

**Meeting the Transportation Challenges of the 21<sup>st</sup> Century:  
Intermodal Opportunities in the Appalachian Region**

**Intermodal Case Studies**

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## **CASE STUDIES OF INTERMODAL OPPORTUNITIES**

This report builds on the companion regional study of commodity movements within and between the Appalachian Region and the rest of the world by transportation mode to identify exemplary case studies of intermodal initiatives and opportunities in the Appalachian Region. The study team consulted closely with ARC staff to select these case studies; nevertheless the study team recognizes that these examples represent only a sampling of transportation opportunities within the Region. The case studies represent a range of examples, from projects that have already been implemented, to projects that are being planned, to project concepts that are still being evaluated. Taken together, however, these case studies provide concrete examples of how intermodal transportation infrastructure can strategically stimulate and support economic development in Appalachia.

## **Case Study 1: Trans Tennessee Railroad**

### **Concept**

The Trans-Tennessee Railroad presents a plan to create a major rail freight corridor connecting the Tennessee cities of Knoxville, Nashville, and Memphis. The plan would essentially create a direct rail corridor between the three cities that roughly parallels I-40 through the center of the state. There are essentially two distinct concepts for the development of this railroad, the lower-cost Basic Freight Rail Connection and the more ambitious Multi-state East-West Rail Connection. The stated objectives of each concept are similar, as are the means of achieving them.

The majority of the proposed corridor is comprised of existing track currently in use by either Norfolk Southern in the eastern section of the State or CSX in the central and western sections of the state. The completion of the Trans-Tennessee rail corridor is dependant on closing a gap in the existing rail line between Algood, Tennessee (approximately midway between Nashville and Knoxville along the I-40 corridor) and Oliver Springs, Tennessee (just west of Knoxville). This segment, when complete, will create a new cross-state rail corridor to achieve the following four primary goals:

- Relieve congestion on the I-40 corridor
- Introduce freight rail competition to middle-Tennessee
- Enhance freight rail service within the Appalachian Region
- Introduce passenger rail service between Memphis-Nashville-Knoxville

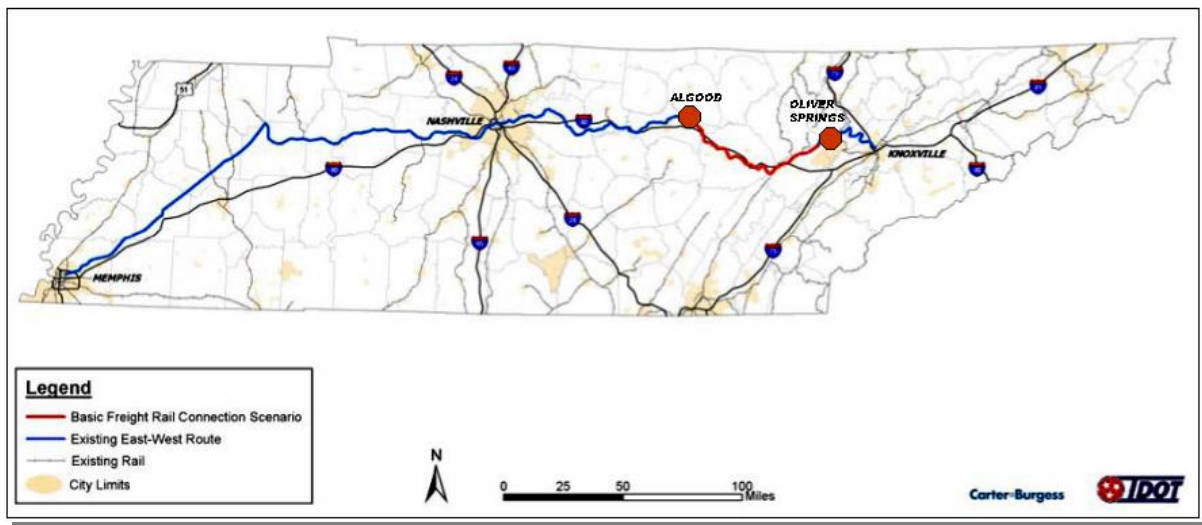
The low-cost Basic Freight Rail Connection scenario relies heavily on the rehabilitation of existing underutilized or abandoned right-of-way between Algood and Oliver Springs. The routing would follow I-40 through the communities of Algood, Monterey, Crossville, Crab Orchard, Rockwood, Harriman, Everton, Blair, Kelly Town and end in Oliver Springs. Exhibit 1-1 illustrates the proposed route with the new and rehabilitated track between Algood and Oliver Springs highlighted in red.

The cost estimate for the Basic Freight Rail Connection scenario is approximately \$118 million, or an average of \$1.4 million per mile. Though the strategy of existing track utilization serves to

minimize project cost, it is unable to offer the potential for high speed/high capacity operations. When compared to the Multi-State approach, this option will require multiple speed restrictions at numerous points along the line, increasing transit time and reducing its overall competitive potential.

The alternative Multi-State East-West Rail Connection scenario is a more ambitious concept on two important levels. First, this approach envisions a more direct, efficient and expensive connecting route between Algood and Oliver Springs and it expands the corridor's service, connectivity, and project coordination beyond the borders of Tennessee.

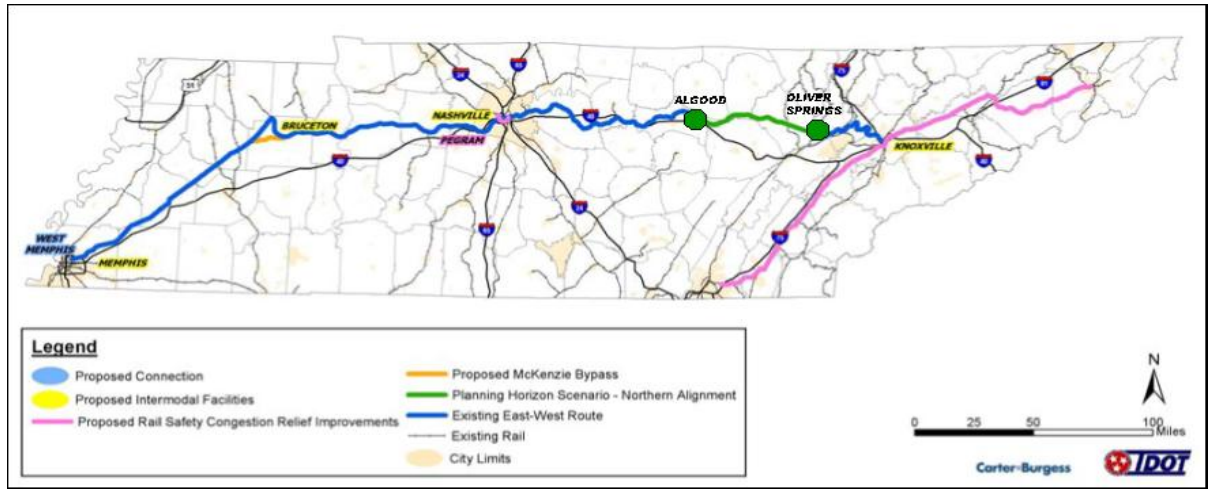
### Exhibit 1-1 Basic Freight Rail Connection



Source: Tennessee Department of Transportation, 2002 Tennessee Rail System Plan

To achieve its full potential in the 21st century, the speed of railways must be expedited and the distance traveled by their trains must be long enough to compensate for the time and cost of associated intermodal (truck-to-rail) transfers. The Multi-state East-West Rail Connection addresses both points – speed and distance. Exhibit 1-2 illustrates the shorter and more direct connection between Algood and Oliver Springs.

## Exhibit 1-2 Multi-state East-West Rail Connection



Source: Tennessee Department of Transportation, 2002 Tennessee Rail System Plan

Additional route adjustments and improvements (as identified in Exhibit 1-2) are planned near Bruceton and Pegram, further enhancing the speed and efficiency of the Multi-State approach.

The Multi-state East-West Rail Connection scenario positions the Trans-Tennessee Railroad as part of a larger, multi-state rail corridor offering service to east coast ports (Port of Norfolk), northeast rail gateways (Harrisburg, PA), the western rail gateway in Memphis, and Gulf coast ports (New Orleans, LA and Houston, TX). Development of the Trans-Tennessee Railroad could be completed in conjunction with I-81 corridor improvements from Knoxville to the Virginia border and in conjunction with corridor improvements in Virginia (see Exhibit 2, pink rail corridor line). Such a scenario would provide Tennessee and the southern Appalachian Region with improved access to the Port of Norfolk and other primary northeast destinations, via Harrisburg, PA. In addition, central and northern Appalachia will gain improved access to the western rail gateway in Memphis.

The increased scope, benefits, and efficiency of the Multi-state East-West Rail Connection can only be achieved through heightened investment. The high-speed connection between Algood and Oliver Springs needed to complete the Trans-Tennessee Railroad, coupled with the Bruceton and Pegram bypass and enhancement plans, will cost an estimated \$842 million. This amount

will cover completion of the Memphis-Nashville-Knoxville route. For rail connectivity to points north and east through Virginia, approximately \$399 million of additional improvements will be needed from Knoxville to the Virginia state line.

### **Progression**

In 1999, the U.S. Congress approved \$500,000 in funding to conduct a feasibility study for an east-west Trans-Tennessee railroad that would connect Memphis to Knoxville. From this initial study, the two scenarios described in the previous section were laid out -- essentially a low-cost option and a high performance option. As each scenario developed, it became clear that the Multi-state East-West Rail Connection offered important performance capabilities not found in the alternative Basic Freight Rail Connection Plan. As an added benefit, the Multi-state East-West Rail Connection features the development of a new system of passenger rail services linking Tennessee's three major population centers.

The 2002 Tennessee Rail System Plan examined both concepts in great detail using the State of Tennessee's Strategic Project Evaluation Protocols and Procedures that calculates a proposed project's cost-to-benefit ratio in dollar terms. Infrastructure needs and enhancements along each proposed route were identified and associated costs quantified to arrive at the projected project cost detailed in the previous section. The next step, key in both determining the overall effectiveness of each scenario and in assessing the cost-to-benefit ratio, was forecasting the level of truck traffic diversion from I-40 to the new Trans-Tennessee Railroad. The direct, high-speed routing and additional destinations to eastern ports and northeast rail gateways provides the Multi-state East-West Rail



Connection plan with a strong diversion advantage over the Basic Freight Rail Connection. Related financial benefits from truck-to-rail diversion, in terms of reduced shipping charges and

highway maintenance, congestion, and accident savings, also favor the Multi-state East-West Rail Connection.

Projected diversion and related economic benefits (i.e. quantified project benefits), coupled with the initial project capital costs, were computed to provide a Benefit to Cost Ratio over the anticipated 30-year useful life of the rail infrastructure. The Benefit to Cost Ratio, simply put, gives the dollar return (through savings or quantified efficiency gains) that can be expected over the project’s life for every dollar initially invested. Exhibit 1-3 provides a Benefit to Cost summary for both projects. Note that despite the Multi-state East-West Rail Connection’s much greater initial cost, its Benefit to Cost ratio is still greater. This analysis suggests that, dollar for dollar, the East-West Rail Connection will provide increased transportation and economic benefits (\$1.38 return for every dollar invested versus \$1.19 return on the Basic Freight Rail Connection).

**Exhibit 1-3  
Trans-Tennessee Railroad Scenario Comparison  
Benefit to Cost Summary**

	<b>Basic Freight Rail Connection</b>	<b>Multi-state East-West Rail Connection*</b>
Truck Traffic Reduction (2010 estimate)	33,089	223,465
Estimated Shipping and Highway Related Savings (2010 dollars)	9,036,000	116,325,000
Project Capital Cost (2002 dollars)	118,042,000	841,989,000
Benefit to Cost Ratio (over 30-years)	1.19	1.38

Source: Tennessee Department of Transportation, 2002 Tennessee Rail Plan

\* Assumes a conservative 10 percent truck-to-rail diversion rate.

The Multi-state East-West Rail Connection has been identified as an attractive development scenario, in terms of regional freight transportation benefits (versus intra-state only), benefit-to-

cost ratio, truck diversion, economic development opportunities, and potential intra-state passenger rail connectivity (Memphis-Nashville-Knoxville).

While the projected cost of the East-West Rail Connection option is the greatest obstacle to the plan's implementation, other project hurdles must also be addressed. The potential funding sources for the project have been identified as federal dollars, supplemented by state funding and railroad interests.

### **Regional Benefits**

Benefits from the Trans-Tennessee Railroad will be realized to the greatest extent by businesses within the Appalachian Region and those shipping goods through the Region. In addition to increased modal options, it is estimated that shipping freight via the Trans-Tennessee Railroad can reduce the current shipping costs by 20 percent.

Cost efficiencies would be realized by reductions in traffic congestion along the I-40 corridor in Tennessee and I-81 corridor in Virginia. The degree of such benefits is dependant on the actual level of truck to rail diversion. A reduction in truck traffic may also reduce the need or scope of the proposed widening of I-40, which is estimated to cost \$4.2 billion. If the Tran-Tennessee Railroad proves to divert a substantial amount of truck traffic, the need, scope and timing of the I-40 widening could be adjusted, thus diverting funds to other highway projects within the region.

To complement new rail operations, additional and/or expanded intermodal facilities will need to be constructed. It is anticipated that these facilities will be financed and built by railroad and local community interests associated with the new route. Such new intermodal facilities will create localized economic activity within the region through their construction and operation. In addition, these facilities can spur secondary economic development in the region by attracting freight intensive industry and ancillary transportation service providers to areas surrounding the intermodal facility.

