# Table of Contents

1. Introduction .......................................................................................................................... 7

2. Case Studies in Statewide Freight Planning ........................................................................... 8
   2.1 Maryland ............................................................................................................................. 10
      2.1.1 Description ................................................................................................................ 10
      2.1.2 Main conclusions ......................................................................................................... 11
   2.2 Virginia .............................................................................................................................. 13
      2.2.1 Description ................................................................................................................ 13
      2.2.2 Main conclusions ......................................................................................................... 15
   2.3 Minnesota .......................................................................................................................... 17
      2.3.1 Description ................................................................................................................ 17
      2.3.2 Main conclusions ......................................................................................................... 19
   2.4 Indiana .................................................................................................................................. 21
      2.4.1 Description ................................................................................................................ 21
      2.4.2 Main conclusions ......................................................................................................... 22
   2.5 Michigan ............................................................................................................................ 24
      2.5.1 Description ................................................................................................................ 24
      2.5.2 Main conclusions ......................................................................................................... 25
   2.6 Implications for Freight Planning in Ohio: Best Practices ..................................................... 27

3. Modal Strategy: Rail .................................................................................................................. 30
   3.1 Leverage Ohio’s Rail Intermodal Network ............................................................................ 30
      3.1.1 Truck/Rail Diversion Associated with New Intermodal Hub ....................................... 30
      3.1.2 Development of Domestic Intermodal Corridor(s) ....................................................... 33
      3.1.3 Intermodal Terminals and Economic Development ..................................................... 36
   3.2 Adjust to Changes in Rail Demand – Shale Oil and Gas ....................................................... 42
   3.3 Bring Infrastructure to 286,000 Pound Standard .................................................................. 44
   3.4 Conclusion .......................................................................................................................... 46

4. Modal Strategy: Trucking ......................................................................................................... 47
   4.1 Prospects for LNG Fueled Commercial Vehicles ................................................................. 47
      4.1.1 Benefits ..................................................................................................................... 48
      4.1.2 The Fueling Challenge ............................................................................................... 48
      4.1.3 Current Fueling Status ............................................................................................... 49
      4.1.4 Current Ohio Fueling Status ...................................................................................... 50
      4.1.5 Other Industry Concerns ............................................................................................ 51
      4.1.6 Opportunities for Ohio ............................................................................................. 51
      4.1.7 Strategy Options ........................................................................................................ 52
   4.2 Capacity Concerns in Trucking ............................................................................................ 54
      4.2.1 Driver Shortage .......................................................................................................... 54
      4.2.2 Driver Hiring Restrictions ........................................................................................... 55
      4.2.3 Driver Image .............................................................................................................. 56
      4.2.4 Driver Training and Tuition ....................................................................................... 56
      4.2.5 Other Capacity Concerns ........................................................................................... 57
      4.2.6 Supply Chain Adjustments ......................................................................................... 57
### 4.2.7 Strategy Options: Drivers for the Future

57

### 4.3 Developing Truck Parking through Public-Private Partnerships

58

#### 4.3.1 Commercial Vehicle Parking

58

#### 4.3.2 Ohio Rest Area Commercialization Efforts

59

#### 4.3.3 Developing Truck Parking through Public-Private Partnerships

60

#### 4.3.4 Technology-based Options

60

#### 4.3.5 Leverage Existing Facilities

60

### 4.4 Increasing Ohio’s Truck Weights

61

#### 4.4.1 Long Combination Vehicles

62

#### 4.4.2 LCV Considerations In Ohio

63

#### 4.4.3 Advantages and Concerns for LCVs

66

#### 4.4.4 Best Practice LCV Benefits

67

#### 4.4.5 Cost and Revenue

67

#### 4.4.6 Options for Strategy

68

### 5. Modal Strategy: Waterborne Freight

70

#### 5.1 Opportunities in the Energy Economy

70

##### 5.1.1 Market Context

71

##### 5.1.2 Silica Movements

71

#### 5.2 Container Service on Lake Erie or the Ohio River

72

#### 5.3 Other Opportunities

73

#### 5.4 Dredging Strategy

74

##### 5.4.1 Dredging: Introduction and Context

75

##### 5.4.2 Rationalize Allocation of Maintenance Resources

76

#### 5.5 Strategic Development of Ohio River Freight Assets

86

##### 5.5.1 Factors Governing Ohio Promotion of Barge Terminal Development

86

##### 5.5.2 Construction and Maintenance of “Last Mile” Road and Rail Connections

86

##### 5.5.3 Designating Ohio Barge Terminals as Part of Oversize/Oversize Load Routes

87

##### 5.5.4 Participation in the Federal Marine Highway Program

87

##### 5.5.5 Advocacy for Adequate Federal Lock and Dam Funding

87

##### 5.5.6 Publicly-Driven Marketing and Logistics Campaigns

88

##### 5.5.7 Promotion of the Tennessee-Tombigbee Waterway as a Mississippi River Drought Alternative

88

### 6. Modal Strategy: Air Cargo

90

#### 6.1 Strategic Implications for the Region’s Four Largest Cargo Hubs

91

##### 6.1.1 Rickenbacker

91

##### 6.1.2 Toledo

92

##### 6.1.3 Wilmington

92

##### 6.1.4 Cincinnati-Northern Kentucky

93

#### 6.2 Other Strategic Focus Areas

94

##### 6.2.1 Safety

94

##### 6.2.2 Mobility and Efficiency

94

##### 6.2.3 Accessibility and Connectivity

94

##### 6.2.4 Economic Development

95
List of Exhibits

Exhibit 1: Freight Planning Components by State ................................................................. 9
Exhibit 2: Effect of Distance and Density on IMX Market Share (7 Year Average, 2002-2008) .......... 31
Exhibit 3: Market Area Definition for North Baltimore Truck to Intermodal Rail Diverion Analysis...... 32
Exhibit 4: Divertible Truck Traffic for Potential North Baltimore Routes .................................. 33
Exhibit 5: NS Crescent Corridor and Parallel Interstate Highways ........................................... 34
Exhibit 6: Primary Truck and CSX/NS Intermodal Rail Corridors in Regions Surrounding Ohio ...... 35
Exhibit 7: NS Heartland Corridor (with Connection to Cincinnati) ........................................... 36
Exhibit 8: Summary of Intermodal Facilities Planned, Recently Constructed, or Under Construction ... 37
Exhibit 9: Number of Metropolitan Areas with CSX and NS Intermodal Terminals by Population .... 38
Exhibit 10: Market Area of NS Intermodal Terminals Serving Ohio ........................................ 39
Exhibit 11: Top Ten Commodities by Weight and Value ....................................................... 40
Exhibit 12: UP Chicago Area Intermodal Terminals ............................................................... 41
Exhibit 13: Rail Lines Unable to Handle 286,000 lb. Railcars .................................................... 45
Exhibit 14: LNG Containerized Station .................................................................................... 47
Exhibit 15: Top Ten States for Alternative Fuels, and Ohio, 2010 .......................................... 49
Exhibit 16: Network of Natural Gas Refueling Stations, United States .................................... 50
Exhibit 17: Network of Natural Gas Refueling Stations, Ohio .................................................. 50
Exhibit 18: Sources of Driver Shortage by Cause ..................................................................... 55
Exhibit 19: Current and Hypothetical Annual Truck Volumes in Ohio at 80,000-lb and 90,000-lb .... 61
Exhibit 20: Trailer Types, Size, and Weight ............................................................................. 62
Exhibit 21: Twin 48-foot Trailers ............................................................................................. 62
Exhibit 22: Allowance of Longer Combination Vehicles on the National Highway System, 2010 ...... 63
Exhibit 23: Truck Traffic on I-90 in Ohio, 2012 ....................................................................... 64
Exhibit 24: Ohio-based Trucks, Through Trucks, and All Trucks, 2012 ...................................... 65
Exhibit 25: Benefits of LCV Use .............................................................................................. 67
Exhibit 26: Historical and Projected Proppant Demand ........................................................... 71
Exhibit 27: USACE Contracted Dredging Costs and Volumes at Ohio’s Lake Erie Ports, 1997-2011 ... 77
Exhibit 28: USACE Confined Disposal Facilities in Ohio, by Capacity ....................................... 78
Exhibit 29: Average Costs of Dredging Authorized Harbors and Navigation Channels Nationwide ... 79
Exhibit 30: Multi-year Funds Used for Dredging and Disposal, as Designed, FY 2005 – FY 2011 .... 82
Exhibit 31: Multi-year Funds Used for Dredging and Disposal, as Performed, FY 2005 – FY 2011 ... 82
Exhibit 32: Multi-year Funds…Compared to the Volume and Value of Waterborne Commerce ...... 83
Exhibit 33: Drought Conditions in 2013 have Reduced Water Volumes within the MS River System... 89
1. INTRODUCTION

This draft report is submitted to the Ohio Department of Transportation for agency comment in fulfillment of Parsons Brinckerhoff’s commitment to perform elements 3.1 and 3.2 of the scope of services for the Ohio Statewide Freight Study. This draft includes a review of pertinent examples of statewide freight planning, selected among Ohio’s regional peer states, or for the quality of the plans themselves. In summarizing these plans, this report supplies a high-level assessment of their conformance to MAP-21 freight plan requirements (although all of the plans preceded MAP-21), and points of relevance to Ohio.

The remainder of the report sets forth an array of strategy options for freight modes in rail, trucking, water, and air transport. They address concerns and opportunities described in the Needs Analysis portion of this Study, and further develop a number of the strategic responses outlined there. These include infrastructure improvements, operational initiatives, and policy actions that promise benefit to the Ohio freight system, its users, and the economy and livelihood of the state. These strategies are designed to fulfill freight’s role in the goals of Access Ohio 2040: preservation, safety, mobility and efficiency, accessibility and connectivity, stewardship, and economic development.
2. CASE STUDIES IN STATEWIDE FREIGHT PLANNING

In the past decade, freight plans nationwide have progressed from basic descriptive analyses of commodity flows and asset inventories to fully multimodal documents linking freight movement’s economic relationships with demographic changes, macroeconomic trends, and land use policy. The most comprehensive plans now include a list of specific prioritized projects, and develop evaluation frameworks detailing how projects can be ranked according to costs and benefits. Some recent plans address capacity building exercises within DOTs and MPOs by identifying institutional barriers to continuous freight plan improvement and implementation, and suggest policy outcomes that may overcome these challenges.

This section reviews best practices in statewide freight planning with a view toward identifying methods of organization, approach, means of implementation, and relevance to the Ohio Statewide Freight Study. A selection of state freight plans are summarized according to the guidance proposed in MAP-21, which includes a number of provisions to improve the condition and performance of the national freight network and support investment in freight-related surface transportation projects. While all reviewed plans were completed prior to the enactment of MAP-21, the freight plan requirements later specified by MAP-21 are highlighted in each summary if a plan conforms.

The states selected for this review are Maryland, Virginia, Minnesota, Indiana, and Michigan. The first two are included based on an informal recommendation from AASHTO as to better examples of state freight plans, and the latter three are peer states for Ohio. In the case studies, text that refers to research and planning categories required or recommended by MAP-21 appears underlined.

The required components of MAP-21 compliant freight planning documents are:

- Freight system trends, needs, and issues
- Freight policies, strategies, and performance measures to guide transportation investment
- How the plan will improve the ability of the state to meet the national freight goals
- Consideration of innovative technologies/operational strategies (such as ITS) that improve freight safety and efficiency
- Description of improvements to reduce or impede freight deterioration on heavy vehicle routes
- Inventory of facilities with freight mobility issues such as bottlenecks, and description of the strategies to address those issues

The national freight goals are defined by the National Freight Policy (23 USC 167):

- Improving the contribution of the freight transportation system to economic efficiency, productivity, and competitiveness
- Reducing congestion on the freight transportation system
- Improving the safety, security, and resilience of the freight transportation system
- Improving the state of good repair of the freight transportation system
- Using advanced technology, performance management, innovation, competition, and accountability in operating and maintaining the freight transportation system
- Reducing adverse environmental and community impacts of the freight transportation system
These nationally promulgated freight goals echo the goals and policy statements that had driven freight planning documents in the past decade, sharing an emphasis upon freight’s economic impacts, the importance of improving connectivity and relieving congestion, practicing sustainable asset management, and investing in modal choices that minimize environmental impacts where possible.

The pre-MAP-21 freight plans reviewed in this section ranged in scope from basic to advanced. The most mature built upon a base of commodity flow analysis, asset inventory, needs assessment, and modal strategy structure, accompanying this content with detailed implementation frameworks, project evaluation workflows prescribing cost-benefit analysis and project prioritization methods, and industry perspectives from shippers and manufacturers culled from robust stakeholder engagement.

### Exhibit 1: Freight Planning Components by State

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2.1 Maryland

- The DOT chose to include specific projects and estimated construction/rehabilitation costs
- The first state to incorporate analysis of land use policies into freight strategy

2.1.1 Description

The *Maryland Statewide Freight Plan* was completed in 2010 and catalogues issues confronting freight infrastructure and invested stakeholders as Maryland prepares for a 75 percent increase in freight volumes forecasted for 2030 from a 2010 base year. Maryland is a state in which the DOT chose to include specific projects within its freight plan, with additional notation regarding estimated construction or rehabilitation costs for each project. The plan prioritizes projects based on criteria such as the projects contributions to connectivity or safety and security.

Freight system trends, needs, and issues are summarized in the second section of this freight plan, titled ‘Maryland’s Freight Story,’ providing context for the document’s findings. The section includes an overview of population and economic prognosis as well as anticipated freight growth (tonnage by mode). Key drivers of freight included the state’s traditional sectors of manufacturing, wholesale and retail trade, transportation, financial services, agriculture, and government contracting, but also were influenced by notable growth in the information technology, telecommunications, and aerospace industries. After summarizing existing multimodal capabilities, the ‘Freight Story’ section describes the role of the Maryland transportation system in supporting population and economic growth. The state is expected to see 25 percent population growth in two decades, while increasing density of federal and related service jobs will build on the above-average in-state GDP growth in previous years (7.4 percent, compared to the national average of 6.7 percent between 1997 and 2007). The plan then highlights the prospects of tonnage growth attributed to Maryland’s freight intensive industries on existing trade corridors such as I-95 while highlighting the prospects for growth in such new vectors as I-270. It notes that existing capacity issues can only be exacerbated by growth in freight volumes, bringing with them associated risks of losing industries and related jobs to other states.

Organization

The content of the Maryland Statewide Freight Plan is organized into eight sections and an introduction. After the ‘Freight Story’, described above, the plan has a section assessing future and present demands upon statewide freight movement infrastructure, and a section summarizing trends and issues drawn from demographic and economic data (and supplemented with industry interviews). Afterward, a section outlining ‘policy directions’ addresses the principal issues and barriers to achieving the publicly beneficial freight goals outlined in the plan. Mitigating and solving problems proceeds according to a framework for prioritization that is presented in the following section, which then includes the list of prioritized projects at various locations statewide. The plan concludes with an emphasis upon implementation by outlining next steps, financing strategies, institutional partnership opportunities, and performance management measures.
Approach

Foreshadowing the requirements of MAP-21, Maryland’s freight plan does include freight policies, strategies, and performance measures to guide transportation investment. Section 7, titled ‘Freight Transportation Policy Directions’ presents the issues and challenges facing the state’s goods movement system. The plan contains a policy direction matrix with issues/challenges, desired outcomes, and actions and programs to implement change.

‘Maryland’s Freight Strategy’, in Section 3, outlines the overarching goals that guide the Plan’s development and freight activities within the State. These goals are broken down into five categories: quality of service, safety and security, system preservation and performance, environmental stewardship, and connectivity. Each goal or objective has a corresponding strategy. The plan’s implementation strategy, in Section 9, assesses opportunities and obstacles to advance projects and programs, and provides an action plan to guide the DOT’s efforts.

Section 9 of the plan also provides an overview of financing strategies, interagency institutional and organizational relationships, and performance measurement over time. It identifies key measures to gauge the performance of Maryland’s freight transportation system by assessing the condition of the system, identifying problems, and prioritizes on actions to resolve those problems. Performance measures suggested include:

- Travel time in freight intensive corridors
- Expenses per mile for the trucking industry
- Congestion costs and delay times at freight bottleneck areas

2.1.2 Main conclusions

The Maryland plan effectively ranks a prioritized project list according to contributions to common benefit categories. The projects congruent with the plan’s five broad goals are, in turn, supported by modal strategies.

Needs

Maryland’s freight plan includes an inventory of facilities with freight mobility issues and description of the strategies to address those issues in its prioritized project list found in Section 8. Grouped by county, the table lists specific projects by mode. There are 95 highway projects listed. Highway widening, interchange reconstruction, roadway geometry improvements predominate. There are 27 rail projects listed, with bridge rehabilitations, track additions and reconstruction, and provision of double-stack clearance appearing as common needs. Sixteen port projects are prioritized within the freight plan, with dredging of berths (and constructed of containment facilities for dredged material), peer renovation, and crane purchases representing some of the more pressing expenditures. No air cargo

1 Connectivity and mobility limitations are also described thematically in the policy direction matrix in Section 7, to describe statewide limitations such as ‘lack of double-stack rail capacity, shortage of truck parking, increasing demand on rural highway corridors, and urban interchange bottlenecks’.
facilities appear as prioritized action items in the freight plan. Projects are scored according to a rubric encompassing quality of service, safety and security, environmental stewardship, connectivity, and coordination.

Consideration of innovative technologies/operational strategies (such as ITS) that improve freight safety and efficiency is present in the Maryland Statewide Freight Plan, though only to a limited extent. As identified in Section 8’s ‘Freight Program Development’, the plan focuses on projects that improve freight flows through new investments in capacity or operations. The congestion indicated by a roadway widening project, for example, may be addressed through alternative means, such as intelligent transportation system (ITS) strategies. The policy section of this freight plan addresses the importance of maintenance projects but specific projects are not identified in this portion of the document. Some operational strategies target the goals identified in ‘Maryland’s Freight Strategy’ in Section 3 at a conceptual level to address improvements to service, safety and security, system performance, and environmental impact. Broad goals pertaining to freight safety are to reduce the number of transportation-related injuries and fatalities, secure assets and goods in transit, and coordinate and refine emergency response plans. Specific strategies are not listed. Neither are specific technologies or strategies considered to attain the goal to ‘maximize operational performance and efficiency of existing systems’ in Maryland.

**Strategies**

Five broad goals promoted by the DOT are supported by strategies to achieve them:

- **Quality of Service**: address travel time reliability; promote interagency collaboration; increase multistate coordination to effectively serve overhead traffic
- **Safety and Security**: reduce injuries and fatalities; coordinate emergency response
- **System Preservation and Performance**: maintain existing capacity and maximize asset performance; identify critical needs; practice demand management; explore funding alternatives for expansion and maintenance
- **Environmental Stewardship**: coordinate land use decisions with freight planning; preserve existing environmental and historic resource context; minimize freight impacts
- **Connectivity for Daily Life**: improve multimodal options for goods movement; expand network capacity to manage growth and promote economic competitiveness; consider public-private partnerships for program delivery

While the plan does effectively link individual strategies with the state’s increasing ability to implement its stated policy objectives and achieve goals parallel to MAP-21’s national freight goals, the presence of specific projects extends this planning beyond the conceptual level. Industry trends in freight movement that have led to system deficiency are answered with strategies to address freight mobility issues, but there is no special focus on improvements for heavy vehicle routes.
2.2 Virginia

- The most comprehensive plan in articulating the connection between short term project implementation and long-term strategy
- Is not merely aware of macro-economic trends, but uses them to shape policy and make funding decisions pertaining to capacity preservation and expansion

2.2.1 Description

Virginia freight planners cite demographic and economic growth as an impetus for sustained investment in the creation and preservation of freight capacity in their state, highlighted in Section 2 of Phase I. Citing Virginia Employment Commission statistics that the population will grow by 30 percent by 2030, the study relates that job growth in state (29 percent) exceeded the national rate of increase (24 percent) from 1990 to 2006. The majority of this growth is concentrated in the northern portion of the state fronting Washington, DC, while the state’s southwest and Piedmont regions remained flat or shrank, respectively.

Freight system trends, needs, and issues orient the reader of Virginia’s Statewide Multimodal Freight Study in the first three sections of Phase I. The plan contains a section on freight’s relevance to the state (Phase 1, Section 1), reporting that freight-related industries provide 34 percent of employment in the state and contribute to 28 percent of the gross state product (GSP). Of freight-intensive sectors such as agriculture, manufacturing, and retail, the plan identifies manufacturing as a key jobs-driver in Virginia, responsible for a larger portion (9.3 percent) of jobs than any other freight-related sector.

The plan, following a synopsis of its commodity flow analysis, provides a high level overview of some of the needs and issues that the state faces with respect to freight infrastructure. For highways, these issues include bridge and tunnel condition, safety and emergency response impacts of truck parking shortages, system performance impacts of congestion, intermodal connectivity needs, and air emissions associated with a high reliance on trucking, and optimizing use of off-peak highway capacity. For rail these issues include the promotion of modal shift facilitated by intermodal container service, system preservation of aging infrastructure, creating 286,000 pound capacity and double-stack capacity for tracks, bridges, and clearances, financial assistance for shortline railroads, connectivity with ports, and creating platforms for multi-state coordination. The relevant port issues identified are improvements to safety and security, accommodation of growth (to accommodate a projected tripling of intermodal container volumes in the coming three decades), preservation of landside truck and rail access, and participation in MARAD Marine Highway programs that promote barge transportation. Air cargo facilities exhibited no capacity constraints, and the plan noted the importance of attempting to capture more of the traffic that enters facilities in larger origin-destination markets (such as those New York) that is trucked to Virginia. The challenges and opportunities are outlined in greater detail in Section 6 of the first phase of the plan.
Organization

Virginia’s Office of Intermodal Planning and Investment—located within the Secretary of Transportation hierarchy—completed a two-phase Statewide Multimodal Freight Study in 2010. Phase I introduces its content with a summary of the significance of freight to the state’s economy, state-specific planning challenges, and the key findings of the study. Section 2 provides a profile of demographic and economic trends, with particular attention paid to developments affecting current and future industrial outputs. The following section summarizes freight demand by commodity, mode, and origin-destination profile before forecasting how these current baselines will change by 2035. Next, an asset inventory details Virginia’s freight movement capabilities for each mode: truck, rail, marine, air, and intermodal. A stakeholder input section presents the findings of industry interviews and the organization of a statewide Freight Advisory Committee. Phase I concludes by introducing an evaluation (‘return on investment’) framework for measuring the efficacy of freight infrastructure expenditures, before highlighting opportunities for improvement by mode and by geography.

Phase II begins with an evaluation of the recommendations of the Multimodal Freight Plan through network model analysis, monetized transportation benefit analysis, and monetized economic benefit analysis. This first section also lists specific projects already programmed in the near-term, along with additional potential near-term and long-term projects, and an explanation of how they advance freight strategy statewide. The following section applies a benefit-cost evaluation tool to several categories of freight performance enhancement, including highway improvements, rail track improvements, rail grade separation, modal diversion, and port expansion among others. The third major component of Phase II is composed of the geographic definitions and commodity profiles for key trade corridors and population regions within Virginia, with main project recommendations and an asset inventory for each corridor and region.

Approach

Freight policies, strategies, and performance measures to guide transportation investment are presented in Section 6 of Phase I. This section defines some of Virginia’s most critical freight chokepoints, bottlenecks, and issues; looks ahead to potential issues and impacts in the year 2035; summarizes important freight enhancement projects and initiatives underway; and outlines additional innovative strategies and opportunities that could be part of Virginia’s program for freight advancement. A return on investment framework for approaching freight challenges and opportunities includes an examination of freight issues in the Commonwealth with a brief discussion of the benefits, costs, and performance metrics associated with freight improvements. Specific freight bottlenecks within the state are highlighted here by mode. The plan presents a framework whereby investments can be evaluated for contribution to benefit categories that include: travel time improvements, travel cost reductions, increased reliability, improved freight capacity, decreased environmental impact, and improved safety and security.

The plan then discusses a benefit cost evaluation tool, accompanied by a series of representative applications using hypothetical project data. This basic prioritization tool was developed to quantify the
public benefit of freight investments across all modes: highway, rail, marine, and air. The tool was specifically designed to capture impacts upon long-sought modal diversion between modes and to apply, as nearly as possible, a comparison between parallel factors for the estimation of benefit values. For example, a rail improvement might divert trucks from a long-haul interstate but add trucks to local roads.

2.2.2 Main conclusions
The Virginia study is the most comprehensive in articulating strategic connections between short-term action and long-term goals.

Needs

The Virginia Multimodal Freight Study includes an inventory of facilities with freight mobility issues, and description of the strategies to address those issues, in Section 2 of Phase II. It details programmed near-term projects, which are listed in Virginia modal system planning documents (with costs, mode, and location). It also details potential longer-term projects that may be implemented by the year 2035. Some of these projects are identified in long-range modal system plans, others are being discussed but have not advanced to modal system plans, and a third group is comprised of new concepts being introduced for further consideration (with costs not yet estimated). Programmed near term projects total $5.6 billion in cost and potential long-term projects total $14.6 billion. Of the $5.6 billion for the most immediate needs, highway uses constitute $3.8 million (68 percent), ports $1.6 billion (29 percent), and rail $194 million (3 percent). No funding is budgeted for air cargo projects in this study. Comparative efficacy of the projects is measured through qualitative bottleneck analysis (cross-checking the projected mobility and capacity improvements against a list of high priority locations of congestion), highway network model analysis (whereby benefits are summed as contributions to highway capacity and potential for modal diversion to non-truck movements), and monetized public benefits. These benefit categories include the effects of VMT reductions upon shipper costs, averted pavement maintenance costs, decreased emissions, and fewer instances of fatality and injury.

Most improvements simply create or preserve freight capacity, while some employ technological advances to achieve greater connectivity and mobility. Section 6 includes consideration of innovative technologies/opertational strategies (such as ITS) that improve freight safety and efficiency. Performance-based planning and return on investment analysis rank the comparative benefits of ITS, relative to other expenditures, and its ability to reduce congestion costs and increase reliability. The other new equipment type introduced to the set of benefit models is the allowance of long combination vehicles (LCV), which would produce productivity savings to shippers by allowing greater economies of scale in load volumes per truck and driver employed.

