffic volumes on US 1 tend to be higher north of the Turnpike than they are in the southern portion towards Philadelphia, despite the fact that US 1 has fewer travel lanes north of the Turnpike. Between the PA Turnpike Interchange and the US 1 split with Business US 1, volumes remain roughly constant at around 81,000 vpd. North of the split with Business US 1 the volume drops by nearly 11,000 vpd to 69,600 vpd.

The major facilities that allow access to US 1 in this area include the Pennsylvania Turnpike, Street Road, and Rockhill Drive. All of these facilities are below grade to US 1 and have on and off ramps to access US 1. The most heavily traveled of these is the PA Turnpike, with current volumes of 94,400 vpd west of the US 1 interchange, and 46,500 vpd east of the interchange. Street Road, west of US 1, carries between 33,400 vpd and

# Figure 1. US 1 Widening and Reconstruction Traffic Study Area




Delaware Valley Regional Planning Commission
July 2008

# US 1 Widening and Reconstruction Traffic Study
## Figure 2. Current Average Annual Daily Traffic Volumes

47,700 vpd. Just east of the expressway, Street Road carries 43,300 vpd. Its lowest volume of 37,800 vpd occurs between Mechanicsville Road and Knights Road. Rockhill Drive's highest volume of 24,000 vpd occurs just east of the US 1 Interchange, as this is the access area for the Neshaminy Mall. West of US 1, Rockhill Drive serves 17,000 vpd.

Traffic counts were also collected along other facilities that are important to the traffic flow within the US 1 study area. Old Lincoln Highway mainly runs parallel to US 1, providing traffic with access to the corporate parks adjacent to the US 1 corridor. This facility carries 19,900 vpd from Street Road to Rockhill Drive, but has a slightly lower volume of 16,400 vpd south of Street Road as it reconnects with US 1. Bristol Road does not directly connect to US 1, but it carries a significant amount of volume, and creates the northern border of the Neshaminy Mall complex. South of US 1, Bristol Road has a daily traffic volume of 13,000 vehicles, but serves 20,400 vpd on the northern side of US 1.

## B. Current AM and PM Peak Hour Volumes

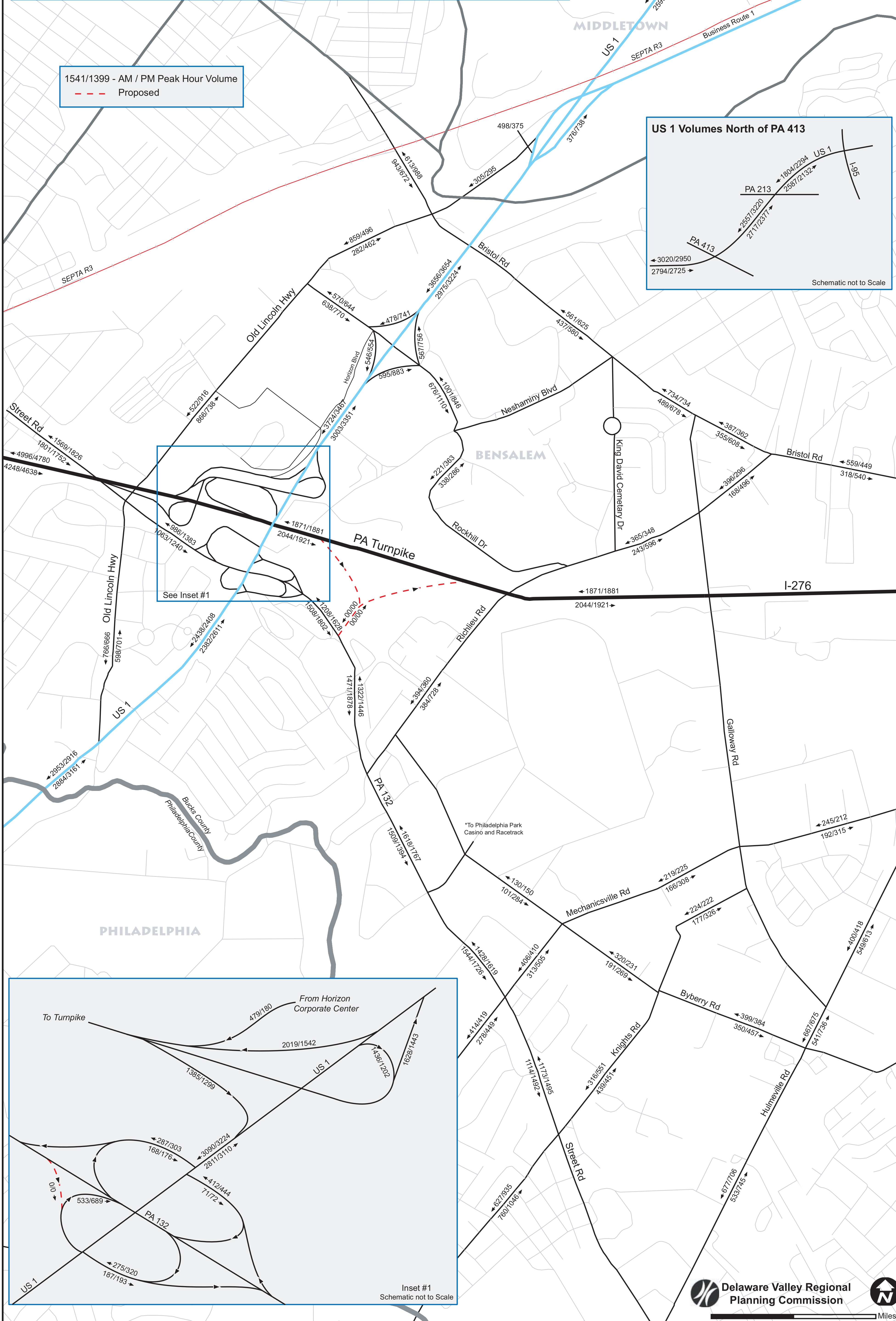
Current AM and PM peak hour traffic volumes were also collected along the US 1 corridor throughout the study area. Figure 3 displays these volumes. Peak hour volumes within the study area generally follow the same patterns as their corresponding daily volumes.

Along US 1, the highest peak hour volumes occur between the PA Turnpike and Rockhill Drive interchanges. This location has the highest US 1 volumes during both the AM and PM peak hours in both the northbound and southbound directions. Peak hour volumes generally decrease as one moves north from this location. The lowest US 1 peak hour volumes in the study area occur between PA 213 and I-95. South of the US 1/Street Road interchange, peak hour volumes on US 1 are somewhat less than those north of this interchange. South of Street Road, peak hour volumes on US 1 are typically between 2,400 and 3,000 vph. However, from Street Road north to US 1 Business, peak hour volumes range from approximately 3,000 to 3,700 vph.

In the southbound direction, higher volumes occur during the AM peak hour, compared to the PM peak hour. The opposite is true in the northbound direction, where the highest volumes occur during the PM peak hour. Nevertheless, between PA 413 and the PA Turnpike, southbound US 1 traffic volumes are higher than northbound volumes during both the AM and PM peak hours. South of Street Road, however, northbound volumes are higher than southbound volumes during the PM peak hour.

During the AM peak, southbound volumes along US 1 range from 1,804 to 3,724 vph. These volumes steadily increase as traffic moves south from I-95, towards Street Road. Once past Street Road, the AM volume drops to 2,438 vph, and then increases as one moves towards the city of Philadelphia. Northbound volumes range from 2,382 to 3,003 vph. These volumes decrease as one moves from Philadelphia towards Street Road. In this area, Old Lincoln Highway serves as an alternative route for traffic destined for Street Road westbound.

# US 1 Widening and Reconstruction Traffic Study
# Figure 3. Current AM/PM Peak Hour Traffic Volumes




April 2008

PM peak hour volumes follow the same trends in both the southbound and northbound direction as the AM peak hour volumes. Southbound PM peak volumes range from a low of 2,294 vph just south of I-95, to a high of 3,654 vph just north of Rockhill Drive. Northbound PM peak hour volumes decrease as traffic moves away from Philadelphia towards Street Road, going from 3,161 to 2,611 vph. Again, the highest volume is located just north of the PA Turnpike at 3,351 vph, and decreases as one moves north along US 1.

The Turnpike has significantly higher volumes west of its interchange with US 1, averaging well over 4,000 vph in both directions during each peak period. Westbound volumes are higher than those in the eastbound direction, for both time periods. Westbound peak volumes are 4,996 and 4,780 vph during the AM and PM peak hours, respectively. Eastbound volumes at this location are 4,248 vph during the AM peak and 4,638 vph during the PM peak. East of US 1, peak hour volumes along the PA Turnpike are less than half of the volumes west of the interchange. Eastbound volumes are 2,044 and 1,921 vph during the AM and PM peak hours, respectively. Westbound volumes are 1,871 vph during the AM peak hour and a nearly identical 1,881 vph during the PM peak.

Westbound Street Road volumes, west of US 1, are significantly less than those east of US 1 in both the AM (986 vs. 1,208 vph) and PM (1,383 vs. 1,628 vph) peak hour. The same is true in the eastbound direction. Volumes increase from 1,063 to 1,508 vph during the AM peak, and increase from 1,240 to 1,802 vph during the PM peak, as one moves across US 1. East of US 1, Street Road volumes range from 1,114 to 1,544 vph during the AM peak hour, and from 1,394 to 1,878 vpd during the PM peak hour.

During the AM peak, westbound volumes along Rockhill Drive range from 338 to 1,001 vph, with the highest volume occurring just east of the US 1 interchange, and the lowest east of Neshaminy Boulevard. Westbound volumes are lower, ranging from 221 to 676 vph; again with the highest volume between US 1 and Neshaminy Boulevard, and the lowest east of Neshaminy Boulevard. In the PM period, the same characteristics hold true as those in the AM, with the lowest and highest volumes (286 and 1,110 vph respectively) in both directions being east of US 1 and east of Neshaminy Boulevard, respectively. Generally the PM volumes are higher in the eastbound direction versus the westbound direction, on both sides of US 1.

AM peak hour volumes on Old Lincoln Highway, range from 305 to 859 vph in the southbound direction, while northbound AM peak volumes range from a low of 282 vph to a high of 866 vph. During the PM peak hour, southbound volumes are between 295 and 916 vph, while northbound traffic volumes range from 462 to 738 vph. Generally, the highest traffic volumes on Old Lincoln Highway are recorded between Street Road and Rockhill Drive, along the northwestern side of the Horizon Corporate Center.

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# III. 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.

Traffic forecasts are prepared and evaluated for the years 2015 and 2035 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. Improvement Alternatives

The No-Build Alternative does not include any changes to US 1. This alternative does, however, include improvements to other regional facilities that are included in DVRPC's Transportation Improvement Program (TIP) and Long Range Plan, and may have an impact on US 1 traffic volumes once they are built. These TIP and Plan projects include the proposed Street Road slip ramps to and from the eastbound PA Turnpike, just west of Richlieu Road; the construction of the PA Turnpike/I-95 Interchange; PA Turnpike widening between US 1 and the New Jersey Turnpike; an extension of County Line Road from Bustleton Pike to Philmont Avenue; Scudder Falls Bridge widening; and several closed-loop traffic signal projects, including along Bridgetown Pike, Bristol Pike, and US 1 Business.