Additional benefits to the Region (economic, environmental, and transportation oriented) as identified in the 2002 Tennessee Rail System Plan include the following:

- Reduced overall fuel consumption due to truck to rail diversion
- Reduction in highway maintenance costs
- Reduced motor vehicle accident, injury and fatality rate
- Potential for passenger rail operations (Memphis-Nashville-Knoxville)

### **Regional Intermodal Connectivity**

The Trans-Tennessee Railroad can increase the volume of intermodal truck-to-rail transfers at existing facilities along the I-40 corridor. Nashville will see the most dramatic spike in intermodal activity, if the Trans-Tennessee Railroad stimulates Class I rail competition as planned. Nashville is currently served by a single Class I railroad, CSX. With the completion of the East-West Rail Connection, and the associated access agreements for the new route, new service competition from Memphis to points east can be expected as the five Class I railroads operating in Memphis seek to feed their western gateway operations via the new route.

As discussed in the previous section, new intermodal facilities will be constructed in support of the Trans-Tennessee Railroad. The number and location of these facilities will be based upon which approach is ultimately chosen, the Multi-state East-West Rail Connection or the Basic Freight Rail Connection. The Basic Freight Rail Connection will serve intra-Tennessee freight markets, translating into a smaller catchment area and less freight volume for potential intermodal facilities. Greater opportunity for new and expanded intermodal facility development lies in the Multi-state East-West Rail Connection with its larger catchment area and higher projected truck-to-rail diversion. New and/or expanded intermodal facilities will be required at both Nashville and Knoxville along the I-40 corridor to handle increased volume, and a new facility is proposed at Kingsport in Northeast Tennessee along the I-81 corridor. Exhibit 1-4 lists ADHS corridor and interstate highway access in relation to the nearest Trans-Tennessee Railroad service points.

**Exhibit 1-4  
Trans-Tennessee Railroad  
ADHS and Interstate Corridors**

<b>Knoxville</b>	<b>Nashville</b>	<b>Memphis</b>
I-75 to Corridor F	I-40	I-40
I-40	I-24	I-55
I-81 to Corridor S	I-65	US 278
US 25W	Corridor J (SR-111)	

**Needs and Next Steps**

In order for development of the Trans-Tennessee Railroad to progress, the following four areas must be addressed:

- Project Scope – Concept Selection
- Coordination
- Funding
- Public-Private Cooperation

***Project Scope***

Proponents of the Trans-Tennessee Railroad must determine which of the two development alternatives is the most viable. Studies completed to date have indicated that the Multi-State East-West Connection offers the greatest benefits to the region, yet also demands significantly higher investment levels. It must be assessed whether the anticipated \$1.2 billion price tag for the East-West Connection concept will be too great an obstacle for the plan to proceed.

***Coordination***

Coordination of the project entails multiple local, state, and federal government agencies, private transportation interests, trade and industry organizations, and public/citizen involvement. Collaboration between stakeholders is essential to fully evaluate the various transportation development alternatives (such as planned I-40 improvements and Virginia’s I-81 corridor study).

Coordination of government agencies, particularly in a multi-jurisdictional, multi-state project such as this, will be key in developing the Trans-Tennessee Railroad into a seamless, regional freight transportation network. Federal government consultation and support is necessary to obtain necessary approval and funding for the rail improvements. In addition to attracting the support needed to secure funding from federal agencies, additional requirements, such as an environmental impact assessment, will be needed to move the project forward.

### ***Funding***

Identifying funding sources can be considered a subtask of the coordination process, though undoubtedly of critical importance to the project. Because federal investment will be critical to the success of the project, the importance of gaining U.S. DOT, Surface Transportation Board, and applicable rail authority support is critical. At least in the initial planning, design and environmental impact stages, the potential exists to combine the I-40 corridor and the Trans-Tennessee Railroad into a single corridor study under FHWA funding.

### ***Public-Private Cooperation***

Public-Private cooperation will prove critical in the development of the Trans-Tennessee Railroad. Funding, track access and agreements, and intermodal facility development are all issues that need to be negotiated and clarified. Large sections of the route may be owned and/or operated by different rail interests. Line maintenance agreements must be addressed, as well as new agreements for the potential launch of intercity rail passenger service along the new corridor.

It is anticipated that new expanded facilities will be needed to serve the increased traffic along the new route. The location, size, and financing of these facilities will need to be determined as project development advances. Cooperation with private rail interests in both the construction and operation phase of the Trans-Tennessee Railroad is essential to the success of the overall concept.

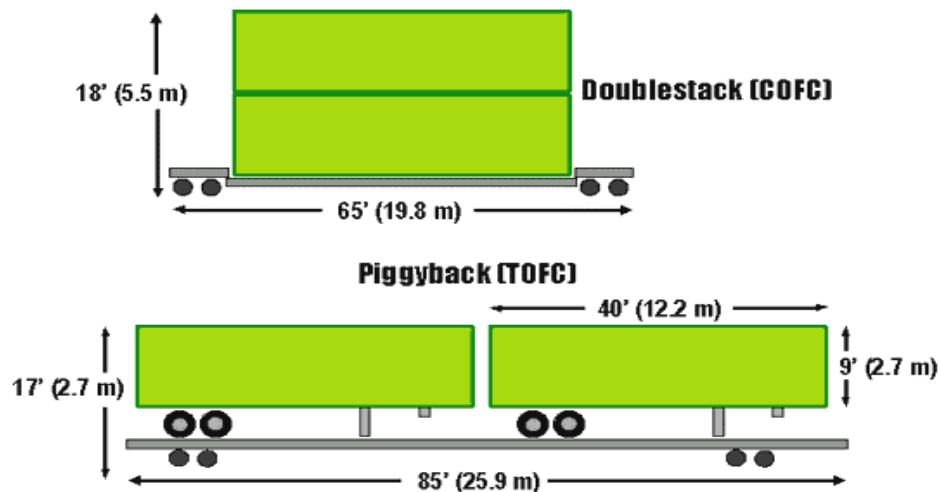
## Case Study 2: Central Corridor Doublestack and Prichard Intermodal Facility

### Concept

Doublestack container service (DS), or the rail transportation of intermodal freight containers, one stacked on top of the other, provides intermodal rail operators and users with increased efficiency and capacity. Simply put, DS container service allows a shorter train (length and number of cars) to carry more freight per run. Compared to Container-on-Flat Car (COFC) and Trailer-on-Flat Car (TOFC) container service, doublestack service saves much more convoy space than the COFC and TOFC (or piggyback) methods with the added advantage of not to have to carry a trailer.<sup>1</sup> Exhibit 2-1 illustrates the piggyback versus doublestack configuration.

### Exhibit 2-1

#### Doublestack versus Piggyback



Source: *Transportation*, Fourth Edition, Coyle, J.J., E.J. Bardi and R.A. Novack (1994), West Publishing Company, p. 262.

The evolution of the doublestack concept began in 1977 with the Southern Pacific Railroad and American Car and Foundry (ACF). By 1979, ACF had manufactured the initial series of DS flatcars that were put into service by the Southern Pacific Railroad. Throughout the 1980's, DS flatcar technology was improved, making the cars lighter in weight and more flexible, allowing

<sup>1</sup> *Transportation*, Fourth Edition, Coyle, J.J., E.J. Bardi and R.A. Novack (1994), West Publishing Company, p. 262.

them to carry a variety of container types and sizes. Throughout the 1980's and 1990's DS container service was widely expanded by virtually all major railroads due to the increased capacity and efficiency of operations they offered.<sup>2</sup>

However, certain railroad mainlines are not compatible with doublestack service because of the required height clearance for bridges and tunnels (20 feet). This restriction is particularly pronounced on the U.S. east coast where older bridges and tunnels present height limitations in the greatest numbers. Needless to say, converting a rail line to doublestack



capability can be a very expensive undertaking involving multiple infrastructure redesign and improvement efforts along the proposed DS rail corridor.

Creating doublestack capability along the Norfolk Southern (NS) route through the heart of Appalachia (connecting the Region to Columbus, Ohio and Norfolk, Virginia) will require a substantial investment to the railroad's infrastructure. Any investment aimed at providing DS capability for this corridor will undoubtedly strengthen the transportation infrastructure of the Region, while increasing the efficiency and capacity of area intermodal rail operators and businesses who increasingly rely on high speed/high efficiency access to markets worldwide.

### **Progression**

A preliminary study of doublestack service for the NS rail corridor entitled "Central Corridor Doublestack Initiative" was conducted by the Appalachian Transportation Institute and completed in March of 2003. The study offers a comprehensive overview of the challenges and

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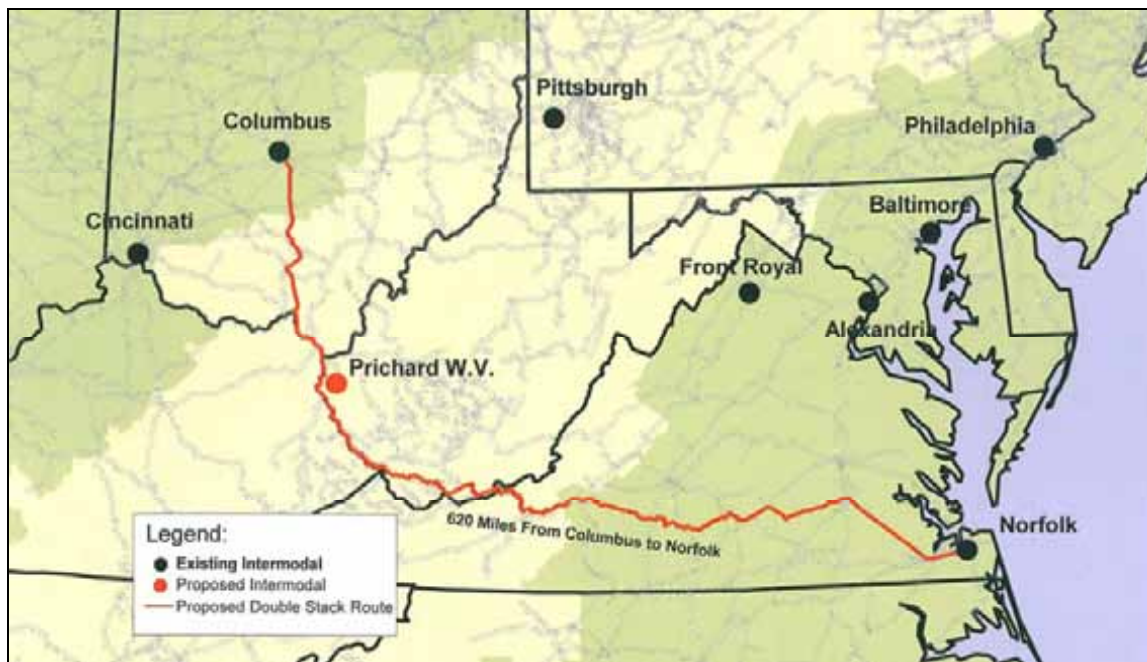
<sup>2</sup> *Intermodal Freight Transportation*, Fourth Edition, Gerhardt Muller (1999), Eno Transportation Foundation, Inc., p. 32

benefits of a doublestack capable rail route through the central Appalachian Region. The initial steps of the project are addressed, including route selection, obstruction/tunnel identification, regional intermodal terminal facilities (existing and needed), order-of-magnitude project costs, and regional transportation and economic benefits.

The proposed Central Corridor doublestack route, depicted in Exhibit 2-2, is deemed to be the most feasible in terms of route efficiency and required infrastructure improvements. Current NS doublestack services between Norfolk and Columbus require indirect routings that take DS trains either north through Harrisburg, PA or to the south through Knoxville, TN. These routings add an additional 36 hours of transit time to that of the proposed “Central Corridor” Norfolk-Columbus line, hurting both the competitiveness of the railway and its customers.

## Exhibit 2-2

### Proposed Norfolk-Columbus Doublestack Route



Along the proposed route, all physical obstructions and height restricted tunnels that prevent doublestack operations have been identified. These include approximately 25 obstructions such as slide fences, overhead wires and bridges, and 28 height-restricted tunnels totaling

approximately 25,000 to 30,000 feet in length. The majority of these modifications (both obstruction and tunnels) are located in West Virginia, with the remainder in Ohio, Virginia and Kentucky.

With the assistance of Norfolk Southern, preliminary order-of-magnitude cost estimates were prepared for enlarging height restricted tunnels and removal/mitigation of obstructions.

Addressing height restrictions at the 28 tunnels along the proposed route will represent the bulk of the expense, while eliminating the remaining obstructions will account for just 2.5 to 6 percent of the total project cost. Exhibit 2-3 summarizes the project cost estimates in terms of lower and upper estimate boundaries for both tunnels and obstructions. The difference between the lower and upper estimates are due to the varying methods of tunnel heightening that may be employed depending upon timing, speed and continuing operations issues that need to be addressed.

**Exhibit 2-3**  
**Norfolk-Columbus Doublestack Route**  
**Summary of Cost Estimates**  
**(in millions)**

<b>Cost Driver</b>	<b>Lower Boundry</b>	<b>Upper Boundry</b>
Tunnel	\$43.3	\$108.4
Obstructions	\$2.7	\$2.7
<b>Total</b>	<b>\$46.0</b>	<b>\$111.1</b>

Source: Central Corridor Doublestack Initiative, March 2003

Two factors must be considered when addressing the planned modifications to the Norfolk-Columbus route. First, the rail line must remain in operation for the entire duration of the construction/modification process. This factor will significantly add to the cost, complexity, and duration of the project. At the same time, all 25 obstructions and 28 tunnels must be addressed before the first doublestack train can utilize the route. A piecemeal approach to the construction of this project will protract the process and cost, while delaying the revenue generating and transportation/economic benefits to be derived from the project's completion.