Strategies

General planning strategies advocated by the freight study are the formation and support of a Freight Advisory Committee to gain insight into the values and views of private sector freight interests during the planning process, as well as the implementation of a ‘return on investment’ approach to the comparative evaluation of freight project costs and benefits.
Concrete actions considered that concern specific facilities include:

- **Highway**: I-81 safety improvements and diversion of traffic to rail; I-95/I-395/Capitol Beltway Improvements; I-66 capacity improvements; Route 460 location study; I-64 capacity and safety improvements; I-564 connector completion; Route 29 corridor study; conceptual development of Hampton Roads third crossing
- **Rail**: address critical choke points identified in Virginia State Rail Plan (CSX east of Clinchport, NS west of Blacksburg, NS west of VA Port Authority, NS west of Roanoke, NS and CSX east of Lynchburg, CSX east of Clifton Forge, CSX east of Scottsville, CSX west from Richmond, Buckingham Branch north from Manassas); I-81 freight rail improvements; completion of the Mid-Atlantic Rail Operations Study, comparing the efficiency of rail service to that offered by I-95, I-81 and other major highway corridors; Heartland Corridor Double-Stack Initiative; proposed CSX I-95 rail corridor; I-664/Route 164 Median Rail
- **Ports**: Virginia Port Authority Master Plan; capacity enhancements at Craney Island, Portsmouth; landlord port development by Maersk; improved access and capacity at key port-serving routes: I-64, I-264, I-664, I-95, and I-81, I-85; U.S. 460, and U.S. 58
- **Air**: no substantial air cargo issues are documented

General strategies addressing the major freight issues, by mode, are:

- **Trucking**: introduction of truck toll lanes; high occupancy toll (HOT) lanes; supporting time shifting to off-peak times; increased truck parking; better dissemination of truck information; larger vehicles; modal diversion
- **Rail**: safety improvements for at-grade rail crossings; system preservation as a means of promoting modal diversion; system modernization and capacity improvements; consideration of public private partnerships; assistance to shortline operators; increased port access; multistate coordination; and accommodation of passenger use of rails
- **Ports**: security improvements for cargo; capacity expansion for substantial growth in container volumes; preserving and expanding landside access of truck and rail to port assets; MARAD ‘Marine Highway’ initiative to encourage container-on-barge service; increased rail-to-dock capacity; port-related intermodal parks and logistics space
- **Air**: attempting to capture more of the traffic trucked from New York City airports; extension of MetroRail to Dulles Airport to free lane capacity for trucks

In listing specific projects, the study is clear in advising how the projects contribute to the state’s ability to improve freight movement characteristics in ways now comparable to the national freight goals of MAP-21. More than the other plans reviewed in this set of case studies, this freight study concretely describes the relationship of the proposed improvements and the study’s efforts to address freight mobility issues, although there is no special focus on heavy vehicle routes.

Phase II of the Virginia *Multimodal Freight Study* states that the freight study should serve as a means of considering the impacts of the policy decisions of the Virginia Transportation Long Range Plan upon freight-intensive activities in the state. Additionally, the potential long-range projects listed in Phase II of
the freight study augment the aims of the programmed near-term projects and discuss funding and revenue generating opportunities for projects without established financial support. The freight study then acts as a conduit transmitting, evaluating, and to some extent modulating the inputs of the Freight Advisory Committee in aggregating contributions to what may eventually become part of the state’s Transportation Long Range Plan. Further linking the strategies of the freight plan to the long-range planning process, Phase II of the study recommends the placement of freight-knowledgeable staff within the Office of Intermodal Planning and Investment.

2.3 Minnesota

- Specific projects are not identified or evaluated, but modal issues are addressed thematically
- Rail preservation was a key focal point in a state that moved a disproportionate volume of dry bulk tonnage

2.3.1 Description

The Minnesota DOT published the Minnesota Statewide Freight Plan in 2005 and has since followed with mode-specific research focusing on heavy commercial vehicle safety, truck weight enforcement, truck parking, regional freight studies, freight performance measurement, and a freight rail study. No comprehensive statewide freight planning document has been completed since.

Freight system trends, needs, and issues are described in the commodity flow analysis (Section 3) and system analysis (Section 4), which focus upon presenting and analyzing freight movement trends extrapolated from state-specific data from Transearch and FAF, as well as U.S. Census data. Minnesota moved four percent (636 million tons) of U.S. freight volume in 2001, and 6 percent ($560 billion) of national freight value. Intrastate traffic comprised a third of the tonnage, with overhead traffic being comparatively minimal (22 percent by volume). Inbound/outbound directional flow slightly favored outbound flows (24 percent of tonnage) over inbound (21 percent). The plan forecast a 60 percent increase in freight tonnage for 2020 from a 2001 baseline, with intrastate flows expected to increase more than other movement categories. Regionally, freight movement relationships were most concentrated in the Midwest, Plains, and Mountain region states, as well as substantial traffic from U.S.-Canada gateways.

In 2001, rail moved 33 percent of freight by volume. Only 2 percent of this rail volume was moved using intermodal containers. This modal distribution can be attributed to the predominance of bulk freight movements—agricultural products, coal, chemicals, and lumber—generally heavy, low value commodities that are well served by rail. Air cargo presence was minimal by volume in 2001, at approximately .1 percent of tonnage (and only 4 percent of value), with slightly more inbound tonnage than outbound. Water moved 8 percent of tonnage in 2001. Not unexpectedly, trucks carried 79 percent of value in 2001, with 14 percent of Minnesota freight value hauled by rail. For the 2020 forecast year, trucks were predicted to maintain the largest modal share, carrying 79 percent, with rail declining slightly to 28 percent of tonnage, and water declining to 6 percent. Air cargo volumes were forecast to increase by 133 percent, but remain a minimal share (less than 1 percent) of the total tonnage moved.
The plan analyzed in-state freight trends by sub-region, dividing Minnesota into the Northeast (with a focus upon mining), Western (farming and food processing), and Central-Southeast (manufacturing and service industries). The first two regions are adequately served by railroads, reflecting the commodity mix represented, while higher value activities in the manufacturing and retail sectors increase truck demand in the Central-Southeast.

Section 6 unpacks the freight impacts of in-state population and employment trends prior to the publication of the study and predicts the relevance of changes for the 2020 forecast year. Job growth and population growth were to be heavily concentrated in the Twin Cities metropolitan area, with the focus of warehousing and manufacturing activities also taking place there. Growth in rapid shipment of high value, low weight shipments, trending in Minnesota and the nation in the 15 years prior to the study year of 2001, was expected to continue. This explained the commodity flow forecast’s prediction that air freight would gain 133 percent in tonnage, while truck would grow by 79 percent. NAFTA trade shipments were expected to claim a disproportionate share of incremental growth. Additionally, the plan notes that flows to the Ports of Los Angeles and Long Beach could be enhanced substantially should intermodal container shipment become possible without backtracking to Chicago. Barge traffic would drive tonnage increases to the American south via the Mississippi River. National trends mentioned in Section 6 include the replacement of ‘push’ to ‘pull’ supply chains and that change’s impact upon just-in-time logistics in Minnesota; effects of deregulation on trucking; the impediments to air cargo growth due to limited passenger service; and the threat posed by rail congestion in the Chicago region.

Organization

The Minnesota Statewide Freight Plan begins with an asset inventory of highways, railroads, ports and waterways, air freight, intermodal, and U.S.-Canada border crossing facilities. The following section details freight flows by direction, origin-destination profile, commodity, and modal preference, with primary trade corridors and population regions delineated. A needs analysis component lists systemic infrastructure backlogs by mode with notation on the deficiencies’ impact on multimodal performance. Afterward, a separate section itemizes DOT programs within Minnesota that pertain to freight operations and asset construction or rehabilitation, as well as existing planning and research efforts. The plan’s section on freight performance measures is organized by mode. Performance measures quantitatively track the progress of the DOT on issues related to modal capacity preservation and creation, safety, intermodal connectivity, and travel times. The public involvement section concludes with a brief treatment of ‘next steps’. A new freight policy articulated by the freight plan offers that the DOT’s mission, as it relates to freight, should be to offer ‘safe, reliable, and competitive access to statewide, national, and international markets’ by way of each of the listed modes. Six ‘policy directions’—ranging in subject from asset condition to planning process guidance—then offer a means by which the DOT can achieve the performance mandate of the new freight policy.
**Approach**

Guidance related to freight policies, strategies, and performance measures to guide transportation investment is limited in the *Minnesota Statewide Freight Plan* compared to the offerings of the plans produced from 2009 to 2012. Those later plans present project evaluation tools, such as highway modeling, cost-benefit analysis, and net present value of financial benefits, that can be used to rank or prioritize specific projects as they compete for limited funding resources. Section 6 of the Minnesota plan briefly relates policy trends at the federal level (ISTEA and TEA-21) as they pertain to freight, and summarizes the state and local level policies in Minnesota that affect freight. The plan notes that local land use or zoning decisions are not coordinated with the freight objectives of transportation officials, and residential and commercial development are displacing industrial and marine freight assets.

Performance measures proposed in the freight plan provide a means for the DOT to monitor and evaluate transportation system needs when weighing the timing and location of freight investments against competing uses of funds. Specific performance measures quantitatively track asset condition, the percentage of municipalities engaging in freight related planning, bottleneck mitigation, emergency management outcomes, snow clearance efficacy, roadway throughput, peak to off-peak ratios, rail access, at-grade rail crossing crashes, and roadway access for air cargo facilities, among others.

### 2.3.2 Main conclusions

Compared to more recent freight plans, the scope of analysis for this plan is limited. However, the plan is able to extract substantial value from commodity flow data sources in compiling a thematic list of modal deficiencies (by region and industrial focus) and associated strategies for their mitigation.

**Needs**

The system analysis in Section 4 of the Minnesota plan serves as a list of facility deficiencies by mode, considering capacity, facility condition, levels of service, infrastructure demand, market penetration in key commodity regions, intermodal capabilities, service cost, and security. This content is analogous to the MAP-21 requirement that future freight plans create an inventory of facilities with freight mobility issues and description of the strategies to address those issues. However, the Minnesota plan does not address limitations or deficiencies at specific freight facilities, or recommend specific projects.

Recurring themes in freight needs are identified by mode. Highway freight flows are constrained by geometric impediments such as curvature, embankment, and overhead clearances beneath bridges. Many roadways at the time of publication could not support weights in excess of 10 tons per axle, or 80,000 in gross weight. Peak congestion periods brought decreased travel speeds unacceptable to motor carriers. Finally, very few freight generating locations had adequate connectivity with key interregional corridors (IRCs) monitored by the DOT.

Rail needs include the formulation of a policy response to railroad industry shifts to unit train service of 100+ cars, requiring farmers to truck freight 75-100 miles to a shuttle loader to take advantage of this service. Shortline railroads also expressed concern that rates offered shippers of 100+ cars for long hauls were not offered to them, as railroads increasingly focused on trainload traffic and placed less emphasis
on serving carload traffic generators. Intermodal transloading facilities were limited at the time of the plan’s publication. Rail interests in general noted the impacts of encroaching residential and commercial development as well as the difficulties posed by congestion in the regional rail hub of Chicago, the main interchange for eastern and western railroads. The freight plan notes the coalescing support of shippers and industry interests behind the Chicago Regional Environmental and Transportation Efficiency project (CREATE), elements of continue to be implemented in 2013.

Primary needs related to ports and waterways were the degraded condition of the lock and dam system on the Mississippi River between Minneapolis and St. Louis. USACE studies concerning the enlargement of seven to twelve of the locks (increasing their size to 1,200’ in length by 110’ in width) suggested significant travel time benefits were possible as more barges could be moved per tow and crew without needing to disassemble the configuration of barges for lock transit. Rail access to ports is mentioned as one capacity constraint, increasing truck reliance and decreasing rail service having raised farmers’ transportation costs. Finally, recreational uses of the river and riverfront land present demands upon waterway resources that are sometimes incompatible with freight movement.

Air cargo needs centered upon the desire to attract an international freight carrier to the Minneapolis-St. Paul airport, in spite of limited passenger offerings in this space at the time. One solution proposed was a distribution center up to 60 miles from the airport that would consolidate freight forwarder operations, as well as LTL truck shipments bound for the airport, while also providing the airport security clearance off-airport grounds. No consideration of cost-benefit analysis or comparative effectiveness is introduced for the airport policy recommendations or those of other modes.

Consideration of innovative technologies/operational strategies (such as ITS) that improve freight safety and efficiency is limited in the Minnesota Statewide Freight Plan. ITS is mentioned as a strategy for improving highway-rail crossing capabilities, traveler information for motor carriers, updated weather condition information, and changes to freight routing. This ITS strategy affirms one of the policy directives of the Minnesota plan to enhance operational performance of statewide freight systems.

Strategies

Planning processes, institutional partnerships, and motor carrier regulations are the subject of three of the six primary ‘policy directions’ supporting the DOT aim to offer safe, reliable, and competitive access to markets across all modes. Three policy directions provide a means to address freight mobility issues, as now required by MAP-21 in future freight plans. Strategies focused upon improving the condition, connectivity and capacity of statewide freight systems focus on truck movements, but also include rail and waterborne freight in their advocacy for refining funding programs to include performance targets and cost-benefit analysis and increased truck-rail facilities. Strategies targeting roadway-based movements address bridge and pavement deficiencies and improved penetration of interregional connectors. While there is no explicit treatment of heavy vehicle routes, concern for this aspect of traffic is evident in the plan. Predating the formation of MAP-21’s national freight goals, the specific goal of utilizing advancements in technology or innovation to improve freight performance may have been outside the scope of this 2005 plan.
2.4 Indiana

- Most comprehensive platform for comparative evaluation of projects
- Identifies process by which projects are prioritized for advancement within DOT structure

2.4.1 Description

Forecasting from a 2010 base year to 2035, the *Indiana Multimodal Freight and Mobility Plan* analyzes present and future demand upon the state’s existing freight infrastructure and identifies gaps where capacity, connectivity, reliability, or other performance factors may be improved. Completed in 2009, the *Indiana Multimodal Freight and Mobility Plan* presents freight system trends, needs, and issues through commodity flow analysis (Section 3) and a statewide economic and industrial profile (Section 4).

The plan’s commodity flow analysis is conducted through the use of publicly available data. FAF sources are supplemented with tonnage estimates extrapolated from the INDOT Statewide Travel Demand Model (ISTDM) for highways, waybill data for rail, BTS data for air cargo volumes, and waterborne tonnage from USACE annual statistics. One limitation of this approach was the lack of detailed accounting for overhead volumes that is possible through the use of commercial freight traffic data or larger scale FAF modeling; instead, the plan relied on stakeholder insights into this class of traffic. Truck movements predominate for shorter intrastate movements, while rail becomes competitive on interstate routes, with slightly more volume outgoing from Indiana than inbound in both the base year (2010) and the forecast year (2035). Indiana’s growth rates—measuring population, employment, and income—have been modest compared to the larger nation.

Major trade corridor gaps and needs appear in Section 6. Summarized thematically, the primary trends in systemic needs are: accommodating freight demand volumes driven by economic and industrial factors in Minnesota, Ohio, and Michigan; supporting Indiana’s disproportionate reliance on jobs in manufacturing (including automotive), transportation, and warehousing; surging export growth for the state’s healthcare and medical sector; transportation demands of legacy industries such as agriculture (corn and soybeans), metals (steel), and stone (limestone).

**Organization**

The *Indiana Multimodal Freight and Mobility Plan* begins with an introduction and the presentation of the results of its stakeholder coordination and outreach efforts. This section summarizes the positions of MPOs, university administrators, freight system users, and economic development officials. A section evaluating the condition and performance of freight assets in Indiana draws conclusions from an analysis of the Federal Highway Administration’s Freight Analysis Framework (FAF) for truck, rail, marine, air, and pipeline modes of freight movement. The following section presents statewide economic trends that drive changes in freight volume and gauges the impact of national trends within Indiana. While measuring the economic impacts of freight and transportation upon Indiana, the plan also features a business forecast for activities associated with Indiana’s freight-intensive industries. Its ‘Freight Policies’ describes the role of the state DOT and MPOs in freight planning and reviews previous studies that have analyzed freight movement in the state. This section also summarizes the process by which projects are prioritized for advancement within the DOT structure. Project planning categories are thematically
grouped by mode as infrastructure supply gaps prompted by growing freight demand. A subsequent section summarizes funding levels and outlines the system through which funding is incentivized and approved. The plan concludes with a framework for project evaluation at the planning stage and a process for implementation of selected projects.

**Approach**

The Indiana plan’s treatment of freight policies, strategies, and performance measures to guide transportation investment documents existing processes and recommends use of an economic impact model for proposed freight system improvements. Existing policies and mandates are organized in Section 5 and a succinct framework for project evaluation comprises Section 8. Section 5 catalogs existing DOT processes and reports involving freight planning in place prior to the publication of the freight plan, and an organizational diagram defines key functional relationships in the workflow.

The plan defines the roles of MPOs, quasi-government agencies, and private sector advocates in the DOT’s freight planning process, with specific reference to Long Range Transportation Plans (LRTPs) and the Transportation Improvement Plans (TIPs). The DOT’s Annual Program Development Process (APDP) is the formal process by which the DOT adds projects to its LRTP. The process initiates with a DOT call for suggestions from departmental divisions, MPOs, and other agencies. The DOT then prioritizes projects for inclusion in a project directory of highway improvements or the STIP, and achieves concurrence with the MPOs on projects included in their TIPs submitted to the FTA and FHWA.

Project prioritization (in Section 5) proceeds according to a scoring process defined by Major Moves (2006-2015), the Indiana infrastructure recapitalization program. Contributions to transportation efficiency, economic development, and safety are the determinative factors in establishing a proposed project’s rank. Facility preservation and enhancement are major value drivers worth 50 percent of a total score, while safety and job creation impacts constitute 25 percent each.

Section 8 of Indiana Multimodal Freight and Mobility Plan proposes a new framework for the comparison of projects based upon the measurement of economic impacts using REMI, a proprietary economic modeling software. The freight plan chose to incorporate this particular software because it was already in use within the DOT for projects that did not involve freight. The evaluation framework only addresses improvements to highway capacity, modifications to highway geometry, and rail upgrades, and does not provide a means of comparing the impact of port or air cargo project facility investments. The plan describes a conversion system whereby each of the three improvement types can be measured in parallel units of benefit and cost, which are then annualized in REMI after being monetized. REMI is known for estimating secondary and tertiary economic impacts in addition to the immediate effect of the project itself.

**2.4.2 Main conclusions**

The plan’s commodity flow analysis disaggregates the state’s core commodity groups by inbound and outbound flow and identifies key locations of congestion growth on the eight Interstate Highways that cross Indiana. With the findings of present and predicted infrastructure demand, the plan identified key facility deficiencies and needs, and outlined strategies to address them.
**Needs**

The freight plan provides a detailed inventory of facilities with freight mobility issues and description of the strategies to address those issues in Section 6, which is organized by mode and region, and includes a description of the economic, demographic, and industrial factors that are contributing to each freight system gap or need. Highway projects mostly produced capacity improvements (I-65, I-465, I-69, I-70, I-74, U.S. 31, U.S. 36, U.S. 41), and the Illiana Expressway represented the introduction of a new bi-state corridor. Railroad system needs included capacity improvement to Class I track and switching yards, the upgrading of shortline and regional rail assets to 286,000 pound capability, improved access to U.S. 36, and the construction of an intermodal rail facility in-state connecting Indiana with the ports of Los Angeles and Long Beach. The plan includes the consideration of innovative technologies/operational strategies (such as ITS) that improve freight safety and efficiency, noting that ITS may be one means of mitigating the state’s shortage of truck parking facilities in key locations by disseminating information on parking availability to freight system users. As noted, the state has made investments in software platforms for evaluating the comparative costs and benefits of transportation infrastructure projects throughout Indiana (using REMI, Net_BC, and the State Travel Demand Model). The plan also lists technological advancements enabling greater connectivity in intermodal rail service through the redesign of trailers and platform cars that allow more rapid transloading on Canadian Pacific.

Air cargo system needs included capacity expansions (in the form of longer runways) at Gary Airport and improvements to U.S. 40 in its approach to Indianapolis Airport. Needs prioritized as meaningful to the Indiana shippers’ ability to move waterborne freight included condition improvements on the Ohio River locks, roadway approaches to marine assets in Buffington harbor and Indiana Harbor, access improvements to I-265 at the Jeffersonville port facility, SR-62 improvements serving the Evansville and Mt. Vernon freight facilities on the Ohio River, capacity improvements to U.S. 50 at I-275, and the absence of adequate roll-on/roll-off service on Lake Michigan.

**Strategies**

Responding to the outline of needs presented in the *Indiana Multimodal Freight and Mobility Plan*, Section 6 of the plan presents corresponding strategies for each system deficiency. In describing improvements to address freight mobility issues, some strategies are more conceptual, such as the suggestion to incentivize a shift from trucking to rail and waterborne modes to effectuate demand reduction on I-65. Other recommendations are more actionable, such as the consideration of tolled truck lanes in all future highway capacity improvements on I-65, I-70, I-80, I-90, and I-94. Additional strategies were to prioritize funding for designated truck routes, provide additional truck parking facilities in high demand locations, and revisit state regulations concerning truck size and weight limitations (encompassing heavy vehicle activity). Rail strategies focused upon capacity creation, the creation of incentives for service continuity, and the segregation of some commodity service offerings to produce more reliable service system-wide. Funding for 286,000 pound capacity conversions for facilities was a top priority. Shippers also sought a direct intermodal rail link with west coast ports that did not involve Chicago. Other modal diversion possibilities included the development of a distinct ‘coal
corridor’ to increase the modal share of Indiana railroads in this commodity flow (though volume declines in the years since this plan’s publication would likely make this concept uneconomic today).

No air strategies are presented, given these facilities’ limited scope of needs. Marine freight strategies were brief. The plan suggests that the DOT work with the private sector to study the possibility of roll-on/roll-off service on Lake Michigan and increase rail connectivity with port facilities. Finally, while the plan identified no system gaps or needs for pipelines transportation, the plan does outline that this sector would benefit from simplified legislation concerning the acquisition of abandoned rail right-of-way. The plan also suggests that land acquisitions for pipeline construction could take place in coordination with land acquisition for new highways.

Finally, though the plan pre-dates the formulation of the national freight goals included in MAP-21, the content of the Multimodal Freight and Mobility Plan clearly establishes the connection between types of freight facility investment and the accrual of public benefits in categories substantively similar to the MAP-21 national freight goals.

2.5 Michigan

- One of a series of white papers produced as background to the new 2035 State Long Range Transportation Plan, the Michigan Freight Profile supplies treatment of freight issues and strategies that the LRTP does not
- While freight volumes and values decreased substantially, the DOT recognizes its role in facilitating solutions to capacity limitations for users in-state while participating in regional coordination efforts to affect policy changes that benefit the regional goods movement system

2.5.1 Description

While not a formally executed statewide freight plan, the Michigan Freight Profile, published in 2012, briefly summarizes freight system trends, needs, and issues by introducing more recent 2009 data to the analysis presented in the previous statewide Transportation Plan’s Freight Profile Technical Report (published in 2006 with 2003 data). The document updates many of the DOT’s strategies to reflect the recessionary climate of 2009, and what that climate has meant for freight-intensive industries such as manufacturing. The report cites the statistic that Michigan lost approximately half of its manufacturing sector from 2000 to 2010, from one million employees to 500,000. A total of 434 million tons of freight were moved in Michigan in 2009 (including inbound, outbound, intrastate, and overhead movements), representing a 35 percent decrease from 2003. Of the decreases tracked by mode, trucking was the most affected. Freight value also decreased substantially in 2009, compared to 2003, going from over $1 trillion to $520 billion in goods moved, a decline of 48 percent. Commodities moved traditionally by rail were the least impacted, and thus as trucking’s modal share decreased, rail movements (by both volume and value) increased slightly. Rail accounted for 19 percent of volume and 21 percent of value in 2009. Perhaps a conservative freight forecast, the Michigan Freight Profile indicates that 2003 levels of freight demand will return to Michigan by 2030, requiring a 50 percent increase over current tonnage moved.
Organization

The Michigan Freight Profile is eighteen pages in length and appears as a white paper supplementing the content of the State Long-Range Transportation Plan. Beginning with an introduction to the macroeconomic drivers of the substantial decrease in the value and volume of freight movements, the report disaggregates the trend data by mode and commodity, drawing upon the Transearch database. For each mode, a set of strategies appear under the commodity profile that address needs in terms of physical infrastructure and regulatory issues. The profile includes all four major modes, while also appending issues and strategies for border crossings in Michigan, noting that Michigan has the largest state-level trade volume with Canada, the largest trade partner to the U.S. The report concludes by summarizing the DOT’s efforts to advance the aims embodied by MAP-21, and notes that performance measures and standards for freight movement have been a part of Michigan DOT’s policy framework prior to the introduction of MAP-21 legislation. The DOT also discusses its outreach efforts, in forming a freight committee comprised of cross-functional staff within the Department, as well as outreach efforts to regional universities and collaboration on studies to identify transportation infrastructure gaps.

Approach

The profile engages freight policies, strategies, and performance measures to guide transportation investment, but does not include a means of prioritization or project evaluation for transportation planners. Rather than capacity preservation or enhancement, many of the trucking industry strategies hinge upon outreach, safety, and regulatory issues handled by the DOT. (Truck parking is one instance of a physical infrastructure deficit that is included.) Conversely, the rail strategy portion leads with assessments of infrastructure gaps, particularly in terms of intermodal capabilities. The waterborne freight strategies pertain to common challenges observed in relation to projects to be funded by the federal Harbor Maintenance Fund and the limitations imposed by the functional obsolescence of locks on the Great Lakes and St. Lawrence Seaway. The air cargo section addresses policy frameworks for policy support of air cargo facilities within Michigan.

