

**Building Virginia's Future:**

# **The Economic Impacts of a \$1 Billion Annual Transportation Capital Investment**

- **Jobs**
- **Economic Output**
- **State Tax Revenues**

**December 2010**

## **About the ARTBA Transportation Development Foundation**

This report was prepared for the American Road & Transportation Builders Association Transportation Development Foundation (ARTBA-TDF) by a team led by ARTBA Vice President of Policy & Senior Economist Alison Premo Black. The Foundation was established in 1985 as a 501(c)3 tax-exempt entity to support research, education and public awareness programs relating to transportation development in the United States.

The Foundation supports a wide array of programs and activities including: the National Work Zone Safety Information Clearinghouse; the Highway Workers Memorial Scholarship Program; the Transportation Builder Institute, which offers executive education and safety training; economic and research reports; the permanent Transportation Exhibition at the Smithsonian's National Museum of American History and annual awards programs recognizing best practices, innovation, community service and environmental stewardship.

Building Virginia's Future: The Economic Impacts of a \$1 Billion Annual Transportation Capital Investment

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# The Economic Impacts of a \$1 Billion Annual Transportation Construction Investment

## Executive Summary

This report examines how public investments in Virginia's transportation infrastructure stimulate business activity and government revenues throughout the Commonwealth. This study examines the impact of an increase of \$1 billion annually in additional ongoing transportation construction work and capital outlays to the current baseline of highway and bridge work in Virginia.

The results show specifically that a sustained \$1 billion annual increase will:

- ❖ Create and sustain an additional 18,695 new jobs throughout the state's economy, with a total annual payroll of \$720.4 million.
- ❖ Reduce unemployment by 0.5 percent.<sup>1</sup>
- ❖ Boost the state's total economic output by \$2.45 billion to \$399.48 billion.
- ❖ Generate and sustain a total of \$162 million in new state tax revenues, including \$118.7 million state sales tax, \$42.3 million in state income tax revenue and \$1.6 million in state payroll tax collections.<sup>2</sup>
- ❖ Increase output in Virginia's manufacturing (\$265.5 million increase in output) and real estate (\$148.3 million) sectors, among others.<sup>3</sup>

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<sup>1</sup> This is based on the unemployment rate in August 2010, which was seven percent. If an additional 18,695 Virginians were working at that time the unemployment rate would be 6.5 percent.

<sup>2</sup> State payroll tax is the unemployment insurance tax levied by the state.

<sup>3</sup> The entire economy is impacted by transportation construction investment through direct, indirect and induced effects. Economic activity is generated not only by the construction and purchases of materials related to specific construction projects, but also by the goods and services those new employees will be buying from other sectors of the economy. For example, a new employee on a construction site will use part of their earnings to purchase some goods that are manufactured in Virginia, hence increasing demand and output in the manufacturing sector. See the methodology for a more detailed explanation.

- ❖ Add new jobs in the retail sector (1,918 new jobs); manufacturing sector (1,051 new jobs) and accommodation and food services industries (1,002 new jobs), among others.

<b>Economic Impact of \$1 Billion Transportation Investment in Virginia</b>			
	Current Value	Impact of \$1 billion investment	New Value
Total Output	\$397.03 billion	\$2.45 billion	\$399.48 billion
Earnings	\$138.9 billion	\$720.4 million	\$139.6 billion
Employment	3,184,234 jobs	18,695 jobs	3,202,929 jobs
Value Added		\$1.27 billion	
State Payroll Tax	\$913.2 million	\$1.6 million	\$914.8 million
Federal Payroll Tax	\$30.37 billion	\$53.7 million	\$30.43 billion
State Income Tax	\$10.1 billion	\$42.3 million	\$10.14 billion
State Sales Tax	\$6.09 billion	\$118.7 million	\$6.21 billion

Source: U.S. Bureau of Economic Analysis and U.S. Census Bureau RIMS, County Business Patterns, Government Census

<b>Economic Impact of \$1 Billion Transportation Investment in Virginia</b>		
Industry	Additional Industry Output (in millions)	Additional Jobs Supported/ Created
Mining	\$87.83	350
Construction	\$1,007.60	8,349
Manufacturing	\$265.50	1,051
Wholesale trade	\$71.70	360
Retail trade	\$135.60	1,918
Transportation and warehousing	\$62.00	442
Finance and insurance	\$88.10	348
Real estate and rental and leasing	\$148.30	344
Professional, scientific, and technical services	\$123.10	904
Accommodation and food services	\$43.90	1,003
<b>Major Industries &amp; Services</b>	<b>\$2,033.63</b>	<b>15,069</b>
Other Indirect & Miscellaneous Services	\$340.00	3,312
<b>Total Industry Impact*</b>	<b>\$2,373.63</b>	<b>18,381</b>

\* Does not include impact on Government output

This report provides:

- ❖ A concise, current economic profile of the Virginia transportation construction industry.
- ❖ An economic “snapshot” of key business sectors in the Commonwealth and how they would be impacted by a sustained \$1 billion increase in annual state transportation construction investment.

The results show the unique and synergistic nature of transportation capital investments—how they trigger immediate economic activity that creates and sustains jobs and tax revenues, yet yield long-lived capital assets that facilitate economic activity for many decades to come by providing access to jobs, services, materials and markets. Transportation capital investments also improve mobility, help reduce congestion and increase safety — all factors that will help improve the quality of life in Virginia for today and years to come.

Most importantly, the results strongly suggest that such an investment should be a fundamental component of any plan to grow the state’s economy, recover from the economic downturn and boost its future competitiveness in regional, national and international markets.

# Virginia's Transportation Construction Industry

The firms and public agencies that design, build, maintain and manage the Commonwealth of Virginia's transportation infrastructure network—together with those who manufacture and produce the equipment, materials, supplies and services necessary for their work—comprise the Virginia transportation construction industry. Its impacts on the state's economy are enormous:

- ❖ **Annual Output Value**—The annual value<sup>4</sup> of capital outlays by Virginia on highways and bridges is approximately \$1.5 billion. This represents the value of work completed during the year on highway and bridge projects, as reported to the Federal Highway Administration (FHWA) and the U.S. Census Bureau, and does not include routine maintenance, which is an additional \$1 billion in spending. Capital outlays are not a measure of contract awards, but rather the *sustained level* of ongoing work. This is the value of work during the year, regardless of when a project was awarded or when work began. To put this amount in perspective, this is larger than the annual output of Virginia's entire air transportation industry (\$1.48 billion), farm production (\$1.48 billion), paper manufacturing (\$1.2 billion), and warehousing and storage industry (\$1 billion), among others. It is just below output levels for Virginia's computer and electronic products manufacturing (\$1.6 billion) and machinery manufacturing (\$1.7 billion).
- ❖ **Annual Contribution to State GDP**—As the money invested in transportation construction industry employment and purchases for the \$1.5 billion in highway & bridge capital outlays moves through the Commonwealth's economy, it generates more than \$3.4 billion in total annual economic activity for the state—the equivalent of just under 1 percent of the Virginia's Gross Domestic Product (GDP).