The No-Build Alternative also includes several improvements to regional facilities that serve long-distance trips and may bring traffic into the study area. These improvements include widening the PA Turnpike between the Valley Forge and Norristown interchanges, widening its Northeast Extension between the Lansdale and Mid-County interchanges, widening the New Jersey Turnpike between Exit 6 and Exit 9, and several interchange improvements along I-95.

Both Build alternatives include these TIP and Plan projects. In addition, Build Alternative 1 widens US 1 from two to three lanes in each direction from Old Lincoln Highway to the Penndel Interchange (US 1 Business). This alternative would also provide a new ramp from Street Road eastbound to US 1 southbound. Build Alternative 2 is similar, except that the US 1 widening occurs only between Old Lincoln Highway and the Neshaminy Interchange at Rockhill Drive.

For the 2015 analysis year, only two ramps from the proposed PA Turnpike/I-95 interchange project are included in the model due to that project's construction schedule. Only the I-95 northbound ramp to the PA Turnpike eastbound and the PA Turnpike westbound ramp to I-95 southbound are scheduled to be open to traffic by 2015. The 2035 forecasts assume the completion of the interchange, with all interchange movements provided for.

## B. 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 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 areas outside the region. 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. US 1 Expressway Study Area Forecasts

As part of the US 1 Widening and Reconstruction 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 2035 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 2035, the total population in the greater study area is projected to increase by 15,559 residents to 202,339. This represents an increase of just over eight percent from the 2005 value of 186,780. Hulmeville Borough and Middletown Township have the greatest relative increase in population at 22.4 and 21.0 percent, respectively. However, only three municipalities are expected to add more than 1,000 new residents between 2005 and 2035. They include Middletown, Bensalem, and Bristol townships, adding 9,990, 2,462, and 1,904 residents, respectively. The remaining municipalities have absolute growth values ranging from 42 to 645 residents, with Lower Southampton Township being the highest of this group.

The study area will also add nearly 21,000 new jobs between 2005 and 2035, an increase of 21.5 percent. Once again, Middletown, Bensalem, and Bristol townships are expected to add the most jobs between 2005 and 2035. Bensalem Township is responsible for nearly half of the study area’s employment growth during this time period, with 10,035 new employees. Middletown Township has the largest percent increase at 29.0 percent, followed closely by Bensalem Township and Penndel Borough with expected increases of 26.2 percent and 25.3 percent, respectively.

**Table 1. Study Area Population and Employment Forecasts**

| | Population | | | | | | Employment | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2005 - 2035 Growth | | | | | | 2005 - 2035 Growth | |
| **Municipality** | **2000** | **2005** | **2015** | **2035** | **Abs.** | **Pct.** | **2000** | **2005** | **2015** | **2035** | **Abs.** | **Pct.** |
| Bensalem Township | 58,435 | 58,886 | 60,374 | 61,348 | 2,462 | 4.2% | 37,661 | 38,301 | 42,981 | 48,336 | 10,035 | 26.2% |
| Bristol Township | 55,521 | 54,649 | 55,360 | 56,553 | 1,904 | 3.5% | 20,718 | 21,114 | 22,162 | 23,925 | 2,811 | 13.3% |
| Hulmeville Borough | 895 | 880 | 953 | 1,077 | 197 | 22.4% | 133 | 137 | 142 | 150 | 13 | 9.5% |
| Langhorne Borough | 1,980 | 1,977 | 2,020 | 2,093 | 116 | 5.9% | 1,166 | 981 | 986 | 995 | 14 | 1.4% |
| Langhorne Manor Borough | 925 | 1,081 | 1,097 | 1,123 | 42 | 3.9% | 1,394 | 1,409 | 1,511 | 1,685 | 276 | 19.6% |
| Lower Southampton Township | 19,275 | 19,345 | 19,586 | 19,990 | 645 | 3.3% | 10,612 | 11,267 | 11,592 | 12,145 | 878 | 7.8% |
| Middletown Township | 44,140 | 47,564 | 51,294 | 57,554 | 9,990 | 21.0% | 20,884 | 22,697 | 25,152 | 29,268 | 6,571 | 29.0% |
| Penndel Borough | 2,420 | 2,398 | 2,474 | 2,601 | 203 | 8.5% | 1,149 | 1,098 | 1,202 | 1,376 | 278 | 25.3% |
| **Study Area Total** | **183,591** | **186,780** | **193,158** | **202,339** | **15,559** | **8.3%** | **93,717** | **97,004** | **105,728** | **117,880** | **20,876** | **21.5%** |

DVRPC, April 2008

## C. DVRPC's Travel Simulation Process

For the US 1 Widening and Reconstruction Traffic Study, a focused simulation process was employed. A focused simulation process uses 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 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 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 are 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 that 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.

For the US 1 Widening and Reconstruction Traffic Study, an additional trip purpose was added to the DVRPC's standard travel demand model to represent casino visitor trips. These trips have different characteristics than the other trip purposes in the DVRPC's travel demand model. They tend to have a different trip length frequency distribution with a longer average trip length, and a somewhat higher average auto occupancy than other trips.

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.

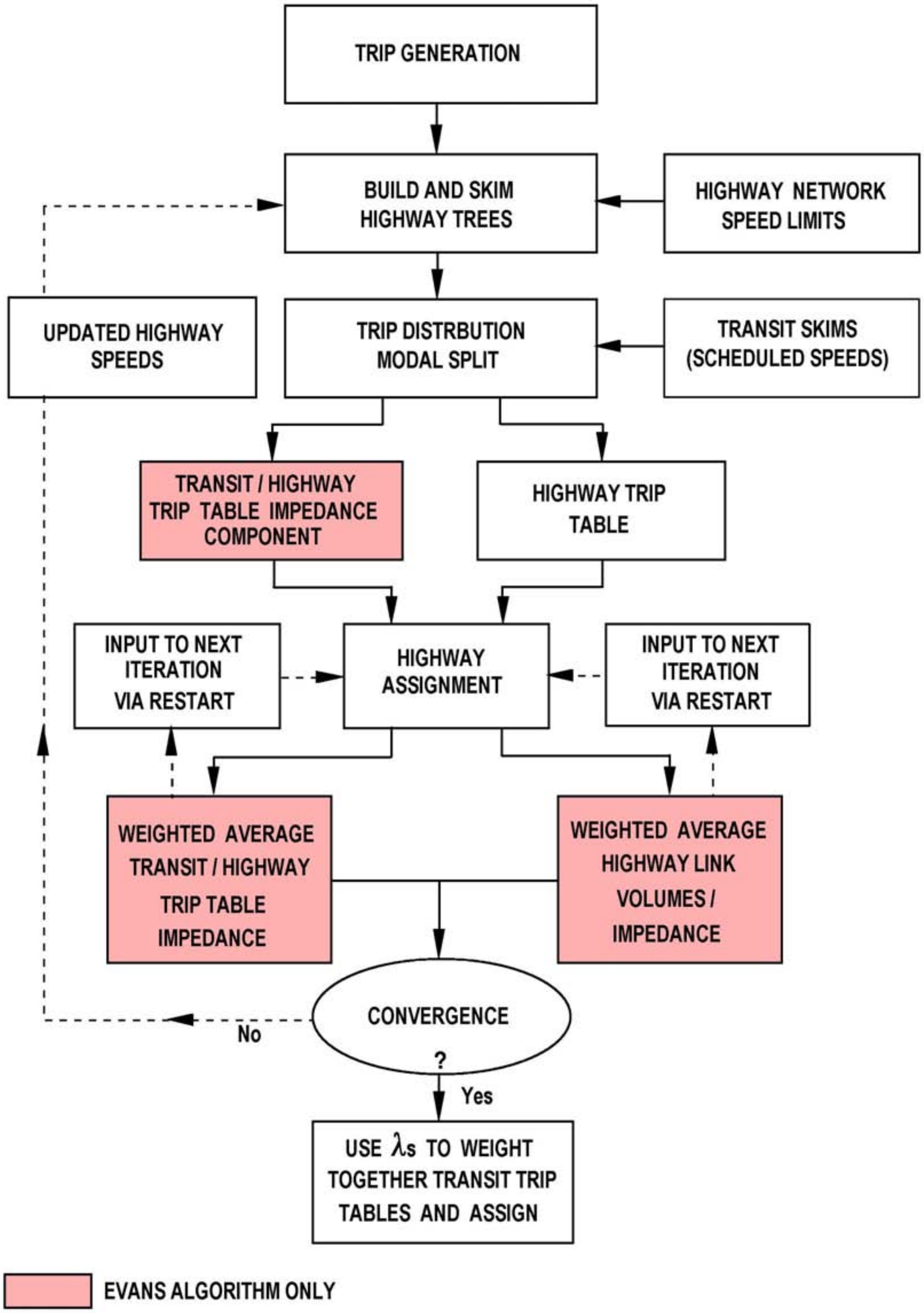
### 1. Trip Generation

Both internal trips (those made within the DVRPC region) and external trips (those 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 includes 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 4. DVRPC's Travel Modeling Process



## 3. Trip Distribution

Trip distribution is the process by which the zonal trip ends established in the trip generation analysis are linked together to form origin-destination patterns in a trip table format. Peak, midday, and evening trip ends are distributed separately. For each Evans iteration, a series of ten 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 that 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 allows 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," which means 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," which means 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.

## D. Highway 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 is executed with current conditions and the results are 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 future-year conditions.

The following tabulation summarizes the aggregate error in the assigned daily traffic volumes. A total of 68 locations throughout the greater study area with available daily traffic counts were used for model validation. Eight of these locations are along US 1; 18 are ramp counts at various locations including the PA Turnpike and Street Road interchanges; 19 are other facilities that are generally parallel to US 1, including Old Lincoln Highway, Mechanicsville Road, and Richlieu Road; and 23 are on facilities that either cross US 1 or are perpendicular to it, such as the PA Turnpike, Street Road, Rockhill Drive, and Bristol Road. The total assigned traffic on all facilities, 1.62 million vehicles, is within about two percent of the total counted volume of 1.65 million vehicles, as shown below:

| Facilities | Number of Locations | Counted Volume | Simulated Volume | Difference | Percent Difference |
|---|---|---|---|---|---|
| US 1 Mainline | 8 | 564,284 | 543,738 | -20,546 | -3.6 % |
| US 1 Interchange Ramps | 18 | 147,183 | 130,911 | -16,272 | -11.1 % |
| Parallel Facilities | 19 | 227,672 | 222,481 | -5,191 | -2.3 % |
| Crossing Facilities | 23 | 715,281 | 719,996 | 4,715 | 0.7 % |
| **All Facilities** | **68** | **1,654,420** | **1,617,126** | **37,294** | **-2.3 %** |

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# IV. PROJECTED TRAFFIC VOLUMES

Projected traffic volumes for the anticipated opening year, 2015, and a horizon year of 2035 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 forecasts are provided for each alternative at the same locations shown in Figure 3. These volumes may be found in appendices A and B.

