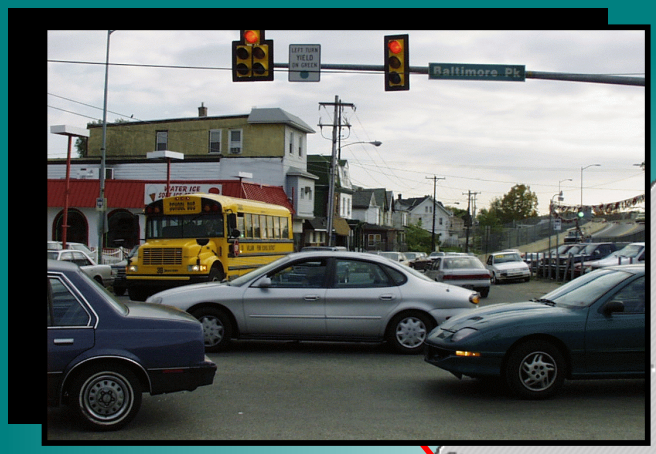
PENNSYLVANIA CONGESTION MANAGEMENT SYSTEM
US 1 / BALTIMORE PIKE CORRIDOR



Delaware Valley Regional Planning Commission

June 2000

Pennsylvania Congestion Management System US 1/Baltimore Pike Corridor

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Created in 1965, the Delaware Valley Regional Planning Commission (DVRPC) is an interstate, intercounty and intercity agency that 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 requests 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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I. EXECUTIVE SUMMARY

As a component of the Pennsylvania Congestion Management System (CMS), this report provides an examination of congestion at key intersections and arterial segments within the US 1/Baltimore Pike Corridor in Delaware County, and identifies improvement strategies that are both practical and implementable.

Conditions at the major intersections within the corridor were evaluated during peak periods. A total of 25 intersections experienced 70 or more seconds of delay during one or more of these periods which is considered failure. Of these critical intersections, the 14 most congested were examined in further detail. Proposed measures to be employed to alleviate current and future congestion were identified. Proposed congestion relief includes the following: signal coordination along major arteries to facilitate a progressive traffic flow; road widening on approaches to major intersections to increase traffic passing through the intersection; installing protected left turn signals; and restricting on-street parking within designated areas.

In specific segments of the corridor, additional studies have been recommended to arrive at more comprehensive solutions. The Baltimore Pike corridor between PA 452 and PA 352 should be studied further to determine the feasibility of widening to eliminate bottlenecks at signalized intersections by constructing acceleration/deceleration lanes in each direction. It is also proposed that a parking study be done along Baltimore Pike in Media to examine the feasibility of reducing on-street parking.

Transit service improvements as a means of reducing traffic congestion were also explored. Transit improvements do not constitute a traditional approach to congestion management. However, due to high residential density and existence of a dense transit network within the corridor, the use of transit is a viable tool towards congestion mitigation in the corridor. Recommendations were made for improvements which would result in reduced transit travel time, increased accessibility, and increase in customer comfort and convenience. Transit will become a more desired commuting option with improvements to the safety and attractiveness of the station environment. This can partly be achieved by improving waiting areas through installing adequate shelter such as canopies, benches, and glass windscreens designed for customer comfort. The placement of Trailblazer signs at strategic locations along arterials will also make transit more visible and accessible to people currently not using transit.

Travel time savings is a key factor in attracting customers to transit. Both the age and condition of existing low-level platforms and the need to improve service indicates that a station improvement program will be necessary to provide a responsive, quality service. High-level platforms will facilitate easier boardings and alightings which in turn leads to shorter dwell times at stations. The result is faster travel times for all rail customers, enhancing the competitive advantage of transit versus autos.
Adequate parking at transit stations is necessary to accommodate existing demand and future growth

in transit ridership. Furthermore, the lack of parking negates much of the potential to attract new riders. By the year 2020, the utilization rate of parking at 11 of 12 regional rail stations along the R3 line in Delaware County is expected to be at 99 percent of capacity. It is therefore necessary for SEPTA to actively explore additional opportunities for surface or structure parking at the existing stations to accommodate existing and future demand.

It is recommended that a study be done toward implementation of a circulator bus service for all types of development in the study area and for commercial development in areas that may be served by transit from the US 1/Baltimore Pike Corridor. It is also proposed that public/private partnership funding be investigated.

In addition to these site specific recommendations, regionwide Travel Demand Management (TDM) measures and TransitChek should also be promoted. Mobility Alternatives Program (MAP) is a PennDOT-sponsored, DVRPC-managed program which provides commuters in Southeastern Pennsylvania with alternatives to driving to work alone. The Delaware County Transportation Management Association should be supported in its efforts to promote non-traditional transportation such as carpools, vanpools, demand responsive paratransit and subscription buses in order to reduce regionwide congestion.

II PURPOSE

A Congestion Management System (CMS) study identifies traffic congestion, determines its causes, and develops and prioritizes the most effective strategy or group of strategies to mitigate congestion. The CMS developed by the Delaware Valley Regional Planning Commission (DVRPC) for the Pennsylvania portion of its region, (*Pennsylvania Congestion Management System - Phase 2 Report, July 1997*) represents a comprehensively planned regional approach to managing the area's transportation infrastructure and improving efficiency and effectiveness of the overall transportation system. The Pennsylvania CMS, completed in 1997, is the first such CMS for the region under the mandate of the Intermodal Surface Transportation Efficiency Act (the precursor to the Transportation Equity Act for the 21st Century - TEA21), and is a departure from previous DVRPC practice of performing CMS studies in response to transportation needs and proposed improvements on a facility-by-facility basis.

Creating a corridor specific CMS is an effective extension of the regional CMS which will allow transportation projects in a given area to be developed according to a cohesive plan and programmed in a logical, prioritized manner.

The US 1/Baltimore Pike Corridor, chosen from those corridors identified originally in the Year 2020 Long Range Plan and the Pennsylvania CMS, is the first to be subjected to a sub-regional CMS study. The corridor is considered particularly suitable for CMS study due to its consistent, corridor-wide traffic congestion over a dense network of arterial roadways and its substantial transit network.

Conducting individual CMS studies for corridors that have been identified as major connectors for activity centers within the region by DVRPC's Year 2020 Long Range Plan, is the next step in the CMS process. The Year 2020 Plan, identified the region's major travel corridors that serve as connectors for activity centers. DVRPC's CMS process calls for conducting CMS studies for those individual corridors, providing more detailed analysis and local input.

The US 1/Baltimore Pike Corridor CMS study is designed to:

1. Identify locations of traffic congestion and document its severity and duration
2. Identify highway deficiencies and other causes of traffic congestion
3. Identify, document and analyze alternatives to manage traffic congestion including
   - Traffic operations
   - Transit service and related elements
   - Programs and policies that reduce traffic within the corridor
4. Develop a recommended program of improvements to reduce traffic congestion

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III. STUDY AREA DESCRIPTION

The CMS study area spans the US 1/Baltimore Pike Corridor from just west of PA 452 through central Delaware County to the Philadelphia City limit. The width of the study corridor extends approximately one mile north of US 1 to approximately one mile south of Baltimore Pike and encompasses area transit lines and other related roadways.

The study area includes, or is adjacent to, the following Delaware County municipalities: Aldan Borough, Aston Township, Chester Heights Borough, Clifton Heights Borough, East Lansdowne Borough, Edgmont Township, Haverford Township, Lansdowne Borough, Marple Township, Media Borough, Middleton Township, Millbourne Borough, Morton Borough, Nether Providence Township, Ridley Township, Rose Valley Borough, Springfield Township, Swarthmore Borough, Upper Darby Township, Upper Providence Township and Yeadon Borough. The study area also borders on Lower Merion Township in Montgomery County, and West and Southwest Philadelphia.

Figure 1 is an outline of the transportation network in the study area. The roadway network includes all principal arterials and approximately 25 percent of the minor arterials within the study area. The CMS study focuses on east-west travel through and within the corridor, emphasizing US 1 and Baltimore Pike.

The transit network for the CMS study includes all mass-transit within the study area including segments of the R3 Elwyn regional rail line, Route 101 Media trolley, Route 102 Sharon Hill trolley, and the 69th Street terminal.

