FINAL REPORT

ST. LOUIS REGIONAL FREIGHT STUDY

PREPARED FOR:
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Missouri Department of Transportation
Illinois Department of Transportation

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Project Framework

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Introduction

Beginning in June of 2012, AECOM Technical Services Inc. (AECOM) was engaged by the East-West Gateway Council of Governments (EWG) to complete a freight study for the St. Louis Region. The effort was undertaken with financial support by the Illinois Department of Transportation (IDOT) and the Missouri Department of Transportation (MoDOT). To complete the engagement, the AECOM project team included the following partners:

Project Outline

The intent of the St. Louis Regional Freight Study has been to clarify the current status of freight movement through the St. Louis Region as well as the future ability of local freight infrastructure to sustain growth in jobs and economic opportunity, as the St. Louis Region recovers from the Great Recession. Key work efforts associated with the project as described in this report included:

Chapter 02 - Stakeholder Interviews

The engagement effort focused on three elements. First, the effort began with establishment of a 23-person advisory committee to provide input to the process, and to help identify stakeholders. The committee members represented public and private sector interests in both Missouri and Illinois, with a general focus on the people organizations and operations involved in freight movement. Three advisory committee meetings were held over the course of the study. The stakeholder engagement effort included interviews with over 75 people representing public and private freight movement and economic development interests in Missouri and Illinois. The interviews were essential in framing how freight moves through the St. Louis Region and identifying key priorities for the local freight movement system. The engagement process concluded with a focused workshop on the local trucking industry to discern and understand view of truckers and safety officers regarding the function of the regional and local road network, key choke points, and areas of evolving concern.

Chapter 03 - Global Context for Freight Movement

Over the last 20 years, and since 2009 in particular, supply chains and distribution networks have evolved tremendously, responding to both market forces and regulatory influences, which include:

- Impact of the Panama Canal Expansion
- Changes to Great Lakes, Mississippi, and Missouri River Shipping
- Freight rail corridor improvements
- Shifts in truck served industrial sites

With the St. Louis Region's role as a transportation gateway as a given, it is critically important to document and understand the broad array of global shifts in freight movement and infrastructure that are now occurring, and what local impacts are likely to be. An array of shifts, linked with technology, shifting markets, and changing regulations were studied. Key regional, national, and global trends that will influence the study have been summarized, clarifying critical factors to chart over the planning horizon.

Chapter 04 – St. Louis Regional Freight Infrastructure Context

Study efforts were built around an extensive review of GIS information from numerous sources, including EWG, Federal Highway Administration (FHWA), U S Department of Transportation (USDOT), and Federal Railroad Administration (FRA), as well as local county-level GIS departments across the St. Louis Region. Information collected as part of the GIS exercise included:

- Rail lines and yards, including freight train counts and accidents
- Interstates and primary / secondary roads, including traffic counts and truck accidents
- Parcels and land use, covering population, employment, and businesses by type
- Transportation analysis zone (TAZ) data
- Industrial real estate
- Other transportation infrastructure, including river terminals and intermodal yards

The GIS system was used as a backbone for detailed analysis of defined sub areas and freight corridors. Other work efforts included analysis of regional economic and industrial market data, as well as a summation of broader economic factors linked with transportation.

Study efforts also relied on the input from IHS Global Insight, which provided access to several in-house freight databases:

- Transearch is a database of U.S. freight flows by mode at a county level, covering seven modes and over 450 commodity classes.
- Rail Waybill Data, collected with the support of MoDOT and IDOT

This section also begins to frame an underlying concern for the St. Louis Region, which is the growing awareness that U.S. transportation infrastructure has struggled to keep pace with the vast increases in shipping in recent decades. Deregulation of freight railroads led to considerable consolidation in rail lines, which increased efficiency and lower rates, but also dramatically reduced capacity. Today, although rail providers are investing heavily to increase capacity along main lines and key intermodal hubs like LA / Long Beach, Kansas City, Memphis, Chicago, Columbus, and North Baltimore (OH), infrastructure in many other secondary markets (like St. Louis) remains arguably unprepared for anticipated growth in freight volumes.

Chapter 05 – Regional Economic Context

A set of broader economic metrics for the St. Louis Region were evaluated, in part to provide a broader context for the study. This section initially explores state and national perspectives on a variety of economic indicators, including bank assets, consumer borrowing, home prices, and employment, in part to frame recovery from the "Great Recession". The second part of the analysis

focuses on the St. Louis Metropolitan Area and takes a closer look at indicators focused on regional population, labor force, employment, and gross domestic product. In some cases, other comparable MSA's are included in the analysis as benchmarks in order to provide context. These indicators are analyzed over a set of three basic timelines: pre-recession growth, recessionary decline, and post-recession recovery.

Chapter 06 – Economic Value of the Transportation System

Understanding the economic value of freight movement to the St. Louis Region is not a simple conversation. Economic value of freight can be defined initially in terms of the direct employment supported in these sectors, which generally include distribution, trucking, rail, barge, and air related activities. Beyond employment, while freight movement is generally viewed as a cost of doing business, its inexorable connection to manufacturing comes to the forefront. In the St. Louis Region, manufacturing directly sustained about $55.5 billion or 24% of total Regional output (about $227 billion) in 2010. In this context, understanding supply chains, and the ability to add value locally become critical elements of the conversation. Last but not least, as freight volumes grow, local challenges related to diesel emissions and other so called "negative externalities" also come into play, raising the need to understand freight movement from a broader sustainability and social justice perspective as well.

Chapter 07 - Freight Corridors and Land Use Alignment

The Industrial Land Use context is shaped by clear expectations that freight volumes through metropolitan areas such as St. Louis will only increase over time. Nationally, federal research (FHWA) reinforces expectations for a 60% increase in freight volumes nationally over the next 25 years, which is driving considerable debate about funding strategies and solutions that maximize alignment of modes and land use, while increasing operating efficiencies, and reducing costs.

While expectations for growth in freight volumes are clear, challenges associated with an all-too-often misalignment of land use with regard to transportation are equally apparent. While growing freight volumes and congestion create conflicts, the reality is that freight planning is quite different from other types of planning. As a result, freight planning detailed site access aspects in addition to large scale issues such as the economic and political relationships across countries and markets and industrial supply chains. Looking forward, it is apparent to AECOM that the connection between freight, movement land use and climate change will become increasingly important, with growing awareness of air quality impacts on adjacent / at risk populations.

The study drilled down into 23 specific areas in the St. Louis Region where transportation modes align with industrial land use, assembled from groups of Transportation Analysis Zone (TAZ) blocks. For each area, core characteristics are identified related to total industrial space, employment, train counts, truck counts, accidents, and similar factors. The resulting data is presented in matrix form to help identify how industrial areas in the region are performing, and how the transportation system is performing. Outputs from this section will inform the discussion of critical performance indicators for system monitoring in the future.

Chapter 08 - Freight Flows and Forecasts by Mode

Also provided by IHS, the freight forecast data frames current expectations for the commodities that will flow through the region, and the transportation mode of choice. The forecasts are used to provide an overall shape to regional freight movement with implications for future transportation infrastructure that could be needed locally in the future.

Chapter 09 - Freight System Recommendations

Building from the above work efforts, the conclusions are framed regarding the current status of freight movement through the St. Louis Region, and the current and forecast ability of local freight infrastructure to sustain growth in jobs and economic opportunity for the St. Louis Region into the future.

Acknowledgements

In the completion of this effort, contributions made by the following organizations were instrumental in supporting the completion of this effort:

- East-West Gateway Staff
- The Project Advisory Committee
- MoDOT and IDOT
- The Port Working Group
- Southeast Illinois Leadership Council

Data Sources

The primary study area for this report is the defined East-West Gateway Region, which is otherwise referred to as the St. Louis Region in this report. This study area is a subset of the broader 16-County Metropolitan Statistical Area, which is also used in the report. Current economic performance metrics have been extracted from an array of sources. This information was collected and evaluated to help frame an understanding of strengths, weaknesses, opportunities, and threats that will influence the entire Region. Individual metrics have been benchmarked against other comparable metropolitan areas that were chosen based upon experience and client insight. Data sources included:

Federal Sources

Congressional Budget Office (CBO)

Federal Aviation Administration (FAA)

U.S. Army Corps of Engineers (ACOE) Navigation Data Center

U.S. Census Bureau

U.S. Council for Automotive Research

U.S. Department of Agriculture (USDA)

U.S. Department of Commerce, Bureau of Economic Analysis (BEA)

U.S. Department of Commerce

U.S. Department of Energy

U.S. Department of Labor, Bureau of Labor Statistics (BLS)

U.S. Department of Transportation

Federal Highway Administration

Maritime Administration (MARAD)

U.S. Energy Information Administration (EIA)

U.S. Federal Reserve System / Federal Reserve Bank of St. Louis

State & Local Data Sources

Kaskaskia Port District

Lambert-St. Louis International Airport

MidAmerica Airport

Missouri Department of Economic Development

Missouri Economic Research and Information Center

Missouri Transportation Alliance

St. Louis Development Corporation

News and Other Publications

Bloomberg News

The Economist

Journal of Commerce

New York Times

St. Louis Beacon

St. Louis Business Journal

St. Louis Post Dispatch

Wall Street Journal

Other Sources

American Railroad Development Association

American Transportation Research Institute

ACCRA Cost of Living Index

Boeing- World Air Cargo Forecast 2012-2013

The Brookings Institution

Carnegie Mellon Center for Economic Development

Center for Automotive Research

The CoStar Group

The Council for Community and Economic Research

Council on Competitiveness

ESRI Business Solutions

IMPLAN

Institute of Transport and Logistics Studies, University of Sydney

International Economic Development Council

International Trade Commission

Land Policy Institute

Location One

Texas Transportation Institute

Transportation Research Board

McKinsey & Company

Nelson A. Rockefeller Institute of Government

Pew Center on the States

PwC

The effort acknowledges a number of specific studies that have been completed between 2007 and 2013 which have influenced and shaped this effort:

- Five Years of London's Low Emission Zone: Effects on Vehicle Fleet Composition and Air Quality, Summer 2013
- FHWA Freight and Land Use Handbook, April 2012
- Best Practices in Urban Freight Management: Lessons from an International Survey, July 2012
- MoDOT State Rail Plan, 2012
- IDOT State Rail Plan, 2012
- Poplar Street Bridge Independent Review, HDR, 2012
- State of Missouri, Blue Ribbon Committee on Missouri Transportation Needs, 2012
- Freight Facts and Figures 2012, Office of Freight Management and Operations, U.S. DOT, 2012
- U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels, U.S. Army Corps of Engineers, 2012
- Preserving & Protecting Freight Infrastructure and Routes, Transportation Research Board, 2012
- Performance Measures for Freight Transportation, Transportation Research Board, 2011
- Jefferson County Ports Phase II Master Plan, Jefferson County Port Authority, 2011
- Jefferson County Ports Phase 1 Feasibility Analysis, Jefferson County Port Authority, 2010
- Missouri Department of Economic Development Strategic Plan, 2011
- Missouri River Freight Corridor Assessment and Development Plan, MoDOT, 2011
- Building the Supply Chain of the Future, McKinsey Quarterly, 2011
- Potential of Lambert-St. Louis International Airport to be a Midwest Cargo Hub, Institute St. Onge, 2011
- Chicago Regional Freight System Planning Recommendations Study, CMAP, 2010
- Record of Decision, I-70 Supplemental EIS, MoDOT, 2009National Rail Freight Infrastructure Capacity and Investment Study, Association of American Railroads, 2007

Abbreviations

3PL – Third Party Logistics Provider

BEA – Business Economic Area

BNSF – Burlington Northern Santa Fe

CN – Canadian National Railroad

COB – Container on Barge

CP – Canadian Pacific Railroad

CNG – Compressed Natural Gas

CREATE – Chicago Regional Environmental and Transportation Efficiency Program

EPA – Environmental Protection Agency

EWG - East-West Gateway Council of Governments

EJ&E – Elgin, Joliet & Eastern Railway

FHWA – Federal Highway Administration

FRA – Federal Railroad Administration

GRG – Great Rivers Greenway

ITS – Intelligent Transportation Systems

MARAD – USDOT Maritime Administration

MSA – Metropolitan Statistical Area

MPO – Metropolitan Planning Organization

NS – Norfolk Southern Railroad

SLCEC – St. Louis County Economic Council

SLDC – St. Louis Development Corporation

TAZ – Transportation Analysis Zone

TEU – Twenty Food Equivalent Unit

TRB – Transportation Research Board

TRRA – Terminal Railroad Association

UP – Union Pacific Railroad

U.S. – United States

USDOT – United States Department of Transportation

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Stakeholder Engagement Insights

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Introduction

The stakeholder engagement effort for the St. Louis Regional Freight Study incorporated three primary elements. The effort began with the formation of a 23-person advisory committee to provide formal input to the process. The committee represented public and private sector interests in both Missouri and Illinois, with a focus on freight movement by air, water, rail, and truck, as well as broader Regional economic development. The advisory committee met three times over the course of the study. In addition, three presentations to the St. Louis area Port Working Group were made over the course of the study. Initially created in 2009 to help the St. Louis Region's varied freight movement interests to better coordinate their discussions, the Port Working Group membership now includes more than 100 individuals representing public and private aspects of freight movement.

One additional role of the advisory committee and the Port Working Group was to facilitate the identification of additional stakeholders for one-on-one interviews. Over the course of the study, interviews with more than 75 people representing public and private interests in freight movement, manufacturing, distribution, and economic development were completed. These interviews were essential in framing strengths, weaknesses, opportunities and threats for the St. Louis Regional freight movement system and helpful in framing potential roles for the public and private sector in moving forward.

The engagement process concluded with a focused workshop on the local trucking industry to understand view of truckers and safety officers regarding the function of the regional and local road network, key choke points, and areas of evolving concern. After conducting extensive email and personal outreach to more than 40 local trucking representatives using the Missouri Trucking Association membership list, a focus group comprised of nine representatives from the trucking industry was convened in April of 2013. The goal of the focus group was to obtain the truckers' perspective about the St. Louis Region's freight movement system.

The list of stakeholders who were contacted as part of this effort includes the following individuals and organizations.

State and Local Economic Development Organizations

- East-West Gateway Council of Governments (EWG)
- City of Fenton
- City of St. Louis Planning Department
- Center for Transportation Studies/UMSL
- Great Rivers Greenway (GRG)
- Illinois Department of Commerce & Economic Opportunity (DCEO)
- IDOT and MoDOT
- Missouri Department of Economic Development (MODED)
- Jefferson County Port Authority / EDC
- Leadership Council Southwestern Illinois
- Madison County Economic Development
- Metro / Bi-State Development Agency
- Partners for Progress / St. Charles County

- St. Louis Regional Chamber
- Southwestern Illinois Development Authority (SWIDA)
- St. Clair County Economic Development / GIS
- St. Louis County Economic Council (SLCEC)
- SLCEC - World Trade Center
- St. Louis County Planning Department
- St. Louis Development Corporation (SLDC)
- St. Louis County Economic Council (SLCEC)
- SW Illinois Flood Prevention District
- World Trade Center St. Louis

Federal Government

- MARAD
- Federal Reserve Bank of St. Louis

Transportation and Infrastructure

- AEP River Operations
- Alton & Southern Railway
- Arch Coal
- Members of Civic Progress
- B&M Trucking
- Broadreach Transportation
- Burlington Junction Railway
- Burlington Northern Santa Fe Railroad (BNSF)
- Central Midland Railway
- CSX Transportation
- DOT Foods, Inc.
- Eagle Marine Industries
- East County Enterprises
- FedEx
- Kansas City Southern Railway (KCS)
- Kaskaskia Port District
- Kinder Morgan
- Inbound Logistics Magazine
- Ingram Barge
- JB Marine
- Jones Lang LaSalle
- Lambert-St. Louis International Airport
- McEagle Properties
- Mid-America Airport
- Missouri Trucking Association
- Norfolk Southern Railway (NS)
- Conoco Phillips
- Port of St. Louis Port Authority
- Prime Trucking
- Members of the Regional Business Council (RBC)
- Railrunner
- Schnucks
- St. Louis County Port Authority
- St. Louis Downtown Airport
- Port Working Group
- St. Louis County Department of Highways and Traffic
- Terminal Railroad Association of St. Louis
- Tri-Cities Port District / America's Central Port
- USA Truck / Delivery Network

Core Insights

The engagement process identified several core themes which consistently emerged in the conversations:

The Economic Development Impacts Associated with the New Mississippi River Bridge are Significant for the St. Louis Region.

The new bridge and approaches will open up considerable underutilized land in St. Louis, Fairmont City, and East St. Louis for new development. Interviews point to an opportunity for redevelopment of up to 5,000 acres of land in Metro East associated with access improvements created by the new bridge and the corresponding 20% increase in capacity. Interviews also confirmed that the new bridge will also shift how truck traffic moves through the St. Louis Region. Interviews reinforced several points:

- Most interviewees (trucking companies in particular) have not thought in precise terms about how the new bridge will impact their operations.
- Truckers indicated that avoiding the downtown area and existing bridges has been a priority.
- For MoDOT and IDOT, the new Mississippi River Bridge represents one of six on-going / planned major bridge projects that the St. Louis Region will benefit from over the next five years.

Completion of the new bridge also reinforces the need to evaluate the arterial roadway network that brings traffic to and from the interstate roadways and bridge system. Select corridors could include:

- Illinois Route 3 is one example where an integrated arterial roadway corridor infrastructure and land use design effort can enhance investment benefits.
- The Hall Street / Riverview Blvd corridor is a second example of an industrial corridor where transportation, land use, zoning and permitting and utilities need to be re-evaluated.

The St. Louis Region's Rail Network is Emerging as a key Priority and Concern. Questions focused on whether Apparent Rail Congestion and Constraints are related to infrastructure or operational practices. The Answer Appears to be 'BOTH".

The evolution of freight rail in St. Louis builds from the weight of history, in that many current operational practices are an outgrowth of choices negotiated by railroads long since acquired and merged over the last 100 years. Interviews framed several initial insights:

- Historically, the TRRA evolved out of the practical need to ensure that a reported 16 railroads were able to connect at Union Station for passengers, not freight. One unintended result of these multiple connections is that that it can now take up to three days to switch a rail car across the St. Louis Region.
- The Region has explored complex issues associated with Regional rail movement before. In the 1970's the topic of a centralized regional rail yard was discussed, as an outgrowth of the interest in being able to switch traffic in one day or less.

In practical terms, the rail infrastructure issue also relates to whether the Class I railroads should directly connect with each other, or if they do in fact require an intermediary (i.e. TRRA) to make

connections. While the structure of these connections (accidental or deliberate) impacts the velocity and cost of freight movement, the answer is not simple, as questions of infrastructure and operations for the Class I railroads are intertwined with the shifting makeup of freight. For metropolitan areas such as St. Louis, these issues are not insignificant, with numerous connecting railroads each with a diverse history of infrastructure and operations legacy considerations. Other considerations include:

- Interviews spoke to a need to identify rail network improvements, but did not place emphasis on the importance of the MacArthur and Merchants Bridges. Experience would suggest that these bridges are important to national as well as local freight movement.
- Regarding the rail bridges, while some interviews pointed to recent reductions in coal movement having increased available capacity on the MacArthur rail bridge in 2013, other interviews suggested that this critical bridge was already at 80% to 90% of capacity in 2011.
- The reality that rail lines that connect to the approaches for each bridge are limited, and do constrain the regional network. This is a specific concern in Metro East, where rail lines that serve the bridge approaches also cross at grade or connect through existing older rail yards, resulting in congestion and evolving capacity concerns, particularly for run-through trains.
- Interviews also suggested that the railroad bridge conversation is linked with broader debate about the need to expand / rebuild I-70 in Missouri and Illinois. Interviews suggested that, as a result of reduced barge traffic on the Missouri River, truck traffic on I-70 has increased.
- The railroad bridge conversation, by necessity, requires a more in-depth discussion of the regional railroad network's operational performance and effective use of transportation investment capital.
- The Southwestern Illinois Leadership Council has focused the Metro East conversation regarding rail system challenges through the SITE program, which is reportedly modeled on CREATE in Chicago.
- Interviewees commented how markets are currently in flux, responding to shifting freight markets, including coal, petroleum by rail, and connections to export markets.
- Interviews pointed to the evolving impact of unit trains, particularly in Metro East, where existing yards are smaller.
- The evolving impact of containerization on older yards was noted, with existing intermodal yards having apparent capacity constraints to handle anticipated growth in domestic intermodal.
- Connectivity with Chicago will be improving as IDOT and UP finish improvements to the Alton-Joliet line, which eventually will be double tracked to support high speed passenger rail and freight movement.