## A. 2015 Daily Traffic Forecasts

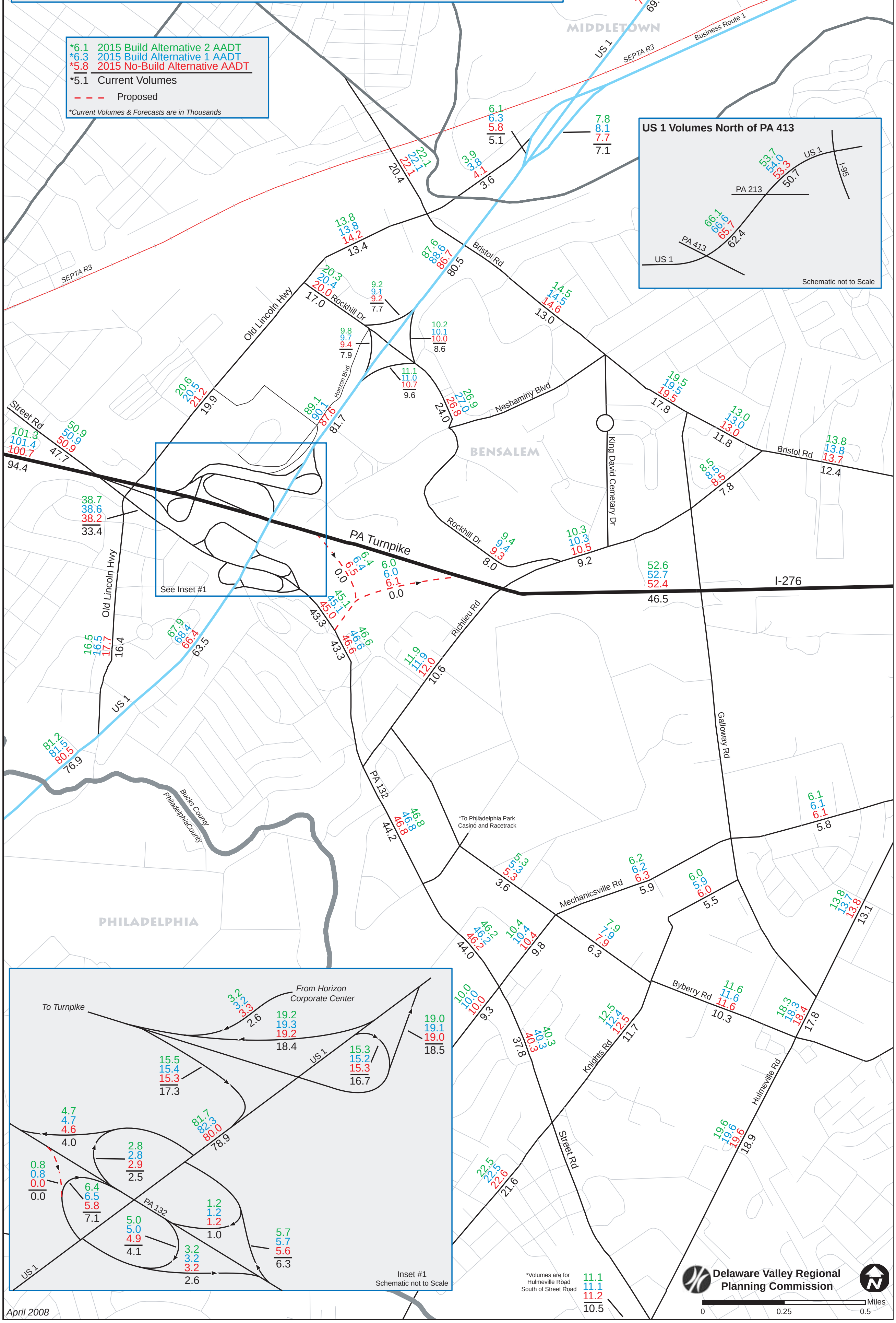
Figure 5 provides the 2015 average annual daily traffic volumes for the No-Build and Build alternatives. In the figure, current traffic volumes are shown in black, underneath the line representing the highway links. No-Build volumes are shown in red, just above the line. Daily traffic volumes for Build Alternative 1 and Build Alternative 2 are shown above the No-Build volume, in blue and green, respectively. Table 2 provides these same volumes, along with comparisons between current and No-Build traffic volumes, between each Build Alternative and the No-Build Alternative, and between the two Build alternatives.

Under the No-Build Alternative, 2015 volumes on US 1 are projected to be between 53,300 and 87,600 vehicles per day (vpd). These volumes represent increases of approximately 3,000 to 6,000 vpd over current traffic counts. The largest increases occur north of the PA Turnpike interchange. Here, No-Build Alternative volumes are between six and eight percent higher than the counted volumes. North of the Penndel Interchange (US 1 Business), traffic volumes on US 1 increase an average of just over five percent under the No-Build Alternative. South of Street Road, US 1 volumes are forecast to increase by slightly less than five percent. The smallest increase occurs between the Street Road and PA Turnpike interchanges at just over 1,100 vpd, or an increase of 1.4 percent.

Daily traffic volumes on the PA Turnpike show a modest increase of 6.7 percent west of The US 1 Interchange; while east of US 1, volumes increase an average of 13.4 percent, or about 6,100 vpd. This larger growth is partly due to the construction of eastbound slip ramps accessing Street Road from the Turnpike at the former Neshaminy Service Plaza. These ramps carry 6,500 vpd and 6,100 vpd, for the off- and on-ramps, respectively.

Street Road No-Build Alternative volumes increase within a range of four to 14 percent, with an average increase of six percent along the facility. The largest growth in volume occurs between Old Lincoln Highway and the US 1 interchange ramps, increasing from 33,396 vpd to 38,200 vpd, or just over 4,800 vpd. The smallest increase of 1,707 vpd is just east of the US 1 interchange ramps and west of the proposed slip ramps with the PA Turnpike. The Street Road volume east of the turnpike slip ramps, towards Hulmeville Road, increases by about 2,000 to 3,000 vpd, with the larger growth occurring near Richlieu Road and the Philadelphia Park Casino and Racetrack.

# US 1 Widening and Reconstruction Traffic Study
# Figure 5. 2015 Average Annual Daily Traffic Volumes



## Table 2. 2015 Average Annual Daily Traffic Volumes for the No-Build and Build Alternatives

| Location / Limits | Current AADT | 2015 No-Build AADT | No-Build/Current Diff. | No-Build/Current Pct. | 2015 Build Alt. 1 AADT | Alt. 1/No-Build Diff. | Alt. 1/No-Build Pct. | 2015 Build Alt. 2 AADT | Alt. 2/No-Build Diff. | Alt. 2/No-Build Pct. | Alt. 2/Alt. 1 Diff. | Alt. 2/Alt. 1 Pct. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *US 1 Mainline* | | | | | | | | | | | | |
| Woodhaven Road to Old Lincoln Highway/Old Trevose Road | 76,891 | 80,500 | 3,609 | 4.7% | 81,500 | 1,000 | 1.2% | 81,200 | 700 | 0.9% | -300 | -0.4% |
| Old Lincoln Highway to Street Road Interchange | 63,498 | 66,400 | 2,902 | 4.6% | 68,400 | 2,000 | 3.0% | 67,900 | 1,500 | 2.3% | -500 | -0.7% |
| Street Road Interchange to PA Turnpike Interchange | 78,887 | 80,000 | 1,113 | 1.4% | 82,300 | 2,300 | 2.9% | 81,700 | 1,700 | 2.1% | -600 | -0.7% |
| PA Turnpike Interchange to Rockhill Drive Interchange | 81,731 | 87,600 | 5,869 | 7.2% | 90,100 | 2,500 | 2.9% | 89,100 | 1,500 | 1.7% | -1,000 | -1.1% |
| Rockhill Drive Interchange to US 1 Business (Lincoln Highway) | 80,527 | 86,700 | 6,173 | 7.7% | 88,600 | 1,900 | 2.2% | 87,600 | 900 | 1.0% | -1,000 | -1.1% |
| US 1 Business (Lincoln Highway) to PA 413 (Pine Street) | 69,607 | 73,800 | 4,193 | 6.0% | 74,800 | 1,000 | 1.4% | 74,400 | 600 | 0.8% | -400 | -0.5% |
| PA 413 (Pine Street) to PA 213 (Maple Avenue/Old Lincoln Highway) | 62,444 | 65,700 | 3,256 | 5.2% | 66,600 | 900 | 1.4% | 66,100 | 400 | 0.6% | -500 | -0.8% |
| PA 213 (Maple Avenue/Old Lincoln Highway) to Interstate 95 | 50,699 | 53,300 | 2,601 | 5.1% | 54,000 | 700 | 1.3% | 53,700 | 400 | 0.8% | -300 | -0.6% |
| *Interchange Ramps* | | | | | | | | | | | | |
| US 1 Southbound Off-Ramp to Street Road Eastbound | 7,105 | 5,800 | -1,305 | -18.4% | 6,500 | 700 | 12.1% | 6,400 | 600 | 10.3% | -100 | -1.5% |
| US 1 Southbound On-Ramp from Street Road Westbound | 2,510 | 2,900 | 390 | 15.5% | 2,800 | -100 | -3.4% | 2,800 | -100 | -3.4% | 0 | 0.0% |
| US 1 Southbound Off-Ramp to Street Road Westbound | 3,991 | 4,600 | 609 | 15.3% | 4,700 | 100 | 2.2% | 4,700 | 100 | 2.2% | 0 | 0.0% |
| US 1 Southbound On-Ramp from Street Road Eastbound | 0 | 0 | 0 | ---- | 800 | 800 | ---- | 800 | 800 | ---- | 0 | 0.0% |
| US 1 Northbound Off-Ramp to Street Road Eastbound | 2,640 | 3,200 | 560 | 21.2% | 3,200 | 0 | 0.0% | 3,200 | 0 | 0.0% | 0 | 0.0% |
| US 1 Northbound On-Ramp from Street Road Eastbound | 4,104 | 4,900 | 796 | 19.4% | 5,000 | 100 | 2.0% | 5,000 | 100 | 2.0% | 0 | 0.0% |
| US 1 Northbound Off-Ramp to Street Road Westbound | 997 | 1,200 | 203 | 20.4% | 1,200 | 0 | 0.0% | 1,200 | 0 | 0.0% | 0 | 0.0% |
| US 1 Northbound On-Ramp from Street Road Westbound | 6,336 | 5,600 | -736 | -11.6% | 5,700 | 100 | 1.8% | 5,700 | 100 | 1.8% | 0 | 0.0% |
| US 1 Southbound On-Ramp from PA Turnpike Toll Plaza | 17,317 | 15,300 | -2,017 | -11.6% | 15,400 | 100 | 0.7% | 15,500 | 200 | 1.3% | 100 | 0.6% |
| US 1 Southbound Off-Ramp to PA Turnpike Toll Plaza | 18,353 | 19,200 | 847 | 4.6% | 19,300 | 100 | 0.5% | 19,200 | 0 | 0.0% | -100 | -0.5% |
| US 1 Northbound Off-Ramp to PA Turnpike Toll Plaza | 16,694 | 15,300 | -1,394 | -8.4% | 15,200 | -100 | -0.7% | 15,300 | 0 | 0.0% | 100 | 0.7% |
| US 1 Northbound On-Ramp from PA Turnpike Toll Plaza | 18,502 | 19,000 | 498 | 2.7% | 19,100 | 100 | 0.5% | 19,000 | 0 | 0.0% | -100 | -0.5% |
| Horizon Corporporate Center On-Ramp to PA Turnpike Toll Plaza | 2,576 | 3,300 | 724 | 28.1% | 3,200 | -100 | -3.0% | 3,200 | -100 | -3.0% | 0 | 0.0% |
| US 1 Southbound On-Ramp from Rockhill Drive | 7,915 | 9,400 | 1,485 | 18.8% | 9,700 | 300 | 3.2% | 9,800 | 400 | 4.3% | 100 | 1.0% |
| US 1 Southbound Off-Ramp to Rockhill Drive | 7,716 | 9,200 | 1,484 | 19.2% | 9,100 | -100 | -1.1% | 9,200 | 0 | 0.0% | 100 | 1.1% |
| US 1 Northbound Off-Ramp to Rockhill Drive | 9,599 | 10,700 | 1,101 | 11.5% | 11,000 | 300 | 2.8% | 11,100 | 400 | 3.7% | 100 | 0.9% |
| US 1 Northbound On-Ramp from Rockhill Drive | 8,594 | 10,000 | 1,406 | 16.4% | 10,100 | 100 | 1.0% | 10,200 | 200 | 2.0% | 100 | 1.0% |
| US 1 Southbound On-Ramp from US 1 Business Southbound | 5,139 | 5,800 | 661 | 12.9% | 6,300 | 500 | 8.6% | 6,100 | 300 | 5.2% | -200 | -3.2% |
| US 1 Northbound Off-Ramp to US 1 Business Northbound | 7,095 | 7,700 | 605 | 8.5% | 8,100 | 400 | 5.2% | 7,800 | 100 | 1.3% | -300 | -3.7% |
| PA Turnpike Eastbound Off-Ramp to Street Road | 0 | 6,500 | 6,500 | ---- | 6,400 | -100 | -1.5% | 6,400 | -100 | -1.5% | 0 | 0.0% |
| PA Turnpike Eastbound On-Ramp from Street Road | 0 | 6,100 | 6,100 | ---- | 6,000 | -100 | -1.6% | 6,000 | -100 | -1.6% | 0 | 0.0% |
| *Parallel Facilities* | | | | | | | | | | | | |
| Old Lincoln Highway - Neshaminy Interplex Drive to Street Road | 16,388 | 17,700 | 1,312 | 8.0% | 16,500 | -1,200 | -6.8% | 16,500 | -1,200 | -6.8% | 0 | 0.0% |
| Old Lincoln Highway - Street Road to Rockhill Drive | 19,850 | 21,200 | 1,350 | 6.8% | 20,500 | -700 | -3.3% | 20,600 | -600 | -2.8% | 100 | 0.5% |
| Old Lincoln Highway - Rockhill Drive to Bristol Road | 13,395 | 14,200 | 805 | 6.0% | 13,800 | -400 | -2.8% | 13,800 | -400 | -2.8% | 0 | 0.0% |
| Old Lincoln Highway - Bristol Road to US 1 Business | 3,550 | 4,100 | 550 | 15.5% | 3,800 | -300 | -7.3% | 3,900 | -200 | -4.9% | 100 | 2.6% |
| Richlieu Road - Street Road to Rockhill Drive | 10,597 | 12,000 | 1,403 | 13.2% | 11,900 | -100 | -0.8% | 11,900 | -100 | -0.8% | 0 | 0.0% |
| Richlieu Road - Rockhill Drive to Galloway Road | 9,204 | 10,500 | 1,296 | 14.1% | 10,300 | -200 | -1.9% | 10,300 | -200 | -1.9% | 0 | 0.0% |
| Richlieu Road - Galloway Road to Bristol Road | 7,794 | 8,500 | 706 | 9.1% | 8,500 | 0 | 0.0% | 8,500 | 0 | 0.0% | 0 | 0.0% |
| Mechanicsville Road - Century Lane to Street Road | 9,302 | 10,000 | 698 | 7.5% | 10,000 | 0 | 0.0% | 10,000 | 0 | 0.0% | 0 | 0.0% |
| Mechanicsville Road - Street Road to Byberry Road | 9,765 | 10,400 | 635 | 6.5% | 10,400 | 0 | 0.0% | 10,400 | 0 | 0.0% | 0 | 0.0% |
| Mechanicsville Road - Byberry Road to Galloway Road | 5,916 | 6,300 | 384 | 6.5% | 6,200 | -100 | -1.6% | 6,200 | -100 | -1.6% | 0 | 0.0% |
| Mechanicsville Road - Galloway Road to Hulmeville Road | 5,813 | 6,100 | 287 | 4.9% | 6,100 | 0 | 0.0% | 6,100 | 0 | 0.0% | 0 | 0.0% |