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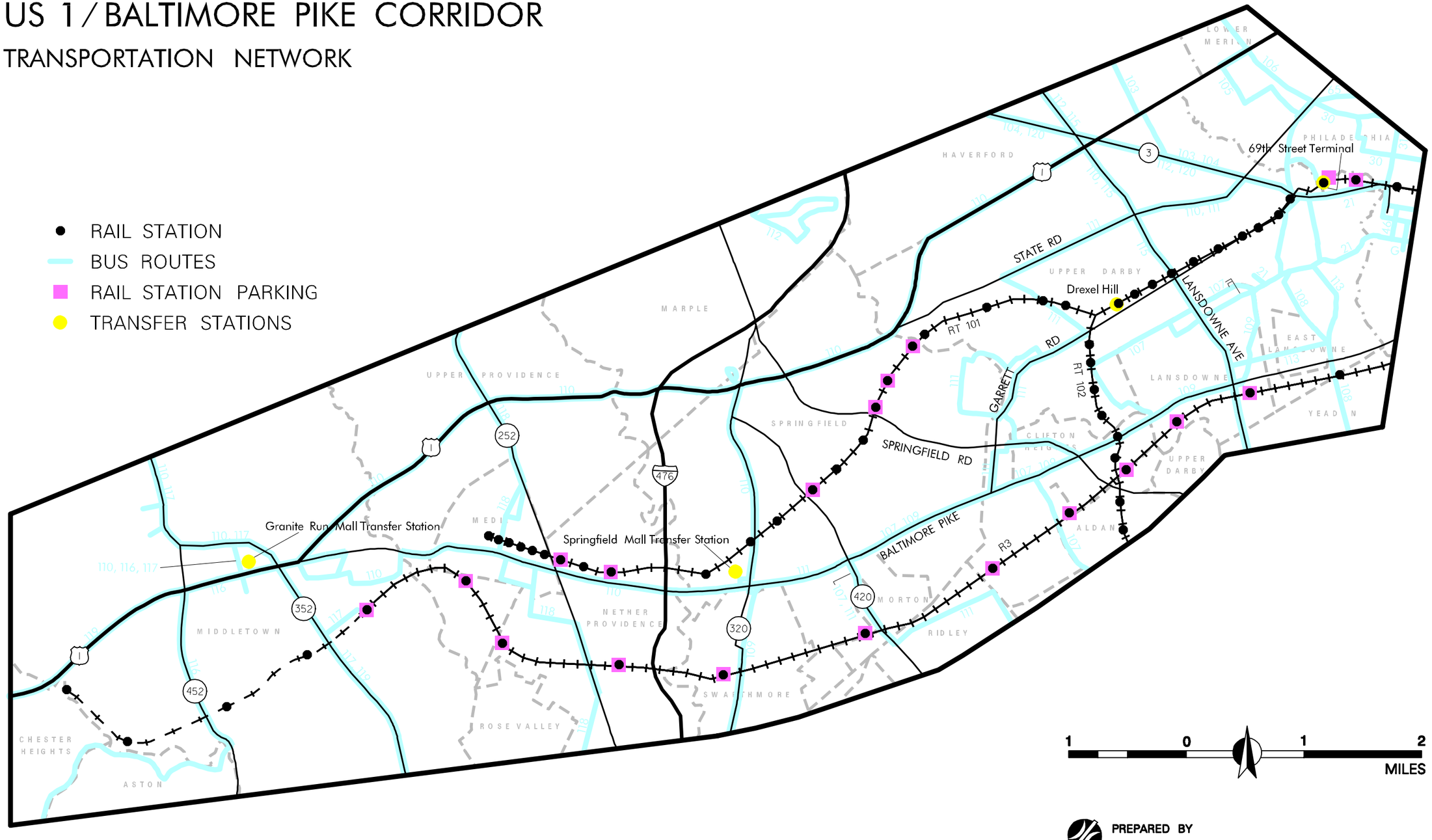
FIGURE 1

US 1 / BALTIMORE PIKE CORRIDOR

TRANSPORTATION NETWORK

- RAIL STATION
- BUS ROUTES
- RAIL STATION PARKING
- TRANSFER STATIONS



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IV. HIGHWAY NETWORK — EXISTING CONDITIONS

Designation of Arterial Sections

The study area highway network includes all principal arterials and selected minor arterials as illustrated by Figure 1. This network comprises several arterial segments which transverse the study area of approximately 74 miles of two-way roadway.

For the purpose of traffic operation analysis, these arterial segments were divided into sections of roadway with similar characteristics of roadway capacity/geometry, traffic demand, and/or adjacent development.

Measures of Performance

Based on the results of comprehensive data analysis for each section (analysis of recorded times for each checkpoint of each travel run) and for each arterial segment as a whole, several criteria are used to gauge traffic performance. These are:

Travel Time Study - For the purpose of this analysis, travel time studies were conducted to measure actual travel speeds within particular corridors and delays at intersections. Congestion and overall traffic performance of the network was measured. Travel runs were conducted by driving along study area arterial segments during the morning and afternoon peak traffic periods - emulating the behavior of median speed through traffic - and recording elapsed time at intersections, queues, and other checkpoints. The peak periods were generally considered to be from 7:00 a.m. to just past 8:30 a.m. and from 4:00 p.m. until about 6:00 p.m. Arterial segments for travel runs were less than 20-minutes in duration. As a result, at least three runs could be performed in the primary traffic direction during the morning and in each direction during the afternoon for each road segment. Typically, three runs in each direction were performed during the morning and four during the afternoon. In this manner, a representative sample of traffic conditions throughout the peak period was documented to assure that the duration of congestion and variation throughout the period was taken into account. Travel runs were conducted on Tuesday, Wednesday, and Thursday of non-holiday weeks, while school was in session, to capture typical weekday traffic conditions. In addition to the peak periods, travel runs were performed along US 1, Baltimore Pike, and State Road throughout midday to study traffic performance in the corridor's primary east-west travel direction.

Level of Service (LOS) — The Transportation Research Board (TRB) applies a standard which defines a LOS for arterial sections of highway based on their design characteristics, functional classification (principal or minor arterial) and measured travel speed. This LOS is useful to evaluate a given arterial section according to national standards for similar types of roads. From methodology described in the *Highway Capacity Manual* (Special Report 209, TRB, 1994), arterials are designated as Class I, II or III based on the free-flow speed over the arterial being traveled. The LOS is determined by the travel speed along the section and its classification. The resulting LOS is a valid indicator of traffic performance, within a range, but the method is not without its limitations; particularly because, in some cases, the choice of classification remains subjective.

Three evaluation models were used to calculate the LOS for roadway segments within the study area based on *Highway Capacity Manual* guidelines: a) Basic freeway segments, b) Multilane highways, and c)Arterials. Freeway LOS criteria was used to evaluate I-476 and the segment of US 1 just west of I-476 to Baltimore Pike. The section of US 1 extending from PA 352 to the western boundary of the study area was evaluated as a multi-lane highway to determine congestion. LOS for arterials such as PA 420 and similar arterials, were also evaluated by using the *Highway Capacity Manual* guidelines. The levels of service for the most congested arterial sections in the AM and PM peak periods are illustrated in Figures 2 and 3 respectively. Figure 4 illustrates the level of service for the most congested arterial sections in either the AM or PM peak period.

Travel Speed — Average peak period travel speed throughout the CMS highway network is 25-mph. System wide, the average peak period travel speed for all non-freeway arterial segments is 22-mph; ranging from 10-mph, for northbound Lansdowne Avenue from south of Garrett Road to Bond Avenue during the morning peak, to 49-mph for Baltimore Pike west of Media to US 1. Peak period travel speed on freeways averaged 60-mph, with a range of 45-mph to 67-mph. Although travel speed alone is not a valid performance measure to establish level of service or compare unlike arterials, it is useful for identifying arterial sections with comparatively poor traffic flow.

Travel Time versus Ideal Travel Time — The ideal travel time for any segment is taken as the time it would take the typical driver (or at least typical for peak hour drivers wishing to travel as fast as conditions permit) to drive the segment as if there were no non-permanent impediments to traffic flow, such as red-lights, turning and slow vehicles, or school zones. Thus, the ideal travel time is simply the time it would take to drive a segment at the average free-flow speed. The free-flow speed for each arterial segment or section is calculated by averaging observed free-flow speeds noted for links during the travel runs. It should be noted that the designation of free-flow speed is not necessarily a goal but serves as a benchmark by which the effect of traffic congestion and operational deficiencies can be gauged. The concept of travel speed versus free-flow speed forms the basis for the level of service measure previously presented. However, since free-flow speeds were actually recorded in the field, a straightforward comparison of travel time, speed versus free-flow time or speed, is less subjective and more precise than level of service. Throughout the network as a whole, average peak period travel speed was 56 percent of ideal travel speed. The ten arterial sections having the lowest measured peak period travel speed, as compared to estimated ideal travel speed, are listed in Table 1.