One key to rationalizing a network is to increase the effectiveness of independent smaller scale operations. For the St. Louis Region, future strategies should be focused on system performance, aligned with enhancement of each individual railroad's operational metrics when viewed in the aggregate for the St. Louis Region.

Road Congestion Remains a Question, and the Answer Impacts the Trucking Industry.

Interviews suggest that across the St. Louis Region, congestion is pretty modest compared to other parts of the United States (U.S.). At the same time, there are specific locations where traffic congestion causes problems for trucks moving through the St. Louis Region. Specific areas identified in trucking interviews included:

- Poplar Street Bridge
- I-55 Northbound to I-70 East
- I-70 East, particularly through St. Peters, St. Charles
- I-270 East and IL Route 3 / Il Route 111
- I-44 interchanges with Arsenal and Kingshighway Boulevard
- Page Avenue between I-270 and I-170
- I-64 near Vandeventer
- Chouteau & Jefferson
- Interchange of I-44 & I-70

Trucking industry interviews reinforced the following:

- St. Louis is centrally located in the U.S., and benefits from connections to several major interstates. Thru traffic also benefits from the presence of key interstate bypass routes around the St. Louis Region.
- In general, roads are well maintained / in good condition, and fuel prices are relatively inexpensive (compared to other places).
- New interstate openings have made a difference in distributing traffic throughout the St. Louis Region.
- Traveling from one side of the St. Louis Region to the other during off-peak hours there are nominal delays.
- For regional and national trucking firms passing through the St. Louis Region, overall congestion appears modest. Reportedly, the primary truck route through the region is I-270, which crosses the Mississippi River north of downtown St. Louis, aligned with access to Chicago, Kansas City, and Indianapolis. This route includes the New Chain of Rocks Bridge over I-270, which is planned for eventual reconstruction, with congestion created by a shift down to two lanes across the structure.
- For companies delivering freight in the St. Louis Region, certain industrial districts are more difficult to access from interstates. Discussions generally focused on areas such as Hall Street, with some discussion of expanding connections to I-70 and I-270. Other areas of potential concern are along I-44, around the Arsenal Road interchange.
- Conversations also focused on the premise that it takes too long for trucks to get from the America's Central Port area to the Hall Street area in part due to traffic on the McKinley Bridge and I-70.

- Across St. Louis (City and County) east-west connections tend to be strong, while north-south connections are weak.
- For the St. Louis Region and the State of Missouri in particular, the current condition of I-70 is a core concern.
- Truckers commented that Regional wayfinding and ITS systems do help them understand bridge congestion levels, to make more informed decisions on how to traverse the St. Louis Region.

The interviews point to a need to more closely focus on areas where truck traffic is interfering with other vehicle movements, creating conflicts and safety questions. Land use is closely linked with this question, particularly conflicts with residential land use. Experience also suggests that congestion can be a clear indicator of economic activity. In this context, a lack of congestion can be a concern.

Has Intermodal Activity Across the St. Louis Region Increased since 2010?

While on the surface it appears that St. Louis has been bypassed for imported intermodal activity that originates on the U.S. West Coast and terminates in Memphis, Kansas City, and Chicago, interviews point to emerging local opportunities:

- UP, NS, Triple Crown Services, and CSX have seen recent growth locally in domestic intermodal shipments.
- UP appears interested in growing intermodal traffic along the Alton to Joliet route, connecting with their Global 4 intermodal yard in Chicago with their Dupo Yard, which interviews suggest is planned for intermodal expansion, linked with a new interchange at I-255.
- A number of the intermodal facilities particularly BNSF yard in Linwood and the NS Yard at Hall Street are land-locked, and arguably too small for modern trains. Even so, these yards are functioning. It is unclear how much additional growth they can support.
- Given recent investments by western railroads, Intermodal opportunities in St. Louis could in fact be linked more in the future to eastern railroads (NS and CSX), as well as broader growth in domestic container movement.
- Given the practical challenges of getting freight through Chicago, railroads are evaluating alternatives to avoid Chicago, particularly if cargo is not intended to stop there. Interviews pointed to the current agreement between CN and the Indiana Railroad as one example.

Increasing the Efficiency of the Regional Network Starts with the Identification of Specific Locations where One or More Modes Align (or could align better).

Illinois – Route 3 is a question and a key opportunity for North-South Access

- UP Dupo Yard / I-255 / IL Route 3 Connections. The UP intermodal facility has been targeted for improvement. Developers have proposed the Discover Business Park which would require another interchange off of I-255 at Davis Street Ferry Road; timing is unclear. The Dupo Yard traditionally supported car loading as well, which has changed with the closure of a majority of the area's auto plants one challenge for the St. Louis Region is to define how these assets can be repurposed.

- I-270 / I-255 / NS Intermodal Yard / Gateway Commerce Center – Already a key regional distribution node, with several consumer products companies represented. Intermodal share of truck traffic from this area has increased according to interviews. Gateway Commerce Center still has room to grow.
- Americas Central Port – Connections with existing rail and Route 3 to I-270.
- Route 3 Connections to the new eastern Mississippi River Bridge access, with connections to Tri-Level interchange (I-55 / I-70 / I-64), and Route 3 waterfront access related to the SCF / Bunge North American terminal in Fairmont City.
- Kaskaskia is currently not part of the "Port District of St. Louis" as defined by the U.S. Army Corps of Engineers; it appears positioned for future growth.

Missouri – Key challenges build from a lack of north-south access, focused in part on assets such as Hall Street / Riverview and Broadway. Conversations focused on:

- I-270 / Riverview / Hall Street - An important riverfront truck access route that parallels IL Route 3 in Missouri.
- Jefferson County Port Authority Doe Run Site, with potential connections may need to be established to interstate roadways and rail.
- Northern industrial waterfront and connections to I-70, I-270 via Hall Street and the new Mississippi River Bridge. Concerns focus on stormwater management problems in the area, along with the poor condition of many at grade rail crossings. Opportunities relate to intermodal activity at the NS Hall Street yard, and repurposing the vacant industrial properties.
- The 151-acre Hazelwood Commerce Center, located in Hazelwood, St. Louis County, with connections to Lindbergh Boulevard and I-270, and NS. Also, the 180-acre Aviator Park (former Ford assembly site in Hazelwood) has connections to Lindbergh Boulevard and I-270, as well as rail access. Both have proximity to Lambert, along with North Park, a 550-acre development east of Lambert, with direct access to I-70. Phase 1 includes office projects such as UMSL and Express Scripts. Phase 2 includes land further north along Hanley Road, with indirect connections to I-170. There is additional vacant land in Bridgeton that is being proposed for development.
- Downtown St. Louis, linked with transportation plans for Arch Grounds, connected with new I-70 Bridge, and land use in North St. Louis, aligned with underutilized corridors of Page Avenue, MLK / St. Charles / Rock Road, and Natural Bridge. These key arterials have the potential to provide significant capacity, so questions of changing their alignment and width need to be contemplated in a larger picture.
- South waterfront in Lemay / Carondelet, linked with casino access from I-55 to waterfront sites in the City of St. Louis, including Carondelet Coke.
- Impact of completion of the Page / Olive Connector with MO 141, which has increased access to 3,000 to 4,000 acres of levee protected development in the Maryland Heights area.
- Chrysler Site in Fenton – One of a few places where BNSF and UP routes align with considerable vacant / underutilized land in industrial use.

- SLDC City Dock – Benefited from a $20 million dollar investment – the next steps to leverage this investment will be important, including any connections with I-70 to be improved.
- Plans in Illinois to begin higher speed (HSR) passenger rail service to St. Louis speak to the challenge of getting passenger trains from Alton to East St. Louis, across the Mississippi River and into downtown St. Louis, while sustaining growth in freight volumes.

Airports and Air Cargo Remain a Sensitive Issue for the St. Louis Region. What is the Best Path Forward?

Interviews pointed to the following:

- While Lambert-St. Louis International Airport is clearly performing below its historic levels due to the loss of hub status, interviews suggest that Lambert is still performing well amongst its regional peers, outside of Chicago.
- Currently, both Lambert and MidAmerica are focused on strategies for growing traffic, focused in part on opening up cargo routes between Asia, St. Louis, and South America. Interviews suggest that while the premise is reasonable, the trade routes and resulting cargo activity cannot be expected to unfold by accident, but rather only occur through deliberate steps and actions.
- With the loss in hub status, a share of air cargo from St. Louis is now being routed through Chicago.
- Both Lambert and MidAmerica are financially challenged
- A shared regional vision for air freight seems to be elusive
- The respective airports' landside attributes are anticipated to become more important in the future. For Lambert, proximity to growing operations associated with Express Scripts is one example. For MidAmerica, growth of North Bay Produce is equally important. Both airports have considerable land that can be developed or repurposed.

Experience would suggest that growth in passenger levels at St. Louis airports is largely going to be a function of regional growth. If growth can accelerate, the results will be manifested in overseas flights, with greater opportunities for cargo as well.

What are the Organizational Roles for Existing Port Authorities, Economic Development Agencies, and Regional Planning Agencies in Enabling Freight to Move across the St. Louis Region more Efficiently?

The current regional economic development framework is built around an array of entities, including the Chamber, the St. Louis County Economic Council, St. Louis Development Corporation, individual county and city government-led economic development departments, Civic Progress, the Regional Business Council (RBC), Southwestern Illinois Leadership Council, METRO / Bi-State Development Authority, and East-West Gateway. Each of these entities has evolved over time with different capacities with varied constituencies. Considerations include:

- The leadership transitions that have unfolded at the Chamber, METRO / Bi-State, and East-West Gateway are a unique, "once in a lifetime" opportunity. As the St. Louis Region moves forward, getting beyond the historical penchant for fragmented and parochial thinking will be essential.

