

Freight Transportation Study

Conducted for the Salisbury/Wicomico Metropolitan Planning Organization

August 2011



Conducted By:
The Business, Economic, and Community
Outreach Network (BEACON)
Of the Franklin P. Perdue School of Business
At Salisbury University



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Executive Summary

The Business, Economic, and Community Outreach Network of the Franklin P. Perdue School of Business at Salisbury University (BEACON) conducted this Freight Transportation Study for the Salisbury/Wicomico Metropolitan Planning Organization (MPO). The Salisbury/Wicomico MPO region (hereafter referred to as “the study region”) consists the following jurisdictions: City of Salisbury; City of Fruitland; Town of Delmar, MD; Town of Delmar, DE; Unincorporated portions of Wicomico County immediately adjacent to Salisbury; Fruitland, MD; and Delmar, MD; and Unincorporated portions of Sussex County immediately adjacent to Delmar, DE. This study has been conducted in tandem with the Regional Freight Transportation Study for the Maryland Department of Transportation in partnership with the Salisbury/Wicomico MPO, the Delaware Department of Transportation, the Virginia Department of Transportation, and Virginia Department of Rail and Public Transportation, as well as representatives and stakeholders from the various transportation industries in the region.

Each of the various components of the study area’s freight network, including roads, railways, waterways, and airway play an integral role in the Salisbury-Wicomico Metropolitan Planning Organization (MPO) area. To gain a better understanding of the role each mode of freight transportation plays in the study area, several local companies were interviewed to examine why certain freight transportation modes were selected over others and to identify any issues the companies are experiencing with the freight network.

A large portion of the freight is moved by roadway, the major routes include Route 13/Route 13 Business and Route 50/Route 50 Business. Railways move a smaller portion of freight in the area. This is due in part to companies lacking rail spurs or rail sidings or their distance from rail. While no concerns have been expressed regarding mobility along the waterways, capacity issues may impact freight movements along the Wicomico River if current dredge spoil site issues are not resolved. The Wicomico Regional Airport is experiencing passenger and freight traffic growth. The

infrastructure, the runways, and the roadways leading to and from the airport are sufficient to handle the current volume and that projected in the near future.

The freight transportation industry goes beyond the physical freight transportation network. There are many industries that rely heavily on the freight transportation industry, such as manufacturing and tourism. It is estimated that if the industrial zones were utilized at full capacity, roughly 1,633 production occupations could be created. According to the laborshed analysis conducted in this study, just over 38% of the employees of freight intensive industries in Wicomico County reside outside of the county. Approaches to incentivize shippers and receivers to implement off-peak deliveries (OPD), to help mitigate traffic issues and lessen the effect of congestion on freight movement and shipping costs are also explored in this study. A number of scenario analyses were conducted with iDecide and IMPLAN software packages to reflect the value of the current network infrastructure as well as changes, which ultimately would affect the network itself, its users, and related industries. The economic impact of the rail and barge system, and the Bay Coast Railroad Car Barge are estimated to be \$1.5 Billion, \$1 Billion, and \$4 Million respectively. The disappearance of any of these transportation modes would most likely result in additional truck traffic, greater pollution, and greater fuel consumption. The loss of the Cape-May Ferry would be problematic but the complete elimination of water dredging would be a much bigger problem. Disappearance or severe curtailing of any of the transportation modes would result in increased fuel and food prices. Fluctuation in fuel prices would be economically detrimental to the region. More specifically, it would affect companies that do long distance trips with off-Peninsula origins or destinations.

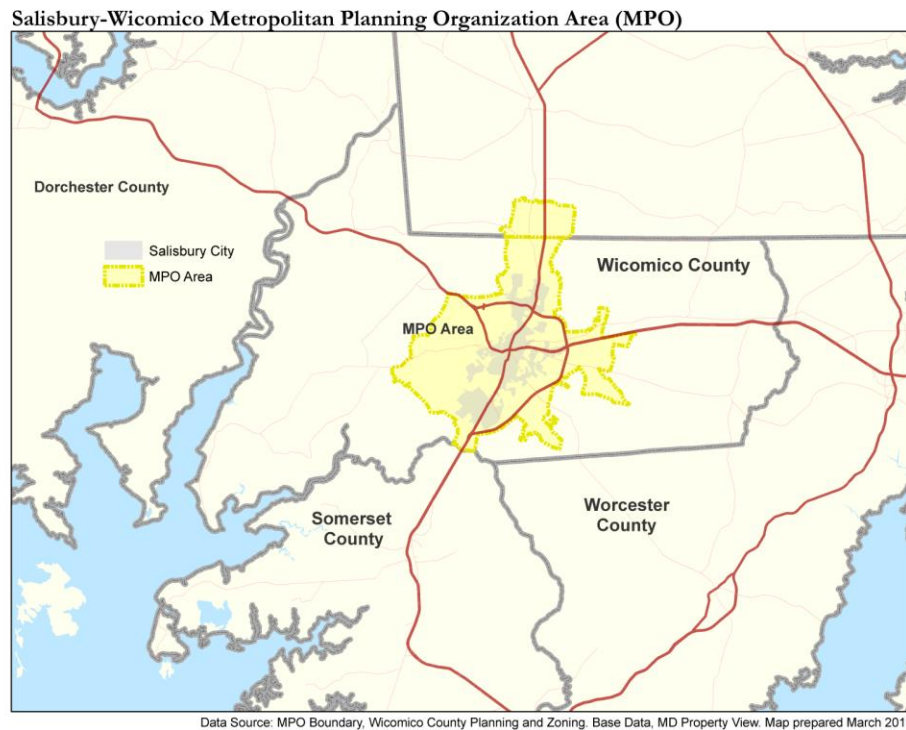
This study also looks at eight different and broad freight network issues that can indirectly impact the study area. Currently, the system is in delicate balance and alternatives that include expanding the Chesapeake Bay and looking at other intramodal opportunities to reduce truck traffic should be explored and implemented. Railroad maintenance, while costly, is another issue that should be considered for the public's benefit through a coalition of key stakeholders. The creation of separate task forces that

would look further into the national security and waterway dredging issues is recommended. It is also important to address the need for synced policies and procedures regarding data collection and analysis as well as the use of GIS and dashboarding tools. With these, the various stakeholders would be able to discuss and reach better decisions to respond to possible disruptions to the system. Finally, a process or structure should be developed to analyze network preservation. A strategic focus should be put on retaining commercial zones close to railroads and other modes.

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Introduction

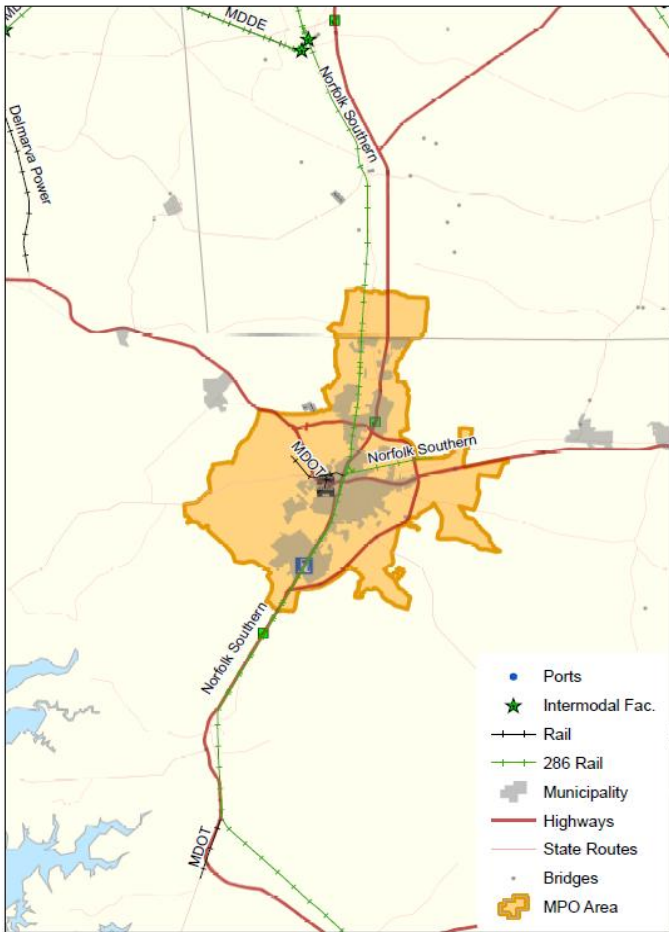
The Business, Economic, and Community Outreach Network of the Franklin P. Perdue School of Business at Salisbury University (BEACON) conducted this Freight Transportation Study for the Salisbury/Wicomico Metropolitan Planning Organization (MPO). The Salisbury/Wicomico MPO region (hereafter referred to as “the study region”) consists the following jurisdictions: City of Salisbury; City of Fruitland; Town of Delmar, MD; Town of Delmar, DE; Unincorporated portions of Wicomico County immediately adjacent to Salisbury; Fruitland, MD; and Delmar, MD; and Unincorporated portions of Sussex County immediately adjacent to Delmar, DE. This study has been conducted in tandem with the Regional Freight Transportation Study for the Maryland Department of Transportation in partnership with the Salisbury/Wicomico MPO, the Delaware Department of Transportation, the Virginia Department of Transportation, and Virginia Department of Rail and Public Transportation, as well as representatives and stakeholders from the various transportation industries in the region.



Freight Network

The freight network in the study region consists of roads, railways, waterways, and airway. The following map shows the various components of the study region's freight network. Freight transportation by land, sea, and air is integral to the County and study region's economic vitality. The freight transportation network within the study region is also vital to the economic health of the rest of the state and the Delmarva Peninsula. The network connects the study region to the rest of the Delmarva Peninsula and other major metropolitan areas and allows states along the east coast to the north and south to connect with one another more directly. Without a strong, resilient freight transportation network transportation time and costs would significantly increase.

Freight Inventory
Delmarva 2010



Each of the four modes of freight transportation available in the study region: road, rail, water, and air, is important to the overall health and functionality of the freight transportation network and the meeting to the needs of the end users. The following sections provide details on each mode as it currently operates, any planned or recommended improvements for the future, the major users of each mode of transportation in the study region, and the major commodities moved via each mode.

Roadway System

A large portion of the freight moved within the study region is moved along the roadway. The area roadways serve as a hub for the entire highway network of the region. The major roads that run through the study region include U.S. Route 13/Route 13 Business, which links the study region to the Philadelphia-Wilmington region, and U.S. Route 50/Route 50 Business, which links the study region to the Baltimore-Washington metropolitan area and to the beach resort of Ocean City, Maryland. Of the various types of freight moved via the roadways some of the key commodities being transported include Lumber and Wood Products; Chemical and Allied Products; Primary Metal Products; Petroleum or Coal; and Clay Concrete, Glass or Stone. Shipping via roadways is often the chosen mode of transportation when time is a primary consideration.

The Perdue Farms Processing Plant located within the study region is one of the main users of the roadway for transporting goods to and from its facility. Approximately 84 percent, a three year average of about 764,000 tons, of the grain shipped into the facility comes by truck.

improvement projects are planned for the study region.

Nustar Energy, a petroleum storing facility located on Marine Road along the Wicomico River, is one of the main shippers of petroleum products in the study region and on the major the roadways. Trucks operate 24 hours a day in the 3 trucking lanes open for fueling at the facility. Larger trucks transport 6,000-8,000 gallons of petroleum products to local stores for consumer fueling. When contacted, the Plant Manager stated that there are currently no significant accessibility issues pertaining to trucks. The only traffic flow inconvenience is trucks waiting along Marine Road when loading lanes are full.

Recommended Improvements and Maintenance

The following three tables provide information on the various roadway projects planned for the study region. The projects listed only include those that impact portions of the roads network that are heavily used for freight movement. Table 1 provides information on the fiscally constrained projects in the study region included in City of Salisbury FY 2012- FY 2016 Capital Improvements Program; Wicomico County FY 2011-2015 Capital Improvements Program and FY 2012-2016 Capital Improvements Program; and Maryland's FY 2011-2016 Consolidated Transportation Program (CPT). In total, approximately \$25.8 million in fiscally constrained roadway improvements are planned for the study region over the next five (5) years.