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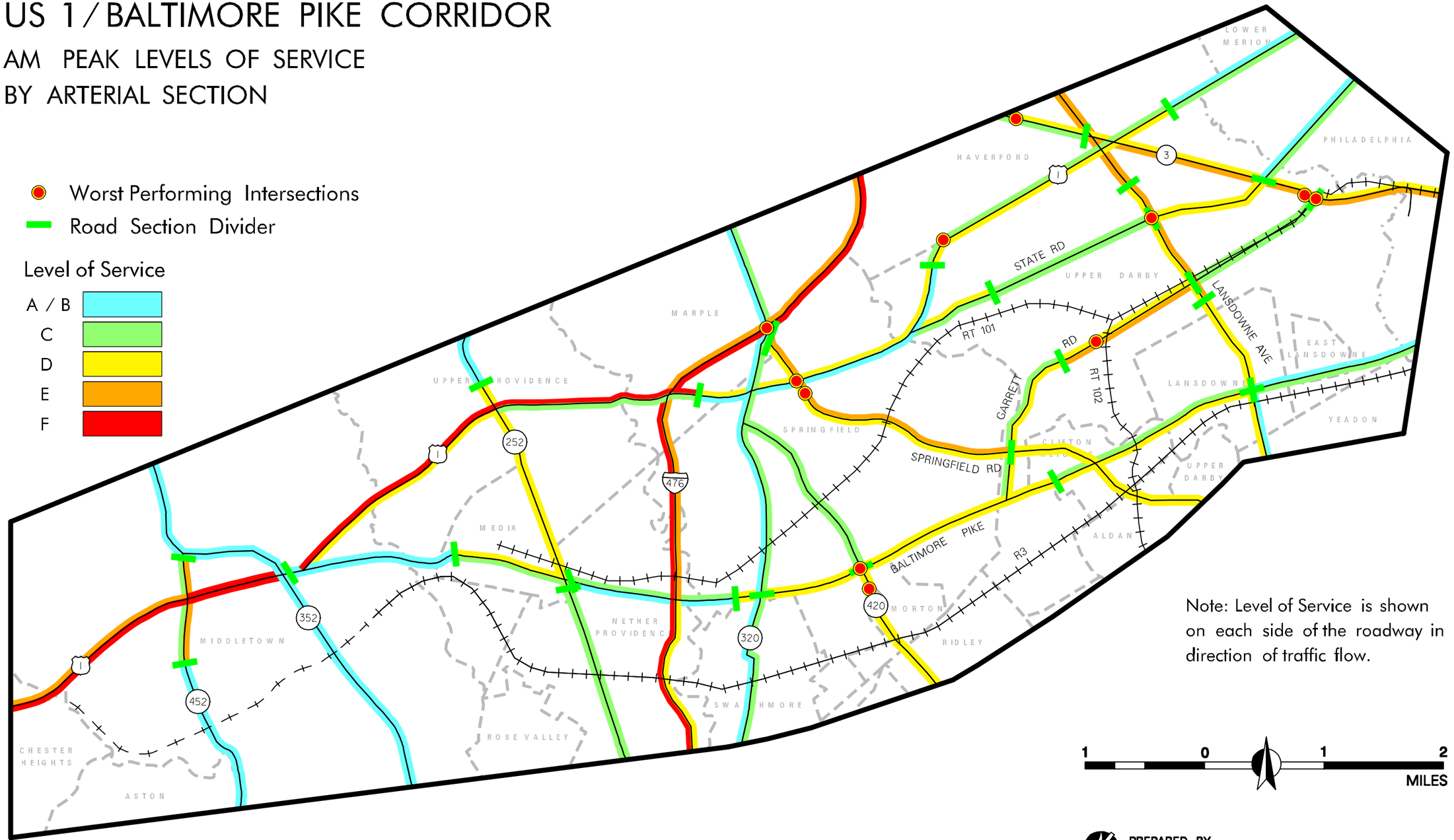
FIGURE 2

US 1 / BALTIMORE PIKE CORRIDOR

AM PEAK LEVELS OF SERVICE BY ARTERIAL SECTION



Note: Level of Service is shown on each side of the roadway in direction of traffic flow.

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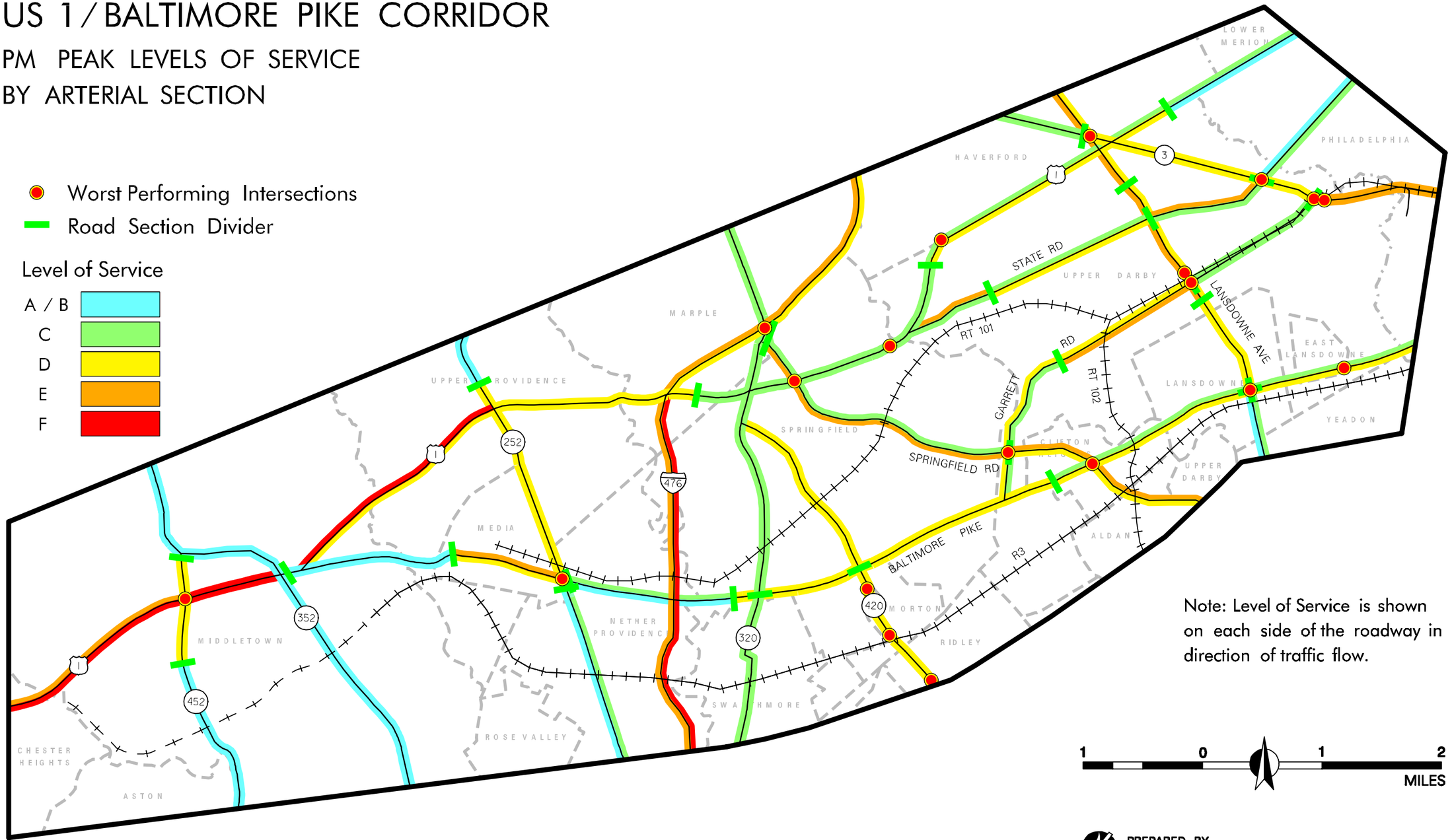
FIGURE 3

US 1 / BALTIMORE PIKE CORRIDOR

PM PEAK LEVELS OF SERVICE BY ARTERIAL SECTION



Note: Level of Service is shown on each side of the roadway in direction of traffic flow.

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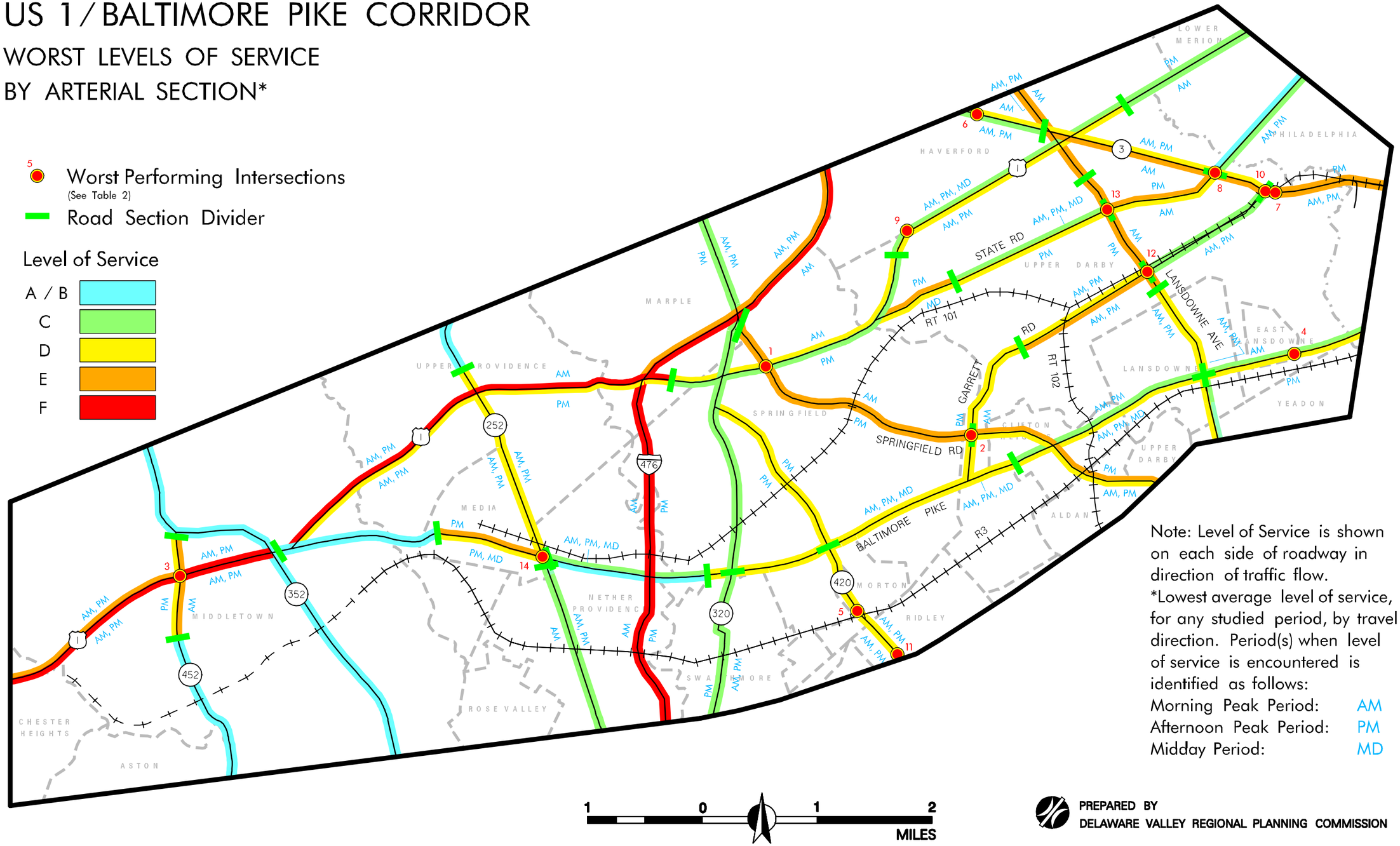
FIGURE 4