2.5.2 Main conclusions

The inventory of facilities with freight mobility issues and description of the strategies to address those issues in the Michigan freight profile is succinct and targeted. While some of the strategies summarize steps already undertaken to address issues, others represent the desired outcomes of industry groups for the state’s freight movement network.

Needs

By value, most freight carried by trucks is classified as transportation equipment, mostly automobiles or their components. Food products and machinery follow, indicating generally high value freight content is moving in Michigan by this mode. Accordingly, maintaining system performance standards and facility users’ perceptions of travel time reliability are very important. The report includes reference to trucks’ contributions to congestion costs, but does not address the impacts of congestion on supply chain disruption or inventory costs. While highway fatalities and injuries decreased substantially between 2004 and 2009 (perhaps attributable to the precipitous decline in freight volumes that were largely
conveyed by trucking), the Michigan DOT retained a program emphasis on increasing highway safety. The profile noted the costs of pavement damage, caused by heavy vehicles, in maintaining the freight movement network in Michigan. Nationwide challenges of limited truck parking and a fragmented system of regulatory jurisdictions also appear among the trucking issues.

While rail tonnage and value both decreased by approximately 30 percent from 2003 to 2009, endemic capacity limits remain an issue, particularly in urban areas of more intense development patterns that reduce the possibilities for enlarging overhead clearances, right-of-ways, and turning radii. The report lists minor issues with rail safety, as well as the difficulties presented by rail bottlenecks within the state. Accessibility to rail transportation in the northern parts of the state’s Lower Peninsula is also hindered as many lines have been abandoned by carriers as uneconomic. The profile also covers national challenges of delivering railcar availability to seasonal agriculture shippers, as well as 286,000 pound capacity for bridges and other structures.

Though carrying less than one percent of freight by value in Michigan, the state’s network of waterborne freight assets remains an important class of infrastructure for shippers of bulk commodities in the region. However, the deferred maintenance of ports, locks, and navigation channels, due to both the limited availability of Harbor Maintenance Fund support and a substantive environmental review process presents challenges for this sector.

The report notes difficulties encountered by the air freight industry in general during the recession and notes that some airports are not accessible in all weather. The profile calls particular attention to the condition of the Willow Run Airport in Ypsilanti as an important freight asset now operating in limited capacity. This is caused by runway lengths that cannot allow the access of wide-body aircraft that are fully loaded and fueled, leading them to limit the amount of fuel they carry until refueling in Detroit. This limitation decreases the marketability of this facility to cargo operators.

**Strategies**

The profile contains a number of initiatives through which public agencies may begin improvements to freight mobility in Michigan. The I-94 Corridor Operations Partnership in one attempt at reducing user delay and increasing travel time reliability through stakeholder outreach and coordination. Similarly, the Great Lakes Regional Transportation Operations Coalition (GLRTOC) is a collaborative effort between U.S. states and Canadian provinces to coordinate on programs of a regional significance that improve freight mobility.

Addressing state of good repair for roadways used by the trucking industry, the Michigan DOT continues to invest in pavement maintenance. Michigan’s three transportation management centers (TMCs) use ITS and video feeds to relay information concerning congestion and disruption incidents to system users, allowing for better management of congestion and increased on-time arrival reliability. A similarly structured Truck Parking Management and Information System is being developed. Increased investments in median barriers and shoulder ‘rumble strips’ have produced a marked decrease in associated injuries and fatalities. Finally, representatives of the DOT, Michigan State Police, Federal Highway Administration, and Federal Motor Carrier Safety Administration have met to weigh the costs
and benefits of increasing truck speeds in-state. Touching on heavy vehicles, policies concerning truck weight and axle configuration are being similarly studied.

Rail facilities in the process of being developed with the DOT include the Detroit Intermodal Freight Terminal (DIFT), which will consolidate operations of several smaller terminals. The DOT also provides technical support to project planners of the Detroit River Freight Tunnel. The DOT’s safety program includes funding for problematic at-grade rail crossings. Broadening accessibility to rural users of rail facilities, the DOT has pursued a process of vertical unbundling, buying 530+ miles of track and contracting with private operators to provide service on the lines. The DOT has studied the problem of rail car shortages and has begun a dialogue with service providers to address the issue.

Serving users of waterborne freight assets, the DOT has been involved in the planning processes of the Soo Locks rehabilitation, which is delayed through funding constraints. Aside from issues that can be addressed through physical planning or state regulatory action, the DOT recognizes that many of these issues will need to be resolved at the federal level.

Support of air cargo services in state has taken the form of the Air Service Program that provides funding for capital improvements at airports that handle freight. One consideration of innovative technologies/operational strategies that improve freight safety and efficiency is the suggestion that more Michigan airports become ‘all-weather’ in accessibility. The addition of GPS-based approach systems and automated weather observation systems (AWOS) that provide weather data to aircraft would prevent situations in which air cargo facilities become unavailable as crucial back-up facilities in times of supply chain disruption. Nationwide, approximately 70 percent of airports are accessible in all-weather.

### 2.6 Implications for Freight Planning in Ohio: Best Practices

As freight planning continues toward greater degrees of sophistication and integration in larger statewide planning processes, MAP-21 should be read as a codification of what had already become best practices in statewide freight planning.

For the past decade, two of the legislation’s requirements—that plans outline freight system trends, needs, and issues, and that the plan feature a description of improvements to reduce or impede freight deterioration—had long been basic elements of a freight plan. Minnesota’s plan is an example of this limited scope, in that the policy frameworks in its Statewide Freight Plan promote general ambitions rather than tools to quantitatively evaluate, compare, and prioritize freight infrastructure expenditures. In place of plans targeting discrete facilities, its strategies address topics such as stakeholder outreach and increased connectivity for state-owned systems of freight movement.

However, one substantial component of MAP-21 freight planning compliance that may be new to some states is the requirement that performance deficiencies in specific facilities must be identified in tandem with strategies to improve, accompanied by an assessment of how these projects advance the aims of the state’s Long Range Plan. The observation that the utility of a freight plan increases to the degree
that its authors have engaged the detailed implications of its aims, strategies, and policy outcomes upon specific freight facilities is reinforced with a comparison of the freight plans reviewed here. The compelling arguments made for investment in freight facilities seemed to deliver more insight than broad mission statements to increase access to markets, and were able to link specific mitigation strategies to near-term goals with opportunities for action in the future should funding allow. Virginia’s *Multimodal Freight Study* represents a best practice in explaining how short-term actions advance the state’s system toward its long-term goals. The project inventory of the Indiana plan is also noteworthy, though the Virginia study is more thorough in aligning individual freight asset expenditures with larger statewide strategy.

The most basic statewide freight plans addressed demographic and economic trends and their implications for freight consumption and origination in their states. Other plans broadened their analyses beyond the states’ borders to include the impacts of technological advancements in freight moving equipment, investment in internationally impactful freight facilities (such as the Suez and Panama Canals and the Ports of Los Angeles and Long Beach), and industrial changes to systems of manufacturing and distribution. However, less common were freight plans that fully allowed these macro-level trends to not only preface their planning, but to shape it. In anticipating global changes and preempting their impacts, the Virginia study is the most successful in presenting a palette of options that address capacity constraints the modes are expected to face in their forecast years.

MAP-21 mandates that plans include an inventory of facilities with freight mobility issues and description of the strategies to address those issues, while also describing freight policies, strategies, and performance measures to guide transportation investment. Notions of comparative effectiveness were included thematically in the earliest freight plans reviewed (Minnesota), in which the idea was popular with freight stakeholders consulted in interviews and outreach efforts. The most detailed description of a comparative effectiveness framework is found in the *Indiana Multimodal Freight and Mobility Plan*, which demonstrates the process through which forecast benefits are quantified, converted to comparable units in multiple platforms (including the State Travel Demand Model), monetized, annualized, and then gauged for their economic impacts in proprietary economic modeling software. The Virginia study also evaluates projects through multiple processes: highway model analysis, monetized transportation benefit analysis, and monetized economic benefit analysis.

However, the Indiana DOT’s experience in comparative project evaluation does provide one caveat. Despite the evaluation framework’s comprehensive design, full calculation of all benefit categories for most projects was halted incomplete as transportation planners were unable to accurately supply data substantiating the economic development and jobs-creation impacts of the projects that they sought to rank. Additionally, the scoring process advantaged projects accommodating high traffic volumes and congestion on the Interstate Highway system, to which DOT planners then appended an additional priority rating to achieve a qualitatively informed balance. A lesson derived from this comprehensive approach is that evaluation platforms must be built upon data demands that are sustainable.

After prioritization and selection, project implementation and recurring planning activities should also promote concrete ‘next steps’ for DOT and MPO officials. Maryland’s *Statewide Freight Plan* included a
step of delegating responsibility for project components to distinct process owners that would oversee the review and adoption of prioritized projects, identify funding, raise awareness, form institutional support through outreach, and maintain continuous dialogue with an expanded stakeholder group while planning. (The Freight Advisory Committee assists in this capacity in some states.)

Finally, many of the plans sought to further identify and leverage opportunities for multi-state freight corridor planning and preservation. The Midwest America Freight Coalition in which Ohio participates is an example of a method to foster this, as are the state’s efforts to share planning considerations with its neighbors. Another practical opportunity for this to occur is presented in capacity preservation for Ohio River freight facilities, since the river both defines state boundaries and DOT accountability and responsibility.
3. MODAL STRATEGY: RAIL

This section provides a description of recommended strategies to address Ohio’s freight rail needs and opportunities.

3.1 Leverage Ohio’s Rail Intermodal Network

As discussed in the Rail Needs Analysis, Ohio is home to an unusually large number of truck/rail containerized intermodal terminals. At 13, the number of intermodal terminals located in Ohio is second only to that of Illinois. These terminals provide Ohio shippers with transportation options and help to make Ohio a desirable place for businesses to locate. They also support Ohio’s $16 billion logistics industry. One logical question for communities is how to benefit from these terminals. Intermodal ramps can benefit Ohio communities in several ways. Railroad transportation to and from the terminals could divert trucks from the state’s highways. Intermodal ramps can also bring economic development benefits as businesses decide to locate near intermodal terminals in order to reduce transportation costs. This section explores potential strategies and considerations on how communities could benefit from Ohio’s intermodal network.

3.1.1 Truck/Rail Diversion Associated with New Intermodal Hub

As discussed in detail in the Rail Analysis, a key component of the CSX National Gateways initiative is the Northwest Ohio Terminal Facility near North Baltimore. This terminal is expected to serve as a hub for CSX’s intermodal system with a capacity to handle nearly 2 million containers per year. This terminal could provide intermodal service to other markets for which service was not currently available to Ohio shippers. These services in turn have the promise to remove trucks from roadways. Reviewing the CSX service matrix as of November 2012, the carrier maintains intermodal terminals but does not currently provide intermodal service between North Baltimore and the following markets that are at least 250 miles from the North Baltimore facility:

- Atlanta, GA
- Savannah, GA
- New Orleans, LA
- Charlotte, NC
- Syracuse, NY
- Charleston, SC
- Memphis, TN
- Nashville, TN
- Louisville, KY
- Buffalo, NY
- Chambersburg, PA
- Evansville, IN

The potential for diverting truck traffic to rail generally relates to the distance and origin/destination freight traffic density. Rail is more competitive to trucking over longer distances and between origin-destination pairs with large volumes of freight. In these high volume corridors, freight can be
consolidated into trainload quantities or at least large blocks of cars. Shipping intermodal requires high volumes of freight. Analysts have estimated the following dry van\(^2\) load market share for rail intermodal by market density and mileage block.\(^3\)

**Exhibit 2: Effect of Distance & Density on IMX Market Share (7 Year Average, 2002 – 2008)**

<table>
<thead>
<tr>
<th>Miles</th>
<th>Market Tons (000's)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 – 31.6</td>
</tr>
<tr>
<td>&lt;250</td>
<td>0.1%</td>
</tr>
<tr>
<td>250 – 500</td>
<td>0.2%</td>
</tr>
<tr>
<td>500 – 750</td>
<td>0.2%</td>
</tr>
<tr>
<td>750 – 1,000</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

An analysis has been completed which assesses the potentially divertible truck traffic passing between North Baltimore and the markets listed above. In order to assess the potential of markets to divert to rail, it is necessary to define markets. Truck data from the Federal Highway Administration (FHWA) Freight Analysis Framework (FAF-3) freight flow database has been disaggregated to the county level. The definition of the intermodal market area around North Baltimore depends upon the distance of the rail move. As a general rule, one would not expect intermodal rail to be feasible if the truck portion of the truck/rail movement is 20 percent or more of the total distance. For the purposes of this analysis, the North Baltimore market is defined by the counties that lie within a 50, 100, and 150 mile radius of the Northwest Ohio Terminal Facility. The market area is wider for trade with more distant markets and smaller for trade with markets that are not as far. Markets that trade with Ohio have been defined by metropolitan areas, either as Freight Analysis Framework zones (FAF zones, which or most often U.S. Census Combined Statistical Areas) or Metropolitan Statistical Areas. Markets definitions used in this analysis are shown in Exhibit 3.\(^4\) The opportunities associated with the CSX terminal in North Baltimore are illustrative. Other new intermodal market opportunities may present themselves at other intermodal ramps, including terminals owned by both CSX and NS. The analysis also focuses on opportunities within the eastern United States. New market opportunities may also become available for connections to markets outside of the NS and CSX networks, such as multiple-carrier moves involving UP, BNSF, KCS, CN, or CP.

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\(^2\) Basic enclosed truck body type used for hauling general merchandise. Contrasts to other body types such as tanker, flatbed, bulk, etc.


\(^4\) This analysis is considered adequate for investigating opportunities but is subject to a number of limitations as a representation of likely truck/rail diversion. Some intermodal terminals such as in Chambersburg, PA do not attract freight so much from the surrounding metropolitan area as markets along a freight corridor, I-81 and I-70 in the case of Chambersburg. When considering distances between intermodal markets, the location of a shipper within a market area can impact the modal decision, so that a shipper that must backtrack away from an intended origin or destination to access an intermodal ramp may be less inclined to use that ramp.
Exhibit 3: Market Area Definition for North Baltimore Truck to Intermodal Rail Diversion Analysis

Exhibit 4 (following page) applies the average intermodal market share as shown in Exhibit 2 to truck freight flows between North Baltimore and CSX markets in order to estimate divertible truck traffic for potential North Baltimore intermodal routes.

These results suggest that trade with Atlanta has by far the most potential for freight to shift from truck traffic to rail if CSX were to initiate service. Trade between Ohio and Memphis could also generate significant diversion, particularly if freight originating/terminating in Memphis is combined with freight traveling to/from western carriers through the Memphis gateway.

The impact on Ohio’s roadways would be moderate. For example, if the average truck has a payload of 17 tons\(^5\) initiating service to/from Atlanta would remove about 23,000 trucks per year or about 63 trucks per day. This would benefit Ohio in a number of ways, including associated reductions in highway maintenance, truck emissions, congestion, and safety impacts. While this shift would bring about these

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\(^5\) Includes the total freight truck tonnage in the United States divided by the total estimated number of trucks, both loaded and empty, from the FHWA Freight Analysis Framework-3 (FAF-3) Freight Traffic Analysis.
public benefits, the shift would not have an overwhelming impact on highway relief for I-75 in Ohio. The average annual daily truck traffic (AADTT) for segments of I-75 in Ohio is around 13,000 to 14,000,\(^6\) so a reduction in truck traffic of 63 trucks would represent a decrease of less than half a percent of truck traffic.

Exhibit 4: Divertible Truck Traffic for Potential North Baltimore Routes

<table>
<thead>
<tr>
<th>CSX Locations without Service to N. Baltimore</th>
<th>Tons</th>
<th>Roadway Miles</th>
<th>N. Baltimore Market Radius</th>
<th>Intermodal Share from Matrix</th>
<th>Divertible Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta, GA</td>
<td>4,702,846</td>
<td>629</td>
<td>100</td>
<td>8.4%</td>
<td>395,039</td>
</tr>
<tr>
<td>Savannah, GA</td>
<td>641,680</td>
<td>785</td>
<td>150</td>
<td>7.7%</td>
<td>49,409</td>
</tr>
<tr>
<td>New Orleans, LA</td>
<td>344,005</td>
<td>971</td>
<td>150</td>
<td>7.7%</td>
<td>26,488</td>
</tr>
<tr>
<td>Charlotte, NC</td>
<td>756,727</td>
<td>536</td>
<td>100</td>
<td>6.2%</td>
<td>46,917</td>
</tr>
<tr>
<td>Syracuse, NY</td>
<td>83,854</td>
<td>472</td>
<td>50</td>
<td>0.4%</td>
<td>335</td>
</tr>
<tr>
<td>Charleston, SC</td>
<td>267,141</td>
<td>741</td>
<td>100</td>
<td>6.2%</td>
<td>16,563</td>
</tr>
<tr>
<td>Memphis, TN</td>
<td>1,057,920</td>
<td>650</td>
<td>100</td>
<td>8.4%</td>
<td>88,865</td>
</tr>
<tr>
<td>Nashville, TN</td>
<td>291,428</td>
<td>439</td>
<td>50</td>
<td>0.9%</td>
<td>2,623</td>
</tr>
<tr>
<td>Louisville, KY</td>
<td>686,214</td>
<td>267</td>
<td>50</td>
<td>1.1%</td>
<td>7,548</td>
</tr>
<tr>
<td>Buffalo, NY</td>
<td>426,678</td>
<td>328</td>
<td>50</td>
<td>1.1%</td>
<td>4,693</td>
</tr>
<tr>
<td>Chambersburg, PA</td>
<td>23,553</td>
<td>410</td>
<td>50</td>
<td>0.2%</td>
<td>47</td>
</tr>
<tr>
<td>Evansville, IN</td>
<td>182,250</td>
<td>385</td>
<td>50</td>
<td>0.9%</td>
<td>1,640</td>
</tr>
</tbody>
</table>

3.1.2 Development of Domestic Intermodal Corridor(s)

Ohio has been the site of major public/private intermodal initiatives, including the NS Heartland Corridor and the CSX National Gateway Corridor. The Heartland Corridor improved the intermodal route between the Port of Virginia and the Ohio Valley/Chicago. The tunnel clearances enable NS to operate double stack trains over a route that is 220 miles shorter than the alternate route. The CSX National Gateway initiative has been initiated to improve the efficiency of routes between the Mid-Atlantic and Midwestern markets.

The NS Crescent Corridor initiative has targeted truck to rail diversion on specific highways. The aim is to divert freight travelling by highway between the Northeast/Mid Atlantic and Southeast to rail rather than necessarily improve port connections to inland markets. The initiative is a logical response to the status of I-81 as one of the nation’s most heavily used truck freight corridors, much of the traffic of which is long-haul and potentially divertible to rail. At the same time, the parallel freight rail corridors have been relatively minor with low densities of rail traffic. The logic of the Crescent Corridor initiatives is that with improvements to the capacity and efficiency of the parallel rail corridors, freight will divert from truck to rail.

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\(^6\) FAF-3 network file.
A logical question for Ohio would be whether there exist any highway corridors within the state with a similar potential for diversion from truck to rail. Are there long-haul corridors with heavy volumes of truck traffic without a corresponding major intermodal rail corridor? Of the services that railroads provide, intermodal competes most closely with truck. Exhibit 6 displays NS and CSX rail intermodal corridors categorized into three levels of intermodal rail density, as well as truck volumes on primary highway freight corridors. The freight densities suggest the I-80/I-90 and I-76 corridors are roughly paralleled by high density rail corridors. I-75 is roughly paralleled in Ohio by a relatively light density intermodal corridor. There is no high-density rail corridors parallel to I-70 or I-71. To some extent, this may be a result of routing. For example, rail traffic between the Northeast and St. Louis, MO may route northward, passing through Greenwich, OH or Fort Wayne, IN instead of following I-70’s route through Columbus. In the case of the I-71 corridor, it is arguable that alternatives such as CSX routing through Sidney, OH provides an alternative to I-71 between Cleveland and Cincinnati.
Interestingly, the former Pennsylvania Railroad’s “Panhandle” route had served as a direct route between Pittsburgh, Columbus, and Indianapolis, roughly paralleling I-70. According to some sources, the route was a busy mainline in the 1940’s. Much of the route west of Columbus was abandoned. When Conrail threatened to abandon the line east of Columbus, the State of Ohio purchased the line between Columbus and Mingo Junction. The Columbus & Ohio River Rail Road (CUOH) currently provides service on the line. Because their networks are small, short line railroads such as the CUOH typically do not participate in the containerized intermodal network. However, class I rail carriers sometimes route traffic onto shortline routes, but only when their own parallel routes are capacity-constrained and it is more advantageous for Class I’s to invest in a shortline route rather than their own.

Although currently only small volumes of intermodal freight travel between northern Ohio and the Southeast, improvements and new developments could bolster the amount of intermodal freight through Ohio that generally parallels I-75. One new development is the double stack clearance of the NS “Heartland Connector” between Columbus and Cincinnati. This project was completed in January, 2012 and was made possible by a federal grant, plus additional funds provided by NS and the Ohio-Kentucky-Indiana Council of Governments. While much of the focus of this project relates to movements between the Port of Virginia and Cincinnati, the project also opens new possibilities for intermodal freight moving...
between northern Ohio and the Southeast through Columbus and Cincinnati. For the first time, there is a continuous NS double stack route that links northern Ohio to the NS intermodal mainline in Cincinnati. Traffic to/from the Southeast could be anchored by NS’s large intermodal terminal at Rickenbacker.

Exhibit 7: NS Heartland Corridor (with Connector to Cincinnati)

Source: Norfolk Southern Corporation

Improvements that may increase the volume of north/south intermodal traffic could include expansion of capacity in Cincinnati and Toledo. For example, additional trackage to help NS stage trains near the Airline Yard in Toledo may make new intermodal services possible. Capacity additions on both the NS and CSX in Cincinnati may increase the number of train slots that these carriers can devote to intermodal. On CSX, improvements south of Ohio to provide double stack clearance on the direct route between Cincinnati and Atlanta via Knoxville may help to encourage the growth of intermodal traffic.

In each case, the ability of railroads to increase intermodal volume and thereby divert trucks from roadways will be limited by carriers’ ability to accommodate new intermodal trains, as well as the specific market dynamics of the corridor. Rail carriers may not necessarily have the capacity to accommodate additional intermodal trains. New intermodal services or expansion of existing services will only be desirable if there is a market for them. It will be important that the related infrastructure and market demand be in place for the public benefits of new public/private partnerships to be realized.

3.1.3 Intermodal Terminals and Economic Development

Throughout the nation, many local officials believe that if a railroad were to locate an intermodal terminal in their community, the terminal would generate economic development benefits to that area. Railroads frequently receive requests for new intermodal terminals. One logical question that follows is:
Why do railroads construct intermodal facilities at some locations and not others? What is the railroad decision-making process of where to locate intermodal terminals?

In general, railroads add new locations to their intermodal networks wherever they believe there will be sufficient customers to support that terminal. However, below a threshold level of traffic, intermodal terminals are not economically justifiable to build, maintain or operate – and they are expensive to construct. Exhibit 8 shows the size, capacity, and required investment of several intermodal terminals that are planned, recently constructed, or under construction. Once built, these terminals must be staffed, so they incur operating costs whether they handle zero or many containers. The cost of serving, operating, and investing in intermodal terminals generally decreases with the number of containers handled. The more containers handled, the lower cost per unit to own and operate the terminal. Railroads prefer to serve intermodal terminals originating and terminating trainload quantities of intermodal freight, since they can provide faster, less expensive service when they ship containers/trailers in trainload quantities. Trains that travel from origin to destination, stopping only for fuel, crew changes, and car inspections are faster than trains that must stop to set out and pick up blocks of cars.

Exhibit 8: Summary of Intermodal Facilities Planned, Recently Constructed or Under Construction

<table>
<thead>
<tr>
<th>Facility</th>
<th>Carrier</th>
<th>Acreage</th>
<th>Lift Capacity</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prichard, WV</td>
<td>NS</td>
<td>100</td>
<td>30,000 (est. usage)</td>
<td>$35 million</td>
</tr>
<tr>
<td>Greencastle, PA</td>
<td>NS</td>
<td>200</td>
<td>85,000</td>
<td>$95 million</td>
</tr>
<tr>
<td>Roanoke, VA</td>
<td>NS</td>
<td>65+</td>
<td>30,000 (est. usage)</td>
<td>$35.5 million</td>
</tr>
<tr>
<td>San Antonio, TX</td>
<td>UP</td>
<td>300</td>
<td>180,000, expandable to 250,000</td>
<td>$100 million</td>
</tr>
<tr>
<td>Tacoma, WA (TacSim)</td>
<td>UP</td>
<td>40</td>
<td>150,000</td>
<td>N/A</td>
</tr>
</tbody>
</table>

There is no set rule as to the minimum number of containers that a terminal must handle to be feasible. In the West, BNSF Railway representatives put forward 91,250 containers per year as the minimum number of containers handled for a BNSF intermodal facility to be successful. This is based upon 250 containers handled 365 days per year. As can be seen from Exhibit 8, NS is building a terminal in Prichard, WV and another in Roanoke, VA, both of which are expected to only handle about 30,000 containers at the outset. For the two carriers that provide intermodal service in Ohio, CSX and NS, these 30,000 containers could probably be considered a minimum. It is also important to note that the Prichard and Roanoke facilities are being constructed as part of the Heartland Corridor Initiative, a public-private initiative. Carriers may be less likely to add new terminals if they are funding the construction and engineering themselves or are not tied to major public investment initiatives.

Because railroad intermodal service is most often used for hauling consumer products, railroads typically locate intermodal terminals near large metropolitan areas. These are the locations that generate sufficient demand to justify building and serving an intermodal terminal. Forty-four metropolitan areas are served by CSX and NS. Exhibit 9 provides a histogram that relates the number of metropolitan areas served by CSX or NS to the size of metropolitan areas. Of the 44 metropolitan areas
served by CSX and/or NS intermodal terminals, only one town has a population less than 100,000, Marion, OH. Three metropolitan areas with populations less than 250,000 are served by intermodal terminals.