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<sup>4</sup> Capital outlay and maintenance information is reported annually to FHWA and is published in the Highway Statistics series. It includes work on all state administered highways. The estimate of \$1.2 billion is an average of reported capital outlays in 2007 and 2008, the latest year information was available. Capital outlays include revenues from Virginia state sources as well as federal aid funds. An additional \$300 million was spent on highway capital outlays by local governments, according to the U.S. Census Bureau. The additional \$1 billion in maintenance expenditures are classified by FHWA as projects that do not extend the serviceable life of a road, and are therefore not included in the total contribution to Virginia's GDP.

- ❖ **Creating & Sustaining Virginian Jobs**—All levels of transportation construction in Virginia supports the equivalent 94,901 full-time jobs. This includes 47,277 direct jobs in transportation construction and related-activities and 47,625 jobs induced, or sustained, by transportation construction industry employee, firm and agency spending throughout the state’s economy.

To put the industry’s impact on Virginia’s employment in context, it directly provides more Virginia jobs than direct employment by the state’s real estate firms (43,026), automobile dealers (39,706), department stores (34,474), food manufacturers (29,453), elementary and secondary schools (20,072), machinery manufacturing (17,452), mining, quarrying, and oil and gas extractor firms (10,671) and beverage and tobacco product manufacturing (7,790), among others.

- **Contributions to Virginia’s Payroll & Taxes**—Transportation construction activity in Virginia generates \$4 billion annually in direct and induced wages. These workers contribute an estimated \$9 million each year in state payroll tax revenue and an additional \$303.2 million in federal payroll taxes.

But that is only a small part of the picture. Without the infrastructure built, maintained and managed by the Virginia’s transportation construction industry, *virtually all of the major industry sectors that comprise the Virginia economy—and the American jobs they sustain—would not exist or could not function.*

**Dependent Employment**—The simple fact is that nearly 2 million Virginia jobs in just tourism, manufacturing, transportation and warehousing, agriculture and forestry, mining, retailing and wholesaling alone *are fully dependent on the work done by the state’s transportation construction industry.* These dependent industries provide a total payroll in excess of \$34.2 billion and their employees contribute more than \$5.2 billion annually in state and federal payroll taxes.



## Scope of the Virginia Transportation Construction Industry

The U.S. Census Bureau maintains a national database of all business establishments in the United States, organized under the North American Industry Classification System (NAICS). The NAICS is used by government and business to classify individual businesses by the type of economic activity they conduct. Each firm selects its own NAICS designation, choosing a six-digit code that allows the firm to be correctly classified by specialty type under an umbrella of 20 major industry sector categories. Through this rich database, we are able to quantify the number of firms, down to the county level, that conduct certain business activities within a state.

According to U.S. Census Bureau data, there are more than 37,000 individual business establishments and public agencies directly involved, at least partially, in transportation infrastructure design, construction or management activities in the Commonwealth of Virginia. They include:

- ❖ **579 highway and bridge contractor firms** that employ 13,978 men and women full-time
- ❖ **24,687 general construction firms** whose *transportation work* supports 8,705 full-time jobs<sup>5</sup>
- ❖ **8,829 design and engineering firms** whose *transportation work* supports 1,737 full-time jobs
- ❖ **25 asphalt manufacturing firms** whose *transportation project sales* support 117 full-time jobs
- ❖ **146 aggregate and materials business establishments** whose *transportation market sales* support 694 full-time jobs

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<sup>5</sup> Those 24,687 firms actually employ over 219,000 workers in Virginia, but for this study we have pulled out the estimated jobs related to transportation construction, based on the company's transportation construction work. We have used a similar process for the other industries in this list – we have taken the average amount of output used for highway and bridge construction, available from the U.S. Census Bureau, and estimated the number of jobs in the industry supported by transportation construction investment.

- ❖ **247 cement and concrete business establishments** whose *transportation project sales* support 583 full-time jobs
  
- ❖ **2,594 construction equipment manufacturing, sales, rental and maintenance establishments** whose *transportation market sales* support 248 full-time jobs; and
  
- ❖ **25 traffic safety and control device manufacturers or distributors** whose *transportation market sales* support 26 full-time jobs.<sup>6</sup>
  
- ❖ **17,400 Virginians are employed full-time by federal, state or local transportation agencies**, including transit workers, county and state engineers and DOT employees.

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<sup>6</sup> This number may appear low, but that is because the industry classification that includes traffic safety and control devices also includes a large number of other businesses that manufacture all types of communications equipment. For that reason, the percent of transportation work for this industry, overall, is fairly low. However, if there is a manufacturing firm in Virginia that solely works on traffic control and safety device manufacturing, that employment number could be higher. We don't have enough specific information to make that determination, so what you have is a baseline average.

## **The Return on Investment That Keeps Recurring**

One of the most attractive benefits of major public investments in transportation infrastructure is they create tangible capital assets that are long-lived. In addition to creating jobs and generating tax revenues throughout the economy during the construction cycle, these investments provide infrastructure improvements that foster and facilitate continuing economic growth over many years beyond the initial investment.

The greatest long-term economic returns can often be found in strategic investments that facilitate business activity. Infrastructure investments aimed at reducing traffic congestion or providing faster point-to-point travel, for example, can increase productivity by reducing travel time. In addition, transportation investment helps improve mobility and enhance safety.

A 2004 study by Cambridge Systematics and the Battelle Memorial Institute identified 12 major highway interchange traffic bottlenecks in Virginia that were causing 4 million hours of delay annually for trucks in just the Richmond, Norfolk and Virginia Beach and Northern Virginia areas alone. Mitigating or eliminating those bottlenecks would save billions of dollars in lost productivity and motor fuel that would benefit the Commonwealth. Such work would also significantly reduce unnecessary motor vehicle emissions.

Investments in multi-modal new capacity for “Critical Commerce Corridors” like “truck only” lanes, intermodal connectors and freight transfer facilities would provide long-term economic benefits for many areas of the Commonwealth.

The Federal Highway Administration’s National Bridge Inventory shows 3,483 bridges in Virginia are considered deficient and need major rehabilitation, widening or replacement. The state reports that it would cost an estimated \$6.9 billion to make needed repairs to 5,313 bridge structures in the state. The imposition of a weight restrictions, closure, or collapse of a single bridge also all have productivity and cost impacts for businesses and the public. Avoiding those costs by preserving existing assets is well worth the investment.

What would an additional \$1 billion per year investment in transportation infrastructure make possible in Virginia? Consider the possibilities.