## Table 2. 2015 Average Annual Daily Traffic Volumes for the No-Build and Build Alternatives

| Location / Limits | Current AADT | 2015 No-Build AADT | No-Build/Current Diff. | No-Build/Current Pct. | 2015 Build Alt. 1 AADT | Alt. 1/No-Build Diff. | Alt. 1/No-Build Pct. | 2015 Build Alt. 2 AADT | Alt. 2/No-Build Diff. | Alt. 2/No-Build Pct. | Alt. 2/Alt. 1 Diff. | Alt. 2/Alt. 1 Pct. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Knights Road - Dunks Ferry Road to Street Road | 21,638 | 22,600 | 962 | 4.4% | 22,500 | -100 | -0.4% | 22,500 | -100 | -0.4% | 0 | 0.0% |
| Knights Road - Street Road to Byberry Road | 11,718 | 12,500 | 782 | 6.7% | 12,400 | -100 | -0.8% | 12,500 | 0 | 0.0% | 100 | 0.8% |
| Knights Road - Byberry Road to Galloway Road | 5,543 | 6,000 | 457 | 8.2% | 5,900 | -100 | -1.7% | 6,000 | 0 | 0.0% | 100 | 1.7% |
| Hulmeville Road - Bristol Pike to Street Road | 10,539 | 11,200 | 661 | 6.3% | 11,100 | -100 | -0.9% | 11,100 | -100 | -0.9% | 0 | 0.0% |
| Hulmeville Road - Street Road to Byberry Road | 18,858 | 19,600 | 742 | 3.9% | 19,600 | 0 | 0.0% | 19,600 | 0 | 0.0% | 0 | 0.0% |
| Hulmeville Road - Byberry Road to Galloway Road | 17,754 | 18,400 | 646 | 3.6% | 18,300 | -100 | -0.5% | 18,300 | -100 | -0.5% | 0 | 0.0% |
| Hulmeville Road - Galloway Road to Mechanicsville Road | 13,092 | 13,800 | 708 | 5.4% | 13,700 | -100 | -0.7% | 13,800 | 0 | 0.0% | 100 | 0.7% |
| Hulmeville Road - Mechanicsville Road to Gibson Road | 16,956 | 17,900 | 944 | 5.6% | 17,700 | -200 | -1.1% | 17,800 | -100 | -0.6% | 100 | 0.6% |
| *Intersecting Facilities* | | | | | | | | | | | | |
| Street Road - Brownsville Road to Old Lincoln Highway | 47,747 | 50,900 | 3,153 | 6.6% | 50,900 | 0 | 0.0% | 50,900 | 0 | 0.0% | 0 | 0.0% |
| Street Road - Old Lincoln Highway to US 1 Interchange | 33,396 | 38,200 | 4,804 | 14.4% | 38,600 | 400 | 1.0% | 38,700 | 500 | 1.3% | 100 | 0.3% |
| Street Road - US 1 Interchange to Proposed Street Road Slip Ramps | 43,293 | 45,000 | 1,707 | 3.9% | 45,100 | 100 | 0.2% | 45,100 | 100 | 0.2% | 0 | 0.0% |
| Street Road - Proposed Street Road Slip Ramps to Richlieu Road | 43,293 | 46,600 | 3,307 | 7.6% | 46,600 | 0 | 0.0% | 46,600 | 0 | 0.0% | 0 | 0.0% |
| Street Road - Richlieu Road to Tillman Drive/Philadelphia Park Drive | 44,153 | 46,800 | 2,647 | 6.0% | 46,800 | 0 | 0.0% | 46,800 | 0 | 0.0% | 0 | 0.0% |
| Street Road - Tillman Drive/Philadelphia Park Drive to Mechanicsville Road | 44,012 | 46,200 | 2,188 | 5.0% | 46,200 | 0 | 0.0% | 46,200 | 0 | 0.0% | 0 | 0.0% |
| Street Road - Mechanicsville Road to Knights Road | 37,801 | 40,300 | 2,499 | 6.6% | 40,300 | 0 | 0.0% | 40,300 | 0 | 0.0% | 0 | 0.0% |
| PA Turnpike - Willow Grove Interchange to US 1 Interchange | 94,409 | 100,700 | 6,291 | 6.7% | 101,400 | 700 | 0.7% | 101,300 | 600 | 0.6% | -100 | -0.1% |
| PA Turnpike - US 1 Interchange to Proposed Street Road Slip Ramps | 46,469 | 52,800 | 6,331 | 13.6% | 53,100 | 300 | 0.6% | 53,000 | 200 | 0.4% | -100 | -0.2% |
| PA Turnpike - Proposed Street Road Slip Ramps to Proposed I-95 Interchange | 46,469 | 52,400 | 5,931 | 12.8% | 52,700 | 300 | 0.6% | 52,600 | 200 | 0.4% | -100 | -0.2% |
| PA Turnpike - Proposed I-95 Interchange to Bristol Road Interchange | 46,469 | 66,700 | 20,231 | 43.5% | 66,700 | 0 | 0.0% | 66,700 | 0 | 0.0% | 0 | 0.0% |
| PA Turnpike - Bristol Road Interchange to New Jersey Turnpike Connector | 43,179 | 57,700 | 14,521 | 33.6% | 57,700 | 0 | 0.0% | 57,700 | 0 | 0.0% | 0 | 0.0% |
| Rockhill Drive - Old Lincoln Highway to Horizon Boulevard | 17,003 | 20,000 | 2,997 | 17.6% | 20,400 | 400 | 2.0% | 20,300 | 300 | 1.5% | -100 | -0.5% |
| Rockhill Drive - US 1 Interchange to Neshaminy Boulevard/Old Trevose Road | 23,985 | 26,800 | 2,815 | 11.7% | 27,000 | 200 | 0.7% | 26,900 | 100 | 0.4% | -100 | -0.4% |
| Rockhill Drive - Neshaminy Boulevard/Old Trevose Road to Richlieu Road | 7,965 | 9,300 | 1,335 | 16.8% | 9,400 | 100 | 1.1% | 9,400 | 100 | 1.1% | 0 | 0.0% |
| Bristol Road - Browsnville Road to Old Lincoln Highway | 20,427 | 22,100 | 1,673 | 8.2% | 22,100 | 0 | 0.0% | 22,100 | 0 | 0.0% | 0 | 0.0% |
| Bristol Road - Old Lincoln Highway to Neshaminy Boulevard | 12,962 | 14,600 | 1,638 | 12.6% | 14,500 | -100 | -0.7% | 14,500 | -100 | -0.7% | 0 | 0.0% |
| Bristol Road - Neshaminy Boulevard to Galloway Road | 17,767 | 19,500 | 1,733 | 9.8% | 19,500 | 0 | 0.0% | 19,500 | 0 | 0.0% | 0 | 0.0% |
| Bristol Road - Galloway Road to Richlieu Road | 11,799 | 13,000 | 1,201 | 10.2% | 13,000 | 0 | 0.0% | 13,000 | 0 | 0.0% | 0 | 0.0% |
| Bristol Road - Richlieu Road to Hulmeville Road | 12,424 | 13,700 | 1,276 | 10.3% | 13,800 | 100 | 0.7% | 13,800 | 100 | 0.7% | 0 | 0.0% |
| Byberry Road - Tillman Drive/Philadelphia Park Drive to Mechanicsville Road | 3,646 | 5,300 | 1,654 | 45.4% | 5,300 | 0 | 0.0% | 5,300 | 0 | 0.0% | 0 | 0.0% |
| Byberry Road - Mechanicsville Road to Knights Road | 6,314 | 7,900 | 1,586 | 25.1% | 7,900 | 0 | 0.0% | 7,900 | 0 | 0.0% | 0 | 0.0% |
| Byberry Road - Knights Road to Hulmeville Road | 10,299 | 11,600 | 1,301 | 12.6% | 11,600 | 0 | 0.0% | 11,600 | 0 | 0.0% | 0 | 0.0% |

DVRPC, April 2008

In 2015, under the No-Build Alternative, Rockhill Drive growth ranges from 1,335 vpd to 2,997 vpd, with the largest increase occurring between Old Lincoln Highway and US 1, for a net gain of 17.6 percent.

