October 2012

CONNECTIONS *2040* Transportation Investment Scenarios

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

CONNECTIONS *2040*

Connections 2040: Transportation Investment Scenarios compares total regional transportation infrastructure needs for Greater Philadelphia over the next 27 years to available revenue under three scenarios.

The **high scenario** is a best case for transportation funding in the region. It forecasts some decline in current road and bridge conditions, while the region's transit infrastructure achieves a state-of-good repair. This scenario invests in a number of road and transit operational improvements, and additional new transit routes. This will allow the region to be more economically competitive and will enhance our quality of life.

The **medium scenario** is a likely investment level for transportation infrastructure, based on current funding levels. In it, road and bridge conditions worsen considerably. Transit infrastructure remains in the same condition as today, but is still far from a state-of-good repair. This scenario is able to invest in a few road and transit operational and system expansion improvements.

The **low scenario** is a worst case for regional transportation funding. In it, road and bridge conditions decline substantially between now and 2040, and 100 state-maintained bridges close due to lack of funding. This would cause more congestion, lower travel speeds, and increase vehicle operating cost. The region's transit infrastructure backlog of state-of-good repair needs worsens to where service is compromised. Poor transportation system condition would negatively impact the region's economic competitiveness.

None of the scenarios are able to fund all needs. Under each, the region must carefully balance system preservation, operational improvement, and new capacity investments.

Regional Transportation in the Global Economy

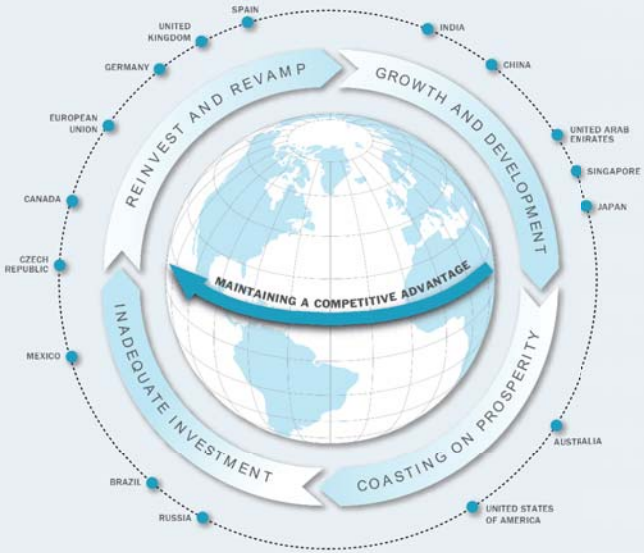
The degree to which we fund Greater Philadelphia's transportation infrastructure greatly impacts our quality of life and our economic competitiveness. As the basic unit of competition in the global economy, regions will be most successful if they: promote internal cooperation rather than competition; have a transportation system that can easily and inexpensively move people and goods; and have direct access to many other regions.

In the United States, we continue to live off past investments. Current transportation funding levels barely allow us to maintain our existing infrastructure, and are well below what is needed to invest in new facilities to ensure future prosperity. Meanwhile, many of the regions we compete with around the world are becoming better equipped and financed to meet modern demands.

- China has completed more than half of its goal to build 10,000 new miles of high-speed rail by 2020 in just a few years. These trains would cover the distance between New York and Atlanta in less than five hours. The rapidly changing Chinese landscape is also being dotted with new highways, airports, subways, and ports.[1]
- Brazil is preparing for the 2014 World Cup and 2016 Olympic Games by building a new high-speed rail line between Rio de Janeiro and Sao Paolo, while modernizing roads, transit systems, and ports.[2]
- India is spending $200 billion per year to build new commuter rail lines, highways, airports, water treatment facilities, and power plants.[3]
- Europe continues to invest a much higher percentage of gross national product in transportation infrastructure compared to the United States, despite the economic crisis and fiscal austerity efforts.[4]

Due to the age of our transportation infrastructure, Greater Philadelphia is also at a competitive disadvantage to many other regions in the country. We have to invest a greater percentage of available funds in order to maintain and preserve the system, meaning that there is less for projects that can improve the operation of the system or expand it. Additionally, the region is more reliant on federal and state funding for transportation projects compared to many of our peers.

[1] *Urban Land Institute and Ernst & Young, Infrastructure 2011: A Strategic Priority (Washington, DC: Urban Land Institute, 2011).*
[2] *Ibid.*
[3] *Ibid.*
[4] *Ibid.*



The Urban Land Institute has found that due to lack of investment, the United States is falling behind its foreign competitors in developing the type of transportation system that maintains a competitive economic advantage.

Source: Urban Land Institute and Ernst & Young, Infrastructure 2009: Pivot Point (Washington, DC: Urban Land Institute, 2009).

Total Regional Transportation Funding Assumption 2014-2040 by Scenario*

** Formula funding for capital projects only; does not include potential New Starts, Small Starts, or other sources of competitive grant funding. Source: Delaware Valley Regional Planning Commission, 2012.*

Looking at Alternative Futures

Greater Philadelphia has a large and complex transportation network. The system is mature, largely built out, and was designed to serve 20th-century travel patterns. It is also aging. The region has numerous 100+-year-old bridges, obsolete transit power substations, and other infrastructure that have served well beyond their useful lifespan. Rebuilding and modernizing our transportation infrastructure is critical to maintaining economic competitiveness in the global economy.

Connections 2040: Transportation Investment Scenarios considers how different future funding levels will affect transportation infrastructure conditions between 2014 and 2040:

- The **high scenario** is a best-case situation for transportation funding in the region. This scenario assumes a 35 percent increase in reasonably anticipated funding over the life of the *Connections 2040* Plan.
- The **medium scenario** is a likely investment level for transportation infrastructure. It is based on a continuation of present funding levels.
- The **low scenario** is a worst case development for regional transportation funding; this scenario assumes a 20 percent decrease compared to current transportation funding levels.

> Without some change in how we pay for transportation projects, the low scenario detailed in this analysis is as likely to happen as the medium.

The high scenario is based on the highest funding level proposals put forth during the federal transportation reauthorization debate that led to the passage of *Moving Ahead for Progress in the 21st Century* (MAP-21). These proposals represent the best opportunity for increased transportation funding in recent years. However, none of them identified a source of additional funding.

The medium scenario is based on Delaware Valley Regional Planning Commission (DVRPC) forecasts of likely transportation funding over the next 27 years, incorporating MAP-21 revenue authorizations. However, it assumes less funding than in the current Long-Range Plan. This is because *Connections (2035)* anticipated some growth in federal funding from 2009 to 2014, which has not occurred.

The low scenario is based on Congressional Budget Office forecasts for federal gas tax revenue over the next 10 years, extended out to 2040. Without some change in how we pay for transportation projects, the low scenario detailed in this analysis is as likely to happen as the medium.

Transportation Funding in Greater Philadelphia

Funding for transportation projects comes from a combination of federal, state, and local sources, with federal and state gas taxes being the largest contributors. Changes in funding could come from any level of government, or increased participation from the private sector. Regardless of the source, any new funds will likely require either: tolling, increased gas taxes, vehicle mile traveled fees, vehicle fees, transit fares, or come from non-transportation-related sources, such as increased sales tax.

The recently enacted MAP-21 is a two-year reauthorization, whereas past transportation bills have been for six years. This legislation funds federal transportation programs at only a slightly higher level than its predecessor, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) did on average from 2004 to 2009. That is, from 2009 to at least 2014, federal funding levels will have been flat. In the meantime, funding needs have expanded.

Lack of growth in transportation revenue is tied to lagging gas tax collections at both the federal and state levels in recent years. These taxes are a fixed amount per gallon of gasoline purchased and are thus not affected by changes in price, and are not indexed to inflation. The federal gas tax was last increased in 1993, while state gas taxes were last raised in New Jersey in 1988, and in Pennsylvania in 1997.

The Transportation Funding Advisory Commission (TFAC) estimated $3.5 billion in annual unmet transportation funding need in Pennsylvania. This amount is increasing each year. TFAC identified a recommended funding stream of $2.5 billion per year, filling the remainder of the gap with efficiencies and cost savings. TFAC also advocated for gradually phasing out the gas tax in favor of a vehicle mile traveled fee; increasing private sector involvement in transportation project finance; giving local governments more control over planning and funding of projects; and using new technologies to lower costs.

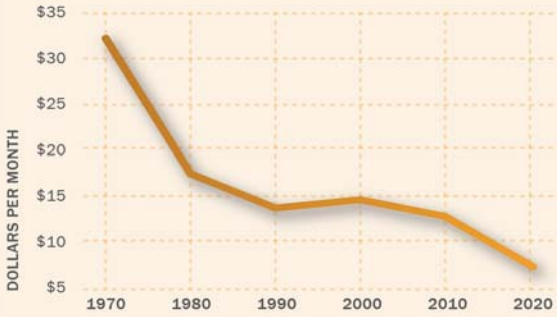
Since the last federal gas tax increase, the purchasing power of the dollar has eroded by one-third due to inflation.[5] In addition, both the economic downturn and improving vehicle fuel efficiency have reduced total fuel consumption, lessening the amount of revenue collected. With the national debt continuing to grow and the economy still slowly coming out of recession, there has been little appetite at either the federal or state level to generate much-needed additional revenue.