While there is no single answer to the question, “How much does it cost to build a mile of road?” some states, like Florida, have developed cost models to guide planning for their highway construction program. These models provide a “ballpark figure” for various kinds of highway improvements. Here are some examples:

- ❖ Construct a new 2-lane undivided road: approximately \$2-\$3 million per mile in rural areas; \$4-\$5 million in urban areas
- ❖ Construct a new 4-lane highway: approximately \$4-\$6 million per mile in rural and suburban areas; \$8-\$10 million per mile in urban areas
- ❖ Construct a new 6-lane Interstate highway: approximately \$7 million per mile in rural areas; \$12 million or more per mile in urban areas
- ❖ Mill and resurface a 4-lane road: approximately \$1.25 million per mile
- ❖ Expand an Interstate Highway from 4 lanes to 6 lanes: \$4 million per mile.

## **Economic Benefits Well Documented**

The economic benefits of highway investment to private sector productivity and economic activity are well documented in the economics literature. There are numerous studies that have found a positive correlation between transportation infrastructure investment and economic development. Although exact impact of the investment has varied among studies, the fact that there is a positive relationship is widely accepted.<sup>7</sup>

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<sup>7</sup> Economic studies have found output elasticities ranging from as high as 0.56 (Aschauer 1989) to a low of 0.04 (Garcia-Mila and McGuire 1992). This means that a one percent increase in highway investment would result in between 0.04 to 0.56 percent increase in output. Most of this variation is because studies have a different focus- looking at different types of investment measures and output at either the national, state or county level.

In addition to the direct employment supported by highway construction activities, as described in this report, there are also direct user benefits, such as time savings and safety improvements, as well as gains in industry productivity.<sup>8</sup>

A study by Dr. Alicia Munnell of the Federal Reserve Bank of Boston concluded that states that invested more in infrastructure tended to have greater output, more private investment and more employment growth.<sup>9</sup> Her work found that a one percent increase in public capital would raise national output by 0.15 percent<sup>10</sup>. She further notes that the major impact of public capital output is from investment in highways and water and sewer systems. Other public capital investments, such as school buildings and hospitals, had virtually no measureable impact on private production.<sup>11</sup> Munnell also concludes that public capital and infrastructure investment have a significant positive impact on a state's private employment growth and private sector output.

Additional studies have found that transportation infrastructure investments have an impact on the attractiveness of local communities, which helps determine local economic activity and land values. In general, most studies find that locations close to large transportation infrastructure investment have higher land values.<sup>12</sup>

M. Ishaq Nadiri of New York University and the National Bureau of Economic Research and Theofanis P. Mamuneas of New York University find significant cost structure and productivity performance impacts on the U.S. manufacturing industry as a result of highway investment. Their work shows that the rate of return on highway investment can be greater than private investment.

Some major findings include<sup>13</sup>:

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<sup>8</sup> U.S. Department of Transportation, *Productivity and the Highway Network: A Look at the Economic Benefits to Industry from Investment in the Highway Network*.

<sup>9</sup> Munnell, Alicia, *How Does Public Infrastructure Affect Regional Economic Performance*, New England Economic Review, September/October 1990

<sup>10</sup> Munnell's elasticity for private capital is 0.31, so that a one percent increase in private capital would raise national output by 0.31 percent. This is in line with other studies of returns from private capital investment.

<sup>11</sup> Munnell says she is not implying that government-provided education and health services have no effect on productivity, but rather "the stock of buildings ... may not be the best indicator of the quality of education services; teachers' salaries, for example, might be a better measure."

<sup>12</sup> A synopsis of these studies are available in the Transportation Research Board's *Expanding Metropolitan Highways: Implications for Air Quality and Energy Use – Special Report 245*, 1995

<sup>13</sup> Summary provided by U.S. Department of Transportation, *Productivity and the Highway Network: A Look at the Economic Benefits to Industry from Investment in the Highway Network*.

- ❖ Over the period 1950 to 1989, U.S. industries realized production cost savings averaging 18 cents annually for each dollar invested in the road system.
- ❖ Investments in non-local roads yield even higher production cost savings – estimated at 24 cents for each dollar of investment.
- ❖ Although the impact of highway investment on productivity has declined since the early 1970s and the initial construction of the Interstate, evidence suggests that highway infrastructure investments more than pay for themselves in terms of industry cost savings. This means that the cost of investment in transportation infrastructure is more than paid for by the subsequent savings to the general business community from enhanced mobility, safety and product delivery.
- ❖ The highway network’s contribution to economic productivity growth was between 7 and 8 percent over the time period 1980 to 1989.
- ❖ The net social rate of return on investment in the non-local road system during the 1980s was 16 percent, and the rate of return for the entire road network was 10 percent.<sup>14</sup>
- ❖ This rate of return was significantly higher than the prevailing rate of return on private capital and the long-term interest rate during this time period.
- ❖ The higher return to highway capital is due to its network feature, since the benefits are shared by all industries.
- ❖ The transportation construction industry in Virginia not only provides the infrastructure to keep the state moving, it also serves as an engine of economic growth and job creation for the entire state economy.

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<sup>14</sup> The net social rate of return is an estimate of the benefits to private industries derived from the shared use of public highways.

<b>Economic Impact of \$1 Billion Transportation Investment in Virginia</b>			
	<b>Current Value</b>	<b>Impact of \$1 billion investment</b>	<b>New Value</b>
Total Output	\$397.03 billion	\$2.45 billion	\$399.48 billion
Earnings	\$138.9 billion	\$720.4 million	\$139.6 billion
Employment	3,184,234 jobs	18,695 jobs	3,202,929 jobs
Value Added		\$1.27 billion	
State Payroll Tax	\$913.2 million	\$1.6 million	\$914.8 million
Federal Payroll Tax			
Tax	\$30.37 billion	\$53.7 million	\$30.43 billion
State Income Tax	\$10.1 billion	\$42.3 million	\$10.14 billion
State Sales Tax	\$6.09 billion	\$118.7 million	\$6.21 billion

Source: U.S. Bureau of Economic Analysis and U.S. Census Bureau RIMS, County Business Patterns, Government Census

Under this model, total output in Virginia would increase by \$2.45 billion as a result of an additional \$1 billion highway and bridge construction investment. Output by the Virginia manufacturing industry would increase by over \$265 million. Other industries that would increase output by over \$100 million include real estate (\$148.3 million), retail trade (\$135.6 million) and professional and technical services (\$123.1 million).

An estimated 18,695 jobs would be created throughout the Virginia economy with earnings of over \$720.4 million, including approximately 1,918 jobs in retail trade, 1,051 jobs in manufacturing and 1,032 jobs in health care services. To put this in perspective, the unemployment rate in Virginia in August 2010 was 7 percent. If an additional 18,695 Virginians were working during that time, the unemployment rate would have been 6.5 percent.

The Virginia government would receive an estimated \$162.6 million in new tax revenues from an additional \$1 billion in highway and street construction investment. This includes an estimated \$1.6 million in state payroll taxes, \$42.3 million in income tax revenue and \$118.7 million from the state sales tax.