Usually, intermodal terminals located outside of major metropolitan areas cater to specific customers, specific industries, serve as gateways (e.g. ports), or have some other specific reason for their location other than general economic activity. Large nearby customers can justify a terminal’s location. As an example, the NS facility in Georgetown, KY is strategically located in close proximity to a Toyota automotive plant. The intermodal facility in Marion, OH was established to provide dedicated service for Schneider National. Among Schneider’s reasons for locating in Marion are nearby manufacturing plants of Whirlpool, Pillsbury, and Boise Cascade. This location also had preexisting infrastructure that made the terminal’s construction more economical.

Exhibit 9: Number of Metropolitan Areas with CSX and NS Intermodal Terminals by Population

![Bar Chart]

*Source: U.S. Census, CSX and NS Websites*

Because intermodal terminal costs decline with volume, rail carriers usually prefer to limit the extent to which terminals on their systems compete with each other. For NS and CSX, the market area of an intermodal terminal is typically somewhere within a 50 to 100 mile radius, depending upon the length of the rail move. If a move will travel over 1,000 miles by rail, it becomes easier to justify a 100 mile truck dray on one end of the intermodal move. Exhibit 10 and Exhibit 11 display the market areas of both NS and CSX intermodal terminals as defined by a 75 mile drayage radius. As can be seen, most of Ohio lies within NS and CSX intermodal terminal market areas, with significant overlap between some terminals. Dayton and Akron are large metropolitan areas with 2010 populations of about 840,000 and 700,000, respectively, yet both lack intermodal terminals. This lack is probably due to Akron’s proximity to terminals in Cleveland and Dayton’s proximity to others in Cincinnati and Columbus.
Exhibit 10: Market Areas of NS Intermodal Terminals Serving Ohio
In evaluating specific sites, NS lists the following criteria on its website⁷; these considerations would be in addition to market potential and the availability of service from existing facilities:

- Adjacent to the main rail line
- Large, relatively flat land with minimal streams and wetlands, minimizing impact to protected habitats and species
- Minimal interference with vehicular traffic at railroad crossings
- Convenient access to customers via Interstate highways
- Locality with potential for additional economic development. Community interest in jobs and green freight transportation alternatives.

Communities may be interested not only in whether an intermodal facility will or will not be located within their area, but also the development that will be associated with a given terminal. Intermodal ramps themselves generate relatively few jobs per acre, but associated distribution and warehousing locations can create more. Companies locate near intermodal terminals to reduce the cost of truck

⁷ Available online at www.thefutureneedsus.com.
transportation between the terminals and their facilities. Employment is generated by employers either moving to the area to locate near a logistics hub, or preexisting employers who benefit from a new or improvements to an existing intermodal terminal. To some extent, land use will influence the development potential around intermodal terminals. For example, new development may be less apt to occur if an intermodal terminal is located within a densely developed urban area where there are few buildable locations. Development may be more feasible if there are plenty of buildable sites nearby with good highway connections.

There has been a trend in recent years toward building intermodal terminals on the outskirts of urban areas, in part to accommodate expected development associated with these facilities. One example is NS moving much of its intermodal operations from the Forrest Yard in a densely developed area of Memphis to the outskirts of Memphis in Fayette County. This movement of intermodal terminals to the urban rim is apparent from the UP Railroad’s pattern of development in the Chicago area. UP has built a series of terminals in the Chicago area, each named “Global.” Generally, a new terminal was built when the old terminal(s) no longer had the capacity to accommodate growth in traffic. Global I is located near downtown Chicago. Global II is located just outside of Chicago in Northlake, IL, while Global III and IV are located further away from the urban core in Rochelle and Joliet, IL, respectively.

![Exhibit 12: UP Chicago Area Intermodal Terminals](image)

The economic development potential of intermodal terminals is also influenced by the same general considerations that drive the location of other logistics facilities. The Transportation Research Board’s (TRB) National Cooperative Freight Research Program (NCFRP) 23, *Economic and Transportation Drivers for Siting Freight Intermodal and Warehouse Distribution Facilities*, analyzed companies’ criteria in selecting freight facility locations. The study found that companies assess locations by the following criteria, in declining order of importance:

1. Ability to access key markets and customers
2. Interaction with the transportation network
3. Labor and workforce
4. Availability and cost of suitable facilities
5. Utilities
6. Permitting and regulation
7. Tax environment
8. Public sector assistance and incentives
9. Climate and natural hazards

To some extent, the critical success factors facing logistics/warehouse development around an intermodal ramp are the same issues that drive the success of the ramp itself. All else being equal, intermodal ramps with higher traffic volumes have a higher economic development potential. As an example, the relatively small terminals in Prichard, WV and Roanoke, VA shown in Exhibit 8 are forecast to generate modest economic impacts when compared to much larger projects. A feasibility study for the Prichard terminal estimated that it would generate 700 to 1,000 jobs in West Virginia.\(^8\) The terminal in Roanoke was estimated to create between 740 and 2,900 jobs.\(^9\) This is much less than major developments around much larger intermodal terminals, such as Alliance, TX which is estimated to have created 24,000 jobs between 1990 and 2005,\(^10\) or the CenterPoint Intermodal Center in Elwood, IL is estimated to generate between 6,909 and 7,427 jobs,\(^11\) or the NS Rickenbacker Terminal, which is expected to create 20,000 jobs over 30 years.\(^12\) While each of these jobs estimates is subject to significant uncertainty and different methodologies, there is a general relationship between the volume size of intermodal terminals and their economic impacts, all else being equal.

3.2 Adjust to Changes in Rail Demand – Shale Oil and Gas

Another rail strategy for Ohio is to help shippers and carriers adjust to the changing needs for the Ohio rail network. New demands will shift the location and needs for rail infrastructure. One of the most significant potential “game changers” for rail in Ohio is the growth of shale energy developments. Some studies put the volume of recoverable natural gas in the Marcellus Shale deposit at 487 trillion cubic feet, making it the second largest deposit in the world, second only to the South Pars field in Qatar and Iran.\(^13\) The Utica formation is deeper in the ground than the Marcellus formation but is thicker in Ohio and has more economic potential for the state. Furthermore, Utica shale in Ohio could be a “liquid play” where crude oil and wet gas are recovered along with natural gas. In addition to methane, wet gas contains useful byproducts, such as ethane, butane, and propane. Ethane is employed to make ethylene, which is used in a variety of consumer goods; the local availability of such byproducts potentially creates lower cost feedstock for the Ohio chemical industry.


\(^12\) Columbus Regional Airport Authority.

Rail in Ohio can play a number of roles in regards to shale oil and gas.

- Shale well development. A shale well typically requires 30 rail carloads of inbound well service materials (pipe, sand, aggregates and lubricants) and can produce more than 20 carloads of outbound materials (drill cuttings, brine water). Well development is expected to generate increasing demand for rail over the next 10 years. By 20 years, however, new development should begin to taper off with lower demand for rail transportation of associated commodities. After wells are established, they can be maintained by truck transportation and are frequently served by pipeline.

- Ohio as a supplier of steel. Steel remains one of Ohio’s largest manufacturing industries. Shale oil and gas exploration has prompted some Ohio steel plants to expand production.\(^{14}\) As an example, the Timken plant in Canton plans to add a total of two million square feet of production space at a cost of $1.5 billion. Much of this capacity will be used to cast steel billets to be made into parts for drilling platforms and other oil and gas industry needs. U.S. Steel is opening a new steel pipe mill in Lorain, and Vallourec & Mannesmann (V&M Star) is opening another steel pipe mill in Youngstown. Both are expected to serve the oil and gas sector. These plants will serve not only oil and gas developments in Ohio, but also more distant markets. These developments will increase the demand for rail between Ohio’s steel producing areas and shale oil and gas production areas. Whether rail will be competitive for serving Ohio shale oil and gas needs for steel from sources within the state will depend upon the quantities shipped and distances involved. Generally, rail becomes more competitive delivering larger shipments longer distances. A cost analysis developed elsewhere for the Ohio Freight Study suggests that in some instances, shipping steel piping by rail to shale oil development areas may be more economically feasible by truck rather than rail because the distances are short.

- Ongoing transportation of oil, gas, and byproducts. Rail will compete with trucking and pipeline transportation for movements of natural gas, oil, and byproducts. It is expected that most dry natural gas will be shipped by pipeline. Rail may have a larger role in shipping liquid products. Rail could be used for transporting crude oil, although in doing so, it would compete with pipeline transportation. Crude oil is cheaper to ship by pipeline that by rail, but pipelines are expensive to build and less flexible than rail. In the West, there is debate whether the current boom in crude oil shipments by rail will continue once the pipeline infrastructure catches up with the new sources of supply. Rail will almost certainly be important to the transportation of natural gas byproducts. Natural gas liquid processing facilities are being built with a variety of transportation options, including pipe, rail, truck, and in many instances, marine access. The Columbus & Ohio River Road Company (CUOH) has signed an agreement to serve a natural gas liquids fractionation hub being constructed in Scio.\(^{15}\) The CUOH will build a one-mile rail siding and rehabilitate a three-mile storage track to serve the facility. When fully operational, the facility is expected to ship 10,000 carloads of natural gas liquids (NGL)’s annually. The


fractionation process separates methane gas from propane, butane, and ethane. The MarkWest Energy Partners, L.P. processing facility in Hopedale will start with a 200 railcar siding and 24 loading racks, expanding to a 400 railcar siding.

Some rail improvements have already been proposed to address the needs of shale oil and gas developments.

- Transload facilities. Transload facilities are locations where non-containerized freight is transferred between trucks and railcars. Transload enables customers that are not directly served by rail to benefit from railroad transportation. As example, the Ohio Commerce Center in Lordstown is a 467 acre industrial park sited on a World War II Era military shipping depot. Among other uses, the site is seen as a potential location for shale oil and gas developers to stockpile steel pipes, sand and other materials. The Commerce Center recently received a $2 million Job Ready grant from the Ohio Department of Development.\(^\text{16}\) The grant will be used to prepare the site, including improvements to rail access for the park. Rail improvements will include construction and improvements to sidings, as well as improvements to rail lines within the park. Steel plant expansion. As mentioned above, steel plants within Ohio have expanded production and capacity to meet demand for steel tubes and other products from the shale oil and gas industries. These expansions in turn require improvements to associated rail infrastructure.

- Corridor improvements/restoration. Some rail lines that could be used to serve the shale oil and gas industry are in relatively poor state of repair. By agreement between Hannibal Real Estate of White Plains, NY and Carload Express of Oakmont, PA, service is being restored on a 12 mile rail line in Monroe County. The line will be used to haul sand, concrete, and other commodities related to shale oil and gas development. The line has had no traffic for 10 years.\(^\text{17}\)

- Rail access to major processing facilities. As mentioned above, the CUOH has agreed to serve a fractionators hub in Scio. This was made possible through a public/private partnership.

### 3.3 Bring Infrastructure to 286,000 Pound Standard

As mentioned in the Rail Analysis technical memorandum, a number of rail lines within Ohio are unable to accommodate industry standard 286,000 pound railcars. Locations that are unable to accommodate these heavy railcars are shown in Exhibit 13.

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Exhibit 13: Rail Lines Unable to Handle 286,000 lb. Railcars

<table>
<thead>
<tr>
<th>Railroad/Rail Line</th>
<th>Cities without 286,000 lb. Rail Lines*</th>
</tr>
</thead>
<tbody>
<tr>
<td>IORY Monroe to Mason</td>
<td>Mason</td>
</tr>
<tr>
<td>IORY Monroe to Lebanon</td>
<td>Lebanon</td>
</tr>
<tr>
<td>IORY Columbus to Logan</td>
<td>Lancaster &amp; Logan</td>
</tr>
<tr>
<td>IORY Cincinnati to Brookville, Indiana</td>
<td>Harrison, Ohio (and Brookville, Indiana)</td>
</tr>
<tr>
<td>Maumee &amp; Western</td>
<td>Antwerp, Napoleon, Liberty Center</td>
</tr>
<tr>
<td>Ohi-Rail Minerva to Hopedale</td>
<td>Amsterdam, Bergholz, Hopedale</td>
</tr>
<tr>
<td>US Rail, City of Jackson Line</td>
<td>Jackson, Wellston, Hamden, MacArthur</td>
</tr>
<tr>
<td>Wheeling &amp; Lake Erie Canton to Carrollton</td>
<td>Carrollton</td>
</tr>
</tbody>
</table>

*Note: Lines may handle individual cars with special handling but not in regular service

One potential strategy for Ohio is to ensure that all rail infrastructure is able to accommodate 286,000 pound railcars, making it better integrated into the national system. Rail lines must meet several standards to be able to accommodate 286,000 pound railcars. The American Short Line and Regional Railroad Association (ASLRRA) commissioned a study in 2003 to estimate the cost of upgrading the nation’s rail infrastructure on Class II and Class III carriers to accommodate 286,000 pound railcars. Typically, the weight of rail should be at least 100 pounds or more per yard. A minimum of 10 good ties per 39 foot section of rail is recommended for lines with low density and low speeds (< 10 MGT per year, ≤ 10 MPH). However, 15 or 20 good ties per rail are recommended for lines that carry more traffic at higher speeds. At least 2 inches of good clean ballast is required for lines with density and low speeds, but deeper ballast is required for higher density lines with faster speed. A poor (soft) sub-grade may make it impossible for a short line to operate the heavier cars.

The component costs of upgrading rail lines will depend upon the specific circumstances and conditions. Based upon the infrastructure that would need to be repaired or replaced, as well as the cost per unit to repair or replace, the ASLRRA study found that for a representative sample of routes, the cost of upgrading rail was the most expensive component of upgrading short line and regional railroads to 286,000 pound standards. Replacing light rail with heavier rail accounted for about 55 percent of the total sampled upgrade costs. The cost of upgrading bridges accounted for another 26 percent, while replacing ties, turnouts, and ballast/surfacing were another 12, 6, and 2 percent, respectively. The rail segments listed in Exhibit 13 account for about 204 miles of trackage. The report cited earlier in this paragraph estimated the average cost per mile of upgrading sampled rail lines to 286,000 pound standards to be about $102,017 per mile. Updated to current cost levels using the STB’s Railroad Cost Adjustment Factor (RCAF), the current cost would be about $175,061 per mile. Assuming all of each segment listed in Exhibit 13 needed to be upgraded, the total cost for upgrading all 204 miles would be $36 million. Numerous factors could make the actual cost of upgrading these lines differ substantially from the calculations summarized above. The actual cost will depend upon the number and type of

18 An Estimation of the Investment in Track and Structures Needed to Handle 286,000 lb. Rail Cars on Short Line Railroads; ZETA-TECH Associates, Inc.
bridges that must be upgraded, the specific condition of each rail line, as well as other factors. However, the $36 million figure above is provided to offer a sense of the order of magnitude of the issue.

3.4 Conclusion

Data collection efforts conducted as part of this study suggest that several needs and opportunities are particularly prominent for the future of Ohio’s rail network. Appropriate strategies to contend with them summarize as:

- Leverage Ohio’s intermodal rail network;
- Adjust to changes in rail demand; and,
- Bring all rail lines in the state to the 286,000 pound gross railcar weight standard.

The most dramatic development in the composition of rail traffic potentially relates to changes in energy markets, particularly the impact of shale oil and gas development. Intermodal will continue to be the fastest growing component of the railroad industry as well as holding out the highest opportunity for modal diversion from truck to rail. Ohio is the site of significant public investment in rail intermodal. In addition, Ohio’s rail network will not be able to meet the needs of the future if significant portions are kept in poor state of repair and are allowed to become increasingly obsolete. These include segments that are unable to accommodate industry standard 286,000 pound gross weight railcars. Addressing this full set of issues will help to ensure that Ohio’s rail system meets the state’s needs in future decades.
4. MODAL STRATEGY: TRUCKING

Primary strategies to consider in serving the trucking sector include examining the viability of commercial vehicles fueled by liquid natural gas (LNG), considering the public sector role in confronting the persistent truck driver shortage, addressing truck parking issues through public-private partnerships, raising truck weights, and testing expansion of the routes for long combination vehicles.

4.1 Prospects for LNG Fueled Commercial Vehicles

As a result of changes in the oil and gas market, the trucking industry is now seriously considering the widespread adoption of natural gas. The price of natural gas has fallen by half since 2007 as vast amounts of natural gas in shale rock formations have been unlocked by improved drilling techniques. Meanwhile, diesel prices have continued to rise. When considering that the 3.2 million tractor trailers on U.S. roads today use nearly 25 billion gallons of diesel fuel annually, and natural gas can be up to $2 cheaper per gallon than diesel, it is clear that the trucking industry stands to save billions of dollars by switching to natural gas. It comes as no surprise that analysts expect 15,000 to 20,000 natural gas vehicles will be sold annually within the next few years.

The term “natural gas,” as used here, refers to both compressed natural gas (CNG) and liquefied natural gas (LNG). Trucks running on CNG have an operating range of 300-400 miles, while those using LNG reach a range of 500-600 miles; these distances correspond generally to the daily work shift ranges of regional and long haul fleets, implying that different fuel forms could be suited to local versus interstate trucking. There are two types of CNG fueling stations: fast-fill and time-fill. Typically, retail stations use fast-fill while fleets that have central refueling and the ability to fill overnight use time-fill. There are three types of LNG stations: mobile, containerized, and customized stations. In mobile fueling, LNG is delivered by a tanker truck that contains metering and dispensing equipment onboard. A starter station, or containerized station, includes a storage tank, dispensing equipment, metering and required containment. A custom station has greater storage capacity and is tailored to meet fleets’ needs. Generally, CNG stations require more equipment and configuration, while LNG stations require less equipment but more safety precautions during fueling.
In order to facilitate the adoption of natural gas technology for the trucking industry, trucking companies are collaborating with natural gas distributors and clean energy advocates to solve the “chicken and egg” issue of deciding which comes first: natural gas trucks or refueling stations. Both require a significant investment on the part of the owner, which cannot be recouped unless the other party invests in the required infrastructure.

4.1.1 Benefits
The biggest benefit of using natural gas is that it currently costs significantly less than diesel fuel, and is expected to do so for the foreseeable future. At the pump, a gallon of diesel costs more than twice as much as CNG on a diesel-gallon-equivalent basis. Trucking companies can expect to save up to $2.00 per gallon by switching to natural gas. Since the average fuel usage is 6 miles per gallon, this can add up to significant savings that translate into lower cost to market for Ohio industry, and lower delivered costs for consumers.

There is an abundance of natural gas available in the United States, with experts estimating that the supply will last for at least 100 years. The availability of natural gas suggests that the trucking industry will not have to worry about the instability of fuel prices in the future provided the transition can be made successfully. The development of oil and gas reserves in the Utica and Marcellus shale deposits of Ohio, coupled with the ability of the state’s truck (and automobile) manufacturers to produce vehicles fueled by it, makes natural gas a signally Ohio resource for the transportation sector.

Not only does the use of natural gas fuel reduce operating costs for vehicles, it also reduces greenhouse gas emissions up to 30% in light-duty vehicles and 23% in medium to heavy-duty vehicles. Emissions of criteria air pollutants also are lower – notably carbon monoxide, nitrogen dioxide, and particulate matter - because natural gas burns cleaner than diesel or gasoline. This is significant for Ohio’s non-attainment areas, especially those situated on major routes for trucks passing through the state, such as I-80/90 as it traverses the Cleveland region. Managing the environmental effects of substantial through traffic can be a dilemma, and providing support to natural gas adoption may offer a more effective response today than it could in the past.

4.1.2 The Fueling Challenge
The main challenge for long-haul carriers is the lack of fueling stations. A recent survey of 100 trucking executives conducted by PLS Logistics (May of 2012 in the Online Wall Street Journal) found only 30 open LNG fueling stations in the country - many of them clustered in Southern California. An LNG-fueled truck driving from Washington D.C. to Los Angeles would run out of fuel near Nashville, far from the nearest open station. A 2010 study by the US Department of Transportation showed that the majority of the 912 CNG and LNG stations nationally were located in just four states: California, New York, Utah and Oklahoma. The clustering in California and New York is indicative of port related programs and overall concerns with air quality in their congested urban areas. Ohio ranked 21st in 2010, and has since added one LNG station, according to more recent sources (cited further below).
Exhibit 15: Top Ten States for Alternative Fuels and Ohio, 2010

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>CNG Stations</th>
<th>LNG Stations</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CA</td>
<td>213</td>
<td>32</td>
<td>245</td>
</tr>
<tr>
<td>2</td>
<td>NY</td>
<td>101</td>
<td>0</td>
<td>101</td>
</tr>
<tr>
<td>3</td>
<td>UT</td>
<td>72</td>
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<td>AZ</td>
<td>36</td>
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<td>41</td>
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<tr>
<td>6</td>
<td>TX</td>
<td>30</td>
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<td>MA</td>
<td>22</td>
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<tr>
<td>21</td>
<td>OH</td>
<td>11</td>
<td>0</td>
<td>11</td>
</tr>
</tbody>
</table>

Source: State Transportation Statistics, 2011, Bureau of Transportation Statistics, USDOT

The ten states with the fewest number of fueling stations, a list that includes Iowa, Kentucky, Minnesota, Nebraska and West Virginia, had a combined 7 CNG stations and 0 LNG stations in 2010. This could explain why in a recent survey of 100 trucking executives, 54% felt the current infrastructure is inadequate for natural gas usage.

4.1.3 Current Fueling Status

By next spring, the industry expects 120 new LNG stations to have been completed, although many are being immediately mothballed until LNG trucks become more plentiful. Clean Energy owns and operates the bulk of these, including 70 LNG truck fuel stations along highways that link major U.S. metropolitan areas which were planned for operation by the end of 2012. Most stations are adjacent to long-haul trucking routes linking the Southwest Corridor (Los Angeles to Atlanta), The Texas Triangle (Atlanta to Chicago to Texas), and major corridors in the Midwest and Northeast. Clean Energy also had 62 CNG station projects in 2012 and expects a similar number for 2013.
Exhibit 16: Network of Natural Gas Refueling Stations, United States

Source: Business Wire

4.1.4 Current Ohio Fueling Status

Exhibit 17: Network of Natural Gas Refueling Stations, Ohio
As shown above, Ohio currently has several CNG stations but only one LNG, which is a Clean Energy installation at Seville Ohio on land owned by Pilot Flying J Truck Travel Centers. This station was established initially for the use of a specialized trucking operation making dedicated deliveries in Ohio. A grant to help fund the development of the Clean Energy LNG station was awarded to Clean Fuels Ohio by the U.S. Department of Energy, as part of the federal American Recovery and Reinvestment Act stimulus program.

4.1.5 Other Industry Concerns
Another challenge is the bulky tanks for compressed gas. Natural gas isn't as dense as diesel (CNG is only 25% as dense and LNG is 60% as dense), which means trucks need more tanks or bigger tanks or they must refuel more often to travel the same distance as with diesel. A typical tractor trailer combination must carry 1.7 gallons of LNG for the energy equivalent of one gallon of diesel. This can cause problems for trucks whose payloads are already approaching the legal highway limit. The weight of the tanks decreases the potential payload and serves to reduce the equivalent MPG. Several large common carriers and private fleets are currently experimenting with configurations of tractors and engine types seeking to overcome these problems.

There are also hazards involved with the handling of liquefied gas. This has environmental as well as safety implications. Currently, the government estimates that nearly 3% of natural gas used in trucks leaks somewhere in the supply chain. The methane released is 72 times more potent than carbon dioxide as a greenhouse gas, making it more damaging to the environment.

The up-front investment cost required for natural gas infrastructure and trucks will also deter many companies. These costs vary based on size, capacity, and the type of natural gas. In 2010, the cost of installing a CNG fueling station ranged from $10,000 to $2 million while the cost of an LNG fueling site ranged from $1 to $4 million. A brand new LNG truck can command a premium of up to $90,000 over a traditional diesel-powered truck, although this cost should come down as they are produced in greater quantities. A CNG truck costs about $30,000 more than a new diesel truck, but the fuel savings recoup that costs in just one year according to analysis done by Tampa Solid Waste. Waste Management spends about $300,000 for each new heavy-duty CNG truck, about $30,000 more than the sticker price for a comparable diesel truck. The Environmental Protection Agency recently approved retrofit technology for trucks that allows them to burn both LNG and diesel. This should drive down the cost of implementing the technology as retrofitting solutions are produced in greater quantities.

The PLS Logistics Survey reported in the online Wall Street Journal referenced above had the following result: eight in ten respondents said natural gas in its densest form, as LNG, has potential for highway use. Nearly a third said they were actively researching it for their own companies. But 54 percent said current infrastructure is inadequate and 23 percent worried about the higher cost of the trucks.

4.1.6 Opportunities for Ohio
The number of fueling stations in metropolitan regions strongly supports the evidence that companies operating in local and regional markets are having clear success with alternative fuels in their equipment, reducing costs and improving air quality. Major carriers with localized requirements such as
UPS and Waste Management are strong supporters of the technology and are engaged in ordering new equipment for their fleets.

Many of Ohio’s industries, particularly agriculture and automotive manufacturing, are supported by regional sources and vendors operating in a fairly localized network. The carriers supporting these industries are prime prospects for conversion to natural gas fuels. The continued adoption of the technology by major entities such as UPS and Wal-mart are further evidence that the technology has strong support for the future.

Clean Fuels Ohio is a non-profit organization which is dedicated to promoting the use of cleaner fuels for both freight and public transportation. Through its Ohio Green Fleet program Clean Fuels provides:

- Direct consultation with fleet managers to develop plans tailored to specific needs
- Hands-on support with implementation, including seeking grant funding
- Recognition of environmental leaders through a five star rating system based on reductions in emissions and improved fuel efficiency

While Federal tax incentives for the purchase of natural gas vehicles have not existed since 2010, some states continue to support the technology on their own for various types of vehicles including tax incentives and rebates. Oklahoma is considered a leader in encouraging greater use of cleaner-burning natural gas, offering various tax incentives to spur development of alternative fuels. For instance, a one-time income tax credit is available for 50 percent of the incremental cost of purchasing a new Alternative Fuel Vehicle (AFV) or converting a vehicle to operate on an alternative fuel. A tax credit is available for up to 75 percent of the cost of building alternative fueling infrastructure. Louisiana also offers incentives, including an income tax credit of 50 percent of the cost of converting a vehicle to operate on an alternative fuel, 50 percent of the incremental cost of purchasing a new AFV and 50 percent of the cost of building an alternative fueling station.