Table 2 provides information on State Highway Administration (SHA) Highway Improvement projects within the study region that are fiscally unconstrained. In total, approximately \$584.2 million in fiscally unconstrained highway

Table 1. Fiscally Constrained Projects
Thousands of Dollars

Project Type	Facility	Location	Project Description	Estimated Project Cost	Available Funding
City of Salisbury Roadway	Culver Road	Intersection of Northwood Drive and Naylor Mill Road	Install new traffic signal	\$150	\$150
Wicomico County Roadway	Beaglin Park Drive	Old Ocean City Road and new pavement joint located north of railroad	Renovate railroad crossing, resurfacing and striping	\$171	\$171
SHA Highway Improvement		Various State Roadways	Resurface	\$2,424	\$2,424
SHA Highway Improvement	U.S. Route 13 Business / South Salisbury Boulevard	College Avenue to Kay Avenue	Resurface	\$350	\$350*
SHA Highway Improvement	U.S. Route 13 / North Salisbury Boulevard	South of Salisbury Bypass to north of Dagsboro Road	Resurface	\$1,546	\$1,546
SHA Highway Improvement	U.S. Route 13 Business North Salisbury Boulevard	Bridgeview Street to Zion Road	Resurface	\$628	\$628
SHA Highway Improvement	Maryland 350- Mt. Hermon Road	Twilley Bridge Road to Waste Gate Road	Resurface	\$357	\$357
SHA Highway Improvement	Maryland 350- Mt. Hermon Road	Phillip Morris Drive to Twilley Bridge Road	Two-lane reconstruct	\$500	500*
SHA Highway Improvement	U.S. Route 13 Business North Salisbury Boulevard	Bridge 22026 over U.S. Route 50 Business	Bridge Deck Replacement	\$4,544	\$4,544
SHA Highway Improvement	U.S. Route 13 Business North Salisbury Boulevard	E. Church Street to north of London Avenue, William Street, Park Avenue and Isabella Street	Drainage Improvement	\$6,169	\$6,169
SHA Highway Improvement	U.S. Route 13 Business North Salisbury Boulevard	North of Bridgeview Street to Zion Road	Drainage Improvement	\$3,182	\$3,182
SHA Highway Improvement	U.S. Route 13 Business / South Salisbury Boulevard	Waverly Road, South Boulevard, Lloyd Street, and Hanson Street to the Wicomico Road	Drainage Improvement	\$4,004	\$4,004
SHA Highway Improvement	Maryland 349 - Nanticoke Road	U.S. Route 50 Business to North Culver Road	Construct thru land and left turn lane	\$1,800	\$1,800

Source: City of Salisbury FY 2012- FY 2016 Capital Improvements Program; Wicomico County FY 2011-2015 Capital Improvements Program and FY 2012-2016 Capital Improvements Program; Maryland's FY 2011-2016 Consolidated Transportation Program

*Denotes projects funded by the 2009 American Recovery and Reinvestment Act

Table 2. Fiscally Unconstrained SHA Highway Improvements Projects
Thousands of Dollars

Facility	Location	Project Description	Estimated Project Cost	Available Funding
Maryland 349 - Nanticoke Road	Crooked Oak Lane to U.S. Route 50	Multilane Reconstruct	\$383,020	\$0
U.S. Route 50 - Ocean Gateway	Hobbs Road/ Walston Switch Road	Interchange construct	\$48,800	\$0
U.S. Route 13 - North Salisbury Boulevard/Ocean Highway	Salisbury Bypass to Delaware state line	Divided highway reconstruct with access control improvements	\$91,500	\$0
U.S. Route 13 - South Fruitland Boulevard	Somerset County line to U.S. Route 13 Business	Divided highway reconstruct	\$12,700	\$0
Maryland 350 - Mt. Hermon Road	Beaglin Park Drive to Airport	Two-lane reconstruct	\$13,600	\$10
Maryland 12 - Snow Hill Road	Worcetser County line to South of U.S. Route 13 Bypass	Two-lane reconstruct	\$21,900	\$0
Maryland 12 - Snow Hill Road	North of U.S. Route 13 Bypass to City limits at Vine Street	Multilane Reconstruct	\$25,400	\$0

Source: Maryland State Highway Administration Highway Needs Inventory-Wicomico County 2009 Revised

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Table 3. County Comprehensive Plan Roadway Improvements

Timeline	Location	Description
Immediate (1 to 5 years)	Parsons Road and Fitzwater Street Reconstruction	Heavy truck traffic on these streets has caused the failure of the existing pavement. The City proposes to remove the existing pavement and replace it with new paving that can withstand the excessive loads.
Intermediate (6 to 10 years)	Northwood Drive Extension	The extension of Northwood Drive north of Naylor Mill Road to Connelly Mill Road at Foskey Lane is recommended to provide access to lands proposed in this Plan for industrial development. See Land Use Element, Chapter Seven. Some of these lands currently have severe accessibility issues, especially north of Leonard's Pond Run. This proposed Road would connect with future extensions of Hampshire Road, West North Pointe Drive, and possibly Dagsboro Road to provide an alternate means of access to U.S. Route 13 North, and should be developer-funded. This future roadway is currently located in the County, but is within both Salisbury's and Delmar's Municipal Growth Area. Coordination among all three jurisdictions will be necessary, and this project may be an ideal proposal to be considered by the MPO for further study. A part of this recommendation includes the geometric improvements and signalization at the Northwood Drive/Naylor Mill Road intersection.
Intermediate (6 to 10 years)	Beam Street Extension	With the construction of the Bypass, access to the Northwood Industrial Park was no longer available via Scenic Drive, as Scenic Drive is no longer a thru road to Naylor Mill Road. Access to the Industrial Park is still provided by Goddard Parkway and Marvel Road, but the extension of Beam Street in an easterly direction to West Gordy Road will provide a more direct route to U.S. Route 13 for businesses located in the southern portion of the Industrial Park.
Long Range (10 years and beyond)	Airport Road Relocation	This recommended new alignment of Airport Road would provide a direct access road from the intersection of Hobbs Road and U.S. Route 50 to the intersection of Mt. Hermon Road (MD 350) and Airport Road. This new alignment would provide a much needed direct access from U.S. Route 50 to the airport.

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Railways

The railway in the study region runs North to South parallel with Route 13, which is an important transportation link on the Delmarva Peninsula, and East to West from The Farmers and Planters Co., Inc. to Perdue Farms Processing Plant. Compared to other transportation modes, rail offers a viable cost alternative for freight movement, and the demand for rail can be expected to increase to coincide with increases in fuel prices. The railroad within the study region is owned by the Maryland Department of Transportation and Norfolk Southern. The main commodities transported by rail into the study region include Food and Kindred Products and Chemicals or Allied products. A majority of the commodities transported out of the study region by rail are Farm Products.

The use of rail may be further expanded within the study area if certain barriers were alleviated. Several local companies were interviewed to determine what form of transportation they currently use, what would cause them to switch transportation modes, and why they are not utilizing the rail if it is accessible to them.

With many companies located in the study region serving as distribution hubs for the Eastern Shore region, freight movement is vital to the success of their companies. The companies that were interviewed said they liked their location regardless of type of



*Regional Freight Study
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transportation used and feel it is the best location for distribution centers on the Eastern Shore. However, some companies did offer explanations as to why they do not use rail. One reason given is that although some firms are located close to the rail they lack the rail spur or rail siding needed to utilize the rail.

When speaking with one firm the distribution manager stated that when they bought the property in 2001, they had intention to use the rail to receive goods but lacked the rail spur. The company stated that the rail system, if used, would lower their freight costs, but found after doing their own research it would cost the company around \$250,000 to have the rail spur put in by the city. The company also stated that they did not feel there were any incentives for putting in the spur from the city, but if they were given incentives they would possibly reconsider the rail. Other companies also stated that there were currently not incentives for them to use the rail.

When speaking with local business owners several reasons were identified as to why businesses elect to use truck transportation instead of rail transportation for shipping and receiving goods. The incentives that trucks bring to the companies are timeliness of material to market and proximity of the business to its customers.

Additionally, it was noted that some business owners perceive the railway as a “dead end” when traveling south due to the need to switch modes of transportation, either utilizing the car float from Pocomoke City, MD to Norfolk, VA or trucks to move the goods via the Chesapeake Bay Bridge Tunnel. For many companies these factors can add time, costs, and complications to their transportation logistics and shipping.

In addition, the mode of transportation utilized partly depends on the type of goods being transported. Different factors that must be considered include the weight and volume of the goods and whether the goods are

perishable. For example, Perdue Farms Processing Plant, a major shipper within the study region, uses all three main modes of transportation for its goods, with a 3 year average for grain of 19,000 tons shipped by rail, 764,000 tons by truck, and 130,000 tons by barge. Although Perdue uses the railway, it only does so for a small portion of the grain shipped due to different factors regarding safety. Former Database and Truck routing manager Brenda Shores explained that due to the grain dust present with shipments a fire hazard exists because the dust is extremely flammable. The trucks bringing the grain in are equipped with covered tops to minimize the dust's movement and the grain elevator which moves the grain is highly ventilated. The grain on the barges has had no issues and Perdue has not experienced any waterway problems as far as accessibility and mobility.

The Farmers and Planters Co., Inc. ships approximately 2,000 tons annually along the railway. In speaking with Charles Otto, a Certified Crop Consultant and Sales Representative for The Farmers and Planters Co., Inc., rail was identified as the more cost effective mode of transportation as compared to shipping via trucks. The Farmers and Planters Co., Inc realizes a cost savings of approximately 15% to 20% by using rail rather than truck. Currently, approximately 20 railcars are required for shipping. This would equal nearly 80 truckloads if the company were to switch modes. Mr. Otto also noted that it is more difficult to find trucks for shipping as the industry is consolidating and many independent truckers are going out of business.

At the time of this study Norfolk Southern has no planned railway improvements within the study region. In future development of the railway and land surrounding the railway, it is important to strategically focus on retaining commercial or industrial zoned land in close proximity to the railroads and freight corridors, as a means of preserving and expanding the commercial and industrial base.

Waterways

The Wicomico River is the main waterway that serves the study region. The river and its dredged channels (up to 14 feet) provide navigable waterways for small boats and barges. Barge transportation is an economical mode of transport for bulk items that would otherwise require extensive truck transport. According to the U.S. Army Corps of Engineers (USACE), the waterway is often used to bring petroleum products, grains, and crude materials into the Port of Salisbury.

The Port of Salisbury is the second largest port in Maryland, after the port of Baltimore, in terms of waterborne commodity flow. The Delmarva Water Transportation Committee (DWTC), a non-profit organization created in 1974, encourages the development of waterborne commerce on the rivers, bays, and harbors of the Delmarva Peninsula through the promotion of adequate dredging, safe navigation and maintenance in an effort to protect and conserve the environment¹. DWTC estimates that a barge delivering petroleum to Salisbury is equal to 150 tractor trailer trucks. An additional 122,850 tractor trailer trucks would be needed annually (or 2,363 per day) if barges transporting the same commodity were halted or ceased to exist of the Delmarva Peninsula.

The main waterborne commodities transported along the river include Petroleum and



¹ <http://www.dwtconline.com>

Petroleum Products, Crude Materials, and Food and Farm Products. In 2009, approximately 1.1 million short tons were transported via barge.

As with the roadways, Nustar is also one of the major users of the waterways in the study region. Barges deliver petroleum products to Nustar along the river and offload the fuel through a network of pipelines and storage tanks. As with the roadways, the Plant Manager at Nustar identified no current significant accessibility issues pertaining to barges. The barges typically carry around 12,000 barrels and offload time takes anywhere from 4-10 hours depending on the volume of the barge.

Barge and Tug Operators

The U.S. Institute for Water Resources of the Army Corps of Engineers 2009 report *Waterborne Transportation Lines of the United States* identified two barge and tug operators located in the study region: Eastern Shore Holdings, LLC and Wicomico County Roads Division. According to the report the Eastern Shore Holdings, LLC operates one dry open barge while Wicomico County Roads Division has 2 specialized carriers for passengers and automobiles. No tug boat operators have expressed a concern for mobility along the river.

Waterway Dredged Spoils Disposal Locations

To maintain the navigability of the waterways, they must be dredged periodically. The spoils from the dredging process must be disposed off. Currently, there are three existing dredged spoils location sites for the Wicomico River: Sharps Point, Sims Point, and White Haven. Table 4 below provides additional information about the established sites.

Table 4. Established Spoils Disposal Locations	
Name	Description
Sharps Point DMP	An existing site for dredging off the Upper Wicomico River, located on Sharps Point Road in Fruitland, Maryland. The facility handles silt.
Simms Wharf DMP	An existing site for dredging off the Middle Wicomico River, located on Cooper Road in Eden, Maryland. The facility handles silt.
White Haven DMP	An existing site for dredging off the Lower Wicomico River, located on White Haven Road. The facility handles silt.

When asked about future concerns along the local waterway Becky Robinson, Executive Director at DWTC, stated that Jim Grindle, Wicomico County Public Works Engineer, was at the forefront of this issue. In a conversation about the matter Mr. Grindle stated that the Wicomico River is sectioned off into two classifications; the upper part of the river and the lower part of the river. The river as a whole is dredged periodically every 2-3 years to maintain its 14 foot channel for transportation. Each section of the river is done separately throughout the year. The Upper River was recently dredged in July of 2010 and the Lower River dredging will soon begin.

According to Mr. Grindle, all three spoils disposal sites are experiencing capacity issues and he expressed a dire concern for resolving the situation. When interviewed about the dredge sites he stated there have been no new sites explored in the past one and a half years and that his efforts to find sites with prospective land owners have generated no new leads. He offered insightful knowledge on the possibility of exploring new spoil location sites and said that if no sites were found the Lower River could see freight movements crippled. Mr. Grindle also suggested that more research be done on dredged spoils relocation and on converting the spoils for alternative uses such as top soil.