## **Regional Benefits**

Benefits to the Appalachian Region from the proposed Central Corridor doublestack rail corridor would come in two forms; increased capacity and efficiency of intermodal freight movement through the Region and important new access to intermodal freight service for businesses located within the Region.

Estimates from the “Central Corridor Doublestack Initiative” study place the transportation cost benefits derived from the project at between 201 and 368 million dollars over a 20-year period (depending upon intermodal freight growth rates and development of the catchment area for the route). These savings will be achieved through increased capacity and expedited transit time, coupled with reduced reliance and/or distance of trucking operations.

Appalachia will achieve direct economic benefits, coupled with new access to intermodal services and efficiencies resulting from doublestack capability, only if a truck-to-rail intermodal facility along the proposed corridor is constructed. Norfolk Southern has agreed that as a part of the overall project, a truck-to-rail intermodal facility would be constructed in West Virginia. The search for potential site locations has centered on Prichard in Wayne County, West Virginia, though this site selection has yet to be formalized. It is estimated that approximately 11,000 containers annually will transit the West Virginia facility upon its opening. The anticipated benefits of offering competitive truck-to-rail services would extend to surrounding cities and towns in the Appalachian Region up to 100 miles distant, depending upon drayage costs and back-haul opportunities. The Prichard facility catchment area could include Ashton, Huntington, Ironton, Charleston, Williamson, Portsmouth, Logan, Morehead and Pikeville.<sup>3</sup>

## **Regional Intermodal Connectivity**

The proposed NS intermodal facility along the Central Corridor in West Virginia (tentatively located in Prichard, WV) will open important new intermodal access for business



<sup>3</sup> Central Corridor Doublestack Initiative, p. E-5 & E-10, March 2003

throughout the Region, improving their efficiency and competitiveness.

The “Central Corridor Doublestack Initiative” study has listed the following four factors bolstering Prichard as the logical site for this truck-to-rail intermodal facility:

1. NS ownership of much of the necessary property
2. Access to mainline track
3. Close proximity to I-64 and US-23 (Corridor B and B1 of the ADHS)
4. Limited number of nearby residential structures

Such a facility will provide the central Appalachian Region with direct east-west truck-to-rail intermodal connectivity, along with international sea connectivity via rail-to-ship transfers at the Port of Norfolk with new access to key Pacific Ports, as well.

### **Needs**

Funding for additional engineering studies and, eventually, construction/modification of the identified tunnel and obstruction constraints is the primary need for the Central Corridor doublestack concept. It is estimated that a full engineering study of the proposed route that addresses all tunnels and obstructions along the line will cost approximately four million dollars. From the findings of this detailed study, cost estimates for the construction/modification elements of the project can be refined, thus providing a more accurate overall cost estimate.

### **Next Steps**

Additional study, particularly on the engineering and construction aspects of the proposed route is the required next step. As previously mentioned, an additional engineering study would allow for more concise cost estimates along with scheduling requirements and project duration. In addition to an engineering study, the “Central Corridor Doublestack Initiative” study recommended the following next steps to the project’s Steering Committee members:

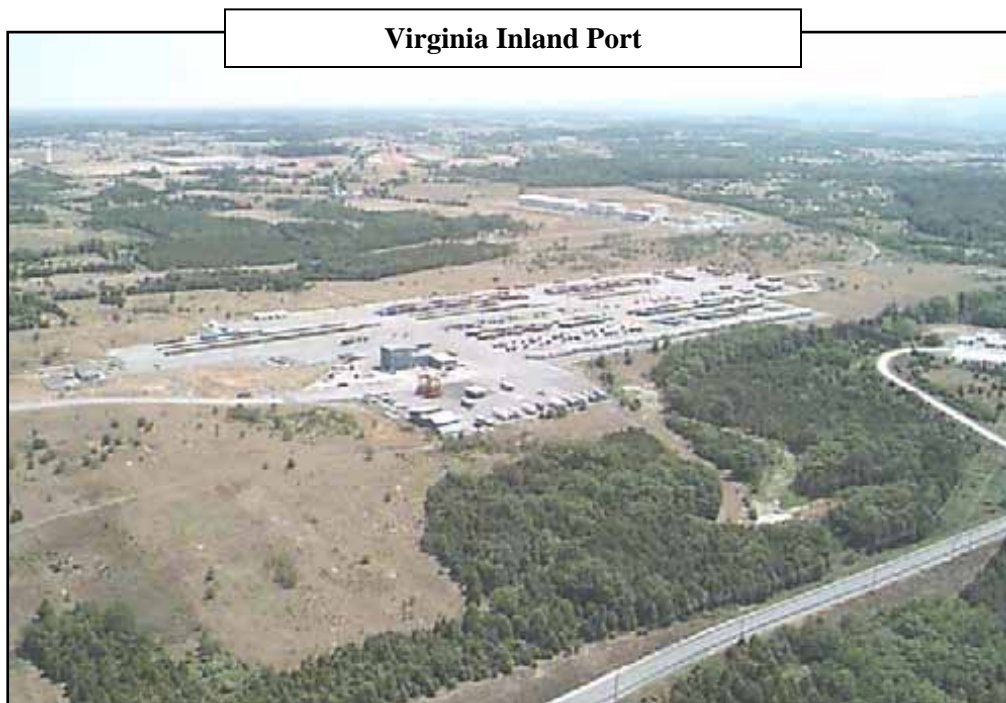
- Review the current study outcomes with their respective organizations and work to identify available funds that might be used to perform preliminary engineering tasks identified in the study (i.e., funds for the engineering study).

- Explore the processes for forming a multi-state compact and other necessary formal relationships (i.e., public-private partnerships) necessary to the further pursuit of the project.
- Designees of the Steering Committee should meet with federal Congressional leaders from Kentucky, Ohio, Virginia and West Virginia to educate and seek support for the project.
- Continue to refine estimates of costs and benefits of the project so that the decision making process is as informed as possible



Operated as an intermodal container transfer facility, the VIP provides a seamless interface between truck and rail for the transport of ocean-going containers to and from the Port of Virginia (Hampton Roads). The Virginia Inland Port is near Interstates I-81, I-66 (at Rt. 522 and Rt. 340) and ADHS Corridor H, on a highway corridor to the Northeast U.S. that is less congested than Interstate I-95 and strategically closer to the industrial Midwest.

Containers that arrive via ship at Hampton Roads are lifted by cranes onto railroad cars, and then carried by the Norfolk Southern railroad to the Shenandoah Valley. There the containers are lifted off the railroad cars and placed on the chassis of 18-wheeler trucks, which carry the load to the final destination. Obviously the railroad would like to carry the load all the way, but in many cases the Norfolk Southern does not serve the ultimate destination - and many facilities are not on a rail line.<sup>4</sup> Land is available at the VIP to steamship lines for container storage and ancillary service companies.



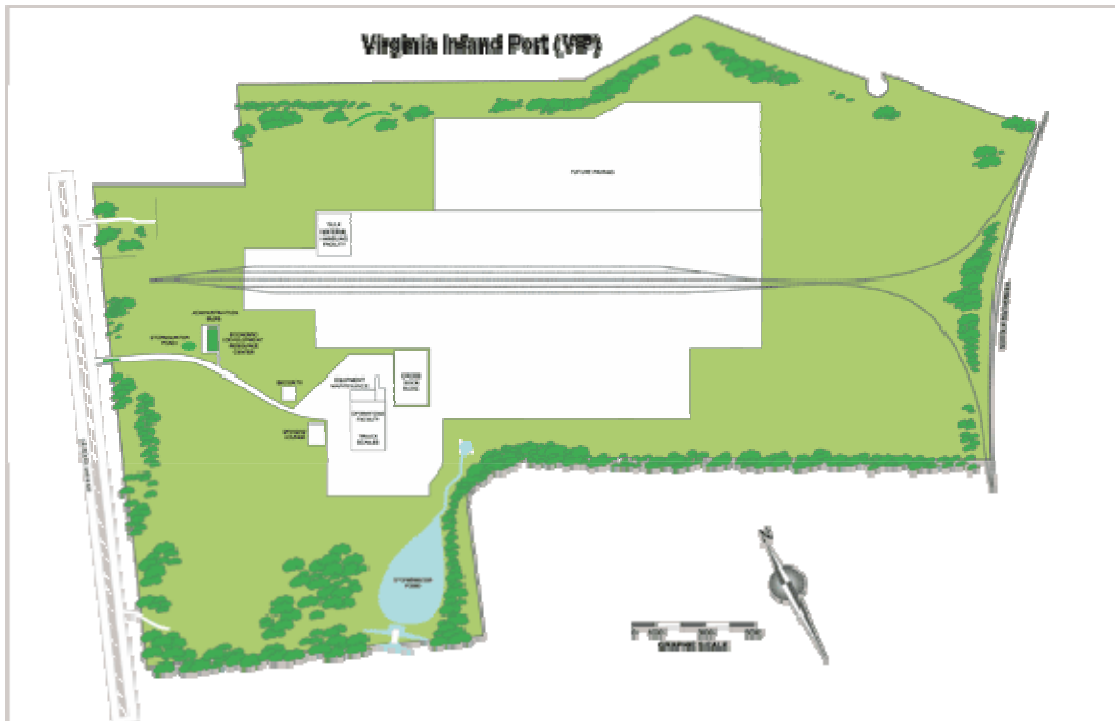
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<sup>4</sup> Virginia Port Authority, 2003

Five parallel tracks totaling 17,820 feet allow for efficient uncongested container handling and transfer. Exhibit 3-2 depicts the layout of the VIP.

### Exhibit 3-2

#### Virginia Inland Port – Facility Layout



Source: Virginia Port Authority

Scheduled six-day-a-week rail service between the VIP and the marine terminals in Hampton Roads allows direct access to the trade routes of 75 international shipping lines. In addition, the Virginia Inland Port is a US Customs-designated port of entry and a Foreign Trade Zone, with a full range of customs functions available to customers.

The Inland Port terminal has a three-door cross-dock warehouse facility for transferring cargo, and a maintenance building for vehicle repairs. USDA inspections and light fumigation are provided on terminal as needed.

## Progression

The VIP concept, based on similar successful facilities in Europe, was first explored in the early to mid-1980s, with the project's main purpose being to capture a larger market share in areas in the Ohio Valley Region (Ohio, Pennsylvania, Western Maryland, and West Virginia) and Virginia for the Port of Virginia. At that time, cargo from the Ohio Valley was primarily being sent through the Port of Baltimore. The envisioned market expansion was intended to be a powerful sales tool in convincing additional ship lines to add Virginia to their schedules or to increase their business in Virginia. The initial examination of this Ohio Valley market revealed a potential for 100,000 containers. The Virginia Port Authority (VPA) determined that one way to attract this business was to build an intermodal facility in close proximity to these areas that could be linked by rail to the port area. **Exhibit 3-3** illustrates the Appalachian Region market area for the VIP.

## Exhibit 3-3

### Virginia Inland Port Target Market Area



Planning for the inland port began in earnest in 1984 and involved a series of meetings among representatives of all transportation modes, shippers, and brokers. VPA and Norfolk Southern (NS) reached an agreement in January of 1987 that the VPA should precede with the inland port development. Several sites were examined with NS officials and local area leaders before the eventual site in Warren County, VA was selected. This site features easy access to I-66, I-81, and ADHS Corridor H, and has 1,400 feet of common boundary with Norfolk Southern.

The initial concept was to run a dedicated NS train three days per week between the Hampton Roads and VIP. It was anticipated that this level of service would attract approximately 20,000 international containers annually. One advantage that Virginia had was that the funding fell into place rather easily and did not require any borrowing to support construction activities at VIP. The original expenditure was easier than expected due to a series of fortunate circumstances, including: the election of a new Governor committed to transportation infrastructure, a special session of the General Assembly, and a report from the citizen advisory Commission on Transportation. Legislation was passed in 1986 to create a Transportation Trust Fund. The inland port was constructed with money entirely from the Trust Fund. The original \$10.75 million and subsequent \$2.25 million was paid in cash, on a pay-as-you-go basis. Thus, Virginia managed to avoid incurring debt in the construction of the intermodal facility.

The Virginia Inland Port started operations in 1989 with initial annual volumes of 8,000-9,000 containers. The VIP's annual throughput volume approached the targeted level of 20,000 international containers annually in 1999 and has been near that level through 2001. Container volumes are expected to almost double within the next few years. About 8,000 empty containers were stored at the facility in 2001 at a storage charge of \$0.52 per TEU per day. Currently, the VIP charges tariffs of \$244 per loaded unit COFC (either 20' or 40'), and \$161 per empty unit COFC (either 20' or 40') for transport from its location in Front Royal to the terminals at Norfolk. Turnaround time for truckers at the Port is 30 minutes.

### **Regional Benefits**

Since the port opened, it has spurred nearly \$600 million in private sector capital investments, resulting in 6.25 million square feet of construction and over 7,000 new jobs. It is estimated that

95 percent of the business generated by the VIP is new business for the Port of Virginia-Hampton Roads. The local community expects that the VIP facility be used to stimulate regional economic development. This local expectation caused VPA to move from the original targeted plan concentrated on international containers to a broader program encompassing domestic rail service and regional economic development (increasing jobs, wages and taxes), which is its core mission to the Commonwealth of Virginia. Approximately 17 full-time employees conduct operations at the VIP. The VIP has been generating operating profits and its establishment is credited with strengthening the overall competitive position of Virginia's ports.