[5] National Surface Transportation Infrastructure Financing Commission, Paying Our Way: A New Framework for Transportation Finance (Washington, DC: National Surface Transportation Infrastructure Financing Commission, 2009).

Federally Authorized Transportation Funding, Nationwide 1992-2014

Source: Adapted from federal funding authorizations in the Intermodal Surface Transportation Efficiency Act (ISTEA), the Transportation Equity Act for the 21st Century (TEA-21), the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and its continuing resolutions, and Moving Ahead for Progress in the 21st Century Act (MAP-21). Delaware Valley Regional Planning Commission, 2012.

Monthly State Fuel Tax Paid by an Average Pennsylvania Driver in 2010 Dollars



Source: Transportation Funding Advisory Commission, 2011.

The nine-county Delaware Valley Regional Planning Commission region consists of Bucks, Chester, Delaware, Montgomery, and Philadelphia counties in Pennsylvania, and Burlington, Camden, Gloucester, and Mercer counties in New Jersey.

Deck structure of the Chestnut Street Bridge over Amtrak's Northeast Corridor in Philadelphia. This bridge is currently weight restricted. Due to a lack of funding, regional agencies such as the Pennsylvania and New Jersey departments of transportation, the Southeastern Pennsylvania Transportation Authority, and New Jersey Transit are frequently applying patchwork fixes. Over time, this remedy costs far more than adequately maintaining infrastructure in the first place, especially as the region's infrastructure continues to deteriorate to the point that it requires extensive reconstruction.

Photo: Pennsylvania Department of Transportation.

Planning for a Better Region

As the Metropolitan Planning Organization (MPO) for Greater Philadelphia, DVRPC is responsible for prioritizing and programming federally funded transportation projects in the region. Every four years the Commission must prepare a long-range plan that prioritizes transportation investments. The financial portion of this plan must be fiscally constrained. This means the region cannot propose to expend more revenue on transportation projects than it reasonably anticipates receiving over the life of a long-range plan. In addition, all project cost estimates are required to be shown in year-of-expenditure dollars. This accounts for inflation that is expected to occur between now and when the project is actually constructed.

The transportation investment scenarios will help guide the development of the *Connections 2040* update of the region's Long-Range Plan. These scenarios consider only capital projects. The needs assessment for pavement and bridges considers the current condition, full life-cycle needs, and uses regional project costs from DVRPC's Transportation Improvement Program (TIP) for all phases: design, right-of-way acquisition, utility improvements, and construction.

This analysis assumes a pay-as-you-go approach to funding transportation infrastructure. Regional transportation needs could also be funded through increased debt obligations. However, Pennsylvania has largely avoided debt service, due to bad experiences in the 1970s. Debt levels in New Jersey mean payments on outstanding liabilities are approximately equal to the gas tax revenue collected by the state each year.

DVRPC continues to highlight the region's funding gap and seeks approaches to maximize funding. Additional locally generated funding is one approach by which we can control our own destiny, ensure that the projects we build are the best for the region, and gain a competitive advantage in national and international markets. With much of our region's infrastructure either at, or fast approaching, the end of its useful life, now is a critical time to continue the dialogue and build consensus on how to upgrade and modernize our key transportation facilities.

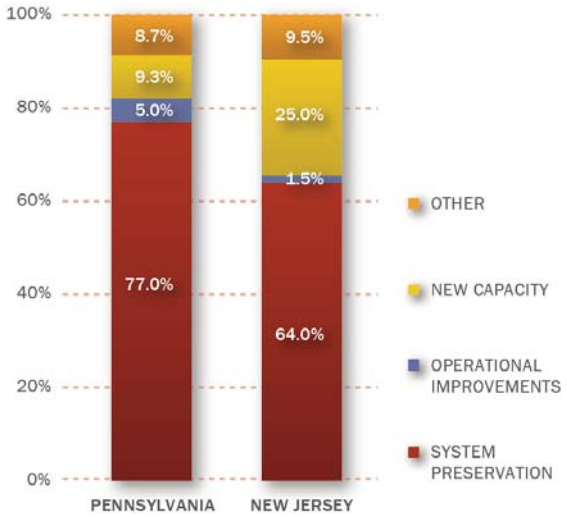
Prioritizing Transportation Funding

1.
2.
3.

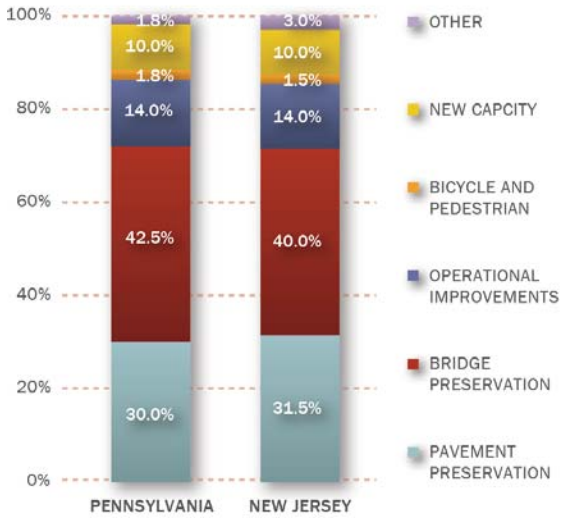
The current Long-Range Plan sets funding allocation targets, based on identified need and policy. However, the total need for all kinds of transportation infrastructure is far greater than available revenue, so these allocation rates recognize that many needs will go unfunded. The vast majority of funding is currently dedicated to preservation, maintenance, and replacement of outdated infrastructure, with limited funding for new capacity. The figures on this page detail the percent of total funding available for different categories of projects. Each scenario maintains the allocation targets for its reasonably anticipated funding levels. This determines how much funding goes toward bridge repair or roadway resurfacing in the scenario exercise.

These are targets for how the region will spend its transportation revenue. They do not represent a guaranteed funding level. Nor do they restrict the ability to fund specific critical-needs projects. This analysis assumes that funding will be distributed as identified in the current Long-Range Plan to estimate how different future funding levels impact infrastructure condition. These funding allocation formulas will be revisited as part of the *Connections 2040* Plan update.

Transit Funding Allocation



Roadway Funding Allocation



Source: Delaware Valley Regional Planning Commission, 2012.

Transportation projects should support the four key principles of the *Connections (2035)* Plan:

- ✔ Creating livable communities;
- ✔ Managing growth and protecting resources;
- ✔ Building an energy-efficient economy; and
- ✔ Modernizing the transportation system.

Transportation projects identified for funding in the Plan should utilize smart transportation principles; be tailored to the size of the problem; respect the character of the community; take alternative modes into account; and be planned in collaboration with the community. This will help to ensure that we are getting the most out of our transportation investments.

Goods Movement and the Economy

The cost of shipping is passed on to consumers when they pay for goods and services. Nearly all freight movement is completed by truck for some portion of the trip. Therefore, how well we maintain the road network has an impact on how much we pay for the everyday products and services we need or want. Savings generated by good road conditions have a positive impact on our economy.

Congestion also plays a significant role in transportation's economic impact. There will always be some degree of congestion. This is considered acceptable, because it shows that a region is a desirable and active location. However, reducing congestion in heavily traveled areas, like Greater Philadelphia, correlates with increases in the region's gross regional product and new job creation.

Employers take the ability of employees to access the worksite and their products to reach markets into consideration when deciding where to expand. Time wasted in traffic is often lost economic productivity. Consider, for instance, a plumber who spends an extra hour per day stuck in traffic, which could be spent on job sites.

This is why it is important to invest in Intelligent Transportation Systems (ITS) and other operational improvements, as well as new facilities. The region could also consider revenue generators, such as congestion-based pricing, that can both lower congestion and provide much-needed additional funding to further improve the region's transportation system.

Assessing Our Roads and Bridges

There are nearly 11,000 lane miles of state-maintained roads in Greater Philadelphia. The region has nearly 3,000 state-maintained bridges, containing more than 32 million square feet of deck area. Due to age, the region's weather, and high traffic volumes, **maintenance and preservation** is the most critical issue for roads and bridges. Priorities include:

- Pavement reconstruction and resurfacing; and
- Bridge rehabilitation and replacement.