# **The Economic Impacts of a \$1 Billion Annual Investment in Transportation Construction on Major Industry Sectors**



## *The Impacts of a \$1 Billion Increase in Transportation Construction on...*

# Mining

### *Sector Overview*

Mining output in Virginia totaled \$2.17 billion in 2008, according to the U.S. Bureau of Economic Analysis. This accounts for 0.5% of the state's \$397 billion gross state product. This sector includes 540 establishments and sole proprietorships with an existing payroll valued at \$550.18 million. These businesses contribute an estimated \$43.35 million in state and federal payroll taxes. Individuals working in this sector earn an average of \$52,488 each year. This industry contributes an estimated \$28.94 million to Virginia's state income tax collections.

The Mining, Quarrying, and Oil and Gas Extraction sector comprises establishments that extract naturally occurring mineral solids, such as coal and ores; liquid minerals, such as crude petroleum; and gases, such as natural gas. Some of the activities in this area most impacted by transportation construction investment include businesses related to stone mining and quarrying and construction sand and gravel mining. Many of these firms supply the aggregate materials used for highway construction.

<b>Mining</b>	<b>Current Value</b>	<b>Percentage of State Total</b>
<b>Industry Output</b>	\$2.17 billion	0.5%
<b>Establishments</b>	540 businesses	0.1%
<b>Employment</b>	10,482 people	0.3%
<b>Average Annual Salary</b>	\$52,488 dollars	
<b>Total Payroll</b>	\$550.18 million	0.3%
<b>State Payroll Tax Contribution</b>	\$1.27 million	0.3%
<b>Federal Tax Contribution</b>	\$42.09 million	0.3%
<b>State Income Tax Contribution</b>	\$28.94 million	0.3%
<b>State Sales Tax Contribution</b>	\$108.55 million	0.7%

### *Impact of Increased Highway & Bridge Spending On This Sector*

A \$1 billion increase in highway and bridge construction spending would have a positive impact on the output, employment and value added for this industry. Total employment would increase by 350 jobs. Total industry payroll would increase by \$20.49 million, reaching approximately \$570.67 million. Output would increase by \$87.83 million and value added, the gross output of the sector less the inputs, would increase by an estimated \$46.84 million.

<b>Mining</b>	<b>Current Value</b>	<b>Impact of \$1 billion increase in highway and bridge spending</b>	<b>Estimated New Industry Total</b>
<b>Total output</b>	\$2.17 billion	\$87.83 million	\$2.26 billion
<b>Employment</b>	10,482 people	350 people	10,832 people
<b>Payroll</b>	\$550.18 million	\$20.49 million	\$570.67 million
<b>State Payroll Tax Contribution</b>	\$1.27 million	\$47.14 thousand	\$1.31 million
<b>Federal Tax Contribution</b>	\$42.09 million	\$1.57 million	\$43.66 million
<b>State Income Tax Contribution</b>	\$28.94 million	\$967.18 thousand	\$29.90 million
<b>State Sales Tax Contribution</b>	\$108.55 million	\$4.39 million	\$112.94 million

## *The Impacts of a \$1 Billion Increase in Transportation Construction on...*

# Construction

## Sector Overview

Construction output in Virginia totaled \$16.38 billion in 2008, according to the U.S. Bureau of Economic Analysis. This accounts for 4.1% of the state's \$397 billion gross state product. This sector includes 90,146 establishments and sole proprietorships with an existing payroll valued at \$14.28 billion. These businesses contribute an estimated \$1.13 billion in state and federal payroll taxes. Individuals working in this sector earn an average of \$48,739 each year. This industry contributes an estimated \$745.63 million to Virginia's state income tax collections.

The construction sector comprises establishments primarily engaged in the construction of buildings or engineering projects. It includes the businesses classified as highway and bridge contractors, which are companies where the primary source of business is transportation construction. It also includes business establishments that maybe classified as general contractors, but who do perform some types of transportation investment. There are also companies in this category that perform site preparation work and utility system construction.

Construction	Current Value	Virginia Ranking (of 19)	Percentage of State Total
<b>Industry Output</b>	\$16.38 billion	9	4.1%
<b>Establishments</b>	90,146 businesses	2	14.3%
<b>Employment</b>	292,978 people	5	8.1%
<b>Average Annual Salary</b>	\$48,739 dollars	9	
<b>Total Payroll</b>	\$14.28 billion	3	8.8%
<b>State Payroll Tax Contribution</b>	\$32.84 million	3	8.8%
<b>Federal Tax Contribution</b>	\$1.09 billion	3	8.8%
<b>State Income Tax Contribution</b>	\$745.63 million	3	8.9%
<b>State Sales Tax Contribution</b>	\$819.20 million	9	5.1%

## Impact of Increased Highway & Bridge Spending On This Sector

A \$1 billion increase in highway and bridge construction spending would have a positive impact on the output, employment and value added for this industry. Total employment would increase by 8,349 jobs. Total industry payroll would increase by \$343.60 million, reaching approximately \$14.62 billion. Output would increase by \$1.01 billion and value added, the gross output of the sector less the inputs, would increase by an estimated \$452.30 million.

Construction	Current Value	Impact of \$1 billion increase in highway and bridge spending	Estimated New Industry Total
<b>Total output</b>	\$16.38 billion	\$1.01 billion	\$17.39 billion
<b>Employment</b>	292,978 people	8,349 people	301,327 people
<b>Payroll</b>	\$14.28 billion	\$343.60 million	\$14.62 billion
<b>State Payroll Tax Contribution</b>	\$32.84 million	\$790.28 thousand	\$33.63 million
<b>Federal Tax Contribution</b>	\$1.09 billion	\$26.29 million	\$1.12 billion
<b>State Income Tax Contribution</b>	\$745.63 million	\$21.25 million	\$766.88 million
<b>State Sales Tax Contribution</b>	\$819.20 million	\$50.38 million	\$869.58 million

*The Impacts of a \$1 Billion Increase in Transportation Construction on...*

# Manufacturing

## Sector Overview

Manufacturing output in Virginia totaled \$34.10 billion in 2008, according to the U.S. Bureau of Economic Analysis. This accounts for 8.6% of the state's \$397 billion gross state product. This sector includes 5,743 establishments and sole proprietorships with an existing payroll valued at \$12.88 billion. These businesses contribute an estimated \$1.01 billion in state and federal payroll taxes. Individuals working in this sector earn an average of \$46,180 each year. This industry contributes an estimated \$668.53 million to Virginia's state income tax collections.

The Manufacturing sector comprises establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. Some of the companies directly related to transportation construction include: asphalt paving products manufacturing; petroleum products manufacturing, such as gas and diesel; cement and ready-mix concrete manufacturing; concrete pipe manufacturing and steel manufacturing.