The Ohio Public Utilities Commission has been investigating ways to provide a revolving loan fund for natural gas vehicles including fleet conversions. In addition to loans and tax incentives the provision of land for fueling stations has also been promoted. Airport authorities and other public agencies are making space available thereby reducing the cost of entry for fuel retailers.

4.1.7 Strategy Options
Ohio is positioned to experience both the rewards and the challenges of the natural gas revolution. The southeast corner of the state is experiencing the economic benefits of drilling as well as the infrastructure demand from heavy equipment. Natural gas is in supply in the state and industries are positioned regionally to make use of the fuels without incurring the problems associated with long haul fleets.

The foregoing review of the natural gas market shows that there is significant economic incentive for private industry to adopt natural gas technology in the coming years. There are also considerable economic development, environmental, and security benefits for states that lead the way in the
conversion from traditional fuel sources to natural gas. There are three ways in which the Ohio state
government can support this conversion:

1) Increasing the number of fueling stations
2) Expanding the number of LNG stations in non-attainment areas
3) Converting fleets from traditional to natural gas sources

Although the development of fueling stations is a private activity, it can be facilitated through regulatory
and legislative actions that remove restrictions on the number or location of fueling stations. The recent
MAP-21 legislation provides a national framework that states can follow in promoting the growth of
fueling stations. LNG is the standard most likely to be adopted by long haul trucking due to its greater
operating range. Long haul truck traffic constitutes much of the “through” traffic in the state along the
turnpike, I-70 going east and west, and the north-south route I-75. The through traffic traverses major
metropolitan areas which may be in non-attainment status (areas with air quality worse than
the National Ambient Air Quality Standards). LNG stations should ideally be located along these through
routes encouraging the LNG vehicles, particularly those that also have dual capabilities. CNG vehicles are
more likely to be regionalized and those fueling stations should be focused more on their areas of use.
Some private fleets who have made large conversions to natural gas maintain their own fueling
capabilities at terminal locations.

Thus far, national proponents of natural gas adoption have focused on major interstates. US highways in
Ohio also serve interstate longer haul traffic – US Routes 250, 24, and 30 are examples – and the
regional system overall is vital for Ohio-based traffic. For large scale adoption to take hold in the state,
the businesses that buy freight transportation must see the natural gas option reach their doors, and in
turn they will encourage their carriers to support it as lower cost and cleaner trucking. This requires the
penetration into the economic geography of Ohio that the regional network provides. Such facilities as
U.S. 23, 30, and 33, and State Route 32 could be candidates for fueling points, coupled with coverage in
metropolitan areas that is deeper (greater Cleveland and Columbus) or entirely new (the I-75 cities of
Cincinnati, Dayton, and Toledo). A critical mass dynamic might be expected as fleets decide whether
natural gas is a niche or a mainstream play, and steps the state may take to facilitate fuel availability can
help propel that decision.

Lastly, the state should support fleet conversions for all of the above reasons, as well as the possibility of
having equipment and fuel provided by Ohio-based manufacturers. This provides added incentive in
terms of economic development (jobs and wages) and environmental quality. Support for fueling
locations and fleet conversions can come in the form of policy, rebates and tax incentives, as well as
access to land and support for public private partnership in these ventures. Programs under MAP-21
such as Clean Cities and the Congestion Mitigation and Air Quality Improvement Program support both
fuel stations and fleet conversion initiatives. The state can also promote clean fuel technology through
conversion of state and public utility fleets to the new technologies.\footnote{More information is available at the following sources: AFDC: “Natural Gas Fueling Infrastructure Development”. U.S. Department of Energy, November 2012; Ahlers, Mike M., Dunnan, Tory: “At nation's truck stops, talk of}
4.2 Capacity Concerns in Trucking

One of the primary concerns for businesses in Ohio and throughout the country is the availability of adequate capacity for surface freight transportation. This is particularly true for the trucking industry, where shortage of qualified drivers has persisted despite sluggish economic conditions. Trucking accounts for roughly 77% of the freight and goods movement in the United States which makes a shortfall in capacity a significant issue. Carriers and industry organizations are clear that capacity in the trucking sector is already tight and that demand will quickly outpace availability as the economy improves. Local and regional driving jobs are more desirable and so the risk is highest for longer haul activities. However no segment is completely immune. The drain on capacity is coming from multiple sources.

- Aging driver population: average age of a U.S. truck driver currently is 50
- Inability to recruit and hire new drivers
- Attrition of carriers, owner operators, and drivers due to economic pressure and the anticipated effects of the new Compliance, Safety, and Accountability Program (CSA) of the Federal Motor Carrier Safety Association (FMCSA)
- Reduced productive time due to new Hours of Service (HOS) regulations
- Loss of capacity utilization from congestion and adequate parking facilities for driver rest

4.2.1 Driver Shortage

The American Trucking Association stated in its November 2012 update on the driver shortage that 90 percent of the trucking companies in America cannot find enough drivers that will meet federal standards. The largest gap is in the truckload sector where the current need is estimated to be 20,000 to 25,000 drivers. The 2022 forecast is for a number that could reach 240,000 open driving jobs.

In the November report the ATA suggests that implementation of the HOS provisions in 2013 will cause a reduction of 3% of the available capacity due to productive time for utilization. This exacerbates the driver shortage. They anticipate that the CSA regulations will heighten the shortage by reducing the available pool of qualified drivers, and estimate the effect to be somewhat under 7 percent.


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21 Truck Driver Shortage Update, American Trucking Association (ATA), November 2012.
products. The internet shopping wave has given rise to an increased level of residential deliveries contributing to this need. Basic driver training is expensive and while many trucking firms reimburse tuition after a specified time of service the student is still required to have the funds up front.

Exhibit 18: Sources of Driver Shortage by Cause

- Retirements 37%
- Non-Voluntary Departures 16%
- Voluntary Non-Retirement 11%
- Industry Growth 36%

(Average number of drivers needed per year over the next ten years = 96,178)

4.2.2 Driver Hiring Restrictions

The federal government requires that applicants for an interstate Commercial Drivers License (CDL) be 21 years of age. This regulation is based on research that indicates that accident rates are higher among younger drivers. Some carriers are questioning the limit as it applies to military personnel with experience operating heavy equipment, particularly returning combat veterans. While there have been programs to investigate the age limit it has not changed. Several states allow an intrastate CDL at age 18 which can be useful in certain business models but limits flexibility for larger fleets that have interstate operations.

The higher accident risk is reflected in greater insurance premiums for drivers in the 21-25 age brackets. The same is true for drivers over 65. Insurance rates for larger fleets of trucks are determined based on a risk profile of the drivers and equipment and thus younger drivers have a negative effect on coverage cost. For this reason some fleets set a minimum age limit for their fleet higher than 21, the minimum age to obtain a CDL. There is no provision within the insurance underwriting system currently to give benefit to younger drivers with extensive experience, particularly those coming out of the military. Younger drivers who might be qualified for the recruiting pool and interested in trucking careers are excluded early and then move on to other career choices before reaching age 25, never to return to this market.
Military personnel also have been negatively affected in the past by state residency requirements for CDL licensing. In October of 2012, President Obama signed The Military Commercial Driver’s License Act of 2012. This bill specifically addresses the domicile requirement for a Commercial Driver’s License. Under current federal law, a state is permitted to issue a CDL only to legal residents of that state. Since military personnel often receive their vehicle training in locations other than their home states, the law makes it difficult for these individuals to obtain a CDL before leaving the military. New legislation would allow states to issue a CDL to an individual not domiciled in the state, but whose temporary duty station is located in that state.

4.2.3 Driver Image
The American Trucking Association is in the midst of a campaign to rebrand the image of the American truck driver and its various connotations in order to persuade more young people to consider a career in truck driving, broadening the base of the applicant pool and mitigating some of the endemic shortage of qualified applicants. The media campaign has a substantial web component.

4.2.4 Driver Training and Tuition
Many trucking companies reimburse drivers for their training expenses after a specified term of service. While this program helps it doesn’t remove one of the primary barriers to training which is having the funds to pay the tuition up front. Some driver training programs are such that their programs qualify for traditional student loans and grants. However there is a great deal of competition among the training schools and they are not all created equal in terms of quality. It is difficult for potential students to navigate the system successfully.

In order to mitigate the problem of up front funding some states have sponsored loan programs in concert with the trucking companies in their state. The Arkansas Department of Workforce Services (DWS) has renewed emphasis on its Truck Driver Training Pilot Initiative. This program works in concert with several carriers – both common and private – resident in the state. The training is conducted at a campus of Arkansas State University. The funding includes both tuition and room and board for students living more than 50 miles away. In addition to funding this program supports the students and potential employers by providing screening of applicants for suitability to the driving lifestyle and ensuring that the quality of the training meets the needs of the carrier. There are terms of employment and state residency required by the program.

In addition, ATA and the Office of the Chief of the Army Reserves (CAR) have agreed in principle on a driver development Pilot Program. As currently conceived, USAR would identify and work to train active duty Army Service personnel to CDL and HME standards in preparation for simultaneous civilian employment as truck drivers and Reserve duty status. ATA would serve as the conduit to connecting these drivers to carriers. ATA in return, will help the USAR inform the commercial driver population about opportunities they may have with the USAR. Some states have processes to verify military training for operating heavy equipment and will reduce the entry training requirements for a Commercial Drivers License (CDL) as a result then making it easier for veterans to enter the profession. Most carriers advertise aggressively for military veterans as drivers recognizing the value of their experience in developing a quality workforce.
4.2.5 Other Capacity Concerns
The negative effect of congestion on highway transportation is clear. Meeting customer expectations for on time pick-up and delivery in congested areas requires more time for transit and staging and results in lost utilization of equipment and drivers. Additional units are often needed to complete delivery routes for those carriers that supply goods to service industries in urban and residential areas.

Less obvious is a nationwide problem of the lack of adequate truck parking for drivers to complete their break time. Truck stop space fills up early in the evening and many rest areas have been closed. Streets and roadways, including those near major shippers and receiving facilities are often closed to truck parking. Some trucks find parking along the ramps on limited access highways but that can be dangerous and is often restricted as well. The limitations on parking cause drivers to stop short of their allowed driving time in order to secure a parking space reducing the utilization and therefore capacity.

4.2.6 Supply Chain Adjustments
One way that shippers are finding additional capacity is by diverting traffic from truck to rail. The cost of fuel and congestion to the trucking industry along with improved rail services have reduced the length of haul over which rail intermodal service is cost effective. Ohio is well positioned for this change given the intermodal development that has occurred and the increased double stack capacity that the Class I railroads have added on the corridors from the east coast ports and distribution zones.

Industry is seeking other solutions to capacity constraints beyond intermodal diversion. These solutions are also directed at reducing transportation costs and time to production and to market. There is a rising trend for sourcing materials and products closer to the point of consumption (near sourcing) and for creating distribution networks over shorter distances.

A recent panel of CEO’s at the 2012 Council of Supply Chain Management Professionals (CSCMP) suggested that developing near sourcing networks and increasing access to short haul intermodal services offer the best defense against shrinking capacity. This is good for Ohio given the proximity to major markets, its strong manufacturing base, and the number and quality of distribution services in the region.

It is important to not lose sight of the fact that many regional industries will still have requirements for trucking services and that every intermodal load requires a truck for pick-up and delivery. Regional business will be affected by rising prices and reduced service levels should the capacity levels continue to decline.

4.2.7 Strategy Options: Drivers for the Future
The driving job, as noted, is becoming more integrated with actual customer service and the performance of ancillary tasks such as assembling and installing products in businesses and homes. This change requires a different set of skills beyond the traditional CDL and company operations knowledge.
The large carrier J. B. Hunt Transport Services, Inc. has identified their final mile, home delivery business as one of the fastest growing and more strategic initiatives for the future. This business segment is an example of trucking jobs requiring other skills in addition to driving, and it provides more attractive employment besides by not requiring long periods of work away from home.

There is an opportunity to develop new driver training programs through community colleges and other institutions that could provide additional training and further workforce development. Speaking recently at the World Economic Forum about markets and jobs in Ohio, Governor Kasich said that Ohio has great opportunity to renew its place in the world as a manufacturing center. One theme in his message was that “education is the key”. The resurgence of manufacturing, particularly for higher value products, will require a skilled driving workforce supplying the capacity to take Ohio goods to today’s exacting markets. Ohio certainly has excellent public and private education at all levels. The Governor referenced the engineering training available in the state as a valuable resource in economic development, and might have cited logistics training as well.

Beyond technical education there is an opportunity to carry the labor pool preparation theme forward to CDL programs themselves, perhaps sponsoring specialized training that goes beyond the basic CDL requirements to develop a professional transportation workforce. Such a program would improve the image of the driver, attract a motivated student population, and increase the quality of drivers available to Ohio’s business community.

While it would be difficult for the state to affect insurance rates nationwide, there is potential for insurance rates for intrastate drivers to be subsidized in some way that would allow younger people with good driving records to choose a trucking career. Coupled with an enhanced CDL program and placing special emphasis on unemployed, honorably discharged veterans, a state agency like Jobs Ohio might make the case to state insurers that young drivers prequalified in this way formed a better risk group than others in their age bracket. A regional coalition, particularly one involving Michigan, could add leverage in negotiating with insurers, and be beneficial by opening a larger pool of potential employees to operate over a broader region, inclusive of the areas important to the automotive industry.

4.3 Developing Truck Parking through Public-Private Partnerships

This section considers the impact of privatization on the service provision of truck parking and rest areas, and their policy import.

4.3.1 Commercial Vehicle Parking

The American Transportation Research Institute (ATRI) indicates that insufficient access to parking for rest breaks ranked number eight on the list of the top ten industry concerns in 2012. The organization completed a short survey of 242 drivers and 93 carriers revealing that the two most common concerns related to lack of parking were driver fatigue management and the ability to comply with tightening Hours of Service (HOS) regulations. These concerns were echoed in the carrier interviews done in conjunction with this study. The issues of safety and compliance are critical to the industry as a whole and were consistently repeated as linked to the availability of parking in the interviews. A less obvious
aspect is the effect that the parking shortage has on equipment and driver utilization. In order to secure parking to complete the requisite break time, drivers often have to stop short of their full complement of driving hours, reducing their effective utilization. This contributes to the capacity concerns the industry is facing due to the decreasing population of qualified drivers, a topic discussed in a separate strategy section. Thus the availability of adequate commercial vehicle parking is a safety, compliance, and productivity concern.

The issue of commercial vehicle parking was being reported as a problem in the 1990s and investigated by the Federal Government as early as 2003 when the Transportation Research Board authorized a study under the National Cooperative Highway Research Program (NCHRP) Synthesis 317 Dealing with Truck Parking Demands. Over the ensuing years investments have been made but the gap has continued to grow due to increasing demand and decreasing resources.

In recent years, declining public sector revenues and higher costs of maintenance have caused many states to close down some of these rest areas in order to save money. Virginia closed 18 of the state's 42 rest areas to save $12 million annually. Arizona shut down 13 of its rest areas. Georgia, Vermont, Louisiana, New Hampshire, Colorado and Maine have also closed or will close some of their rest areas for the same reason. Other states have converted or added rest areas that provide parking only with no facilities. While this helps alleviate the basic space problem it fails to provide drivers with the most basic sanitary conditions. Drivers continue to seek parking wherever possible including the on and off ramps on limited access highways. While some states allow ramp parking it is a recognized safety hazard and not something that can be supported long term.

4.3.2 Ohio Rest Area Commercialization Efforts

Over time, states have developed an interest in expanding public and private cooperation in the provision of parking to leverage investment dollars and improve services. One potential solution that could create more truck parking is the public-private partnership model.

ODOT spends almost $50 million annually to maintain all 104 rest areas in Ohio. Rest area maintenance costs include paying gas, water, electric and sewage bills, as well as mowing grass, resurfacing parking lots, improving buildings and paying for janitorial and housekeeping services.

Ohio has considered converting non-interstate rest areas into privately run service plazas, where motorists could buy fuel, food and other things in one stop. In 2012 ODOT launched the Sponsorship, Maintenance, Advertising and Revenue Targeted (SMART) program to permit advertising and sponsorship opportunities at interstate rest areas and welcome centers throughout Ohio. The idea was that money saved or generated by these initiatives could be put directly into the agency’s capital budget to speed up the construction of ODOT’s major new transportation projects.

In mid-2012 the state proposed a project to pursue the conversion of five of the state’s 59 non-interstate rest areas, to service centers similar to what currently exists on the Ohio Turnpike. The five included two on U.S. Route 50 in Athens County, two on U.S. Route 33 in Hocking County and one on U.S. Route 23 in Pickaway County. While there was strong interest expressed prior to the release of the request for proposals, there were no bids offered.
4.3.3 Developing Truck Parking through Public-Private Partnerships
While Ohio has had uneven success in commercializing existing rest areas, a strategy focused on truck parking and facilities could be more fruitful. There are a number of considerations to address with this strategy, as outlined below.

- Federal prohibition on commercialized rest areas: Current federal law prohibits commercialization (such as long term concessions) of rest area facilities located on the Interstate Highway System. This prohibition motivated Ohio to explore public-private partnerships for rest areas off the Interstate System. Similarly, in creating public-private partnership opportunities for truck parking, locations will either need to be on US state system routes.
- Business volume: it is possible that Ohio did not receive bids for its rest area partnership opportunities because the routes had low traffic volume, relative to other routes in the state. The optimum routes for commercial truck parking facilities would be in proximity to the I-70, I-71 and I-75 corridors.
- Other location considerations: a number of truck stops and rest area facilities are serving as “staging areas” for trucks scheduled to make deliveries in urban areas. Truck parking areas can be located at urban fringe locations to take advantage of land availability and cost.
- Service offerings: Where other states have commercialized rest area facilities (on toll roads not governed by federal law), the key revenue stream is fuel sales. Fuel sales were not contemplated in Ohio’s rest area partnership offering. An obvious synergy would be an offering of CNG or LNG fueling stations, which would stimulate that market. Natural gas fueling stations are also eligible for federal CMAQ funding, providing a potential source of capital funding for truck parking facilities.

4.3.4 Technology-based Options
The University of Minnesota is leading a project that’s testing a Truck Parking Availability System (TPAS) aimed at using technology – in this case, a network of cameras tied by wireless networks into a central database – to more effectively manage public truck parking slots along the highway. Several other states are investigating similar ideas including reservations systems. The developing systems are designed to get information to drivers and fleet managers via websites, cell phone apps and variable messaging signs placed strategically. The technology based ideas have wide support in the trucking industry; however, fees charged for reservations do not. Reservation systems present opportunities, but there are hurdles to planning a schedule to match the rest area location with the trip plan and not impact the utilization of equipment and drivers.

4.3.5 Leverage Existing Facilities
While the industry problem is a lack of parking, providing parking space alone is not sufficient. The addition of parking areas without water and restrooms creates sanitary problems and doesn’t help promote a better lifestyle for the drivers. Resources would be better put to expanding parking space at facilities that are already equipped to provide basic services.
4.4 Increasing Ohio’s Truck Weights

Driver shortages, traffic congestion, hours-of-service regulations, and other factors are impacting the productivity of trucking firms. Among the array of strategies discussed in this section, a potential policy alternative is to increase the legal weight limit of trucks, so that more cargo is carried by each driver and tractor trailer. There was a recent proposal in the Ohio General Assembly to increase legal truck weights to 90,000 pounds (from 80,000 pounds), for trucks traveling on the Ohio state highway system (trucks using the Interstate Highway System would be still be subject to federal laws and regulations, which remain at 80,000 pounds). In theory, increasing the legal weight of trucks would reduce the number of trucks needed to haul freight in Ohio, since each individual truck would carry a greater amount of cargo.

The Ohio Statewide Travel Demand Model was used to analyze the impact of increasing the legal weight limit of trucks to 90,000 pounds, from its current maximum of 80,000 pounds. The Statewide Model includes estimates of truck freight flows, by commodity, derived from the FHWA’s Freight Analysis Framework. The table below provides summary results of this analysis.

<table>
<thead>
<tr>
<th></th>
<th>Truck Traffic Type</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current Truck Count (at 80k limit)</td>
<td>63,491,368</td>
<td>33,746,501</td>
</tr>
<tr>
<td></td>
<td>Truck Count (if limit raised to 90k)</td>
<td>62,272,117</td>
<td>33,655,403</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>(1,219,251)</td>
<td>(91,099)</td>
</tr>
<tr>
<td></td>
<td>Percent Difference</td>
<td>-1.9%</td>
<td>-0.3%</td>
</tr>
</tbody>
</table>

Source: Parsons Brinckerhoff

In brief, increasing Ohio truck weight limits from 80,000 to 90,000 pounds would decrease the number of trucks on Ohio roadways by—at most—1.3 percent. The analysis was shaped by the following factors:

- Different commodities have different payload factors, i.e., there are some lighter weight cargos that fill a trailer, without reaching the legal weight limit. The Statewide Model breaks freight into more than 31 categories, each with a different payload factor;
- A percentage of trucks are empty, as they travel to pick up loads;
- The analysis was limited to truck trips internal to Ohio, or traveling between Ohio and Michigan (Michigan allows heavier trucks), because 80,000 pound weight limits are still enforced in other neighboring states;
- The statewide model is unable to restrict the routing of trucks to exclude Interstate Routes (Interstate Highways still being subject to federal weight regulations), which likely inflates the impact of this policy change.
This is a seemingly small return for a 12.5 percent increase in legal truck weight, but there are reasons that the impact on truck volume is not greater. It is worthwhile to emphasize the following points from this analysis:

- As a practical matter, an Ohio-based truck weight increase has limited benefits, because neighboring states (except Michigan) retain their 80,000 pound legal limits;
- There are a number of different types of trucks that haul commodities (vans, dump trucks, etc), and a 90,000 pound weight limit would apply only to tractor trailers;
- Most tractor trailers are not loaded to their 80,000 pound legal weight limit. Some are empty; some are partially loaded, and some commodities fill a trailer before reaching the maximum legal weight limit. Therefore if these commodities do not “max out” at 80,000 pounds, they will not “max out” at 90,000 pounds, either;
- There may be other benefits to increasing truck weight limits, including decreases in congestion, air quality improvement, and lower costs that accrue to shippers.
- Just as there are other benefits, there are other costs which are not accounted for in this analysis, which could include safety, pavement degradation, and bridge damage.

4.4.1 Long Combination Vehicles

Long combination vehicles, commonly called "LCVs,” are tractor-trailer combinations with two or more trailers that may exceed 80,000 pounds gross vehicle weight (GVW). LCVs typically include three vehicle types:

Exhibit 20: Trailer Types, Size, and Weight

<table>
<thead>
<tr>
<th>Type</th>
<th>Weight</th>
<th>Overall Length</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rocky Mountain Double</td>
<td>105,000</td>
<td>95</td>
<td>48-53</td>
<td>28</td>
<td>-</td>
</tr>
<tr>
<td>Turnpike Double</td>
<td>135,000</td>
<td>120</td>
<td>48-53</td>
<td>48-53</td>
<td>-</td>
</tr>
<tr>
<td>Triple Trailer</td>
<td>110,000</td>
<td>110</td>
<td>28</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>

Source: Federal Highway Administration

Since passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, states have been prohibited from increasing the size and weight of combination vehicles on the federal aid highway network. Under this “ISTEA Freeze”, LCVs are allowed by a grandfathering clause only in states and on routes where they were in operation before June 1, 1991. East of the Mississippi River since ITEA, turnpikes in five states have allowed
double combinations in the effective form of twin 48’ trailers: Florida, Indiana, Massachusetts, New York, and Ohio. In addition, triple 28’ trailer combinations (characteristic of some LTL carriage) are allowed on the turnpikes in Ohio and Indiana, but not elsewhere in the east. The accompanying map depicts this, and illustrates the so-called “LCV gap” for turnpike doubles on I-90, between its separation from the Ohio Turnpike around Cleveland and the beginning of the New York Thruway at the Pennsylvania-New York border.

Exhibit 22: Allowance of Longer Combination Vehicles on the National Highway System, 2010

4.4.2 LCV Considerations In Ohio
Ohio is heavily dependent on trucking to meet the needs of industry. Trucking capacity is already reduced due to economic and regulatory effects and the lack of drivers will worsen conditions. Regional trucking associated with the automotive industry is particularly important to the state, and both carriers and automakers are concerned about the looming driver shortage. The retail segment, with its distribution center network, is another important example, and capacity in this supply chain has a direct effect on the price of consumer goods. While rail intermodal service is growing and offers some relief, it does not target the regional traffic lanes that account for the majority of truck activity.

In addition to the issues of truck capacity, Ohio is faced with highway congestion on several of its significant corridors that is likely to worsen with growth. Congestion creates issues for transit time and system performance for the freight industry and for passenger traffic. It also contributes to air quality deterioration. Air quality non-
attainment zones designated by U.S. EPA are particularly prominent in Ohio’s urban areas along I-71, with the Cleveland region facing the greatest challenge in terms of the number of elevated criteria air pollutants.

When taking both capacity and environmental issues into consideration it makes sense to look for other alternatives to provide ongoing capacity. LCV opportunities certainly fall into that category, and an obvious scenario would be extension of their existing operation beyond the Ohio Turnpike. A 2012 report by the National Center for Freight & Infrastructure Research & Education (CFIRE) estimated that the annual net benefit of LCV carriage on the Ohio Turnpike totaled between $.45 and $.75 per vehicle mile, principally through savings in diesel costs, as well as equipment and emissions.22 This study concluded that pavement costs would not rise, because axle loads were not different from single trailer carriage, and it did not estimate safety costs, because outcomes on this point were uncertain (safety is further discussed below). Driver cost savings were calculated to be offset by the additional labor required to assemble and break down double configurations, although unit labor costs would drop with higher activity, and scarcity in the value of drivers is not accounted for.