> "... [the Commonwealth of Pennsylvania has almost] 6,000 structurally deficient bridges. You will pass structurally deficient bridges or drive over structurally deficient bridges ten times more [often] than you will see a McDonald's restaurant."
>
> *—Jack Wagner*
> *Auditor General, Commonwealth of Pennsylvania*

Operational improvements are the next regional priority. These projects can lower traffic volumes and reduce road congestion, often at much lower costs than expanding the system. Projects in this category include:

- Intelligent Transportation Systems (ITS) comprised of closed-circuit TV (CCTV) cameras to monitor roadways, linked to variable message signs (VMS) that send real-time information to drivers along routes.
- Closed-loop traffic signal systems that connect traffic lights through timing and signal coordination to manage traffic flow along a stretch of road.
- Incident management to provide quick clearance of accidents or other roadway impedances in order to maintain traffic flow and reduce the potential for associated traffic crashes.
- Emergency service patrols provide quick response to crashes and disabled vehicles. They may serve as the emergency responders or help other emergency responders (such as ambulances). They also provide minor services such as battery charging, supplying gas, and help to quickly clear the scene of an accident.
- Access management strategies improve road safety and efficiency by limiting and controlling access points to and from a facility.
- Roundabouts improve road operations by decreasing traffic delays and speeds at intersections, and benefit safety by reducing the number and severity of accidents.
- New turning lanes and other intersection improvements.

The third option for improving our road network is to **add capacity**. This includes new roads, roadway extensions, additional through lanes, and new interchanges.

Maintaining Our Roads

Most of the region's roads were designed for a 40-year life expectancy, though newer roads are anticipated to have a longer duration. Roads can be kept in good condition with proper maintenance for a much lower cost than reconstructing a road that has fallen into a state of disrepair. Lack of funding has meant that this region has been unable to keep up with pavement maintenance and repair requirements.

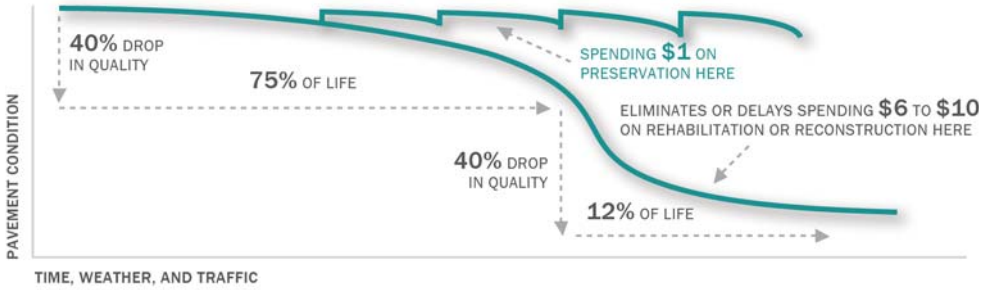
Regular resurfacing and preservation helps to maintain good pavement condition. This ensures that our roads are smooth and safe for operation. Typically, a road is resurfaced every 12 to 15 years, though a high-traffic volume interstate may be resurfaced every seven years, while a lower-volume collector road may be resurfaced only every 25 years. Pavement in poor condition causes unnecessary vehicle damage, increasing the cost of driving, and slows down traffic, increasing congestion.

DVRPC estimates that the region needs to resurface about 19,000 lane miles and reconstruct more than 3,300 lane miles of road between 2014 and 2040. This accounts for the existing backlog of pavement projects and anticipates future needs as they arise. The total cost to achieve and maintain a state-of-good repair during this period is estimated to be $19.1 billion. The medium scenario anticipates investing $11.0 billion in pavement maintenance over the life of the *Connections 2040* Plan.

Investment Scenarios

Each scenario funds only a fraction of the reconstruction projects that are needed. As a result, the region will likely see an increase in the amount of pavement in poor condition over the next 27 years. Long-term investment in pavement in the high scenario will pay off. By 2040, this scenario projects a 15 percent reduction in lane miles in deficient condition compared to the medium scenario, and 28 percent less than in the low scenario. Fewer deficient lane miles mean less travel on poor roads, lowering vehicle operating costs, enhancing safety, and reducing the cost of goods and services.

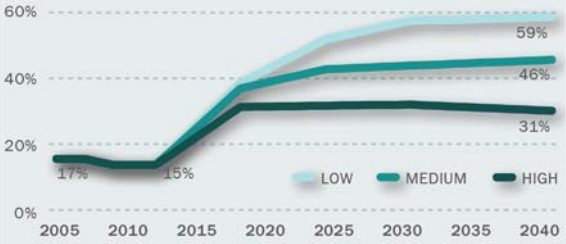
Pavement Maintenance Costs



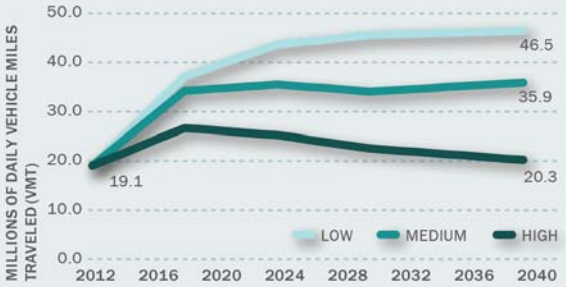
Source: Adapted from Federal Highway Administration, 2012.

State-Maintained Lane Miles of Reconstruction and Resurfacing 2014 to 2040 by Scenario Compared to Estimated Need

Percentage of State-Maintained Lane Miles in Poor Condition by Scenario

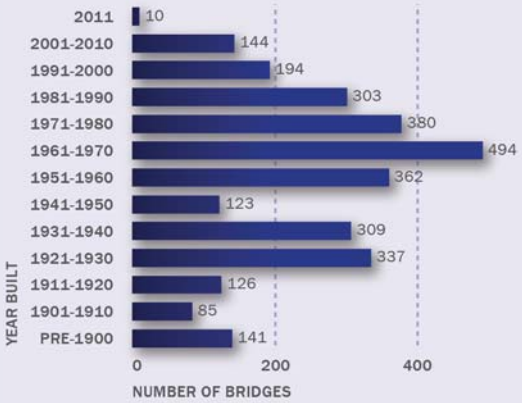


Daily Vehicle Miles Traveled on State-Maintained Pavement in Poor Condition by Scenario

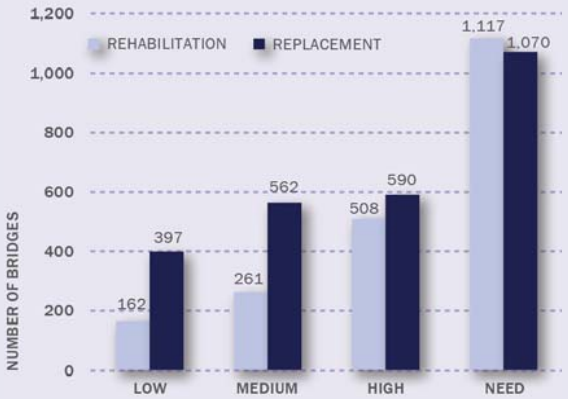


Source: Delaware Valley Regional Planning Commission.

State-Maintained Bridges by Decade Built



State-Maintained Bridge Projects in Each Scenario Compared to Estimated Need, 2014-2040



Source: Delaware Valley Regional Planning Commission.

Preserving Our Bridges

Pennsylvania has the highest number of deficient bridges of any state in the nation. To remedy this, the Commonwealth has made a substantial investment in bridges over the past few years. The number of bridges in structurally deficient condition in the Pennsylvania portion of the region has declined from 22 percent in 2009 to 17 percent in 2011. Additional bridge funds have come from the American Recovery and Reinvestment Act (ARRA), an accelerated bond program, and by reducing expenditure on pavement maintenance.[6] However, the backlog of bridges to be repaired during the timespan outlined in the *Connections 2040* Plan is substantial.

A typical bridge's useful life ranges from 50 to 100 years. Some historic masonry and concrete bridges can last longer, given low traffic volumes and regular maintenance. Unfortunately, over the next 27 years, a large number of bridges built between 1900 and 1960 will come due for replacement, and many of the bridges built from 1960 to 1990 will need major rehabilitation. Bridge rehabilitation involves the reconstruction of a major component of the bridge to correct structural deficiency. Bridges past their useful design life, or with multiple deficient components, are usually replaced. Replacement means a deficient bridge is removed entirely, and a new bridge is built in place of the old one.

If all of the region's bridge deck area were recreated as a single, two-lane bridge, it would extend for 253 miles. If this bridge began in Center City Philadelphia, it would stretch all the way to Richmond, Virginia.

Bridges in poor condition are not unsafe for driving, but they will need major rehabilitation or replacement within the next few years. This may lead to weight restrictions on a number of bridges, or increased risk of closure for emergency repairs. State departments of transportation inspect each bridge on a two-year cycle. Bridges in deficient condition are inspected more frequently. These regular inspections help to ensure that bridges are safe to use.

Overall, the region needs to replace or rehabilitate nearly 2,200 bridges in order to achieve and maintain a state-of-good repair for all bridges from 2014 to 2040. The cost for all these projects, along with regular preservation, is estimated to be $58.4 billion over this period. Expected funding for bridge preservation in the medium scenario is just $15.4 billion.

[6] *The accelerated bond program in Pennsylvania borrowed $200 million per year from 2008 to 2010 to fund additional bridge improvements. More than 1,100 bridges statewide will be repaired by this effort, but this debt will now be repaid against future transportation revenues.*

Investment Scenarios

Only a fraction of necessary bridge projects in the region can be accommodated over the next 27 years under any of the investment scenarios. To reduce the risk of closures under all three scenarios, this assessment has prioritized replacing bridges before they will close to traffic. This uses up much of the funding reserved for bridge maintenance. With most funding allocated for replacement, less is available for more cost-effective projects, such as rehabilitation and preservation, both of which extend a bridge's useful life. This strategy also reduces the amount of funding that is directed toward other critical projects, such as reconstructing the Interstate 95 viaducts in South Philadelphia.