US 1 / BALTIMORE PIKE CORRIDOR

WORST LEVELS OF SERVICE BY ARTERIAL SECTION*



Note: Level of Service is shown on each side of roadway in direction of traffic flow.
*Lowest average level of service, for any studied period, by travel direction. Period(s) when level of service is encountered is identified as follows:

Morning Peak Period:	AM
Afternoon Peak Period:	PM
Midday Period:	MD

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Table 1 below shows the worst performing arterial sections in the peak periods both in terms of levels of service as well as travel speed.

TABLE 1

10 Worst Performing Arterial Sections Based on Peak Period Travel Speed as Percentage of Ideal Speed

	Arterial Section	Peak Period	Average Travel Speed (mph)	Ideal* Speed (mph)	Travel Speed as Percentage of Ideal Speed	AM Peak LOS	PM Peak LOS	Midday LOS
1.	**NB Lansdowne Ave** from south of Garrett Rd to Bond Ave	**AM**	**10.4**	**39**	**27%**	**E**	**D**	**-**
2.	**WB PA 3** from 62nd St to Garrett Rd	**PM**	**11.5**	**35**	**33%**	**D**	**E**	**-**
3.	**EB PA 3** from Garrett Road to 62nd St	**AM**	**11.6**	**35**	**33%**	**E**	**E**	**-**
4.	**WB US 1** from Dermond Road to PA 320 underpass	**AM**	**18.4**	**54**	**34%**	**D**	**C**	**A**
5.	**WB Baltimore Pike** from Beatty Rd to Brook St (through Media)	**PM**	**13.2**	**38**	**35%**	**D**	**E**	**D**
6.	**EB PA 3** from Lansdowne Ave to Garrett Rd	**AM**	**15.5**	**44**	**35%**	**E**	**D**	**-**
7.	**SB Lansdowne Ave** from Manoa Road to Bond Ave	**PM**	**14.9**	**42**	**35%**	**E**	**E**	**-**
8.	**EB Springfield Rd** from PA 320 to Bishop Ave	**PM**	**14.1**	**40**	**35%**	**D**	**E**	**-**
9.	**WB PA 3** from Lansdowne Ave to Glendale Rd	**AM**	**17.2**	**49**	**35%**	**D**	**C**	**-**
10.	**SB Lansdowne Ave** from Bond Ave to south of Garrett Road	**PM**	**13.9**	**39**	**36%**	**D**	**E**	**-**

***** Ideal Travel Speed for any segment is taken as the travel time it would take the typical driver to drive the segment if there were no non-permanent impediments to traffic flow such as red-lights, turning and slow vehicles, or school zones.

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V. MOST CONGESTED SUBCORRIDORS

The most congested subcorridors within the study area were analyzed, and recommendations were made regarding the policies and actions necessary to have an impact in reducing congestion. These subcorridors encompasses several of the most congested arterial segments identified in Table 1. The following is an analysis of the subcorridors identified; they are listed generally from west to east as they appear in the study area.

1. US 1 from Baltimore Pike to PA 452

Existing Conditions

Traffic along this segment of highway is impeded by five different elements. Because of the short distance between each impediment, the cumulative impact has resulted in an exaggerated condition which needs to be addressed by a comprehensive solution. Congestion is first impacted by the intersection of US 1 and PA 452 and this is characterized by heavy flow from PA 452 and US 1. This is also the area where US 1 transitions from a high speed highway to a suburban arterial. Just to the east of this intersection is Granite Run Mall and a series of retail outlets with numerous curb cuts. East of this second segment is the grade separated interchange between US 1 and PA 352 which, with almost non-existent acceleration/deceleration lanes, does not meet current design standards. At the easternmost end of this segment is the Baltimore Pike/US 1 interchange. This is at the terminus of the US 1 Media bypass. There are weaving problems associated with traffic traveling from PA 352 to US 1/Baltimore Pike due to short on/off ramps. Finally, entering this area, westbound traffic on US 1 is delayed because of the problems described above. The congestion at the PA 452/US 1 intersection is described in greater detail in the intersection analysis section.

Recommended Improvements

Middletown Township is studying improvements to the PA 452/US 1 intersection. There are two Transportation Improvement Program (TIP) projects: one for intersection design, the other for signal coordination. What is needed is a corridor-wide analysis which is outlined below.

a. A multi-modal transportation plan for the corridor should be developed to define the needs and deficiencies, identify alternative improvement options and funding sources, and continue developing a local consensus on what needs to be done.

b. Alternatives that should be examined should include:
   - Widening the highway from PA 452 to Baltimore Pike from four to six lanes.
   - Reconfigure the PA 352/US 1 and Baltimore Pike/US 1 interchanges.
   - Increase capacity at the US 1/PA 452 intersection.
   - Improve signal coordination along the corridor.
   - Improve access management to commercial/retail uses along the highway.
   - Integrating transit, bicycles and walking as potential design elements in the above alternatives.

2. Baltimore Pike from US 1 to PA 252

Existing Conditions

While the larger subcorridor extends from US 1 to approximately PA 252, the boundaries encompassing the most congested segment extends from Beatty Road in the east to Lemon Street in the west. There are 8 traffic signals within this two mile section of Baltimore Pike in Media. The character of this area is that of a CBD with many short turn lanes, one travel lane in each direction, on-street parking, and vehicles exiting parking lots. Travel time surveys showed that the most congested area was at the intersection of PA 252 and Baltimore Pike which was rated as the 14th most congested intersection in the corridor. Other intersections that consistently showed modest congestion were found at Jackson, Monroe, and Olive Streets.

Recommended Improvements

a. Implement intersection improvements to PA 252 and Baltimore Pike as described in the intersection improvement section.
b. Conduct a parking study along Baltimore Pike in Media to examine the feasibility of reducing on-street parking or consolidate parking to locations which will minimize interference with traffic flow, and time restrictions for on-street parking. We recognize this as being a viable commercial district and as such, on street parking is essential. However, parking should be rationalized so as not to impede access to the business area.
c. If the parking problem is not successfully addressed, then additional improvements such as traffic signal improvements and the addition of left turn lanes should be considered.

3. Baltimore Pike from Church Lane to Springfield Road

Existing Conditions

This segment of highway experiences long delays in places due partly to impedance from on-street parking as well as delays at major intersections. There are 12 signalized intersections between Church Lane and Springfield Road. With the exception of major intersections, left turn lanes are absent at most signalized intersections particularly at the eastern end of this segment. Left turning vehicles, in effect, restricts through traffic to one lane. This section of Baltimore Pike also has metered parking on both sides of the street - most of which are not utilized.

Recommended Improvements

a. Better signal coordination along Baltimore Pike from its intersection with Church Lane to Springfield Road. This is being addressed in the current TIP.

b. Restrict on-street parking to one side of the street so as to secure an additional travel lane for through traffic. This should be implemented primarily between Church Lane and 4th Street where only approximately 50 percent of the parking spaces are utilized. A special effort should be made to consolidate on-street parking in the vicinity of retail establishments.
c. Install protected left turn signals at all signalized intersections to reduce congestion at intersections.

4. I-476 (Blue Route) from PA 3 to MacDade Boulevard

Existing Conditions

This is a 4-lane interstate within the study area. The speeds are generally constant except for the interchanges at Baltimore Pike and US 1 where traffic slows considerably. Generally, traffic at this location operates at the E/F level of service. Congestion at the interchange with I-95 has resulted in southbound traffic spilling back on to the Blue Route, resulting in congestion upstream.

Recommended Improvements

a. Pennsylvania Department of Transportation has installed ramp metering at all access ramps. As the equipment is activated, it should be monitored to see if it addresses congestion deficiencies.
b. Although the I-95 interchange is outside the study area, it is recognized that it is a cause for back-ups on the Blue Route. A study should be done to address capacity constraints at the interchange with the Blue Route and I-95.
c. If improvements resulting from a. and b. above do not adequately address congestion problems, a study should be done to determine the feasibility of adding one additional lane in each direction to relieve congestion.

