1. TRUCKING NEEDS ANALYSIS

Ohio has the nation’s fourth largest interstate system with 6,700 lane miles, the seventh largest highway network overall, and the second highest number of bridges (43,412) out of the fifty states. Over this system travels the country’s fifth highest volume of overall traffic, the sixth greatest tonnage of originated truck freight, and the seventh greatest tonnage terminated.\(^1\) Ohio is a large ‘pass through’ state for commerce, with 34 percent of its truck traffic crossing the state from outside its borders, between external origins and destinations. Another 41 percent of Ohio’s truck traffic is entirely internal, having both origin and destination within the state. While through traffic dominates such prominent east/west routes as I-80/90 and I-70, the I-71 corridor is heavily oriented to traffic with an origin or destination in the state. Such ‘Ohio-based’ traffic is the freight serving the businesses and people of the state, and it depends substantially on the Ohio two-lane highway network to do this.

ODOT, in conjunction with the state’s Metropolitan Planning Organizations (MPOs) and other stakeholders, is working to address a number of roadway issues to ensure that the state’s roads are well planned and maintained to serve the needs of its users. Ohio has consolidated all of its regional programs and projects (put forth by its MPOs) into its 2012-2015 State Transportation Improvement Program (STIP), which is a comprehensive list of all highway and transit projects that proposed for Federal funding.

As in the other modal synopses of the needs analysis, assessments and themes for trucking are grouped according to the goals established by Access Ohio 2040:

- **Preservation:** Maintain transportation assets so that they remain in state-of-good repair and meet or exceed acceptable service levels. Improving the condition of pavement and bridges statewide, a key component of the rehabilitation and maintenance of aging infrastructure, assists the network in accommodating a growing industrial user base. Capacity expansion projects prepare roads for projected future growth in traffic.
- **Safety:** Reduce transportation-related fatalities and injuries. Ohio is working to improve safety in identified “hot spots,” or two-mile segments of freeway or non-freeway locations with more than 250 crashes over three years. Feasibility studies continue to gauge financial and operational implications of Dedicated Truck Lanes (DTLs) in Ohio and the surrounding region.
- **Mobility and efficiency:** Increase travel time reliability for passengers and freight. Several projects have been selected for study at the DOT and MPO level to increase the efficiency of the network. They include Interstate widening, lane additions, and Interstate reconstructions that address roadway geometry.
- **Accessibility and connectivity:** Improve the access to the Ohio multimodal system, as well as network connectivity within and between transportation modes. ODOT is working to improve state and local road connections, multi-modal connections, and connections between regional roadway networks.

\(^1\) Truck tonnage from IHS Global Insight TRANSEARCH data base, 2010
• Stewardship: Optimize usage of public funds by partnering with private sector and local funding partners. Minimize the environmental impact of the transportation system through more sustainable technology.

• Economic development: Identify and deliver economic development projects. Congestion has been identified as one of the state’s most pressing roadway issues, particularly around interchanges and metropolitan areas where interstate highways converge with county and local roads. As firms make their supply chains increasingly lean, the management of congestion through ITS and associated tools becomes critical to industrial performance.

1.1 Introduction and Context

• Lean supply chains favor trucking for its reliability and visibility, with air cargo used as back-up

• State’s road network and skilled labor force are key attractors for industrial firms

• Ohio-based businesses depend substantially on the two-lane network

• ITS feed is crucial for logistics management on this network, which will also require capacity investment as volumes grow

The long-term trend in manufacturing and distribution is to supply systems that are highly responsive to local market conditions with little inventory exposure. Reliance on minimal inventory and the use of freight carriage and information systems to manage supply has created acute sensitivity to disruption risks in the transportation network and surrounding environment. The modal implications of this trend favors the trucking industry as the most demand responsive and scalable option for moving large volumes of freight, offering a service spectrum spanning package carriers like FedEx and UPS, to less-than-truckload (LTL), truckload for hire, and private fleets. Vulnerability to disruption makes the service reliability, service recovery, and supply chain visibility advantages offered by trucking critical for allowing business continuity in this competitive environment. Backing up this system are the higher cost service offerings of air cargo, which allow Ohio businesses to weigh the expense of these rapid movements against the substantial opportunity cost (as well as wasted labor, energy, and other costs) of an idled factory or empty shelves.

A key finding of the traffic analysis conducted for this study is that the routes favored by through freight movements are distinct from those used by Ohio-based business, for whom local routes penetrating more deeply into the state are important. Interviews with Ohio stakeholders pointed to the strength of the Ohio roadway network, buttressed by a skilled labor force and the region’s network of suppliers and industrial services as compelling attractors. However, the facility locations of stakeholders and suppliers bind their success to the preservation of a safe and uncongested network of two-lane highways within Ohio. In many cases there are no alternative routes that can provide site access to plants and vendors in case of roadway disruption due to congestion, construction, accidents, or snow and ice events. In those instances, risks can be mitigated through increased use of Intelligent Transportation Systems (ITS), which allow facility users to respond proactively to service challenges and manage their consequences.