Recent investments in bridges will continue to pay dividends over the next several years, but this progress will be short lived without additional expenditures. The age and poor condition of many of the region's bridges mean that early in the 2020s, the system will fall further into disrepair and will continue to decline over the life of the *Connections 2040* Plan.

Percentage of State-Maintained Deck Area in Poor Condition by Scenario

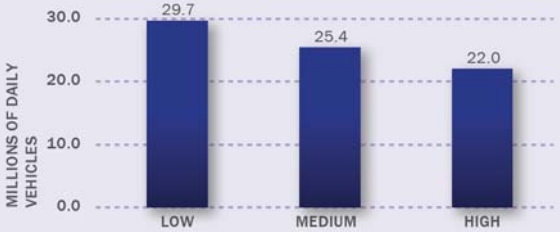
Source: Delaware Valley Regional Planning Commission.

In the low scenario, we estimate that more than 100 state-maintained bridges will close due to lack of funding for proper repair or replacement. These bridge closures will not necessarily be permanent. However, whenever and wherever closures occur, traffic congestion will increase. In response, individuals will either: forego trips, change to another mode of travel, or need to extend trip length in order to detour around the closed bridge. Currently, more than 700,000 vehicles a day use the bridges that could close by 2040 in this scenario. Bridge closures on roads with a larger share of trucks will be particularly harmful to goods movement and the economy.

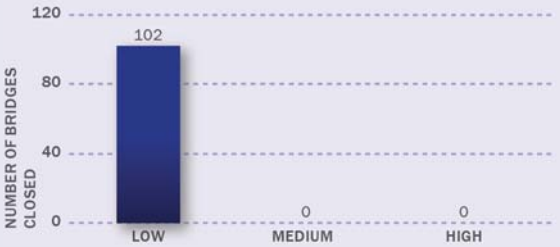
Poor deck condition on the State Road Bridge over rail tracks (owned by the Southeastern Pennsylvania Transportation Authority and leased to CSX) in Bucks County has led to this bridge's deficient condition. This is one of more than 600 structurally deficient bridges that currently need significant maintenance in the region.

Photo: Pennsylvania Department of Transportation.

Daily Vehicles Using State-Maintained Bridges in Poor Condition in 2040 by Scenario



Number of State-Maintained Bridges Closed to Traffic in 2040 by Scenario



Source: Delaware Valley Regional Planning Commission.

Local Roads and Bridges

The Keim Street Bridge in Pottstown, PA, is one of more than 30 local bridges currently closed in the region. Other notable closed local bridges include the 41st Street Bridge in West Philadelphia and the East Bridge Street Bridge in Parkesburg, PA. Some of these bridges may never be rebuilt. Another 280 local bridges are weight restricted.

Photo: Montgomery County Planning Commission.

State-maintained roads and bridges comprise only a portion of the total regional transportation network. There are more than 18,800 linear miles of county and municipally maintained roads in the region, of varying numbers of lanes. Local governments also usually own, operate, and maintain the traffic signals on local streets.

There are more than 750 locally maintained bridges greater than 20 feet long, with 2.7 million square feet of deck area.[7] While about 14 percent of state-maintained bridges are currently structurally deficient, more than 28 percent of locally maintained bridges over 20 feet are structurally deficient.

> "Our entire population depends upon transportation, whether or not a person drives. The transportation system allows food, clothing and materials to be shipped, school buses to carry children, transit to carry riders, emergency vehicles to respond expeditiously..."
>
> *The Transportation Funding Advisory Commission Final Report*

Both the Pennsylvania and New Jersey state governments restrict the type of taxes a local government can collect. This means that most maintenance and preservation activity on local roads and bridges is funded by property taxes, for which these projects must compete with other community priorities, such as public safety, for limited municipal general funds. Poor road conditions, and closed or posted bridges may become more the norm, as lean municipal, county, and state budgets provide little available revenue for locally maintained facilities.

Investment Scenarios

There is limited federal and state transportation funds for these facilities. The high scenario represents an increase in state and federal assistance to locally and county-maintained roads and bridges, but will require an increase in local matching funds for state projects. The medium scenario maintains the status quo. The low scenario means even less funding overall, though some local funds that would be applied to state-maintained facilities could be used on locally maintained facilities due to reduced local match requirements.

Regardless of the investment scenario, future local road and bridge conditions will be largely dependent on municipal funding decisions. Without political will at both the state and local levels, future funding will likely be inadequate to properly maintain locally owned roads and bridges.

[7] Accounts for local bridges over 20 feet in Pennsylvania only. Local New Jersey bridges over 20 feet are generally funded by the state with a local match. Needs and condition for local New Jersey bridges over 20 feet are reflected in the Preserving Our Bridges section of this report. Local roads and bridges under 20 feet are largely maintained by counties or municipalities in both states. No condition data is available for local roads or bridges under 20 feet.

Improving Roadway Operations

Disabled vehicles, traffic crashes, maintenance and construction activity, special events, and adverse weather conditions are estimated to cause about 60 percent of the traffic delays that occur in major metropolitan areas. Transportation operations strategies attempt to mitigate congestion caused by these types of events. ITS infrastructure in the region includes: VMS, CCTV, traffic signals, transportation operation centers, emergency service patrols, and the Regional Integrated Multi-Modal Information Sharing (RIMIS) project. RIMIS is an information exchange network to share and disseminate real time operational information.

There are considerable ongoing operating costs with implementation and maintenance of ITS elements, since this infrastructure can become obsolete over time due to technological improvements or wear and tear.

Investment Scenarios

Full implementation of regional ITS is the key goal of the Transportation Operations Master Plan. Implementation includes capital funding for CCTV, VMS, and transportation operations centers, as well as other expenses associated with transportation operations. Only the high scenario is able to fully fund this plan. In the medium scenario, it will be about 85 percent complete by 2040, and in the low scenario, it will be about 60 percent complete. Segments of roadway that don't have recommended ITS equipment will be subject to more delay and less safe driving conditions.

Active Traffic Management (ATM) is a new concept to improve traffic flow on expressways using variable speed limits and overhead lane-control signs. One component of ATM is hard-shoulder running: using shoulders as a travel lane during peak hours or times of congestion. Above is an example of hard-shoulder running on I-66 in northern Virginia. The Delaware Valley Regional Planning Commission is currently conducting a feasibility study for hard-shoulder running on I-476 in Delaware County.

Photo: Virginia Department of Transportation.

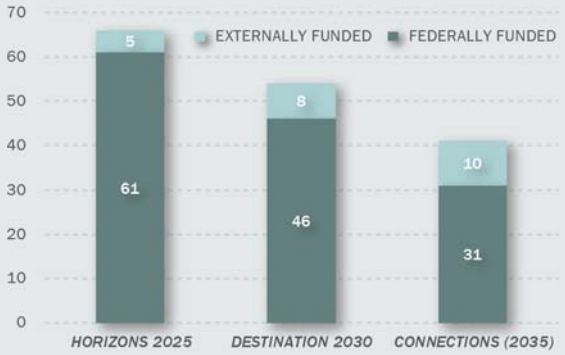
Intelligent Transportation Systems Infrastructure Vision

Source: Delaware Valley Regional Planning Commission.

The Transportation Operations Master Plan sets the vision for Intelligent Transportation Systems (ITS) in the Greater Philadelphia region. This plan sets regional operating goals and objectives, establishes location and deployment levels for ITS and other operations programs, and identifies specific capital projects and operating budget needs. Substantial progress has been made in implementing the vision set forth in the Plan, thanks largely to the American Reinvestment and Recovery Act (ARRA). ARRA funded closed-circuit television (CCTV) and variable message signs (VMS) to cover the length of I-95 from the Delaware to New Jersey state lines, along US 1, and Woodhaven Road.

*MAP: **Primary coverage** includes full CCTV coverage, VMS on roadway and key interchanges, incident detection, and travel time monitors. **Secondary coverage** includes limited CCTV coverage on roadways, primarily at interchanges, CCTV coverage on arterials, VMS, travel time detectors, and interconnected signal systems. **Tertiary coverage** includes CCTV at major intersections, VMS at decision points, travel time detectors, and interconnected signal systems. **Emergency routes** include limited CCTV coverage and limited VMS.*

Major Regional New Road Capacity Projects by Funding Source in 2025, 2030, and 2035 Long-Range Plans



Source: Delaware Valley Regional Planning Commission, 2012.

Direct connection of I-95 and the Pennsylvania Turnpike will reduce traffic congestion on nearby local roads and improve the flow of people and goods. After this project is completed, the existing I-95 will be renumbered I-195 to the north of the interchange, and what is now I-276 to the east of it will become I-95. This project is being built with a combination of funds from federal and state sources and the Pennsylvania Turnpike Commission. As more revenue is shifted to maintenance, projects to improve or expand the system are likely to become less frequent.