- The Region's economic development structure has found ways to work cooperatively, as evidenced by the formation of the Great Rivers Greenway District, funding for Metro East Levee improvements, and recent voter approval of a sales tax increase to fund Metro maintenance and expansion.
- Interviews spoke to the question of what entity should champion regional freight infrastructure improvements. Tracking freight operations and trends, as well as improved infrastructure alignment across modes and multiple jurisdictions will be critical. The resulting entity will need to be positioned with a mix of freight planning, operations and investment capabilities, while adapting local land use and infrastructure decisions.
- Interviews also suggested that transportation needs will in fact vary across the St. Louis Region. For example, it is clear that the majority of rail infrastructure is in Metro East, even as the St. Louis Region's center of economic gravity clearly remains in Missouri.
- Discussions raised comments on the current role of the Port Working Group in ensuring communication across the river, and what it could do in the future.
- Interviews also pointed to the current status and future role of several port authorities in the St. Louis Region, including entities such as the East St. Louis Port Authority, which do not appear to be functioning at present.

Barge Operators on the Mississippi and Missouri Rivers have a Long History of Moving Commodities through the Port of St. Louis. Since 2011, Freight Volumes have Increased; is the St. Louis Region Ready?

While the Mississippi River is a key piece of the U.S. freight transportation system, it is clear that river infrastructure faces challenges, particularly north of St. Louis where a total of 29 locks are used to ensure navigability. The majority of the locks have exceeded their functional lifespan and struggle with operational challenges, factors which drive a competitive advantage for the St. Louis Region. While the need to improve the locks is clear, and led to congressional passage of the 2007 Upper Mississippi and Illinois River Locks Modernization Act, funding has never been fully appropriated for defined projects.

The Missouri River context links with the difficult reality that upstream activity above St. Louis on the commercially navigable sections of the Missouri River remains challenged, with an apparent interest by upstream states in recreational activities as a priority. Interviews spoke of practical challenges in moving freight along this river, with channels, buoys, and water levels constantly changing. Water levels become the critical detail for the St. Louis Region to track over time, and advocate for long-term sustainable solutions. Priorities and procedures for Missouri River management have been set for the U.S. Army Corps of Engineers by legislation and administrative rulemaking. St. Louis will be directly impacted by these decisions, as reportedly about 40% to 60% of the Mississippi River's flow past St. Louis comes from the Missouri River. Other considerations include:

- The Port of St. Louis context builds from the initial reality of regional political fragmentation, which has made it harder for the defined "Port of St. Louis" District to operate. In this context, interviews suggested that the role of the Port Working Group may need to be redefined in the future.

- Kaskaskia is currently not part of the “Port District of St. Louis” as defined by the U.S. Army Corps of Engineers. The Kaskaskia area is linked with coal exports from Illinois, and supports a number of terminals for loading and unloading of commodities. Interviews suggested that this port is likely to see growth in commodity movement in coming years.
- TIGER grant funding is helping the Tri-City Port Authority district to establish a definitive port area above and below the controlled section of the river.
- The City of St. Louis and SLDC invested $20 million to rebuild their public dock as one step in sustaining and restoring the industrial activity in north St. Louis.
- Jefferson County is evaluating several port development areas, many associated with sites in Herculaneum. Additional infrastructure investments will be needed to leverage these assets.
- Private sector companies have made significant investments along the river. In 2011, Bunge / SCF Grain announced plans to build a grain terminal and transload facility in Fairmont City.

Interviews suggested that with the aforementioned improvements, that freight velocity along the river will increase, and that that land side impacts should be anticipated, particularly linked with the anticipated growth in unit trains. Lastly, the interviews also pointed to looming concerns for air quality linked with diesel exhaust, with implications for proximate residential areas.

Implications

The stakeholder engagement process highlighted critical factors that need to be kept in mind as the study moves forward:

- In general, the interviewees appreciated that they were included in the process, and as a result, significant input was collected. Moving forward, it will be critical for the St. Louis Region to stay engaged with these stakeholders (manufacturers, distributors, and movers of freight) to sustain current momentum, and better forge needed public private partnerships. Engagement approaches for Class I railroads and trucking companies (for example) will be very different.
- There is a clear need to engage with the trucking industry in preparation for the opening of the new Mississippi River Bridge. In general, interviews did not point to a clear sense of how companies will shift their operations once this new regional asset opens.
- Interviews with local governments point to a need to expand municipal freight planning capacity, if only to help prepare them for the local consequences of future growth in freight movement. Although the interviews did not suggest broader concern about emissions and air quality, they would suggest that social justice factors will increasingly play into the first and last mile of freight movement.
- While the St. Louis Region has evaluated freight rail infrastructure before, this effort points greater emphasis on the need to better understand how the railroads are choosing to operate (or are compelled to operate) across the St. Louis Region’s rail infrastructure as a critical next step.
- The question and opportunity for regional air cargo did surface, aligned with a palpable sense of fatigue about the past and present, and a need to look to the future. Interviews suggested that

both Lambert and MidAmerica have strategies in place to move forward incrementally; a positive step.

Interviews pointed to several apparent disconnects that the St. Louis Region faces:

- Disconnects between land use decisions made at a local level and broader transportation and freight movement decisions that can only be made at a larger regional geographic scale. Specifically for marine and river interests along the Mississippi River, where fragmentation prevents users from seeing the big picture.
- The challenge of inconsistent federal jurisdiction across the St. Louis Region.

While the St. Louis Region has a number of economic development entities to respond to project specific infrastructure needs, there appears to be a missing organizational piece in helping the St. Louis Region offset these disconnects. Given the St. Louis Region's recent apparent ascendance as a top 20 inland port, increasing pressure on existing infrastructure is to be expected, and may need to be planned for.

03

Global Context for Freight Movement

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Introduction

Today, as the U.S. recovers from the "Great Recession", the North American transportation network, including air, rail, truck, water, and pipeline segments, finds itself at a unique moment in time, which offers significant uncertainty, recognizable risks, and significant opportunity for the St. Louis Region. Industry outreach efforts have highlighted an array of factors, which are simultaneously global and national in nature that will influence the path forward for the St. Louis Region.

Recovery from the Recession

The pace of recovery from the Great Recession continues to be slow. For the Midwest, there is concern about the lack of job creation, with overall employment levels in 2012 which remain well below levels achieved 10 years ago, reinforcing the sense of a "lost decade". Within the overall trend, recovery in manufacturing has been notable, particularly in automotive sectors, and oil & gas extraction.

Recovery from the Recession has been supported by exports. Nationally, the dollar value of exports in 2011 was greater than in 2008. For the Midwest, exports have recovered to pre-recession levels. Growth rates in exports across Illinois and Missouri have been strong.

Reshoring of manufacturing is linked with significant labor cost growth in China, rapid labor turnover in India, higher transportation costs / more unstable supply chains.

Figure 1 – Midwest Regional Employment Trends

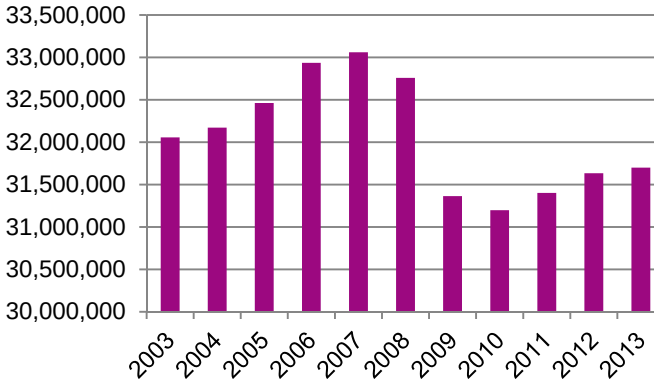
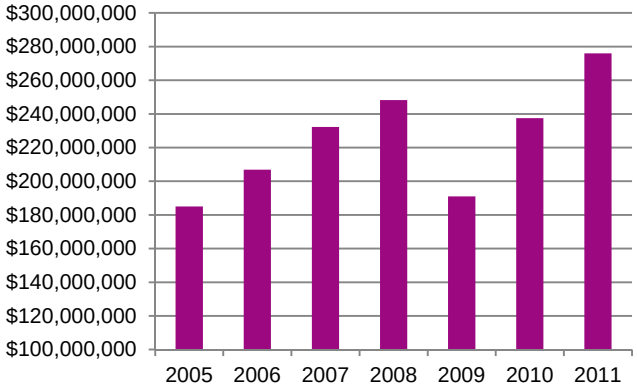
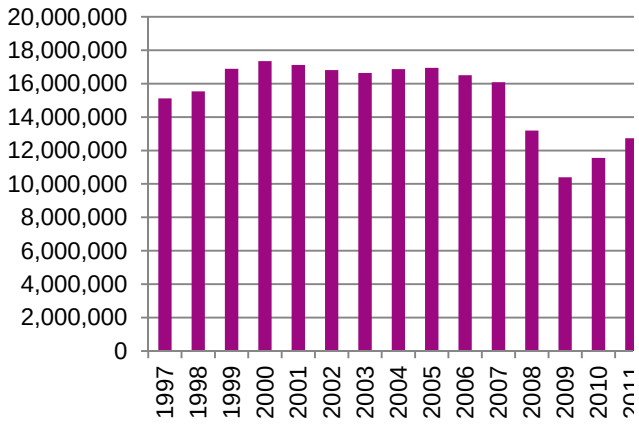


Figure 2 – Midwestern Exports by Year ($1,000's of U.S. $$)