Looking further ahead, protection and preservation of existing capacity, as well as the creation of new capacity to address growing demand in the coming decades, will require corridor widening, redesigns of
roadway and intersection geometry, signal retiming, and the upgrading of bridges whose structures may not be optimized for use by the vehicles of today or tomorrow.

Finally, this study proceeds with the assumption that value creation is the central goal of shippers and firms engaged in altering their supply chains to become progressively more lean and averse to waste. Stakeholder mode preferences are not inherent, but are instead customer responses to the characteristics of trucking’s role in door-to-door freight movement evaluated in terms of cost, timeliness, reliability, safety, and visibility.

1.2 Preservation

- Asset management means preservation of level of service, roadway surface conditions
- Demographic and economic changes foretell an existing and deepening shortage of qualified truck drivers that will affect an industry known for its high labor content

Asset Management and Performance Improvement

The Access Ohio 2040 goal of Preservation for the trucking mode is most closely associated with the continuance of performance levels and physical asset conditions within the state’s highway system. Stakeholder surveys conducted in completing the Asset Inventory of the Statewide Freight Study, document industry support for a sustained program of capacity expansion by continuing Department efforts in lane widening and redesign of interchanges and roadway geometry to address bottlenecks in strategically important corridors. Ohio DOT has demonstrated initiative in researching and improving technologies in pavement condition maintenance and snow and ice removal. Finally, the trucking industry sees the possibility of increased partnership with the Ohio DOT in shared access to data, particularly DOT-aggregated ITS feeds, valued for their utility in managing supplier response to congestion events on Interstates and highways.

Truck Driver Shortage

One primary issue affecting the regional trucking industry’s ability to preserve existing modal capacity is the persistent shortage of qualified driver personnel. Long haul fleets have routinely experienced 100 percent annual personnel turnover, though increasing regulatory requirements and expensive training programs have brought similar scarcity conditions to the local driver market, as well. The average age of a truck driver in 2012 was 50 years\(^2\), reflecting the industry’s difficulty in replenishing its labor pool. Changes in lifestyle preferences from one generation to the next affect this, and truck lines have reconfigured some operations to offer drivers more nights at home. Some in the industry attribute the decreasing attractiveness of the job description to a population that is becoming increasingly educated. Today, more than 30 percent of adults over the age of 25 have a bachelor’s degree of higher, while in 1980, this figure was less than 20 percent. Additionally, current insurance industry policies discourage

trucking companies from hiring drivers younger than 25. By this age, the firms find that the pool of desirable young industry entrants is severely diminished, as many stable labor market participants began settling their career choices three to four years earlier. Notably, prospective drivers leaving a period of service in the military, where they may have gained considerable skill sets transferable to this field, are not exempted from these insurance conditions.

Other factors influencing the recruitment, retention, and productivity of drivers have been cited in industry interviews:

- New federal CSA (Compliance, Safety, Accountability) regulations,
- Federal Hours of Service regulations tightening work time definitions, and
- MAP-21 inclusions of mandatory Electronic Driver Logs and Electronic On-Board Recorders (EOBRs), with a timeline for an initial rulemaking slated for October 2013

While these changes have so far resulted in a driver pool that is safer but smaller in size, labor is increasingly more expensive per hour logged or mile traveled. With new regulations more strongly enforcing an eleven hour shift length, time (rather than distance) is becoming the driving variable of service cost. There is a belief amongst some industry stakeholders that should the driver supply condition persist as the economy recovers, the increases in truck driver wages necessary to attract and retain qualified drivers will impact freight rates within the mode and possibly divert some tonnage to rail service.

Labor supply is not a typical concern for DOTs, but trucking is vital to the movement of freight and the driver shortage is a long term, structural problem. A concrete policy response by Ohio’s public sector could match skilled unemployed job-seekers with opportunities in truck driving. Workforce development initiatives could encourage the prequalification of drivers, particularly younger labor market entrants with good driving records and completed periods of military service, and the state could conceivably work with insurance companies to bring such entrants into the industry at more favorable rates. Although Ohio drivers will not work exclusively in the state, domicile certainly affects work assignment. By stimulating the supply of new drivers to the trucking industry, Ohio would support the needs of manufacturing and distribution businesses for trucking services that make their supply chain strategies possible, and add to its attractiveness as a business-friendly state.