In recent years, 17 companies have located plants in the counties surrounding the VIP. These firms actively take advantage of the VIP to ship a variety of products overseas, including plastics, medical supplies, apparel, auto parts, furnishings, food, paper, and four-wheel-drive vehicles.<sup>5</sup>

### **Regional Intermodal Connectivity**

Through its unique location, the VIP is able to offer the northern Appalachian Region (Ohio, Pennsylvania, western Maryland, West Virginia and the northern Shenandoah Valley) excellent seaport access. Prior to the operation of the VIP, businesses in the Region were using trucks and railroads to move product to ports in Baltimore and Philadelphia because the Port of Virginia was simply not cost competitive. Success with these companies hinged on moving the Port closer to the market in the form of the VIP. Shippers in the northern Appalachian Region now have the option of efficiently moving freight direct to the Port of Virginia-Hampton Roads through the VIP truck-to-rail intermodal facility rather than often longer, slower, and more expensive routes to Baltimore and Philadelphia. The resulting timesavings alone have led to improved shipper service, profitability, and competitiveness.<sup>6</sup>

The location on the Virginia Inland Port provides excellent Appalachian Development Highway System (ADHS) access to the west via Corridor H (SR-55/U.S.-33), eventually connecting to I-79, and to the east to Washington DC via I-66. ADHS corridors to the north and south are

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<sup>5</sup> Virginia Port Authority, 1999

<sup>6</sup> Virginia Port Authority, 2003

directly accessed via I-81. As discussed in the previous section, a Norfolk Southern rail line provides connectivity to the port at Hampton Roads. Exhibit 3-4 illustrates key VIP road connectors within the Appalachian Development Highway System.



**Exhibit 3-4 Key Virginia Inland Port Road Connectors to The Appalachian Development Highway System**

Exhibit 3-5 details distance and drive time to major highway and interstate connectors to the ADHS from the VIP.

**Exhibit 3-5  
Virginia Inland Port  
ADHS Corridor Proximity**

<b>ADHS or Interstate Corridor</b>	<b>Distance in Miles to Corridor</b>	<b>Drive time to Corridor</b>
I-81	9.4	9 minutes
I-66	2.5	2 minutes
Corridor H (WV SR-55)	13	15 minutes
Corridor E (I-70)	52	1 hour

Source: WSA

**Long-Term Direction**

The Virginia Inland Port seeks to increase container volume throughput with marketing efforts designed to raise awareness of the facility and its benefits to shippers. Marketing efforts are conducted in conjunction with economic development initiatives based on the global access that the VIP offers the region. In 1995, a long-term VIP Mission and Strategic Plan was created that advocated making the inland port the focal point for regional economic activity. To this end, the Virginia Port Authority created an Economic Development Center, including an administration building and warehouse facilities at the VIP.

**Needs and Next Steps**

Looking to the future, expanding VIP capacity and upgrading its efficiency will require investment. However, the VIP will not need to rely solely on public financing for its expansion funds, as it has been self-sufficient and operating profitably since 1994. As of this writing, expansion is underway.

Beyond targeting and increasing market-share from within the existing VIP market area, the Port of Virginia also seeks to expand the VIP market area and customer base. This plan will involve significant area and regional economic development efforts. In conjunction with Washington-

Dulles International Airport, ongoing efforts are underway to develop the corridor between the two facilities into a principal freight distribution center/hub. This involves attracting warehouse and distribution facilities (and ancillary support infrastructure) to the area.

Expansion of the Foreign Trade Zone to land and facilities surrounding the VIP is also seen as a positive step for the Port. Such an FTZ expansion would include land owned and operated by various economic development agencies in the region.

## **Case Study 4: South Carolina Inland Port**

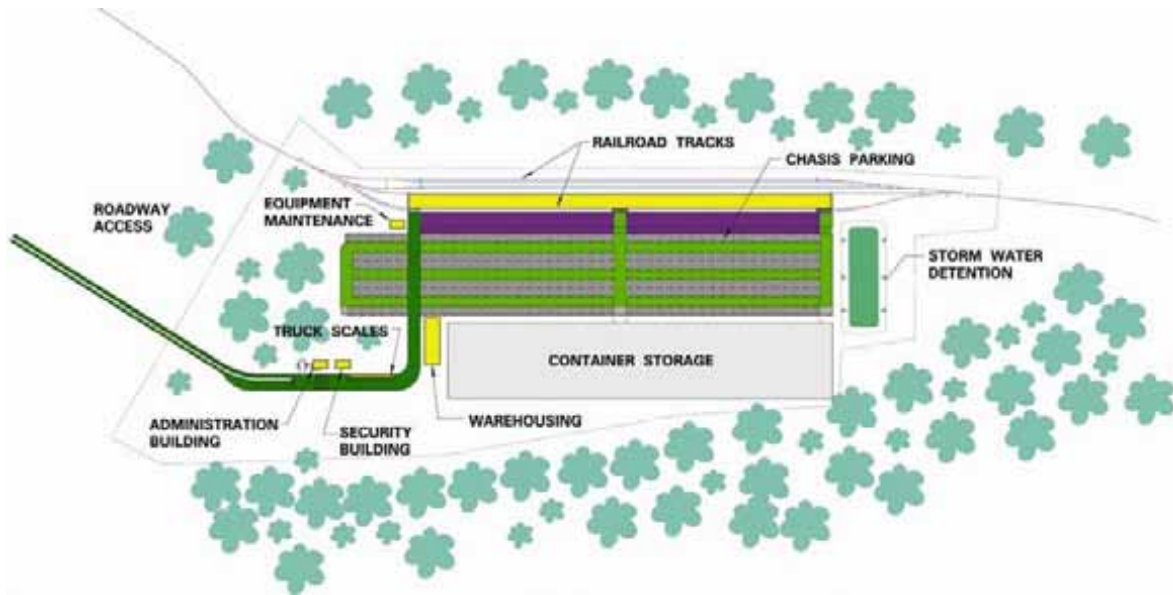
### **Concept**

Inland ports are an emerging, and relatively new business concept in America's freight transportation complex. An inland port, as previously discussed in the Virginia Inland Port chapter, is a facility specializing in the staging and transfer of intermodal (containerized) sea-borne freight. The primary drivers behind inland port development is to position container facilities at uncongested inland locations, where rail and truck access are easier, where land use conflicts are less, and where economic development is desired. Some of the notable examples include the previously mentioned Virginia Inland Port in Front Royal, Port Inland Distribution Network in New York State, and North Carolina Inland Port Terminals.

The primary objective of a South Carolina Inland Port (SCIP) would be to alleviate congestion at the Port of Charleston and to assist in accommodating future volume (container throughput) growth. As the Port of Charleston has developed, several issues regarding traffic congestion and safety, port expansion, compatible land-use, and environmental impact have threatened the Port's future growth potential. Voices calling for alternative waterfront land development and concerns of increasing truck traffic and unsightly rail and container storage yards have prompted the consideration of developing a South Carolina Inland Port.

As illustrated in Exhibit 4-1, many of the problematic functions and land-use issues currently encountered at the Port of Charleston can be addressed in a properly designed and located Inland Port. Warehousing, container storage, excellent highway and rail access, and container staging areas, coupled with customs and administration functions, can all be centrally provided at a location away from a congested port's coastal site.

## Exhibit 4-1



### Inland Port Generic Layout

The core principal guiding the discussion of a South Carolina Inland Port is supplementing the capacity of the Port of Charleston in a manner that fosters and accommodates the Port's anticipated growth. As specifically stated by South Carolina Ports President, Bernard Groseclose in the 2001 State of the Port Address,

“It is important that we understand the role of the inland port as the Department of Commerce undertakes its analysis of the need and possible locations. Any successful inland port or intermodal facility must serve the growth of the Port of Charleston, but it cannot replace port expansion. If our port does not expand, then there is no need for such a facility.”

### Container Storage Port of Charleston Land-Use Conflict



## **Progression**

South Carolina's Port of Charleston is currently one of the busiest container ports on the east coast. Because South Carolina is a major port state, and the state's trade and transportation sector of the economy is inextricably tied to the efficient functioning of its ports, it has been deemed essential that alternatives such as the inland port concept be examined as potential ways to support expansion at the Port of Charleston. Initial studies into the feasibility of such a port have been commissioned to evaluate the role an inland port can play in lowering congestion along high-use corridors linking the Port of Charleston to the inland markets.

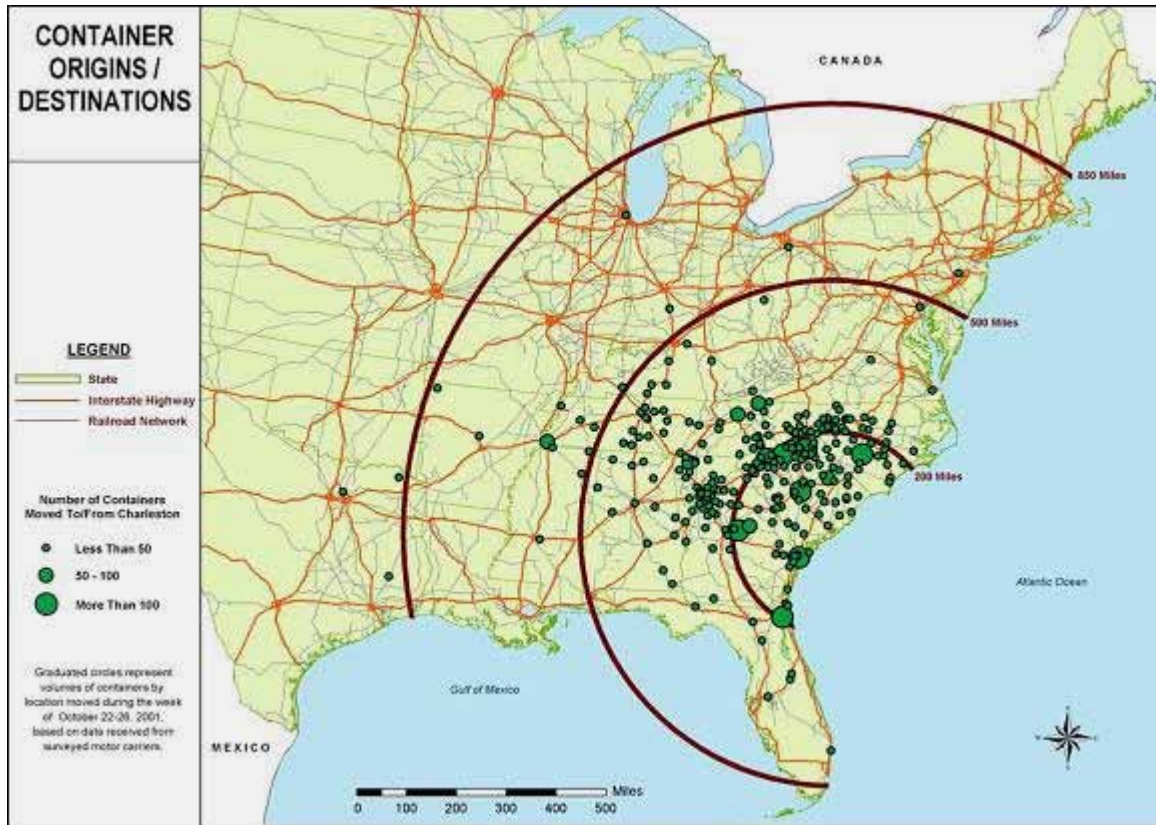
Other reasons to explore this concept in South Carolina include quality of life issues, the need to better use existing infrastructure, and enhanced economic development opportunities. For these reasons, the South Carolina Inland Port Study Steering Committee – consisting of a diverse group of individuals representing institutions such as the South Carolina Department of Commerce, the South Carolina Department of Transportation, the South Carolina State Ports Authority, South Carolina Transportation Infrastructure Bank, South Carolina Public Railways, State and Federal Congressmen's Offices – was formed to lead the study of a South Carolina Inland Port.

The planning and development of a South Carolina Inland Port is still in the early stages of study. A series of questions and issues need to be addressed before the feasibility and full potential of an SCIP can be determined. Among the most critical issues that need to be examined are the location of the SCIP, the potential throughput (container volume) of the facility, and the cost (capital investment and operating costs).

## ***SCIP Location***

In order to capture market share for the Port of Charleston, the inland port should intercept the Port's major container flows. Exhibit 4-2 illustrates the highest concentrations of origin and destination containers utilizing the Port of Charleston. This area could otherwise be identified as the Port of Charleston's catchment area. Note the heavy concentrations within the Appalachian Region.