Dredged Spoils Utilization

After Mr. Grindle expressed an interest in possible dredged spoil utilization as top soil, BEACON researched the issue to see if any local progress was being made in that area. Rich Whittecar from Old Dominion University and Charles Carter from Weanack Land LLP designed a case study for such a purpose with the Woodrow Wilson Bridge and placed the 500,000 cubic yards (CY) at Shirly Plantation in Weanack². Shirly Plantation is located along the James River where barges brought in the material to be spread out along the old gravel / sand mine. Each 30,000 CY barge shipment that came in would pull up along the river and be sampled to ensure the material didn't contain any trace amounts of outlawed contaminants. The following two pictures depict the site before and one year after being dewatered and oxidized, respectively.



Afterwards, compost was added to the test plots that were protected with containment dikes to discourage any leeching into the James River. Corn and wheat were then planted on the patches to establish a viability of the soil and its output per-acre. Production was above average according to the findings and they also estimated the probability of selling

the new top soil at \$10 per CY and backfilling



the plot.

Airway

The Salisbury-Ocean City: Wicomico Regional Airport is the only commercial airport within the study region and the second largest commercial airport in the State. The facility has approximately 123 aircraft including single and multi-engine planes, jets, helicopters, and ultralights. According to AirNav Data, the airport averaged 111 flights per day for a 12-month period ending on December 31, 2009.

The Salisbury-Ocean City: Wicomico Regional Airport is the only air cargo facility on the Lower Delmarva Peninsula that provides daily air cargo services. U.S. Airways Express and FedEx are the two companies that provide scheduled air cargo service at the airport. According to Terry Jones, Operations Supervisor of the airport, Fed Ex ships freight twice a day, five (5) days a week with its three (3) planes and two (2) tractor trailers.

The main product shipped into the airport via the roadway is fuel. Fuel is shipped into the airport twice a week with a total of 104 loads per week using 8,000 gallon tankers. Mr. Jones indicated that the roadway infrastructure to and from the airport was sufficient to meet the current projected near future needs of the airport.

² "Upland Dredge Spoil Utilization on Old Sand and Gravel Mines." Daniels, Lee W. Virginia Polytechnic and Institute and State University.
<http://www.cses.vt.edu/revegetation/Papers%20PDF/Weanack%20dredge%20spoil%20utilil.pdf>
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In 2010 the airport extended its primary runway to accommodate larger aircraft through a \$1.175 million grant from the U.S. Department of Transportation. This was the only planned expansion for the next ten (10) years. However, there is opportunity for the airport to expand in the upcoming years and the airport does have the easement (property rights) in place that will make expansion possible. Since 2007, passenger travel has been growing, according to Mr. Jones. Freight movement at the airport correlates with passenger traffic and is expected to continue increasing as well.

infrastructure and services of the Airport and is working with the county, state, and federal government to obtain funding commitments for this plan.

Aviation projects at the Salisbury - Ocean City: Wicomico Regional Airport are identified below in Table 5. The Wicomico County portion of these projects will be funded by Airport Revenue. More than 95 percent of the funding for these projects is expected to come from Federal and State sources.

Other future projects include adding radar to the control tower to increase safety of operations under all weather conditions. Additionally, the Wicomico Airport Commission has developed a plan for improving

Table 5. Aviation Improvements		
Facility	Description	Estimated Project Cost County/Federal and State
Runway 14-32 Extension	Phase 2	\$79
Taxiway E and Apron	Design and Reconstruction	\$113/\$4,166
Runway 5-23 and Taxiway B	Design and Reconstruction	\$168/\$6,573
T-Hanger Taxi-Lanes	Design and Reconstruction	\$88/\$3,442
Piedmont Hanger	Renovate Roof	\$470/\$0
T and Corporate Hanger	Renovations Phase 1 and 2	\$800/\$0
Air Carrier Apron	Design and Reconstruction	\$62/\$2,408
Acquire Land for Runway Protection Zone		\$12/\$449
Refurbish and Acquire Snow Removal Equipment		\$14/\$816
Construct Storage Building for Snow Removal Equipment		\$57/\$2,217
Total		\$1,863/\$20,071

Source: Wicomico County FY 2011-2015 Capital Improvements Program and FY 2012-2016 Capital Improvements Program.

Commodity Flow

Understanding where and by which mode (highway, railway, air, and water) commodities move, currently and under anticipated future conditions, is important to any coordinated freight planning effort. There are four types of commodity flows typically examined in goods movement analyses, which include inbound, outbound, internal, and through movements. Inbound movements are movements from any other U.S. Census Region, adjoining state, or other Maryland county to Wicomico County. Outbound movements are movements from Wicomico County to any other U.S. Census Region, adjoining state, or other Maryland county. Internal movements are movements with an origination and destination within Wicomico County. Through movements are movements with both origination and destination outside of Maryland that are routed through Maryland.

Based on Maryland Department of Transportation's TRANSEARCH database, in 2006, approximately 9.4 million short tons were moved locally by way of inbound, outbound, and internal freight movements. A majority of the tonnage, 69 percent, or about 6.5 million short tons, was moved inbound. Outbound and internal movements comprised 30 percent and 1 percent respectively. Freight movement into, out of, and within Wicomico County is projected to increase to 15.1 million short tons by 2035, representing a 61 percent increase from 2006. The breakdown of movement by direction is project to be roughly the same as in 2006 with slightly more, 4 percent, attributed to inbound movement and a total of 26 percent attributed to outbound and internal movement.

Mode Split

The TRANSEARCH data shows that trucks transport the majority of freight tonnage in Wicomico County for each of the different types of movement. In 2006, of the approximately 9.4 short tons of freight moved, 82 percent of the total tonnage was transported

by truck, 17.2 percent is transported by water, 0.6 percent is transported by rail, and less than one percent is transported by air.

By 2035, trucks are projected to transport approximately 85 percent of local freight movements. Of the remaining 15 percent it is projected that 14.5 percent will be transported by water while rail and air account for less than one percent combined.

Figure 1 Freight Mode Share in Wicomico County-2006
Inbound, Outbound, and Internal Short Tons

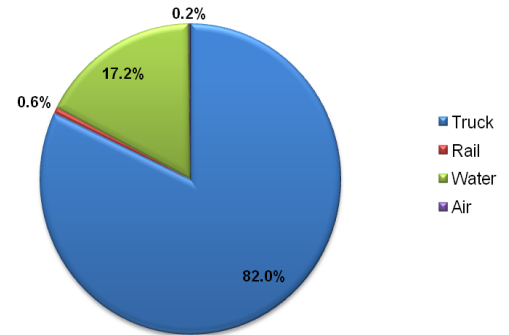
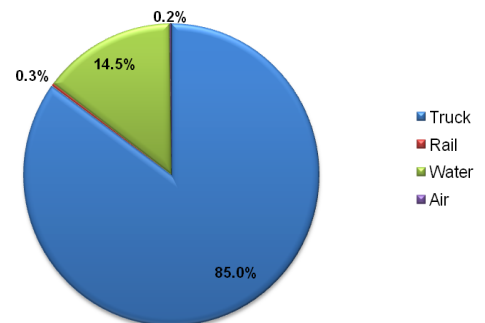


Figure 2 Freight Mode Share in Wicomico County-2035
Inbound, Outbound, and Internal Short Tons



In the future, the Salisbury/Wicomico MPO should promote strategies that increase the share of tonnage carried by water and rail modes to counter the increased use of trucks to transport freight. Support for intermodal freight movement is one way in which the Salisbury/Wicomico MPO can promote a more balanced freight transportation system. Intermodal connections and availability of multimodal freight transportation options in the study region are essential to providing

a comprehensive transportation system, especially one that seeks to minimize some of the negative/undesired impacts of truck freight transportation. For example, moving goods on a rail car or barge as opposed to a truck translates into less congestion on the roadway network and less pollution.

Top Commodities

The top five (5) commodities by tonnage in 2006 that moved into, out of, and within Wicomico County by truck, rail, and water included: Non-Metallic Minerals (17 percent); Petroleum or Coal Products (16.5 percent); Food or Kindred Products (12.1 percent); Lumber or Wood Products (11.2 percent); and Secondary Traffic (9.3 percent). Of the top five groups, Petroleum or Coal Products are almost exclusively an inbound commodity (99 percent of total moves by direction), primarily as waterborne commerce moving into the Port of Salisbury. In 2035, Secondary Traffic is projected as the top commodity, accounting for about 20 percent of total tonnage for inbound, outbound, and internal moves.

Freight Industry

The freight transportation industry and its effect on the economy go beyond the physical freight network and the goods that move along it. Many industries are heavily reliant on the freight transportation industry, particularly production and manufacturing industries.

Job Creation from Full Use of Industrial Zones

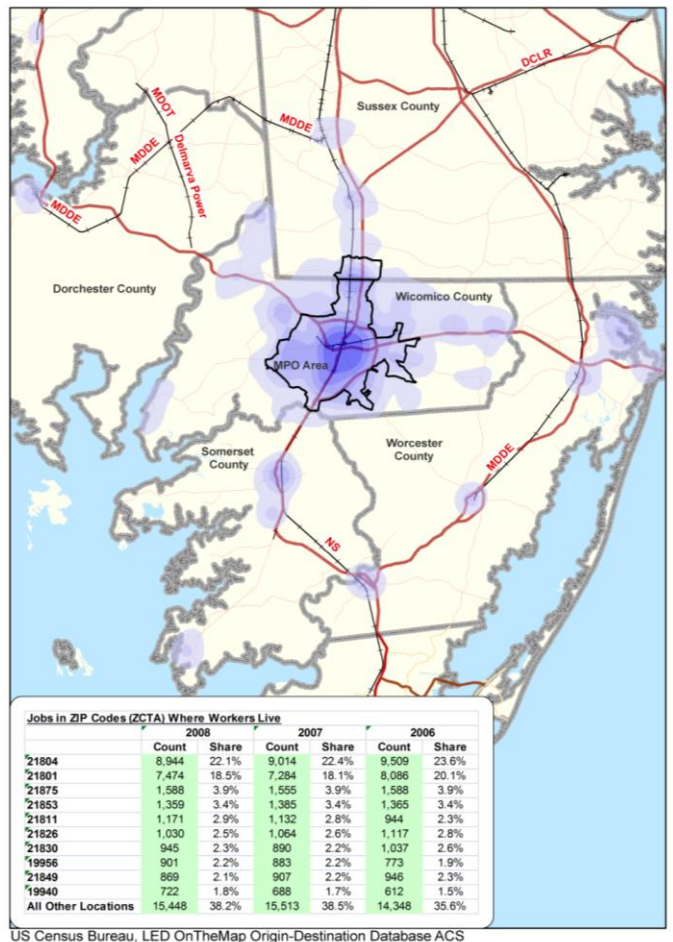
Based on current employment data for industrial zones, the expected job creation from the full use of industrial zones is estimated at the county level. This estimation is based on the total number of workers age 16+ for production occupations in 2010 by county and the total area identified as industrial zones compared to the portion of that area currently in use. In Wicomico County, it is estimated that in 2010 there were 2,513 people 16 years and older employed in production occupations. If

those areas designated as industrial zones within the county were fully utilized, it is estimated that the number of those age 16 years and older in production occupations would increase to 4,146.

Labor Shed Analysis

The table in Figure 1 below provides a breakdown of the workforce in Wicomico County for freight transportation related industries, the number of workers, and percentage of that workforce that resides in each of the zip codes in the county, and the number and percentage of workers that are coming from outside the county. In addition the following map presents this geographically.

Figure 1. Laborshed Analysis: Wicomico County 2006-2008



US Census Bureau, LED OnTheMap Origin-Destination Database ACS

Tourism and Freight Industries

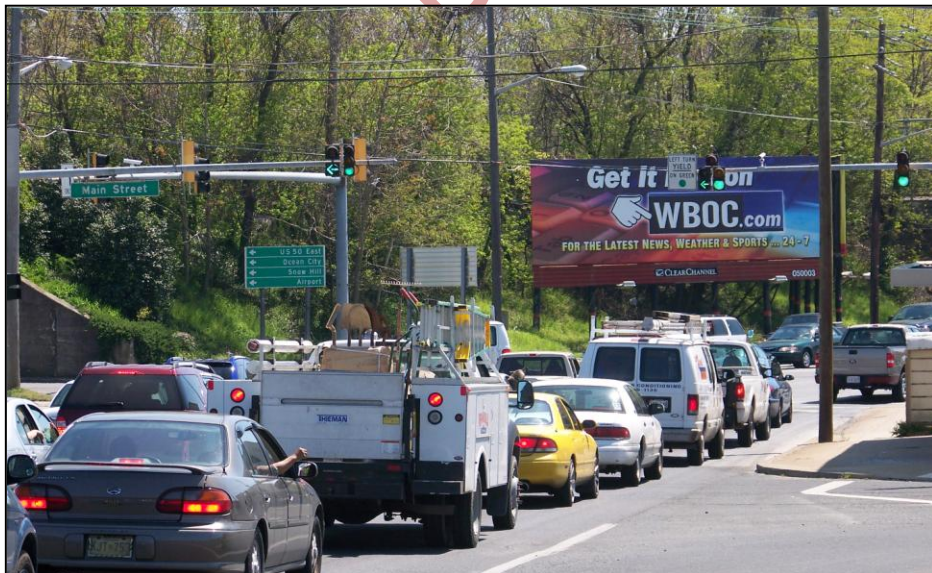
The tourism industry, particularly in areas that are seasonal recreation destinations, has a significant impact on the freight industries in those areas. The tourism industry impacts the freight industry in two main ways; seasonal fluctuations in population causes fluctuations in the amount of commodities needing to be transported to destination areas, and increases in seasonal traffic due to tourism can slow down the movement of freight, increasing the total transportation costs.