Build Alternative 1 results in 2015 daily traffic volumes of 54,000 to 90,100 vpd on US 1. Compared to the No-Build Alternative, widening US 1 from Old Lincoln Highway to the Penndel Interchange increases traffic volumes by 700 to 2,500 vpd. The largest percentage increase occurs from Old Lincoln Highway to the Street Road Interchange with an increase in volume of 3.0 percent, followed closely by a 2.9 percent increase between the PA Turnpike and Rockhill Drive. The smallest increases occur near the Philadelphia County border and the US 1/I-95 interchange with Build volumes 1.2 and 1.4 percent higher than the corresponding No-Build Alternative volumes.

The PA Turnpike, Street Road, Bristol Road, and Rockhill Drive all show minor changes of 100 to 400 vpd between Build Alternative 1 and the No-Build Alternative. Most of these locations experience small increases of about 1.0 percent over No-Build Alternative traffic volumes. The largest difference, 2.0 percent, occurs at Rockhill Drive between Old Lincoln Highway and Horizon Boulevard.

For parallel facilities, only Old Lincoln Highway exhibits a noteworthy difference in traffic volumes. In 2015, daily traffic volumes on Old Lincoln Highway are lower under Build Alternative 1 compared to the No-Build Alternative. These traffic volume reductions range from 300 to 1,200 vpd, with the largest decrease occurring between Street Road and Rockhill Drive.

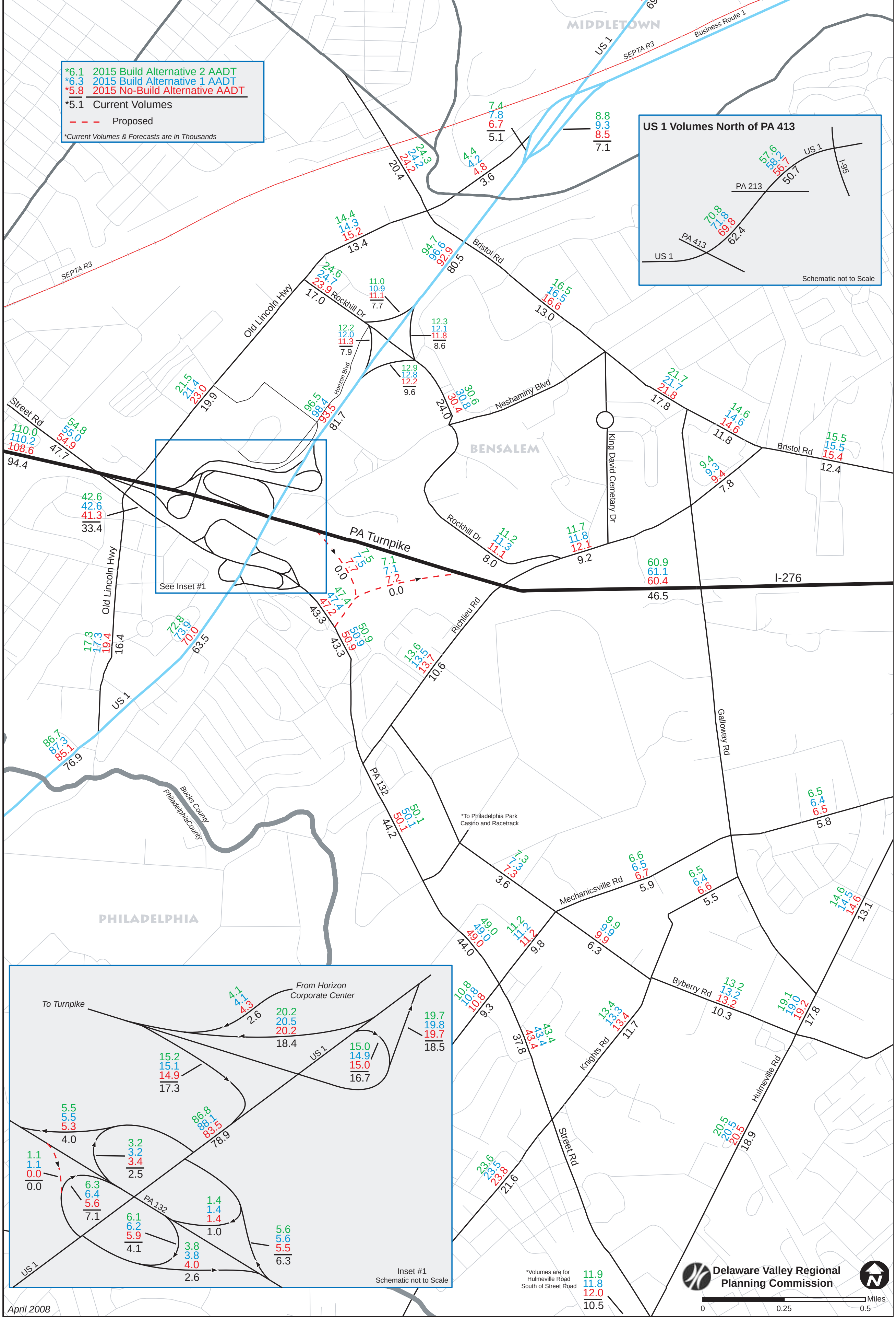
In 2015, under Build Alternative 2, US 1 carries slightly less traffic Build Alternative 1. US 1 volumes are about 300 to 1,000 vpd less in most locations in Build Alternative 2, which results in the alternatives being less than 1.0 percent different. Once again, the largest changes along US 1 occur between the PA Turnpike and Rockhill Drive interchanges. For the most part, in 2015, the majority of facilities, both parallel and crossing, experience little change between the two Build alternatives.

## B. 2035 Daily Traffic Forecasts

The 2035 daily traffic forecasts generally follow similar patterns to the 2015 forecasts, except that the 2035 volumes are higher than the corresponding 2015 volumes. Those areas that show the largest growth or change in 2015 continue to show the largest differences in 2035. However, these differences are much more pronounced.

Figure 6 provides the 2035 average daily traffic volumes for the No-Build and Build alternatives. Table 3 provides these same volumes, along with comparisons between current and No-Build traffic volumes, each Build alternative versus the No-Build Alternative, and between the two Build alternatives.