Manufacturing	Current Value	Percentage of State Total
<b>Industry Output</b>	\$34.10 billion	8.6%
<b>Establishments</b>	5,743 businesses	0.9%
<b>Employment</b>	278,806 people	7.7%
<b>Average Annual Salary</b>	\$46,180 dollars	
<b>Total Payroll</b>	\$12.88 billion	7.9%
<b>State Payroll Tax Contribution</b>	\$29.61 million	7.9%
<b>Federal Tax Contribution</b>	\$984.96 million	7.9%
<b>State Income Tax Contribution</b>	\$668.53 million	8.0%
<b>State Sales Tax Contribution</b>	\$1.70 billion	10.5%

## Impact of Increased Highway & Bridge Spending On This Sector

A \$1 billion increase in highway and bridge construction spending would have a positive impact on the output, employment and value added for this industry. Total employment would increase by 1,051 jobs. Total industry payroll would increase by \$46.10 million, reaching approximately \$12.92 billion. Output would increase by \$265.50 million and value added, the gross output of the sector less the inputs, would increase by an estimated \$94.20 million.

Manufacturing	Current Value	Impact of \$1 billion increase in highway and bridge spending	Estimated New Industry Total
<b>Total output</b>	\$34.10 billion	\$265.50 million	\$34.36 billion
<b>Employment</b>	278,806 people	1,051 people	279,857 people
<b>Payroll</b>	\$12.88 billion	\$46.10 million	\$12.92 billion
<b>State Payroll Tax Contribution</b>	\$29.61 million	\$106.03 thousand	\$29.72 million
<b>Federal Tax Contribution</b>	\$984.96 million	\$3.53 million	\$988.48 million
<b>State Income Tax Contribution</b>	\$668.53 million	\$2.52 million	\$671.06 million
<b>State Sales Tax Contribution</b>	\$1.70 billion	\$13.28 million	\$1.72 billion

## The Impacts of a \$1 Billion Increase in Transportation Construction on...

# Wholesale Trade

## Sector Overview

Wholesale trade output in Virginia totaled \$16.53 billion in 2008, according to the U.S. Bureau of Economic Analysis. This accounts for 4.2% of the state's \$397 billion gross state product. This sector includes 14,777 establishments and sole proprietorships with an existing payroll valued at \$6.86 billion. These businesses contribute an estimated \$540.90 million in state and federal payroll taxes. Individuals working in this sector earn an average of \$55,721 each year. This industry contributes an estimated \$362.97 million to Virginia's state income tax collections.

The Wholesale Trade sector comprises establishments engaged in wholesaling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise. Some examples of companies in this industry include wholesalers for such goods as motor vehicles, furniture, lumber or commercial equipment.

Wholesale Trade	Current Value	Percentage of State Total
<b>Industry Output</b>	\$16.53 billion	4.2%
<b>Establishments</b>	14,777 businesses	2.3%
<b>Employment</b>	123,191 people	3.4%
<b>Average Annual Salary</b>	\$55,721 dollars	
<b>Total Payroll</b>	\$6.86 billion	4.2%
<b>State Payroll Tax Contribution</b>	\$15.79 million	4.2%
<b>Federal Tax Contribution</b>	\$525.12 million	4.2%
<b>State Income Tax Contribution</b>	\$362.97 million	4.3%
<b>State Sales Tax Contribution</b>	\$826.55 million	5.1%

### ***Impact of Increased Highway & Bridge Spending On This Sector***

A \$1 billion increase in highway and bridge construction spending would have a positive impact on the output, employment and value added for this industry. Total employment would increase by 360 jobs. Total industry payroll would increase by \$21.40 million, reaching approximately \$6.89 billion. Output would increase by \$71.70 million and value added, the gross output of the sector less the inputs, would increase by an estimated \$46.00 million.

Wholesale Trade	Current Value	Impact of \$1 billion increase in highway and bridge spending	Estimated New Industry Total
<b>Total output</b>	\$16.53 billion	\$71.70 million	\$16.60 billion
<b>Employment</b>	123,191 people	360 people	123,551 people
<b>Payroll</b>	\$6.86 billion	\$21.40 million	\$6.89 billion
<b>State Payroll Tax Contribution</b>	\$15.79 million	\$49.22 thousand	\$15.84 million
<b>Federal Tax Contribution</b>	\$525.12 million	\$1.64 million	\$526.75 million
<b>State Income Tax Contribution</b>	\$362.97 million	\$1.06 million	\$364.04 million
<b>State Sales Tax Contribution</b>	\$826.55 million	\$3.59 million	\$830.14 million

### ***The Impacts of a \$1 Billion Increase in Transportation Construction on...***

## **Retail Trade**

### ***Sector Overview***

Retail trade output in Virginia totaled \$22.72 billion in 2008, according to the U.S. Bureau of Economic Analysis. This accounts for 5.7% of the state's \$397 billion gross state product. This sector includes

29,382 establishments and sole proprietorships with an existing payroll valued at \$10.76 billion. These businesses contribute an estimated \$847.81 million in state and federal payroll taxes. Individuals working in this sector earn an average of \$24,430 each year. This industry contributes an estimated \$505.24 million to Virginia's state income tax collections.

The Retail Trade sector comprises establishments engaged in retailing merchandise, generally without transformation, and rendering services incidental to the sale of merchandise. Examples of a retail trade establishment include gasoline stations, clothing stores, automobile dealers, office supply stores or department stores. Output in this sector increases as a result of transportation investment because the new employees in the construction sector are purchasing more goods at retail stores.

Retail Trade	Current Value	Percentage of State Total
<b>Industry Output</b>	\$22.72 billion	5.7%
<b>Establishments</b>	29,382 businesses	4.7%
<b>Employment</b>	440,405 people	12.1%
<b>Average Annual Salary</b>	\$24,430 dollars	
<b>Total Payroll</b>	\$10.76 billion	6.6%
<b>State Payroll Tax Contribution</b>	\$24.75 million	6.6%
<b>Federal Tax Contribution</b>	\$823.07 million	6.6%
<b>State Income Tax Contribution</b>	\$505.24 million	6.0%
<b>State Sales Tax Contribution</b>	\$1.14 billion	7.0%

### ***Impact of Increased Highway & Bridge Spending On This Sector***

A \$1 billion increase in highway and bridge construction spending would have a positive impact on the output, employment and value added for this industry. Total employment would increase by 1,918 jobs. Total industry payroll would increase by \$42.60 million, reaching approximately \$10.80 billion. Output would increase by \$135.60 million and value added, the gross output of the sector less the inputs, would increase by an estimated \$80.20 million.