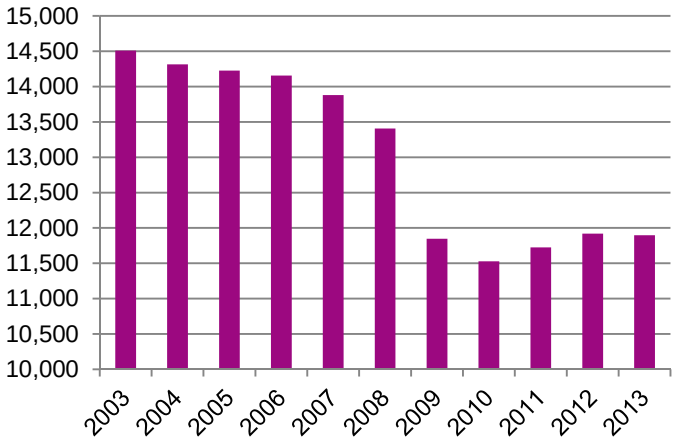
Source: US Census

Figure 4 – Total U.S. Light Vehicle Sales



Source: Wards

Figure 3 – U.S. Manufacturing Employment, 2002 to 2012

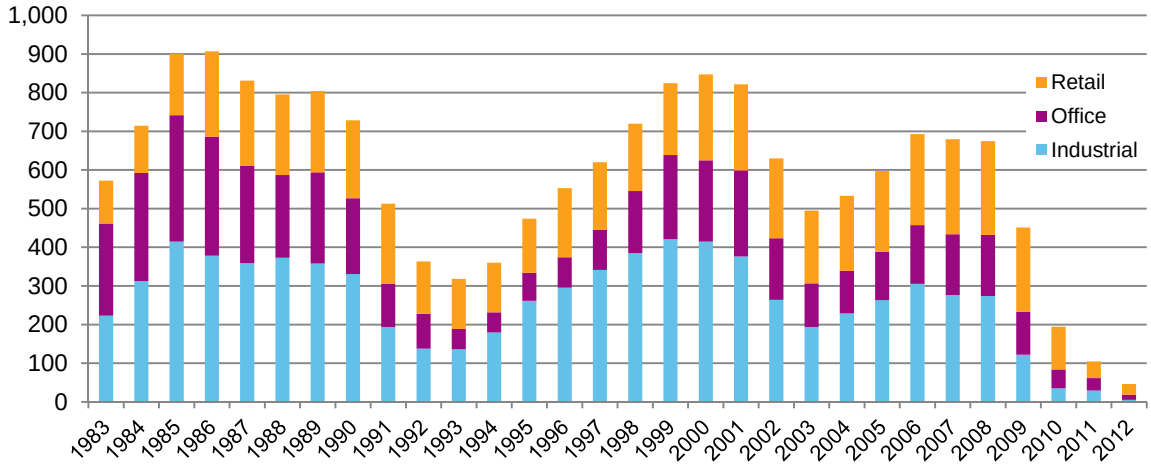


Source: Bureau of Labor Statistics, CES

These above factors have encouraged companies to think about bringing manufacturing jobs back to the U.S. While this trend remains in its infancy, for the first time in recent memory, manufacturing employment in the U.S. has begun to increase.

Real Estate Markets continue to struggle, with a pace of new construction that remains very slow by historic standards. While the past recession had specific impacts on retail space, both office and industrial markets also felt the impact. While opinions vary on the pace of recovery, there is a general sense that retail will lag other sectors, with the pace of job creation, linked with stability in real estate values, driving new construction and seeing improvement by 2014.

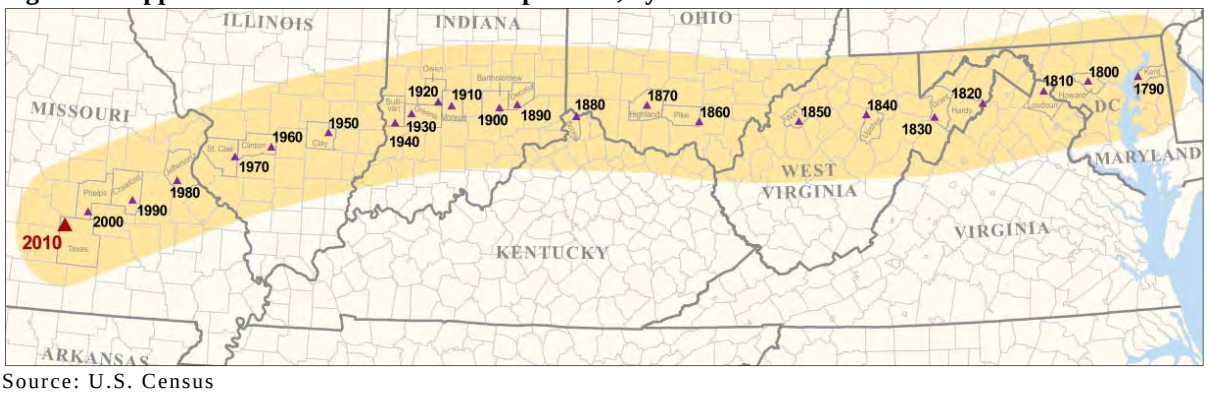
Figure 5 – U.S. Real Estate Construction Trends, 1,000's of Square Feet, 1983 to 2012



Source: COSTAR

Recessionary influences also have impacted geographic mobility, with the pace of western movement of U.S. population having decreased to its slowest pace going back to the 1930's, attributable, in part, to the sluggishness of the housing sector and growth in employment. What is also notable about the westward shift of the center of U.S. population is its tendency to run parallel to Interstates 44 and 70 between Springfield and Columbus.

Figure 6 – Approximate Center of the U.S. Population, by Decade



Source: U.S. Census

The Nature of Manufacturing has changed fundamentally. Where once heavy manufacturing facilities imported raw materials and turned them into finished goods in a single large facility, today several stages of manufacturing add incremental value to goods, and these stages may take place over large distances and multiple suppliers, as company supply chains become more flexible. New technologies

(3D Printing) and advanced materials (powdered metals / composites, plastics, and adhesives) will continue to influence manufacturing processes. For the Midwest, while the auto industry is recovering from extensive economic damage caused by the recession, the underlying industry logistics infrastructure is still adapting to changing industry volumes and assembly techniques. For example, industry reports point to continued growth in the use of lighter-weight aluminum and reconfigured power trains, along with plastics and special adhesives in future cars.

Shifting Goods Distribution

The nature of manufacturing and distribution has changed drastically. Where once U.S. goods were manufactured, stored in warehouses, shipped to retailers' shelves, and sold, today goods are manufactured as they are needed; inventory is drastically cut down; and global supply chains provide just-in-time merchandise. For many companies, “inventory” is more likely to be on a truck or plane than in a warehouse. Growth of the internet has also changed distribution, with the emergence of larger order fulfillment centers run by companies such as Amazon and others. This point is magnified by continued growth in internet based shopping. According to the U.S. Census Bureau, by 2012, electronic shopping accounted for more than 10% of retail spending.

E-Commerce has emerged as a new business model in the last decade, linked with continued growth in internet sales and larger format stores such as Walmart and Home Depot. For large internet retailers—including exclusively online companies like Amazon as well as traditional retailers with an online presence like Wal-Mart—there is a new kind of industrial property: the fulfillment center. Fulfillment centers used to be the reserve of catalog businesses, but have been reborn for the 21st Century. Images of Montgomery Ward’s employees roller-skating around the massive distribution center have been replaced by robotics, complicated systems of optical scanning, and miles of conveyor belts. A second factor since 2000 is the continual pressure faced by retailers to keep shipping costs as low as possible. From a trucking standpoint, there is greater emphasis on maximizing the volume and weight that an individual truck can carry. This point is impacting manufacturing production processes as well, better aligning manufacturing with transportation modes and costs. These companies are also reducing costs by consolidating distribution and using Third Party Logistics Providers (3PL), with a focus on much larger buildings, generally greater than 750,000 SF in size. These organizations help companies make decisions on factors such as optimal freight modes, carrier loading & scheduling, warehouse management, and outsourcing of some business functions, including customer returns and repairs. Other factors include:

- Fulfillment centers are often called pass-through centers because merchandise does not sit on the shelves for long. This is a logical outgrowth of consumers’ demand that items ship within 24 hours, but is also a reflection of “just in time” supply chain management.
- As well, as retailers have started linking their online and in-store businesses, allowing customers to order an item online and pick it up in the store.

Wal-Mart often demands that suppliers deliver straight to their stores. However, this comes with intense pressure to deliver goods reliably and cheaply. Wal-Mart’s inventory management system is one-of-a-kind, allowing suppliers to track sales, inventory, and prices, thereby providing more reliable inventory and lower prices. Other firms like Home Depot carry almost no inventory besides what is on store shelves. Toyota demands that suppliers to its automotive assembly plants deliver their goods to a staging area nearby, where the parts can be shuttled to the assembly line precisely when

they are needed. Toyota reportedly demands deliveries to be made every two hours and for reliability to be better than 99%, which puts significant pressure on its suppliers. Each of the auto assembly plants, as well as other manufacturing facilities, closely track the distance and on-time delivery of their supplier networks.

Because they specialize and have access to many different shipping modes, technology, and warehouses, 3PL's are often a logical option for companies that want to make the most of the logistics process. In recent years, many firms have outsourced some key business functions to their 3PL's. Many logistics providers, for example, are involved with product-return issues. Toshiba has outsourced all its computer repairs to UPS. Although consumers believe they return their PC's to Toshiba, they actually "return" them to UPS employees, trained by Toshiba, who repair the computers and ship them back to the consumer.

Containerization & Global Supply Chains

Containerization of freight has dramatically reduced transportation costs. Worldwide, the number of shipping containers (20-foot equivalent units) continued to grow between 2000 and 2010 in spite of the recession. According to the U.S. Army Corps of Engineers, across the continental U.S., the number of shipping containers, otherwise known as twenty-foot equivalent units (or TEU), increased from about 25 million to about 31.5 million, or about 3% annual growth. Looking to the future, companies such as IHS predict that the number of imported TEU's will increase from about 17 million in 2011 to 60 million in 2037.