# US 1 Widening and Reconstruction Traffic Study
# Figure 6. 2035 Average Annual Daily Traffic Volumes



## Table 3. 2035 Average Annual Daily Traffic Volumes for the No-Build and Build Alternatives

| Location / Limits | Current AADT | 2035 No-Build AADT | No-Build/Current Diff. | No-Build/Current Pct. | 2035 Build Alt. 1 AADT | Alt. 1/No-Build Diff. | Alt. 1/No-Build Pct. | 2035 Build Alt. 2 AADT | Alt. 2/No-Build Diff. | Alt. 2/No-Build Pct. | Alt. 2/Alt. 1 Diff. | Alt. 2/Alt. 1 Pct. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *US 1 Mainline* | | | | | | | | | | | | |
| Woodhaven Road to Old Lincoln Highway/Old Trevose Road | 76,891 | 85,100 | 8,209 | 10.7% | 87,300 | 2,200 | 2.6% | 86,700 | 1,600 | 1.9% | -600 | -0.7% |
| Old Lincoln Highway to Street Road Interchange | 63,498 | 70,000 | 6,502 | 10.2% | 73,900 | 3,900 | 5.6% | 72,800 | 2,800 | 4.0% | -1,100 | -1.5% |
| Street Road Interchange to PA Turnpike Interchange | 78,887 | 83,500 | 4,613 | 5.8% | 88,100 | 4,600 | 5.5% | 86,800 | 3,300 | 4.0% | -1,300 | -1.5% |
| PA Turnpike Interchange to Rockhill Drive Interchange | 81,731 | 93,500 | 11,769 | 14.4% | 98,400 | 4,900 | 5.2% | 96,500 | 3,000 | 3.2% | -1,900 | -1.9% |
| Rockhill Drive Interchange to US 1 Business (Lincoln Highway) | 80,527 | 92,900 | 12,373 | 15.4% | 96,600 | 3,700 | 4.0% | 94,700 | 1,800 | 1.9% | -1,900 | -2.0% |
| US 1 Business (Lincoln Highway) to PA 413 (Pine Street) | 69,607 | 79,200 | 9,593 | 13.8% | 81,500 | 2,300 | 2.9% | 80,400 | 1,200 | 1.5% | -1,100 | -1.3% |
| PA 413 (Pine Street) to PA 213 (Maple Avenue/Old Lincoln Highway) | 62,444 | 69,800 | 7,356 | 11.8% | 71,800 | 2,000 | 2.9% | 70,800 | 1,000 | 1.4% | -1,000 | -1.4% |
| PA 213 (Maple Avenue/Old Lincoln Highway) to Interstate 95 | 50,699 | 56,700 | 6,001 | 11.8% | 58,200 | 1,500 | 2.6% | 57,600 | 900 | 1.6% | -600 | -1.0% |
| *Interchange Ramps* | | | | | | | | | | | | |
| US 1 Southbound Off-Ramp to Street Road Eastbound | 7,105 | 5,600 | -1,505 | -21.2% | 6,400 | 800 | 14.3% | 6,300 | 700 | 12.5% | -100 | -1.6% |
| US 1 Southbound On-Ramp from Street Road Westbound | 2,510 | 3,400 | 890 | 35.5% | 3,200 | -200 | -5.9% | 3,200 | -200 | -5.9% | 0 | 0.0% |
| US 1 Southbound Off-Ramp to Street Road Westbound | 3,991 | 5,300 | 1,309 | 32.8% | 5,500 | 200 | 3.8% | 5,500 | 200 | 3.8% | 0 | 0.0% |
| US 1 Southbound On-Ramp from Street Road Eastbound | 0 | 0 | 0 | ---- | 1,100 | 1,100 | ---- | 1,100 | 1,100 | ---- | 0 | 0.0% |
| US 1 Northbound Off-Ramp to Street Road Eastbound | 2,640 | 4,000 | 1,360 | 51.5% | 3,800 | -200 | -5.0% | 3,800 | -200 | -5.0% | 0 | 0.0% |
| US 1 Northbound On-Ramp from Street Road Eastbound | 4,104 | 5,900 | 1,796 | 43.8% | 6,200 | 300 | 5.1% | 6,100 | 200 | 3.4% | -100 | -1.6% |
| US 1 Northbound Off-Ramp to Street Road Westbound | 997 | 1,400 | 403 | 40.4% | 1,400 | 0 | 0.0% | 1,400 | 0 | 0.0% | 0 | 0.0% |
| US 1 Northbound On-Ramp from Street Road Westbound | 6,336 | 5,500 | -836 | -13.2% | 5,600 | 100 | 1.8% | 5,600 | 100 | 1.8% | 0 | 0.0% |
| US 1 Southbound On-Ramp from PA Turnpike Toll Plaza | 17,317 | 14,900 | -2,417 | -14.0% | 15,100 | 200 | 1.3% | 15,200 | 300 | 2.0% | 100 | 0.7% |
| US 1 Southbound Off-Ramp to PA Turnpike Toll Plaza | 18,353 | 20,200 | 1,847 | 10.1% | 20,500 | 300 | 1.5% | 20,200 | 0 | 0.0% | -300 | -1.5% |
| US 1 Northbound Off-Ramp to PA Turnpike Toll Plaza | 16,694 | 15,000 | -1,694 | -10.1% | 14,900 | -100 | -0.7% | 15,000 | 0 | 0.0% | 100 | 0.7% |
| US 1 Northbound On-Ramp from PA Turnpike Toll Plaza | 18,502 | 19,700 | 1,198 | 6.5% | 19,800 | 100 | 0.5% | 19,700 | 0 | 0.0% | -100 | -0.5% |
| Horizon Corporporate Center On-Ramp to PA Turnpike Toll Plaza | 2,576 | 4,300 | 1,724 | 66.9% | 4,100 | -200 | -4.7% | 4,100 | -200 | -4.7% | 0 | 0.0% |
| US 1 Southbound On-Ramp from Rockhill Drive | 7,915 | 11,300 | 3,385 | 42.8% | 12,000 | 700 | 6.2% | 12,200 | 900 | 8.0% | 200 | 1.7% |
| US 1 Southbound Off-Ramp to Rockhill Drive | 7,716 | 11,100 | 3,384 | 43.9% | 10,900 | -200 | -1.8% | 11,000 | -100 | -0.9% | 100 | 0.9% |
| US 1 Northbound Off-Ramp to Rockhill Drive | 9,599 | 12,200 | 2,601 | 27.1% | 12,800 | 600 | 4.9% | 12,900 | 700 | 5.7% | 100 | 0.8% |
| US 1 Northbound On-Ramp from Rockhill Drive | 8,594 | 11,800 | 3,206 | 37.3% | 12,100 | 300 | 2.5% | 12,300 | 500 | 4.2% | 200 | 1.7% |
| US 1 Southbound On-Ramp from US 1 Business Southbound | 5,139 | 6,700 | 1,561 | 30.4% | 7,800 | 1,100 | 16.4% | 7,400 | 700 | 10.4% | -400 | -5.1% |
| US 1 Northbound Off-Ramp to US 1 Business Northbound | 7,095 | 8,500 | 1,405 | 19.8% | 9,300 | 800 | 9.4% | 8,800 | 300 | 3.5% | -500 | -5.4% |
| PA Turnpike Eastbound Off-Ramp to Street Road | 0 | 7,700 | 7,700 | ---- | 7,500 | -200 | -2.6% | 7,500 | -200 | -2.6% | 0 | 0.0% |
| PA Turnpike Eastbound On-Ramp from Street Road | 0 | 7,200 | 7,200 | ---- | 7,100 | -100 | -1.4% | 7,100 | -100 | -1.4% | 0 | 0.0% |
| *Parallel Facilities* | | | | | | | | | | | | |
| Old Lincoln Highway - Neshaminy Interplex Drive to Street Road | 16,388 | 19,400 | 3,012 | 18.4% | 17,300 | -2,100 | -10.8% | 17,300 | -2,100 | -10.8% | 0 | 0.0% |
| Old Lincoln Highway - Street Road to Rockhill Drive | 19,850 | 23,000 | 3,150 | 15.9% | 21,400 | -1,600 | -7.0% | 21,500 | -1,500 | -6.5% | 100 | 0.5% |
| Old Lincoln Highway - Rockhill Drive to Bristol Road | 13,395 | 15,200 | 1,805 | 13.5% | 14,300 | -900 | -5.9% | 14,400 | -800 | -5.3% | 100 | 0.7% |
| Old Lincoln Highway - Bristol Road to US 1 Business | 3,550 | 4,800 | 1,250 | 35.2% | 4,200 | -600 | -12.5% | 4,400 | -400 | -8.3% | 200 | 4.8% |
| Richlieu Road - Street Road to Rockhill Drive | 10,597 | 13,700 | 3,103 | 29.3% | 13,500 | -200 | -1.5% | 13,600 | -100 | -0.7% | 100 | 0.7% |
| Richlieu Road - Rockhill Drive to Galloway Road | 9,204 | 12,100 | 2,896 | 31.5% | 11,800 | -300 | -2.5% | 11,700 | -400 | -3.3% | -100 | -0.8% |
| Richlieu Road - Galloway Road to Bristol Road | 7,794 | 9,400 | 1,606 | 20.6% | 9,300 | -100 | -1.1% | 9,400 | 0 | 0.0% | 100 | 1.1% |
| Mechanicsville Road - Century Lane to Street Road | 9,302 | 10,800 | 1,498 | 16.1% | 10,800 | 0 | 0.0% | 10,800 | 0 | 0.0% | 0 | 0.0% |
| Mechanicsville Road - Street Road to Byberry Road | 9,765 | 11,200 | 1,435 | 14.7% | 11,200 | 0 | 0.0% | 11,200 | 0 | 0.0% | 0 | 0.0% |
| Mechanicsville Road - Byberry Road to Galloway Road | 5,916 | 6,700 | 784 | 13.3% | 6,500 | -200 | -3.0% | 6,600 | -100 | -1.5% | 100 | 1.5% |
| Mechanicsville Road - Galloway Road to Hulmeville Road | 5,813 | 6,500 | 687 | 11.8% | 6,400 | -100 | -1.5% | 6,500 | 0 | 0.0% | 100 | 1.6% |

## Table 3. 2035 Average Annual Daily Traffic Volumes for the No-Build and Build Alternatives

| Location / Limits | Current AADT | 2035 No-Build AADT | No-Build/Current Diff. | No-Build/Current Pct. | 2035 Build Alt. 1 AADT | Alt. 1/No-Build Diff. | Alt. 1/No-Build Pct. | 2035 Build Alt. 2 AADT | Alt. 2/No-Build Diff. | Alt. 2/No-Build Pct. | Alt. 2/Alt. 1 Diff. | Alt. 2/Alt. 1 Pct. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Knights Road - Dunks Ferry Road to Street Road | 21,638 | 23,800 | 2,162 | 10.0% | 23,500 | -300 | -1.3% | 23,600 | -200 | -0.8% | 100 | 0.4% |
| Knights Road - Street Road to Byberry Road | 11,718 | 13,400 | 1,682 | 14.4% | 13,300 | -100 | -0.7% | 13,400 | 0 | 0.0% | 100 | 0.8% |
| Knights Road - Byberry Road to Galloway Road | 5,543 | 6,600 | 1,057 | 19.1% | 6,400 | -200 | -3.0% | 6,500 | -100 | -1.5% | 100 | 1.6% |
| Hulmeville Road - Bristol Pike to Street Road | 10,539 | 12,000 | 1,461 | 13.9% | 11,800 | -200 | -1.7% | 11,900 | -100 | -0.8% | 100 | 0.8% |
| Hulmeville Road - Street Road to Byberry Road | 18,858 | 20,500 | 1,642 | 8.7% | 20,500 | 0 | 0.0% | 20,500 | 0 | 0.0% | 0 | 0.0% |
| Hulmeville Road - Byberry Road to Galloway Road | 17,754 | 19,200 | 1,446 | 8.1% | 19,000 | -200 | -1.0% | 19,100 | -100 | -0.5% | 100 | 0.5% |
| Hulmeville Road - Galloway Road to Mechanicsville Road | 13,092 | 14,600 | 1,508 | 11.5% | 14,500 | -100 | -0.7% | 14,600 | 0 | 0.0% | 100 | 0.7% |
| Hulmeville Road - Mechanicsville Road to Gibson Road | 16,956 | 19,000 | 2,044 | 12.1% | 18,700 | -300 | -1.6% | 18,800 | -200 | -1.1% | 100 | 0.5% |
| *Intersecting Facilities* | | | | | | | | | | | | |
| Street Road - Brownsville Road to Old Lincoln Highway | 47,747 | 54,900 | 7,153 | 15.0% | 55,000 | 100 | 0.2% | 54,800 | -100 | -0.2% | -200 | -0.4% |
| Street Road - Old Lincoln Highway to US 1 Interchange | 33,396 | 41,300 | 7,904 | 23.7% | 42,600 | 1,300 | 3.1% | 42,600 | 1,300 | 3.1% | 0 | 0.0% |
| Street Road - US 1 Interchange to Proposed Street Road Slip Ramps | 43,293 | 47,200 | 3,907 | 9.0% | 47,400 | 200 | 0.4% | 47,400 | 200 | 0.4% | 0 | 0.0% |
| Street Road - Proposed Street Road Slip Ramps to Richlieu Road | 43,293 | 50,900 | 7,607 | 17.6% | 50,900 | 0 | 0.0% | 50,900 | 0 | 0.0% | 0 | 0.0% |
| Street Road - Richlieu Road to Tillman Drive/Philadelphia Park Drive | 44,153 | 50,100 | 5,947 | 13.5% | 50,100 | 0 | 0.0% | 50,100 | 0 | 0.0% | 0 | 0.0% |
| Street Road - Tillman Drive/Philadelphia Park Drive to Mechanicsville Road | 44,012 | 49,000 | 4,988 | 11.3% | 49,000 | 0 | 0.0% | 49,000 | 0 | 0.0% | 0 | 0.0% |
| Street Road - Mechanicsville Road to Knights Road | 37,801 | 43,400 | 5,599 | 14.8% | 43,400 | 0 | 0.0% | 43,400 | 0 | 0.0% | 0 | 0.0% |
| PA Turnpike - Willow Grove Interchange to US 1 Interchange | 94,409 | 108,600 | 14,191 | 15.0% | 110,200 | 1,600 | 1.5% | 110,000 | 1,400 | 1.3% | -200 | -0.2% |
| PA Turnpike - US 1 Interchange to Proposed Street Road Slip Ramps | 46,469 | 60,900 | 14,431 | 31.1% | 61,500 | 600 | 1.0% | 61,300 | 400 | 0.7% | -200 | -0.3% |
| PA Turnpike - Proposed Street Road Slip Ramps to Proposed I-95 Interchange | 46,469 | 60,400 | 13,931 | 30.0% | 61,100 | 700 | 1.2% | 60,900 | 500 | 0.8% | -200 | -0.3% |
| PA Turnpike - Proposed I-95 Interchange to Bristol Road Interchange | 46,469 | 78,800 | 32,331 | 69.6% | 78,900 | 100 | 0.1% | 78,800 | 0 | 0.0% | -100 | -0.1% |
| PA Turnpike - Bristol Road Interchange to New Jersey Turnpike Connector | 43,179 | 67,100 | 23,921 | 55.4% | 67,100 | 0 | 0.0% | 67,100 | 0 | 0.0% | 0 | 0.0% |
| Rockhill Drive - Old Lincoln Highway to Horizon Boulevard | 17,003 | 23,900 | 6,897 | 40.6% | 24,700 | 800 | 3.3% | 24,600 | 700 | 2.9% | -100 | -0.4% |
| Rockhill Drive - US 1 Interchange to Neshaminy Boulevard/Old Trevose Road | 23,985 | 30,400 | 6,415 | 26.7% | 30,800 | 400 | 1.3% | 30,600 | 200 | 0.7% | -200 | -0.6% |
| Rockhill Drive - Neshaminy Boulevard/Old Trevose Road to Richlieu Road | 7,965 | 11,100 | 3,135 | 39.4% | 11,300 | 200 | 1.8% | 11,200 | 100 | 0.9% | -100 | -0.9% |
| Bristol Road - Browsnville Road to Old Lincoln Highway | 20,427 | 24,200 | 3,773 | 18.5% | 24,200 | 0 | 0.0% | 24,300 | 100 | 0.4% | 100 | 0.4% |
| Bristol Road - Old Lincoln Highway to Neshaminy Boulevard | 12,962 | 16,600 | 3,638 | 28.1% | 16,500 | -100 | -0.6% | 16,500 | -100 | -0.6% | 0 | 0.0% |
| Bristol Road - Neshaminy Boulevard to Galloway Road | 17,767 | 21,800 | 4,033 | 22.7% | 21,700 | -100 | -0.5% | 21,700 | -100 | -0.5% | 0 | 0.0% |
| Bristol Road - Galloway Road to Richlieu Road | 11,799 | 14,600 | 2,801 | 23.7% | 14,600 | 0 | 0.0% | 14,600 | 0 | 0.0% | 0 | 0.0% |
| Bristol Road - Richlieu Road to Hulmeville Road | 12,424 | 15,400 | 2,976 | 24.0% | 15,500 | 100 | 0.6% | 15,500 | 100 | 0.6% | 0 | 0.0% |
| Byberry Road - Tillman Drive/Philadelphia Park Drive to Mechanicsville Road | 3,646 | 7,300 | 3,654 | 100.2% | 7,300 | 0 | 0.0% | 7,300 | 0 | 0.0% | 0 | 0.0% |
| Byberry Road - Mechanicsville Road to Knights Road | 6,314 | 9,900 | 3,586 | 56.8% | 9,900 | 0 | 0.0% | 9,900 | 0 | 0.0% | 0 | 0.0% |
| Byberry Road - Knights Road to Hulmeville Road | 10,299 | 13,200 | 2,901 | 28.2% | 13,200 | 0 | 0.0% | 13,200 | 0 | 0.0% | 0 | 0.0% |