Retail Trade	Current Value	Impact of \$1 billion increase in highway and bridge spending	Estimated New Industry Total
<b>Total output</b>	\$22.72 billion	\$135.60 million	\$22.85 billion
<b>Employment</b>	440,405 people	1,918 people	442,323 people
<b>Payroll</b>	\$10.76 billion	\$42.60 million	\$10.80 billion
<b>State Payroll Tax Contribution</b>	\$24.75 million	\$97.98 thousand	\$24.84 million
<b>Federal Tax Contribution</b>	\$823.07 million	\$3.26 million	\$826.32 million
<b>State Income Tax Contribution</b>	\$505.24 million	\$2.20 million	\$507.44 million
<b>State Sales Tax Contribution</b>	\$1.14 billion	\$6.78 million	\$1.14 billion

### ***The Impacts of a \$1 Billion Increase in Transportation Construction on...***

# **Transportation and Warehousing**

## ***Sector Overview***

Transportation and warehousing output in Virginia totaled \$9.53 billion in 2008, according to the U.S. Bureau of Economic Analysis. This accounts for 2.4% of the state's \$397 billion gross state product. This sector includes 5,359 establishments and sole proprietorships with an existing payroll valued at \$4.44 billion. These businesses contribute an estimated \$349.54 million in state and federal payroll

taxes. Individuals working in this sector earn an average of \$43,327 each year. This industry contributes an estimated \$228.70 million to Virginia's state income tax collections.

The Transportation and Warehousing sector includes industries providing transportation of passengers and cargo, warehousing and storage for goods, scenic and sightseeing transportation, and support activities related to modes of transportation. Businesses in this sector include all types of freight and passenger air transportation, line-haul and short line railroads, deep sea, coastal and great lakes freight and passenger transportation, truck transportation, pipelines and urban transit systems.

<b>Transportation and Warehousing</b>	<b>Current Value</b>	<b>Percentage of State Total</b>
<b>Industry Output</b>	\$9.53 billion	2.4%
<b>Establishments</b>	5,359 businesses	0.9%
<b>Employment</b>	102,380 people	2.8%
<b>Average Annual Salary</b>	\$43,327 dollars	
<b>Total Payroll</b>	\$4.44 billion	2.7%
<b>State Payroll Tax Contribution</b>	\$10.20 million	2.7%
<b>Federal Tax Contribution</b>	\$339.34 million	2.7%
<b>State Income Tax Contribution</b>	\$228.70 million	2.7%
<b>State Sales Tax Contribution</b>	\$476.35 million	2.9%

### ***Impact of Increased Highway & Bridge Spending On This Sector***

A \$1 billion increase in highway and bridge construction spending would have a positive impact on the output, employment and value added for this industry. Total employment would increase by 442 jobs. Total industry payroll would increase by \$17.80 million, reaching approximately \$4.45 billion. Output would increase by \$62.00 million and value added, the gross output of the sector less the inputs, would increase by an estimated \$32.10 million.

<b>Transportation and Warehousing</b>	<b>Current Value</b>	<b>Impact of \$1 billion increase in highway and bridge spending</b>	<b>Estimated New Industry Total</b>
<b>Total output</b>	\$9.53 billion	\$62.00 million	\$9.59 billion
<b>Employment</b>	102,380 people	442 people	102,822 people
<b>Payroll</b>	\$4.44 billion	\$17.80 million	\$4.45 billion
<b>State Payroll Tax Contribution</b>	\$10.20 million	\$40.94 thousand	\$10.24 million
<b>Federal Tax Contribution</b>	\$339.34 million	\$1.36 million	\$340.70 million
<b>State Income Tax Contribution</b>	\$228.70 million	\$987.35 thousand	\$229.69 million
<b>State Sales Tax Contribution</b>	\$476.35 million	\$3.10 million	\$479.45 million

### ***The Impacts of a \$1 Billion Increase in Transportation Construction on...***

## **Finance and Insurance**

### ***Sector Overview***

Finance and insurance output in Virginia totaled \$23.12 billion in 2008, according to the U.S. Bureau of Economic Analysis. This accounts for 5.8% of the state's \$397 billion gross state product. This sector includes 28,155 establishments and sole proprietorships with an existing payroll valued at \$12.06 billion. These businesses contribute an estimated \$950.05 million in state and federal payroll taxes. Individuals working in this sector earn an average of \$65,835 each year. This industry contributes an estimated \$646.09 million to Virginia's state income tax collections.

The Finance and Insurance sector comprises establishments primarily engaged in financial transactions (transactions involving the creation, liquidation, or change in ownership of financial assets) and/or in facilitating financial transactions. This includes banks and credit unions, financial investment firms, insurance firms and pension funds.

Finance and Insurance	Current Value	Virginia Ranking (of 19)	Percentage of State Total
<b>Industry Output</b>	\$23.12 billion	4	5.8%
<b>Establishments</b>	28,155 businesses	9	4.5%
<b>Employment</b>	183,130 people	9	5.1%
<b>Average Annual Salary</b>	\$65,835 dollars	5	
<b>Total Payroll</b>	\$12.06 billion	5	7.4%
<b>State Payroll Tax Contribution</b>	\$27.73 million	5	7.4%
<b>Federal Tax Contribution</b>	\$922.32 million	5	7.4%
<b>State Income Tax Contribution</b>	\$646.09 million	5	7.7%
<b>State Sales Tax Contribution</b>	\$1.16 billion	4	7.1%

### ***Impact of Increased Highway & Bridge Spending On This Sector***

A \$1 billion increase in highway and bridge construction spending would have a positive impact on the output, employment and value added for this industry. Total employment would increase by 348 jobs. Total industry payroll would increase by \$20.30 million, reaching approximately \$12.08 billion. Output would increase by \$88.10 million and value added, the gross output of the sector less the inputs, would increase by an estimated \$50.20 million.

Finance and Insurance	Current Value	Impact of \$1 billion increase in highway and bridge spending	Estimated New Industry Total
<b>Total output</b>	\$23.12 billion	\$88.10 million	\$23.21 billion
<b>Employment</b>	183,130 people	348 people	183,478 people
<b>Payroll</b>	\$12.06 billion	\$20.30 million	\$12.08 billion
<b>State Payroll Tax Contribution</b>	\$27.73 million	\$46.69 thousand	\$27.78 million
<b>Federal Tax Contribution</b>	\$922.32 million	\$1.55 million	\$923.87 million
<b>State Income Tax Contribution</b>	\$646.09 million	\$1.23 million	\$647.32 million
<b>State Sales Tax Contribution</b>	\$1.16 billion	\$4.41 million	\$1.16 billion

### ***The Impacts of a \$1 Billion Increase in Transportation Construction on...***

## **Real Estate and Leasing**

### ***Sector Overview***

Real estate and leasing output in Virginia, which includes rental activity, totaled \$50.31 billion in 2008, according to the U.S. Bureau of Economic Analysis. This accounts for 12.7% of the state's \$397 billion gross state product. This sector includes 70,371 establishments and sole proprietorships with an existing payroll valued at \$7.33 billion. These businesses contribute an estimated \$577.69 million in state and federal payroll taxes. Individuals working in this sector earn an average of \$60,754 each year. This industry contributes an estimated \$390.46 million to Virginia's state income tax collections.