5. PA 420 from MacDade Blvd to Baltimore Pike

Existing Conditions

PA 420 is a heavily-traveled corridor with very high volumes in comparison to the rest of the study area. Delays are caused by lack of capacity, long traffic signal cycle lengths and lack of coordination with adjacent signals. The R3 Regional Rail line at-grade crossing causes significant delays in the peak periods on both the northern and southern segments of PA 420. Delays are compounded when a train enters or leaves the station which results in delays on the affected roads. Additional analysis of the key intersections within this segment can be found in the congested intersections section of this report.

Recommended Improvements.

a. Improve signal coordination to move traffic efficiently along PA 420. Traffic signals at the MacDade Boulevard intersection should be coordinated with the signals at Academy Avenue. The traffic signals north of Morton Avenue to Baltimore Pike should be coordinated with the signals at Baltimore Pike. The signal timing at Morton Avenue is dependent on train movement.

b. Widen PA 420 north of MacDade Boulevard to Academy Avenue, to two through lanes in each direction. This would allow traffic to clear the PA 420/MacDade Boulevard intersection quickly due to the added capacity. Right-of-way could be obtained from the fringes of the vacant parking lot at the northeast quadrant and the open lot at the northwest quadrant.

c. Improvements to the intersection of PA 420 and Green Briar Lane will have a corresponding positive impact to the traffic flow to and from Baltimore Pike. The left turn lane unto Green Briar Lane should be eliminated. Subsequently, left turn movements should be prevented. Traffic will be permitted to make a left turn one block to the south at Eaton Road. At this intersection, a left turn lane should be constructed.

6. PA 3 from Lansdowne Avenue/Darby Road (Haverford,Upper Darby) to 69th Street Terminal

Existing Conditions

There is heavy east-west traffic flow along PA 3 in both AM and PM peak periods. A maximum of three through lanes and one left turn lane exist on eastbound PA 3. While westbound, there are generally two through lanes and one left turn lane at most intersections. At the easternmost end near the 69th Street terminal, the corridor is congested primarily due to numerous intersections close together, and high traffic volumes. Poor signal timing and coordination are currently being addressed by PennDOT. Additional analysis of the major intersections within this segment is in the Most Congested Intersection section of this report.

Recommended Improvements.

a. Improve signal coordination along PA 3. Currently, signals within the corridor extending along PA 3 from 69th Street to Brighton Avenue are being upgraded. These include intersections at Leighton Terrace, State Road, Pennock Avenue, Carol Boulevard, Cedar Lane, Windsor Avenue, Lynn Boulevard, and Linden Avenue. The new signals should be coordinated once they are on line.

b. Enforce on-street parking restrictions within 30 feet of signalized intersections along PA 3 between 69th Street and US 1. On-street parking should be prohibited before 10:00 am in the direction of peak traffic flow in high traffic commercial areas along PA 3, Garrett Road, and 69th Street. This would provide an additional travel lane and minimize conflict between through traffic and parked cars.

c. Install overhead destination signs along PA 3 primarily at major intersections such as 69th

Street, Garrett Road/Cardington Avenue, State Road, US 1 and Lansdowne Avenue. These signs are necessary to guide traffic along a route or towards a destination. At this location, traffic volume is at or near capacity during the AM and PM peaks; sight distance is restricted; there is insufficient space for ground signs; and there is a background of street lighting which obscures less prominent signs.

7. Lansdowne Avenue from Baltimore Pike to Garrett Road

Existing Conditions

This segment of highway is characterized by numerous signalized intersections with left turning traffic. Traffic is primarily along one through lane in each direction. During the AM and PM peak periods, through traffic is restricted by left turning traffic from Lansdowne Avenue to the intersecting streets. Where there are seven signalized intersections within this segment, not all have signalized left turn lanes. The result is long queues at intersections where there are no left turning lanes. There is an absence of signal progression which, when combined with the absence of left turn signals, result in slow peak period travel speeds.

Recommended Improvements

a. Install left turn lanes and protected phasing left turn signals at all signalized intersections to reduce congestion.
b. Improve signal progression along this segment of Lansdowne Avenue. Signal timing should be responsive to peak traffic flow patterns.

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VI. MOST CONGESTED INTERSECTIONS AND RECOMMENDED IMPROVEMENTS

The major intersections within the corridor were evaluated and a total of 25 experienced 70 or more seconds of delay which is considered failure.

The 14 most congested intersections with 88 or more seconds of delay were evaluated in an effort to determine the order of magnitude of delays that occurred. Table 2 below ranks the congestion experienced at these intersections in seconds of delay experienced in AM and PM peak periods.

TABLE 2

Top 14 Worst Performing Intersections Based on Peak Period Delays

	Intersection	Direction	Peak Period	Delay in Seconds
1.	**US 1** at Springfield Road (approach leg) **US 1** at Springfield Road **US 1** at Springfield Road (approach leg) **US 1** at Springfield Road	**WB** **WB** **WB** **EB**	**AM** **AM** **PM** **PM**	**219** **147** **115** **97**
2.	**Springfield Road** at Bishop Ave.	**EB**	**PM**	**134**
3.	**US 1** at PA 452 **PA 452** at US 1	**EB** **SB**	**PM** **PM**	**127** **92**
4.	**Baltimore Pike** at Church Lane **Baltimore Pike** at Church Lane	**EB** **WB**	**PM** **PM**	**126** **73**
5.	**PA 420** at Morton Ave	**SB**	**PM**	**121**
6.	**PA 3** at Eagle Rd.	**WB**	**AM**	**112**
7.	**PA 3** at 69TH Street	**WB**	**PM**	**102**
8.	**State Road** at PA 3	**WB**	**PM**	**97**
9.	**US 1** at Burmont Road **US 1** at Burmont Road	**EB** **EB**	**AM** **PM**	**94** **74**
10.	**Garrett Road** at PA 3	**EB**	**AM**	**91**
11.	**PA 420** at MacDade Blvd.	**NB**	**PM**	**90**
12.	**Garrett Road** at Lansdowne Ave	**WB**	**PM**	**89**
13.	**Lansdowne Ave** at State Road **State Road** at Lansdowne Ave	**NB** **WB**	**AM** **AM**	**88** **70**
14.	**Baltimore Pike** at PA 252	**WB**	**PM**	**88**

An analysis was done of the 14 most congested intersections to identify improvement strategies. At a few of these intersections (PA 3 at Eagle Road, US 1 at Burmont Road, and PA 452 at US 1), no practical solutions were arrived at that would have a significant impact on reducing congestion. The following is a description of the most congested intersections, and the recommended measures to alleviate current and future congestion.

I. US 1 at Springfield Road (Springfield Township)

Existing Conditions
Excessive traffic volumes on all approaches lead to delays at this intersection. On Springfield Road, there is one through lane and one left turn lane in both directions. Approaching US 1, Springfield Road has a right-of-way width of 36 feet and a posted speed limit of 35 miles per hour. On US 1, there are two through lanes, one left turn and one right turn lane in both directions. More than 219 seconds of delay is experienced on US 1 westbound in the AM peak. During the PM peak, US 1 is congested in both directions. Heavy turning movements are observed from US 1 to Springfield Road southbound and from Springfield Road northbound to US 1 east and west.

Recommended Improvements.
a. Extend the left turn lane on Springfield Road south of US 1 to accommodate left turn volumes. However, operational improvements alone will not result in a significant reduction in delays.
b. Long term solution could include making the intersection a grade separated interchange by depressing US 1. This would necessitate widening US 1 and Springfield Road to accommodate access ramps similar to what exists at the adjacent intersection of US 1 and PA 320.

2. Springfield Road at Bishop Avenue (Springfield Township)

Existing Conditions
The intersection of Springfield Road with Bishop Avenue is frequently congested and is above capacity for much of the PM peak period. Both eastbound and westbound Springfield Road is extremely congested due to excess volumes with eastbound PM traffic being the worst. Heavy volumes also exists on westbound Bishop Avenue in the PM.

Recommended Improvements
a. Install left turn signals at Springfield Road. These are already in place on Bishop Avenue. This will prevent through traffic from being delayed behind left turning traffic.
b. Upgrade traffic controller to permit exclusive left turns and overlap phasing**.**

3. US 1 at PA 452 (Middletown Township)

Existing Conditions

This intersection has left turn lanes and left turn signals at all approaches. One through lane exists on PA 452 (Pennell Road) in each direction north and south of US 1. AM traffic on PA 452 is heavier from the south. The intersection with US 1 is beyond capacity for critical movements for most of the time during the peak periods. Congestion is most severe in the westbound AM peak and eastbound PM peak. Northbound traffic on PA 452 turning left to westbound US 1, experiences delays leading to long queuing. Northbound traffic from PA 452 to eastbound US 1 clears the intersection easily via a channelized right turn lane. Extensive delays exists on US 1 in both directions during the peak periods.

Recommended Improvements

Because of the severe congestion which exists along US 1 from points just west of PA 452 to the interchange with Baltimore Pike, it is recommended that a need and feasibility study be conducted for this sub-corridor. Among the options the study would examine are:

a. Constructing a double left turn lane from US 1 to PA 452 south.
b. Improve the interchange between PA 352 and US 1 with longer auxiliary lanes. There is a TIP funded study for this location.
c. Widening approaches to and from US 1 at Baltimore Pike.

4. Baltimore Pike at Church Lane (East Lansdowne Borough)

Existing Conditions

This intersection is beyond capacity particularly in the PM peak period resulting in long delays. Traffic is heavy on Church Lane as it approaches Baltimore Pike. At this intersection, left turn lanes exists only from Church Lane to Baltimore Pike. Retail/commercial uses at three of the four corners of this intersection contributes to the congestion.

