Railroad and Regional Characteristics

Railroad Security Considerations

A security risk assessment consists of three primary components: threats, vulnerabilities, and consequences. Although all hazmats on the rail line are a concern, the transport of toxic inhalation hazard (TIH) materials and their potential impact on dense population and economic centers warrant the greatest attention.

Threats

A threat is any intentional circumstance or event with the potential to cause loss of, or damage to, an asset or death and/or injury to people. The U.S. Department of Transportation (USDOT) has found that both national and international terrorist groups have typically targeted large gatherings or dense population centers with the hope of disrupting the mobility and economic vitality of communities. They have sought to cause a large number of casualties and inflict severe damage to historical or landmark sites, high-value assets, transportation systems, and economic centers.

Within the Washington, DC region, freight and passenger railroad operations face a spectrum of threats. These threats include:

- Using improvised explosive devices (IEDs), vehicle-borne explosive devices (VBIEDs), and other explosive devices to perpetrate catastrophic structural damage to rail infrastructure, including overpasses and interlockings, to impact freight distribution;
- Disrupting Amtrak, MARC, or VRE passenger rail operations by causing the release of TIH cargo from a rail tank car within the rail alignment;
- Causing catastrophic injury and death in densely populated areas of the Washington, DC region at mass gatherings or large-scale events, such as 4th of July celebrations on the National Mall, by causing the release of TIH cargo;
- Disrupting government and business centers and/or vital utility structures within the Washington, DC region through the release of TIH cargo;
- Destroying well-known national icons, historic landmarks, and other significant targets such as the U.S. Capitol by causing flammable or explosive cargo to ignite; and
- Combining any or all of the above.

Railroad infrastructure within the Washington, DC region makes for an attractive terrorist target because it transports hazardous materials close to iconic structures, dense populations, and economic centers. The existing CSX mainline passes through the Southwest Federal Center where more than 77,000 employees work daily. Most of these employees work in federal buildings including the Department of Agriculture, Department of Energy, Department of Transportation, and Department of Education. The existing CSX mainline is also located less than one-half mile from the U.S. Capitol, which is not only a large office building but also a key national symbol.

Even before the 9/11 attacks, the FBI had placed the Washington, DC region at the top of its potential terrorist target list because of its iconic status as the symbol and seat of American power and the potential consequences of an attack, which include disrupting/destroying federal government operations and its associated leaders. Terrorists could consider an attack against any target with in the Washington, DC region to be an attack against the United States.

Terrorists typically evolve their tactics to improve the success of their attacks. It is probable that terrorists have considered using rail tank cars loaded with hazmat as a weapon to cause mass casualties. A similar tactic was recently used when terrorists used chlorine truck bombs to cause mass casualties in Iraq.

Vulnerability

The vulnerability of an area or target is assessed by analyzing terrorist weapons and their delivery methods. The most popular weapons currently used by terrorists are the IED and the VBIED. Though either of these weapons can cause significant damage and injury by itself, they can also be used to rupture a freight car with a toxic or explosive cargo, resulting in catastrophic consequences. The rupture of a tank car

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containing TIH cargo at a critical location, by either an intentional derailment or a direct attack to the rail tank car, could possibly cause many of the threats previously discussed. Accidental freight derailments involving TIH cargo have proven lethal in the past. On January 6, 2005, an NS freight train missed a switch and crashed into a locomotive stored on a spur track in Graniteville, SC. The collision caused a tank car with 90 tons of chlorine to rupture. Nine people died as a result of chlorine inhalation and more than 550 people sought medical assistance.

Another type of attack is the sabotage of railroad infrastructure. In 1995, the criminal tampering of a freight rail track in Arizona caused an Amtrak passenger train derailment that resulted in the loss of life. This type of intentional sabotage could cause train derailment within the District's Monumental Core, in turn causing loss of life and damage to iconic structures.

To assess the vulnerability of a target, elements such as access, detection, interdiction,[1] and security protective countermeasures are considered. Any vulnerability identified within those elements may be mitigated through implementation of the appropriate countermeasure. These countermeasures can include physical barriers (i.e. fences, locked gates, etc.) to deny or deter entry to an area, technological sensors/ intrusion detectors, visible security patrols, security cameras to detect unauthorized intrusions, and emergency response plans and training.

This study included a high-level inspection of key rail alignment points within the Washington, DC metropolitan area. The inspection found several vulnerabilities:

- Fences and gates needing maintenance
- Lack of physical pedestrian and vehicles barriers to the railroad
- Lack of security patrols
- Lack of enforcement of parking and trespassing violations
- Poor area lighting, lack of appropriate signage
- Insufficient public awareness/public involvement
- Track areas that are hidden in remote locations without any type of alarm, CCTV, or detection sensor systems

Another vulnerability found was the stopping and holding of freight trains in unprotected areas. Because of railroad traffic bottlenecks approaching and within the District, freight trains regularly sit and wait for congestion to clear in locations such as Crystal City, Anacostia, and Northeast DC. This issue is discussed in Appendix B.

Consequence

Consequence is the effect of a terrorist attack in terms of casualties, economic loss, political impact, and psychological damage. The consequence of an attack in the Washington, DC region includes the disruption of government at the local, state and federal levels. This consequence of stopping/ disrupting the functions of the U.S. Capitol and other federal government agencies would be catastrophic not only to the region, but to the entire United States and its international allies. Reducing vulnerabilities and improving response and recovery will reduce consequence.