Image: Pennsylvania Turnpike Commission.

Providing Limited New Road Capacity

Beginning with the *Destination 2030* Long-Range Plan, the Greater Philadelphia region has capped expenditures on new roadway capacity at 10 percent of total roadway funding. This reflects the region's transportation infrastructure philosophy of fixing-it-first, before expanding. It also acknowledges that while new roadway lanes initially relieve congestion, over the long term they lead to more auto trips and encourage sprawl. In order to maintain fiscal constraint, each iteration of the Plan has had to reduce the number of new capacity projects. Some projects have been completed, others have been removed from consideration, while only a limited number of new projects have been identified.

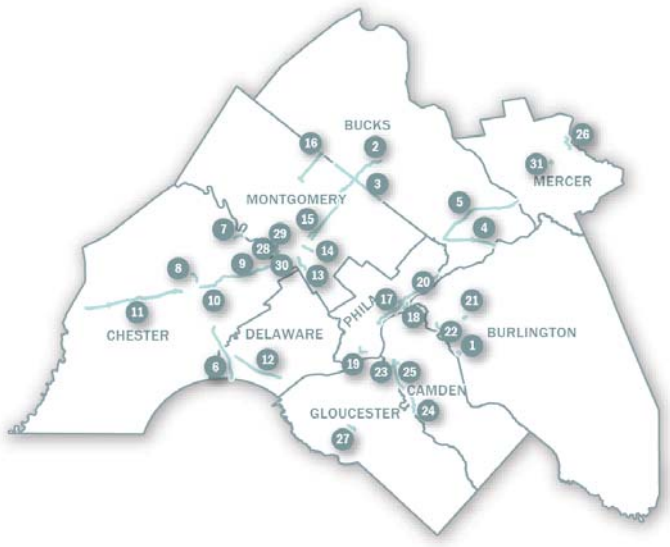
> Highway access has consistently been the top reason for business location decisions in Local Area Development magazine's annual survey of company site selection factors.

The *Connections (2035)* Plan has 41 major new roadway capacity-adding projects, of which 10 are nonfederally funded. This is 30 fewer federally funded projects than were envisioned in the *Horizons 2025* Long-Range Plan, and 15 less than in the *Destination 2030* Plan. Externally funded major regional projects have been increasing in number, as the region's toll authorities are maximizing their capacity to deal with rising travel demand. These facilities are able to be expanded because toll authorities have the dedicated revenue stream to fund them. However, such funding streams face future uncertainty, and it is not clear that these are the most strategic projects for the region to invest in from an economic competitiveness standpoint. Though limited in scope, additional transportation capacity is critical to future economic growth and quality-of-life issues for the region's residents. Failure to improve the system means that as population expands, there will be increased traffic gridlock, more wasteful emissions, and negative economic impacts.

Investment Scenarios

Total funding in the low scenario is estimated to be enough to complete all remaining new capacity projects in the *Connections (2035)* Plan. The medium and high scenarios would then have even more revenue that could be applied to additional projects. Given the sheer volume of pavement and bridge needs in the region, a key question becomes whether the additional revenue under the medium and high scenarios should be allocated to more new capacity projects, or put toward system maintenance and preservation projects, as is done in this assessment.

Federally Funded Major New Road Capacity Projects in *Connections (2035)*



Source: Delaware Valley Regional Planning Commission, 2012.

ID	Facility	Project Description	Status
1	Marlton Circle	new interchange	complete
2	US 202 (Section 700)	new road	complete
3	County Line Road	widen, reconstruct	under construction
4	I-95 & PA Turnpike	new interchange, widen PA Turnpike	under construction
5	US 1	reconstruct, widen, improve interchanges	planned
6	US 202 (Section 100)	widen	planned
7	French Creek Parkway	new road	planned
8	PA 100	widen	planned
9	US 202 (Section 300)	widen, reconstruct	under construction
10	US 30 Business	widen	planned
11	US 30 / Coatesville-Downingtown Bypass	reconstruct, widen, new interchange/ramps	planned
12	US 322	widen, reconstruct	planned
13	I-76 & Henderson Road	new interchange; widen and reconstruct Henderson Rd.	complete
14	Lafayette Street	extend roadway, new interchange with PA Turnpike	planned
15	US 202 (Section 600)	widen, reconstruct	planned
16	PA 309 Connector Road	new road	ph. 1 complete, ph. 2 planned
17	I-95 (Philadelphia North)	reconstruct, improve interchanges	under construction
18	North Delaware Avenue	road extension	planned
19	Pennrose Avenue / 26th Street	new access road to Navy Yard	planned
20	Adams Avenue Connector	road extension, new ramps onto I-95	planned
21	I-295 at NJ 38	new ramps	planned
22	NJ 73	widen, improve intersections	under construction
23	I-295 at I-76 / NJ 42	new ramps	planned
24	NJ 42 at College Drive	new interchange	planned
25	I-295 (Direct Connect)	direct connection through interchange with I-76/NJ 42	planned
26	US 1 (Penns Neck)	new connector road, interchanges, widening	planned
27	US 322 Mullica Hill Bypass	new road	complete
28	US 422 and PA 363	new ramps	under construction
29	US 422 Bridge and PA 23	bridge replacement and widening, improve interchange	planned
30	US 422	widen	planned
31	Mercer County Road 533	new interchange at County Road 638	planned

Transportation Investment Scenarios

Roundabouts improve road operations by decreasing traffic delays and speeds at intersections, and benefit safety by reducing the number and severity of crashes. They can also reduce road operating costs, but the ability to convert appropriate intersections depends on capital fund availability.

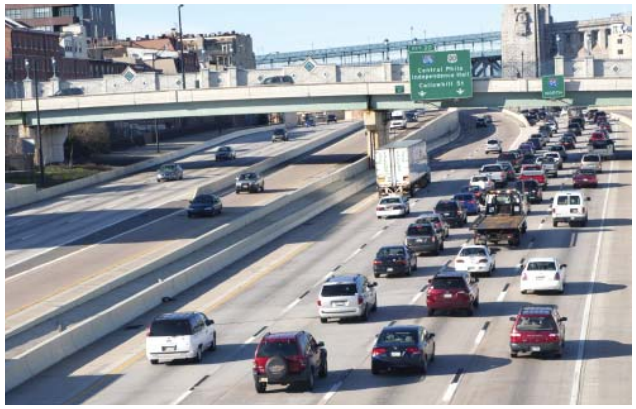
Photo: Delaware Valley Regional Planning Commission.

The relocated Sumneytown Pike in Montgomery County is a component of the PA 309/Sumneytown Pike Connector Road. This major regional project will link PA 309 and the Pennsylvania Turnpike, benefiting local residents and businesses by providing more efficient travel alternatives. This project was right-sized to save on construction costs by reducing lane and shoulder widths and eliminating direct movements at the PA 309 interchange; it was also split into two separate construction projects. This first phase has been completed; but the second phase is delayed due to funding constraints.

Photo: McCormick Taylor

The new I-76 and Henderson Road on-ramp. This project also added an off-ramp between these facilities and widened Henderson Road. This major regional project was completed with funding from the American Recovery and Reinvestment Act (ARRA). Symbolic of the lack of revenue for anything beyond system preservation is that many of the recently constructed operational and new capacity projects were funded through ARRA or Transportation Investment Generating Economic Recovery (TIGER) federal grants.

Photo: Greater Valley Forge Transportation Management Association.



I-95 is primarily a viaduct through much of the City of Philadelphia. This facility contains about 30 percent of the region's total bridge deck area. Much of I-95 in Philadelphia was constructed in the 1970s and will be well past the end of its useful life by 2040 if it does not undergo major rehabilitation before then. There is currently not enough funding to properly maintain I-95's viaducts and all the other bridges in the region.

Highlighting Interstate 95

Interstate 95 represents a significant challenge for maintenance in the region. This facility traverses 51-miles through the region and is critical to the economy, providing access to Center City, the Philadelphia International Airport, business parks, ports, industrial facilities, and sports stadiums; it also serves as an important megaregional link between Washington, DC, and points south, and New York City and points north. This interstate has more than 10 million square feet of bridge deck area in the region. A large crack found on one of the viaducts in North Philadelphia closed a portion of this facility for two days in 2008 while temporary emergency repairs were made.

Reconstructing I-95 has been ongoing in sections north of Center City Philadelphia and will continue over the next several years. The entire portion to the south of Center City Philadelphia needs to be rebuilt during the life of the ***Connections 2040*** Plan. To meet modern design and safety requirements, this facility may need to be widened in many areas when it is reconstructed. More than eight million square feet of deck area needs to be rehabilitated or replaced during the timeframe of the ***Connections 2040*** Plan, at a total estimated cost of $22.0 billion.