Recommended Improvements

a. Protected left turning phase from Baltimore Pike to north- and southbound Church Lane. This is essential to facilitate the heavy left turn movements onto Church Lane.

5. PA 420 at Morton Avenue (Morton Borough)

Existing Conditions

PA 420 is a heavily-traveled corridor with very high volumes in comparison to the rest of the study area. The R3 Regional Rail line at-grade crossing causes significant delays in the peak periods on both the northern and southern segments of PA 420. Delays are compounded when a train enters or leaves the station. Crossing gates at PA 420 remain down whenever an eastbound train is in the station which results in delays on the affected roads.

Recommended Improvements.

a. The westbound train should stop further west away from the intersection with PA 420. This would permit the train to enter the station at a greater rate of speed and therefore minimize the time the railroad crossing gates are down on PA 420. As an extra benefit, this would also bring the train closer to the 100 space commuter parking lot on Church Road. The feasibility of keeping the railroad crossing gates up once the train is in the station should also be considered.

b. Realign the intersection of Morton and Taylor Avenues at PA 420 to minimize conflicting vehicular movements.

6. PA 3 at Eagle Road (Haverford Township)

Existing Conditions

This intersection fails due to heavy volumes on all four legs. PA 3 is a major route for commuters entering and leaving the City of Philadelphia. Eagle Road is a connector between US 1 in the south and Darby Road in the north. There are two through lanes and one protected left turn lane on both PA 3 approaches to this intersection. Eagle Road has one through, one left turn, and one right turn lane from the north, and one through and one left turn lane from the south. Both left turn lanes are protected. The traffic signals at this intersection are all optimized. The adjacent land use is retail with no available vacant land.

Recommended Improvements.

a. Congestion will not be alleviated significantly with minor improvements such as changes in signal timing due to excess volumes. Substantial capital outlay and property takings will be necessary in order to effectuate major congestion relief. The incremental reduction in congestion could not justify the negative economic impact of condemning property at this location in order to widen the intersection.

7. PA 3 at 69th Street Terminal (Upper Darby Township)

Existing Conditions

The 69th Street terminal area is geometrically complex, with complicated signal patterns and long cycle lengths. Traffic flow is exacerbated by: operations of trolleys and buses; on-street parking; retail activity; turning movements; poor signal timing; poor signal coordination; and heavy through volumes. Maximum delay occurs westbound during the PM peak period.

Recommended Improvements.
Because this intersection is in a built-out urban setting, major infrastructure improvements to alleviate congestion would be very costly and is beyond the scope of this study. The following are a series of low cost alternatives which could have a positive impact on congestion reduction in the short term. [See also recommendations for PA 3 at Garrett Road (#10)]

a. A one hour time limit should be instituted for on-street parking in high traffic commercial areas along PA 3, Garrett Road and 69th Street to minimize long term parking.
b. Enforce No Parking Zones along PA 3, between Garrett Road and 69th Street.
c. Install prominent street name signs at the major streets near the terminal (69th Street, PA 3, Garrett Road and Cardington Avenue) which will aid in alleviating congestion as well as improving safety by providing clear directions to drivers unfamiliar with the area.

8. State Road at PA 3 (Upper Darby Township)

Existing Conditions
There is heavy east-west traffic flow along PA 3 in both AM and PM peak periods. There are three through lanes and one left turn lane on eastbound PA 3. Westbound, there are two through lanes and one left turn lane. Northbound State Road has one through lane, one left turn, and one right turn lane. The right turn lane has a short stacking capacity with storage for approximately 2 cars, which is often blocked by through traffic.

Recommended Improvements

a. Extend right turn lane on State Road south of PA 3 by approximately 30 feet to permit better stacking and a smoother transition.
b. Improve turn radius for traffic turning from PA 3 eastbound to State Road south. This may involve acquiring right-of-way adjacent to the southbound lane where a Burger King restaurant is located. This is expected to have only a minor impact on its operations.

9. US 1 at Burmont Road (Upper Darby Township)

Existing Conditions
The heaviest volumes at this intersection are experienced by traffic traveling east on US 1 in both the AM and PM peaks. US 1 has two through lanes and one left turn lane in both direction. Burmont Road has one through lane and one left turn lane approaching the intersection from both directions. All four quadrants of this intersection are built-out. Three of the four contain retail establishments, and the fourth contains a church.

Recommended Improvements
Congestion will not be alleviated significantly with minor improvements to this intersection. Expansion to include additional travel lanes on US 1 to accommodate the heavy volumes is needed. This would require substantial capital outlay and property takings which might not be practical at this time.

10. PA 3 at Garrett Road (Upper Darby Township)

Existing Conditions
Heavy volumes and complex geometry of intersecting streets have severely reduced travel speed at this intersection. Buses and trolleys entering and leaving the 69th Street Terminal at frequent intervals have resulted in long cycle lengths at this intersection.

Recommended Improvements.
Improvement at this intersection should be coordinated with signal upgrade work underway along the PA 3 corridor. [See recommendations for PA 3 at 69th Street Terminal (#7)]

a. Reduce on-street parking at or near the intersection so as not to impede traffic flow.

11. PA 420 at MacDade Blvd (Ridley Township)

Existing Conditions
Delays caused by lack of capacity, long traffic signal cycle lengths, and lack of coordination with adjacent signals. There is heavy through movement on PA 420. MacDade westbound left onto PA 420 southbound also experiences heavy traffic. The signals at this intersection are actuated but are not fully responsive.

Recommended Improvements.

a. On northbound PA 420, the stop bar for the left turn lane onto MacDade Boulevard should be set back from the intersection to accommodate turning vehicles from MacDade Boulevard.
b. Optimize traffic signal to maximize traffic flow through the intersection. Signal timing appears not to be responsive to peak traffic flow. Signals should be reprogrammed to respond to changing conditions.
c. Coordinate traffic signals at the intersections of PA 420/MacDade Boulevard and at PA 420/Academy Avenue.

12. Garrett Road at Lansdowne Avenue (Upper Darby Township)

Existing Conditions
The AM peak is impacted by northbound traffic on Lansdowne Avenue to Upper Darby High School, Monsignor Bonner High School, Archbishop Prendergast High School and Delaware County Hospital, all located between Garrett Road and State Road. The presence of a trolley station at the northwest corner of the intersection further contributes to congestion. Trolley passengers traverse Lansdowne Avenue to and from the station to access the schools as well as the hospital. PM peak traffic flow on Lansdowne is particularly heavy southbound between State Road and Garrett Road. This is exacerbated by heavy pedestrian activity at the end of the school day.

Recommended Improvements.

a. Relocate trolley station east of its current location east of Lansdowne Avenue to minimize pedestrian conflict at the intersection. This may require obtaining a sliver of land from Monseigneur Bonner/Archbishop Prendergast High School to accommodate the trolley station. This would improve pedestrian safety by minimizing the number of pedestrians entering the intersection. PennDOT will be conducting a traffic study along the 101/102 trunk line which will in part, examine the impact of the trolleys on this intersection.

13. Lansdowne Avenue at State Road (Upper Darby Township)

Existing Conditions
This intersection experiences delays caused by excess volumes on both roads. School traffic, both vehicular and pedestrian, on Lansdowne Avenue results in long delays especially in AM peak on all approaches.

Recommended Improvements.

a. Congestion will not be alleviated significantly with minor improvements such as changes in signal timing due to excess volumes. Substantial capital outlay and property takings will be necessary in order to effectuate major congestion relief. The incremental reduction in congestion could not justify the negative economic impact of condemning property at this location in order to widen the intersection.

14. Baltimore Pike at PA 252 (Media Borough)

Existing Conditions

Westbound PM peak travel at this intersection experiences significant delays due to heavy volumes. Train movements along the Route 101 Media trolley causes delays at the intersection of State Street to the north on PA 252 which spills back to Baltimore Pike. Because there is only one left turning lane on southbound PA 252, traffic making a left turn to the shopping center frequently impedes traffic making a left onto eastbound Baltimore Pike.

Recommended Improvements

a. Widen or re-stripe PA 252 from Baltimore Pike to just north of State Street to accommodate an additional left turn lane to eastbound Baltimore Pike.
b. Extend PA 252 left turn lane south of Baltimore Pike to permit additional storage for left turning traffic.
c. Coordinate signals at the intersections of PA 252 and Baltimore Pike, and PA 252 and State Street.