The consequence of the rupture of a hazmat rail tank car containing TIH cargo in the Washington, DC region has been previously analyzed by others. This scientific computer analysis using simulation technology showed that if a TIH such as chlorine were released in the District during a major public event, a several-square-mile area could be covered and 100,000 people could be put at serious and lethal health risk within the first 30 minutes.[2] The consequences of such an attack would depend on atmospheric conditions, the amount of TIH cargo released, and the population within the release area, among other considerations. These consequences from a TIH release—massive

1 Interdiction is a tactical operation used to divert, disrupt, delay, or destroy a terrorist action before it can be used against a target.

2 Presentation of Dr. Jay Boris, U.S. Naval Research Laboratory, to D.C. Council, October 6, 2003.

death and injury, economic loss, psychological and political impact, and attacking an icon—are the ultimate goals of terrorists.

Installation of New Security Measures on the Rail Line

In response to the security risks to the rail line in this study, the U.S. Department of Homeland Security is undertaking the National Capital Region Rail Pilot Project (NCRRPP), a test-bed project using technology to create a virtual security boundary for the rail line.

The boundary will consist of two elements, a virtual fence surrounding the rail line and virtual gates installed at each entry to the rail corridor. Monitoring and surveillance equipment, including security lighting, infrared intrusion detectors, fixed cameras, pan/tilt/zoom cameras, and radio frequency identification transmitters/receivers, will be mounted on poles at the tracks to provide intelligent video surveillance of the rail line as well as detection, identification, and distinction between unauthorized and authorized personnel. The virtual gates will be designed to provide advance notification of train traffic approaching the line with identification signal recognition as well as early detection equipment for radioactive materials, chemical agents, and toxic industrial chemicals. The system will be designed to allow around-the-clock monitoring of real-time streaming video and data from CSX's and Amtrak's police communication centers and from other law-enforcement command centers. The system's design will allow additional technologies to be incorporated as they become available.

The NCRRPP will increase the level of surveillance and monitoring of the rail line, but it will not completely remove security concerns. The NCRRPP will not prevent access to the rail line.

Regional Freight Markets

The Washington, DC region generates a limited amount of freight-rail traffic and relies heavily on truck transportation to deliver and ship goods. This is due to several factors, including:

- The region's economic composition, which is predominantly service and government oriented;
- The absence of major manufacturing or transportation facilities (i.e. port, rail terminal); and
- The ability for trucks serve the region's needs from distribution centers on the periphery of the metropolitan area or from nearby states.

Unlike Baltimore, which has a maritime port, there are no major freight-generating facilities for rail traffic in the Washington, DC region. Instead, the region's freight-rail demand is primarily related to the consumption of goods and energy (inbound) and the generation of waste materials (outbound). Overall, freight-rail tonnage originating or terminating in the District and its suburbs is a small percentage of the total tonnage moving on the region's rail system. Most traffic in the region—and especially on the rail line under study—is traffic moving through the region as it is shipped between other states; this is also called overhead traffic.

In order to quantify the freight-rail shipments in the District and on the CSX line under study, the following freight market overview draws from the Carload Waybill Sample Data obtained from the U.S. Surface Transportation Board. This data set is a stratified sample of carload waybills obtained from railroads that provides information on commodities, origin, termination, and rail carrier(s). For purposes of this study, local traffic is traffic originating, terminating, or moving solely within the District.

The focus of this study was the north-south freight movements through the District. Rail freight movement between Richmond and points west is lower in magnitude and has lower future growth potential than north-south freight, primarily because good alternate rail routings exist for the south-to-west traffic.

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Traffic Description

In 2005, more than 22.4 million tons of freight traveled north-south on the rail line under study.[3] This total included more than 97,940 local inbound tons, 112,332 local outbound tons, no "internal" tons traveling solely within the District, and 22.2 million through-traffic tons.[4] Figure 2-8 shows the distribution of the inbound, outbound, and through shares of the District's total freight rail tonnage for 2005. In percentages, inbound accounted for 0.5 percent, outbound was 0.4 percent, and through traffic accounted for 99.1 percent.

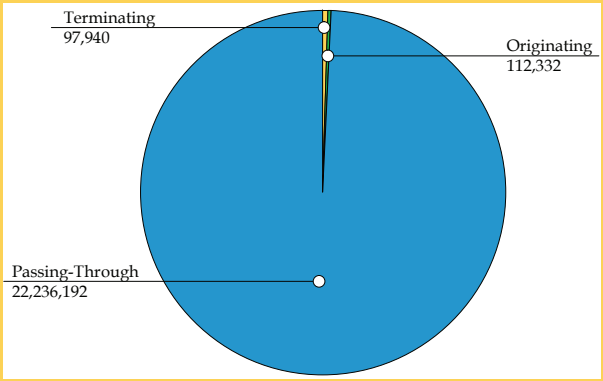

Figure 2-8. DC Freight Rail Tonnage (2005)

The District's 2005 rail freight traffic consisted of 251,689 carloads and 116,800 intermodal units (trailers and containers) in 2005.[5] Figure 2-9 illustrates the share of carload versus intermodal freight rail movements in the District. Thirty-two percent of all unit movements were intermodal. Of the local inbound and outbound traffic, there were 2,264 carloads and no intermodal units.