The accompanying map gives a sense of the routes where LCV extension might function. It depicts truck traffic on I-90 and the other routes that traffic travels. The map focuses on the option of bridging the Ohio portion of the LCV gap in the direction of the New York Thruway, but because I-90 and the Ohio Turnpike overlap in much of the state, it also offers an approximation of the route connections for the Turnpike itself. Several points stand out:

- Truck traffic is substantially heavier toward the Pennsylvania line on the Turnpike than on I-90.
- The other significant connecting routes are the combination of I-271 and I-71, and US 250. The former are multi-lane divided highways that generally cross Ohio non-attainment zones; the latter has neither characteristic.

• I-75 does not appear as a connecting route. Because the map is produced through traffic modeling, it is more likely that the model favors other connections to I-75, than that little truck traffic factually flows between the Turnpike and I-75, which is one of the principal freight routes of the State.

The left and center maps below respectively break down the I-90 traffic between Ohio-based trucks and trucks passing through the state. While the scales are different, the maps suggest that through trucks are relatively more reliant on the Turnpike toward Pennsylvania than on I-90, and that I-90, I-271, and I-71 are all significant for trucks serving customers in the state. The map below at right shows total Ohio truck activity and the prominence of I-75.

Exhibit 24: I-90 Ohio-based Trucks (left), I-90 Through Trucks (center), and All Trucks (right), 2012

Several further observations should be made about LCV extension from the Turnpike. First, assuming that I-75 is a more substantial connection than it appears, its character as the main corridor of the automotive industry has a special advantage. The auto industry is uniquely suited to the LCV concept due to the one to one nature of the shipments, that is one trailer load of parts inbound to assembly is equally matched with one outbound trailer load of racks back to the parts manufacturer. This correspondence means the equipment is equally balanced and extra trailers won’t accumulate at the destination points when operated in a combined configuration. Such balance is an important consideration for practical adoption of LCVs, both because the LCV network itself is small, and because doubles are limited to 48’ trailers. The standard over-the-road trailer in the trucking industry is 53’, making a 48’ trailer specialized equipment not in general use, and unattractive to many shippers of goods. Specialized equipment requires balance for efficiency, without which there is added cost to reposition it for its next trip. Of course, an alternative would be to change the overall length limit for LCVs to accommodate 53’ trailers.

Bridging the LCV gap on I-90 in eastern Ohio – provided it also were bridged on its 46 miles in Pennsylvania – should offer promise for higher LCV adoption. Without it, there is a break in service that is difficult for carriers to manage. Under the right set of circumstances they are able to make use of doubles in the corridor but the freight profile and operation must have a specific fit for their network. The conditions cannot be relied upon to be widely applicable. With the gap bridged, LCVs are able to run from East Chicago to Boston and New York City, a significant improvement in conditions that could well draw traffic from other routes, including some that are lower capacity and untolled. Finally, the number of lanes in the roadway is another consideration for LCV extension. Turnpike doubles operate today on divided highways with two lanes in each direction (much of the upstate New York Thruway is this way, and eastern sections of I-90 in Ohio would follow suit), but three allows a passing lane and a far left lane restriction, which is attractive to motorists sharing the road with these much larger vehicles. This configuration also is conducive to managed lane concepts, with a toll assessed for LCVs.
4.4.3 Advantages and Concerns for LCVs

The advantages of LCVs include:

- **Productivity:** LCVs improve productivity due to an increase of cargo-carrying capacity per tractor and driver. This results in fewer truck trips, lower cost, and fewer miles driven. In Ohio where two 48 foot trailers are allowed, the gain over one 53 foot trailer is a 55% improvement in the interior trailer volume and the difference between 68,000 pounds and 40-43,000 pound in weight. The heavier weights are more likely to require a different, more expensive tractor and so the greater potential lies with freight that will cube out – fill the trailer volume – before it weighs out.

- **Cost:** Transport costs are lower due to fewer drivers and tractors needed per cargo unit, and more efficient use of fuel. The cost savings benefit the carriers and subsequently their customers and consumers at the checkout counter.

- **Traffic:** Improved productivity results in fewer trucks on the road. The I-90 Corridor Case Study\textsuperscript{23} sponsored by FHWA suggests that the single trailer to LCV configuration conversion potential ranges from 2% to 10%. For some industries with specific operating conditions it might potentially be higher. Further research is warranted.

- **Air Emissions:** LCVs produce lower air emissions per unit of cargo transported.

The concerns regarding LCVs include:

- **Equipment:** The requirement for 48 foot trailers creates problems for the industry which is standardized on 53 foot equipment that includes domestic intermodal containers. The need for alternate equipment is an additional cost factor for carriers. Additionally, the heavier loaded weights of LCVs can require tractors with a different configuration for power and braking technology, which can be more expensive.

- **Safety:** There are concerns that longer vehicles create more serious traffic accidents due to factors including longer stopping distances and instability. Others counter that the accident rate can be lower for these vehicles, particularly in managed lane operations and when newer braking systems and other truck technology are employed. Part of this would be due to the higher skill level and experience of the drivers with a CDL endorsement for doubles. TRB Special Report 267\textsuperscript{24} issued in 2002 concluded that no studies had clearly shown that multi-trailer configurations are less safe than tractor-semitrailers, and that any safety difference may be small. While this was less an endorsement than a finding that better studies were needed, it also did not reveal demonstrably large safety risks.

- **Pavement Damage:** Heavier vehicles do more pavement damage. However, the axle loading for LCV’s may offer some mitigation. Again, the managed lane scenario can actually improve the pavement situation by putting the burden on one lane only and reducing repair requirements to the additional highway lanes.

- **Infrastructure Damage:** LCVs, especially Turnpike Doubles and Rocky Mountain Doubles, demonstrate wider off-tracking on curves than currently legal tractor-trailer combinations. Off-tracking can damage shoulders, curbs, and roadside signs along ramps and intersections. The solution is to apply newer design standards for areas affected by the vehicles.

\textsuperscript{23} “Longer Combination Vehicles on Exclusive Truck Lanes: Interstate 90 Corridor Case Study”, Federal Highway Administration, September 2009

\textsuperscript{24} “Regulation of Lengths, Weights, and Widths of Commercial Motor vehicles” Transportation Research Board Special Report 267, Washington DC, 2002
- **Parking**: The parking spaces at State rest areas and truck stops are not designed for trucks longer than 80 feet.
- **Diversion**: LCVs in long distance operation pose a risk of traffic diversion from rail carriage. To the extent that this returns rail traffic to highways, or prevents rail relief of highways, it could be regarded as an added cost to highway capacity and maintenance, air emissions, and safety exposure.

### 4.4.4 Best Practice LCV Benefits

In a presentation for the FHWA Talking Freight Series in 2009, John Woodruff from the University of Michigan Transportation Research Institute (UMTRI) cited results from studies including statistics from Alberta British Columbia that showed the positive effects of LCV use.

**Exhibit 25: Benefits of LCV Use**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck VMT reduction</td>
<td>44%</td>
</tr>
<tr>
<td>Cost savings to shipper</td>
<td>29%</td>
</tr>
<tr>
<td>Reduction in fuel, CO₂, and NOx emissions</td>
<td>32%</td>
</tr>
<tr>
<td>Reduction in road consumption</td>
<td>40%</td>
</tr>
<tr>
<td>Exposure crash reduction</td>
<td>44%</td>
</tr>
<tr>
<td>Policy-affected crash rate reduction (excluding VMT exposure reduction benefits)</td>
<td>5x</td>
</tr>
</tbody>
</table>

*Source: UMTRI Essentials of Long Combination Vehicles, FHWA Talking Freight May 20, 2009*

Policy and technology applications both have a role in reducing concerns about expanded LCV implementation. According to the UMTRI research, the policy and management techniques to be applied as best practice include:

- Acceptance into the program requires a minimum performance threshold
- Require special safety technologies on vehicle
- Regular incident reporting by carriers important to ensure maximum benefit
- Highway safety and weight violation information linked to performance evaluation
- Meaningful enforcement is essential
- Managed lane strategies

The addition of the following truck vehicle technologies have been recommended as part of the best practice methodologies:

- Lane Departure Warning Systems
- Roll Stability Systems and Electronic Stability Systems
- Forward Collision Warning Systems with Adaptive Cruise Control
- Vehicle Diagnostic and Location Systems

Of these, only the fourth can be seen as widely implemented in the trucking industry. Others are implemented only in some fleets although the attraction of operating LCVs could supply some impetus toward installing additional technology.

### 4.4.5 Cost and Revenue

Implementation of the LCVs has a cost stemming from pavement maintenance, changes to configurations for turning and access, and parking/staging areas for breaking out and assembling the combined units. The FHWA I-90
Corridor Case Study suggests tolling the highway facilities in order to pay for the additional expense. This research suggests that the predicted conversion volumes at the low end of the 2-10% range are not sufficient to balance the cost. However, the focus of this study was exclusive truck lanes, whose cost would be borne solely by freight traffic; this is a different financial profile than shared use lanes designed in part for LCV operation.

The collection of the toll revenue can add another element of cost in the purchase and installation of equipment if traditional tolling methods are used. Other technologies such as cameras or weigh in motion (WIM) stations may provide the same opportunities at a reduced price. In fact the weigh-in-motion facilities serve a dual purpose “killing two birds with one stone”. WIM stations replace traditional scales where trucks are required to leave the highway to weigh. The technology uses a Radio Frequency Device (RFD) installed in the vehicle to identify the tractor and its operating company. The unit is weighed and identified as it crosses the in-highway installation. This technology is capable of a configuration to count the number of axles over a certain spacing which can identify the type of vehicle along with the axle weights. The unit installed in the vehicle is similar to a toll tag or pike pass which are common for companies consistently operating on the turnpike. The Ohio Truck Drivers Guidebook published by the DOT lists 10 district headquarters with platform scales. All but the one in Van Wert county are equipped with electronic technology working from PrePass, a common RFD device used for tolling. As WIM stations expand, the potential to use them for truck tolling grows alongside.

4.4.6 Options for Strategy

Ohio’s option to extend LCV operations beyond the Ohio Turnpike to anywhere on the federal aid system depends on the cooperation of U.S. DOT and probably the Congress. The States of Maine and Vermont succeeded in winning allowance for a one-year 2010 pilot of higher weight trucks by congressional action. Pilots thus have precedence, and TRB Special Report 267 urged that they be used. However, US DOT is now commencing a Comprehensive Truck Size & Weight Limits Study, as mandated by MAP-21 and scheduled for completion at the end of 2014. It is not likely that U.S. DOT or the Congress will take any new action while this study is underway. Even so, the scope of the study as described in its Request for Proposal considers only one multi-trailer combination, and that is a vehicle with two 33’ units. Turnpike doubles of 48’ or 53’ and all other varieties of LCV are not scheduled for evaluation, which would be the first step toward any expansion of operation. It is possible that U.S. DOT would enlarge the scope of study at the urging of states and industry; no public information is available on this point, although the published scope could be taken as a deliberate statement of preference. If Ohio wishes to test expansion of LCV routes, the possible approaches include a) petitioning U.S. DOT for greater scope in its study; b) offering itself as a pilot location, either while the study is in progress, or as a recommended follow-on. As a state experienced in LCV operation in urban as well as rural settings, Ohio has a stronger claim to serve as a test location than many states, and a stronger reason to be heeded.

Criteria for selection of a pilot corridor should include:

- Connection to the Turnpike
- Environmental and congestion improvement opportunities
- Sufficient lanes for operation and managed lane options
- Potential safety risks
- Volume and type of freight in the corridor, including opportunity for equipment balance
- Cost savings to critical industry and consumers
- Continuity of the corridor

Three potential pilot corridors have emerged from the previous discussion. A fourth option would be allowance of twin 53’ trailers on the Turnpike; this could be proposed on its own, or combined with the others. The three corridors are:
• **I-71** south from the Turnpike to approximately Mansfield, offering multiple lanes to where the important freight routes of US 30 and US 250 connect. A variation could add a branch with I-271, although this section is limited to two lanes in each direction. The I-71 option responds well to air quality and congestion relief needs, serves Ohio industry and consumers, and is the least likely to affect rail traffic.

• **I-90** east from the Turnpike to the Pennsylvania line. Variations could add a branch on I-271, or substitute I-271 for the section of I-90 through Cleveland. The routes vary between multiple lanes in the metropolitan area to fewer outside. This extension would be most effective as a collaborative effort with the Commonwealth of Pennsylvania, yet could have some value without it. The I-90 option aids air quality and congestion needs, serves Ohio industry and consumers as well as through freight, but (if extended across Pennsylvania) is the most likely to affect rail traffic.

• **I-75** north to the Michigan border and south to Findlay, offering multiple lanes to where the important freight routes of US 68 and the SR 15 connection to US 23 branch off. This extension would be more effective as a collaborative effort with the State of Michigan, which does not allow turnpike doubles but does have relatively liberal size and weight regulations. It is aimed particularly at the economically important and well-balanced automotive industry traffic, although other business and consumers could benefit.

Any of these options offers a way to test the benefits and challenges of broader LCV operations in a controlled, responsible way. Whether implementation could find support at the federal level remains to be seen.
5. MODAL STRATEGY: WATERBORNE FREIGHT

Ohio ports such as Toledo see opportunity for cargo and revenue growth in Ohio’s developing energy sector, as the state becomes a focal point of exploration and extraction opportunities driven by technological advancements in the harvesting of shale oil and gas. Numerous prospects are now being considered, from the support of refining operations through the construction and operation of pipeline equipment at Ohio ports, to transportation of project cargos, to the movement of containerized goods through short sea shipping.

The core strategies for waterborne freight policy are:

- Rationalization of dredging priorities on Lake Erie
- Pursuit of opportunities in new energy economy
- Include riverfront barge terminals in permitted oversize/overweight trucking routes
- Promote ‘last mile’ connections (rail-to-truck) at river terminals
- Protection of maritime industrial areas on riverfronts through local zoning and incentives
- Acknowledge the strengths and weaknesses of the marine mode for lake and inland waterways
- Understand that federal action will have the largest impact on inland waterways infrastructure

5.1 Opportunities in the Energy Economy

As discussed in the Needs Analysis, energy exploration and extraction activities now centered upon the Marcellus and Utica Shale formations—beneath the eastern third of Ohio and western half of Pennsylvania—have the potential to reactivate components of those state’s freight movement systems that have long been underused. In areas in which these types of extraction activities have progressed, such as Oklahoma and elsewhere, frac sand and other industrial components and products have revitalized non-truck modes such as barge transportation and short line rail.

As in Oklahoma, the Ohio ports may assist in a rail-based strategy to create a ‘rolling pipeline’ in Ohio when environmental permitting for traditional pipeline routes cannot move as fast as market demand for extracted energy supplies. In the past, the Toledo-Lucas County Port Authority has pursued USDOT funding through competitive grant opportunities to support the design and construction of facilities of this type, but has not yet been successful in securing project funding. Even so, crude by rail has been growing - in part because of its network flexibility - and rail-water combinations can be a lower cost alternative to some markets. The market as a whole is relatively new and fluid, and could yet justify this kind of development.

As North American crude production climbs, ports can be intermodal connections in other ways as well. Two refineries near Toledo are now served by pipelines running from dock to the refinery site, delivering ‘slugs’ of crude as they arrive at the port. At present, pipeline permitting and construction opportunities are limited as new sites develop, due to land acquisition requirements and the timetable of the necessary environmental reviews – but timely support and market evolution could bring about more activity.
5.1.1 Market Context

It is beneficial for Ohio ports to examine how they may benefit from this new economic activity, but care should be taken to understand the nature of the market driving extraction and exploration, and to be aware of its risks. The success of Ohio ports as nodes in a new energy supply chain on the Great Lakes is contingent upon how successfully they can divert cargos such as silica that are now traveling by truck from nearby states, such as Wisconsin and Minnesota.

Additionally, it should be remembered that low-cost energy has the potential to revitalize many heavy industrial and manufacturing sectors that have experienced regional decline in past years, namely aluminum, paper, iron, steel, and petrochemical industries, as energy inputs represent a large portion of these firms operating expenses. Transportation planners responsible for asset management of port (and associated rail) infrastructure in Ohio should maintain an outreach effort with key firms and leaders in these industries to be best positioned to serve their needs as the market evolves.

The potential for large-scale movements of liquefied natural gas on the Great Lakes and St. Lawrence Seaway is extremely limited, due to the standard economies of scale achieved through the use of large vessels that would not fit in the existing system of locks. Additionally, such a trade flow on the Seaway would be contingent on a number of economic and regulatory factors that define whether natural gas can or will be exported through any port at all.

5.1.2 Silica Movements

So-called frac sand, a material distinguished by its size, shape, strength, and purity that make it ideal for use in the hydraulic fracturing process, has been promoted as a burgeoning supply chain that offers revenue opportunities for Ohio ports. This sand is used to prop the fissures created in the hydraulic fracturing process, while steel and metal inputs used in the fracturing process are also integral cargoes. (This strategic option is discussed in greater length in the Needs Assessment segment of the Access Ohio 2040 freight component.) However, frac sand alone cannot be expected to produce substantial revenue gains for port owners.

Exhibit 26: Historical and Projected Proppant Demand, as of July 2012

With a projected North American market demand of 30 million tons in 2016 and 40 million tons in 2021, the total demand for frac sand for the entire continent will be less than the tonnage handled by Ohio’s Lake Erie ports in 2005. With Ohio predicted to have approximately 2,500 to 4,000 horizontal drilling
sites within three years, the average number of new projects per year suggests that Ohio will constitute less than 10 percent of national frac sand demand per annum (4 million tons), if the state is home to less than 10 percent of new project sites. Estimating by multiplying a projected total for horizontal drilling sites in Ohio by 2015 (2,500 to 4,000) by the volume of sand required to drill each one (800 tons) produces an Ohio demand estimate ranging from 2 million to 3.2 million tons cumulatively moved over the course of three years.

Revenues are apt to be modest as well. With values for raw (uncoated) sand at approximately $60 per ton at the site of origin in 2012—roughly comparable to the value of central Appalachian coal futures in March 2013—revenue enhancement opportunities for port authorities are present, but limited. A study by the U.S. Energy Information Administration (EIA) evaluated transportation costs of coal via barge from 1979 to 1997, concluding that the rate per ton fluctuated around an approximate average cost of $4 per ton for the entire barge journey. Even if Ohio ports could claim up to $1 per ton of the total cost of barging, it would still limit short term revenue potential from frac sand traffic to $2 million to $3.2 million for the three year period.

Finally, given vertical consolidation trends in the energy industry, whereby drillers are acquiring input suppliers (including frac sand mining pits), it is likely that these firms would want to construct private terminals for the unloading of sand at the ports should they decide that waterborne movements are economical. Accordingly, some of the revenue potential for port authorities in this scenario would be found in lease negotiations with prospective terminal operators, rather than cargo handling for the sand itself.

5.2 Container Service on Lake Erie or the Ohio River

Trends in increasing containerization of metals, bulk scrap, and agricultural staples—which are key revenue streams for Ohio ports—have compelled consideration of renewed container service on the Great Lakes that has been attempted intermittently in recent years. The implications of the Jones Act in terms of vessel construction and crew have made container service uneconomic for nearly all American markets, aside from those entirely dependent upon Jones Act carriers (Hawaii, Guam, Puerto Rico, etc.). Subsidized container-on-barge service based in Canada has also failed to recover the costs of operating. The seasonal nature of the Seaway as a facility, with little or no winter service, would also hinder planned operations. Additionally, the ports would face a challenge in changing their relationship with freight forwarders in the region by offering this new service.

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25 In fact, the SEC filings of one producer of sand proppant stated that Ohio represented only 7 percent of ‘frac’ sand deliveries in 2012, primarily for use in the Utica Shale basin. Comparatively, Texas was the destination of 36 percent of ‘frac’ sand volumes that year, with most destined for the Permian and Eagle Ford basins. Pennsylvania consumed 24 percent of ‘frac’ sand tonnage with Marcellus shale operations in 2012. (See: Hi-Crush Partners LP, Form S-1 Registration Statement to the Securities and Exchange Commission, 2012.) While Pennsylvania consumption may boost rail movements in Ohio, it is unlikely to affect waterborne trade, as the economies of scale afforded by barge are not great enough to prompt movement from truck to barge, to truck again, for Midwestern sand supply chains originating in Minnesota and Wisconsin.

Apart from containerized bulks, goods that travel in intermodal containers generally have a high value-to-weight ratio and are sensitive to delay and supply chain disruption. While waterborne carriage in the Midwest has been improving in terms of reliability and minimization of delays, service via river barge or lake vessel is generally too slow when compared to trucking or even intermodal rail. Though a truck trip Cincinnati to Wheeling, West Virginia, requires 3.5 hours via Interstate, the same journey by barge would require 35 to 38 hours when moving at nine knots. This represents a ten times increase in inventory costs for shippers, which is likely untenable for movers of containerized goods.

5.3 Other Opportunities

Ohio is home to several Foreign Trade Zones (FTZs) that formerly provided some measure of support for industrial activities taking place within them. However, as the State of Ohio does not now impose an inventory tax—and one of the primary attractions of the FTZ concept was the ability to delay the tax’s collection until strategically beneficial to the zone’s commercial users—user demand for the FTZs has declined. These sites may have the potential to serve as inland ports in the months for which the Seaway is not navigable, or for the duration of the year.

Some further considerations in pursuing these opportunities are also appropriate. First, the ports are aware that pursuing a revenue base built of project cargos is a labor intensive way to derive spot revenue streams of various scales. Nevertheless, the reshoring of manufacturing to the United States should be a spur to this kind of business, so the prospects for traffic should be continuing and growing, if also intermittent. Additionally, the prominent role that private terminals play in some Ohio ports limit the revenue gain potential that is possible through increased marketing activity and cargo attraction for primary users. As of 2013, federal set-aside programs for American ports mandating aid-in-kind food donations to low-income nations also face an uncertain future as shifting policy priorities have now begun to favor purchasing such aid in the countries of destination to develop agricultural economies abroad.

All of the foregoing suggests a mixed bag of business prospects for Ohio ports. The energy economy does not offer a single pivotal opening for growth, but it does offer a variety of more modest ways to play. Container traffic does not seem promising but project cargo probably does, despite its periodic character. This outlook supports an overarching strategy for Lake Erie facilities, whereby potential economies of scale and scope may be uncovered through marine asset rationalization. Under this approach, uneven traffic opportunities and diminished Great Lakes tonnage could be concentrated towards assets best capable of handling those volumes, and also where these supply chain nodes could create the most value. Prominent ports that would benefit—namely Toledo, Cleveland, and Ashtabula—are the most competitive in terms of possessing a large amount of amount of covered storage space, climate controlled storage, and acres of lay-down space with no existing bottlenecks or access issues. The costs and benefits of this strategy are discussed at length in the following section.
5.4 Dredging Strategy

Dredging and storage of the removed material at Ohio’s Lake Erie ports is an important category of asset management for maritime facility owners that must be undertaken in conjunction with the recapitalization of cranes, berths, breakwaters, piers, and other structures and navigational aids. This section outlines a decision-making framework by which public investments in the dredging and storage of silts, clays, and other debris may be prioritized according to ports’ potential to move the most freight per dollar invested. It suggests that publicly funded dredging at less active Ohio ports be suspended in order for those resources to be directed to more heavily used ports that serve larger origin-destination markets. The strategy proposed for asset management of harbors and navigational channels at Ohio ports involves four parts:

**Ohio transportation planners could influence the decision of where dredging occurs.** Current dredging needs are fulfilled through Congressional appropriations that are not presently coordinated with Ohio transportation improvement plans or statewide freight movement frameworks. Influencing the process by which ports facilities are advanced for dredging priority will mean that public resources are allocated in a productive manner, and that the greatest yields in Ohio cargo can be achieved for the federal funds devoted to marine facilities.

**The state should be able to reap the benefit of cost savings it volunteers.** Currently dredging funds are allocated on an individual basis through the U.S. Army Corps of Engineers (USACE) scheduling and the assistance of Congressional appropriations. Accordingly, hypothetically ‘decommissioning’ the dredging schedule of a less active port does not guarantee that those resources will be dedicated instead to other facilities in Ohio. This will need to be resolved as a part of the interagency coordination between state and federal bodies in transitioning to a revised dredging program.

**Presently unmet dredging needs, determined by ports’ trade volumes, should be addressed.** Between FY 2005 and FY 2011, Ohio port facilities required $107.2 million in dredging by design, as specified by Congressional authorization. However, only $46.3 million was allocated to dredging these facilities, due to inadequate resources available for federally funded harbor maintenance activities nationwide. In comparing the programmed dredging needs and allocated funding for Ohio ports during these six years, Cleveland experienced a shortfall of $14.7 million in dredging resources, Toledo lost $12.8 million, and Ashtabula missed $2.4 million. Additionally, less active ports at Huron ($15.1 million), Lorain ($7.2 million), Fairport ($7.2 million), Sandusky ($3.4 million), and Conneaut ($1.4 million) also saw unmet needs due to deferred dredging funding. Concentrating limited dredging resources where they would create the greatest impact on Ohio’s economy mean prioritizing the most active ports so that they can be dredged more frequently. While other support services for the legacy infrastructure at Cleveland, Toledo, and Ashtabula should undoubtedly follow, dredging schedules present the largest current unmet need.

**Differences in cost-effectiveness of dredging at ports should be leveraged.** Harbors and navigational channels across Ohio’s Lake Erie shoreline encounter widely varying costs for dredging and disposal of material (Exhibits 30 and 31). Accordingly, transportation planners should
Acknowledge that some facilities, such as the port at Cleveland, due to natural bathymetry or soil composition will be more expensive to dredge, but will continue to operate economically due to the scale of industrial and retail activities in the ports’ hinterlands. Additionally, some ports (such as Ashtabula) are advantaged not only in being located in a landscape that is comparatively inexpensive to dredge, but also enjoying proximity to a large industrial base. Rationalizing dredging resources according to trade volumes will mean that more resource intensive dredging programs can be undertaken where they are more likely to have an effect based on existing trade flows (in ports like Cleveland and Toledo), while less expensive ports like Ashtabula can offer additional productive capacity.