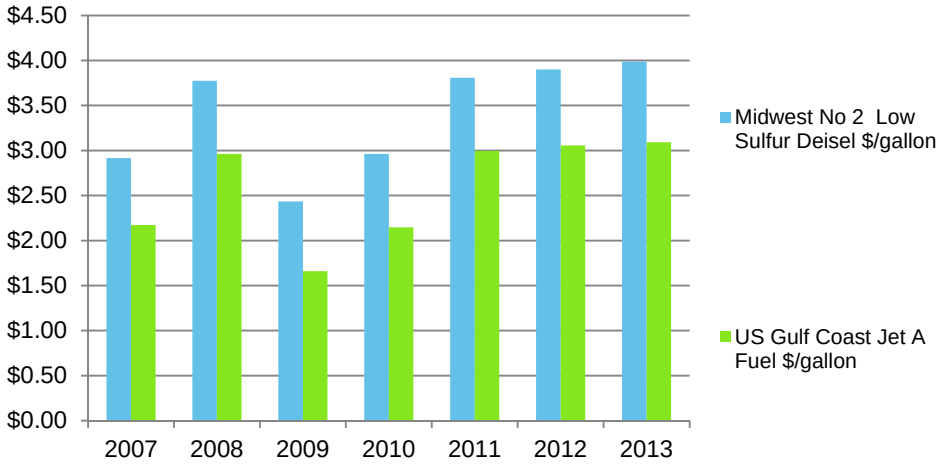
For the Midwest, containerization of higher value commodities is viewed as one area for specific growth, linked with Asian markets. In 2011, 7% of U.S. grain exports moved by container, according to the U.S. Department of Agriculture, up strongly from 2010. Along with growth in containerization, the size of containers has grown, from the original standard 20-foot length, to include 40-foot, 45-foot, 48-foot, and 53-foot long containers, the latter of which are most often used for domestic shipping needs. A key driver of commodity-linked container demand relates to identity preserved grains, which are produced with specific export-oriented end-user in mind who is concerned enough about a confirmed origin that they are prepared to pay a premium for container service; soybeans destined for Asian markets are a specific example.

One clear outgrowth of containerization is the emergence of larger port facilities across the Western U.S. to handle ever increasing import container shipments. These ports, including LA / Long Beach, Seattle, and Tacoma, have expanded several times to meet demand, while also dealing with regulatory impacts. Other West Coast ports are not sitting still either. For example, the Mexican port of Lazaro Cardinas is expanding its capacity from 160,000 to 2.2 million TEUs, benefiting from a direction connection to Chicago and Kansas City via Kansas City Southern. The Canadian port of Prince Rupert in British Columbia is viewed in a similar fashion, as it is a shorter distance from North Asian ports. The port enjoys a direct rail connection via CN to Chicago and southward to New Orleans. The port is slated for additional expansion, to reportedly quadruple its capacity to approximately 4 million TEUs, reportedly by 2015.

While global supply chains have delivered low costs, pressure and instability has been constant, in part due to natural disasters (flooding in Thailand and Japan in 2011), but also because companies are reacting to increasingly fragmented markets and higher transportation costs. For example, 2010 was reportedly the first year that Nike made more shoes in Vietnam than in China.

Higher fuel prices will continue to be a concern for the global economy. While natural gas prices are at 10-year lows today, cost increases for gasoline, jet fuel (kerosene), diesel fuel over the same period have been unsustainable, slowly building momentum for containerization of freight and further growth in intermodal traffic. The Figure 7 indicates that since 2007, the average cost of a gallon of jet fuel has grown at a faster annualized pace (6.1%) than diesel fuel (5.4%).

Figure 7 – Comparison of Average Annual Jet Fuel and Low Sulfur Deisel Fuel Prices



Source: U.S. Energy Information Administration

For the private sector, managing month to month price volatility is the primary challenge. For shipping companies, higher diesel fuel prices have added a day to transit times between Asia and the U.S. West Coast, as container ships have reduced speeds to save on fuel costs. For the Midwest, higher fuel prices have specific long-term implications for food production and delivery to destination markets, including removal of waste material.

While higher fuel prices are impacting sectors that rely on gasoline or jet fuel, the same cannot be said for industries that rely on natural gas. Within the past five years, through processes known as "fracking", the U.S. has dramatically increased domestic extraction of natural gas and prices have fallen as a result. New production in shale basins such as the Bakken area in North Dakota and Montana have resulted in massive increases in natural gas reserves for domestic and export use. The use of fracking technologies has also boosted oil production, with places such as the Bakken going from production of about 36,000 barrels per day in 2008 to more than 400,000 barrels in 2012.

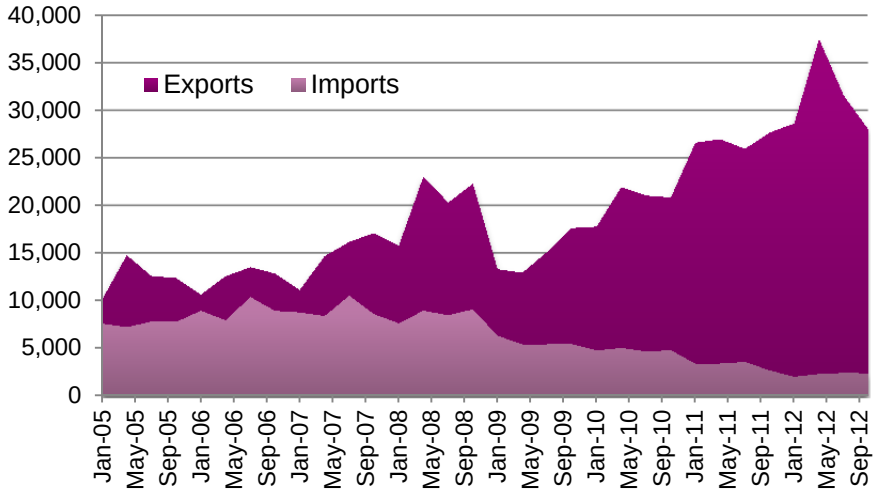
These markets are significantly altering traditional ways that fuels are transported, with railroads seeing significant growth of unit train movement of petrochemicals, even as several pipelines routes are being evaluated, including routes that will directly connect northern oil with Gulf Coast production facilities. The increased importance for the use of diversified destinations has contributed to the growth in rail delivery of crude hydrocarbons. Additionally, while the railroad industry has been able to more quickly respond to the growth in the sector than the pipeline industry, over the long-term, there are significant cost advantages to bulk movement by pipeline, particularly given the very large volumes that need to be transported cost effectively.

Regulatory Influences

Federal Regulations related to the railroads are also continuing to shift. The industry is currently dealing with implementation of Positive Train Control (PTC) under a congressional mandate for installation by 2015. Equally significant are current discussions within the Surface Transportation Board focused on the concept of reciprocal switching for "captive shippers". If implemented, the rule would allow shippers to access other railroads, reducing shipping costs. Air Quality Regulations will continue to impact transportation sectors. While already twice as efficient as trucks in moving intermodal cargo, EPA air quality requirements will further transform the rail and barge sectors over the next 10 years, with Tier III and IV standards for Class I railroads of particular note.

Changing regulations are also impacting the coal sector as a rail and water carried cargo, beginning with the impact of a reported 27 gigawatts of coal-fired base-load capacity set to retire within five years. New extraction technologies have also increased the supply of natural gas and reduced its cost, which has favorably impacted several industry sectors that rely on natural gas as a feedstock, particularly chemicals. For the coal companies, regulatory changes, combined with a warm winter in 2011/2012 reduced domestic demand for coal by a reported 10% to 15%. Even as domestic consumption has decreased, exports of coal have grown dramatically, as shown. Growth has put pressure on existing export facilities and supply chains, leading to recent, as well as anticipated, infrastructure changes.

Figure 8 – U.S. Coal Imports and Exports, Millions of Short Tons, by Quarter



Source: U.S. Energy Information Administration

Markets are also shifting in the ethanol industry due to changing regulation. This industry experienced tremendous growth beginning in 2006 when 4.8 billion gallons were produced. Through 2010, ethanol production had increased to about 13.9 billion gallons. Increased production capacity has been tied to the demand for ethanol in gasoline, both domestically, and increasingly internationally. Federal subsidies ended in 2011, after 30 years. As past energy legislation mandates that gasoline formulations include ethanol, the demand for ethanol to be produced is unlikely to go away, even without the tax subsidies in place.

Major Infrastructure Projects

The Panama Canal Expansion is scheduled for completion in mid-2015. The project includes a new parallel set of longer locks with a greater draft, and deeper navigational channels at a cost of about $5 billion. The improvements will allow ships significantly larger than the current Panamax standard to pass through the canal, creating potential savings and opening up new markets. According to the U.S. Army Corps of Engineers, these ships currently make up 16% of ship inventory, but now account for about 45% of cargo capacity. For the Midwest, some experts presume that the expanded canal will gradually benefit agricultural markets, given that a reported 44% of U.S. soybean exports already pass through the Panama Canal, primarily to Asian markets. Port reactions vary:

- Gulf & East Coast ports are contemplating investments to support larger ships, analysis suggests that at present, only a small number of U.S. ports have been dredged to the 50-foot standard required for post-Panamax vessels, including core West Coast ports (LA/Long Beach, Oakland, and Seattle), as well as the East Coast ports of Norfolk and Baltimore.
- A project is currently underway to deepen the main channel and container berths at the Port of NY/NJ to the 50-foot standard, along with raising the height clearance of the Bayonne Bridge; the port of Miami is making similar plans.
- The Port of New Orleans, including terminals up to Baton Rouge, can only support ships that draw up to 45 feet; the Port of Houston is in a similar situation; for the Midwest, depth issues in the Gulf are a clear constraint.

There remains a fair amount of uncertainty where these larger post-Panamax ships will sail as they enter the fleet in larger numbers. A review of industry literature would suggest that owners of these ships are likely to experience considerable pressure to keep them at sea, and to minimize unloading time, suggesting that a smaller number of U.S. ports will see significant increases in activity.

For the Midwest, recent reports by the Chicago Metropolitan Agency for Planning (CMAP) suggest that one potential impact is that a share of freight that currently goes through greater Chicago will shift to East Coast Ports, which would imply slower growth in container volumes through Chicago. A slowing in volumes would be interesting, as container volumes through Chicago intermodal yards increased from about 5.9 million TEU in 2000 to about 6.7 million TEU in 2011. Discussions between CN and the Indiana Rail Road also speak to future trajectories for this trend, with CN confirming plans to move containers that are currently drayed from Chicago to Indianapolis by rail instead, using the Indiana Railroad.