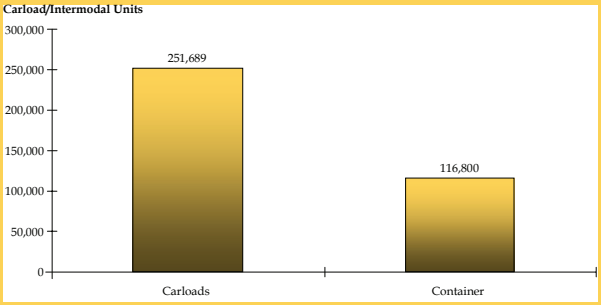

Figure 2-9. DC Rail Carloads and Intermodal Movements (2005)

Figure 2-10 displays the ten top origin and destination rail movements through the District by state pairs. With nearly 1.5 million tons in 2005, South Carolina-Pennsylvania was the top state pair moving cargo through the District, representing 6.5 percent of the total through tonnage. Traffic moving between Illinois and North Carolina comprised 4.2 percent of freight movements, and traffic moving between West Virginia and Virginia totaled 2.8 percent of the total freight movements. Of the local inbound and outbound moves, traffic between West Virginia and the District

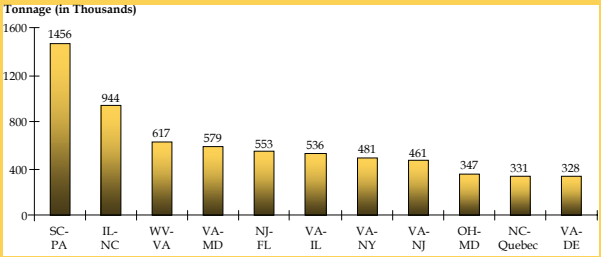

Figure 2-10. DC Rail Movements - Top 10 Origin and Destination Pairs (2005)

3 This section uses the 2005 Surface Transportation Board Carload Waybill Sample. For the purpose of this study, DC rail traffic is considered any traffic moving north-south through in the District of Columbia.

4 Terminology used in this report. "Inbound" is interstate traffic terminating in DC. "Outbound" is interstate traffic originating in DC. "Local" is DC intrastate traffic. "Through" is traffic neither originating nor terminating in DC, but passing through the State. "Origins" include both outbound and local. "Terminations" include both inbound and local.

5 Carload total excludes cars hauling intermodal units.

was heaviest. Table 2-1 shows the top District inbound or outbound origin and destination pairs.

The commodities listed in Figure 2-11 represent the highest tonnage commodity groups moving through the District. Coal movements are dominant, comprising 17 percent of the total tonnage in 2005. Waste or scrap materials follows at 13 percent; pulp, paper, or allied products at 11 percent; chemical or allied products at 9 percent; and food or kindred products at 8 percent.

Of the local traffic, waste or scrap materials comprise all of the outbound District traffic. Coal destined for the Capitol Power Plant, waste or scrap material, electrical machinery, equipment or supplies, and transportation equipment are all commodities traveling inbound. Table 2-2 shows the percentage of all inbound District traffic by commodity type.

Of the commodities moving through the District, 1,686,085 tons are considered hazmat, representing approximately eight percent of the total tonnage. Nationally, approximately 0.3 percent of hazmat shipments by rail are toxic substances—such as chlorine gas—that would pose inhalation risks if released.[6]

Market Analysis

When assessing the implications of alternative rail alignments through the study area, it is important to understand both the current market for freight rail shipments as well as how that market could change as a result of relocating the rail. This section describes the existing market for rail freight in the District as well as future trends and opportunities that may influence that market.

Existing Market Conditions

Although the vast majority of freight rail movements within the District consist of overhead traffic and

6 Testimony of Edward Hamberger, American Association of Railroads, Hearing Before the U.S. House of Representatives Committee on Transportation and Infrastructure, Subcommittee Railroads

Table 2-1. Washington, DC Top Trading Partners (Annual Carloads)

Trading Partner	Number of Carloads
West Virginia	720
Virginia	716
New Jersey	296
Delaware	132
Massachusetts	120
North Carolina	120
Florida	80
Maryland	40
New York	40

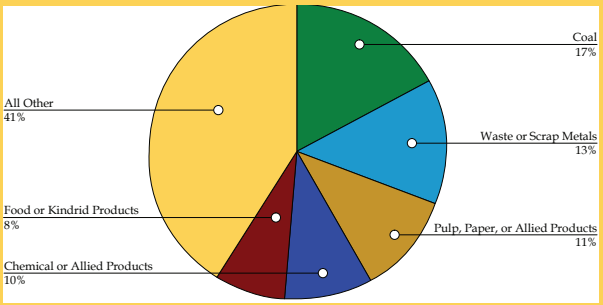

Figure 2-11. Top Commodities by Tonnage Moving Through DC (2005)

Table 2-2. Percent of Total DC Inbound Freight Rail Commodities

Coal	64%
Waste or Scrap Materials	27%
Electrical Machinery, Equipment or Supplies	5%
Transportation Equipment	4%

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freight rail plays a small role in the overall freight transportation system within DC, it is critical in the movement of two primary market segments:

- **Coal**, which is used by the U.S. Capitol Power Plant. This plant is fed primarily by coal and entering the District from the south.
- **Warehousing and distribution services**, for various bulk commodities including wood and paper products. Distribution centers primarily feed the region's construction activities.

The limited existing market for freight rail destinations in the District is not surprising, as the regional economy consists primarily of service-related industries and government. These industries have limited rail freight transportation needs.

Recognizing the limited market for rail service that currently exists in the District, there are several other sectors of the local economy that could potentially be served by rail, particularly the manufacturing, transportation/utility, and wholesale trade industries. Table 2-3 shows the contribution of these three sectors to the economy of the District, as well as the percentage of each sector's contribution to the gross regional product (GRP) that is spent on transportation. These three industry sectors—manufacturing, transportation/utility, and wholesale trade—are transportation-intensive industries. They rely heavily on the transportation system to carry goods related to their businesses. If freight rail offered a more desirable transportation option than the current transportation options available, some businesses in these sectors could potentially shift their transport mode from truck to rail.