5.4.1 Dredging: Introduction and Context

- Dredging removes naturally accruing sands, silts, and other material to deepen harbors and navigational channels
- The cost of dredging is contingent upon a number of site-specific factors, such as the type of material being dredged and the most appropriate equipment to remove it
- Channels and harbors that are federally authorized by the U.S. Congress are dredged at federal expense by USACE according to funding availability

The dredging that is undertaken by the U.S. Army Corps of Engineers (USACE) and its contractors is intended to counteract the effects of the natural sedimentation process by which soil, sand, rocks, and other materials accrue within the basins and navigation channels of Ohio’s ports. Removal of this dredged material provides the necessary clearance for vessels to enter the ports at their designed capacities to deliver and collect cargo without being damaged by the waterway bottom. Materials are removed from the channel or harbor floor and either moved via barge, pipeline, or the hopper of the dredging vessel itself, to their eventual disposal site. In the last five decades, USACE and its contractors have dredged between 200 and 300 million cubic yards of material per year to preserve the accessibility of federally authorized navigational channels nationwide. An average of 681,000 cubic yards of material has been removed annually from Ohio ports from 2006 to 2011. The cost of providing this service widely varies based on a number of factors, including equipment availability and bid competition, weather at the time of maintenance, type of disposal (open water placement, capping, confined disposal facility (CDF), beach or wetlands nourishment, or other uplands use) and other factors.

The dredge of choice for most Ohio projects from 1997 to 2011 has been the bucket or mechanical dredge, often preferred for its ability to operate while using a small amount of space in a harbor. With the mechanical dredge itself mounted on a barge, this type of operation is supported by two or more dump scows that ferry material from the dredging site to the place of disposal. This dredge type is most appropriate for coarse materials such as rocks and other debris. Oppositely, finer sands and similar materials are best removed by hydraulic equipment such as hopper dredges and ‘cutterhead’ pipelines. As one of the more efficient means of removing dredged material, USACE and its contractors have used pipeline equipment to dredge Toledo’s Maumee River and its bay, and also at Conneaut and Lorain.

28 USACE, 2006-2011, Contract Dredging Awards, sum of cubic yards for this period divided by number of years.
However, because the material discharged from the pipeline is comingled with large volumes of water that can leach from the disposal site, this method of material removal can only be employed at project sites where there is little risk of disturbing contaminated settlements that might escape the disposal site as water drains. During hopper dredge operations, the material is collected via intake pipes into a storage unit on the dredge barge itself while water collected as part of the slurry is drained immediately. Highly mobile and ideal for heavily used navigation lanes, hoppers have been used at Toledo, but also at less active ports in Sandusky and Huron.

5.4.2 Rationalize Allocation of Maintenance Resources

- Reserve resources such as dredging funds to the most productive and competitive port assets

Ohio transportation stakeholders are tasked with investing in a portfolio of maritime assets with the expectation that returns on public investments in port facilities should be maximized through the allocation of resources to the most competitively performing assets. Currently, some ports receive dredging funds from USACE while moving comparatively small volumes of freight to and from Ohio while all ports consistently meet the challenge of scarce funds through deferred dredging.

- From 1997 to 2011, over 75 percent of USACE dredging funds were allocated to maintain federally authorized harbors and channels at the ports of Toledo and Cleveland
- Ashtabula was dredged only once, costing less than 2 percent of the period’s dredging funds

USACE maintains 137 navigation projects on the Great Lakes, with 70 of those requiring deep-draft clearances of 18 feet or more. Authorized harbor and channel projects dredged by USACE may be funded and maintained for either commercial or recreational use. In addition to these federally maintained navigational channels and harbors, secondary channels that connect private docks with the main access routes are dredged with funds sourced from private dock owners, municipalities, and port authorities.

From 1997 to 2011, federal appropriations have funded $47.7 million in dredging activities for Ohio ports to remove 9.6 million cubic yards of material in 15 years, with an average cost of $4.67 per cubic yard over these fifteen years. (This total excludes dredging of channels that are used for purely recreational purposes.) During this time period, Toledo was the site of most of this dredging, removing 5.6 million cubic yards at a cost of $23 million in federal funds, representing 48 percent of all dredging expenses in Ohio since 1997. Nearly 60 percent of Ohio’s dredging by volume supports Toledo’s port. Cleveland benefited from $11.2 million in federally funded dredging during this same period (24 percent of all dredging activities by expense), removing 1.4 million cubic yards of silt and clay (14 percent of dredged materials by volume). Having been dredged only once from 1997 to 2011, Ashtabula’s use of funds was much lower at $857,000 to remove 137,000 cubic yards of material. Together, Toledo, and Ashtabula spent $35 million, roughly 80 percent of the funding from 1997-2011, with the remaining fifth allocated between Lorain, Sandusky, Fairport, Huron, and Conneaut. Dredging costs from 1997 to 2011 are detailed in Exhibit 27 below.

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29 Ibid.
Much of this dredged material removed from Ohio’s ports has been deposited in confined disposal facilities (CDFs) that are designed, constructed, and monitored by USACE. CDFs are the preferred alternative when environmental review has determined that open water or uplands placement may cause negative environmental impacts, and is the most common management approach for contaminated dredged materials. The facilities may be constructed on land or in water, and most CDFs have been designed to accommodate ten years’ worth of dredged sediment. Municipalities or other authorities serve as title-holding local sponsors for the CDFs, though their 25 percent local cost-share obligation can be waived through implementation of a water quality program.

At present there are nine permitted CDFs in Ohio, five of which were constructed under the authority established by the River and Harbor Act of 1970. Four contain materials dredged from port and river assets owned by the Cleveland-Cuyahoga County Port Authority. Each CDF presents the opportunity for the local sponsor to deliver an industrial or recreational resource to its surrounding community. Cleveland CDFs, once filled, are programmed for commercial water front development (two sites), recreation (one site), and a municipal airport expansion (one site). One CDF at Toledo is slated to support a program of port development, according to USACE, while the other two permitted CDFs are not yet programmed. CDFs at Huron and Lorain will become small boat harbors. With the exception of Toledo’s Grassy Island CDF, all are in water and adjacent to land. Cleveland’s 10B is a later extension to 10A. CDF capacities and construction costs are detailed in Exhibit 28.

### Exhibit 27: USACE Contracted Dredging Costs and Volumes at Ohio’s Lake Erie Ports, 1997-2011 (Excludes Costs of CDFs)

<table>
<thead>
<tr>
<th>Port</th>
<th>Times Dredged</th>
<th>USD ('000)</th>
<th>CY ('000)</th>
<th>USD/CY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toledo</td>
<td>12</td>
<td>22,989</td>
<td>5,619</td>
<td>6.25</td>
</tr>
<tr>
<td>Cleveland</td>
<td>6</td>
<td>11,214</td>
<td>1,354</td>
<td>8.28</td>
</tr>
<tr>
<td>Lorain</td>
<td>6</td>
<td>3,265</td>
<td>402</td>
<td>8.12</td>
</tr>
<tr>
<td>Sandusky</td>
<td>5</td>
<td>3,056</td>
<td>768</td>
<td>3.98</td>
</tr>
<tr>
<td>Fairport</td>
<td>3</td>
<td>2,839</td>
<td>532</td>
<td>5.34</td>
</tr>
<tr>
<td>Huron</td>
<td>6</td>
<td>2,274</td>
<td>523</td>
<td>4.35</td>
</tr>
<tr>
<td>Conneaut</td>
<td>2</td>
<td>1,204</td>
<td>232</td>
<td>5.34</td>
</tr>
<tr>
<td>Ashtabula</td>
<td>1</td>
<td>857</td>
<td>137</td>
<td>6.25</td>
</tr>
<tr>
<td>All Ports</td>
<td>41</td>
<td>44,642</td>
<td>9,567</td>
<td>4.67</td>
</tr>
</tbody>
</table>

Source: USACE

### Exhibit 28: USACE Confined Disposal Facilities (CDFs) in Ohio by Capacity (2012 Dollars)

<table>
<thead>
<tr>
<th>Name/Location</th>
<th>Year Built</th>
<th>Acres</th>
<th>Capacity (CY)</th>
<th>Construction Cost</th>
<th>$/CY</th>
</tr>
</thead>
</table>

---

<table>
<thead>
<tr>
<th>Name/Location</th>
<th>Year Built</th>
<th>Acres</th>
<th>Capacity (CY)</th>
<th>Construction Cost</th>
<th>$/CY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toledo Harbor Site 3</td>
<td>1976</td>
<td>242</td>
<td>11,100,000</td>
<td>74,245,000</td>
<td>6.89</td>
</tr>
<tr>
<td>Cleveland Harbor Dike 14</td>
<td>1979</td>
<td>88</td>
<td>6,130,000</td>
<td>89,497,000</td>
<td>14.60</td>
</tr>
<tr>
<td>Toledo Harbor Site 3 Ext</td>
<td>1994</td>
<td>155</td>
<td>5,300,000</td>
<td>7,436,000</td>
<td>1.40</td>
</tr>
<tr>
<td>Toledo Grassy Island</td>
<td>1977</td>
<td>150</td>
<td>5,000,000</td>
<td>18,943,000</td>
<td>3.79</td>
</tr>
<tr>
<td>Cleveland Harbor Dike 10B</td>
<td>1998</td>
<td>68</td>
<td>3,840,000</td>
<td>46,341,000</td>
<td>12.07</td>
</tr>
<tr>
<td>Cleveland Harbor Dike 12</td>
<td>1974</td>
<td>56</td>
<td>2,760,000</td>
<td>31,668,000</td>
<td>11.47</td>
</tr>
<tr>
<td>Huron Harbor</td>
<td>1975</td>
<td>63</td>
<td>2,600,000</td>
<td>27,312,000</td>
<td>10.50</td>
</tr>
<tr>
<td>Lorain Harbor</td>
<td>1977</td>
<td>58</td>
<td>1,850,000</td>
<td>29,931,000</td>
<td>16.18</td>
</tr>
<tr>
<td>Cleveland Harbor Dike 10A</td>
<td>1970</td>
<td>-</td>
<td>1,000,000</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: USACE

### Rising Costs of Dredging and Limited Funding Availability

- The average cost of dredging a cubic yard of material has risen substantially in the last decade.
- Rising costs, compounded by an increasingly diminished national dredging budget, mean that many projects are foregoing scheduled dredging activities and operating at lower capacity.
- Current dredging needs are unmet: of $107.2 million in dredging needed from FY 2006 to FY 2011, only $46.3 million was actually allocated and performed.

Dredging activities constitute a large expenditure category for port authorities and their funding sources. The Toledo-Lucas County Port Authority, for instance—which has received approximately $130 million in federal and state funds since 2000—is the owner of projects that have been allocated $20 million\(^{31}\) to remove over 5.1 million cubic yards of silt during that period. While the average cost of dredging continues to rise, competition for dredging funds distributed from the Harbor Maintenance Trust Fund similarly continues to escalate.

As depicted in Exhibit 29, the inflation adjusted costs of dredging have risen substantially nationwide since 2001, when they matched previous highs posted from 1979 to 1984. Measured in 2012 dollars, average costs for dredging a cubic yard of material have not been below $3.00 since 1997, passing the $4.00 mark in 2006, and averaging above $6.00 in 2010. These costs do not include the resources that are required to design, construct, or operate additional CDFs once existing built capacity is surpassed.

Current dredging needs for Ohio ports are not being met: of the $107.2 million of dredging programmed by USACE design specifications for Ohio harbors and navigational channels between FY 2005 and FY 2011, only $46.3 million of funding was actually expended on dredging. Meanwhile, port authorities, state DOTs, and municipalities must defer scheduled maintenance in light of reduced funding availability from the Harbor Maintenance Trust Fund. The American Association of Port Authorities (AAPA) noted in

\(^{31}\) Unless noted otherwise, all uses and sources of funds are referenced as 2012 dollars.
a 2011 memo that annual tax receipts are sufficient to fund the expected dredging needs of channels and harbors now authorized, an amount estimated at $1.3 to 1.6 billion that year, yet approximately $800 million is allocated annually for dredging and maintenance.\textsuperscript{32}

![Exhibit 29: Average Costs of Dredging Authorized Harbors and Navigation Channels Nationwide (2012 Dollars)](image)

Continued authorization and funding is secured through ‘Congressional Adds’ advanced by the state’s delegation in the U.S. House of Representatives. Proceeds from a federal Harbor Maintenance Tax that is levied upon the value of goods moved through U.S. ports are deposited into a Harbor Maintenance Trust Fund from which USACE draws to conduct dredging activities. Applied to domestic movements and imports, the tax is paid by shippers at a rate of .125 percent of value moved. Some industry groups have demonstrated that the receipts placed in the Trust Fund have been used for non-maritime purposes, and that large surpluses have sometime accrued in the trust fund while many federally authorized channels and harbors go without scheduled dredging. Channels and harbors are thus drained less frequently than is ideal, and cannot operate at their designed capacity. Consequently, a 2009 report from the USACE estimated a 17 million ton dredging backlog for harbors and navigation channels on the Great Lakes. Eliminating this backlog (in 2012 dollars) would require approximately $215 million, in

addition to the baseline $40 to $45 million that must be spent annually on dredging to continue operations of Great Lakes maritime assets.\(^{33}\)

**Return on Public Investment**

- Many dredged facilities were originally authorized in the 19\(^{th}\) Century. Modern economic conditions present very different markets and modal preferences
- Today, Ohio’s ports see varying degrees of activity and use that differ by port, with Cleveland, Toledo, and Ashtabula being the most active, by volume
- Cleveland and Toledo enjoy beneficial economies of scale based on the high fixed costs of the CDFs, while Ashtabula can move large volumes with infrequent dredging
- Due to funding limits, maintenance planners have already shifted resources to the most active ports and dredged smaller market ports less frequently than Congressionally authorized

While several of Ohio’s Lake Erie ports remain crucial links in the regional commodity movement supply chain, others have gradually declined in productivity as the Great Lakes states’ economies have transitioned away from a dependence on manufacturing existing at the time of original authorization of these federally supported facilities. Fairport Harbor was first authorized for federal maintenance expenditure in 1825, with designed depths of 25 feet in the outer harbor and 18 to 24 feet in the river. Sandusky Harbor and Lorain Harbor were authorized in 1899 with Sandusky’s depth varying 21 to 26 feet in federal channels and Lorain’s depth legislated as 16 to 29 feet in the outer harbor and 17 to 27 feet in the river. Huron Harbor was federally authorized by Congress in 1905 to maintain depths of 29 feet in its lake approach channel and 21 feet in its turning basin. Conneaut was similarly authorized in 1910 with depths of 22 to 28 feet in the outer harbor and 27 feet in the inner harbor.

Several of the deep draft commercial harbors retain their vitality as active ports serving large markets of shippers. Cleveland Harbor was federally authorized in 1875, with the federal government taking on the responsibility to retain depths of 25 to 29 feet in the outer harbor and 18 to 27 feet in the river. Congress authorized maintenance of navigational assets at Ashtabula in 1896, with depths of 22 to 30 feet in the outer harbor and 16 to 18 feet in the river. In 1899, Toledo Harbor’s federal authorization noted a requirement that depths be 28 feet in Maumee Bay, 27 feet in the lower Maumee River, and 25 feet in the upper river.

Analyzing the data aggregated in Exhibits 30 and 31, two trends become apparent. First, it is clear that current trade patterns in freight movement favor some ports over others and that investment in dredging navigational channels and harbors is better utilized in terms of cargo activity at some ports than their in-state peers. Second, by comparing the tables for dredging costs (‘as performed’ by USACE vs. ‘as designed’) and trade volumes moved for each port, it becomes apparent that maintenance planners are already optimizing resource allocation partially by ensuring the most crucial supply chain nodes (Cleveland and Toledo) are dredged, while lesser trafficked ports are dredged less often.

\(^{33}\) Baseline figures adjusted for inflation from *Great Lakes Navigation: Economic Strength to the Nation*, published by USACE Great Lakes and Ohio River Division, 2009. Depths and boundaries for dredged areas are established in federal authorizing legislation.
Ohio’s Lake Erie Ports Differ both in Level of Traffic and Cost of Service Provision

From FY 2005 to FY 2011, $24.7 million dollars in dredging costs and $21.6 million in storage costs (totaling $46.3 million in Exhibit 31) were borne by the U.S. taxpayer in continuing the designed navigational capacities at Ohio’s eight ports on Lake Erie. Cleveland, Toledo, Lorain, and Huron now feature CDFs and the average cost per cubic yard of designing and constructing these facilities is included in the total cost for each port (on the far left column in both tables). Both Toledo and Cleveland handled 55 million tons of freight between calendar years 2006 and 2010. Ashtabula handled 29 million tons while the remaining ports moved considerably less volume, with Huron and Fairport moving four and nine million tons, respectively, from 2006 to 2010.

The most salient feature of the table is that while Toledo and Cleveland claim the most dredging resources in absolute terms ($20.6 million for Toledo and $16.6 million for Cleveland) over six years, the comparatively much larger volumes of freight that are shipped and received at both ports allows them to make beneficial use of the public investment in dredged channels and harbors there. Demonstrating this point, Toledo spends 37 cents on dredging and disposal for every ton of cargo moved at its port, while Cleveland spends 30 cents. As performed (Exhibit 31), more funds were spent on dredging and disposal per ton of freight at Lorain than Toledo or Cleveland (44 cents), while Huron received an amount comparable to the state’s large volume ports (32 cents per ton moved). Lorain was also the most expensive port to dredge at $9.90 per cubic yard (Exhibit 32), during years in which the weighted average cost of dredging a cubic yard of material at Ohio’s eight ports was $5.18.

It should be noted that the key driving variable in evaluating the value achieved per dollar invested in dredging is the volume of commerce handled by the port, a factor that is mostly determined by the economic geography of the ports’ surrounding industrial bases. While some ports may count a lower dredging cost per cubic meter (based on local bathymetry, silt type, dredging equipment required, and weather at the time of dredging) there are diminishing returns to further investment based on that dredging cost alone. A well dredged harbor in a less active trade corridor will not attract the same volume of commerce as a similarly maintained port in a larger market. Additionally, some of the ports with lower dredging costs now appear competitive with larger, more frequently dredged, facilities because of the comparatively low volumes of silt removed at the smaller ports. Were they to be dredged more frequently, the challenges of material disposal would require the design, construction, and operation of a CDF—a high fixed cost—that would render the low volume ports even less attractive from a lifecycle cost perspective.

<table>
<thead>
<tr>
<th>Port</th>
<th>USD ('000)</th>
<th>CY Sched. ('000)</th>
<th>D&amp;D Cost / CY</th>
<th>Freight Tons ('000)</th>
<th>D&amp;D Cost ($) / Freight Ton</th>
<th>Vessel Arrivals and Departures</th>
<th>D&amp;D Cost / Movement</th>
<th>CDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleveland</td>
<td>31,334</td>
<td>1,350</td>
<td>23.21</td>
<td>55,484</td>
<td>0.56</td>
<td>9,034</td>
<td>3,468</td>
<td>Yes</td>
</tr>
<tr>
<td>Toledo</td>
<td>33,405</td>
<td>5,100</td>
<td>6.55</td>
<td>54,987</td>
<td>0.61</td>
<td>6,658</td>
<td>5,017</td>
<td>Yes</td>
</tr>
<tr>
<td>Ashtabula</td>
<td>2,430</td>
<td>300</td>
<td>8.10</td>
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Source: Dredged material volumes and costs from USACE. Ashtabula was not dredged in this period.


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<tr>
<th>Port</th>
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<th>CY Dredged ('000)</th>
<th>D&amp;D Cost / CY</th>
<th>Freight Tons ('000)</th>
<th>D&amp;D Cost ($) / Freight Ton</th>
<th>Vessel Arrivals and Departures</th>
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Source: Dredged material volumes and costs from USACE. Ashtabula was not dredged in this period.

Costs of disposal are addressed as the cost of designing and constructing the CDF divided by its design capacity to achieve an average cost per cubic yard of material stored. CDFs included in the analysis are Cleveland Harbor Dike 14, Cleveland Harbor Dike 10B, Toledo Harbor Site 3 Extension, Toledo Grassy Island, Huron Harbor, and Lorain Harbor. Scheduled dredging requirements (Exhibit 23) for each navigational channel or harbor are from USACE project fact sheets. Vessel movements are all traffic directions (arrivals and departures) for vessel drafts 15 feet and above. All financial totals are 2012 dollars. The study period length for dredging costs is longer than the period for dredging expenditures in order to capture allocations to less frequently dredged ports that would otherwise appear to be zero. Commerce figures are available from USACE until 2010.
Additionally, disparities in the frequency of vessel calls highlight differences in the cost of service provision at the ports. Cleveland and Toledo were allocated approximately $1,800 and $3,100 for dredging and disposal per vessel movement recorded from 2006 to 2010, while Lorain and Huron spent $3,400 and $2,800 per vessel movement in those years. While Huron was allocated 150 percent of Cleveland’s outlays per vessel moved, Cleveland brought in more than twelve times the cargo volume of Huron during the years analyzed. Ashtabula handled more vessels and moved more cargo by volume than all other ports aside from Cleveland and Toledo from 2006 to 2010, despite having only been allocated dredging funding one fiscal year (2001) in the previous decade.

It is when the costs of scheduled dredging and disposal are compared (‘As Designed’, Exhibit 30) that the less cost-effective performance of some ports is brought into full view. Taking Huron as an example, it is scheduled by USACE for 190,000 cubic yards of material removal as frequently as every year, and the $16.4 million that would have been required for a seven year period implies a dredging and disposal cost of $3.93 per ton of freight moved at the port. While it is the prorated cost per cubic yard of storing the dredged material in Huron’s CDF that is responsible for 70 percent of this combined maintenance expense, Huron’s dredging-only cost ($3.91 per cubic yard) being comparable to Toledo’s ($3.99 per cubic yard) means that Huron will claim an outsized share of scarce dredging resources. (The combined dredging and disposal costs summarized in Exhibits 30 and 31 are disaggregated in Exhibit 32.) While it requires approximately one half of the amount of programmed dredging that is scheduled for Toledo, Huron attracted less than 1/12th of the cargo handled at Toledo from 2006 to 2010. Exhibit 32, in decomposing the costs of dredging during FY 2005 to FY 2011 (and the associated average cost of CDF storage of that material), highlights that even if the comparatively high costs of Lorain and Huron’s CDFs are set aside, the average costs of dredging material at those sites can be substantially higher than dredging at Cleveland and Toledo.

![Exhibit 32: Multi-year Funds Used for Dredging and Disposal as Designed (FY2005 - FY2011) Compared to Volume and Value of Waterborne Commerce (CY2006 - CY2010) by Port](image)

<table>
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<td>Conneaut</td>
<td>729</td>
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<td>Toledo</td>
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Source: Dredged material volumes and costs from USACE. Ashtabula was not dredged in this period. Existing CDFs are located at Cleveland, Toledo, Huron, and Lorain.
When comparing the costs of scheduled dredging to the volumes of freight actually attracted from 2006 to 2010 in Exhibit 32, Lorain also posts an average dredging cost that is more than twice as expensive as Toledo or Cleveland in light of freight volumes at each port ($1.15 per ton of freight moved at Lorain, compared to 61 cents per ton at Toledo and 56 cents per ton at Cleveland). Fairport, having moved less than 1.3 million tons during calendar years 2006 to 2010, also posts a cost of dredging and disposal (95 cents per ton of freight moved) that is nearly twice as high as the average cost statewide (53 cents) and Cleveland’s cost (56 cents) to handle freight per unit. These and other comparisons from Exhibits 30 and 31 demonstrate that there are considerable economies of scale achieved when handling freight at the ports of Cleveland, Toledo and, Ashtabula. This is due to robust origin-destination markets in the case of Toledo and Cleveland, and the capacity of Ashtabula’s port to accommodate large volumes of freight despite comparatively infrequent dredging.

*Maintenance Planners are Already Optimizing the Allocation of Dredging Resources*

Given the varied returns upon dredging and maintaining harbors and navigation channels at Ohio’s eight ports, it is not surprising that dredging, as performed, is already moving towards a more economic allocation of dredging funds with resources flowing to the more comprehensive commercial ports that serve larger origin-destination markets (Cleveland and Toledo), as other port properties are dredged increasingly infrequently. A comparison of Exhibits 30 and 31 underscores these trends. The large market ports of Toledo and Cleveland were allocated dredging funding five and four times, respectively, between FY 2005 and FY 2011, while together handling 55 percent of Ohio’s Lake Erie tonnage from 2006 to 2010. Dredging Toledo’s material at $3.99 per cubic meter, outperforms the statewide average of $5.18 per ton of freight handled (Exhibit 32) and justifies its place as the most frequently dredged port. (Toledo similarly performs well when comparing the cost of dredging and storing material to the volume of freight handled in the port, in Exhibit 32.) Conversely, with Fairport’s dredging costing $9.46 per cubic meter of material removed, it is not surprising that it was only allocated dredging funding in one instance from FY 2005 to FY 2011. Gradually, in an environment of scarce dredging resources, funding is being moved to the highest performing assets.