Investment Scenarios

Given current funding constraints, a trade-off exists between I-95's viaducts and the rest of the region's bridges. If we focus on reconstructing I-95's viaducts over the next 27 years, then numerous other bridges, currently in worse condition, cannot be repaired. This would potentially mean several hundred bridges around the region being weight restricted, or closed to traffic altogether, between now and 2040. If the trade-off is to shift more funding to bridge repair, then less will be available for pavement preservation, operational improvements, or new facilities.

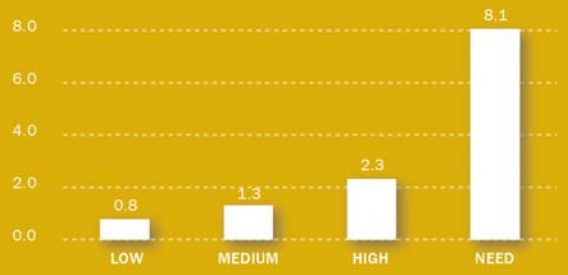
The investment scenarios focused on keeping bridges open. But the result is worsening conditions along I-95. The scenarios are able to perform only a fraction of the bridge work that should occur over the life of the ***Connections 2040*** Plan. By 2040, the high scenario estimates that more than half of the deck area on this facility will be in poor condition, compared to nearly two-thirds in the medium, and more than 70 percent in the low.

Without additional funding, I-95's condition in 2040 could be far worse than it is today. If we have not found the wherewithal to repair this facility between now and then, how will we find a way to fund it at that point when the costs are greater due to inflation, and the amount of time left to repair it is much shorter? Maintaining I-95, as currently configured, along with making all the other bridge repair needs in the region, will take concerted effort and will.

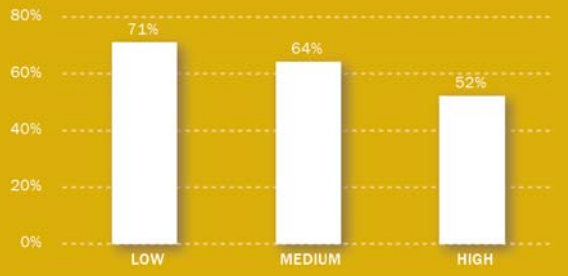
Richmond Street in Philadelphia is being widened and relocated to help handle additional traffic during I-95 viaduct reconstruction. Traffic management during major reconstruction projects increases costs, but is necessary to keep traffic moving.

Source: Pennsylvania Department of Transportation.

I-95 Deck Area Replaced or Rehabbed 2014-2040 by Scenario



Percent of I-95 Deck Area in Poor Condition in 2040 by Scenario



Source: Delaware Valley Regional Planning Commission, 2012.

State of the Transit System

The recent delivery of the Silverliner V rail cars has allowed the nearly 50-year old Silverliner IIs and IIIs to be retired. The Silverliner IVs, built between 1972 and 1974, will need to be replaced in the next decade. Only the medium and high scenarios are likely to have the funding needed to accomplish this before 2040.

Photo: Southeastern Pennsylvania Transportation Authority.

A PATCO rail vehicle undergoing reconstruction. Seventy-five of PATCO's 121 vehicles date from the opening of the line in 1969. Each car will be fully rebuilt to modern standards, while reusing the metal shell.

Photo: Port Authority Transit Corporation.

Greater Philadelphia is fortunate to have a transit network that is the envy of most other regions in the United States. Because the transit system developed along with our classic towns and older suburbs, there is supportive land use that helps to increase ridership. Our transit system provides a low-cost and environmentally friendly way to get around to nearly all corners of the region. Ridership on the Southeastern Pennsylvania Transportation Authority (SEPTA) system has grown by about 15 percent over the last decade.

SEPTA is multimodal and has service area covering the five southeastern Pennsylvania counties, and into the states of New Jersey and Delaware. New Jersey Transit (NJ Transit) operates the RiverLINE, the Atlantic City Rail Line, commuter rail service on the Northeast Corridor, commuter bus routes, and local bus service in each of the region's four New Jersey counties. The Port Authority Transit Corporation (PATCO) provides high-speed commuter rail between Lindenwold, New Jersey, and Center City Philadelphia. Pottstown Area Rapid Transit provides local bus service in Pottstown, Pennsylvania. Collectively, Greater Philadelphia's transit infrastructure is made up of the following components:[8]

[8] *Transit infrastructure refers to the region's public transit agencies only, and does not include infrastructure owned and operated by Amtrak, private freight rail carriers, or private bus companies such as Greyhound or Megabus.*

- Transit vehicles (including 470 commuter rail cars, 464 heavy-rail vehicles, 202 light-rail/trolley vehicles, 38 trackless trolleys, and 1,678 buses);
- 550 track miles (including 31 miles of elevated, 61 miles of tunnel structure, 137 interlockings connecting different tracks together, 425 bridges and 281 at-grade crossings, and 88 power substations and switching stations);
- 383 stations and bus terminals;
- 32 vehicle maintenance and storage shops; and
- Numerous signals and communications equipment.

The region's substantial backlog of infrastructure projects must be completed before it can be considered to be in a state-of-good repair. Top priorities for infrastructure **maintenance and preservation** between now and 2040 include:

- Bridge, substation, and shop roof replacement and repairs are the current critical infrastructure needs;
- New trolley and regional rail vehicle replacements will become more of a critical need over the next 10 years; and
- Major transit station renovations.

The recent procurement of the Silverliner V regional rail cars allowed the region to retire the Silverliner II and III trains. The Silverliner IV fleet is now approaching the end of its useful life and should be replaced in the next 10 years. The proposed Silverliner VI fleet would allow SEPTA to retire the aging fleet and accommodate ridership growth.

SEPTA's Center City trolley tunnel is at capacity. The vehicle fleet, built in 1981, is not compliant with the ADA and is nearing the end of its useful life. To address capacity constraints and regulatory requirements, new fleet specifications will include low-floor, articulated trolleys.

The Broad Street Line heavy-rail vehicles began service in 1982. These cars will need to be rehabilitated or replaced in the 2030s.

Preservation projects are imperative to maintaining transit service. It is also important to invest in **operational improvements** that maximize the capacity of the existing transit network. These projects will benefit existing riders, while making transit more appealing to potential riders. Track improvements on the regional rail system may allow for more frequent regional rail service. Increased parking and development at targeted stations can serve more riders on the existing network. Increasing the frequency of bus service and rider amenities at existing bus loops, stops, and transportation centers can also encourage new users. Examples of operational improvement projects include:

- Double tracking portions of the Warminster Line;
- Adding a crossover on the regional rail trunk line near Wayne Junction to allow trains in the prevailing direction to use two of the three tracks;
- Station improvements and expanded parking;
- Bus and trolley loop revitalization program; and
- Comprehensive "transit first" signal synchronization/preemption program to speed up transit service.

Achieving regional sustainability will demand that state-of-good repair and operational projects be complemented by **system expansion** to support economic growth and development. New capacity should help to focus growth in existing centers in the region.

Philadelphia's City Hall Station has not undergone a major renovation since it began service in 1928. The station suffers from water damage, corrosion, and concrete spalling. The station platforms and stairways are too narrow to deal with the crush of peak-hour use, and the station lacks elevators and other important Americans with Disabilities Act accessibility features.

Photo: Southeastern Pennsylvania Transportation Authority.

Maintaining Our Transit System

The 1930s-era Wayne Junction Substation supplies power to operate the Norristown, Chestnut Hill East, Lansdale-Doylestown, Warminster, West Trenton, and Fox Chase regional rail lines. This aging facility will be replaced in part with a competitive Transportation Investment Generating Economic Recovery (TIGER) grant from the Federal Transit Administration.

The Crum Creek Viaduct was built in 1895 and needs to be replaced in the next 10 years. Only the high funding scenario is likely to afford this project in that timeframe. Delaying the replacement until 2025, in the medium and low scenarios, increases the possibility that this bridge will need to be closed to passenger and freight rail movements before it is replaced.

Photos: Southeastern Pennsylvania Transportation Authority.

SEPTA's 2013 Capital Budget shows more than $5 billion of unmet needs. The components of the region's transit system currently in most need of critical repairs are the bridges, substations, and shop roofs. The longer these projects are delayed, the larger in scope and more expensive they become. Substations are critical because they provide the power necessary to operate the regional rail system, subway, trolley, and Norristown High Speed and Media-Sharon Hill lines. Storage and maintenance shops are critical for regular vehicle servicing and to ensure that vehicles and maintenance equipment are protected against weather.

Investment Scenarios

Key transit maintenance and preservation initiatives that will likely happen in all scenarios include:

- Doylestown Line catenary replacement;
- Chestnut Hill West Line (7) bridge replacements;
- Chestnut Hill East Line (5) bridge replacements;
- Station renovations at Exton, Race-Vine, and 5th Street;
- Norristown High Speed Line tie and signal replacements;
- 30th Street rail yard catenary and structure replacement;
- New rail shop at Midvale;
- Purchase of new commuter rail vehicles for NJ Transit on the Northeast Corridor;
- Atlantic City Rail Line: purchase of new passenger rail cars, locomotives, and rehabilitation of all stations; and
- Purchase of (2,432) 40-foot buses, (288) 45-foot buses, (155) 60-foot buses, and (38) trackless trolleys.