Retail is an important sector because it is the end point of the logistics chain. The location of warehouse/distribution facilities serving importers and exporters is critical in determining traffic patterns. Large shippers like Wal-Mart and Target, for example, receive import containers through ports and typically dray them by truck to warehouse/distribution centers; orders to local stores or secondary distribution centers are filled from these primary centers. Several of the

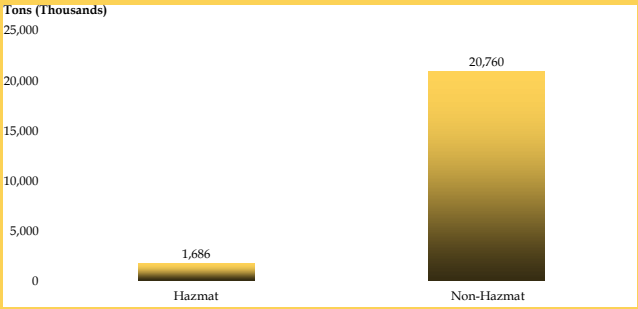

Figure 2-12. Hazardous Material Rail Movements (2005)

Table 2-3. Transportation-Intensive Industries Contribution to GRP and Transportation Costs

Industry	Contribution to GRP 1997 (in $ millions)	Contribution to GRP 2004 (in $ millions)	Transportation Costs as a Percent of Annual Output
Manufacturing	246	232	3.2%
Transportation/ Utility	817	1,150	7.1%
Wholesale Trade	545	715	4.7%

Source: U.S. Bureau of Economic Analysis & Bureau of Transportation Statistics (Transportation Satellite Accounts)

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individual establishments in these industry sectors are located adjacent to the existing freight rail mainline. Figures 2-13, 2-14, 2-15, and 2-16 show the locations of manufacturing, transportation/utility, wholesale trade, and retail establishments with more than 25 employees that are close to the rail mainline. The map is only an indicator of potential rail shippers; only a small percentage of those located on the line ship by rail.