TABLE 3

Summary of Highway Strategies - Corridor Improvements

Location	Signal Coord.	Road Widening/ Reconfig.	Further Study	Grade Separation Over long Term	Signal Timing	Parking Restrict. Study	Transit Imprvmt.	Improve Directional Signage	Left Turn Lanes	Left Turn Signals
1. US 1 at Springfield		X		X					X	
2. Springfield at Bishop	X				X					X
3. US 1 at PA 452		X	X						X	
4. Balt. Pk. at Church	X									X
5. PA 420 at Morton	X	X					X			
6. PA 3 at Eagle Road										
7. PA 3 at 69th St.	X					X		X		
8.State Rd. at PA 3		X								
9. US 1 at Burmont Road										
10. Garrett Rd. at PA 3						X				
11. PA 420 at MacDade	X	X			X					
12. Garrett at Lansdowne							X			
13. Lansdowne at State										
14. Balt. Pk at PA 252		X	X		X	X			X	

VII. TRANSIT SERVICE

The study area is served by a dense network of transit routes unlike any other suburban location in the region. Transit is therefore an available resource, that if fully utilized, could have a positive impact in reducing highway congestion. The following are recommendations targeting regionwide transit service improvements as well as TDM measures which should be considered for congestion relief. All general public transit within the Baltimore Pike/US 1 study area is provided by Southeastern Pennsylvania Transportation Authority (SEPTA). SEPTA operates a total of 18 transit lines which provide service within the corridor. These consist of one regional rail line, two surface trolley lines, and 15 bus routes. The 15 bus routes provide connection from the trolley lines and regional rail to the neighborhoods. The Market-Frankford Elevated Line, together with Trolley Routes 101 and 102, provide a seamless connection for eastbound travel from the corridor to Philadelphia. Six bus routes, originating from 69th Street Terminal, are considered to serve corridor travel desires in only a peripheral manner. In addition to its major transit hub at the 69th Street Terminal in Upper Darby, SEPTA maintains transfer centers at Drexel Hill, and the Springfield and Granite Run Malls. Transit service within the corridor has an orientation towards Center City and not suburb to suburb. This, therefore, limits transit from being a viable option for many people commuting from the corridor to suburban locations.

Commuter Rail as Tools in Reducing Congestion

The average annual ridership for regional rail and Trolley Routes 101 and 102 is more than 4 million passengers. Of the 508 inbound weekday boardings at Media on the R-3 regional rail in 1996, 377, or 74 percent, occurred during the morning peak. This indicates an area-wide total of 2,839 inbound morning peak riders, assuming this percentage holds true for the line as a whole. Without commuter rail service, these commuters would have no alternative but to drive to work. This would add numerous vehicles to the study area roadways. While these trips would be somewhat dispersed within the area and some would occur mostly outside the area, the net effect of such an addition of vehicle trips would significantly increase congestion on the southern section of I-476 and along much of the US 1/Baltimore Pike Corridor.

CMS Benefits of Transit Service Improvements or Transit Use Incentives

New or improved transit service is a valid CMS strategy only so far as it attracts travelers, particularly commuters, who would otherwise drive. To manage traffic congestion by transit service improvements or transit use incentives, it is necessary to identify elements that may convert travelers who choose to drive to become transit passengers. An analysis of such factors is as follows:

- Travel Time - Except in transit service from the eastern end of the corridor into Philadelphia, transit travel times compares unfavorably with driving due to slow travel times on the R-3 commuter rail from Elwyn, the trolley lines, and slow bus traffic due to congestion and frequent stops. The average speed on the R-3 line over a 12 to 17 mile trip is estimated at 25.5 to 20.5 mph, the second slowest in the SEPTA commuter rail system. The delays in

transit travel time is further exacerbated by the time spent accessing and waiting for transit, making connections and reaching the final destination.

- Cost - For commuters that currently drive, it is reasonable to assume that they have already taken steps, intentionally or by economic necessity, to minimize their costs associated with driving. Employer paid transit vouchers is the most direct method incentive, particularly if the employer does not offer parking payment or other payment options, to encourage transit use. Parking restrictions and price increases at driver destinations may also swing the financial advantage to transit.

- Frequency of Service - The fact that a car is available whenever the driver wants it, whereas transit forces passengers to conform their schedule to transit service times, is a transit-use deterrent for many commuters. Frequency is constrained by the demand for service and the resources of the transit operator, but can often be improved within these constraints - by measures such as smaller, but more frequent buses or trains - to a point where infrequent service is not a reason to avoid transit. If service is every 40-minutes, the employee who has to work 10-minutes later than planned is unlikely to view transit as a satisfactory alternative to driving; if it is every 15-minutes, it is unlikely that frequency would deter anyone not wholly opposed to taking transit.

- Comfort and Convenience - These subjective lifestyle issues play a significant role in transportation mode choice and should be integral to all services. Recognizing the lack of potential to capture new transit riders by travel time improvement or cost, and, usually the lack of demand or funding to increase frequency, comfort and convenience become pivotal factors for improvement.

Transit must become competitive in terms of travel time, convenience, and lifestyle, if it is to be a viable option for those currently commuting by auto. Several deficiencies exists which, if addressed, could increase the transit share in the region and therefore have a positive impact in reducing congestion.

Recommended Improvements

Tables 3 and 4 identify stations and arterials requiring improvements that will enhance transit's performance and attractiveness.

A. Immediate

1. **Trailblazer Signs -** Erect "trailblazer" signs at strategic locations along arterials (Baltimore Pike, Springfield Road, Lansdowne Avenue, PA 252, PA 320 and I-476) to indicate the direction to the nearest or most convenient point of access for SEPTA's rail stations within the corridor. With the exception of approaches to the Swarthmore and Morton train stations,

trailblazer signs are nonexistent for stations on the R3 line. Signs should be placed along the following routes to direct drivers to the following trolley stations with parking facilities: Baltimore Pike for the Bowling Green and Pine Ridge stations, PA 252 for the Bowling Green station, Springfield Road for the Springfield Road station, Woodland Avenue for the Woodland Avenue station, US 1 for the Scenic Road station and State Road for the Drexeline station. These signs would increase the visibility of transit as a travel mode. It is recommended that the trailblazer assembly be designed to include the SEPTA train/bus symbol and a single-headed directional arrow pointed along the route leading to the facility.

2. **Improve Station Access** - Improve approaches to station area by providing adequate lighting, as well as safe and unimpeded access ways for pedestrian traffic at the station. This is particularly needed at the 101 trolley line at the Springfield Mall Station. Improvements should include pedestrian signals and pedestrian actuation where appropriate. This is particularly lacking at the trolley stations within the study area. The Secane, Wallingford, and Moylan-Rose Valley R3 regional rail station areas in particular need sidewalks, crosswalks, and other pedestrian improvements to provide safe pedestrian access to those stations. Transit will become a more desired commuting option with improvements to the safety and attractiveness of the station environment.

3. **Waiting Areas -** Improve waiting areas at transit stations by providing adequate shelter such as canopies, benches, and glass windscreens designed for customer comfort. These amenities are absent at stations along the suburban 101 and 102 trolley routes. Since the value of transit as a congestion reduction measure is to serve commuters who could otherwise drive, such measures must compare with comfort and convenience of a private vehicle. With the exception of the Elwyn station, which was recently renovated, most stations along the R3 line are in need of either facade improvement or major renovation.

4. **Bus Stop Shelters -** Erect shelters at existing bus stops where appropriate, along the major bus corridors such as Baltimore Pike, Lansdowne Ave, US 1 and PA 320. These shelters should be accessed by paved walkways and have glass windscreens to enhance customer comfort. A current bus schedule should be posted at each bus stop for each route as well as transfer points for intersecting buses and trains. This will increase the attractiveness of transit and result in a corresponding decrease in auto travel.

5. **Location of Bus Stops** - Locate bus stops to the far-side of intersections where feasible. This is particularly required along Baltimore Pike at Lansdowne Avenue where buses at near side bus stops impede through movements and right turn traffic flow. Where feasible, parking bays that remove buses from the traffic stream while loading and unloading should be constructed. This will encourage bus use by making the service more attractive and safe.

6. **Bicycle Parking** - DVRPC's *Southeastern Pennsylvania Bicycle and Pedestrian Mobility Plan (1995)* identified several stations on the R3 line that are in close proximity to existing

or proposed bicycle facilities and corridors. The Wallingford station is close to an official bike trail which connects Baltimore Pike with PA 320. The Elwyn, Gadstone, Lansdowne and Fernwood-Yeadon stations are all near proposed bicycle facilities. The Morton, Secane, and Primos stations are all near proposed bicycle corridors which are yet to be defined. Improvements, such signage between bicycle trails and transit stations, should be pursued. While some stations (Wallingford and Swarthmore) have bicycle racks, they are of the antiquated parallel vertical bar design; no modern and secure racks were observed. Bicycle lockers are not provided at any station along the R3 line. Since bicycles are not permitted on trains during peak periods, bicycle commuter's access to transit is discouraged by a lack of secure parking at stations.

7. **Increase Trolley Travel Speed -** SEPTA and PennDOT have begun to install grade crossing improvements on the trolley lines, including crossing gates, flashing warning signals, and preemption of traffic signals. This program is expected to be completed by 2004. While safety is a major goal, the improvements will also allow faster trolley speeds by reducing the time it takes to clear intersections.

B. Long Term

1. **Parking -** Provide adequate parking at transit stations to accommodate current demand and projected future growth in transit ridership.

SEPTA maintains park-and-ride lots at 11 of the 12 Delaware County R3 rail stations with the exception of Fernwood. These SEPTA-owned parking lots provide a total of 1,466 spaces, which include daily as well as monthly permit users. In addition to the SEPTA lots, there are 194 municipal and private long term lots. A field inventory of parking indicates that there is generally more demand for parking than space provided. In most locations, there are no alternatives to park near the station elsewhere than the SEPTA lot. The lack of parking makes commuting by train unavailable, or at best an unreliable choice, for an unknown number of commuters who would otherwise use the R3 on a daily basis. Furthermore, the lack of parking negates much of the potential to attract new riders. The 101 trolley line provides 223 free spaces with approximately 50% being utilized. Bowling Green station has 44 spaces, Pine Ridge Station has 12 spaces, Woodland Avenue has 5 spaces, Springfield Road has 62 spaces, and Scenic Road and Drexeline stations have 50 spaces each.