Class I Railroads are reacting to the canal expansion by investing in infrastructure and capacity, either through direct capital outlay or through public private partnerships. Considerations include:

- CSX is developing its $842-million-dollar ***National Gateway*** project which will create double-stack container capacity along three rail corridors linking Mid-Atlantic ports to Ohio and Chicago. For CSX, North Baltimore, OH is a key node, so understanding how the St. Louis industrial market connects to it is important. The CSX Roselake and Greenville (IL) facilities represent significant intermodal hubs. In the spring of 2013, CSX announced plans to further expand their North Baltimore intermodal yard.

- NS recently completed a major upgrade to the ***Heartland Corridor***, which effectively doubled container-train capacity from Norfolk to Chicago. The project involved raising tunnel clearances on 28 tunnels and removal of 24 overhead obstructions in Virginia, West Virginia, Kentucky and Ohio, at an estimated cost of $191 million, shared between NS and impacted state governments. NS is also involved in the **Crescent Corridor** project with 13 states focused on 2,500 miles of rail infrastructure. The project, with a reported cost of $2.5 billion, will expand capacity from New Orleans and Memphis, through Birmingham, Chattanooga, Knoxville, and Charlotte, to connect with Philadelphia and New York.
- BNSF - Since 1999 BNSF has invested $1.8 billion to increase capacity on its southern TransCon Line, which now provides double-track service from Los Angeles to Chicago and St. Louis. The last remaining project (Abo Canyon) was completed in 2011.
- KCS has partnered with NS to improve the ***Meridian Speedway***, a route between Shreveport, LA and Meridian, MS to speed traffic from Kansas City and the south / west to the U.S. Mid-Atlantic and east coast. Since 2006, the joint venture has installed centralized traffic control, replaced and relayed ties and rail, and made other improvements to the corridor.

Even as the Class I's are benefiting from these significant corridor improvements, their local (i.e. metropolitan area) networks and yards they serve continue to be a challenge, both in terms of operations, and capital investment priorities. For St. Louis, these latter points are particularly relevant.

Beyond these factors, Class I railroads are also pushing longer unit trains, typically coal, grain / commodities, refrigerated food, petrochemicals or containers with anywhere from 115 to 140 cars. The growth of unit trains aligns with trends of increased containerization. For metropolitan areas, these trends have land use implications:

- Trains are getting longer, with consequences for older rail yards and lines that serve these years, with more frequent blocked crossings. For example, Union Pacific recently experimented with an 18,000-foot-long container train from Southern California to Texas. Both BNSF and UP are reportedly building trains that run between 8,000 and 12,000 feet in length for intermodal service, with longer trains on higher-capacity corridors.
- Growth in containerization suggests that the traditional box car has a smaller future, with implications for traditional rail served industrial sites.
- With the decline in box car use, traditional railroad "hump yards" are seeing less activity as a result; several have been closed recently, including announced closures by CP in Chicago.

Mississippi River System

Growth in unit trains is linked with on-going / planned investments along the U.S. West Coast and Gulf Coast to handle unloading of unit-train coal, petrochemicals, and grain for export markets across the Pacific. While some of these terminal projects have met with resistance, particularly on the West Coast, Gulf Coast and Mississippi River projects have emerged, with implications for existing, smaller capacity terminals along the river. Examples include:

- Orascom / Iowa Fertilizer in Keokuk, IA – A reported $1.5-billion-dollar investment was announced in 2012. The initial phase of the project is a reported $60 to $100 million. This is one of several new fertilizer plants that have broken ground in the U.S., in part due to significantly lower feed stock costs (i.e. natural gas).
- Alcoa / Davenport - Alcoa announced it will expand its Davenport, Iowa, rolled products plant to meet rising demand from the automotive market with an investment of $300 million and the creation of 150 new full-time jobs, bringing total employment at the site to more than 2,300 positions. The expansion is expected to be completed by the end of 2013. The large manufacturing site is located on the Mississippi River, albeit with limited water access.
- Proposed Four Rivers Terminal / SCH Services / Metropolis, IL - Located on the Ohio River, just east of the confluence with the Mississippi, the Four Rivers Terminal would have direct access to multiple railroads, to transfer unit-train rail coal to barges. The Four Rivers Terminal project is currently in the Public Notice phase of the U.S. Army Corps of Engineers permit process.
- TransPORT / Pekin, Ill - The Heart of Illinois Regional Port District is planning an approximately $8-million-dollar public marine terminal along the Illinois Waterway. Reports suggest that the facility is planned to handle bulk cargo as well as manufactured good. The project is currently in the permit application phase of the U.S. Army Corps of Engineers permit process, with construction proposed to begin in 2013. The port district has also studied container on barge, with a plan to better link local construction equipment production with water transportation. Studies currently underway by MARAD are expected to clarify market potentials.
- Mitsubishi Electric Power Products / Memphis – Announced a $207-million-dollar electric transformer assembly plant, to be built in Memphis on a 100-acre site along the Mississippi. Buildout includes about 370,000 square feet of space, with initial production by 2013. Linkage with the water for steel deliveries was a factor.
- Peabody Energy Corp / Gulf Coast Coal – Announced that they have secured agreements with Kinder Morgan Energy Partners to double coal export capacity through Houston and New Orleans by 2020, to serve European markets. The announcement is significant in that it suggests that Peabody is moving away from West Coast capacity proposals which had focused on the Pacific Northwest, due to environmental and NMBY concerns.
- NuStar / EOG Resources / St. James Parish, LA - Plans to develop a 70,000-barrel-per-day unit train offloading facility at NuStar's St. James terminal. The project will enable movement and storage of crude oil production from developing shale plays.
- IC RailMarine Terminal / Covent, LA – As part of a larger agreement involving the CN Railroad, the Covent Terminal will be expanded to 8 million tons of export coal per year, with the potential for an additional expansion of 8 million tons, largely from Illinois coal mines.
- Trafigura / Burnside Terminal / Ascension Parish – A terminal that had closed in 2008 is slated for a $100-million-dollar investment to reopen and serve as a bulk terminal for coal and bauxite. Reports suggest that a clear driver for the reopening is the lack of capacity in the New Orleans area terminals for export coal. Once completed the project is expected to have rail-to-vessel and barge-to-vessel capacity.

It is clear that the Mississippi River is a key piece of the U.S. freight transportation system. Interviews point to broader factors that influence how the river can be used in the future:

- Grain markets drive barge transportation, as opposed to steel, fuel or other commodities.
- Reports suggest that about 50% of barges return north empty, which reinforces the point that barge transportation is largely aligned with commodity movement, as opposed to transportation of finished goods.
- A majority of terminals on the river are in private hands, operate with limited flood protection, and have limited capacity, mostly to load / unload one barge at a time in service for a few select products.
- While there are plans to expand capacity along the river, interviews pointed to capacity constraints in New Orleans and Baton Rouge that ultimately constrain the volume of freight that can be moved down river.
- A clear challenge with putting more commodities on the river is that the trucking industry will need to continue to play a role. While unit train movement of commodities is preferred by the railroads, there are only so many locations were unit trains can be unloaded cost effectively. While it is clear that a large number of trucks are needed to fill a barge, trucks can originate from a much broader area, which is more efficient.
- Coal exports to the west coast have been slowed, forcing companies to look to the Gulf Coast. Terminal capacity appears poised to grow as a result.
- A number of terminals have / are planning upgrades to handle unit trains. As these terminal improvements are made, there is a sense that older terminals with reduced capacity will see reduced market share.
- UP has announced their intention to reroute existing traffic in order to bring unit trains of coal directly to the Gulf Coast
- Major investments appear to be targeted toward larger 40+acre sites, with emphasis on still water locations (i.e. terminal sites outside of the main river current).
- Growth of terminals with unit train capacity suggests that older terminals which have not benefited from investment will see reduced market share in coming years.

With respect to the Mississippi River system, it is apparent that there is a broader need to improve the lock system. While these well-known challenges led to congressional passage of the 2007 Upper Mississippi and Illinois River Locks Modernization Act, funding has never been fully appropriated for defined projects. While Corps of Engineers research suggested that decisions to significantly expand capacity in the controlled section of the river have been postponed indefinitely, at the same time, in part due to concerns related to the drought in 2012, congressional action related to funding for river system improvements seems to be gaining traction at the federal level. Through June of 2012, at least one bill has been moving through the U.S. Congress to help fund port infrastructure projects.

Specific concerns for the Missouri River are different, in that future commercial use of this river links with the difficult reality that upstream activity on the commercially navigable sections of the Missouri

River above St. Louis remains challenged, with an apparent interest by upstream states in recreational activities as a priority. Interviews spoke of practical challenges in moving freight along this river, with channels, buoys, and water levels constantly changing. Interviews reinforce the point that water levels are a critical detail for the St. Louis Region to track over time, and advocate for. Priorities and procedures for Missouri River management have been set for the U.S. Army Corps of Engineers by legislation and administrative rulemaking.

Midwestern Freight Rail Considerations

The Midwestern U.S. has sustained a longstanding connection with manufacturing and distribution. While the effects of the Great Recession continue to linger across the area, the dust is beginning to settle. From a rail standpoint, things are happening that will influence St. Louis:

- CREATE, otherwise known as the Chicago Regional Environmental and Transportation Efficiency Program, is beginning to solve freight bottlenecks in the Chicago area, one of three places where all seven Class I railroads meet. CREATE includes more than 70 specific projects, with a total investment of about $3 billion, to be funded through a public and private contributions.
- In May of 2013, a private sector group proposed a new alternative southern rail by-pass of Chicago. The identified route would connect eastern railroads such as CSX and NS with western railroads (UP and BNSF).
- NS is partnering with CN on the Mid-America Corridor, to reduce transit time between Chicago, St. Louis and Memphis. The goal of this corridor partnership is to share track between the three gateway cities. Elements include NS hauling CN freight between Chicago and St. Louis. As well, NS will access a CN route from St. Louis and Fulton, KY, and lastly, CN will haul NS freight between Chicago and Fulton, KY. The two railroads are also planning a “coal gateway” in Mississippi.
- Detroit is moving forward with plans to build a new rail tunnel connection with Windsor, Canada, called the Continental Rail Gateway. The $400-million-dollar project would allow for double stack container service. The project has received significant commitments from Canadian Pacific as well as the Windsor Port Authority. The tunnel is significant in part because of connections along CP’s route to the Port of Montreal, which just recently received approval to support post-Panamax container ships.
- CN continues to modify their infrastructure following the acquisition of EJ&E. While the generally fragmented nature of the freight system makes it difficult to predict how freight movement will adjust to these improvements, plans by the CN to expand container traffic through the Port of Prince Rupert make it reasonable to assume that container traffic to (or around) Chicago will increase over time.
- Across the Central U.S., Chicago, St. Louis, Memphis, and New Orleans serve as critical interchange points for cargo and containers originating from the Atlantic, Gulf Coast, and Pacific Coast. While Chicago has begun to embrace rail alignment efficiencies through CREATE, these other critical nodes remain behind. Experience suggests that the speed at which freight moves

does correlate with the efficiency and cost of goods movement, which directly translates into economic opportunity and job creation.