Railroad and Regional Characteristics

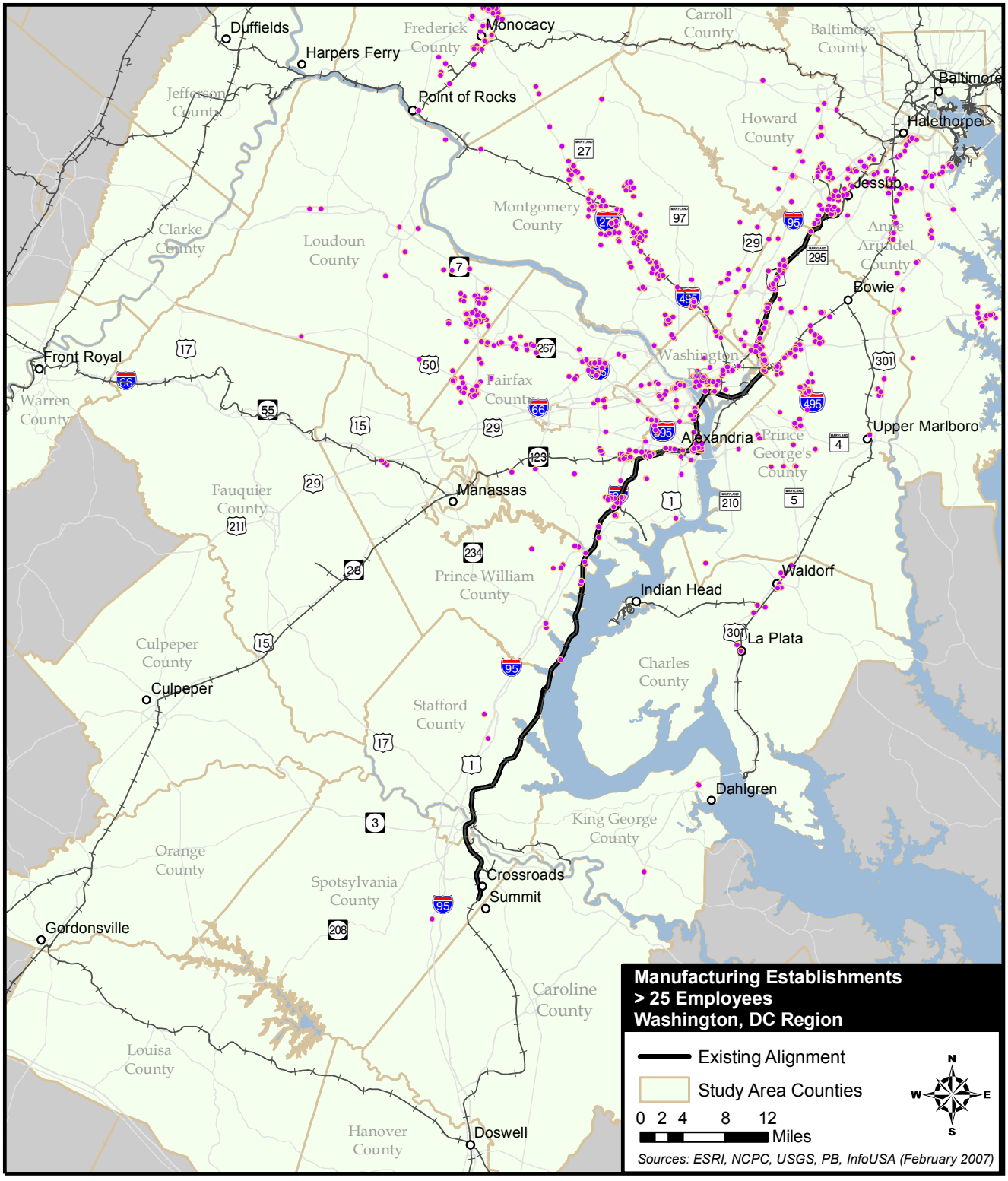

Figure 2-13. Manufacturing Establishments > 25 Employees

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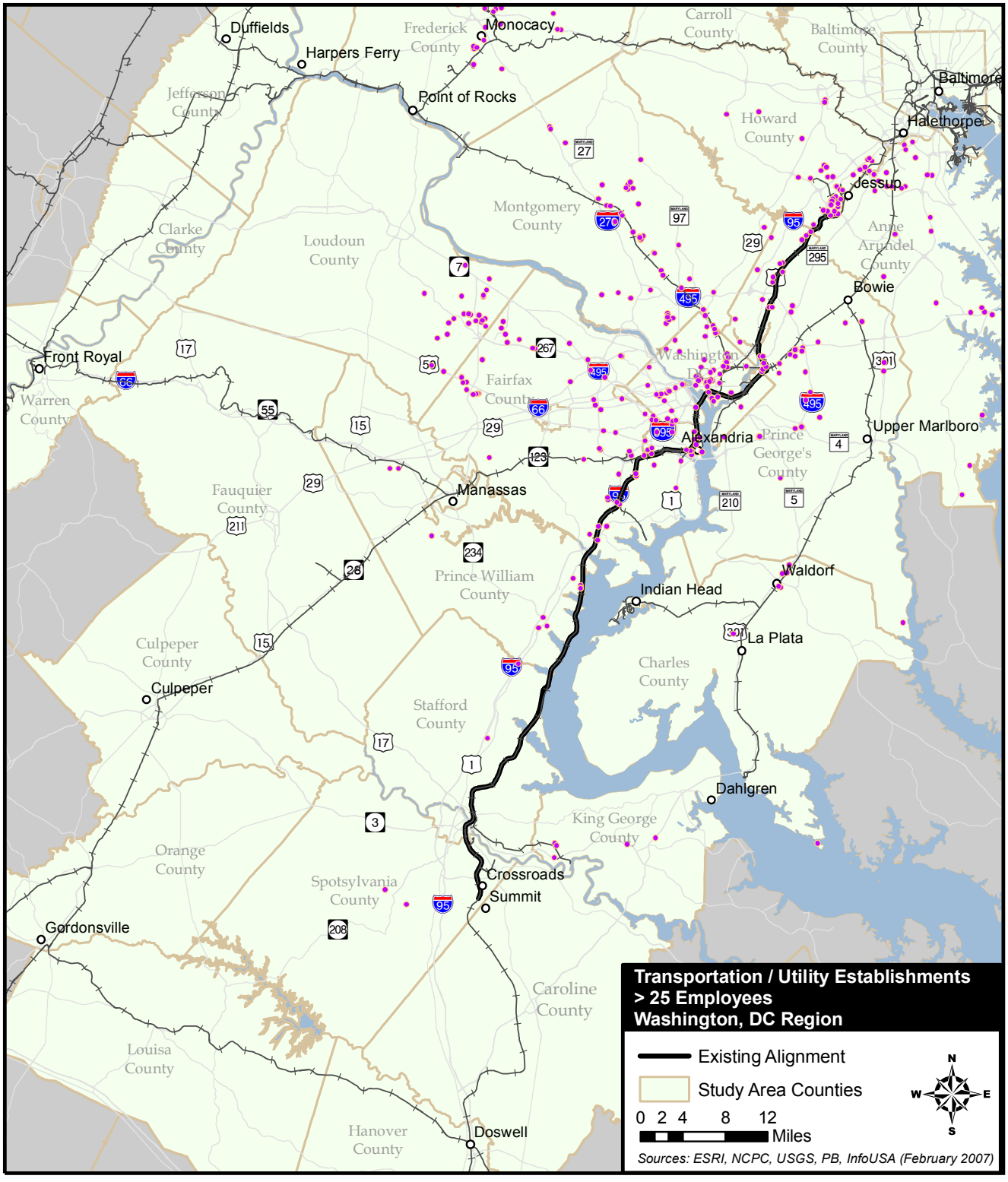