*Reduce Dredging Activities at Lorain, Huron, Fairport, Sandusky, and Conneaut*

- Halt future publicly funded dredging of low volume ports and continue commercial activities there that do not require deep draft vessel access
- Apportion remaining CDF capacity to dredging projects that remove silt from Cleveland, Toledo, and Ashtabula, should transportation prove economically preferable to uplands use
- Preserve historical legacy of maritime assets, such as lighthouses and other features through public or private funding and reprogram small ports for recreational boating and park space
- Shifting dredging resources to the top three ports would mean an extra 100,000 cubic yards dredged at Cleveland, an additional 225,000 at Toledo, or an additional 144,000 cubic yards at Ashtabula in any given year (based on past average costs of dredging)
Countering the trend of low volume commercial ports that have seen their dredging allowances diminished or delayed, the ports at Lorain and Sandusky were dredged three times in the previous six fiscal years, consuming 12 percent of the dredging resources, while only attracting 18.6 million tons of freight from 2006 to 2010 (9 percent of Ohio’s Lake Erie tonnage). As a strategy, this study recommends that state efforts promote a comprehensive approach to resource allocation by which limited dredging resource available to Ohio be directed to core commercial port assets at Cleveland and Toledo, and to a lesser extent Ashtabula. Ports at Lorain, Huron, Fairport, Sandusky, and Conneaut have limited public port infrastructure outside of the private terminals operated there, and spatial planning at these ports has recently trended towards the provision of waterfront park space and the promotion of recreational boating. These spatial programs should be assisted during this period of transition as sites and buildings of historical relevance, such as Lorain’s century-old and culturally significant lighthouse, should be publicly preserved. Additionally, commercial freight activities would not expected to cease entirely at these five ports, merely those requiring additional publicly funded deep draft capabilities. Remaining capacity at the existing CDFs at Lorain (58 acres) and Huron (63 acres) can be made available to accept dredged material excavated at Toledo and Cleveland should economic analysis find that this option is more cost-effective than other upland uses for material now under consideration by their respective project owners. Dredging as part of environmental remediation efforts at all relevant Ohio ports should continue in schedules now established by USACE.

**Cleveland, Toledo, and Ashtabula**

Limited dredging resources should be concentrated at the most active ports by volume (Cleveland and Toledo), with occasional allocation granted to Ashtabula, based on its capacity to perform well and move large freight volumes with limited dredging resources. From 1997 to 2011, Lorain, Huron, Fairport, Sandusky, and Conneaut have been allocated $13.5 million (2012 dollars) of the $47.7 allocated to Ohio’s Lake Erie ports during that period. On average, this presents $900,000 per year that could be used to dredge at Toledo and Cleveland, and occasionally Ashtabula. If alternated between the three ports, this would mean an additional instance of dredging nearly 100,000 cubic yards at Cleveland, an additional 225,000 at Toledo, or an additional 144,000 cubic yards at Ashtabula. More frequent dredging and greater vessel draft capabilities at these ports will exploit the more advanced scale economies already in operation at these sites, as large vessels are able to use the ports without delay, carrying goods at a lower marginal cost to shippers per ton-mile, and spurring increased waterfront freight-related activities surrounding these ports. As such, municipal zoning should protect waterfront industrial activities from the potential of economic development programming that prioritizes non-freight uses such as housing, destination retail, museums, or large-scale event spaces.

Recognizing that all activities intended to alter land and lake bottom topography bring with them concomitant costs in terms of environmental disturbance, it is incumbent upon planning officials to derive the greatest benefits available from port-related costs, whether they take the form of monetary or natural resource commitments. By pursuing a clustering strategy outlined based upon the data analyzed in this section, transportation planners can build upon economies of scale at existing freight

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35 Figure based on an inflation adjusted average cost of $6.25 per cubic yard, as funded by USACE in 2001.
hubs in Toledo and Cleveland, while achieving a greater yield in Ohio cargo for the investment of federal funds, labor, and oversight.

5.5 Strategic Development of Ohio River Freight Assets

Ohio River barge terminals have unique strategic concerns, which impact how much state policies and programs can influence their development. This section outlines progressive strategies for Ohio promotion of river barge terminal development.

5.5.1 Factors Governing Ohio Promotion of Barge Terminal Development

Before discussing various strategic alternatives, it is helpful to review the institutional context that governs and in some cases limits Ohio’s influence over the development of Ohio River terminals.

- Federal Lock and Dam Infrastructure: the largest public role in the inland waterway system is the USACE’s responsibility for lock and dam construction and maintenance, and the US Coast Guard’s role in river navigational aids. These are federal responsibilities with Congressional appropriations, and state governments generally have no role in the finance or administration of these activities.
- Predominance of Single-use Barge Terminals: most Ohio River barge terminals serve a single customer or business, such as coal-fired electric generating stations. There are rarely any public opportunities to fund or promote this infrastructure.
- Private Enterprises: most Ohio River terminals are organized as private corporations, rather than under the governance of a public port authority. Therefore there are perils to providing public aid to one private terminal, which might be a detriment to another.
- Border Issues: A barge terminal can serve a relatively large market area—25 to 100 miles would not be uncommon. Ohio markets could be adequately served by barge terminals in Kentucky, West Virginia, or Pennsylvania, without the need to expend public resources to support terminals located in Ohio. Conversely, a market could be best-served by a terminal in a bordering state, but Ohio would be constitutionally prohibited from providing any public aid to its development.

Within the policy context outlined above, there are still a number of strategies that Ohio can pursue to support Ohio River barge transportation.

5.5.2 Construction and Maintenance of “Last Mile” Road and Rail Connections

Federal transportation legislation such as ISTEA and its successors recognized the importance of designating strategic routes in a “post Interstate” era, first through the designation of the National Highway System (NHS), then through the designation of “NHS Connectors” to intermodal facilities such as river terminals. Ohio has developed and updated its list of NHS intermodal connectors and can strengthen these linkages in the following ways:

- Survey Ohio River terminals about the capacity and safety of their intermodal road and rail connections. Such as survey would serve as part of a MAP-21 mandated performance monitoring system;
- In concert with the above survey, use ODOT congestion and safety management systems to monitor road capacity and safety concerns;
- Program funding to address capacity and safety deficiencies in intermodal connector roads, including ODOT District allocation, safety, Major/New, and MPO-allocated programs;
5.5.3 Designating Ohio Barge Terminals as Part of Oversize/Overweight Load Routes

In the Needs Analysis portion of the Ohio Freight Study, it was discovered that there has been an increase in oversized loads originating from Ohio manufacturers. Water routes offer both capacity and cost advantages to moving oversize loads, but each move seems to be routed on an ad hoc basis, with the identification of routes and river (or lake) terminals a novel activity each time. Strategies that could help Ohio manufacturers move oversized loads more efficiently include:

- Identification of all Ohio River terminals with the capability (lift capacity) to handle oversize/overweight loads. This inventory is fairly small, and by identifying all such terminals, there would be no favoritism of one over another;
- Identify routes from the state highway system to those terminals, which could accommodate weight, overhead clearance, and turn radii;
- Maintain and publish this list through appropriate venues, such as ODOT’s truck permits website;
- Conduct and evaluate the efficacy of annual, semi-annual, or quarterly partnering sessions between ODOT Office of Permits, river and lake heavy-lift terminals, and trucking/rigging companies involved in the routing and carriage of oversize/overweight loads.

5.5.4 Participation in the Federal Marine Highway Program

The America’s Marine Highway Program was established by Congress in 2007 to expand marine highway services throughout the U.S. and integrate inland and coastal waterways more fully into the nation’s freight network. Both the Ohio River and Great Lakes systems are designated as part of America’s marine highway system, and ODOT is an active participant of the program. The program does not currently offer funding for infrastructure improvements or integration, but that potential exists in future authorizations of the federal water legislation. ODOT’s participation helps maintain the visibility of Midwest freight issues, as well as coordination of federal resources for important projects, such as lock and dam maintenance, as discussed below.

5.5.5 Advocacy for Adequate Federal Lock and Dam Funding

A recent assessment of the inland waterway system found that 47 percent of inland waterway locks and dams were functional obsolete, a number that is forecast to grow to 80 percent by 2020. The current 20 cent per diesel gallon inland waterway user fee covers half the cost of lock and dam maintenance, with the other half coming from Congressional appropriations.

A recurrent theme from Ohio River terminal operators is that the inland waterway system lacks a “voice” in transportation policy discussions, and the adequacy of lock and dam maintenance is one good example of this. While states such as Ohio have made great strides in the use of federal funding to target asset maintenance and upgrades, other infrastructure systems such as locks and dams are falling into disrepair, at significant risk to the economy.

Even if lock and dam maintenance is not the statutory authority of ODOT, Ohio has a clear interest in federal efforts to keep the system in a state of good repair. Focusing on objective measures of system conditions, and promoting best practices in asset management, has proven to be an effective and apolitical way to advocate for infrastructure improvements. ODOT can assume this role individually, or through participation in the America’s Marine Highway Program, or other venues.
5.5.6 Publicly-Driven Marketing and Logistics Campaigns

As a final example of the industry lacking a “voice,” Ohio River terminal operators expressed in
interviews that a general lack of attention to the inland waterway industry extends to shippers as well as
public policy makers. There are two reasons that barge transportation does not have a higher profile:

- The vast majority of barge terminals are an extension of a utility, mine, or manufacturing facility,
  so there is no need to market to external “customers;”
- Individually, the public-use barge terminals do not have the resources, or will not realize an
effective return, on large scale marketing efforts.

The implication is that Ohio’s public-use barge terminals could benefit from a collective marketing effort
to tell the story of Ohio’s inland waterway capabilities to a wide audience. There are smaller scale
efforts underway to pursue such a campaign. The public port authority in Columbiana County has been
effective in marketing the capabilities of the terminals in that area, and the Port of Greater Cincinnati
Development Authority is taking steps to provide similar services for area terminals.

A larger scale marketing campaign could raise the profile of the Ohio River barge industry, and its
capability to serve Ohio businesses and attract industry from other states. Potential tactics to fulfill this
strategy include:

- Cooperative partnering arrangements with the state of Ohio, such as through the Ohio Council
  of Port Authorities;
- Seed money for marketing strategy and materials, via grants from local, Ohio or federal
  agencies;
- Development of electronic and printed material to convey the breadth and depth of Ohio River
  shipping capabilities through Ohio terminals;
- Presence at national and global trade events and forums.

5.5.7 Promotion of the Tennessee-Tombigbee Waterway as a Mississippi River Drought Alternative

Water levels on the Mississippi River south of Saint Louis can be erratic, based on drought and other
weather conditions. From November 2012 until the March 2013, both the dammed and free-flowing
lengths of the Mississippi River experienced drought inducing water levels to drop far outside of normal
depth variances. The St. Louis to Cairo portion, crucial to Ohio-based good movements, recorded water
levels reduced to an extent not seen in fifty years. As the navigational channels were necessarily
narrowed on the Mississippi, to accommodate vessel drafts that could only operate in the center portion
of the river because of the reduced depths, barge traffic was reduced to one lane, causing substantial
delays. Many barges chose to lessen their payloads, in some cases by as much as 600 tons per barge,
resulting in decreased operating efficiency for shippers. As a result, the volume of tonnage conveyed by
barge on the Mississippi in December 2012 was lessened by more than one million tons compared to
December 2012. As of April 2013, prospects for goods movement on the Mississippi River have
increased as drought conditions have abated (Exhibit 33), though only after a sizeable disruption lasting
approximately four months.

A strategic opportunity is to promote the Ohio River/Tennessee-Tombigbee Waterway route to the Gulf
as an alternative to the Mississippi River in times of extreme drought on the latter system. The
Tennessee-Tombigbee (Tenn-Tom) proved to be a reliable back-up during previous droughts when the Mississippi River has been closed to barge traffic. Construction of the facility, connecting its two named rivers, was completed in 1984. The waterway is now served by 17 public port and rail terminals. Additionally, the market area served by the waterway is the site of increasing activity in the automotive manufacturing sector, providing possible linkages for Ohio shippers of project cargo or raw materials. The Port of Mobile at the mouth of the system provides international connections, and opens onto the Gulf Intracoastal Waterway.

Exhibit 33: Drought Conditions in 2013 have Reduced Water Volumes within the Mississippi River System

The Tenn-Tom is currently operating with capacity to spare. In 2011, USACE recorded less than six million tons traveling on the Tennessee-Tombigbee, compared to a projected user base of 28 million tons forecast at the time of construction. The Tenn-Tom in fact is not a strong competitor to the Mississippi River in normal conditions: tow sizes are limited to 8 barges and pass through multiple locks, compared to no locks on the lower Mississippi and tows of 30-45 (15 barge tows are typical on the Ohio River itself). Traveling southward on the Mississippi River can take only half as long as comparable movements on the Tennessee-Tombigbee, because of the direction and speed of the current as well as lock passage. (Alternately, loads traveling north toward Ohio on the Tenn-Tom can be faster.) Apart from business located along its route, the implication for Ohio shipping is that the Tenn-Tom waterway is a valuable alternative only when the Mississippi is seriously distressed. However, if the drought conditions of 2012 return in the near or farther future, it offers a welcome back-up worth promoting.
6. MODAL STRATEGY: AIR CARGO

Historically, Ohio has been home to substantial hubbing activity by the air cargo industry. The available ground access and the proximity to a large percentage of the U.S. population made the region extremely desirable. In the 1990’s Ohio was one of the centers for air shipments:

- BAX Global was a substantial presence in Toledo
- DHL had a major hub in Cincinnati
- Emery had its U.S. operations center in Dayton
- Airborne had its operations based in Wilmington
- Continental had one of its major passenger hubs in Cleveland and
- Delta had a major passenger hub in Cincinnati.

Over the past decade, a number of changes in the aviation environment have occurred, which have adversely impacted the industry in general, and Ohio in particular.

In the summer of 2001, FedEx won a major contract from the U.S. Postal Service that locked in substantial portions of the priority mail market. This effectively eliminated a substantial portion of the air express market for other contractors. Shortly thereafter, FedEx began to accept larger packages (by weight) further shrinking the competitive market. After 9/11 the industry saw dramatic changes. Passenger airlines began to “right-size” aircraft, reducing capacity on numerous routes in order to maintain profitability because of decreasing passenger load factors. The result was decreased belly capacity and a shift of cargo to trucks.

The shift to trucking gained momentum as fuel price increases and economic downturns continued to make domestic shipment by air cost-prohibitive for all but the most time sensitive products. As industry in general became more sensitive to costs, shipping patterns changed from “next day” delivery to “second and third day” delivery with a reliance on “time-definite” as opposed to “time-immediate” delivery. The result has been continued emphasis on trucking and a phase out of domestic air freighters.

As the financial picture for freighter operators worsened, acquisitions became a more prominent element of the business. Airborne was acquired by DHL which was in the process of redesigning its penetration strategy for North America. As part of that analysis DHL decided not to utilize a massive new sort facility which it had built in Cincinnati, opting instead to base its operations at Wilmington—an airport which it had acquired in the Airborne transaction. Four years later, the penetration strategy was revisited and DHL decided to focus on international shipping and abandoned Wilmington returning to the facility in Cincinnati from which they currently operate.

Numerous trucking companies were acquired by FedEx and UPS as they attempted to better position themselves for the increased ground emphasis. UPS absorbed Dayton-based Emery and pulled that heavy air freight operation into their facility in Louisville. Schenker acquired BAX and eventually abandoned the long-established operation in Toledo.
The mergers of United with Continental, and Delta with Northwest created operating environments that the new carriers had to reconfigure strategically to minimize duplication and create synergies for existing staff and equipment. The results were a build-up of Chicago, Detroit, Minneapolis, and Atlanta while operations at Cleveland, Cincinnati, and Memphis were dramatically reduced.

In summary, these transactions virtually eliminated the use of domestic freighter traffic for all but urgent express mail, and reduced belly cargo capacity for passenger operations in the State of Ohio.

Each air cargo operation in Ohio has a different history and operating environment. What they do have in common is a central U.S. location bordered by large commercial gateways or integrator shipping hubs. Minneapolis, Detroit, and Chicago attract air shipments from within a 500 mile radius. Chicago recently approved the addition of nearly 1,000,000 square feet of state-of-the-art new cargo facilities. UPS has its second largest U.S. operation in Rockford, Illinois, and FedEx has its second biggest operation in Indianapolis.

It is unlikely that any state in North America has more unutilized air cargo capacity than Ohio. The vacant facilities in Toledo, Wilmington, and Dayton total nearly 3,000,000 square feet. This number exceeds the total capacity at airports such as Chicago, Miami, and Los Angeles. These facilities are geared for freighter operations that no longer exist domestically, and are not attractive to international carriers because of competitive disadvantages. The situation is exacerbated because Cincinnati, Wilmington, Columbus, and Dayton are all geographically proximate and positioned to compete for the same markets.

### 6.1 Strategic Implications for the Region’s Four Largest Cargo Hubs

The statewide freight study focused on the four cargo airports serving Ohio—Columbus-Rickenbacker, Toledo, Wilmington, and Cincinnati-Northern Kentucky (CVG). Even though air cargo operations face a difficult market, there are logical strategies these airports can pursue to attract air cargo, jobs and economic development to Ohio.

#### 6.1.1 Rickenbacker

Rickenbacker is largely dependent on its substantial real estate operations for maintaining its financial position. The existing properties and those proposed for future development are intended to support manufacturing and logistics-oriented businesses which will sustain and grow the region’s multi-modal operations. The primary targets are those firms that ship by air. In the absence of any high volume passenger activity and the available road and aeronautical infrastructure, this appears to be the most appropriate strategy for Rickenbacker to pursue. There are essentially no carriers in the industry to attract for a freighter-hubbing operation, and passenger growth will be focused on Columbus.

To grow air cargo in this industry environment, the most viable strategy would be to develop a product base for shipment. There will continue to be an imbalance between inbound and outbound freight with this strategy, but other options are limited. The creation of a ground-oriented distribution center may attract additional inbound product, but in light of the already heavy regional presence of trucking, any new application would need to address consolidating shipments to reduce less than full trucks being
utilized. There are sufficient facilities to accommodate near-term growth and additional facilities have been planned and can be put in place subject to market triggers. At this time there do not appear to be any significant infrastructure investments that would be warranted.

6.1.2 Toledo
Toledo’s cargo business was built almost entirely on the operations of BAX. There are limited passenger flights and those that currently operate are smaller gauge with little or no cargo capacity. The growing success of waterborne cargo should attract additional logistics operations to the area but the incompatibility of air and waterborne cargo do not offer much in the way of potential for growth in air operations.

The BAX facility is in use by a trucking and logistics operation which has been stable and is experiencing modest growth. The substantial capacity of the building can easily be recaptured or partially converted for air freight operations. There is more than adequate aircraft parking (currently without demand) and the apron and aeronautical infrastructure are in good condition. The major issue is the proximity of Detroit and Chicago – both of which draw potential business from Toledo on both the passenger and cargo sides. Because of the capital investment and assets that carriers have at those two larger airports, relocation of any of their operations is not considered a high probability.

Strategically it makes sense for Toledo to support and grow the existing trucking operation. The objective would be to develop critical mass that will attract manufacturing and related air charter operations. In the absence of growth on the air side, a strong trucking operation will encourage additional such traffic in the area and continue to positively impact waterborne activity.

Given that there is excess building capacity and unutilized aeronautical infrastructure capable of sustaining a substantial cargo operation, in the absence of demand, no infrastructure investments are critical or appear warranted.

6.1.3 Wilmington
Wilmington recently completed a comprehensive land use planning effort which was driven by its potential for real estate development. The Airpark (which was transferred to Clinton County by DHL when they left for Cincinnati) has vast amounts of air cargo facilities and infrastructure available for use. However the configuration of the cargo areas and the buildings themselves are oriented for a single user although there is so much available space there are options for a wide range of users. The undeveloped property around the aeronautical areas presents additional commercial options.

Unlike the other airports, there is no commercial service at Wilmington which makes it more difficult to develop synergies. Additionally, because the Airpark was privately owned prior to its transfer to the County, it has not accessed FAA funding. To do so, and to bring the facility to FAA standards will take both time and dollars, and should the Airpark qualify for, and receive FAA funding it will also encounter certain federal encumbrances from which it is currently free. The decision therefore must be weighed carefully.
The Airpark does have the advantage of having substantial flexibility in the structuring of financial agreements and establishing rates and charges for potential tenants and users when such are identified. In the meantime however, a suggested strategy is the pursuit of a specific niche — food products to Asia. There is substantial demand in Asia and China in particular that could be served through Wilmington which is surrounded by property that could be dedicated to that purpose. Passenger options are remote given the proximity of other airports with commercial activity. A very focused and targeted cargo marketing program could yield future results if the right niche can be identified and the appropriate audience reached.

Depending on the decision to pursue FAA certification, the Airpark may benefit from State assistance in funding required physical improvements. However, the new access road, and the availability of both air cargo facilities and aeronautical infrastructure appear to make financial assistance with more traditional projects unnecessary at this time.

6.1.4 Cincinnati-Northern Kentucky

Of the group, CVG, because of the size of its commercial operation and the presence of DHL appears to have the strongest prospects for future cargo growth.

Despite the reduced Delta presence, the airport still generates cargo from other than the DHL operation. FedEx has become increasingly active at CVG and is exploring expansion options. Southern Air (cargo carrier) is on the verge striking a deal with CVG. As of July 2012, KCAB has approved a five year office lease for Southern Air to relocate its cargo operations to CVG. Under the terms of the agreement, Southern Air would lease about 33,100 square feet of space at the former Comair headquarters (located in the South Airfield), and could add up to 120 new jobs for the region. The deal is currently waiting on finalization from Southern Air. As of this writing it is unclear if the relocation of the Southern Air headquarters will impact their actual cargo operations. Changes to their operation that bring additional traffic to Cincinnati would impact the forecast for CVG positively.

It is however, the presence of DHL and that organization’s apparent commitment to CVG that should provide the strongest attraction for activities and supporting businesses that will increase cargo traffic. The old DHL facilities have been torn down, and despite the efficiencies in the new facility, additional business could require further expansion. DHL has a north option parcel available for expansion if it chooses to do so in the future. This will require both airside and landside capacity that the Airport has planned for and can provide. The DHL operation has stimulated discussion regarding logistics parks in the area. While they do not need to be on-airport, quick and reliable access will be an important consideration in formulating not only development decisions, but also decisions to relocate in a park whose purpose will be to house activities focused on air logistics.

As discussed earlier, the construction of a half-mile long extension of Wendell H. Ford Boulevard to the South Airport Bypass Road represents the most clearly defined infrastructure improvement at the reviewed airports, and in the current industry environment the one that offers the greatest long-term benefit for both air cargo growth and related economic development.
6.2 Other Strategic Focus Areas

Beyond airport-specific strategies, there are some broader strategic focus areas that are generally applicable to all Ohio air cargo developments.

6.2.1 Safety

Management and operations staff at the four airports continue a strong safety record in the prevention of, and response to, critical safety situations in the air cargo industry. While the competent safety record of air freight has been discussed previously in the Asset Inventory and Needs Analysis portions of this study, it is worth noting that some federal study has been devoted to the improvement of safety in air cargo operations. Prior to the large-scale decline of air freight volumes nationally in 2008, the study found that in the preceding decade National Transportation Safety Board (NTSB) records had identified pilot performance as the main causal factor in 80 percent of fatal and 53 percent of non-fatal air cargo accidents. Many of the incidents were attributed to lesser experienced pilots and primarily involved cargo-only airlines. While there is little room for improvement with regard to the responsibilities of pilots that is within the purview of airport staff, airports will be aware that several of the recurring risk factors noted in the GAO study were unclear winter conditions and night operations.

Much of the responsibility for implementing safety improvements is held by the Federal Aviation Administration (FAA) and the cargo-only carriers themselves, advancing requirements for on-board safety technology. Additionally, belly cargo operations benefit from the strong safety records of the passenger airlines on which they depend. However, airport administration should continue to appraise their resources for emergency management and affirm that plans can be consistently implemented, and resources are adequate for mitigating additional risks associated with night time and winter operations. Additionally, airports can sustain efforts in the realm of hazmat enforcement for carriers and training for cargo ramp employees.

6.2.2 Mobility and Efficiency

The air cargo industry operates with a highly peaked demand that overlaps with commuter rush hours. Consequently, truck access routes may one day reach capacity in the hours coinciding with the most attractive aircraft arrival and departure times. Transportation planning officials should monitor the ability of existing access routes to serve this peaked demand, and future physical planning efforts may center upon the design and construction of redundant truck roads serving air cargo facilities. A prime example is the Rickenbacker Parkway under development at that airport. These new surface roads provide alternatives in the event of roadway accident, construction, or other blockage.

6.2.3 Accessibility and Connectivity

While both Rickenbacker and CVG have the runway length and operational capacity to contest ‘front line’ west coast and east coast airports for access to Midwestern markets, trends of market clustering of air cargo activities in regions with larger economic bases suggests the obstacles involved. Attempting economic development through value-added industries prospectively lured away from ‘front line’

destinations would likely bear little fruit in the present environment. Instead, airport-based industrial development may generate public good in Ohio by stressing the compatibility of industrial land uses with noise creating airport facilities, and proximity to truck-based distribution centers.

Recognizing long term trends toward line haul substitution of trucks for aircraft in air freight service offerings, transportation planners should remain aware of the degree to which trucking and air freight movements are closely linked. Aside from the provision of truck access to air freight facilities, general improvements to the state’s roadway system would provide air cargo benefits in that nearly all goods moved by air either begin or end that journey on a truck. Additionally, low inventory logistics operations that are enabled by air movements view truck feeder connections as a point of performance risk that needs management. Increasing the efficiency of trucking operations within Ohio thus has multimodal benefits.

6.2.4 Economic Development

In the recent past, the air cargo industry’s comparatively high labor content has made it an attractive beneficiary of public support. However, the post-2008 volatility of the industry has been evidenced by a national drop in volumes carried, diversion to over-the-road service and the general clustering of air cargo hubs around a few major markets. Given the reduced prospects of generating a return on future public investment in air assets, public interest should take the form of protecting existing jobs in place now.

Some states have created workforce development programs targeting the air cargo industry. In Florida, the state’s workforce development agency has included the air freight industry in its list of targeted fields in which employees qualify for publicly supported ‘quick response training’. This program aims to bolster skills upgrades, re-employment of downsized employees, and workforce readiness for new job seekers. It will require more substantial outreach to the leading carriers operating in Ohio to determine the potential demand or viability of this endeavor.

Authorities that own and operate airports are not limited to the promotion of air cargo movement, however, and Rickenbacker has made progress in its commitment to financial self sufficiency by pursuing revenue opportunities linked to other modes. Working with federal highway funds and private sector support from Norfolk Southern, the airport authority now hosts a rail-truck terminal with a strong market position in the handling of internationally originating containers from the east coast. In a similar vein, and recognizing the substantial overlap between the wellbeing of motor carriage and the air cargo industry, vacant spaces at existing air cargo facilities could be used to support trucking related activities, such as LTL consolidation, or provision of small business incubation space for freight related firms.