The Real Estate sector comprises establishments primarily engaged in renting, leasing, or otherwise allowing the use of tangible or intangible assets, and establishments providing related services. This

includes real estate agents, brokers, automotive equipment rental and leasing and construction equipment rental and leasing.

Real Estate and Leasing	Current Value	Virginia Ranking (of 19)	Percentage of State Total
<b>Industry Output</b>	\$50.31 billion	2	12.7%
<b>Establishments</b>	70,371 businesses	4	11.2%
<b>Employment</b>	120,668 people	11	3.3%
<b>Average Annual Salary</b>	\$60,754 dollars	6	
<b>Total Payroll</b>	\$7.33 billion	9	4.5%
<b>State Payroll Tax Contribution</b>	\$16.86 million	9	4.5%
<b>Federal Tax Contribution</b>	\$560.83 million	9	4.5%
<b>State Income Tax Contribution</b>	\$390.46 million	9	4.7%
<b>State Sales Tax Contribution</b>	\$2.52 billion	2	15.5%

### ***Impact of Increased Highway & Bridge Spending On This Sector***

A \$1 billion increase in highway and bridge construction spending would have a positive impact on the output, employment and value added for this industry. Total employment would increase by 344 jobs. Total industry payroll would increase by \$9.40 million, reaching approximately \$7.34 billion. Output would increase by \$148.30 million and value added, the gross output of the sector less the inputs, would increase by an estimated \$111.50 million.

Real Estate and Leasing	Current Value	Impact of \$1 billion increase in highway and bridge spending	Estimated New Industry Total
<b>Total output</b>	\$50.31 billion	\$148.30 million	\$50.45 billion
<b>Employment</b>	120,668 people	344 people	121,012 people
<b>Payroll</b>	\$7.33 billion	\$9.40 million	\$7.34 billion
<b>State Payroll Tax Contribution</b>	\$16.86 million	\$21.62 thousand	\$16.88 million
<b>Federal Tax Contribution</b>	\$560.83 million	\$719.10 thousand	\$561.55 million
<b>State Income Tax Contribution</b>	\$390.46 million	\$1.11 million	\$391.58 million
<b>State Sales Tax Contribution</b>	\$2.52 billion	\$7.42 million	\$2.52 billion

### ***The Impacts of a \$1 Billion Increase in Transportation Construction on...***

# **Professional, Scientific & Technical Services**

## ***Sector Overview***

Professional, scientific and technical services output in Virginia totaled \$52.61 billion in 2008, according to the U.S. Bureau of Economic Analysis. This accounts for 13.3% of the state's \$397 billion gross state product. This sector includes 109,175 establishments and sole proprietorships with an existing payroll valued at \$34.80 billion. These businesses contribute an estimated \$2.74 billion in state and federal payroll taxes. Individuals working in this sector earn an average of \$71,826 each year. This industry contributes an estimated \$1.88 billion to Virginia's state income tax collections.



This sector comprises establishments that specialize in performing professional, scientific, and technical activities for others. Examples of businesses in this industry include lawyers, accountants, architects and engineers and design services, among others.

<b>Professional, Scientific and Technical Services</b>	<b>Current Value</b>	<b>Virginia Ranking (of 19)</b>	<b>Percentage of State Total</b>
<b>Industry Output</b>	\$52.61 billion	1	13.3%
<b>Establishments</b>	109,175 businesses	1	17.3%
<b>Employment</b>	484,547 people	1	13.4%
<b>Average Annual Salary</b>	\$71,826 dollars	3	
<b>Total Payroll</b>	\$34.80 billion	1	21.5%
<b>State Payroll Tax Contribution</b>	\$80.05 million	1	21.5%
<b>Federal Tax Contribution</b>	\$2.66 billion	1	21.5%
<b>State Income Tax Contribution</b>	\$1.88 billion	1	22.4%
<b>State Sales Tax Contribution</b>	\$2.63 billion	1	16.2%

### ***Impact of Increased Highway & Bridge Spending On This Sector***

A \$1 billion increase in highway and bridge construction spending would have a positive impact on the output, employment and value added for this industry. Total employment would increase by 904 jobs. Total industry payroll would increase by \$49.60 million, reaching approximately \$34.85 billion. Output would increase by \$123.10 million and value added, the gross output of the sector less the inputs, would increase by an estimated \$86.40 million.

<b>Professional, Scientific and Technical Services</b>	<b>Current Value</b>	<b>Impact of \$1 billion increase in highway and bridge spending</b>	<b>Estimated New Industry Total</b>
<b>Total output</b>	\$52.61 billion	\$123.10 million	\$52.73 billion
<b>Employment</b>	484,547 people	904 people	485,451 people
<b>Payroll</b>	\$34.80 billion	\$49.60 million	\$34.85 billion
<b>State Payroll Tax Contribution</b>	\$80.05 million	\$114.08 thousand	\$80.16 million
<b>Federal Tax Contribution</b>	\$2.66 billion	\$3.79 million	\$2.67 billion
<b>State Income Tax Contribution</b>	\$1.88 billion	\$3.50 million	\$1.88 billion
<b>State Sales Tax Contribution</b>	\$2.63 billion	\$6.16 million	\$2.64 billion

# Other Indirect & Miscellaneous Services

## *Sector Overview*

The output for other indirect and miscellaneous services in Virginia totaled \$86.9 billion in 2008, according to the U.S. Bureau of Economic Analysis. This accounts for 21.9% of the state's \$397 billion gross state product. This sector includes 253,732 establishments and sole proprietorships with an existing payroll valued at \$53.04 billion. These businesses contribute an estimated \$4.2 billion in state and federal payroll taxes. Individuals working in this sector earn an average of \$41,460 each year. This industry contributes an estimated \$2.72 billion to Virginia's state income tax collections.

This sector includes the following industries: agriculture, forestry and fishing; arts, entertainment and recreation, educational services, utilities, management of companies and enterprises, administrative and waste management services, information, healthcare and other services.

Other Services	Current Value	Percentage of State Total
<b>Industry Output</b>	\$86.9 billion	21.9%
<b>Establishments</b>	253,732 businesses	40.3%
<b>Employment</b>	1,279,288 people	35.3%
<b>Average Annual Salary</b>	\$41,460 dollars	
<b>Total Payroll</b>	\$53.04 billion	32.7%
<b>State Payroll Tax Contribution</b>	\$121.99 million	32.7%
<b>Federal Tax Contribution</b>	\$4.056 billion	32.7%
<b>State Income Tax Contribution</b>	\$2.72 billion	32.7%
<b>State Sales Tax Contribution</b>	\$4.35 billion	26.8%

## *Impact of Increased Highway & Bridge Spending On This Sector*

A \$1 billion increase in highway and bridge construction spending would have a positive impact on the output, employment and value added for this industry. Total employment would increase by 3,312 jobs. Total industry payroll would increase by \$115.5 million, reaching approximately \$53.2 billion. Output would increase by \$340 million and value added, the gross output of the sector less the inputs, would increase by an estimated \$204.6 million.