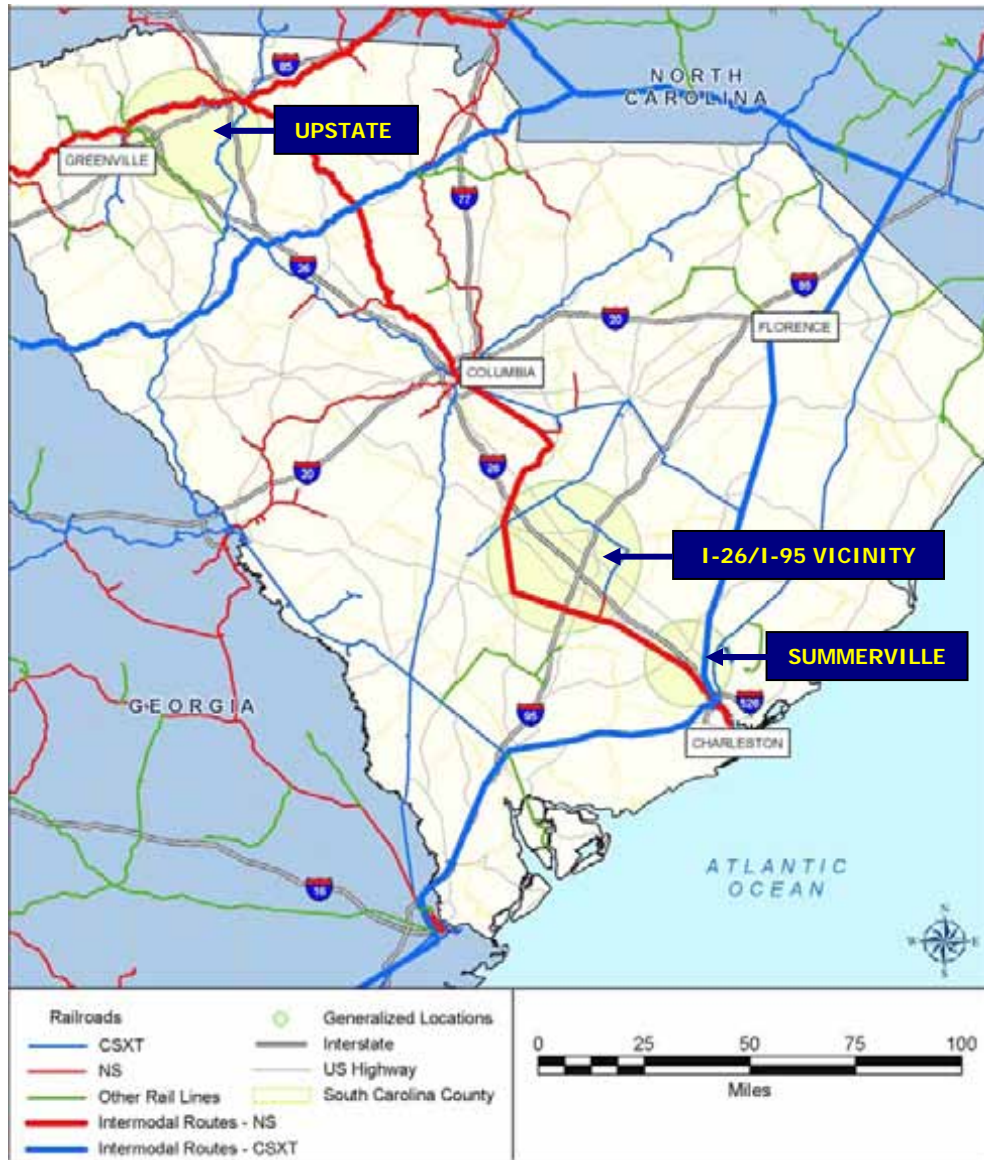
**Exhibit 4- 2**  
**Port of Charleston Container Traffic**  
**Origin and Destination Concentrations**



In addition to being centrally located along the Port of Charleston’s major container flows, the location of the SCIP should allow for easy access to uncongested rail and interstate highway networks. To be successful, the inland port should be located in an area characterized by good availability of developable land, where conflicts are minimized. The inland port would also benefit from being within close proximity of a strong pool of available labor.

Three areas in South Carolina have been identified as potential sites for the SCIP. Exhibit 4-3 illustrates their general locations and highlights existing highway and rail connectivity.

**Exhibit 4-3: Map of Potential SCIP Generalized Locations**



In terms of the relevant factors, these locations can be broadly characterized as the follows:

The *Summerville* Vicinity Generalized Location:

- Has large flows of Charleston originated/destined containers
- Has very good Interstate highway and rail access
- Very close to the Port, but outside the dense and congested urban area
- Rail haul is very short – may not be cost effective
- Already has sites with FTZ status
- Not located within Appalachian Region

The *I-26/I-95* Vicinity Generalized Location:

- Can capture strong flows of Charleston originated/destined containers
- Has superior interstate access in all directions – attractiveness to truckers as a drop-off/pick-up point, and for parking/service facility development
- Has good rail access, but it is not on the CSXT intermodal line
- Close to the Port, but outside the dense and congested urban area
- Rail haul is short - may not be cost effective
- Not located within Appalachian Region

The *Upstate* South Carolina Vicinity Generalized Location:

- Can capture lessened flows of Charleston originated/destined containers
- Has good interstate and rail access
- Further away from the Port than the other two locations
- Rail haul may be more cost effective
- Already has sites with FTZ status
- Located within Appalachian Region

All three locations offer, through active infrastructure development and programs aimed at attracting various institutions, very good economic development opportunities that could take place at and around the inland port. However, the densities of the freight flows vary as the distance from the Port of Charleston increases.

It is too early in the SCIP development process to confidently identify which location will offer the greatest benefit to the Port of Charleston and thus emerge as the frontrunner site for SCIP development. Needless to say, an *Upstate* South Carolina Vicinity site would offer Appalachia the greatest economic benefit, coupled with the highest level of connectivity to the ADHS.

### ***SCIP Throughput***

As noted earlier, the Virginia Inland Port succeeded at generating business for the Ports of Virginia from new markets that were previously serviced by the Port of Baltimore. The VIP is also reported to be making an operating profit. The current throughput volumes at the VIP are about 20,000 containers

annually. Consequently, this throughput volume has been selected as a reasonable proxy target volume for the conceptual South Carolina inland port.

Initial order-of-magnitude throughput volume projections (annual number of containers) have been completed for each of the three potential SCIP locations based on an intermodal scenario involving a use of rail transport between the Port of Charleston and the inland port location, and truck transport to/from locations beyond (markets). Projected container volume for each of the locations is based upon potential truck-to-rail diversion rates, or the amount of truck containers utilizing current highway and interstate corridors to the Port of Charleston that may be diverted to the SCIP. Exhibit 4-4 details the SCIP throughput projections based upon location and capture rate.

**Exhibit 4-4**  
**Throughput Estimates Summary**  
**(By diversion scenario and location for year 2020)**

Highway to Rail Diversion Rate Scenario	2020		
	Summerville Vicinity	I-95/I26 Vicinity	Upstate SC
5%	27K - 41K	26K - 39K	8K - 12K
10%	54K - 81K	53K - 79K	16K - 24K
25%	136K - 204K	131K - 197K	40K - 60K
50%	271K - 407K	263K - 394K	80K - 120K

Source: WSA

Note that to reach the benchmark 20,000 annual container volume of the Virginia Inland Port, the Summerville and I-95/I-26 Vicinity sites for the SCIP need to achieve a five percent diversion rate, while the Upstate site needs a 10 percent diversion rate to garner similar volume.

***SCIP Cost***

Estimated capital costs associated with an inland port can be subdivided into costs attributable to the construction of the terminal and the acquisition of rail equipment for the inland port service.

Construction costs would probably differ somewhat depending on the terminal location within the state. Variations would be primarily due to differences associated with varying land values, terrain constraints, and distances to closest intermodal line connections. The SCIP is envisioned to be initially large enough to accommodate a throughput of about 20,000 annual containers. It would have a land size of about 180 acres, efficient rail configuration, space for administrative and inspection offices, storage and warehousing. The cost projections are in the range of \$26 million to \$31 million depending on the generalized location. The estimates include components such as site work, rail track work, track roadbed, buildings, utilities, engineering, inspections, property acquisition, and contingencies.

Separate from the terminal costs, the cost of connecting the terminal (rail track link) to a mainline was estimated to be, an average, about \$1.2 million per mile. The cost of connecting the inland port with the Class I rail lines will depend on the distance of each particular inland port site location to the nearest mainline. It needs to also be noted that the costs associated with creating rail links between the Port of Charleston and the new inland port have not yet been examined. It is anticipated that the most cost effective solution to this issue would be to utilize the existing infrastructure of the rail lines with trackage rights and operations in the area.

### **Regional Benefits**

There are several potential benefits the SCIP would provide to the Appalachian Region. The extent of these benefits will depend upon the final location of the facility – needless to say, the Upstate location would be the most advantageous to the development of the Region and the ADHS.

The SCIP would promote direct and efficient access to the Port of Charleston for industry located in the central and southern Appalachia. The Port of Charleston is one of America's largest container ports, with port throughput expanding more and more each year. The Port plays a significant role as a gateway for imported and exported goods moving not only in South Carolina, but beyond state boundaries, as well. The SCIP, by effectively moving the catchment area of the Port of Charleston westward, would bring the benefits of this international freight gateway directly into the Appalachian Region.

In addition to impacts specific to the Charleston area, an inland port could generate potential economic development benefits in other parts of South Carolina and the surrounding Appalachian Region. Direct employment growth would arise from various construction, operations, and maintenance activities associated with building and sustaining the inland port. In addition to becoming an intermodal point for more effectively staging and distributing containerized goods to markets, the facility would be expected to attract various logistics services providers and associated employment. It would also be utilized for inspections, storage, warehousing, parking, as well as other related activities such as equipment maintenance and repair. If successfully implemented and operated, this cluster of transportation and logistics activity may serve to attract new commerce and employment into the area, similar to Virginia's success at their inland port. .

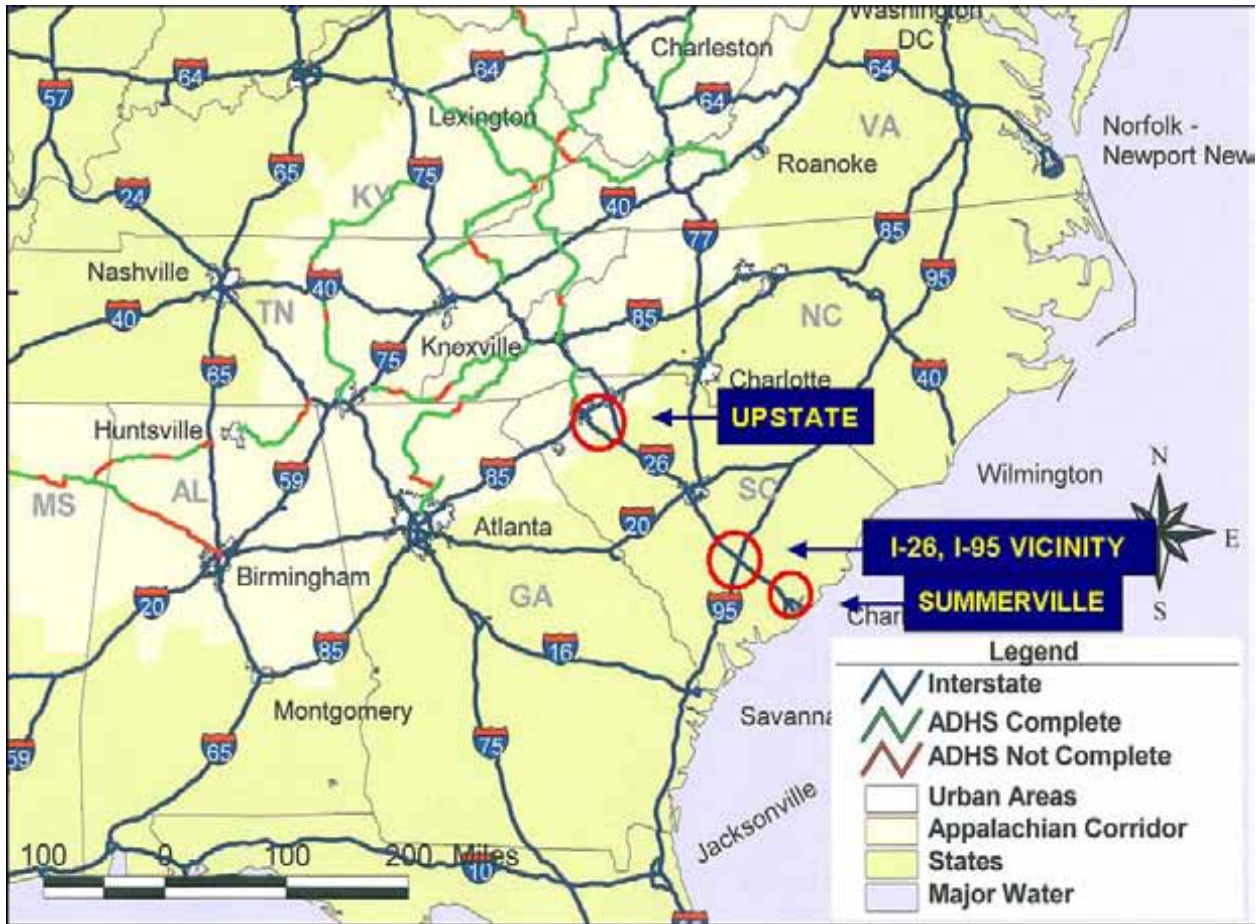
### **Regional Intermodal Connectivity**

While the exact site has yet to be chosen, the SCIP has the potential to become a focal point for rail-to-sea and truck-to-sea (indirectly) intermodal freight movements for south and central Appalachia.

Primary connections to the ADHS for all three sites would be provided by I-26 connecting to Corridor W just to the west of Greenville. Interstate north-south corridors I-85 in northwest South Carolina and I-81 in northeast Tennessee are also accessible via I-26. The Upstate location for the SCIP provides excellent connectivity to Corridor W and I-85, depending on the specific location of the proposed facility. The nearest east-west corridors of the ADHS are Corridors A and K, accessible via I-40 located to the north. Connectivity to I-40 is again provided by I-26. Exhibit 4-5 details the ADHS in relation to potential SCIP sites.