A 1999 DVRPC report: *SEPTA R3 Media/Elwyn Rail Line Parking Demand Study*, showed that parking at stations along this line operated at 97 percent of capacity on a typical weekday. The few unused parking spaces along the R3 do not provide an option for most commuters along the line. Stations are not easily connected by roads, indicating that for many commuters, using a neighboring station is not a viable alternative; even if parking is available at individual stations, driving to a station other than that closest to the commuter's

home is likely to be impractical, compared to driving for the entire commute.

A total of 228 additional parking spaces (Elwyn -140 spaces, Wallingford - 88 spaces) have been proposed for the R3 line by SEPTA and PennDOT by the year 2001. Assuming that these spaces are constructed and parking demand were to remain constant, the overall utilization rate for fare zone 3 would be 79 percent. However, the need for parking at the stations is expected to grow due to latent demand and trend growth which is based on residential growth along the R3 corridor. By the end of the year 2005, the projected total utilization of parking at 11 regional rail stations along the R3 line will be at 94 percent of capacity. By 2020, the utilization rate is expected to be at 99 percent of capacity. It is therefore necessary for SEPTA to actively explore additional opportunities for surface or structure parking at the existing stations to accommodate current and future demand.

2. **High-Level Platforms** - Construct high-level platforms at all stations along the R3 Regional Rail line from the Fernwood-Yeadon station to the Elwyn station. Currently, ramps exists to permit access by the disabled. This, however, does not speed boardings and alightings by the non-disabled public. Both the age and condition of existing low-level platforms, and the need to improve service indicates that a station improvement program will be necessary to provide a responsive, quality service. High-level platforms will facilitate easier boardings and alightings which, in turn, leads to shorter dwell times at stations. The result is faster travel times for all rail customers which enhances the competitive advantage of transit versus autos.

3. **Increase Travel Speeds** - The most direct method of attaining travel speeds may be to eliminate certain stations. However, this may not be a viable alternative (except possibly for Fernwood and the "flag-stop" stations at Angora and 49th St. east of the study area) for the foreseeable future. While the short distances between stations make it tempting to close some, there is often no good driving route between neighboring stations, potentially making access to the station more of a barrier than driving to work. More importantly, each of the stations west of Fernwood provide parking that cannot be replaced by parking at neighboring stations. Since accessing regional rail by driving is the most popular method, any reduction in parking would be detrimental to ridership far in excess of benefits achieved by marginally better performance. An alternative would be to examine the feasibility of increasing the number of express trains that serves the heavy loading stations during the peak period.

   SEPTA and PennDOT are undertaking a program to install gates and flashing lights at all trolley crossings west of Lansdowne Avenue and preemptive traffic signals from Lansdowne avenue east, in an effort to increase trolley speeds.

4. **Park-and-Rides** - Develop bus park-and-rides in areas not currently served by rail transit. To maximize the utilization of any proposed park-and-ride lot, it is proposed that transit park-and-ride should only be considered as a component of a car/vanpool facility.

Park-and-Ride Lots- In addition to formal park-and-ride lots that serve the R3 regional rail line, there are several other parking options for area transit users.
69th Street Terminal - SEPTA's parking lot at 69th Street Terminal is beyond capacity early in the morning peak period, indicating substantial latent demand. There is ample adjacent metered municipal parking which is infrequently used by transit commuters. Metered daily parking rates should be structured to be the same as the daily parking at the SEPTA lot.
69th Street Terminal Parking Expansion - Investigate SEPTA lease of Upper Darby parking spaces adjacent to 69th Street Terminal. It is likely that Upper Darby could serve its parking needs with several dozen fewer spaces on the east side of the lot. These spaces could then be used by SEPTA for commuters using transit.

5. Circulator Bus Service - Study the feasibility of circulator bus service for all types of development in the study area and for commercial development in areas that may be served by transit from the US 1/Baltimore Pike Corridor. For service within the corridor, determine whether faster and more cost-effective service can be provided by replacing portions of existing routes with small bus circulator service and making the existing routes more direct and oriented toward principal arterials. This would also include providing bus shuttles to commuter rail stations where parking supply is inadequate.

Investigate private/public partnership funding. Rather than providing inadequate service for a number of origins and employment centers, it is desirable to serve routes with the most promising trip demand and employer/community support as well as possible.

Table 4 below provides a summary of the transit strategies that should be employed at or close to regional rail stations within the corridor that will facilitate an increase in rail ridership. Table 5 summarizes improvements to the primary arterials needed to accommodate transit access.

TABLE 4

Summary of Transit Strategies

Regional Rail Station Enhancements

R3 Regional Rail Station	Trailblazer Signs on Approach Roads	Station Facade Rehab.	Improve Pedestrian Access	Improve Station Amenities	Bike Racks	Additional Parking*	High Level Platforms
Elwyn	X		X		X	X	X
Media	X	X	X			X	X
Moylan-Rose	X	X	X			X	X
Wallingford	X	X	X		X	X	X
Swarthmore		X				X	X
Morton		X		X	X	X	X
Secane	X	X	X		X	X	X
Primos	X	X		X	X	X	X
Clifton-Aldan	X	X				X	X
Gladstone		X			X	X	X
Lansdowne	X	X			X	X	X
Fernwood-Yeadon	X	X			X	X	X

* Parking lots at these stations may have a few empty general spaces, or unused permit spaces or handicap spaces. However, full utilization of outlying spaces and the presence of illegally parked vehicles indicate that commuters can not rely on finding a space; the lots are effectively beyond capacity.

TABLE 5
Summary of Transit Strategies
Subcorridor Improvements

Arterial Roads	Transit Trailblazer Signs on Approach Roads	Bus Stop Shelters
Baltimore Pike	X	X
Lansdowne Ave.	X	X
US 1		X
PA 320	X	X
Bishop Ave.		X
Springfield Road	X	
PA 252	X	
I-476	X	

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VIII SUPPORTIVE PROGRAMS

In addition to transit service itself and marketing efforts by SEPTA, there are a number of programs that support the use of transit throughout the region, including the CMS study area. These include:

- **TransitChek** is a public transportation commuter benefit program that is tax-free to employees and tax-deductible to employers. TransitChek enables employers of any size to help reduce the cost of employees' commutes on public transit or vanpools with a voucher. Federal tax laws allow employers to offer up to $65/month or $780/year per employee either as a company paid benefit or a pre-tax payroll deduction. TransitChek is accepted by major transit systems such as SEPTA, PATCO, NJ Transit, DART-First State, and third-party vanpool companies.
- **Mobility Alternatives Program (MAP)** is a PennDOT-funded, DVRPC- managed program, which provides commuters in Southeastern Pennsylvania with alternatives to driving to work alone. Administered through a network of seven subcontractors (five Transportation Management Associations, The City of Philadelphia Mayor's Office of Transportation, and SEPTA), MAP is an outreach and education program that provides information on the variety of options available to commuters, including transit, car or van pools, and flexible work hours. Share-A-Ride, a component of the MAP program, is a computerized commute match service that provides commuters with the most convenient transit options or a listing of other commuters who live and work nearby.
- **Transportation Management Association** - The Delaware County TMA should be supported in its efforts to promote non-traditional transportation such as carpools, vanpools, demand responsive paratransit, subscription buses, telecommuting, and compressed work week in order to reduce regionwide congestion. Since the role of these programs is, in part, to support transit, recommendations depend on specific transit service and programs that are studied or implemented. (Delaware County TMA is one of the seven MAP subcontractors.)

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Geographic Area Covered:

The study area includes or is adjacent to the following Delaware County municipalities: Aldan Borough, Aston Township, Chester Heights Borough, Clifton Heights Borough, East Lansdowne Borough, Edgmont Township, Haverford Township, Lansdowne Borough, Marple Township, Media Borough, Middletown Township, Millbourne Borough, Morton Borough, Nether Providence Township, Ridley Township, Rose Valley Borough, Springfield Township, Swarthmore Borough, Upper Darby Township, Upper Providence Township and Yeadon Borough. The study area also borders on Lower Merion Township in Montgomery County, and West and Southwest Philadelphia.

Key Words:

travel time study, measures of performance, congested intersections, intersection analysis, transit service improvements, congested subcorridors, transitChek, mobility alternatives program, transportation management association, level of service analysis, recommended improvements

ABSTRACT

As a component of the Pennsylvania Congestion Management System, this report provides an examination of congestion at key intersections and arterial segments within the US 1/Baltimore Pike Corridor in Delaware County, and identifies improvement strategies that are both practical and implementable. The 14 most congested intersections and selected corridors were examined in detail and proposed measures to be employed to alleviate current and future congestion were identified. The proposed congestion relief includes the following: signal coordination along major arteries to facilitate a progressive traffic flow; road widening on approaches to major intersections to increase traffic passing through the intersection; installing protected left turn signals; and restricting on-street parking within designated areas. Due to the high residential density and existence of a dense transit network within the corridor, the use of transit as a viable tool toward congestion mitigation in the corridor was also explored. Recommendations were made for improvements which would result in reduced transit travel time, increased accessibility, and increase in customer comfort and convenience.

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