There are many causes to increasing congestion, and the problem of congestion is the result of a series of events. As the population of an area increases, especially when the population doubles or triples in a short amount of time, the amount of freight needing to be brought into the area to support the additional population increases. With the increase in population to the region, traffic congestion increases, and as the amount of freight being transported into the region rises, traffic congestion problems are compounded. In the study region, traffic is further increased during the tourism season due to seasonal increases in non-tourism related freight in commodities such as agricultural products that come into harvest during that time. Other less



critical factors that impact congestion more during the tourism seasons include increased traffic accidents and increased traffic stops, both of which further slow down traffic (AASHTO). Increased traffic congestion impacts all forms of truck freight movement through the area, including increased freight movement that is due to tourism, freight movement that is unrelated to tourism, and freight moving to, from, and through tourist destinations. Due to the fact that trucking is a critical piece in freight transportation by other modes, as it is the typical link for intermodal movements, the problems of congestion are not just felt in the trucking industry.

It is understood that tourism brings many positive economic impacts to the region;



however, tourism also affects the freight industry negatively in several ways. For one, the seasonal population of a region is not taken into consideration in the federal and state funding formulas for highway maintenance and repairs even though the increase in traffic poses a significant burden on the infrastructure. The increase in traffic congestion also creates a negative economic impact on businesses. In addition to longer travel times and increased costs, congestion also causes less reliable pick-up and

delivery times for truck operators, which can negatively impact the businesses relying on their deliveries. In 2007, the national average delay in hours per traveler was 51 hours in very large areas, 35 hours in large areas, 23 hours in medium areas, and 19 hours in small areas (Texas Transportation Institute, 2007). Depending on the product being transported, the additional cost to shippers and carriers due to increases in travel time can range from \$25 to \$200 per hour with an additional cost increase of 50 to 250 percent for unexpected delays. To counteract these problems, motor carriers may add vehicles and drivers and adjust their hours of operation to accommodate different shipping times, further exacerbating the cost increases due to delay (Cambridge Systematics, Inc. 2005). Increased congestion also affects the inventory businesses keep on hand. More congestion and less reliable deliveries requires more inventory to be kept on hand due to the delivery uncertainties, and keeping higher inventories increases costs (USDOT 2006). Increases in transportation costs are typically passed along to the businesses whether in part or in whole, who then passes these costs along to consumers in part or in whole. The higher costs being paid by business negatively impact their bottom line if they are unable to pass along the entire cost increase. If they are successful in passing along the entire transportation cost increase, it may cause their customer base to decrease as consumers search for lower priced alternatives.

Off-Peak Deliveries

In this analysis of off-peak shipping and receiving by truck, we examine both receivers (customers who are accepting the deliveries) and shippers (those companies that tender deliveries). We classify both companies that transport their own product and third party shipping companies as “shippers” (or carriers), and assume that, in general, behaviors will be the same

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for both types of shippers. It is important to note that this type of program will likely not work on the whole in the study region because of the local nature of the roads, and prohibitive rules and regulations.

Off-peak shipping and receiving offers several benefits, including reduced travel time, faster turn-around time, lower costs for shippers, and less congestion on the roads and bridges. The positive impacts of these practices on congestion can be even more critical during high tourism seasons when traffic and congestions are further increased. In particular, these practices can potentially help relieve congestion at chokepoints such as the Chesapeake Bay Bridge. Not all industries are appropriate candidates for off-peak shipping and receiving because of the nature of the products being shipped. In the study region one industry that may benefit from off-peak shipping and receiving is the poultry industry, particularly during the summer months when congestion that slows down delivery times can be detrimental to the freshness of product delivery.

There are several impediments to increasing such practices. The successful implementation of off-peak shipping and receiving relies heavily on the receiver’s willingness to accept off-peak deliveries (OPD). If shippers internalize the high productivity of OPD



benefits, the likelihood of implementation will be increased. Due to the nature of the logistics industry, shippers must be responsive to the needs of receivers, providing deliveries at the times the receivers require them. However, if the receivers are widely dispersed geographically, OPD will not be financially feasible for the shippers and thus will not be implemented. The receiver's willingness to accept OPD is directly related to the potential cost savings which can be accomplished by providing financial incentives to either the receivers, shippers, or some combination thereof.

There are several different approaches and policies that can be implemented to incite shippers and receivers to implement OPD. One approach is a "push" approach in which shippers entice their customers to receive OPD by passing along some of the cost savings. Various forms of financial incentives can be offered to one or both parties including tax incentives, financial rewards on a per mile basis, and toll savings. On the other hand, policies can be implemented to deter peak-time deliveries including time of day restrictions (it is important to note that restriction of truck activity on highways needs to be reconciled with federal prohibitions on restricting truck traffic except in certain circumstances-Seattle Urban Mobility Plan) and traffic mitigation fees or congestion charges.

Scenario Analysis-Changing Freight Network

The freight network and its individual components change over time. Each change affects the network, the users of the network, and the related industries in different ways. In this report several possible future scenarios are examined to better understand the different impacts of each. The following scenario analyses were developed for the Regional Freight Transportation Study. The results are presented in terms of the entire Delmarva Peninsula.

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The iDecide software is utilized for the scenario analysis (the iDecide models used, along with additional explanation about the assumptions for each model, can be found in Appendix D-Scenario Analyses iDecide Influence Diagrams), the IMPLAN software package is utilized for the economic impact estimations (more information regarding IMPLAN and definitions of economic impact terms can be found in Appendix B-Data Development Methodology), and many of the scenario analysis input factors, such as greenhouse gas emission rates by mode, fuel usage per ton-mile by mode, and average tons per mode shipment, were gathered from the 2009 Seneca Railport Tiger Grant Application. Where applicable, the greenhouse gases that are examined in this analysis are carbon dioxide (CO₂) and nitrogen oxide (NO_x), and pollution from particulate matter (PM). Economic impact estimations calculate the economic impact of the mode of freight transportation but do not include the impacts from factors such as changes in travel time, reliability factors, and changes in transportation cost per mile. The difference in the economic impact from moving the same value of freight by different modes stems from the fact that every industry has its own set of multipliers that describe how money spent by that industry churns in the economy.

Rail Service South of Northeast Corridor

Rail service is a critical piece of the freight transportation network of the region. This scenario examines all rail service in the study region, which is south of the Northeast Corridor.

Results

If rail service south of the Northeast Corridor at Wilmington, Delaware was lost, the freight previously being transported by rail will most likely shift to truck transportation. The annual economic impact of this portion of rail service, as estimated by IMPLAN, is approximately

\$1.5 billion. The annual economic impact from the same value of freight being transported by truck is approximately \$1 billion. Assuming all freight that shifts from rail to truck stays in the study region, this impact would remain in the study region. The net effect of the shift in mode is an annual economic impact of negative \$475 million. By shifting the total rail freight tonnage (8,687,000 tons in 2010) to truck would lead to approximately 482,562 more truck shipments on the road. The net effect on greenhouse gas from the mode shift is an additional 316,110 tons of CO₂, a loss of 2,219 tons of NO_x, and an additional 46 tons of PM.

of the increase in truck freight movement is approximately \$45 million, resulting in a net annual economic impact of approximately \$15 million. Scenario 1 will likely result in the need for 6,151 additional railcar shipments. The shift to rail transportation would lead to approximately 6,590 additional tons of CO₂, 78 additional tons of NO_x, and 2.0 additional tons of PM. Scenario 2 would result in 30,750 additional truck shipments on the road. The shift to truck transportation would lead to approximately 10,645 additional tons of CO₂, 79 additional tons of NO_x, and 3.4 additional tons of PM.

Table 6. Summary of Pollution Effect

Type	Tons from Rail	Tons from Truck	Net Effect from Mode Shift (Tons)
CO ₂	20,860	336,970	316,110
NO _x	2,470	251	-2,219
PM	63	109	46

Bay Coast Railroad Car Barge

The value of the Bay Coast Railroad car barge is due to its connection of the region to the rest of Virginia. It can be assumed that if this operation ceased, the freight previously transported via the rail car barge will either be rerouted via the railroad or shifted to truck, which would likely travel to and from Virginia via the Chesapeake Bay Bridge-Tunnel. Based on information provided by Bay Coast Railroad, the rail car barge was recently out of commission and the short term solution was to reroute railcars. A long term business solution to be implemented if the rail car barge were to be permanently out of commission is yet to be decided. However, the regional negative impact of such an outcome means that a public dialog might be a better path to resolving this issue.

Barge Service

This scenario examines what would happen if there was no barge service to the area. Two different outcomes for this scenario are examined here. The two scenarios are as follows:

- Scenario 1: all barge freight shifting to rail
- Scenario 2: all barge freight shifting to truck

Results

As determined using IMPLAN, the annual economic impact of barge service to the region is approximately \$31 million. Under Scenario 1, in which all barge freight movement is shifted to rail, the annual economic impact of the increase in rail freight movement is approximately \$45 million, resulting in an estimated net annual economic impact of approximately \$14 million. Under Scenario 2, in which all barge freight movement is shifted to truck, the estimated annual economic impact

The iDecide results show the possible maximum effects if all freight currently utilizing the rail car barge was shifted to truck. It is recognized that some unknown combination of rerouting and mode shift is likely, which would lead to a percentage of the maximum effects being realized.

Trucks would have to travel approximately 37 miles between the origin and destination of the rail car barge (Cape Charles, VA to Norfolk, VA). Estimates for the number of rail cars

being transported via the rail car barge are based on 2007 numbers. The value of the current rail car barge operations is estimated using an average of 90 tons per rail car and an average value per ton of freight transported via rail in the region.

The effect of restrictions on trucks traveling via the Chesapeake Bay Bridge-Tunnel rather than the rail car barge is not considered because the exact specifications of the freight being transported are unknown. Additional drayage costs are not considered here.

Results

The annual economic impact of the rail car barge service, as estimated by IMPLAN, is approximately \$4 million. The annual economic impact from the same value of freight being transported by truck is approximately \$6 million. The net effect of the shift in mode is a positive annual economic impact of approximately \$2 million. Results of the scenario analysis show that at maximum mode shift to truck, approximately 720 additional truck shipments would be on the road. The pollution effect would be approximately 80 tons of additional CO₂, an additional .60 tons NO_x, and an additional 58 pounds of additional PM. Fuel consumed by the additional trucks on the road is estimated to be approximately 28.3 million gallons.

Norfolk Southern Harrington-South Line

The necessary data for building a scenario model for this line was not available, partially due to proprietary reasons and partially due to issues with data collection, data frequency, data units, and data reporting at the local level. However, information gathered from a series of conversations with stakeholders allows for the diagnosis of the problem and for the development of a potential solution.

As a for-profit entity, Norfolk Southern has to balance the required investment in a line with

the expected return on that investment from the operations on that line. The metrics are easily expressed in dollars and cents. On the other hand, public service value to the region cannot be easily expressed monetarily.

The viability of shippers and receivers depending on the Harrington-South line to transport their inputs and outputs within a range of affordability is frequently at stake in these scenarios. Such viability issues bring a loss-of-workforce threats and regional economic impact fears. As a result, the Harrington-South line is more valuable to the shippers and receivers than it is to Norfolk Southern as the operator of the line.

A purely economic solution would spread the cost of necessary investments of such key infrastructure elements over a broader coalition of beneficiaries, including the shippers and receivers, state and local governments.

In the policy realm, these solutions are not so easy to develop and implement. There is a need for maintaining such lines and even for improving them to handle faster and heavier traffic. The economic versus policy dilemma is explored further in the policy implications section of this report under number 2: Railroad Maintenance Issues, with a recommendation for separating the ownership and maintenance of the tracks from the operation of the trains.

Impact of Fuel Price Fluctuation on Various Modes

An iDecide Scenario Analysis Model was developed to examine the impact of fuel price fluctuation on various modes. Two trip types were used for the analysis:

1. Long distance with off-Peninsula as origin or destination;
2. Short distance with entire trip on the Peninsula.

The model showed no statistically meaningful change in mode choice or mode sensitivity on the short distance trips all the way up to the 95th percentile, using a price fluctuation range of minus 50 percent to plus 200 percent.

The main impact was seen to be present for the long distance trips with off-Peninsula origins or destinations. For these trips, using a price fluctuation range of minus 50 percent to plus 200 percent, the following impacts by mode were observed:

Barges:

Ninety percent of the scenario iterations showed no change in mode choice. This is probably due to the fact that a fuel price increase for barges would also be mirrored in the cost of fuel for rail and trucks. Maintaining the cost edge of water transport where it is a viable alternative. Mode sensitivity, however, is impacted at about plus 50 percent fuel price increase, at which point it is estimated that more than half of the users will cease to use the mode. Results indicate that certain users with low operating margins may cease to operate on the Delmarva Peninsula or seek business model changes because they could not absorb higher transport costs.