## Exhibit 4-5

### Potential SCIP Sites – ADHS Connectors



### Needs and Next Steps

The preliminary findings of the SCIP will be strengthened as the concept is further developed. Beyond detailed refinements of throughput forecasts, cost, and the benefits of potential scenarios, there are a number of important issues that require examination. These include the sources and availability of public investment (e.g., in construction, rolling stock costs, etc.) and finding ways to maximize such investment through partnering with the private sector. A detailed market assessment and development study (including surveys seeking responses from current and future shippers) would also help to understand the need for and success of an inland port in the state.

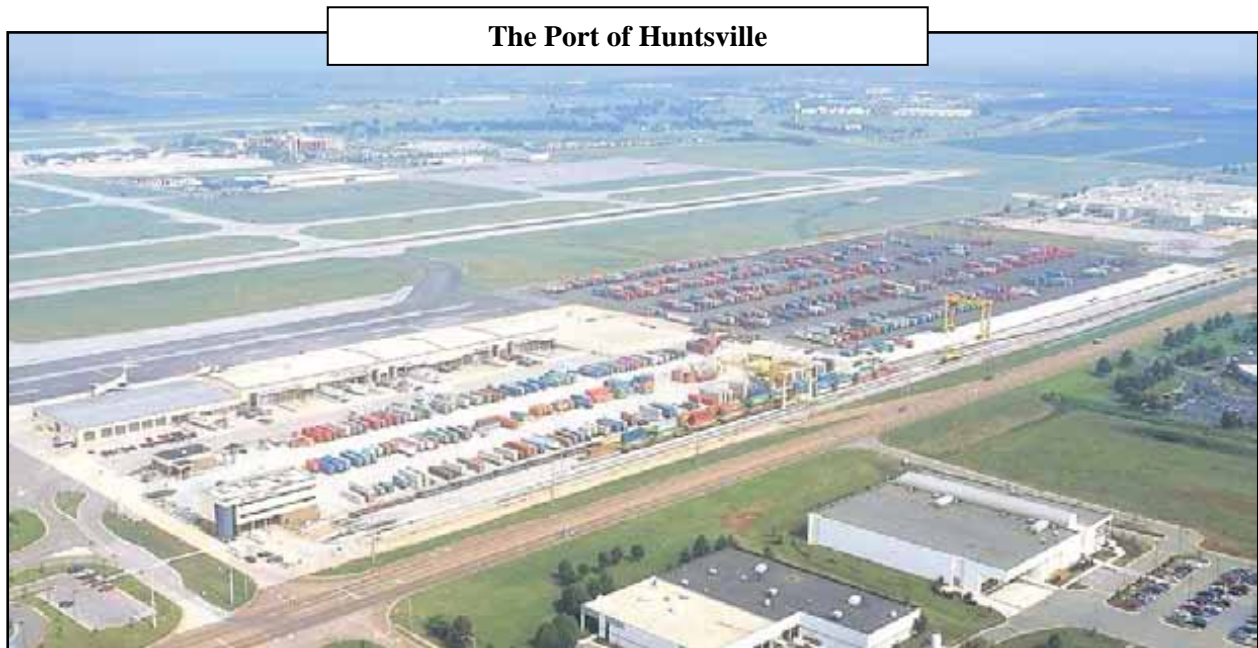
Regardless of the approach to the inland port concept, there is a clear need for a proactive, forward-looking strategic package for addressing the different issues associated with the landside movement of freight to and from the Port of Charleston. This strategic package should examine the impact of a South Carolina Inland Port on relevant issues such as growth in overall traffic along the I-26 corridor, the future expansion of the Port of Charleston at the Navy Base, land use changes in the City of North Charleston, and the need for separation of highway passenger vehicles from freight traffic.

## **Case Study 5: Port of Huntsville**

### **Concept**

The Port of Huntsville is an inland port comprised of Huntsville International Airport (HSV), the International Intermodal Center (IIC), and the Jetplex Industrial Park. This modern intermodal complex provides Huntsville with state-of-the-art aviation, rail, road and ocean connectivity.

The International Intermodal Center (IIC) is an innovative and unique inland port facility. The IIC is a single hub location that specializes in a wide range of services including receiving, transferring, storing, and distributing air, rail, and highway cargo both domestically and internationally. An intermodal rail yard, complete with container handling and storage, is located immediately adjacent to the airport's air cargo facilities.



The IIC is also home to a global air cargo hub that serves the United States, Latin America, and Europe with direct Boeing 747 freighter service. The only scheduled international flights in the State of Alabama take off and land at Huntsville International Airport. In addition, the IIC offers Public Use Foreign Trade Zone No. 83, 24-hour US Customs, USDA inspectors and Freight

Forwarders. The International Intermodal Center is located adjacent to the Huntsville International Airport and Jetplex Industrial Park.<sup>7</sup>

The primary concept leading to the development of the IIC is to offer access to as many modes of freight transport as possible within a single facility. The key to realizing this goal, particularly for a location lacking direct seaport access, is attracting substantial airfreight operations. Air cargo was a primary goal of Huntsville planners throughout the facility's development process.

With the intermodal complex, Huntsville is establishing itself as an important inland port, specializing in air, rail, and highway cargo shipments. "What we're trying to do is become for air what the Port of Alabama is for ocean shipping," says Dwight Jennings, Vice Chair of the Huntsville International Airport Board and Chair of the Alabama Port Authority. "With the expansions which have to be done at Mobile to expand seagoing cargo, we want to do the same type of thing for Huntsville to make it a major seaport by air."<sup>8</sup>

### **Progression**

Currently, Huntsville International Airport has two parallel runways, one 10,000 feet and one 8,000 feet, with a 5,000-foot separation and 1 million square feet of cargo ramp space, allowing for simultaneous flight operations during instrument conditions. The facility is equipped for Category I aircraft operations. Domestic and international all-cargo carriers serve the local and regional high-tech air cargo market. Cargo handling facilities include 200,000 square feet for receiving, storing, transferring, and distributing domestic and international air cargo, ground support equipment that includes two main deck loaders, and substantial acreage for future expansion.

Rail service is provided by Norfolk Southern for both domestic and international containers. Two 45-ton gantry cranes are the heart of a newly expanded operation. The rail-mounted crane can pivot 360 degrees and load chassis parked perpendicular to the track thereby increasing

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<sup>7</sup> Port of Huntsville, 2003

<sup>8</sup> Leaders Share their Vision of Huntsville's Cargo Port Future, Huntsville (AL) Times, August 23, 2000

efficiency. The rubber tire crane can traverse the entire 45-acre yard. Four parallel tracks totaling six miles (recently lengthened) ensure congestion-free operation.<sup>9</sup>

The International Intermodal Center (IIC) rail facility came online in 1987 with international air cargo operations (representing the bulk of HSV air cargo tonnage) following in 1991. In 1991, the Port of Huntsville was able to successfully persuade Swiss freight forwarder Panalpina to utilize the airport as their North American air cargo hub/gateway. Since initial operations commenced with a single weekly B747 freighter flight, growth has been explosive. Panalpina currently operates 15 B747's per week, serving European markets in addition to three weekly flights to Mexico.

Huntsville International Airport has developed into a premier U.S. gateway for international air cargo. In 2001, the airport ranked 18<sup>th</sup> in terms of annual tonnage for international air cargo (total inbound and outbound) out of nearly 200 reporting U.S. airports (as tracked by the U.S. Department of Transportation through T-100 Reports). In 1991, the initial year of international air operations, it ranked 40<sup>th</sup>. By 1995, the airport was 32<sup>nd</sup>, and in 2000 it had reached 20<sup>th</sup>. The Huntsville International Airport now handles more international air cargo than many established major hub airports, including the following:

- Cincinnati/Northern Kentucky International (Delta, DHL)
- Indianapolis International (FedEx)
- Louisville International (UPS)
- Dayton International (Emery Worldwide)
- Minneapolis-St. Paul International (Northwest)
- Detroit International (Northwest)
- Metropolitan Oakland International (FedEx)
- Denver International (United)
- Pittsburgh International (US Airways)

Growth at the intermodal rail facility, while not as explosive as HSV air cargo, is still substantial. In 2002, the International Intermodal Center rail facility conducted over 26,500 (container) lifts.

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<sup>9</sup> Port of Huntsville, 2003

With the recent rail yard and container handling equipment improvements, the IIC rail facility is now capable of conducting 114,000 lifts per year.

### **Regional Benefits**

According to the 1996 Port of Huntsville Economic Impact Study (the most recent available), airport tenants and nearby businesses employ nearly 15,000 workers, with a combined payroll of \$600 million. These jobs, and the spending associated with them, create a multiplied regional impact of 28,594 jobs and \$971 million in total payrolls. The Huntsville MSA (Madison and Limestone Counties) was the home of 10,732 workers counted in the survey. They collectively earned over \$440 million during the study year. The total multiplied impact of this employment was 20,606 jobs, which represents more than 10 percent of the Huntsville MSA labor force.

The Decatur MSA (Morgan and Lawrence Counties) contained 2,248 workers and had a multiplied impact of more than 4,300 jobs, which represents nearly six percent of the labor force in that metropolitan area. The Quad Cities (Colbert and Lauderdale Counties) contribute 670 employees and had a total impact of 1,297 jobs. Other important impacted areas were Marshall, Cullman, and Jackson Counties in Alabama and Lincoln County, Tennessee. All of these areas benefited significantly from the employment opportunities offered by businesses located at or near the Port of Huntsville.

The large increase in the airport's regional impact can be attributed to two factors. The first and most important is the rapid increase of new jobs at or near the airport and the other is the higher proportion of better paying jobs.<sup>10</sup>

The Port of Huntsville estimates the core market area for rail operations are to businesses located within a 50-mile radius of the IIC, with a secondary market extending to a 150-mile radius. As Exhibit 5-1 illustrates, the ICC rail market area encompasses portions of a six states – the majority of which are in the Appalachian Region. The ICC plays a vital role on connecting area industry to the national rail and port system.

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<sup>10</sup> Port of Huntsville, 2003, 1996

## Exhibit 5-1

### Port of Huntsville-IIC Rail Market Area, 150-Mile Radius



The Port of Huntsville’s air cargo market area, particularly for international cargo, is effectively all of North America. International air cargo arriving or departing Huntsville is routinely connected via air (e.g., transferred to/from another aircraft) for service to its final destination point. Generally, however, air-to-air freight transfers occur only if the final origin or destination point of the air cargo is beyond a 600-mile radius from the Port of Huntsville. Air cargo origins and destinations within the 600-mile radius are trucked to and from Huntsville. It is estimated that 85 to 90 percent of HSV air cargo is truck-to-air versus air-to-air cargo (i.e., within the 600-mile radius). Exhibit 5-2 illustrates the truck-to-air market area of the Port of Huntsville. As Exhibit 5-2 shows, nearly the entire Appalachian Region is included within the market area.

**Exhibit 5-2**  
**Port of Huntsville-IIC Air Cargo Market Area**  
**600-Mile Radius**



Note that the Port of Huntsville - Huntsville International Airport - is the primary international air cargo/freight facility within the Appalachian Region.

**Regional Intermodal Connectivity**

The Port of Huntsville offers road, rail, air and sea connectivity via direct linkages to each mode. As discussed in the previous sections, Norfolk Southern provides rail connectivity. The IIC and Norfolk Southern effectively tie Huntsville in to the national rail system via direct routings to some of the nation’s largest rail hubs. All points west of Huntsville, including key West Coast ports, are served through the Memphis gateway via direct Huntsville-Memphis train service. Rail service to the east includes the following direct lines:

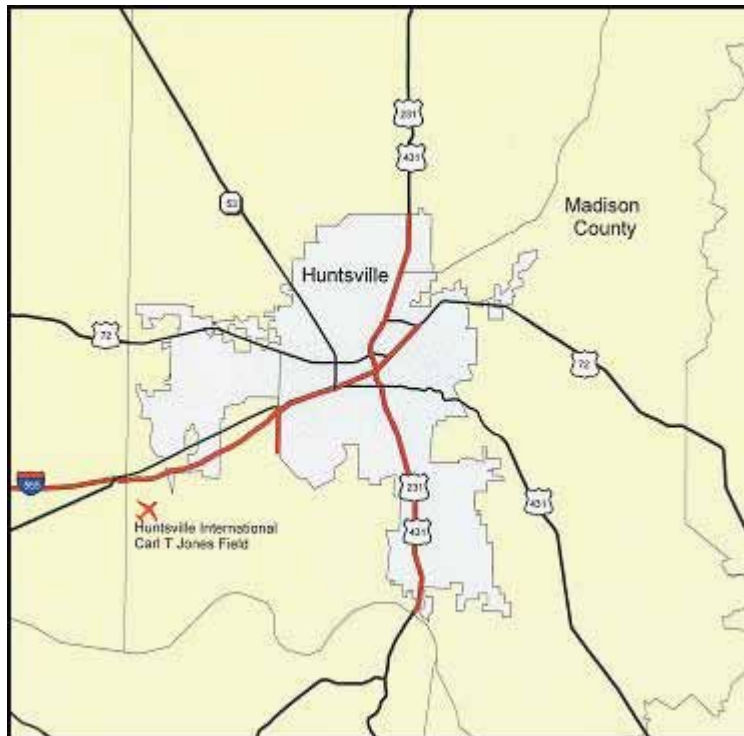
- Huntsville - Jacksonville, FL - Miami, FL
- Huntsville - Savannah, GA

- Huntsville - Charleston, SC
- Huntsville - Elizabeth, NJ
- Huntsville – Rutherford, PA

The rail service to points east provide the IIC and its users direct rail-to-sea connectivity to several of the premier east coast ports.