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Under the No-Build Alternative, 2035 volumes on US 1 are projected to be between 56,700 and 93,500 vehicles per day (vpd). The highest volumes occur just north of the PA Turnpike, between the Turnpike and the US 1/US 1 Business split. US 1 traffic volumes under the No-Build Alternative represent increases of approximately 4,600 to 12,400 vpd over current traffic counts. The largest increases, in both absolute and percent terms, occur between Rockhill Drive and US 1 Business. Here, No-Build Alternative volumes are 15 percent higher than the counted volumes. North of US 1 Business, traffic volumes on US 1 increase over the current volumes by about 12 to 14 percent under the No-Build Alternative.

The PA Turnpike has an average growth of 14,000 vpd at the US 1 Interchange, with increases of 15 and 31 percent, west and east of US 1. The Street Road slip ramps are expected to carry daily No-Build volumes of 7,700 vpd for the off-ramp to Street Road, and 7,200 vpd from Street Road to the Turnpike.

Street Road itself has an increase of about 5,000 to 7,000 vpd along the corridor. The largest increase occurs between Old Lincoln Highway and US 1, for a growth of 23.7 percent, or 7,904 vpd, over the current volume. For Rockhill Drive, the largest absolute and percentage increases occur just west of the US 1 interchange ramps: 6,897 vpd, or 40.6 percent. Old Lincoln Highway experiences growth of 1,250 to 3,150 vpd, which represent increases of 13 to 18 percent, at most locations. An exception, however, occurs between US 1 Business and Rockhill Drive, where a daily traffic volume increase of 1,250 vpd is equivalent to 35.2 percent of the current volume.

Build Alternative 1 results in 2035 daily traffic volumes of 58,200 to 98,400 vpd on US 1. Adding a third travel lane in each direction on US 1 increases traffic volumes on US 1 by 1,500 to 4,900 vpd by 2035, over the No-Build Alternative. Still, these volumes equate to less traffic per lane than the No-Build volumes and also less traffic per lane than currently exists. As traffic moves north from Old Lincoln Highway, volume growth slows. Daily volumes directly south and north of the Street Road and PA Turnpike interchanges have the highest percent increase at about 5.4 percent. The largest increase in terms of absolute volume occurs between the PA Turnpike and Rockhill Drive, with a gain of 4,900 vpd. The smallest changes to US 1 volume is farther north towards the US 1/I-95 interchange with an increase of around 2.6 percent.

The PA Turnpike, Street Road, Bristol Road, and Rockhill Drive again have relatively minor changes in volume between the No-Build and Build Alternative 1. Most of these increments result in small increases of approximately 1.0 percent, which is similar to the 2015 traffic volume trends. One notable increase is between Old Lincoln Highway and US 1 where volume increases 1,500 vpd, or just over 3.0 percent from the 2035 No-Build Alternative volumes. Rockhill Drive again has the largest growth with an average increase of just over 400 vpd, or about two percent.

Almost all of the parallel facilities experience a decrease in overall volumes, with Old Lincoln Highway having the greatest traffic reduction. Old Lincoln Highway losses range from 600 to 2,100 vpd across the study area. The largest decrease occurs between US 1 and Street Road, near the Neshaminy Office Complex. However, the largest decrease in relative terms, -12.5 percent, occurs just north of Bristol Road.

Comparing Build Alternative 2 to Build Alternative 1, the same trends are evident in both 2015 and 2035. Most facilities, both parallel and intersecting, change very little between the two alternatives, with volume increases/decreases hovering around 100 to 500 vpd, which in most circumstances results in net losses/gains of about one percent.

US 1 experiences the greatest difference between the two alternatives. US 1 volumes in Build Alternative 2 range from 57,600 to 96,500 vpd, but overall are one to two percent less than the corresponding Build Alternative 1 volumes. The largest decrease from the Build Alternative 1 volumes centers around the Rockhill Drive interchange. Here volumes are 1,900 vpd less than the Build Alternative 1 volumes. Nevertheless, this section of US 1 still has some of the highest growth in volume from the 2035 No-Build Alternative volumes, increasing by 1,800 to 3,300 vpd, or about two to three percent.

## C. 2015 and 2035 AM and PM Peak Hour Forecasts

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 future 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.

AM and PM peak hour traffic forecasts for the US 1 mainline, individual interchange ramps, and selected highway facilities for the 2015 No-Build and two Build alternatives, are shown in Figures 7 thru 9 in Appendix A. Similarly, the peak hour traffic forecasts for 2035 are shown in Figures 10 thru 12 in Appendix B.

# V. CONCLUSIONS

This traffic study is concerned with the six-mile segment of the US 1 Expressway (Lincoln Highway) which extends from the Philadelphia/Bucks county line to the I-95 interchange in Middletown Township, Bucks County. The current daily traffic volumes along this portion of US 1 range from 50,700 vehicles per day (vpd) to 81,700 vpd.

The study area surrounding this portion of US 1 is home to nearly 187,000 residents and is the location of just over 97,000 jobs. Between 2005 and 2035, it is projected to increase its population by more than 15,000 residents. The study area will also add nearly 21,000 new jobs, an increase of 22 percent, during this time period.

Future traffic forecasts are evaluated for three different highway network alternatives: a No-Build Alternative, Build Alternative 1, and Build Alternative 2. Under the No-Build Alternative, volumes on US 1 are projected to be between 53,300 and 87,600 vehicles per day (vpd) by 2015, and between 56,700 and 93,500 vpd by 2035. The 2035 volumes represent increases of 4,600 to 12,400 vpd over current traffic volumes.

Build Alternative 1 widens US 1 from two to three lanes in each direction between Old Lincoln Highway and the Penndel Interchange (US 1 Business). This alternative increases traffic volumes compared to the No-Build Alternative. Build Alternative 1 results in 2015 daily traffic volumes of 54,000 to 90,100 vpd, and 2035 volumes of 58,200 to 98,400 vpd. These volumes represent an increase of about two to four percent respectively over the No-Build volumes, on US 1. However, this results in a significant reduction in traffic volume per lane, compared to the No-Build Alternative. Daily volumes on the facilities that intersect and surround US 1 are similar to the No-Build traffic volume trends.

Build Alternative 2 widens US 1 from two to three lanes in each direction between Old Lincoln Highway and the Rockhill Drive Interchange. US 1 volumes under Build Alternative 2 are two percent, or 1,000 to 2,000 vpd, lower than the corresponding volumes under Build Alternative 1. Traffic volumes on other facilities within the study area remain about the same between the two build alternatives. Build Alternative 2 results in 2015 traffic volumes between 53,700 and 89,100 vpd, and 2035 volumes ranging from 57,600 to 96,500 vpd along the US 1 Expressway.