Figure 2-14. Transportation/Utility Establishments > 25 Employees

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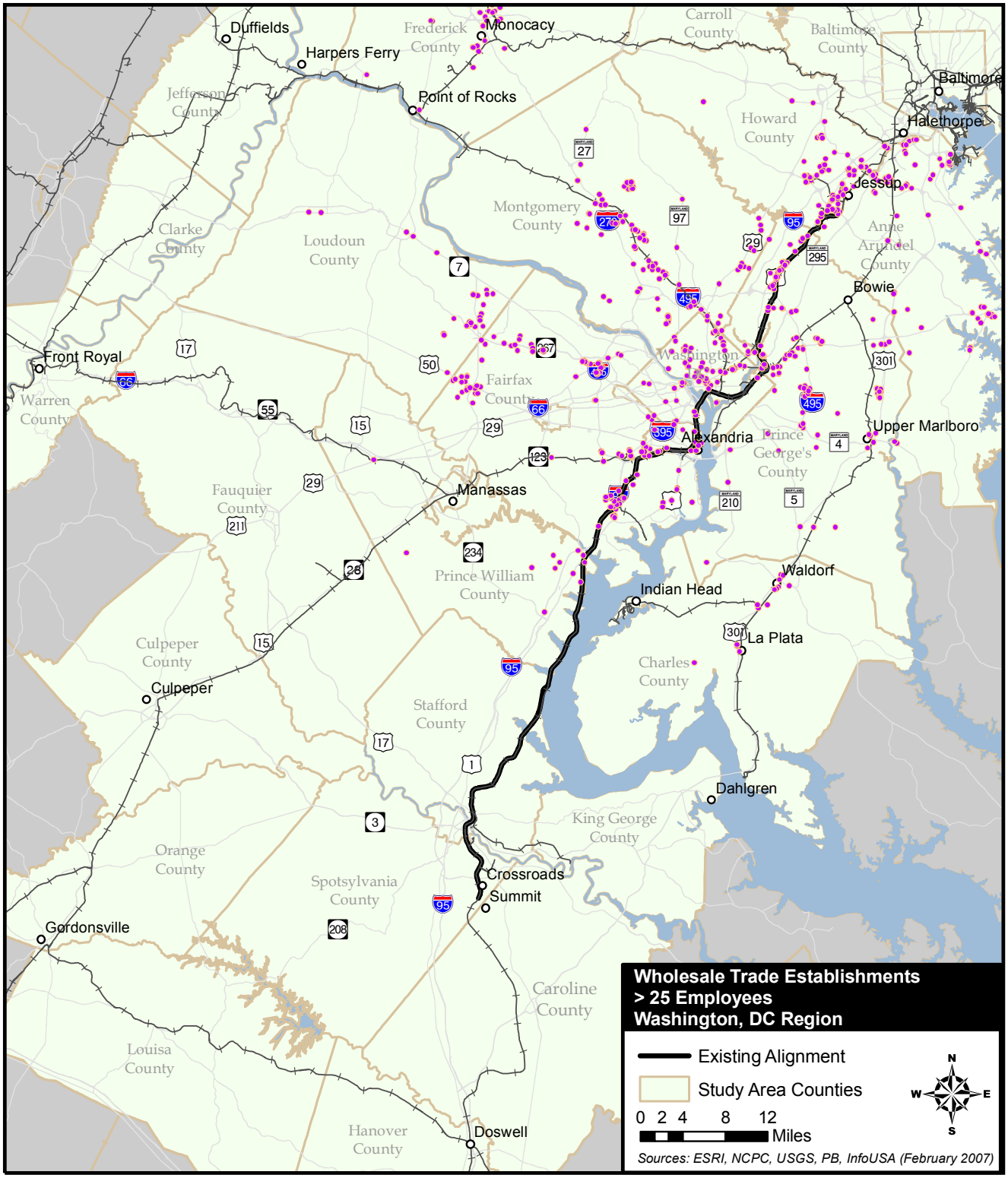