Excellent highway connectivity is key to the air cargo component of the IIC. Exhibit 5-3 illustrates key IIC road connectors to the Appalachian Development Highway System (Corridor V) and other important interstate highways within the Appalachian Region. Exhibit 5-4 details distance and drive time from the Port of Huntsville to major interstate highways and ADHS corridors.

**Exhibit 5-3: Key International Intermodal Center Road Connectors to The Appalachian Development Highway System**



**Exhibit 5-4**  
**Huntsville International Intermodal Center**  
**ADHS Connector Proximity**

<b>ADHS Corridor or Interstate</b>	<b>Distance in Miles to Corridor</b>	<b>Drive time to Corridor</b>
Corridor V East, I-565	1.5	3 minutes
Corridor V West, SR72	1.2	3 minutes
I-65	8.4	10 minutes
I-24	18	25 minutes
I-75	122	2.4 hours
I-40/I-81	123.8	2.4 hours

Source: WSA

The long-term focus for the Port of Huntsville is concentrated on increasing air cargo operations and capturing additional international traffic market share. Huntsville is focusing special attention at emerging Asia/Pacific Rim destinations.

A multimillion-dollar airport improvement program is underway. The plan includes lengthening the 8,000 foot runway to 12,600 feet in order to accommodate fully loaded Asia-bound Boeing B747s or Airbus A380s; an additional taxiway; a maintenance, repair and overhaul facility for large cargo carriers; a new control tower and expanded freight-handling capabilities for the intermodal facility.<sup>11</sup>

Air Cargo growth goals are being carried out in conjunction with Huntsville's tenant freight forwarder, Panalpina. The Port of Huntsville and Panalpina have formed a unique partnership with the common goal of increasing Huntsville's profile as an international cargo hub leader in the U.S. market. To this end, both organizations are working to ensure that each of their respective needs is met in terms of infrastructure, traffic (freight volume), and business development.

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<sup>11</sup> Port of Huntsville, 2003

### **Needs and Next Steps**

Obtaining funding to carry out the planned infrastructure improvements is a primary goal of the Port of Huntsville. Beyond funding necessary improvements, Huntsville is aggressively marketing itself to both freight carriers (particularly air cargo) and to freight intensive industries that can benefit from the IIC's international/intermodal capabilities. Additional air cargo carriers are being courted with the goal of supplementing and enhancing existing air operations. In addition, the Port of Huntsville's Jetplex industrial park is actively recruiting additional tenants with a high demand for freight mobility. Such industries offer a twofold benefit to Huntsville, direct economic stimulus and increased freight and intermodal activity.

## Case Study 6: Port of Pittsburgh Container-on-Barge

### Concept

The Port of Pittsburgh container-on-barge (COB) inland waterway network embraces the concept of containerized transport of commodities via flat deck barge that traditionally move via road or rail. Currently, commodities transported by barge tend to be low value, bulk goods. However, the use of container barges (flat deck), capable of carrying large numbers of containers and being loaded and unloaded quickly at port, has the potential to change the dynamics of barge transport. Exhibit 6-1 illustrates the inland waterway system with connectivity to the Port of Pittsburgh. Theoretically, all points within this waterway network can be served via COB service provided the origin and destination ports are equipped with container handling and intermodal infrastructure.

**Exhibit 6-1**  
**Inland Waterway System Connecting the Appalachian Region**



Source: Port of Pittsburgh

The containerization of barge traffic allows for the transport of higher value commodities typical of interstate truck traffic. Domestic inland and intercoastal barge freight is no longer limited to traditional bulk commodities such as coal and scrap iron. Container barges, coupled with efficient intermodal port facilities, will enable the effective transfer of freight from road to water and back. The Port of Pittsburgh, the Port of Albany, New York and a handful of inter-coastal waterway barge operators on the Gulf of Mexico are pioneering this effort in the U.S.

### **Progression**

Currently, there are several COB networks or specific routes operating with success. Inland waterways in Europe successfully facilitate containerized barge transport, complete with supporting rail and highway intermodal facilities. However, European COB networks may not be a valid comparison to an Appalachian Region Container-on-Barge network due to the differences in population density and geographic dispersion of industrial centers. Concentrations of population and industry along primary inland waterways are more pronounced in European markets than in the Appalachian Region (and in the rest of the U.S.).

There is currently a single, unsubsidized, operator specializing in the transport of container traffic along the Texas-Louisiana Gulf Coast. Osprey Lines, based in Houston, Texas, utilizes ocean-going barges along the Gulf Coast and traditional barge runs along connected intracoastal waterways. Primary Gulf Coast service is provided between the Ports of Houston and New Orleans. Houston-New Orleans service moves containerized freight that feeds large container ships bound for international destinations. This Houston-New Orleans-Houston round-trip route runs approximately once per week depending upon the volume and ship schedules that drive the traffic. For the year ending December 31, 2002, it is estimated that 50,000



containers have been transported between Houston and New Orleans via barge. Expansion of both routes and schedule are planned, eventually developing into a Gulf of Mexico COB network running from Brownsville, Texas to Mobile, Alabama and points between. Though this service can be considered merely a niche market, it proves the commercial viability of the concept.

The Port of Pittsburgh COB concept for the Appalachian Region's inland waterway relies primarily on existing inland waterway infrastructure. However, an initial investment in port equipment will be necessary to facilitate intermodal transfer of containers. In order to load, unload and position the intermodal containers, each port on the proposed COB system will need to add or upgrade equipment. Container handling equipment such as spreader bars that attach to existing cranes, forklifts and container chassis will be needed. Initial cost estimates for such equipment is 750 thousand to one million dollars per port.

Key destination ports served by Port of Pittsburgh container-on-barge service have been identified as the following:

- Brownsville, TX
- Houston, TX
- New Orleans, LA
- Baton Rouge, LA
- Little Rock, AR
- Tulsa, OK
- Memphis, TN
- St. Louis, MO
- Paducah, KY
- Louisville, KY
- Cincinnati, OH
- Huntington, WV

### **Regional Benefits**

A successful Port of Pittsburgh container-on-barge network will offer Appalachia expanded transportation capacity and important new shipping alternatives and efficiencies. Key to the success of the COB program will be the intermodal links between the inland waterway and the region's primary railways and highways, especially ADHS corridors. The following sections present a number of advantages that improved and expanded inland navigation service can bring to the region:





1. Expanded freight capacity and modal options
2. Improved fuel efficiency and operating cost savings
3. Improved Safety
4. Reduced air and environmental impacts

***Expanded Capacity***

The sheer size and capacity of the flat deck container barge is the primary advantage of this mode. Exhibit 6-2 illustrates the capacity of a single barge versus rail and truck equivalents. Note that a barge movement (depending on size and weight of cargo) can move up to 300 containers in a single run. New intermodal connections with ADHS Corridors, interstate highways, and railways will offer businesses within the Region expanded shipping options, increased capacity, and streamlined transport costs.

**Exhibit 6-2**

**Cargo Capacity Comparison**

			
<b>One Barge</b>	<b>1 Rail Car</b>	<b>100 Car Train Unit</b>	<b>Large Semi</b>
<b>1, 500 Ton</b>	<b>100 Ton</b>	<b>10, 000 Ton</b>	<b>26 Ton</b>
<b>52, 500 Bu</b>	<b>3, 500 Bu</b>	<b>350, 000 Bu</b>	<b>910 Bu</b>
<b>453, 600 Gal</b>	<b>30,240 Gal</b>	<b>3, 024, 000 Gal</b>	<b>7, 865 Gal</b>

Source: Iowa Department of Transportation, *The Tennessee Tombigbee Waterway Development Authority*

***Efficiency and Cost***

In terms of fuel usage per ton-mile, barge transport can be the most efficient and cost effective means of moving container traffic. Exhibit 6-3 illustrates the number of miles a ton of freight can be transported per gallon of fuel by truck, rail, and barge.

Additional factors affecting the efficiency of barge transport is the reduced labor requirement of a barge operation. A 300-container barge movement from Pittsburgh, PA to Mobile, AL effectively eliminates the cost of 300 long-haul truck operations.

### Exhibit 6-3

#### Efficiency Comparison

#### Number of Ton Miles per Gallon of Fuel



Source: U.S. DOT Maritime Administration, *The Tennessee Tombigbee Waterway Development Authority*




#### Safety

Safety remains an important consideration when considering the benefits of Appalachian Region barge transport. Again comparing barge transport to truck and rail, Exhibit 6-4 details the number of deaths and injuries per billion ton-miles by mode. Note that deaths and injuries resulting from barge transport are significantly lower than other modes.

### Exhibit 6-4

#### Safety Comparison

#### Deaths and Injuries per billion ton-miles




Mode	Deaths	Injuries
	0.01	0.09
	1.15	21.77
	0.84	N/A

Source: C. Jake Haulk Ph.D. - *Inland Waterways as Vital National Infrastructure: Refuting "Corporate Welfare" Attacks*, *The Tennessee Tombigbee Waterway Development Authority*

**Environmental**

As illustrated in Exhibit 6-5, on a per ton-mile basis, barge transport produces the least amount of emissions when compared to rail or truck transport. In an era of growing sensitivity to environmental pollutants, barge transport can offer an environmental alternative to existing transportation modes.

**Exhibit 6-5  
Emissions Comparison  
Pounds of Emissions per Ton-Mile**

Mode	Hydrocarbons	Carbon Monoxide	Nitrous Oxide
	0.0009	0.0020	0.0053
	0.0046	0.0064	0.0183
	0.0063	0.0190	0.1017

Source: C. Jake Haulk Ph.D. - *Inland Waterways as Vital National Infrastructure: Refuting "Corporate Welfare" Attacks, The Tennessee Tombigbee Waterway Development Authority*

**Regional Intermodal Connectivity**

Intermodal connectivity (barge-to-truck, barge-to-rail) for the Port of Pittsburgh is excellent. Pittsburgh is well served by Interstate and ADHS highways, Class I railroads (CSX and Norfolk Southern) and Class II railroads (Bessemer & Lake Erie Railroad Company (Great Lakes Transportation), Buffalo & Pittsburgh Railroad, Inc., Mountain Laurel Railroad Company Pittsburgh (sic) & Shawmut Railroad and Wheeling & Lake Erie Railway Company). Exhibit 6-6 highlights interstate highway access to the Port of Pittsburgh. Note that I-376 becomes US-22, or ADHS Corridor M. Exhibit 6-7 details distance and drive time to ADHS Corridor M and interstate highways from the Port of Pittsburgh. Rail connectivity with the listed railroads is provided directly at the Port of Pittsburgh.

**Exhibit 6-6  
Key Port of Pittsburgh Road and Rail Connectors**



**Exhibit 6-7  
Port of Pittsburgh  
ADHS Corridor Proximity**

<b>ADHS Corridor or Interstate</b>	<b>Distance in Miles to Corridor</b>	<b>Drive time to Corridor</b>
I-279/I-79	1.6	3 minutes
Corridor M (US-22)	5.5	9 minutes
I-376	6.5	8 minutes
I-70	20	26 minutes
I-76	21	30 minutes

Source: WSA

Additional intermodal COB terminals would provide expanded connectivity to the ADHS throughout the Appalachian Region. A potential COB terminal in Huntington, West Virginia area, for example, would provide connection to ADHS Corridor B and Interstate 64, while a Cincinnati, Ohio COB terminal would provide connection to ADHS Corridor D and Interstates 71 and 75.

## **Long-Term Direction**

For Port of Pittsburgh COB operations to succeed, COB operations must address the following challenges:

- Door-to-Door Network Development
- Distance and Transit Time
- Port Infrastructure

### ***Network Development***

Shippers are increasingly demanding door-to-door delivery service versus traditional port-to-port service. This demand is even more acute when dealing with containerized, intermodal freight. Traditional barge operators are currently not equipped to offer door-to-door service. To effectively market and appeal to shipper needs, inland waterway operators must expand service offerings into intermodal drayage operations, offering single-source door-to-door service.

In addition, time-definite service must be available and reliable. While delays may be acceptable in bulk freight transport, higher value containerized freight must be delivered on schedule. Insuring scheduled barge service may involve expanding locks and choke points along the inland waterway system to decrease delay. A second strategy is to restrict the size of container barge runs to two to three barges per run. This could allow them to sometimes bypass congestion at larger lock chambers (required for longer barge runs), by utilizing smaller, less congested secondary lock chambers.

### ***Distance and Transit Time***

Longer distances between origin and destination points make barge traffic more efficient in terms of both cost and time. Shorter runs proportionally require more staging, load and unload time in relation to actual transit time. If the time a barge spends in port, relative to the time it is in transit can be reduced, the barge operation becomes more efficient in terms of distance covered in a given time period. This efficiency will also translate into cost savings. Since port operations are a fixed cost, a longer run between ports allows the cost to be disbursed over a greater distance, creating a lower per mile cost. The Port of Pittsburgh recognizes the need for longer-distance port-pairs.