Low Scenario

In the low scenario, the region largely spends the next 27 years working through the existing backlog of needs. Lack of funding means many repairs happen much later than they should. Several essential bridge and substation repairs will be delayed until the late 2020s. These delays could lead to speed restrictions and/or service truncations in the meantime. Critical projects that are delayed in this scenario include:

- The Crum Creek Viaduct on the Media-Elwyn Line was constructed in 1895 and carries more than 320 freight and passenger trains per week. Failure to replace this structure in a timely manner could lead to long-term service disruptions for 1,600 daily passengers who use the Elwyn, Media, Moylan-Rose Valley, and Wallingford stations, as well as bring an end to all freight movement that occurs on this line.

- The Norristown High Speed Line Bridge over the Schuylkill River. Originally constructed in 1911, it is now badly corroded. Delaying replacement could slow or disrupt service on this line.
- City Hall Station was constructed in 1928. Narrow platforms and lack of ADA accessibility make the station difficult to use. Safety improvements, including ADA improvements such as elevators, ramps, and high-level platforms, at this and other stations are delayed.
- Delays occur on critical substation replacements, including those at Jenkintown, Lenni, Morton, Bethayres, Chestnut Hill East, Ambler, Doylestown, Hatboro, Clifton, and along the Market-Frankford Line.

Shop roofs are not replaced until the late 2020s, potentially leading to worsening fleet conditions and temporary emergency situations due to water damage. Utility vehicle purchases are also delayed, making maintenance of track and vehicle fleets difficult and more time consuming. This could lead to lower operating speeds and reduced service reliability.

The region is not able to procure all needed 3,199 replacement buses and trackless trolleys. Nor is it able to replace any rail vehicles (Silverliner VIs, trolleys, articulated trolleys, and Broad Street Line cars). As fleet age increases, passenger comfort is reduced, and the system will be less reliable as breakdowns become more common. New buses are more likely to be diesel rather than hybrid or another more fuel-efficient option. Diesel buses cost less at initial purchase, but as energy prices increase, reduced fuel efficiency could result in higher operating expenses over time. In addition, they emit higher levels of air and noise pollution. Meanwhile, congestion may increase on the roads, particularly due to bridge closures. This affects the speed of buses, which travel on the same roads as trucks and vehicles. A number of bus routes will have to be rerouted if bridges are closed, further inconveniencing transit patrons.

Medium Scenario

The medium scenario completes the existing backlog of repair needs in a more timely fashion than the low scenario. It keeps the overall backlog in 2040 at about the same level as exists now. The region is still limited in its ability to fund operational and new capacity improvements. There are delays, due to funding constraint, in the procurement of new Silverliner VI regional rail cars. This does not happen until the late 2020s, about a decade after it should. Broad Street Line vehicles are not rehabbed or replaced prior to 2040.

Bridge and substation repairs are completed within a reasonable timeframe so as not to worsen their condition and increase the scope of the repair work for the projects. This reduces the possibility of rail service disruptions in the late 2020s.

Transit System Perception

The region's transit system is a valuable regional asset. It is critical to achieving a more sustainable and economically competitive transportation system. Ridership can be increased by improving the condition of the system. A rundown, poorly maintained system will more frequently breakdown and will have a hard time attracting new riders. A well-maintained system is safe, clean, comfortable, and reliable, and is more likely to attract new riders and retain the ones it has.

Additional funding means the region is able to procure about 200 more new buses and maintain the current fleet age. This will lower operating and maintenance costs, enhance service reliability, and improve passenger comfort. Vehicle maintenance and storage shop roofs are repaired consistently, reducing the risk of vehicle and maintenance equipment damage.

City Hall Station is updated sooner than in the low scenario. Major station renovations also occur at Paoli, Ardmore, and Levittown, in addition to the 69th Street garage.

High Scenario

At this investment level, the region is able to fund all critical infrastructure needs to achieve a state-of-good repair. Procurement of all replacement vehicles (Silverliner VIs, articulated trolleys, buses, and Broad Street Line cars) occur when needed. Villanova Station also receives a major renovation. Achieving a state-of-good repair allows the region to make additional needed operational and new capacity improvements.

Why is Greater Philadelphia's Transit System in a **State of Disrepair?**

The Norristown High Speed Line Bridge over the Schuylkill River is more than 100 years old and is substantially corroded. While the high and medium scenarios envision replacing this bridge in the next five years, the low would defer its replacement to somewhere in the 2020s, risking the chance of service disruption on this line.

The Jenkintown Substation was constructed in 1930. It supplies power to the Lansdale-Doylestown, Warminster, and West Trenton regional rail lines. This is one of 15 regional substations that are past their useful life.

Photos: Southeastern Pennsylvania Transportation Authority.

When SEPTA took over the remnants of the Pennsylvania and Reading Railroads, the Philadelphia Transportation Company, the Philadelphia Suburban Transportation Company, and the Schuylkill Valley lines, much of the system was already in poor condition due to long-term disinvestment.

A number of events worked against privately run mass transit in both Greater Philadelphia and the United States during the time leading up to SEPTA's formation in 1964. First, the Great Depression led to reduced business and travel activity. Then World War II focused U.S. industrial activity on wartime needs. Finally, after the war, both consumer preference and government policy steered development to new suburban areas accessed almost exclusively by private vehicles. In the 1950s and 1960s, much of the region's transit infrastructure dating from the early part of the 20th century was reaching the end of its useful life. With ridership declining at the time, private operators chose not to reinvest in their transit operations.

Rather than let the region's transit infrastructure disappear, SEPTA was created as a public management agency. Though it has never received the funding needed to achieve a state-of-good repair, the history of SEPTA is largely based on asset management and improved operations:

- In the 1960s and 1970s, new regional rail cars were purchased;
- In the 1980s, the commuter rail tunnel in Center City Philadelphia opened, allowing the former Reading and Pennsylvania rail lines to be joined into a single rail network; and new Broad Street Line vehicles and trolley cars were procured;
- In the 1990s, Norristown High Speed Line and Market-Frankford Line vehicles were replaced;
- The 2000s saw the restoration of the Frankford and Norristown Transportation Centers, reconstruction of the Market-Frankford Line's elevated structure; and
- The recent procurement of the Silverliner V regional rail vehicles.

Additional investments in the transit system are critical to sustaining the ridership growth the region has seen in recent years.

Improving Transit Operations

Investments that improve the performance and better integrate regional transit system facilities provide benefits for residents, businesses, and visitors.

Investment Scenarios

Improvements that will likely happen in all scenarios:

- Positive train control (PTC);[9]
- Norristown High Speed Line retaining walls and embankment improvements;
- Cynwyd Line connection, signals, retaining walls, and embankment improvements;
- Route 101 and 102 signals and interlocking improvements;
- Broad Street Line and Market-Frankford Line communications systems;
- Paoli Line signal and switch improvements for safety and increased service frequency; and
- Broad Street Spur signal replacement.

The low scenario is not able to invest in needed regional rail and trolley vehicles. This leads to overcrowding on these routes starting in the early 2020s and continuing through 2040.

[9] *PTC is a technology that automatically stops a train if it detects possible train-to-train collisions, a train has shifted onto the wrong track, entered a work-zone area, or is moving too fast. This is an unfunded federal mandate on all passenger and Class I freight railroad operators in the United States, with a completion date of December, 2015.*

The medium scenario impacts include:

- Siding and station improvements for increased service frequency on the Atlantic City Rail Line.
- Silverliner VI and trolley procurements are delayed and no articulated trolleys are purchased. This means reduced service reliability and no increase in vehicle capacity, leading to overcrowding on the trolley lines through 2040, and on regional rail lines throughout the 2020s.

In the high scenario, operational improvements allow for both capacity and service frequency enhancements, including:

- Additional tracks on the Norristown, West Trenton, Warminster, and Trenton lines, creating increased reliability and additional service possibilities;
- ADA improvements to stations throughout the network, including high-level platforms on the regional rail system, and expanded transportation centers at Ardmore, Paoli, 69th Street, and Fern Rock;
- Expanded parking at key stations; and
- Restoration of the Route 23 light-rail service in Philadelphia.

Timely and additional vehicle procurements, along with the purchase of articulated trolley vehicles, helps to reduce passenger overcrowding on the trolley and regional rail lines.

Multilevel passenger trains on New Jersey Transit's Northeast Corridor dramatically increase passenger seating capacity compared to a single-level vehicle. This is an example of an operating improvement that increases system capacity at a lower cost than building new track infrastructure.

Photo: New Jersey Transit.

Building New Transit Routes

The proposed Delaware Avenue Rail Line in Philadelphia would be a catalyst for new transit-oriented development along the Delaware River in the region's core. Only in the high scenario could this project be funded.

Image: Penn Praxis and Wallace, Roberts, and Todd.