Other Services	Current Value	Impact of \$1 billion increase in highway and bridge spending	Estimated New Industry Total
<b>Total output</b>	\$86.9 billion	\$340 million	\$87.2 billion
<b>Employment</b>	1,279,288 people	3,312 people	1,282,600 people
<b>Payroll</b>	\$53.04 billion	\$115.5 million	\$53.16 billion
<b>State Payroll Tax Contribution</b>	\$121.99 million	\$265.65 thousand	\$122.26 million
<b>Federal Tax Contribution</b>	\$4.056 billion	\$8.84 million	\$4.066 billion
<b>State Income Tax Contribution</b>	\$2.720 billion	\$6.82 million	\$2.727 billion
<b>State Sales Tax Contribution</b>	\$4.35 billion	\$17.0 million	\$4.36 billion

# Methodology and Sources

The impact of a \$1 billion increase in transportation construction spending is calculated using the U.S. Department of Commerce Regional Input-Output Modeling System (RIMS II). RIMS II is based on input output (I-O) tables. For a given industry, the I-O tables show the industrial distribution of inputs purchased and outputs sold.

Research shows that RIMS II multipliers are similar to other regional I-O models based on in-depth and often expensive surveys. According to the U.S. Department of Commerce, RIMS multipliers have been used to estimate such things as the regional impact of military base closings, tourist expenditures, new energy facilities, offshore drilling and the opening or closing of manufacturing plants and other facilities. The construction multipliers in this report are used frequently to analyze the impact of all types of new construction projects, including transportation construction. The construction multipliers are specific to Virginia and are based on benchmark regional data from 2006 and industry data from the 1997 benchmark series, as published by the U.S. Department of Commerce. These multipliers are standard for this type of analysis and are the latest information available. Because the multipliers are for general construction, we did take the national 1997 benchmark total requirements for mining, which includes the aggregates, concrete and cement industries, as the basis for Virginia's increased demand in this area. We subsequently increased the earnings, employment and value added multiplier by the same amount. This is because the current state specific mining multiplier understates the impact on this industry of an increase in transportation construction activity.

The additional employment generated by the \$1 billion transportation infrastructure investment includes direct, indirect and induced impacts. Direct employment is the employment directly related to the new transportation construction projects. As a result of this economic activity, employment is also generated indirectly in the businesses that supply goods to the transportation construction industry. Finally, there is additional income and employment generated throughout the broader economy, called induced activity, because the employees in the direct and indirect industries are earning money and spending it on such things as housing, transportation, buying clothes and other activities. This is how an increase in transportation construction can stimulate additional demand in the retail sector – the additional employees will be buying goods with their new earnings and this will impact the other sectors of the economy.

Industry output for Virginia is the most recent data from the U.S. Bureau of Economic Analysis GDP estimates for the state, broken out by industry, for 2008.

The employment estimates are derived from several different sources. The information includes establishment and employment data for sole proprietorships and businesses identified as relevant to highway, street and bridge construction. The total direct employment number

for suppliers is calculated using the percentage of an industry's output that is related to highway, street and bridge construction, based on national input output tables from the U.S. Bureau of Economic Analysis. The private employment data is from the U.S. Census Bureau's County Business Patterns and Nonemployer Statistics series. Government employee data is from the U.S. Census Bureau's Annual State and Local Government Census. All payroll data has been adjusted for inflation to 2009 dollars using the Bureau of Labor Statistics Consumer Price Index.

Induced employment is calculated according to the same method used by the U.S. Department of Transportation Federal Highway Administration (FHWA). FHWA estimates that for every \$1 billion invested in highway construction yields 27,823 jobs. Of that total, 13,861 are considered direct jobs for on-site construction and direct and indirect suppliers, and 13,962 jobs are induced. This study uses that ratio, calculating induced jobs based on the direct employment calculated above.

All bridge information, including conditions, is from FHWA's National Bridge Inventory.

The state payroll tax rate is calculated using the average employer tax rate as a percent of total wages. The source for this information is the National Association of State Workforce Agencies (NASWA) and the U.S. Department of Labor Employment Training Administration (ETA) Financial Handbook 394. The federal payroll tax rate is estimated to be 7.65 percent. Income tax contributions are estimated using the average wage in each of the 19 industries and the corresponding tax rate as published by the state of Virginia. For industries where the average earnings are above \$17,000, the income tax is calculated as \$720 plus 5.75 percent of the average wages over \$17,000. Total estimated income tax collections using this method are \$8.4 billion. Actual income tax collections reported by Virginia in the U.S. Census of State & Local Governments was \$10.1 billion. This difference is in part attributable to income taxes paid by government workers. That employment and economic impact is not included in the 19 sector analysis.

The state sales tax revenue is calculated as 5 percent of GDP for each sector, which measures the final sales of goods and services. The estimate in this report comes very close to actual reported revenues for the state sales and use tax. The total estimated value of sales tax receipts in this report is \$5.946 billion. The 2008 Census of State and Local Government Finance, published by the U.S. Census Bureau, reports that Virginia collected \$6.093 billion in sales tax revenue at the state level.

The value of capital outlays is an average from the 2007 and 2008 reported value of capital outlays published in Highway Statistics with an estimated \$300 million in local highway capital outlays as reported by the U.S. Census Bureau's 2008 State & Local Government Finances. The FHWA data is only for capital outlays by the Virginia DOT on state administered highways, and is not the entire transportation construction market in the state. Capital outlays in Virginia averaged an estimated 1.8% of total capital outlays in the United States in 2007 and 2008. Using this ratio, an estimate of Virginia's share of the of the U.S. value of construction work

performed in 2009, would be approximately \$1.5 billion. The U.S. value of construction put in place is available monthly from the U.S. Census Bureau. The Economic Census, conducted every five years, provides a specific breakdown of the state value of highway and bridge construction. Virginia's share of total work has averaged 3.0 percent for the 1997, 2002 and 2007 Economic Census.

This research was conducted for the ARTBA Transportation Development Foundation by a team led by Alison Premo Black, vice president of policy and senior economist for the American Road & Transportation Builders Association in Washington, D.C. Ms. Black, an economic doctoral candidate at The George Washington University in the Nation's Capital, holds an M.A. in International Economics and Latin American Studies from the Johns Hopkins School of Advanced International Studies. She graduated magna cum laude from Syracuse University, where she was a member of Phi Beta Kappa and the Golden Key Honors Society, with majors in International Relations, Latin American Studies and Spanish. Prior to joining ARTBA in 2000, Ms. Black worked as an economic analyst for the Embassy of the Republic of Korea in Washington, D.C., and as a researcher in the Trade Unit of the Organization of American States. She has led teams and authored numerous studies examining state transportation funding and investment patterns.

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