### ***Port Infrastructure***

In order to handle barge container traffic, many traditional barge ports/docks along Appalachian Region inland waterways may need infrastructure improvements, expansion, or both. Traditional barge facilities are designed to primarily handle bulk commodities (i.e., coal, petroleum, scrap iron). To accommodate container traffic and associated barge-to-truck, barge –to-rail, and barge-to-barge transfers, the following improvements must be considered (as briefly addressed in the *Progression* section):

- On and off-load equipment (cranes, forklifts, Ro-Ro capability)
- Container storage and staging areas (land requirements)
- Improved truck and rail access
- Truck queue/waiting areas (land requirements)
- Dredging of key inland waterway segments

Many of these issues, such as dredging and land issues, are currently addressed in the course of facilitating the region’s existing inland waterway bulk freight traffic. Still, a variety of lift and storage equipment will need to be made available at port facilities that are accessible by barge rail, and truck for efficient COB operations. Improved flexibility to change equipment modes is important. Either stationary dockside cranes or mobile cranes can be used to load and unload containers. Alternatively, the Ro-Ro system (Roll-On, Roll-Off) uses trailers or containers on chassis. The choice of equipment and its location depends on a full understanding of local conditions, economics, and operation/freight type.

### **Needs and Next Steps**

As addressed in previous chapters, shippers are increasingly selecting transportation services based on time-definite service and reliability, rather than mode or route. In addition, door-to-door service is increasing important. In order to become a viable alternative to door-to-door truck service or intermodal door-to-door truck-rail service, COB operators must begin to offer full service, time-definite freight transport. The next step for the Port of Pittsburgh is to help incubate the expansion of inland waterway service offerings. This is recognized as perhaps the greatest challenge facing COB networks.

The increase in COB service (door-to-door and time definite) can be accomplished in two ways. First, current barge operators can provide in-house truck service to their customers through either contracted carriers or wholly owned trucking operations. Second, third party agents, such as freight forwarders, can orchestrate freight movements via COB systems, coordinating door-to-door truck-barge freight movements.

## **Case Study 7: Erie to Nanticoke Ferry**

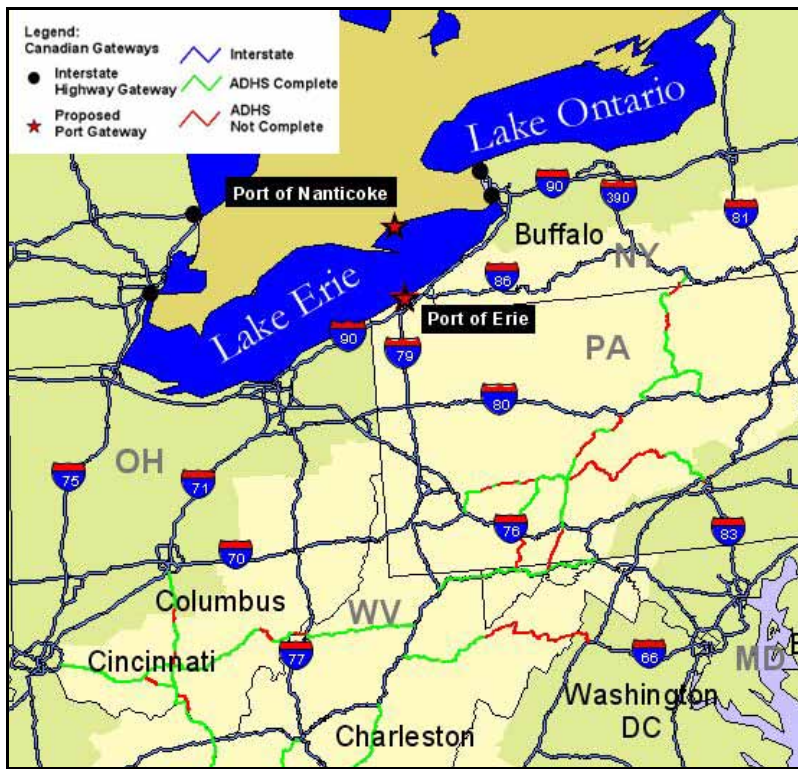
### **Concept**

The Erie to Nanticoke Freight Ferry will provide scheduled, containerized waterborne freight service between the Port of Erie in northern Pennsylvania and Nanticoke in southern Ontario, Canada. The concept is designed to take advantage of increasing trade and associated commodity flow between Canada and the United States, driven in part by NAFTA. As trade levels have increased between the two countries, levels of truck traffic and congestion have increased significantly on the highways and at border crossings connecting the two countries.

The goal of the Erie-Nanticoke Freight Ferry is twofold. The ferry service will seek to capture truck traffic currently traveling from southern Ontario through the Buffalo and Niagara, New York border-crossings and on to the south and west via I-90. The service will also seek to tap new and niche freight business opportunities that can benefit from a new international gateway. A prime example of such a niche market would be large and oversized truck freight that is currently banned from New York highways (thus the Buffalo and Niagara border crossings) due to the state's two-axel limitation on truck trailers.

**Exhibit 7-1** illustrates the location of the proposed freight ferry service (and associated gateways) in relation to the Appalachian Region and affected ADHS segments.

**Exhibit 7-1  
Erie to Nanticoke Freight Ferry  
Locations and ADHS Connectivity**



The Erie-Nanticoke Freight Ferry program differs significantly from intra-coastal container-on-barge (COB) service due its much shorter distance and transit time. Most COB concepts, such as the Port of Pittsburgh’s Ohio River container on barge network, advocate long-distance, multi-state containerized freight transport via barge. The Erie-Nanticoke Freight Ferry will specialize in short distance, scheduled service requiring rapid vessel turn-times (e.g., the time it takes to unload and load containers at port). The ferry distance between Erie and Nanticoke is 49 miles and is



expected to take three and a half to four hours each way, with a maximum four-hour turn-time at port. With the time and distance between the proposed service points being so short in comparison to other COB networks (existing and proposed), the load and unload at port becomes a critical factor in maintaining its competitiveness. To insure the necessary turn-times, the Erie-Nanticoke Freight Ferry will utilize vessels and port facilities that facilitate roll-on, roll-off (ro-ro) loading and unloading of containers/trailers, versus the more time consuming stationary and/or mobile cranes method of loading and unloading freight (lo-lo). This method allows trucks to drive directly on and off the ferry (or barge) to rapidly deposit and remove freight containers without the aid of a crane or lift. The price of the added speed and convenience of ro-ro capability, however, is the inability to stack containers, thus limiting ferry capacity in relation to COB vessels.

An initial study of the Freight Ferry program and its associated catchment area has focused transport potential on select commodity groups as appropriate for truck-to-ferry diversion. The following southern Ontario and northern Appalachian origin and destination freight characteristics were examined by commodity type (SIC code) to identify those most suitable for diversion:

- Distance between origin and destination
- Frequency of travel
- Freight volume
- Time sensitivity
- Seasonality in freight movements
- Variations in freight movement
- Industry growth

Based upon the listed freight and shipper characteristics within the planned catchment area, the following six SIC groups, or commodity types, have been identified as the most likely to utilize the Freight Ferry service:

- Agriculture, Forestry and Fishing
- Food and Beverage
- Light Manufacturing

- Chemicals
- Heavy Manufacturing
- Wholesale/Retail Goods

The market and catchment area within the Appalachian Region is expected to include southwestern New York, western Pennsylvania (inclusive of Pittsburgh), northern West Virginia and eastern Ohio.

### **Progression**

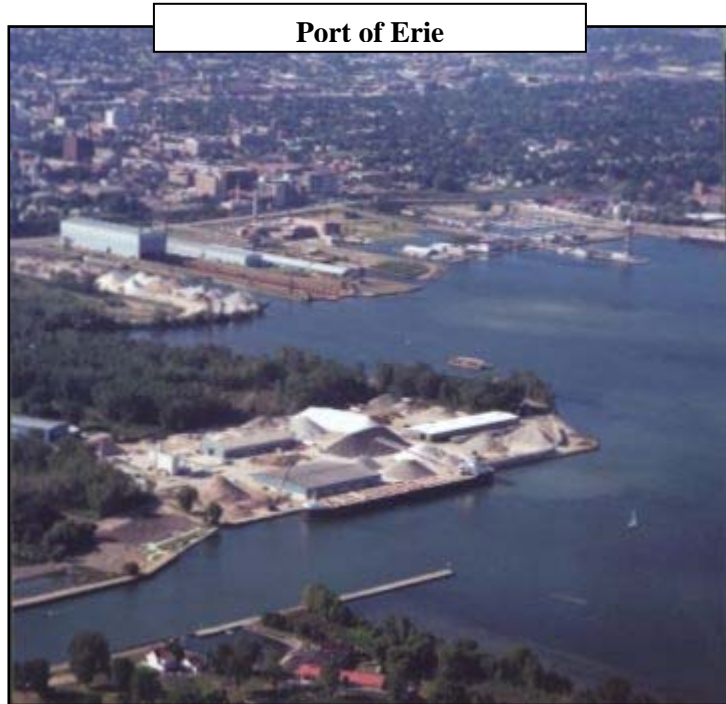
A Canadian interest, the Upper Lakes Group, in conjunction with the Port of Erie has been the driving force behind the Erie to Nanticoke Freight Ferry concept. The Upper Lakes Group will be the operator of the freight ferry and will have the responsibility of developing the port facilities at Nanticoke to support ferry operations. The Port of Erie will be responsible for developing its facilities on the U.S. side of ferry operations. Currently, the Port of Erie has the capacity to handle initial start-up operations (and associated cargo volume) with existing infrastructure. Existing assets include dock facilities, storage and staging yards, rail siding, and U.S. Customs.

Initial service levels will consist of a single ferry operating one and a half to two round-trips operations per day (an average of three and a half one-way operations) with the capacity to move 100 trailers per one-way operation. It is estimated that the service will run six to seven days per week with minimal downtime, translating to 340 annual operating days. On average, the ferry is anticipated to operate at 75 percent capacity, which over the course of a year's operation will translate to 89,250 trailers transported.

The start-up cost for the initial single ferry service rests primarily with the Upper Lakes Group, in terms of both the purchase and operation cost of the vessel itself and in developing the necessary port infrastructure at Nanticoke. The Upper Lakes Group is working with private investors and the necessary Canadian government entities to obtain financing and government approval necessary to begin port construction.

## **Regional Benefits**

The Erie to Nanticoke Freight Ferry will provide the Appalachian Region with two distinct benefits; an increase in intermodal freight throughput at the Port of Erie and a new international gateway to Canada (the United States' largest trading partner). As with the development of any intermodal facility, an increase in activity and service offerings will translate into increased economic activity and job creation. Direct economic stimulation and job creation will be derived from the daily operations of the Port of Erie gateway and intermodal facility. It is also anticipated that secondary benefits will be realized in areas surrounding the Port of Erie, as commerce is attracted by the new and improved transportation and logistics services.



Providing international gateway service for containerized and trailer freight to Canadian markets will also be a tangible benefit and job creation tool for the Erie area. In order to support increased demands for international freight, shippers, forwarders, and carriers will need to establish or retain customs brokers, customs clearing operations, and in-bond storage facilities to support Port of Erie operations.

## **Regional Intermodal Connectivity**

The northern Appalachian Region will gain containerized and trailer truck-to-ferry intermodal connectivity via the Port of Erie. North-south I-79 provides the primary connection from the Port of Erie to Corridor T of the Appalachian Development Highway System (ADHS). From I-79, direct access to east-west I-90, Corridor T (via I-90) and I-80 are easily accessible. This section of the ADHS network offers superior access to the Port of Erie and freight ferry services. Due to

ADHS connectivity, the Port of Erie has the potential to become a primary Canadian gateway for the entire northern Appalachian Region. Exhibit 7-2 details the distance and drive time to the Port of Erie’s nearest interstate highways and ADHS corridor.

**Exhibit 7-2  
Erie to Nanticoke Freight Ferry  
ADHS Connector Proximity**

<b>ADHS Corridor or Interstate</b>	<b>Distance in Miles to Corridor</b>	<b>Drive time to Corridor</b>
I-79	3.2	5 minutes
I-90	7.1	9 minutes
Corridor T (I-86)	14	20 minutes
I-80	70	1 hour 20 minutes

Source: WSA

The potential also exists for ship-to-rail intermodal transfer at each port served by the freight ferry. The Port of Erie is currently served by rail and has the capacity to meet ferry-to-rail intermodal demand with upgrades to existing rail sidings and the addition of container loading equipment. Nanticoke land availability also allows for the construction of ship-to-rail infrastructure. Multiple railroads have been approached to gauge interest in providing rail service (and investment) to each port (Erie and Nanticoke). CSX has expressed interest in providing service at both ports and is working with project developers, Upper Lakes Group, and the Port of Erie, to establish project needs and market potential.

**Needs and Next Steps**

Planning for future growth, the Port of Erie has identified several infrastructure improvement projects that would increase the efficiency and facilitate future expansion of freight ferry operations. Among the port improvement identified are the following:

- Additional rail siding to facilitate direct ferry-to-rail intermodal transfer.
- Expand current or create additional dock space.
- Intermodal transfer yard and staging area.
- New access road to port facilities.

Constructing an additional dock will be the most expensive of the identified improvements. The Port of Erie estimates the project will cost an estimated \$12.5 million and require environmental wetland mitigation measures to complete construction. Note, however, that additional dock construction/expansion is not necessary to handle the initial single ferry operation. This investment would only be necessary to facilitate multiple ferry operations should future demand warrant.

An additional rail siding, should the market for ferry-to-rail intermodal service materialize, will cost an estimated \$1.5 million. CSX has expressed an interest in providing this service, however, it is currently unclear what level of financial support CSX will provide to upgrade the necessary infrastructure. Financing of port growth projects is anticipated to come through a mix of federal and state support supplemented by private investment.