Rail:

Eighty-five percent of the scenario iterations showed no change in mode choice. Mode choice for rail on the Delmarva Peninsula is determined primarily on the basis of availability of service and type of freight. For a majority of users, switching to barge is not an option, and switching to trucks is cost prohibitive. Also, since any price fluctuation would not be mode-specific, the relative advantage of the modes would remain largely unchanged. Mode sensitivity here was impacted at about plus 100 percent fuel price increase, at which point it is estimated that more than half of the users will cease to use the mode.

Results indicate that certain users with low operating margins may cease to operate on the Delmarva Peninsula or seek business model changes because they could not absorb higher transport costs.

Truck:

Ninety percent (90 percent) of the scenario iterations for fuel price fluctuations for users of trucks showed no change in mode choice. It is assumed that the mode choice for a majority of users is made on the basis of service characteristics based on the demand parameters, delivery time, and size of shipments. The price fluctuations of minus 50 percent to plus 200 percent are not sufficient to overcome these delimiters of choice.

Mode sensitivity here is impacted at about plus 200 percent fuel price increase. It is estimated that pervasive price fluctuations would be national in scope, and that demand and pricing equations would shift throughout the supply chain to accommodate such fluctuations giving a certain level of tolerance to users of these services in the long-run. The model is inadequate in estimating the short-term impacts as the broader economic systems are moving toward equilibrium. It is assumed that about 25 percent to 33 percent of the users may have to face temporary or permanent business model changes during the transition period depending on how long it would take to transition from national price volatility back to equilibrium.

Waterway Dredging

An analysis of waterway dredging for water transport on the Delmarva Peninsula shows that the current infrastructure will not be able to handle the removal of key water transport corridors on the Wicomico and Nanticoke Rivers if dredging options are further restricted by the U.S. Army Corps of Engineers.

Based on data from a 2005 study (updated in 2008) conducted by BEACON for the Delmarva Water Transport Committee, the following assumptions were used in this analysis:

A barge has the capacity of 1,500 to 3,000 tons; 62,500 bushels, or 453,500 gallons of product. This translates into 50 to 100 truckloads depending on the density of the cargo and the configuration of the truck. From a cost perspective, barge rates are about 50 percent lower than rail and nearly 95 percent lower than truck rates.

The analysis yields a barge replacement number of over 50,000 trucks per year. However, since the products that are barged into and out of the Delmarva Peninsula's are currently distributed over short distances predominantly by truck, this is not a net replacement. The net impact is on where the traffic shifts. These trucks would be further congesting the bottlenecks of the main arteries instead of traveling to and from node points to the barge terminals that serve as hubs.

In terms of cost, the loss of barge traffic would result in heavy economic burdens. This heavy economic burden would cause certain business and agricultural operations that currently operate on thin margins to cease operations or depart the Peninsula, adding over 95 cents to the price of a gallon of gasoline sold on the Delmarva Peninsula, and increasing the cost of a pound of processed poultry products by seven to 12 cents, which is more than double the current gross margin in that industry. All dredging decisions by the U.S. Army Corps of Engineers are made on the basis of current economic values and not on future changes. The removal of opportunity costs and potential economic development scenarios from the decision process results in a public policy dilemma. Decisions that are supposed to be made on the basis of full public utility may lead to unintended societal costs.

One potential solution to this problem is the sharing of some of the costs of dredging by

local and regional stakeholders maybe in the form of a regional authority and a regional fee/surcharge system distributed across a wider range of supply chain and end user stakeholders. While such a change may be seen as an unsupportable burden for local jurisdictions and supply chain members, the macro level regional benefits and opportunity costs necessitate a different way of approaching the problem. A series of regional and national dialogs need to be launched in order to keep the problem from getting worse.

Cape May – Lewes Ferry

The Cape May - Lewes Ferry currently provides minimal freight transportation services to the region. Based on information obtained from the Ferry operations department, it currently carries an average of one to two trucks per day. The commodity type and value of the freight being transported is not tracked, and trucks are charged solely on the truck's footprint. For those trucks that use the Ferry, the effect of the loss of the Ferry would be an increase in travel time. Because few trucks currently use the Ferry, the overall effect on traffic and congestion in the study region would be minimal. A summary of the effect on pollution and fuel consumption due to the disappearance of Ferry service is found in the following table.

These estimates assume that the one or two trucks use the Ferry every day, each hauling an average of 18 tons, would travel approximately 168 miles around the Delaware Bay if the Ferry did not exist.

Table 7. Loss of Ferry Service-Pollution and Fuel Effects

	1 Truck/Day	2 Trucks/Day
Additional CO ₂ (pounds)	411,150	822,301
Additional NO _x (pounds)	3,068	3,137
Additional PM (pounds)	132	265
Additional Fuel Consumed (gallons)	65,121,840	130,243,680

Although currently the number of trucks utilizing the Cape May - Lewes Ferry is low, it is important to examine the potential capacity of the ferry to transport freight. It is recommended that a study be conducted to determine the viability of freight carriers utilizing the Ferry as an effective option of moving freight, particularly in light of changing trends in passenger traffic on the Ferry.

As was mentioned throughout this report, the freight transportation infrastructure of the Delmarva Peninsula is subject to bottlenecks and vulnerable to disruption. There are few viable alternative routes and modes available to shippers in case their preferred route or mode becomes unavailable. As such, the value of the Cape May - Lewes Ferry should be examined not just as a convenient link between Delaware and New Jersey, but as an important link that enhances the freight system's resilience.

Policy Implications: Issues and Recommendations

The following issues and recommendations were developed throughout the Regional Freight Transportation Study. They are all included in this report because although not all directly involve the study region the issues and recommendations can, at least indirectly, involve or impact the study region.

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1. Regional Access

THE ISSUE: Currently, the entire freight system in the Delmarva Region, as part of the larger transportation network, is in a delicate balance with little resiliency. A major disruption at any point in the system, or a disruption elsewhere in proximity to the region for which this system must serve as a back-up, has the potential to cause segments of the system to have a significant loss of service. Access to the Delmarva Peninsula is naturally restricted by geography. A simple visual analysis of the maps generated for this report and an overview of the economic value of freight transportation into and out of the Delmarva Peninsula presented in the IMPLAN models developed for this study highlights the potential risk posed to the stability and reliability of freight transportation due to limited access.

The three most critical chokepoints are: to the west, the William Preston Lane Jr. Memorial Bay Bridge on Maryland State Route 50; to the south, the Chesapeake Bay Bridge-Tunnel on Virginia State Route 13; and also to the south, the rail car barge operation at the southerly tip of the peninsula. Alternatives to help relieve the chokepoints have been studied, including expanding capacity over the Chesapeake Bay and putting passenger and freight vehicle ferry operations into service. All of the partners



involved with this study agree that it is very clear that adding capacity in the form of an additional Chesapeake Bay crossing is neither feasible nor advisable. Similarly, a vehicle ferry service extending from the Eastern Shore of Maryland to Virginia has been shown to be financially and logistically impractical.

THE RECOMMENDATION:

Restricted geography, critical chokepoints, and continued population growth and development indicate that access will continue to be a challenge unless new alternatives are explored and implemented.

1) Alternatives to an expanded Chesapeake Bay crossing should be identified and forwarded in the planning process. These potential alternatives include: downstate rail as proposed in the Amtrak 2030 Master Plan; possible charter or transit bus opportunities (i.e. reduced-fare express bus to Ocean City), and marine highway barge service on the surrounding bays and waterways. It is important to note the Maryland Department of Transportation and Delaware Department of Transportation are working on the Amtrak Downstate Plan while also coordinating on freight rail opportunities.

2) Intermodal opportunities to reduce truck trips across the bridge must continue to be encouraged. Such opportunities will enable the study region's freight transportation to shift more tonnage to rail by providing for intermodal facilities as collector points for efficient rail access to the short lines and, ultimately, Norfolk Southern.

3) The possibility of a public-private partnership for the operation of a rail car barge should be explored. The viability for this model option is critical for access to the region – the societal benefits raise the value of the investment. Access to the region is limited, even when both barges are operational, analysis indicates that preserving the rail car barge operations is critical.

It is understood that these are politically and economically difficult discussions. However, to ensure continued freight operability and resiliency, detailed regional access planning is needed to prepare for continued freight service to the region, and such planning efforts will assist the stakeholders when they seek political support and funding assistance.

Sources:

- Another East-West Span over the Chesapeake Bay: *Task Force on Traffic Capacity across the Chesapeake Bay*, July 2006, Maryland Transportation Authority.
- Repair and Expansion of the Rail Car Barge:
<http://www.varail.com/baycoast.htm>
and
<http://www.railroad.net/forums/viewtopic.php?f=122&t=64962>.
- Fast Ferry for Cars and Trucks between the Eastern Shore of Maryland and Southern Maryland/Northern Virginia: *Chesapeake Bay, Cross-Bay Ferry Baseline Study*, PB Consult, Inc., 2007-2008, Maryland Department of Transportation.

2. Railroad Maintenance

THE ISSUE: Currently, the business case for maintaining a robust rail network on the Delmarva Peninsula is limited. On a company-by-company basis, the cost of maintenance and improvement is hard to justify economically. However, there are certain critical regional and national considerations that bring this issue away from the realm of corporate profits into the realm of serving the public's interest.

THE RECOMMENDATION: A partnership of federal, state, and local stakeholders should be utilized to designate critical rail corridors on the Delmarva Peninsula as common economic assets, and create a mechanism for funding

the maintenance of these assets. The operators of the trains would share in the cost of this, but a significant portion of the burden would be the responsibility of a wider coalition of stakeholders. The future of freight transportation by rail may depend on the development of a regional solution that separates the ownership and track maintenance responsibility from the operation of the trains.

To this effect, the Virginia Department of Rail and Public Transportation manages the Short line Railway Preservation and Development Fund which funds maintenance work on short line railroads in Virginia with about \$3,000,000 available as grant funds each year. The aim of this fund is to keep short line railroads operating at Federal Railroad Administration Class II track standards and to enable the businesses reliant on rail transportation to keep that mode option. As an example, Bay Coast Railroad recently finished a track maintenance project with monies from this fund, and is also using the fund to pay for 70 percent of the repairs to the rail car barge.

3. Issues Related to Seasonality

THE ISSUE: The Chesapeake Bay, the tidal wetlands, and the Atlantic Ocean make the Delmarva Peninsula an attractive travel destination to millions of residents from the Mid-Atlantic region. With a high-volume season (Memorial Day to Labor Day) and two shoulder seasons (April – May and September – October), freight transportation on the Delmarva Peninsula becomes subject to a series of bottlenecks on the major routes including Routes 50, 301, 13, 113, and 1. In an effort to mitigate the impacts on Route 1, Delaware is implementing a Corridor Capacity Program that restricts direct access to the non-freeway sections north of the resort areas, and the state is implementing a series of projects designed to facilitate the movement of traffic by replacing signaled intersections with grade separated intersections.

THE RECOMMENDATION: Delmarva stakeholders should consider options for toll charge differences combined with a more pervasive use of E-Z Pass on freight carriers in order to help alleviate peak congestion burdens and distribute traffic across times and peak seasonal dates. The concept of “congestion charges” is usually discussed in conjunction with densely populated urban corridors and zones. However, the impact of time-of-year seasonal pressures on limited transport corridors on the Delmarva Peninsula is no different than that of generic congestion in an urban zone during time-of-day segments. Density data suggests that there are multiple time segments that can be priced as preferential use times and dates for freight traffic. It is important to note, any future analysis of this recommendation should incorporate the impacts of tolling on low-income and elderly populations.

NOTE: If congestion pricing is evaluated further, certain critical questions would need to be addressed. Some of these questions and possible answers are presented below:

- **Who would be impacted?**
The objective of this recommendation would be to reduce commercial traffic on the main corridors during peak times of the high season for tourism and to provide tourist transit options. A beneficial impact would be that freight continues to flow efficiently during these times due to adjustments in schedules or decreased congestion due to transit options appealing to tourists that would normally drive to shore destinations. Shore businesses and residents would enjoy decreased congestion and continued or improved efficiencies for goods movement.
- **How would congestion pricing work?**
There are two options. One is through software changes to existing toll systems, and the other is through closed-circuit television camera capture of license plates

and after-the-fact billing. In both options, vehicles with three or more axles are charged a substantially different toll during the designated high traffic times. In some systems currently in use, the time bands are labeled as white, blue, orange, and red. White signifies low traffic times, and the lowest toll. The blue time band indicates two times the toll, orange indicates three times the toll, and red indicates five times the toll. The actual time bands and toll cost multipliers can be determined after a more detailed analysis is conducted.

- **When would tolls change?**

As was discussed above, the toll changes could coincide with pre-determined time bands, and/or they can be adjusted dynamically using traffic volume sensors in the roadbed. In this latter option, advance notice and alternate route information can be provided by traffic information radio systems and by dynamic message signs that are centrally controlled.