Transit New Capacity Lines by Scenario

The Federal Transit Administration's New Starts and Small Starts are competitive grant programs that provide funds for developing new, or extending, passenger rail, subway, and light-rail systems. The investment scenarios assume that any future New Starts and Small Starts grants will be more closely tied to an agency being in a state-of-good repair, in order to ensure the long-term viability of any new facility. The region needs to add new transit capacity to help meet travel needs for future population and economic growth, while making the transportation system more energy efficient.

Investment Scenarios

In the low scenario, the region is able to fund two bus rapid transit (BRT) projects: A (on the map) the South Jersey BRT from Camden and Gloucester counties to Center City, and B the US 1 BRT in Mercer and Middlesex counties. BRT uses priority bus lanes, rail-like stations, efficient boarding and alighting, and improved passenger information to speed up service.

In the medium scenario, the region can fund both BRT projects, the rail line C from Camden to Glassboro, and the reactivated D Media-Elwyn Line to Wawa.

After accounting for the cost of building the lines in the low and medium scenarios, the high scenario would have about $2 billion, plus any New Starts and Small Starts funds the region can attract. This should allow for two to four additional new capacity projects. Potential projects include:

- E extending the Norristown High Speed Line to King of Prussia;
- F extending the Lansdale Line to Pennridge;
- G extending the Paoli-Thorndale Line to Atglen;
- H new rail line along Delaware Avenue in Philadelphia;
- I extending the Broad Street Line to the Navy Yard;
- J new Cultural Connector Line in Philadelphia;
- K Roosevelt Boulevard BRT; and
- L reactivating the West Trenton Rail Line to Bridgewater, New Jersey.

Expanding Our Bike and Pedestrian Facilities

Multimodal improvements, such as new bike and pedestrian facilities, provide mobility choices. Each individual who walks or bikes instead of driving takes a vehicle off the road. This benefits drivers and other transportation system users.

The Circuit, a 750-mile interconnected multiuse trail network, comprises a component of the regional bike and pedestrian infrastructure. Currently, 250 miles of this network exist, while another 50 miles are nearing completion. These are the priority segments of the larger 1,700-mile regional trail network identified in the *Connections (2035)* Plan.

In addition, the *Connections (2035)* Plan includes funding for new bike lanes, sidewalks, streetscaping, pedestrian countdown timers on traffic signals, and other bike and pedestrian infrastructure.

Investment Scenarios

At current funding allocations, only the high scenario fully constructs the Circuit regional trail network by 2040. In addition, this scenario could complete about 80 miles of the larger regional trail network. Under the medium scenario, the Circuit would be 92 percent complete in 2040, while the low scenario would realize about 82 percent of the network.

Miles of Mixed-Use Trail Built 2014-2040 by Scenario

Source: Delaware Valley Regional Planning Commission.

Bike and pedestrian facilities benefit health, increase property values, provide recreational and commuting opportunities, and help to preserve critical open space areas.

Photo: Bicycle Coalition of Greater Philadelphia.

The Circuit: Greater Philadelphia's Regional Trail Network

Source: Delaware Valley Regional Planning Commission.

The Circuit is a planned, interconnected 750-mile mixed-use regional trail network. Only about a third of the network, as envisioned, exists currently. About 50 miles are soon to be completed, but more than 400 miles remain unfunded at this time. Completion of this network will create new opportunities for commuting, recreation, and tourism in the region. More information about The Circuit can be found at www.connectthecircuit.org.

Identify your vision for future development in the region and show us how you would invest in transportation infrastructure by taking the *Connections 2040: Choices & Voices* challenge at **www.dvrpc.org/ChoicesandVoices**

Investment Scenario Implications

As future population and employment increases, the region needs to make existing facilities more efficient and develop new roads and transit routes to meet growing demand. This is necessary both to ensure quality of life and economic competitiveness. Even in the best-case transportation investment scenario, Greater Philadelphia is still falling behind more competitive regions throughout the nation and world.

The age of the system and growing system preservation needs mean that we will have less funding for operational improvements and new facilities. The estimated cost to achieve and maintain a state-of-good repair for all roads and bridges in the region is $27 billion more than the anticipated available revenue in the high scenario. In the medium and low scenarios, road and bridge preservation needs are more than twice the anticipated revenue, before considering any operational improvement or new capacity projects.

The **high scenario** helps the region keep up with population and employment growth by funding new facilities and operational improvements. This scenario forecasts the best road and bridge conditions, though they will worsen relative to today as the system ages. Higher investment in the transportation system allows the region to attain other Plan goals, such as improving safety, reducing congestion, lessening our reliance on energy, lowering greenhouse gas emissions, and adapting to climate change. While there are still many worthwhile transportation projects that will go unfunded in the high scenario, the region will be more competitive in the global economy.

The **medium scenario** focuses on system preservation. The backlog of road and bridge needs will grow and maintenance will becomes less reliable and more costly as the system ages. The transit system remains at about the same condition as it currently is in, and limited investments in operating and new capacity enhancements are made. The age of the system increases operating expenses for both motor vehicles and transit and leads to a more reactive maintenance approach, limiting the region's ability to make strategic capital improvements in a timely manner.

In the **low scenario**, decreased funding levels will likely mean more congestion and higher transportation costs due to deteriorated pavement condition. With more than 100 bridge closures throughout the region, this scenario actually reduces road capacity. The region also faces potential long-term service disruptions of existing transit routes. Taken together, this will lead to a congested and overcrowded transportation system, along with substantial negative economic impacts, particularly as poor road conditions and travel delays increase the cost to ship goods to, from, and through the region. In the end, commerce will be slowed and the region will become less attractive to existing and new businesses.

Our Recommendations

This report is intended to facilitate regional dialogue of a collective vision for the future of Greater Philadelphia's transportation system, and how we will pay for it. This analysis will also guide the development of the *Connections 2040* Plan, particularly the financial portion in which the region will reconsider its investment priorities over the next 27 years.

More than 70 percent of the region's road funding is currently dedicated to road and bridge maintenance, but far more is needed. Reallocating additional funds to system preservation would come at the expense of operational improvements or new capacity. These two project categories have already been reduced, but are critical to serve future population and economic growth. Reallocating existing funding does not close the region's transportation funding gap. Shrinking the gap will take some combination of more efficient project delivery, reducing the size of the system, and finding new funding sources.

A Call to Action

MAP-21 sets federal funding through 2014. After that, declining fuel tax revenue and dwindling federal and state transportation trust fund balances lead to an uncertain future.

Without some new way of funding transportation, the region could be looking at the low investment scenario. In this scenario, the region's roads severely deteriorate, a number of bridges close, and transit service is reduced. This will increase congestion and personal transportation costs, while reducing safety. Even maintaining status quo funding is an unattractive option, as it delays or lacks funding for many critical projects.

Increased transportation funding provides new jobs and a high return on investment for the entire region. Residents, workers, businesses, and visitors can all benefit from enhanced economic competitiveness and improved quality of life. Greater Philadelphia will need to invest in its transportation system to secure our region's future.

Increased efficiency means adopting innovations that reduce the amount of time it takes to complete projects, or develop new design and construction methods to lower costs or extend a facility's useful life. For instance, new pavement design software can more accurately determine needed pavement depth for given traffic and weather conditions than was previously possible. This helps to minimize overdesign and reduces the use of raw materials. The region needs to continue to apply research and new technologies to maximize its limited transportation funding.

In rethinking the size of the system, the region should also begin to identify potentially redundant bridges that could be removed from the network rather than replaced. Other facilities, such as roads, may need to be "right-sized" into fewer lanes if the region is going to live within its current means.

DVRPC explored different funding options in the *Connections (2035)* Plan. Options include user fees, bonds, public-private partnerships, and other nontransportation taxes and fees. Based on household surveys, the public believes the fairest manner by which to generate new revenue, without burdening future generations with debt or forcing nonusers to pay, is through direct user fees or increased public-private partnerships. Such fees could include increased tolling, fuel taxes, vehicle-mile-traveled fees, parking taxes, transit fares, or title and registration fees.

Federal and state funding levels have been relatively stagnant, and any additional revenues will most likely have to come from local or regional sources. Greater Philadelphia currently rates very low in terms of regionally generated funding for its transportation system compared to peer regions in the United States. Many regions across the country are investing in transportation through voter referendums on additional sales tax or other funding measures, or instituting tolls. The region should work to build consensus on a way to fund regional transportation priorities, and work with the state and local governments on various options.

The Delaware Valley Regional Planning Commission is dedicated to uniting the region's elected officials, planning professionals, and the public with a common vision of making a great region even greater. Shaping the way we live, work, and play, DVRPC builds consensus on improving transportation, promoting smart growth, protecting the environment, and enhancing the economy. We serve a diverse region of nine counties: Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer in New Jersey. DVRPC is the federally designated Metropolitan Planning Organization for the Greater Philadelphia Region — leading the way to a better future.

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

190 North Independence Mall West, 8th Floor

Philadelphia, PA 19106

Telephone 215.592.1800

Fax 215.592.9125

www.dvrpc.org

October 2012 | Publication Number: 13004

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 (www.dvrpc.org) may be translated into multiple languages. Publications and other public documents can be made available in alternative languages and formats, if requested. For more information, please call (215) 238-2871.