Figure 2-15. Wholesale Trade Establishments > 25 Employees

Railroad and Regional Characteristics

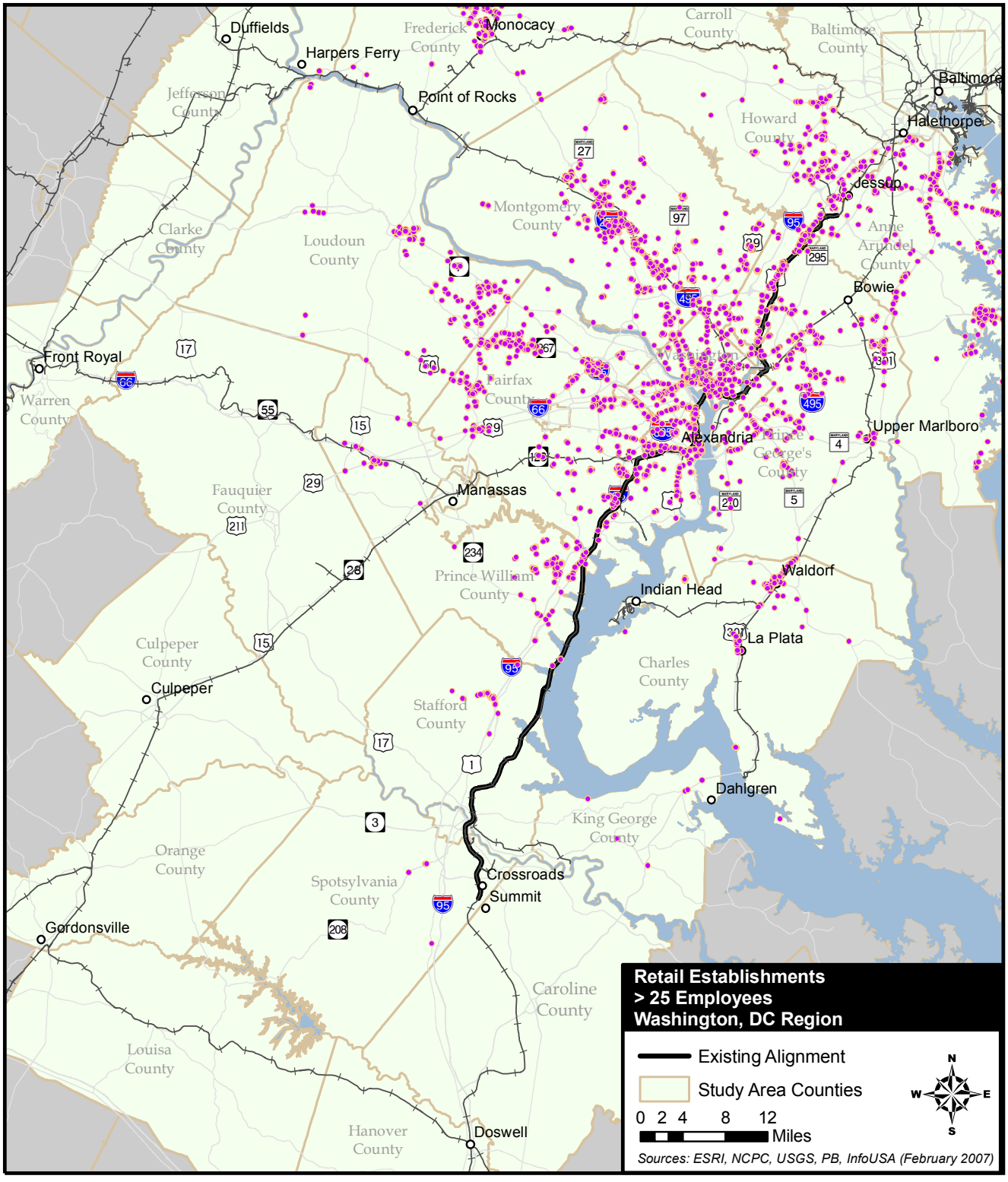


Figure 2-16. Retail Establishments > 25 Employees

Railroad and Regional Characteristics

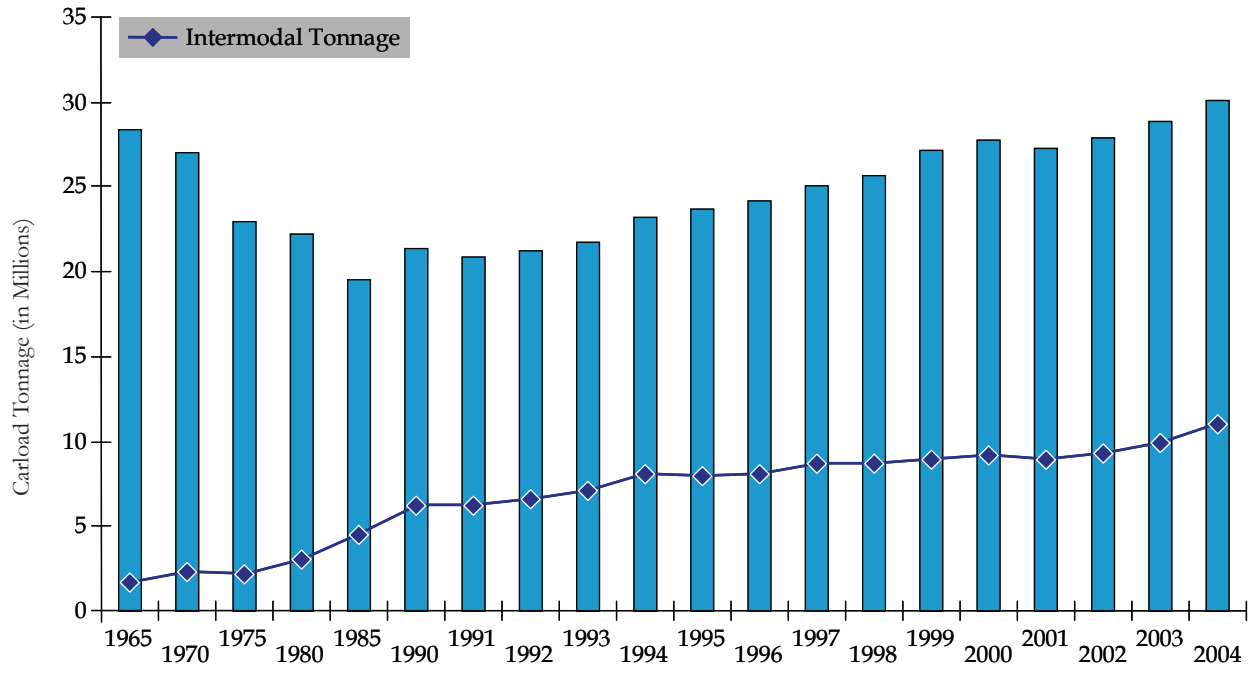
Future Market Opportunities

Forecasts suggest that coal shipments to region's coal-fired power plants will be the most important local market commodity for the railroads in both the near and long terms. Many of the railroads' existing coal contracts are long-term, which provides the railroads with some degree of assurance of both current and future volumes of coal traffic. In addition, there are two other key trends that will impact the type and volume of freight rail traffic serving the District: growth in intermodal traffic and regional population growth.

Class I railroads regionally and nationally are seeing significant changes in their overall traffic mix. Although both carload and unit train traffic continue to be important contributors to the revenue of the Class I railroads, particularly in the Washington, DC region with its significant volumes of coal, the Class Is are handling increasing volumes of intermodal and auto carrier traffic. Figure 2-17 shows that growth in intermodal traffic has greatly outpaced growth in carload traffic (560 percent to 6 percent growth since 1965, respectively) and currently is the primary revenue generator for the Class I railroads.

Class I railroads nationally and in the mid-Atlantic region will continue to focus on intermodal traffic. It is anticipated that railroads will likely choose to allocate capacity to intermodal shipments at the expense of other, less-profitable traffic, in order to boost revenue. As the railroads continue to focus on serving intermodal traffic, future service for local customers of non-coal carload traffic may become more limited.

Currently, intermodal rail traffic bound for the District is routed to intermodal facilities in Pennsylvania, Maryland, and New Jersey and shipped into the region by truck. Because of the distances involved, drayage



Source: AAR.

Figure 2-17. Growth in Intermodal Traffic

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operators can make only a handful of shipments per day, driving up costs for regional shippers, receivers, and consumers and contributing to congestion along the region's highways.