- **Which corridors would this apply to?**

In the short-term, the differential tolls can be piloted on the Maryland Route 50 corridor to Ocean City, using the toll booths and E-Z Pass lanes and dynamic message signs that are already established along Route 50. In the long-term, the three main corridors could be:

- Maryland Route 50 from Annapolis, MD to Ocean City, MD
- Delaware Route 1/Route 113 from New Castle County to the Beach Resorts
- Delaware, Maryland and Virginia Route 13 from Dover, DE to Cape Charles, VA

- **How would this impact freight costs?**

There will indeed be a cost impact (as intended) if commercial traffic chooses to use the high volume time bands. Even in the highest toll band, the toll should not add more than five percent to the total cost of freight movements on this route. A

more difficult cost to calculate would be the impact of the time shift on the shippers and receivers in terms of their labor scheduling to accommodate the different shipping and delivery times. This concept relies on the ability of stakeholders to quantify the time value of their shipments. They will then make the judgment calls necessary to decide whether they will use the higher cost time bands or shift the timing of their operations to the lowest cost band.

- **How would this impact tourism?**

Any initiative that would make the travel to the area's tourism destinations easier will have a beneficial impact. The benefits of traffic load management should far outweigh any inconveniences to shippers at the macro level.

- **Should the Differential Tolls be extended to all traffic?**

It is clear that in the long-run, global traffic shifts will need to be considered. This will mean the creation of incentives and disincentives to ALL traffic in the designated corridors to use more of the low density time bands and not use the high density time bands. Any additional revenues generated by these differential tolls can then be used to pay for the expansion of the hardware and software that make these active flow management activities possible.

4. National Security

THE ISSUE: The Delmarva Peninsula is part of the significant natural hinterland of the most critical political, economic, and demographic corridor in the United States. Any major disruption to the infrastructure at and around the I-95 corridor would adversely impact freight movement, particularly freight movement that is simply going through the region. An excessive overflow of all traffic would be seen on the Route 13/Route 1 corridor through Delaware, the Maryland Chesapeake Bay

Bridge/Route 50 corridor, and the Cape May – Lewes ferry operation. Furthermore, the single remaining operable rail car barge, at the mouth of the Chesapeake Bay, will be unable to sustain the increased volumes of freight traffic passing through the region. Freight movement on the Peninsula would be adversely impacted by any such disruption. Since the additional burden in such a scenario will come from pass-through freight and passenger traffic, the cost of any remedy needs to be borne by those users and not by freight or passenger traffic with an origin or a destination on the Peninsula.

THE RECOMMENDATION: Consideration should be given to the creation of a Delmarva Transportation – National Security Task Force with broad participation from the stakeholders and policy leadership circles. Many of these issues have been studied and discussed in various forums, but the results and recommendations remain in unconnected silos. In the absence of a unified plan, owned by the majority and accepted by all of the stakeholders, solutions will be elusive.

5. Data Collection and Analysis

THE ISSUE: The Delmarva Peninsula tends to operate as a relatively self-contained economic system. As a result of the jurisdictional patchwork associated with encompassing portions of three states, the system has to contend with different, and at times conflicting, sets of policies and procedures. This is also the case for freight transportation; data sources, data collection procedures, reporting units, report formats, and frequencies from each state are not always in sync.

THE RECOMMENDATION: A Delmarva Freight Transportation Data Convention and project will provide a forum to discuss the opportunities, as well as limitations, of the above mentioned challenges. A day-long conference followed by the creation of a study group or coalition can provide the oversight for

such a project. Subsequently, under the guidance of the key stakeholders, the coalition can develop a series of data collection, storage, and reporting guidelines for freight transportation on the Delmarva Peninsula. This coalition should identify the most important and actionable data needs, as well as the best approach to developing an appropriate data model and identify the responsible parties for maintaining the model. A follow-up conference would be an appropriate avenue to present the project findings and to ratify recommendations for further action at the various state and federal levels.

6. GIS and Dashboards

THE ISSUE: This study provides a preliminary investigation of how some Delmarva Peninsula-specific freight transportation policy analysis can be facilitated by GIS solutions and related executive dashboards. There is a need for a series of detailed regional GIS models and executive dashboards to facilitate solutions as discussed in policy issue number 5.

THE RECOMMENDATION: Include freight transportation GIS solutions and executive dashboards for the Delmarva Peninsula to the scope of work of the data collection project discussed in recommendation number 5.

7. Waterway Dredging

THE ISSUE: The freight transportation network on the Delmarva Peninsula does not have the capacity to accommodate the removal of key water transport corridors on the Wicomico and Nanticoke Rivers, which may occur if dredging options are further restricted by the Corps of Engineers. Dredging decisions by the Corps of Engineers are made on the basis of current economic value and not on future changes. The removal of opportunity costs and potential economic development scenarios from the decision process results in a public policy

dilemma. Decisions that are supposed to be made on the basis of full public utility may lead to unintended societal costs when the current constraints are left in place.

preserving and expanding the commercial and industrial base.

THE RECOMMENDATION: A quick resolution is not anticipated. An immediate action would be to convene a regional roundtable meeting with key stakeholders to develop a consensus on the proper definition of the nature and scope of the problem, and to create a small task force to explore potential solution strategies. One potential solution involves sharing some of the financial costs of dredging by local and regional stakeholders in the form of a regional authority and a regional fee/surcharge system. This distributes the cost of dredging across a wider range of supply chain and end user stakeholders, while relieving the burden for local jurisdictions and individual supply chain members.

8. Network Preservation

THE ISSUE: Preservation of the freight network is critical to the sustainability of the study region. With limited alternatives and several critical chokepoints, the connectivity of the network is in a delicate balance. Loss of any piece of the network would debilitate the network as a whole and negatively impact the region. The source of this problem is that freight-related projects have historically been evaluated within political jurisdictions, not on the basis of service to all of Delmarva.

THE RECOMMENDATION: Develop a process or structure to evaluate the Delmarva Peninsula's freight transportation network as a whole, regardless of geographic boundaries, specifically in terms of regional access, land use development, and resiliency. In regards to land use, it is important to strategically focus on retaining commercial or industrial zoned land in close proximity to the railroads and freight corridors in order to maintain freight transportation mobility and as a means of

Appendix A: Data Gap Analysis

Currently, one of the major data gaps identified during this study deals with air freight inventory. In trying to determine the service area of the airport freight operators, several data gathering issues arose. At the smaller airports, who reported shipping/receiving less than 10,000 pounds of freight annually, specific operators could not be identified. At this level of reported freight movement, any freight being moved was identified as an emergency need or special equipment shipment. For the airports shipping/receiving more than 10,000 pounds of freight, the major freight carriers were UPS and FedEx. These operators were unable to provide origin/destination information in order to define their typical freight service area. Both major freight carriers operate on a hub and spoke system. The UPS and FedEx regional air hubs that serve the entire study region are in Philadelphia, Pennsylvania. From interviews with the smaller local airports, it was assumed that all freight moved by UPS and FedEx comes from and goes to their respective hubs and continues on the end destinations.

It is recommended that a stakeholder group be organized to determine the most important and actionable data needs for planning and future study purposes. This group should also work together to determine the best approach to developing an appropriate data model and determine who should maintain such a model (i.e. counties, states, region, etc).

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Appendix B: Methodology

Industry Infrastructure Gap Analysis

The industry infrastructure Gap Analysis simply used Geographic Information Systems to calculate the distance to the nearest major infrastructure. Using the *NEAR* tool in ArcGIS 9.3x, we were able to calculate the distance from each area zoned *Industrial* on the Delmarva Peninsula and their Euclidean (straight line) distance to the nearest infrastructure (Non-Local roads, Rail, Ports). See the Data Sources table for metadata on those layers. Each Industrial polygon was assigned a distance in miles value and noted as to which type of infrastructure was closest. This data was summarized by type of infrastructure to show the average distance from each type of infrastructure and the maximum nearest distance by mode.

Full Use of Industrial Zones

The Full Use analysis is NOT a built out analysis but rather an estimate of potential employment if current industrial capacity was maximized at current rates. It is a cross section analysis considering the quantity of Total SQFT of Industrial Buildings for Wicomico County (Source: Maryland Property View). Then the Maryland Department of Business and Economic Development Buildings and Sites application was used to identify the current level of vacant Industrial facility space, giving us an estimate of the vacancy rate of Industrial buildings. The rate of occupancy along with the current employment levels of Production Occupations were used together to estimate the current capacity for industrial employment in the region.

Rail Inventory GIS Data Attribution

Generally speaking, GIS Data development was outside the scope of this project. For the rail inventory however, it served as the simplest method for capturing and storing needed information about the Rail lines. Rail lines were secured from Maryland and the polyline datasets were clipped to the region. Each line included different attributes, many of which were useless to this process or were incorrect owner/track operators for one. The key questions that were required about the rail system on Delmarva were as follows. Answers to these questions were found by calling each of the track operators individually. Several were partnering on this project and others were able to answer questions on a cold call. Norfolk Southern provided much of the information about Amtrak and CSX as they were not forthcoming.

- Double Track: Created a field in the GIS Database called DoubleTrack and it is assigned Yes or No. This is also identifiable by looking at the GIS line work itself from the states and seeing where multiple lines are drawn.
- Double Stack: Create a field in GIS Database called DoubleStack and it is assigned Yes or No.
- Sidings: Most of the region was deemed Single Track with Sidings and the sidings are visually identifiable in the GIS linework.
- Switching: Identifiable in the GIS linework.

- Bridges: The National Bridge Inventory layer is included with the deliverables and has been clipped to the region.
- 286 Rail: Created a field in the GIS database called Weight and assigned with the weight class.
- Rated at >25mph or <25mph: Created a field in the GIS Database called Class and assigned the FRA class rating to each track segment as defined by track owners. These ratings are federally mandated and have specific speed limitations.
- Number of Intermodal Facilities: The intermodal facilities information was taken from the National Transportation Atlas Database.

Zoning/Planning information

Per the June 7, 2010 meeting request to generate a Delmarva Zoning map, we gathered all of the County Zoning information from the County GIS Contact. Several municipalities provided us with an image snapshot of their current zoning which we then georeferenced (situated it in its real position on the surface of the earth). These are provided on the data CD.

IMPLAN

The IMPLAN software package (produced by the Minnesota IMPLAN Group, Inc.) was utilized to calculate all economic impact estimates. The IMPLAN model is based on Input-Output (IO) theory, for which Wassily Leontief was awarded the Nobel Prize in Economics in 1973. The IMPLAN model includes all economic effects when calculating total output/employment (this includes direct *plus* indirect *plus* induced impacts). Direct, indirect, and induced impacts are defined by the Minnesota IMPLAN Group, Inc. as follows. Direct impact is the impact created by the money from the defined activity entering the economy. The indirect impact is determined by the amount of the direct effect spent within the study region on supplies, services, labor, and taxes. The induced effect measures the money that is re-spent as a result of spending from the indirect effect. The total impact is a summation of the Direct, Indirect, and Induced impacts. The IMPLAN model is based on actual data for each of the study region counties from 2008 inflated to 2010 figures (or inflated to other years when appropriate). The principle advantage of the IO IMPLAN model is in its utilization of state and county-specific data. IMPLAN uses a combination of social account matrixes, regional multipliers, and trade flow models to estimate the economic impacts.

To estimate the economic impact of the various modes of freight transportation or of the freight movement between regions, the primary input utilized by IMPLAN is the value of the freight being transported. The value of the freight being transported is input into the industry spending patterns for the given transportation mode (i.e. rail, truck, barge, air, etc.). The industry spending pattern breaks down how each dollar spent by that industry flows and churns in the economy. Each industry has a unique spending pattern.

All economic impact estimates reported in this study are in 2010 dollars.

iDecide

The iDecide software package, developed by Decisive Tools, was utilized to run the various scenario analyses. iDecide is a software program designed for decision and risk analysis that allows the user to quickly build influence diagrams describing a given scenario. The iDecide software allows for the mixing and matching of several different variables with different viable ranges of values to plan for uncertainties. When the scenario analysis is run, iDecide uses a Monte Carlo Simulation, in which randomly selected viable values are used for every node (variable) in the model. Then iDecide's Monte Carlo simulation engine runs through the influence diagram and simulates all combinations of all the factors to determine the likelihood of each possible outcome. These simulations continue until an accurate representation of all possible combinations has been created. The result is a statistically accurate representation of the range and likelihood of all possible outcomes.

ESRI

The Business Analyst suite brings geography and business intelligence together, allowing users to view data in revealing geographic patterns that enable better decision making. ESRI's technology incorporates geographic location into viewing and analyzing business, demographic, and consumer spending data. ESRI provides demographic, segmentation, consumer spending, business, and census data to help in analyzing markets, profiling customers, evaluating competitors, and identifying opportunities.

A summary of the databases ESRI offers that were used for this study:

- Updated Demographic Data—ESRI's 2010/2015 Updated Demographics data includes more than 2,000 variables of current-year estimates and five-year projections.
- Census Data—Summary variables from Census 2000 and data from the 1990 Census in 2000 geography are available in two databases.