1.3 Safety

- Fatal crash counts have nearly been halved in the last decade, while the number of injury incidents decreased 25 percent in the same period
- Adequacy of overnight truck parking is important to support compliance with tightened safety regulations and for work time productivity
- Snow and ice removal programs generally successful and well administered
Fatalities, Injuries, and Property Damage Involving CMVs

Commercial motor vehicle (CMV) safety conditions in Ohio have demonstrated marked improvement on Ohio roadways in the last decade, both in terms of absolute incident counts for crashed involving fatalities, injuries, and property damage, as well as rates of crash incidence per million vehicle miles traveled. The number of CMV crashes involving fatalities in Ohio has trended generally downward from 2002 to 2011. While the fatality crash count has been reduced from 129 in 2002 to 68 in 2011 (-47 percent), an examination of the fatal CMV crashes per million VMT in Ohio concurs that the meaningful decrease has occurred. In 2002, every million VMT was associated with .0012 fatal CMV crashes, while that rate was reduced to .0008 by 2011, with 2007 and 2009 demonstrating results of .0007 and .0006 fatal CMV crashes per million VMT, respectively. CMV crashes involving injury also declined in absolute occurrences, barring increases of 4 percent in 2003 and 2004 and 10 percent in 2010. Comparing 2002’s total of 2001 CMV injury crashes to 2011’s total of 1465 suggests a decrease of 27 percent in absolute occurrences. Normalizing these incidents per million VMT traveled statewide demonstrates that the rate of CMV injury crashes per distance travelled decreased 21 percent in this time period. Similarly, ‘property damage only’ crashes involving CMVs (PDO crashes) decreased from 6,284 in 2002 to 4,693 (-25 percent). (However, some years of the decade saw small increases in PDO crash counts.) Normalizing the occurrence of property damage crashes involving CMVs against the total VMTs in Ohio each year corroborates a similarly proportioned decline of 28 percent for CMV property damage crashes per distance travelled.

Exhibit 1: CMV Crash Trends (2002-2011)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fatal Crashes</th>
<th>Injury Crashes</th>
<th>PDO Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>129</td>
<td>2001</td>
<td>6,284</td>
</tr>
<tr>
<td>2003</td>
<td>105</td>
<td>2079</td>
<td>6,647</td>
</tr>
<tr>
<td>2004</td>
<td>118</td>
<td>2156</td>
<td>6,755</td>
</tr>
<tr>
<td>2005</td>
<td>110</td>
<td>2075</td>
<td>6,319</td>
</tr>
<tr>
<td>2006</td>
<td>98</td>
<td>1775</td>
<td>5,578</td>
</tr>
<tr>
<td>2007</td>
<td>79</td>
<td>1615</td>
<td>5,174</td>
</tr>
<tr>
<td>2008</td>
<td>91</td>
<td>1631</td>
<td>4,923</td>
</tr>
<tr>
<td>2009</td>
<td>65</td>
<td>1475</td>
<td>4,239</td>
</tr>
<tr>
<td>2010</td>
<td>89</td>
<td>1621</td>
<td>4,655</td>
</tr>
<tr>
<td>2011</td>
<td>68</td>
<td>1465</td>
<td>4,693</td>
</tr>
</tbody>
</table>
**Limited Overnight Parking**

The existing landscape of truck stop locations has not yet responded to the limitations of a strongly enforced eleven hour shift, leaving many areas underserved in terms of resources for rest, refueling and overnight parking, and obliging drivers to stop work before shifts have ended. Further, local regulations limiting the pick-up and delivery window for shipping and receiving activities compel drivers to idle in a location close to a customer until the allotted time period. In areas in which commercial truck stops are not present, truck drivers improvise by parking on roadway shoulders or the entrance and exit ramps of state and Interstate highways. As these activities pose a danger to other users of the roadway, and in view of the losses in productive work time, solutions to the scarcity of overnight driver parking space should be found through either public or private sector initiative.

**Ice and Snow Removal**

Issues of snow and ice removal barely arose from stakeholders contacted for this study, whose views on the quality of Ohio roadways formed a strongly positive consensus. It is fair to conclude that winter maintenance is one of many things they believe Ohio does well. The one stakeholder (a motor carrier) who did raise the issue reported Ohio’s roads as best among four states including Michigan, Indiana, and Kentucky, and cited the state’s use of liquid solutions for ice and snow management as one reason. A substantial portion of the state’s industrial manufacturing activity is located in northeast Ohio, the area most prone to disruptive snow events that could impact increasingly lean supply chains. High value items produced or finished in Cuyahoga, Geauga, Lake, Ashtabula, Summit, Portage, and Trumbull Counties moving by truck could be delayed should snow and ice removal activities diminish in frequency or efficiency. Additionally, accidents involving trucks or automobiles could increase, resulting in more
fatalities and injuries, should snow and ice removal processes diminish in quality. Procedures now in place are producing the desired result of unobstructed and safe roadways.