Developing a more accessible intermodal rail facility to serve the region's growing freight demand would improve the overall efficiency of the supply and distribution chain, allowing the railroads to capture additional market share; reducing costs for regional shippers, receivers, and consumers; and attracting additional industries (and jobs) to surrounding areas. The region's population growth is fueling demand for freight service to retail establishments as well as regional warehouses and distribution centers.

Table 2-4 shows that overall national freight demand is expected to grow from 14 billion to 27 billion tons across all modes. Despite the growth in overall freight traffic, rail's mode share is expected to decline from approximately 13.3 percent in 2002 to approximately 12.9 percent in 2035. Although rail is expected to retain its current market share for traditionally rail-served commodities (i.e., higher weight/lower value goods), these commodities are not forecasted to grow as rapidly as the commodities that are predominantly handled by truck or air.

The overall growth rates for freight shipments in the Washington, DC region shown in Table 2-5 are expected to be much higher than the national average, according to the Federal Highway Administration Office of Freight Management and Operations, though the overall volumes will be much lower. Localized growth rates were derived from several national and metropolitan sources and, in the case of a small geographic region like the District, may not accurately reflect local conditions.

A more realistic estimate of rail freight traffic is provided by the Virginia State Rail Plan[7] and the

Table 2-4. National Freight Growth by Mode, 2002-2035 (millions of tons)

	Truck	Rail	Air	Water	Total
2002	11,539	1,879	10	701	14,129
2035	22,814	3,525	27	1,041	27,407
Growth Rate	97.7%	87.6%	170%	48.5%	94.0%

Source: FHWA, Office of Freight Management and Operations

Table 2-5. Freight Growth by Mode in DC Metropolitan Area, 2002-2035 (millions of tons)

	Truck	Rail	Air	Water	Total
2002	11.6	<0.3	<0.3	1.2	13.2
2035	45.4	<0.3	<0.5	5	51.0
Growth Rate	291%	-	66.6%	316%	286%

Source: FHWA, Office of Freight Management and Operations

Table 2-6. High and Low Growth Rates for DC Freight Rail Shipments, 2002-2035[6]

	2005 Tons	2035 Tons
Low Growth (1% annual)		
Local Traffic (DC Inbound and Outbound)	210,272	283,415
Overhead Traffic	22,236,192	29,971,027
High Growth (2.5% annual)		
Local Traffic (DC Inbound and Outbound)	210,272	441,060
Overhead Traffic	22,236,192	46,641,915

7 *The Virginia State Rail Plan: A Multimodal Strategy to Meet the Commonwealth's Passenger and Freight Transportation Needs Through 2025*. Virginia Department of Rail and Public Transport. June 2004.

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Maryland Multimodal Freight Profile,[8] both of which provide estimates of freight rail growth that more effectively account for local conditions. Using these resources as a guide, high and low growth scenarios were developed. Table 2-6 shows the anticipated change in rail freight traffic within the Washington, DC region under both scenarios.

This study assumed the average annual intermodal and general merchandise growth rates are 3.01 percent and 1.07 percent, respectively. These are the same freight rail growth rates as in the 2002 Mid-Atlantic Rail Operations Study (MAROPS).

Market Conclusions

Ultimately, the Washington, DC region is a "through zone" for goods transported by rail, meaning goods move through the District but do not typically have their origination or destination in it. A review of regional land use maps shows that the industry types most likely to use rail are clustered along the existing alignment. However, it is unlikely that the District's local rail market will see anything more than modest growth at best. A realignment alternative should not affect the one percent of rail traffic that does have its origin or destination in the District. Regardless of any alignment alternative selected, it is expected that accommodations can be made to ensure current District shippers and receivers do not lose rail service.

Outside of local benefits and impacts, there may be larger regional and national benefits that accrue from realigning the CSX freight railroad. For example, opportunities may exist for the development of an intermodal rail facility within the study area. An intermodal facility, where freight could be transferred from rail to truck and then distributed to regional localities, could be developed under any alignment alternative. The location and utilization of rail intermodal terminals can attract rail traffic and spur economic development while deemphasizing truck traffic.

Regardless of any new facilities, national rail market growth will be significant in the future, and it could be accelerated by projects, like the rail realignment in this study and other MAROPS recommendations, that would allow for a substantial increase in capacity along the entire Northeast Corridor. For example, any rail project along the Northeast Corridor that allows for double-stack trains will ultimately move the entire Northeast rail system one step closer to being more efficient and able to carry more goods. If railroads are able to increase the amount of goods they carry, due to improved infrastructure that allows them to increase capacity and capture a larger segment of the future freight market, this translates into significant

Definitions

Class I Carrier - A classification of regulated carriers based upon annual operating revenues. Motor carrier of property: greater than or equal to $5 million: Railroads: greater than or equal to $50 million. Motor carriers of passengers: greater than or equal to $3 million.

Drayage - Transporting of rail or ocean freight by truck to an intermediate or final destination; typically a charge for pickup/delivery of goods moving short distances (e.g., from marine terminal to warehouse).

Shipper - Party that tenders goods for transportation.Source: Federal Highway Administration, Office of Freight Management and Operations

Supply Chain - Starting with unprocessed raw materials and ending with final customer using the finished goods.

Warehouse - Storage place for products. Principal warehouse activities include receipt of product, storage, shipment and order picking.

Source: Federal Highway Administration, Office of Freight Management and Operations

8 *Maryland Multimodal Freight Profile (Draft Report)*. Cambridge Systematics. October 2005.