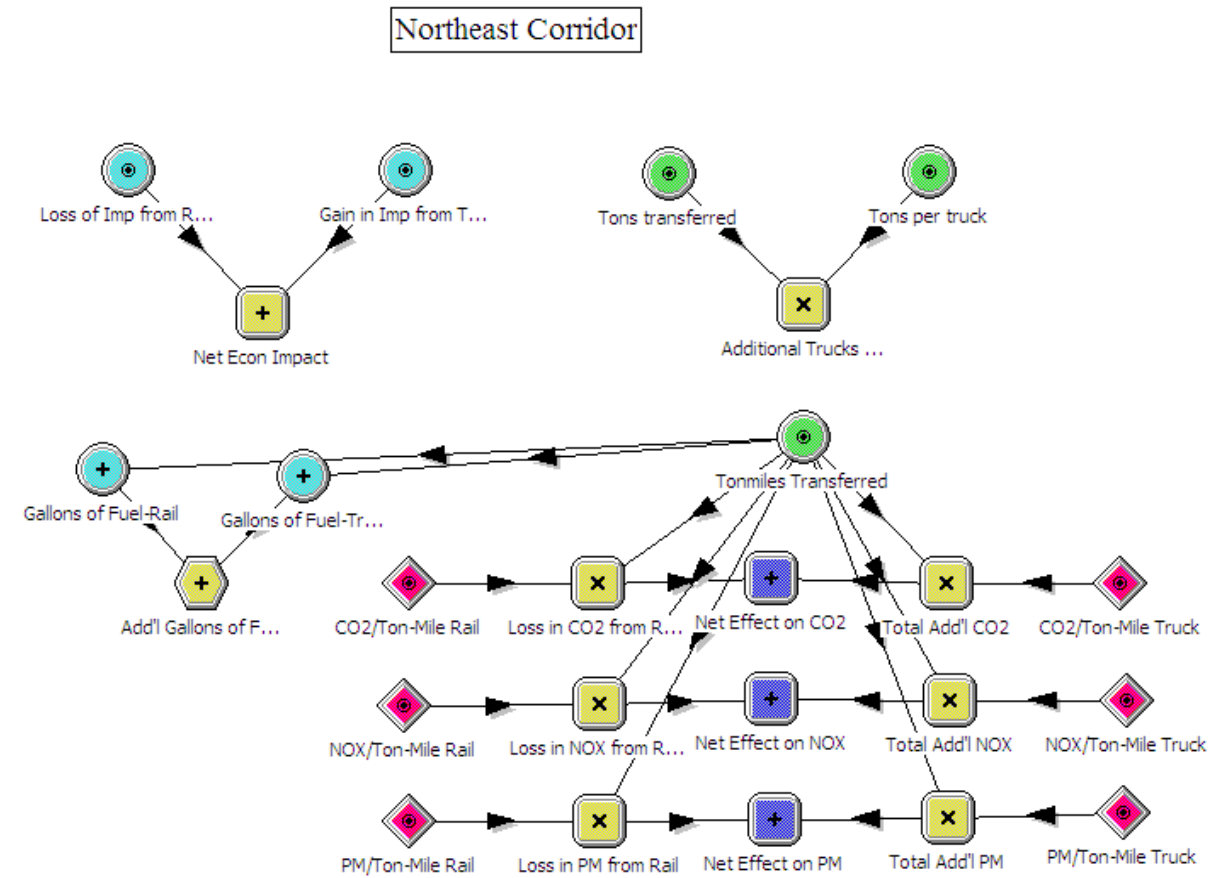
Business Data—ESRI also provides a variety of business data from industry-leading third party providers.

Appendix C: Freight Network Inventory (GIS Based)

- We have compiled many layers from the National Transportation Atlas Database 2009 and combined this with local research.
 - Rail double track, double stack, and sidings
 - All rail nodes and bridges are included here through the “National Bridge Inventory” (NBI Data)
 - Rail that is rated at 286 pounds and rail that is FRA Class 1 and FRA Class 2 or greater
- Also provided as an element of the Freight Inventory are:
 - Waterway terminals, docks, ports, and barge and tug operators.
 - Advertised and awarded waterway dredging contracts for FY 2009, FY 2010, and FY 2011
 - Established waterway dredged spoils disposal locations
 - Highway inventory that includes the National Highway System highways and connections, bridges, and intermodal connections.
- For land use planning and zoning, as seen in the zoning map, we have compiled a comprehensive zoning map of the entire Delmarva Peninsula. All 28 towns were contacted on the Eastern Shore of Virginia to attempt to obtain even the small village zoning. This effort was met with moderate success, as many have no electric (scanned or GIS) copy of the zoning map.
- Industrial-to-infrastructure gap analysis
- Sea Level Rise (SLR) GIS mapping for which Delaware and Maryland have each taken their own approach to SLR mapping. The map of SLR depicts the best analysis performed by each state. Though each is different, all demonstrate the vulnerable areas, and their relationship to transportation.
- Airports and runways have been identified
- Air Freight Service areas-data collection issues for this part are explained in the Data Gap Analysis section of the report
- Expected job creation from full use of industrial zones

Appendix D- Scenario Analysis iDecide Influence Diagrams

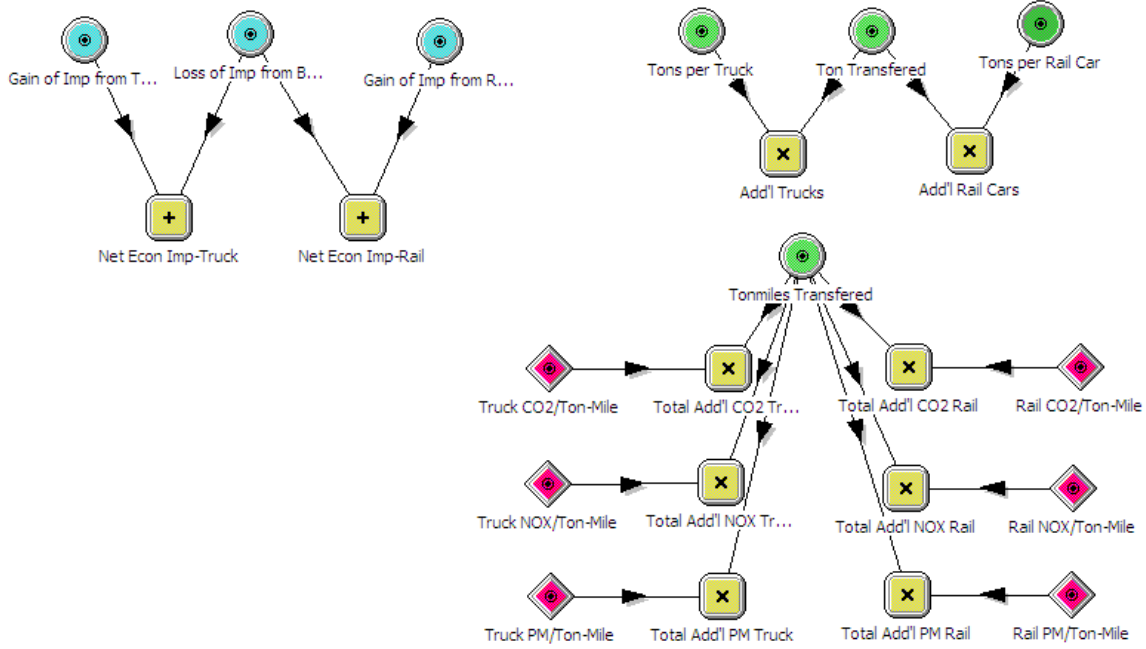
Rail Service South of Northeast Corridor



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Barge Service

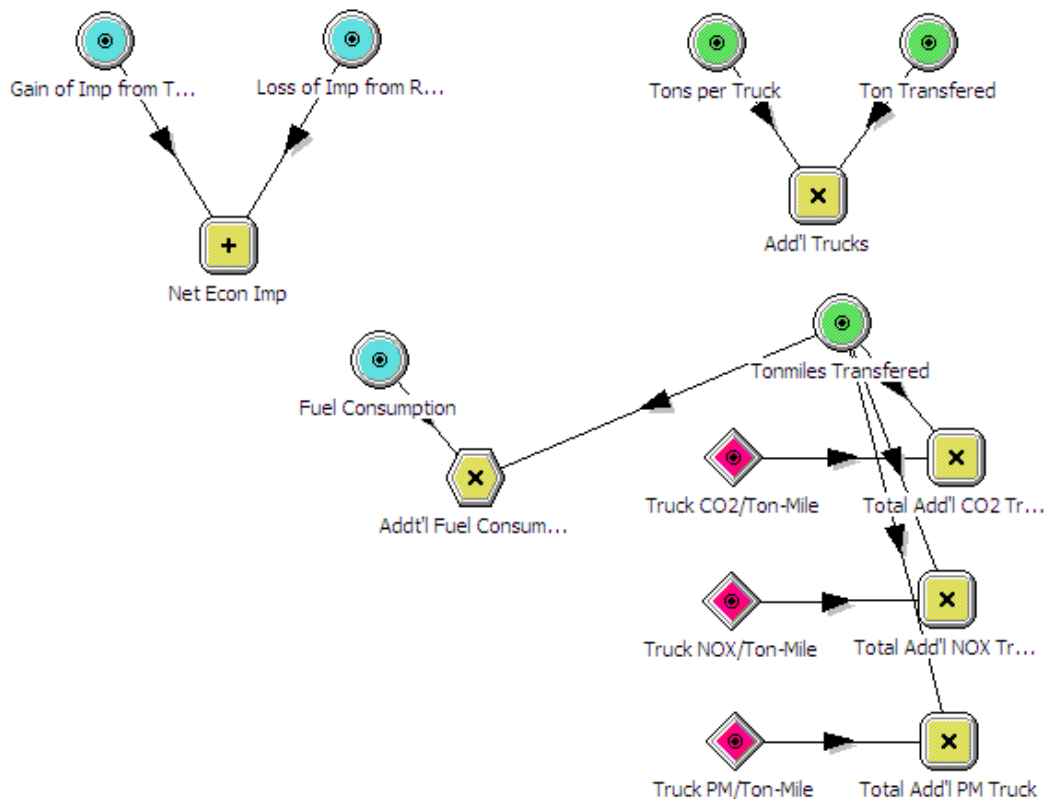
Barge Service



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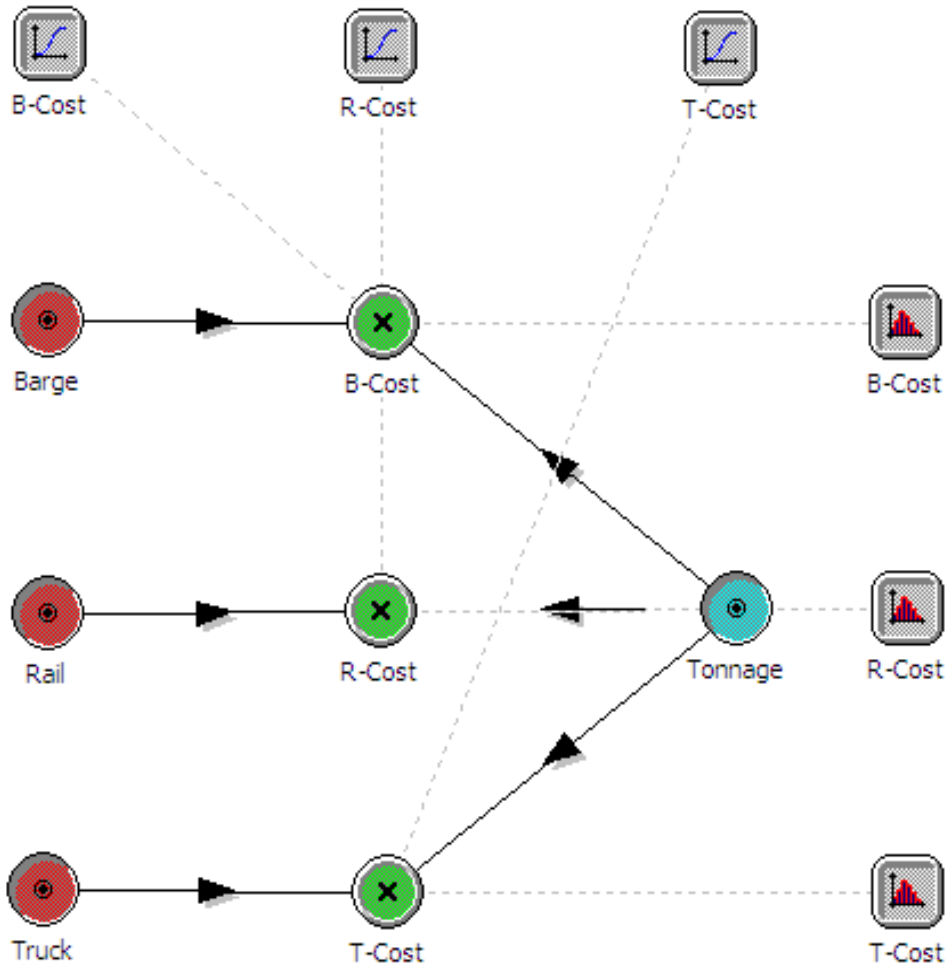
Bay Coast Railroad Car barge