Exhibit 3: Annual Ohio Snowfall (2012)

Snow and ice removal activities constitute the single largest use of funds in the ODOT annual maintenance budget. Typically representing 40 percent of annual operating expenses, the cost of labor, equipment, and materials amounts to $50 million per year. To address an extreme weather event involving accumulated snow, ODOT is able to call upon 1,700 plow trucks, 3,000 employees, and 650,000 tons of road salt stockpiled within the state. The planning and implementation of snow and ice response occurs at the County level, with support from ODOT districts and the central office.

Snow and ice abatement activities are concentrated on ‘priority routes’ recognized for their contribution to maintenance of desired level of service. In rural areas, lower traffic counts allow less costly material applications and labor allocations to be used in de-icing and snow removal. Information systems and
environmental sensing stations (ESS) also play a large part in agilely responding to snow and ice events. ODOT has implemented a Road and Weather Information System (RWIS) to collect, analyze, and disseminate information concerning pavement temperature and pavement moisture on 171 major roadways in each of the 88 counties. The aggregated information is accessible to the general traffic via the Department’s ‘Buckeye Traffic’, or OHGO, web interface.

1.4 Mobility and Efficiency

- Routes of Ohio-based and overhead truck movements display starkly different patterns within the network of Interstates, US Routes, and State Routes
- Truck journeys beginning or ending within Ohio are more likely to use the state’s network of two-lane roadways and are lighter in volume than the overhead traffic, but reach wide and deep into the state’s economic landscape
- Distinct patterns emerge within the two-lane network when examining highway truck traffic movements by industry
- Bottlenecks are presently an issue for Interstate corridors, but may arise as congestion points as traffic volumes increase within the two-lane network in the coming decades
- ITS is viewed by shippers as key to managing risks of delay and reliability
- Gradually improved accommodation of over-dimensional and superload shipments can support target industry in some locations

Through Vs. Ohio-based Traffic

Examining the highway movement patterns of annual Ohio-based truck traffic versus annual through (external to external, or overhead) truck traffic, two distinct patterns emerge, as depicted in Exhibits 4 and 5. Exhibit 4 features in red the routes used by overhead truck movements in 2012, set against a backdrop of total (both overhead and Ohio-based) movements in tan.

The volume of freight truck movements traveling through Ohio highlights a major component of traffic that crosses the state with little relation to the industrial activities taking place within its bounds. These trips have limited impact on job creation, aside from possibilities of inducing some economies of scale in hubbing and trucking support industries such as maintenance, rest stops with dining and concessionaires, and diesel fuel retailing. Some trips also may be to distribution centers in neighboring states that subsequently deliver goods to Ohio. Routes of choice for overhead traffic are Interstates 70 and 80/90 running east and west, along with I-75 traveling north and south.

Alternately, the Ohio-based traffic in Exhibit 5—truck trips that either begin or end in Ohio and interact with the state’s pool of labor, supplier base, and support firms serving the industrial sector—presents a different picture. Local firms transporting inputs and works in progress to one another, or distributing goods from in or out of state, depend substantially on the statewide network of two-lane roadways that

[3 http://www.buckeyetraffic.org]
reaches small and medium sized towns. I-75 remains an important route for this traffic as well, but the east-west interstates fade to the background as I-71 comes to the fore, serving as a workhorse connection between the major cites of Cleveland, Columbus, and Cincinnati.

Exhibit 4: Through (External to External) Truck Volumes, 2012 Annual

Source: Parsons Brinckerhoff traffic modeling
Ohio-based freight is substantially less concentrated in volume than the overhead traffic, because it reaches wide and deep into the state’s economic landscape. Exhibit 6 displays Ohio-based traffic on the network at the level of minimum 1,000 trucks daily at left, and at 12,000 trucks daily at right. Only a small portion of roadway near Columbus survives to the higher range, a level at which overhead traffic on interstate highways would be much more active. The implication is that needs cannot be equated just to volume, because the lighter density two-lane system is the one penetrating the economic geography of the state, supporting Ohio’s development goals of job creation, sustained manufacturing activity, and robust retail distribution supply chains. Moreover, many of the businesses on this system do not have the option of alternative routes in conditions of delay caused by construction, roadway accident, or snow and ice accrual, so that maintaining the integrity of circulation within these corridors is crucial.
Two-Lane System and Ohio-based Truck Traffic

Turning to the two-lane network itself, the following tables display Ohio-based truck volumes on the system’s U.S. and State routes. There are 22 distinct US routes in Ohio, captured for network analysis as 1,369 segments of varying length. Focusing on Ohio-based truck activity, every route had at least one segment that experienced above average traffic, measured against a mean for all US routes of 749 trucks per segment in 2012. These high volume locations represented 36 percent of US route segments and 1,107 miles of roadway. Ranking US routes according to where these locations occur and the Ohio-based truck VMT they register, the top ten routes (Exhibit 7) capture most of the activity: 82 percent of the segments, 87 percent of the miles, and 91 percent of the high volume truck VMT.