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# Appendix A

## 2015 AM/PM Peak Hour Traffic Volumes

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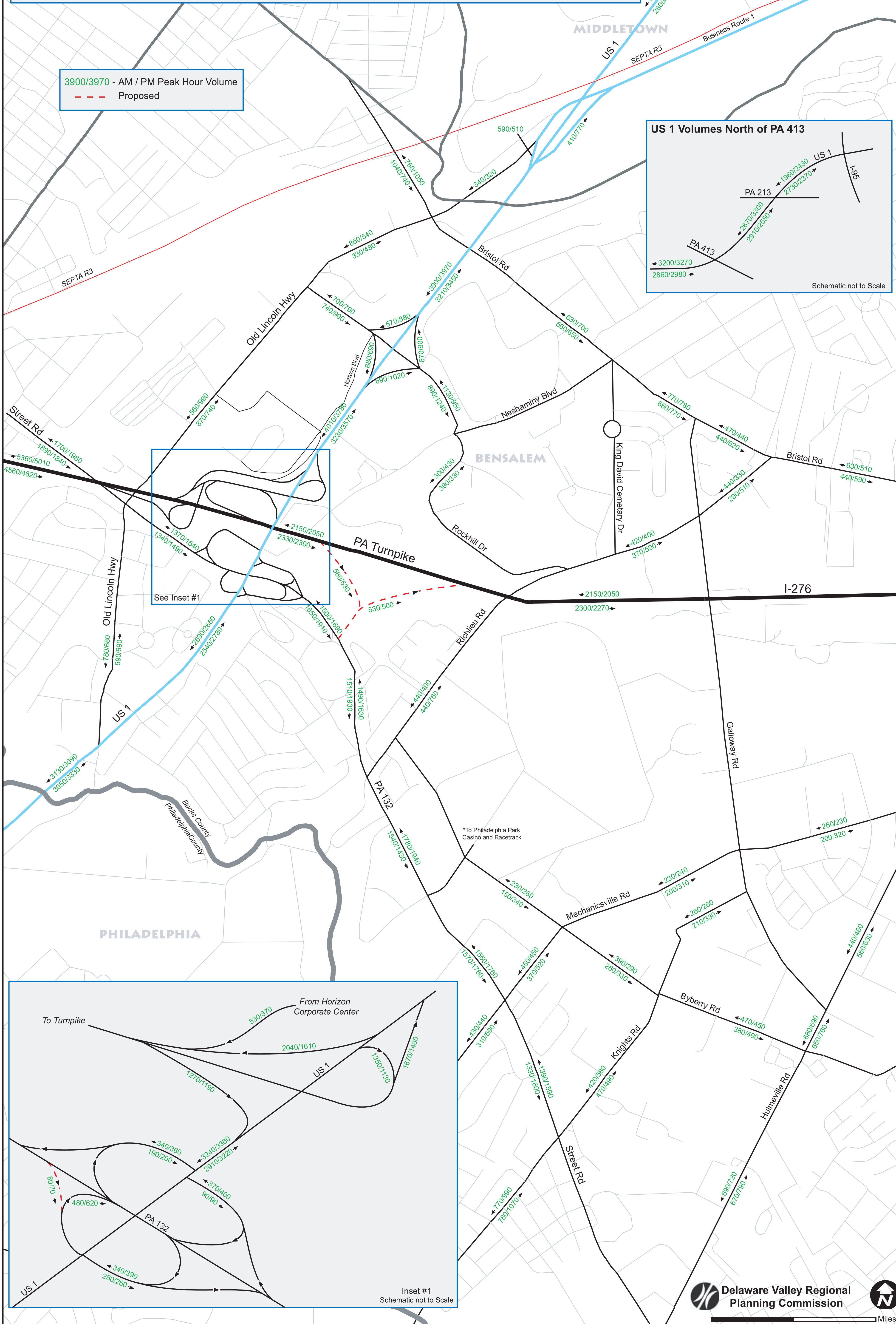
# US 1 Widening and Reconstruction Traffic Study
# Figure 7. 2015 No-Build AM/PM Peak Hour Traffic Volumes

# US 1 Widening and Reconstruction Traffic Study
# Figure 8. 2015 Build Alternative 1 AM/PM Peak Hour Traffic Volumes

# US 1 Widening and Reconstruction Traffic Study
# Figure 9. 2015 Build Alternative 2 AM/PM Peak Hour Traffic Volumes

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## Appendix B

## 2035 AM / PM Peak Hour Traffic Volumes

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# US 1 Widening and Reconstruction Traffic Study
# Figure 10. 2035 No-Build AM/PM Peak Hour Traffic Volumes


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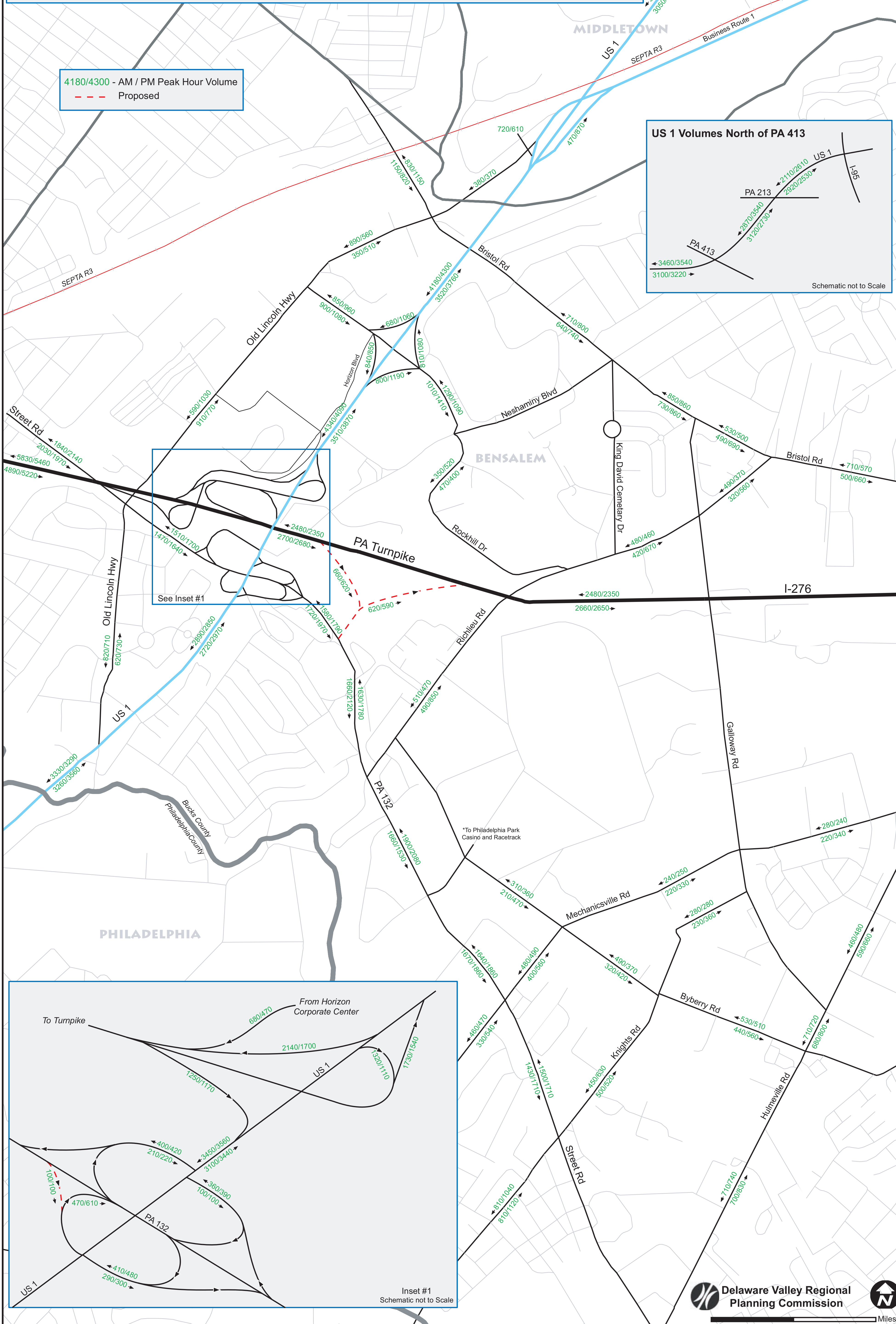
# US 1 Widening and Reconstruction Traffic Study
## Figure 11. 2035 Build Alternative 1 AM/PM Peak Hour Traffic Volumes

# US 1 Widening and Reconstruction Traffic Study
# Figure 12. 2035 Build Alternative 2 AM/PM Peak Hour Traffic Volumes

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## US 1 Widening and Reconstruction Traffic Study

**Publication Number:** 08089

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**Geographic Area Covered:** The municipalities of Bensalem Township, Bristol Township, Hulmeville Borough, Langhorne Borough, Langhorne Manor Borough, Lower Southampton Township, Middletown Township, and Penndel Borough in Bucks County, Pennsylvania.

**Key Words:** US 1 Expressway, Lincoln Highway, Traffic Forecasts, Travel Simulation, AADT, Peak Hour Volumes.

## ABSTRACT

This report documents 2015 and 2035 traffic forecasts for the US 1 Expressway corridor between the Philadelphia County Line and the US 1/I-95 interchange in Middletown Township. Average daily and AM and PM peak hour traffic forecasts are provided for a No-Build and two Build alternatives and compared to current volumes.

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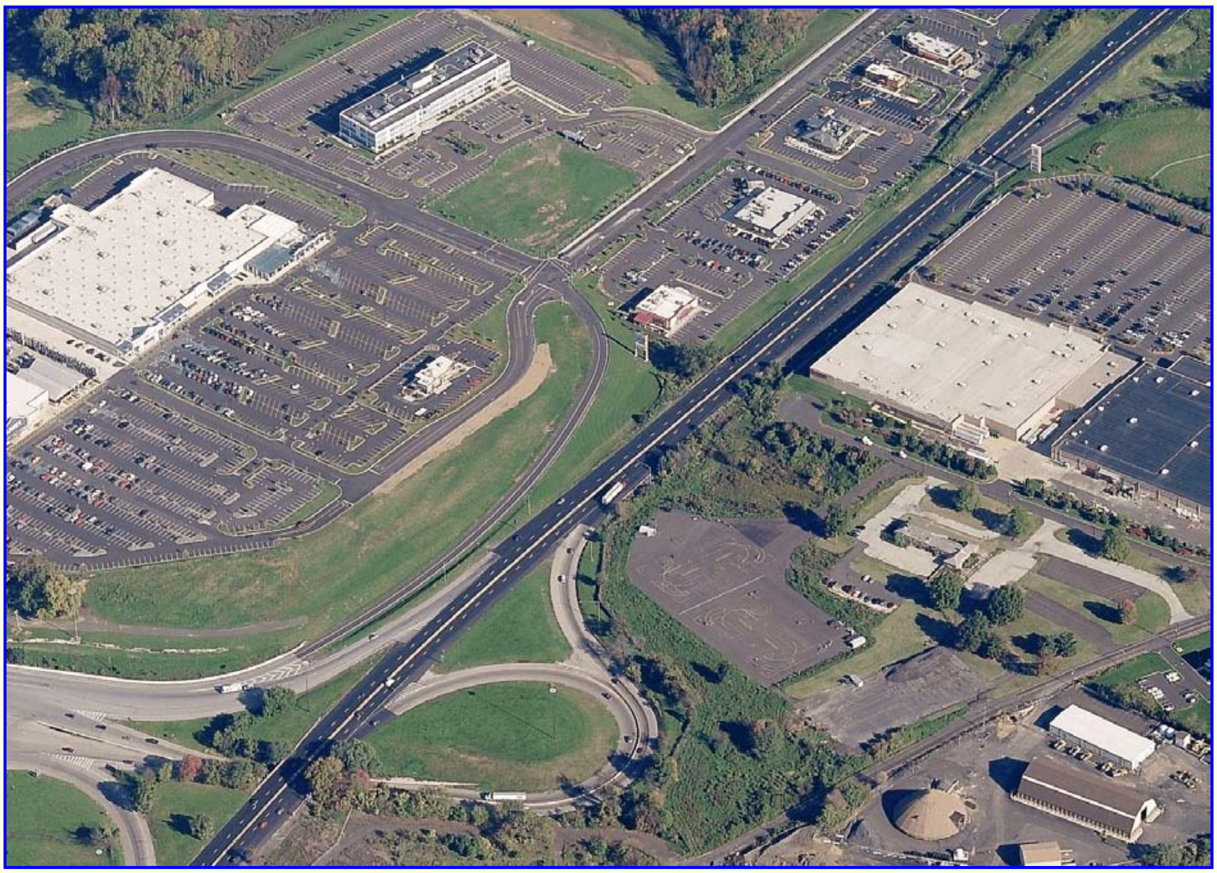
**Technical Memorandum**

# US 1 WIDENING AND RECONSTRUCTION TRAFFIC STUDY



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