Bay Coast Railroad Car Float



DK

Fuel Price Fluctuation



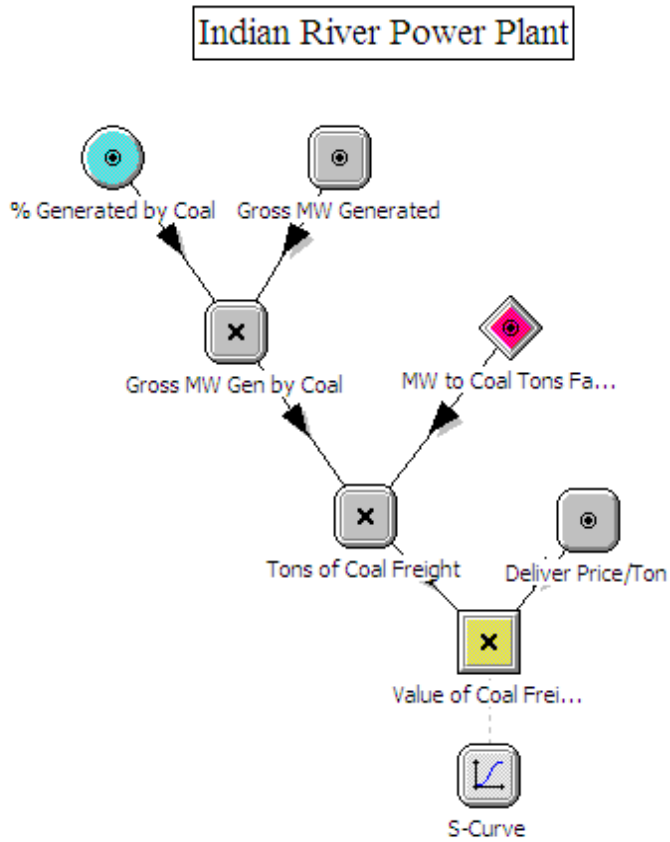


Table 42. Basic Statistics

Name	Minimum	Mean	Maximum
Value of Coal Freight	0	48,021,996.09	101,514,044.97
Deliver Price/Ton	79.9	93.77	105
Tons of Coal Freight	0	511,963.54	999,574.87
MW to Coal Tons Factor	1,351.00	1,351.00	1,351.00
Gross MW Gen by Coal	0	378.95	739.88
Gross MW Generated	740	740	740
% Generated by Coal	0	0.5	1

Wind Farms

Scenario 1

Currently the demand for power in Delmarva is higher than what can be supplied by power plants in the region. Therefore Delmarva must import power from outside the region. If all of the power to be supplied by the proposed wind farms is used to reduce the amount of power being imported to the region, there is no impact on freight transportation in the region (assuming all else is held constant and all existing power plants continue to produce at current levels with the same fuel sources). In 2009, approximately 75 percent of the power consumed in the region was imported from sources outside the region through the PJM market. Presumably, if any portion of the power from the wind farms was going to replace power being imported, 100 percent of the power from the wind farms would go toward filling this gap. This scenario is the most plausible of the three scenarios. Currently power generated in the region cannot meet the demand. As the population continues to increase and the area continues to develop the demand for power will also increase and new sources of power generation, such as wind farms, can help to mitigate this issue.

Scenario 2

Under this scenario it is assumed that the proposed wind farms will be replacing power that is currently being generated by existing power plants which mainly rely on coal or oil as a fuel source. If the replacement is maximized at the full 360 MW, approximately 486,360 less tons of coal and 639,059 fewer gallons of oil will be needed by existing plants. This is the equivalent of approximately 4,632 less railcar loads and 71 less truck loads moving on the freight network in the region annually (assuming that fuel is brought into the plant by 9,000 gallon capacity tanker trucks rather than smaller tankers, barge, or pipeline). The delivered price per short ton of coal for the South Atlantic region in 2008 was \$67.97 (U.S. EIA). Assuming the annual change of 17.4 percent from 2007-2008 holds true through 2010, the 2010 delivered price per short ton of coal would be approximately \$93.68. This equals a total value of \$45 Million in coal freight being lost. Assuming the average price for No. 2 fuel oil in the first quarter of 2010 is representative of the year, the price per gallon is approximately 225 cents, for a total value of \$1.4 Million in fuel oil no longer required by existing power plants. The loss of economic activity associated with this reduction in coal and fuel freight movement, as determined using IMPLAN, is approximately \$44.30 Million annually.

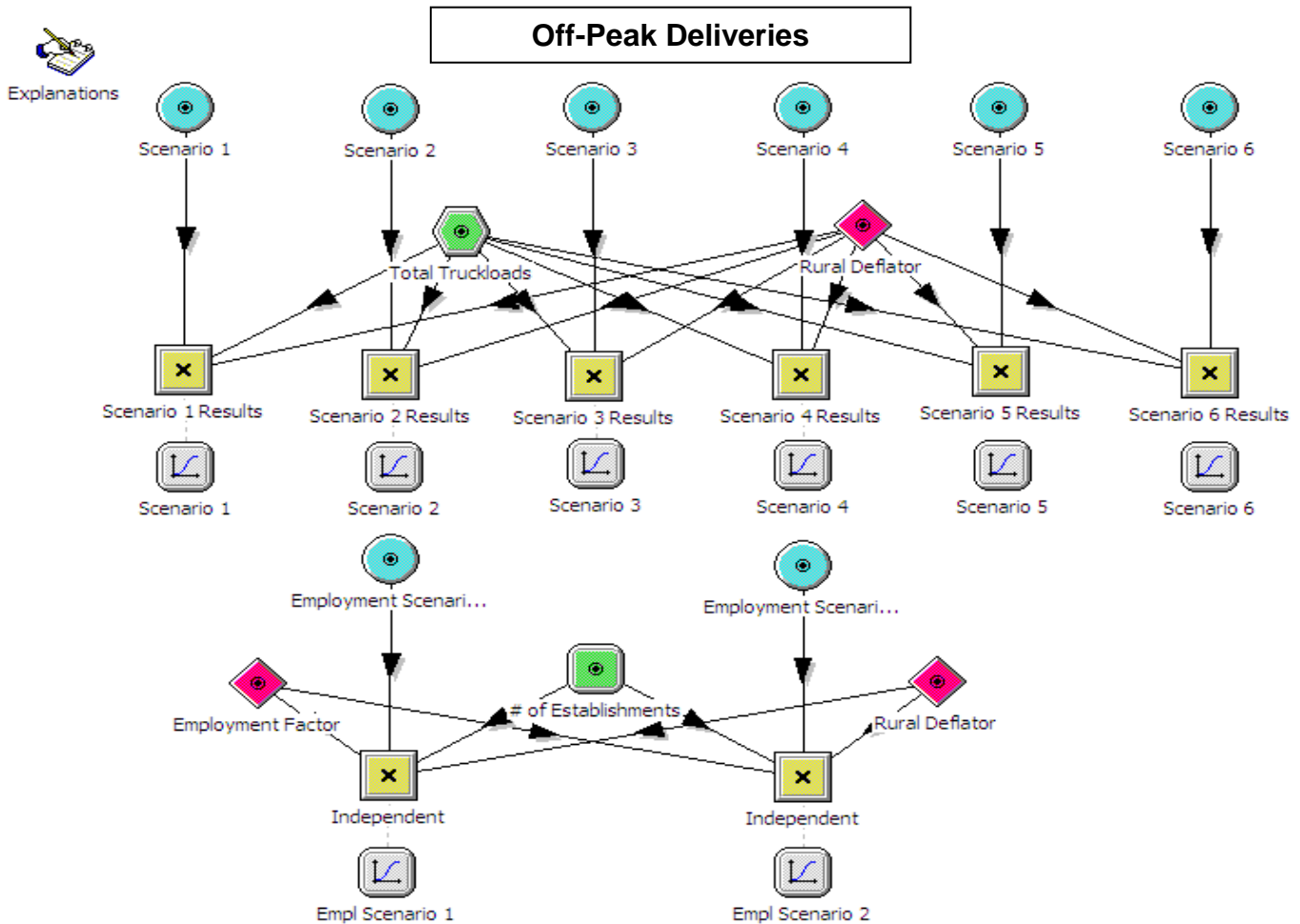
If this scenario were to happen several different effects would likely occur. First, congestion on the transportation network would be relieved, both on the road and railroad. On the railroad, the additional available capacity can be utilized by other industries that are encouraged to use rail to further reduce truck shipments and road congestion. If it becomes likely for this scenario to occur, it is recommended that the states aggressively pursue other potential rail customers to utilize the open capacity.

Scenario 3

This scenario assumes the power generated by the proposed wind farms will be an addition to the current power supply and will not replace any power source currently in use. Under this scenario, there is no impact on freight transportation in the region

(assuming all else is equal). Existing power plants will continue to produce the same amount of power using the same fuel sources and will not result in any changes to the amount of freight being moved on the region's network.

Off-Peak Deliveries



Assumptions

Based on the estimates of the study conducted by Holguin-Veras, et. al., in 2007 in the New York City metropolitan region the market share of OPD among carriers could reach as high as approximately 26 percent depending upon the combination of incentives implemented between both parties. This study assumes that the percentage of carriers likely to participate in OPD will be slightly lower than more congested areas due to factors such as daytime parking space issues, parking fines, etc.

The 2007 study conducted by Holguin-Veras, et. al is the basis for the model assumptions and the different scenarios considered.

This study examined the likelihood that receivers would request OPD under two different scenarios: tax deductions (between zero and 10 thousand dollars) and lower shipping costs (shipping cost differential between zero percent and 100 percent). Given the receivers OPD market shares as a function of these two scenarios carriers OPD market shares were calculated. Three different carrier scenarios were examined in combination with the two different receiver scenarios: no policy directed toward carriers, toll savings (ranging from zero to seven dollars per axle), and financial rewards (ranging from zero cents to seven cents per mile). The following table summarizes the receivers OPD market share ranges and the carriers OPD market share ranges (out of the number of establishments in the OPD sensitive industries) for the various scenarios.

Table 43. Joint Market Shares for Combined Scenarios				
	Receiver Scenario	Receivers (%)	Carrier Scenario	Receivers + Carriers (%)
1	Tax Deduction	4.09 to 22.76	No Carrier Policy	11.71 to 18.11
2	Tax Deduction	4.09 to 22.77	Toll Savings	11.71 to 22.14
3	Tax Deduction	4.09 to 22.78	Financial Rewards	11.71 to 21.02
4	Lower Shipping Cost	4.09 to 33.78	No Carrier Policy	11.71 to 21.69
5	Lower Shipping Cost	4.09 to 33.79	Toll Savings	11.71 to 26.11
6	Lower Shipping Cost	4.09 to 33.80	Financial Rewards	11.71 to 24.89

As stated previously, it is assumed that the percentage of carriers likely to participate in OPD will be slightly lower than in the more congested metropolitan areas. Then, for the model a factor of 10 to 30 percent was used to adjust the ranges for both receivers and carriers.

Potential OPD are only calculated as a percentage of inbound and domestic truckloads and for those industries identified as being sensitive to OPD.

It is also assumed that for each additional establishment implementing OPD 1 to 3 extra jobs will be needed (between some combination of shift employees, managers, security personnel, etc.).

Appendix E: Glossary

Average Annual Daily Truck Traffic (AADTT) - The total volume of truck traffic on a highway segment for one year, divided by the number of days in the year.

Barge - The cargo-carrying vessel that inland water carriers primarily use. Basic barges have open tops, but there are covered barges for both dry and liquid cargoes.

Capacity - The physical facilities, personnel and process available to meet the product of service needs of the customers. Capacity generally refers to the maximum output or producing ability of a machine, a person, a process, a factory, a product, or a service.

Carload - Quantity of freight (in tons) required to fill a railcar; amount normally required to qualify for a carload rate.

Carrier - A firm which transports goods or people via land, sea or air.

Certificated airport- An airport holding an operating certificate issued by the Federal Aviation Administration in accordance with Code of Federal Regulations (CFR) Title 14, Chapter 1, Part 139 allowing it to serve scheduled or unscheduled air carrier aircraft designed for more than 30 passengers.

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).

Inventory - The number of units and/or value of the stock of goods a company holds.

Just-in-time (JIT) – An element of a manufacturing or production process in which the inventory and materials handling of components is minimized by means of relying on the carefully scheduled arrival of components from suppliers.

Off-peak shipping and receiving – shipping and receiving that occurs at times other than peak traffic hours (typically off-peak hours are considered to be between 6PM and 6AM)

Rail Siding - A very short branch off a main railway line with only one point leading onto it. Sidings are used to allow faster trains to pass slower ones or to conduct maintenance.

Reliability - Refers to the degree of certainty and predictability in travel times on the transportation system. Reliable transportation systems offer some assurance of attaining a given destination within a reasonable range of an expected time. An unreliable transportation system is subject to unexpected delays, increasing costs for system users.

Seasonality - Repetitive pattern of demand from year to year (or other repeating time interval) with some periods considerably higher than others. Seasonality explains the fluctuation in demand for various recreational products, which are used during different seasons.

Shipper - Party that tenders goods for transportation.

Short ton - 2,000 pounds.

Transit time - The total time that elapses between a shipment's delivery and pickup.

Truckload (TL) – The quantity of freight necessary to qualify for a TL rate, normally in excess of 10,000 pounds. Truckload operations normally permit the bypassing of intermediate terminals.

Glossary Sources: FHWA: <http://ops.fhwa.dot.gov/freight/fpd/glossary/index.htm>; Delaware Freight and Goods Movement Plan: Technical Report. Delaware Department of Transportation, Division of Planning. June 2004; Delaware Transportation Profile. U.S. Department of Transportation, Bureau of Transportation Statistics.