The top three US routes alone account for 42 percent of the Ohio-based truck VMT on high volume segments. Number one with 150 miles of high traffic activity is US 23. The route runs from the West Virginia-Ohio state line at Portsmouth, through Columbus, to the region south of Toledo. With 20 percent of all truck VMT on ‘above average’ segments and the highest VMT per segment (2,149), US Route 23 demonstrates concentration of use and scale of impact on the two-lane network in 2012. US Route 30, an east-west roadway that crosses I-75 north of Lima, had 152 high volume miles in 2012 and contributed 12 percent of the related truck VMT. Extending from the Athens region through to Fort Wayne, Indiana, US Route 33 saw 11 percent of high volume VMT across 96 associated segment miles.
State routes in the two-lane system (Exhibit 8) show more dispersion and lighter truck volume than the US facilities. There are 119 State Routes composed of 1,456 segments. In 2012, there were 51 State Routes that contained at least one segment with above average traffic volumes, compared to a mean for those routes of 523 trucks per segment. Of 1,456 segments statewide, 396 (27 percent) had above average truck volumes, comprising nearly 900 thousand high volume VMT from Ohio-based truck movements. Just under two thirds of this VMT took place on ten key State Routes, with these heavily trafficked segments totaling 401 miles, or 58 percent of all segment-miles statewide with above average truck volumes.

Many instances of high VMT over relatively short distances – for example, State Route 3 registers 74,000 VMT on just 22 miles – show how point-specific truck concentrations characterize the state route profile and elevate the rankings of routes that may have less significance in other locations. However, some facilities cover more territory: State Route 4, with 132,000 VMT over 115 miles stands out with fifteen percent of the VMT on high volume segments statewide in 2012. State Route 4 runs north-south from Cincinnati to Sandusky. State Route 31, which travels between Kenton and Marysville and is prominent for automotive traffic, handled 69,000 high volume VMT while State Route 309, an east-west roadway running from near Delphos to near Mansfield, carried nearly as much. The two facilities together accounted for 15 percent of the VMT on segments with above average truck counts, but the relevant segments of SR 309 totaled almost 60% more miles than those on SR 31.
Exhibit 8: Top 10 State Routes with High Volume Truck Segments
(>523 Annual OH-Based Trucks/Segment-Mile), Ranked by High Volume Truck VMT, 2012

<table>
<thead>
<tr>
<th>Route</th>
<th>Segments Above Average Volume</th>
<th>Miles</th>
<th>Truck VMT</th>
<th>Average Trucks Per Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>66</td>
<td>115.3</td>
<td>132,430</td>
<td>1,148</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
<td>21.6</td>
<td>73,747</td>
<td>3,421</td>
</tr>
<tr>
<td>31</td>
<td>5</td>
<td>30.6</td>
<td>68,963</td>
<td>2,251</td>
</tr>
<tr>
<td>309</td>
<td>14</td>
<td>48.7</td>
<td>63,556</td>
<td>1,306</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>51.1</td>
<td>50,304</td>
<td>985</td>
</tr>
<tr>
<td>49</td>
<td>12</td>
<td>33.1</td>
<td>48,533</td>
<td>1,467</td>
</tr>
<tr>
<td>16</td>
<td>14</td>
<td>30.2</td>
<td>48,475</td>
<td>1,606</td>
</tr>
<tr>
<td>18</td>
<td>14</td>
<td>18.2</td>
<td>33,520</td>
<td>1,845</td>
</tr>
<tr>
<td>37</td>
<td>11</td>
<td>40.7</td>
<td>31,664</td>
<td>777</td>
</tr>
<tr>
<td>261</td>
<td>13</td>
<td>11.6</td>
<td>28,695</td>
<td>2,484</td>
</tr>
<tr>
<td>Top 10 Sub-Total</td>
<td>178</td>
<td>401.0</td>
<td>579,886</td>
<td>1,446</td>
</tr>
<tr>
<td>All Segments Above Average</td>
<td>396</td>
<td>694.2</td>
<td>883,085</td>
<td>1,272</td>
</tr>
</tbody>
</table>

Source: PB traffic modeling
A significant point about route selection is that not only do usage patterns differ between Ohio-based and overhead truck movements, but that the route networks also differ by industry. Exhibit 9 displays the routes of Ohio-based truck traffic for automotive and transportation equipment, against a backdrop depicting the total outbound and inbound volumes for this traffic by county. Setting aside the expected heavy usage of I-75, industrial activity surrounding and west of the I-71 corridor creates substantial automotive freight traffic on the two-lane State and U.S. highway system in this portion of the state, with considerably lighter activity elsewhere.
By contrast, the dispersion by county of the basic chemicals industry creates entirely different patterns of roadway use in the state, as Exhibit 10 illustrates. With major concentrations of production and consumption in the Cleveland-Akron and the corridor from Cincinnati-to-Dayton, I-71 is the most prominent route, with significant truck activity on the two-lane networks spanning these metropolitan regions and enabling connection to bulk facilities on the lake and river. A similar but lighter volume pattern emerges around Columbus and Toledo, with two-lanes reaching into the nearby counties and also making connections between the regions. I-80 west of Columbus is important, and I-77 and I-75 both appear as active north-south connections to adjacent states.

Both automotive and chemicals are target industries for Ohio. Similarly distinct patterns of network usage appear for other commodity groups, implying that system investments geared to economic
support have different needs by industry, with effect in different parts of the state. By corollary, the exposure of industry to roadway freight bottlenecks also is distinct. The maps of automotive and chemical traffic each display the location of bottlenecks with indication of the delay they impose; Exhibit 12 shows them once more against traffic patterns for total truck volumes. The bottlenecks fall most heavily (and unsurprisingly) in the metropolitan areas and on the heavily traveled interstate highways. For Ohio-based traffic generally, conditions along I-71 are most significant, while I-75 is a particular challenge for the highly time sensitive automotive business – and bottlenecks on both corridors are being addressed.

Exhibit 11: Bottleneck Locations with Truck Volumes per Route and Truck Generation by County, 2012

Source: Parsons Brinckerhoff traffic modeling
However, the two-lane network so important to Ohio commerce and industry tells another story. Bottlenecks are fewer, although some occur: one is on the top US Route 23 south of Columbus (an automotive route) and another is along US 62 east of Cincinnati. As traffic volumes increase in the coming decade, the incidence of bottlenecks should be expected to rise with it, pointing to the need for vigilance to declining conditions and responsive investments in time. Nevertheless, the current and greater need on the two-lane network is management of the risk of supply chain disruption from incidental delays, such as occur from daily or seasonal peaks (like harvest season), or local events (like a parade or fair), as well as from construction, weather and roadway accidents.

Intelligent Transportation Systems offer a clear way to manage this kind of performance risk. ITS technology encompasses video and embedded traffic monitoring, variable message signs, virtual weigh stations, and other methods. Information dissemination generally is passive, requiring users to seek out critical information, but more interactive incident management systems are expected to improve real time advisory to freight stakeholders, and allow them to more agilely adapt their operations to changing conditions. In this way, firms are more accurately able to anticipate and mitigate threatened disruptions, rather than bear the full impacts of the events upon their supply chains. Facilitating the proliferation of ITS across the two-lane network, and fostering its integration into stakeholder management systems, thus is a promising response to the needs for mobility and efficiency on the crucial two-lane network that joins Ohio businesses to markets and Ohio citizens to their household supplies.

Finally, the Advanced Manufacturing that Ohio has targeted for growth includes production of heavy machinery. This industry has intermittent but recurring requirements for over-dimensional and superload permits in order to move very large and/or very heavy – but also very valuable - equipment on roadways. In 2012, the number of permits issued for truck movements of loads exceeding statutory weight limits and dimensions increased 22 percent over the previous year. However, the number of routes that can accommodate these shipments is limited. Transportation planners must find routes nevertheless, and typically seek the shortest feasible path to a transload facility for transport on the Great Lakes or Ohio River, where restrictions are much reduced and permitting and jurisdictional issues disappear. In order for Ohio to remain competitive in retaining and attracting heavy machinery OEMs and other production facilities, and to prepare for the demand for capital equipment that could accompany further economic recovery, better alternatives are desirable. The shipments commonly are affected by overhead clearances, roadway geometrics, roadway width, and bridge ratings. Incremental widening and alteration of existing roadway geometrics as scheduled repair and maintenance activities progress would be a responsive strategy, particularly if focused on waterside access routes. Increased awareness and education pertaining to oversize/overweight loads, accomplished by adding to existing outreach efforts to local planning officials, also could help recognize improvement opportunities and foster accommodation of shipments.

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4 Jeff Honefanger, ODOT Special Hauling Permits, 13 January 2013.
1.5 Accessibility and Connectivity

- Road network completes freight shipments by connecting shippers to receivers in cities and towns – and more and more, in neighborhoods
- Air cargo links to roadway network jeopardized by congestion in Cincinnati region
- Linkages to river terminals are adequate and newly recapitalized
- Future growth is expected in intermodal rail facilities

At the state level, access is about the ability of the highway freight system to reach efficiently into the cities and towns where Ohio commerce and industry are located. As the preceding discussion demonstrated, the state’s two-lane network operating in conjunction with its interstate highways are the means by which this access is created – even as the requirements of access for freight delivery are changing. The blurring of lines between e-commerce and traditional retail is making home delivery steadily more common, whether the home is in a suburban neighborhood or on a rural road, and the recent rise of same day delivery to some locations makes the quality of this access more sensitive. Completing a freight shipment’s journey from shipper’s dock to receiver’s door is thus increasingly a matter of access over a diversity of roadways, whose performance needs to be effective as a whole. These same roads typically also assure connection for businesses and consumers to the facilities of non-highway modes, whether for container shipping on the railways or for air express packages ordered on the web.

Looking specifically at modal connections, the state’s largest volume air cargo hub faces moderate congestion challenges in its linkage to Ohio’s Interstate network. Interviews with stakeholders documented that firms were generally satisfied with the manner in which the state’s Interstate and highway network managed congestion, with the exception of the Cincinnati-to-Dayton juncture of I-70 and I-75. In this area, the Brent Spence Bridge spanning the Ohio River to connect the Ohio portion of the Cincinnati region to the air freight hub at Cincinnati-Northern Kentucky Airport (CVG). FHWA data note that at its peak use, vehicles still pass through the location at an average speed of 37.34 miles per hour, compared to a non-peak average speed of 46.76 miles per hour. Placing this point of congestion in perspective, the top two locations of peak congestion tracked by the FHWA (Chicago’s I-290 at I-90/I-94 and Fort Lee, NJ’s : I-95 at SR 4) decline in average speed from 29.41 to 22.34 miles per hour and 28.98 to 22.67, respectively.

Connections to waterborne freight assets in the Cincinnati region presumably suffer likewise from its congested facilities. While the economic impact of congestion delay should be smaller for the low value bulk commodities that make up the majority of traffic conveyed by barge, delays of all sorts are costly for the capital goods that move to water because of size or weight. East of Cincinnati, the Portsmouth-to-Marietta segment of the Ohio River (served by I-64 and I-77, in addition to US Route 23 near Portsmouth) presents no reported deficiencies. The West Virginia Panhandle portion of the Ohio River, fronting the southeastern quadrant of the state (an area served by Interstates 70, 77, and 79, State Route 7, State Route 11, and U.S. Highway 22) functions similarly. The lake ports are well served by the existing facilities. The Port of Toledo has immediate access to the Ohio Turnpike, with which interview respondents from OEMs and trucking firms were satisfied. Cleveland, with access to I-71, I-77, and I-90 is also well connected. Finally, Ashtabula, connected to I-90 by State Route 11 (a divided four lane highway), faces no substantial congestion.
Connecting Ohio businesses via truck to the nation’s rail network are intermodal terminals in North Baltimore, Sharonville, Maple Heights, Columbus, Cincinnati, Cleveland, Marion, Toledo, and Lancaster. The rail system in turn links to global markets through marine ports and land crossings for export and import trade, and increasingly to domestic markets through new rail intermodal service. Roadways into many of these terminals will need to absorb higher levels of traffic, and facilities like the new access road to North Baltimore that skirts the town may be looked to as a model for accommodating communities along with growth.

1.6 Stewardship

- Transition to natural gas fuels presents substantial opportunities for reductions to harmful air pollutants as well to supply chain costs
- Greater network of natural gas refueling stations is needed to realize air and cost benefits, and to speed support to Ohio industry

Inherently linked to the goals of system efficiency and economic development as well as environmental stewardship, are the prospects of a future in which natural gas resources increasingly replace diesel as a source of fuel for commercial vehicles. The U.S. Department of Energy’s Alternative Fuels Data Center reports that natural gas is a cleaner source of fuel than traditional diesel due to lower emissions of greenhouse gas and criteria air pollutants, notably carbon monoxide and carbon dioxide (CO and CO₂), particulate matter, and oxides of nitrogen (NOx). This is clearly favorable, although for greenhouse gases the picture is mixed: methane released in natural gas production and distribution is a potent greenhouse agent, and unless controlled it can offset the lower carbon released by NG fuels⁵.

Even more important for its likelihood of adoption, domestic natural gas is a much lower cost fuel - recently about half the cost of diesel on an equivalent basis⁶. On-highway diesel averaged $3.82 per gallon in the summer of 2012, according to the U.S. Energy Information Administration⁷, versus a diesel-equivalent price point for compressed natural gas of about $1.90 during the same period⁸. Moreover, natural gas prices have been declining while diesel has moved the other way, as Exhibit 12 demonstrates.

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⁵ Proceedings of the National Academy of Sciences, “Greater Focus Needed on Methane Leakage from Natural Gas Infrastructure”, Alvarez et al, 13 February 2012.
⁶ Because natural gas and diesel are different substances, their costs are commonly compared through their BTU energy content, or converted through BTUs to the energy equivalent of a gallon of diesel.
Increasing fuel costs have been a chronic concern for freight carriers and supply chain managers. More than half of large truck carriers now are considering buying natural gas (NG) fueled trucks, according to a survey by Transport Capital Partners and ACT Research. While consideration may not lead to fleet-wide changes, this is still a telling finding for the conservative trucking industry, and by some projections, the higher cost of an NG truck in long haul service can be recovered through fuel savings within two years, or about half the typical truck replacement cycle in such fleets. Furthermore, the push for conversion will come not only from carriers seeking operating cost reductions, but from their customers seeking reductions in supply chain costs. Reflecting this kind of market demand, the major truck manufacturer Navistar expects one out of three trucks it sells to be NG-fueled within just a few years.

Since the development of shale reserves in the eastern part of the state, natural gas is now an Ohio fuel, and Ohio truck producers are building vehicles to use it. This means that beyond the potential for natural gas conversion to reduce air emissions and lower supply chain costs, it can support state industries as well. Meanwhile, a prime restraint on the growth of NG-powered trucking is the availability of fueling stations. Trucks returning to a home base daily – as do many in intrastate operations – are able to maintain their own fuel supply, although it is certainly preferable to have sources available away from the base. However, motor vehicles in interstate operation or traveling through the state need access to NG fuel at trucks stops just as they have it for diesel. Natural gas in compressed form (CNG) will support an operating range of 300-400 miles for contemporary truck engines; in the denser, liquefied form (LNG, which requires temperatures 260° below zero and

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equipment to create them), the operating range reaches 500-600 miles\textsuperscript{12}. These distances correspond fairly well to the daily work shift ranges of regional and long haul fleets, which implies that a refueling network has to be extensive but not necessarily ubiquitous for conversions to start.

This network has begun to develop, from a handful of public facilities supporting the more difficult LNG distribution to several hundred being introduced over the next few years by each of two leading truck stop chains: Pilot Travel Centers and TravelCenters of America\textsuperscript{13}. As of November 2012, the Alternative Fuels Data Center listed 536 compressed natural gas refueling centers nationwide operating publicly. Ohio had 13 compressed natural gas refueling sites with public access, and one truck stop in Seville offered liquefied natural gas on site. (California by contrast has the largest coverage, with 142 stations statewide.) In addition, dual fuel engines able to use NG with diesel back-up are an option while the fueling stations evolve.

\textit{Exhibit 13: Natural Gas Refueling Sites in Ohio (2012)}

\textsuperscript{12} Cascade Sierra Solutions, ibid.
\textsuperscript{13} Cascade Sierra Solutions, ibid.
The NG fueling network thus is arising on its own, but MAP-21 legislation allows funding support for these facilities under both the Surface Transportation and Congestion Mitigation and Air Quality (CMAQ) programs. From a stewardship perspective, encouragement of this network responds to the need to manage the emissions effect of continuing growth in truck activity, both in Ohio-based freight and in the heavy volume that passes through the state. Faster development cuts emissions sooner. In addition, the network boosts demand for the products of state industry, and it brings cost reductions from local energy into the competitive profile of Ohio supply chains - yielding an advantage against industries in higher cost locations, and attracting business to the state.

1.7 Economic Development

- Highway freight needs affect business performance and development through efficiency, mobility, connectivity, and stewardship
- Motor carriage is a significant direct contributor to the Ohio economy; trucking-related jobs an important source of current and potential employment

Needs of the highway freight system in respect to economic development have arisen at several points earlier in this document. The central role of freight transportation in Ohio supply chains, and their dependence on the state’s network of interstates and two-lane roads, signifies that the condition, performance, and management of the road network has direct bearing on the prospects of industry for growth and job creation. The importance of trucking for creating connection between other freight modes and their customers implies that roadway needs are often multimodal needs, and that the value of Ohio’s multimodal system for retaining and attracting business rests on the roadways as a foundation for the whole. The potential for natural gas conversion to create supply chain cost advantage, as well as to support fuel production and vehicle manufacture in the state, points to another way to spur growth. These aspects of the needs in trucking have a meaningful influence on the Ohio economy, and taken together are a main plank in a platform for development.

Beyond the significance of trucking services to industrial performance, motor carriage is a direct contributor to economic activity. Despite the shortage in supply of qualified truck drivers, the job creation impacts of the trucking industry are still notable in Ohio. According to statistics maintained by the Ohio Trucking Association, one out of fifteen Ohio workers was employed in a trucking related business in the recession year of 2010. The state’s payroll for trucking-related occupations was $11.8 billion. In 2010, 12,730 trucking companies were located in Ohio, with the majority of them being small businesses operating a highly local route network. With the financial barriers to entry in some cases as low for owner-operators as the purchase price of a single Class 8 truck—available new for $100,000 to $120,000, and less for a used vehicle—the industry is unique among the modes both for its high labor content but also for the economic opportunities possible in the market for new entrants. The occupational barrier presented by age and insurability discussed previously in this document consequently looms larger. It affects the ability of otherwise qualified Ohio citizens to go to work, as employees or as entrepreneurs, and as providers of essential services to the commerce of the state.