- Container on Barge (COB) is one area where the impact of containerization remains to be felt. Inland ports, particularly Chicago, have yet to make significant COB investments to dramatically increase the market. For example, in 2010, U.S. Customs ports oversaw the waterborne movement of about 27.6 million TEU's for export. Of this total, only about 400 TEU's originated by water from Midwestern markets, such as Chicago, Memphis, St. Louis, or Cincinnati.

Implications

- Freight networks are adjusting to higher prices for diesel fuel and jet fuel, even as evolving federal regulation also impacts how freight moves. These factors appear to be influencing an underlying shift toward rail movement of containers.
- Distribution networks and logistics providers are also reacting to continual growth in internet based retail, which has grown at a 12% annualized rate since 1992.
- These same freight networks are also reacting to new infrastructure, beginning with Class I railroads and ports planning for the Panama Canal Expansion. At the same time, other major projects, including a new rail tunnel in Detroit, the CSX Heartland Corridor, CN improvements related to the Port of Prince Rupert, as well as near-shoring from Mexico linked with KCS are also unfolding.
- One outcome of current infrastructure projects is an evolving expectation freight movement through the Chicago area will likely grow at a slower pace in the future.
- The Class I Railroads are responding by adding intermodal capacity along their high-density corridors. New yard planning / construction is underway in North Baltimore, OH, Las Cruces, NM; Kansas City, KS; Chicago; IL; and other cities.

For the Midwestern U.S., these changes are unfolding in an uncertain economic environment. While the Midwestern economy is recovering, linked in part with growth in automotive, rates of underlying job creation have been slow.

04

St. Louis Regional Freight Infrastructure Context

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Introduction

Today, the St. Louis Region finds itself at a unique moment in time, as it begins to recover from the Great Recession and react deliberately to previously described transportation infrastructure shifts now unfolding across North America and across broader global supply chains. Understanding the impact of these structural changes builds from a basic understanding of how the Regional transportation system functions, and the nature of what exactly is moving through the Region. With these points in mind, the following analysis of local freight movement will build from several related steps:

1. Use of Geographic Information Systems (GIS) data to place the regional freight movement system in context. This analysis, covering primarily road and rail networks, bridges, and river terminals, is summarized in this Section (04).
2. Section 07 overlays this information with a more detailed land use discussion, with a specific focus on 23 areas where industrial and distribution land use aligns with supply chains and modes of transportation.
3. Section 08 places the St. Louis Region in a broader freight movement context, framing what commodities are moving, and how their origins and destinations correlate with the St. Louis Region, present and future.

This section summarizes key outputs from the GIS analysis, along with a review of broader freight performance measures compared to geographic peer metropolitan areas, such as Memphis, Indianapolis, and Pittsburgh.

GIS Framework

The GIS framework developed for this study was extensive, accessing GIS data from multiple sources, including:

- ESRI, Inc.
- U.S. Department of Transportation
- Federal Railroad Administration
- MoDOT and IDOT
- East-West Gateway Council of Governments
- County planning / GIS departments in St. Louis (City and County), Madison County, and St. Clair County.
- Locations of industrial buildings, along with occupancy, employment, and related metrics
- Traffic, truck speed, and train count data from above noted sources

Information from the above sources was overlaid and synchronized to the extent possible, with the intent being to create a stable GIS platform for the St. Louis Region to use moving forward. For example, the analysis completed a review of the regional rail network, overlaying GIS information with aerial photography, and supported by limited field surveys, to clarify rail lines that are currently in use.

Key outputs from this exercise have been summarized in this section. The GIS files have been provided as a separate deliverable.

Historical Context

An array of sources were used to identify approximate dates when key pieces of regional freight and transportation infrastructure were initially built, and in many cases rebuilt. These assets form the baseline for regional freight infrastructure. Key projects include: (Bold – estimated future date)

1874 - Eads Bridge opens

1890 – Merchants Bridge opens (rail only)

1910 - McKinley Bridge opens; purchased by City of Venice in 1958

1917 - MacArthur Bridge opens (rail primarily)

1921 – Original Chain of Rocks Bridge opened (Route 66 Bypass)

1935 / 1989 / **2015** – Daniel Boone Bridge (carrying I-64 / U.S. 40 / U.S. 61 across the Missouri River)

1951 - Martin Luther King Memorial Bridge opens

1958 / 1978 / **2013** – Blanchette Bridge (carrying I-70 across the Missouri River)

1967 - Poplar Street Bridge opens (carrying I-55, I-64, and I-70)

1967 – New Chain of Rocks Bridge opens (carrying the I-270 bypass)

1983 / 1990 – Jefferson Barracks Bridge opens (carrying the I-255 bypass)

1994 – Clark “Superbridge” Opens (U.S.-67 to Alton)

1997 – MidAmerica Airport opens

2000 - Triple Crown Services Intermodal Yard opens near Edwardsville, IL; the newest intermodal yard in the St. Louis Region.

2003 – Veterans Memorial Bridge (Missouri River crossing for MO 364)

2006 – Lambert-St. Louis International Airport Expansion – New runway completed

2007 – Reconstruction of I-64 begins

2011 – Tri-City Port District begins construction of new port area on Mississippi

2013 – 110 MPH passenger rail between St. Louis and Chicago begins, incrementally

2013 / 2014 – I-270 Chain of Rocks Canal Bridge expected to open

2014 – New Mississippi River Bridge expected to open

2014 – Poplar Street Bridge / access improvement project begins

2017 – Washington Bridge (Route 47) replacement scheduled for completion

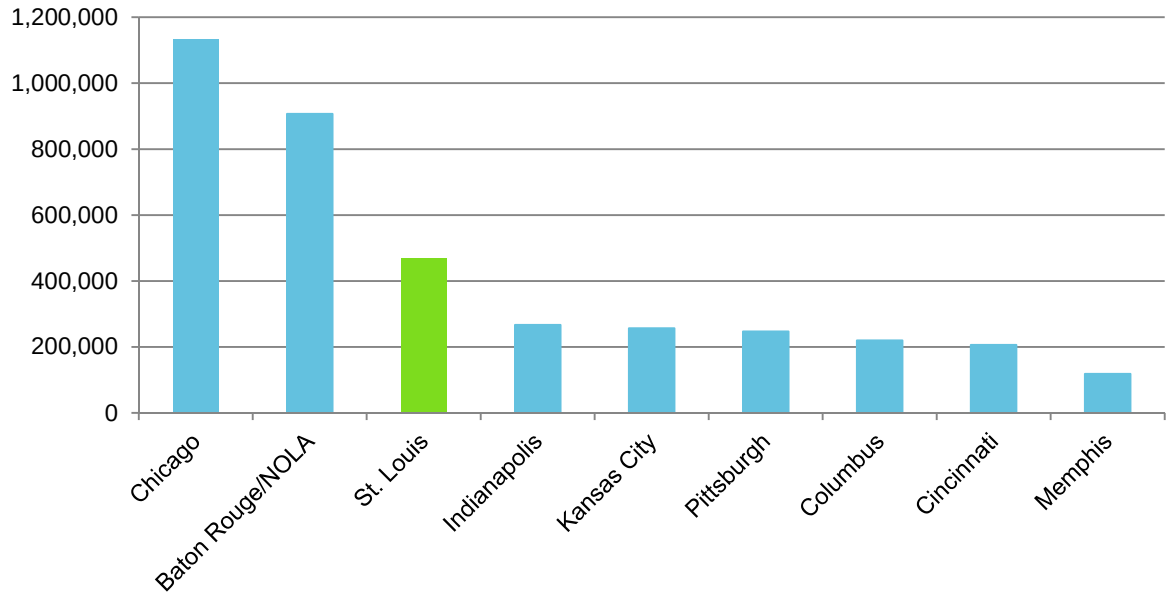
These dates are emphasized for several reasons:

1. The impending opening of the new Mississippi River, along with associated improvements to the Arch grounds and the Poplar Street Bridge will be transformative for the St. Louis Region.
2. Maximizing the return on investment in the St. Louis Region's interstate bridge infrastructure will be critical for the St. Louis Region's future growth.
3. While the St. Louis Region's past and present has been focused on crossing the Mississippi River, its future may be about intermodal and freight rail capacity improvement, and how they align with the river.
4. As the St. Louis Region digests current projects, evolving congestion associated with truck usage of the I-270 New Chain of Rocks Bridge need to be kept in mind.

Midwestern Freight Movement Comparisons

The St. Louis Region handles significantly more freight tonnage compared to its geographic peers (excluding Chicago). In terms of total inbound and outbound tonnage (using 2007 data from the U.S. Department of Transportation's Freight Analysis Framework tool) the St. Louis Region (468,000 thousand tons) handled about twice as much freight as other comparable regions. As exhibited by Figure 1, the St. Louis Region ranks well ahead of Indianapolis (266,000 thousand tons), Kansas City (256,000 thousand tons) and numerous other mid-sized regions in total tonnage. As expected, the Chicago Region has a much higher combination of inbound and outbound tonnage.

Figure 1 – Thousands of Tons of Freight Moving Through Noted Regions, 2007

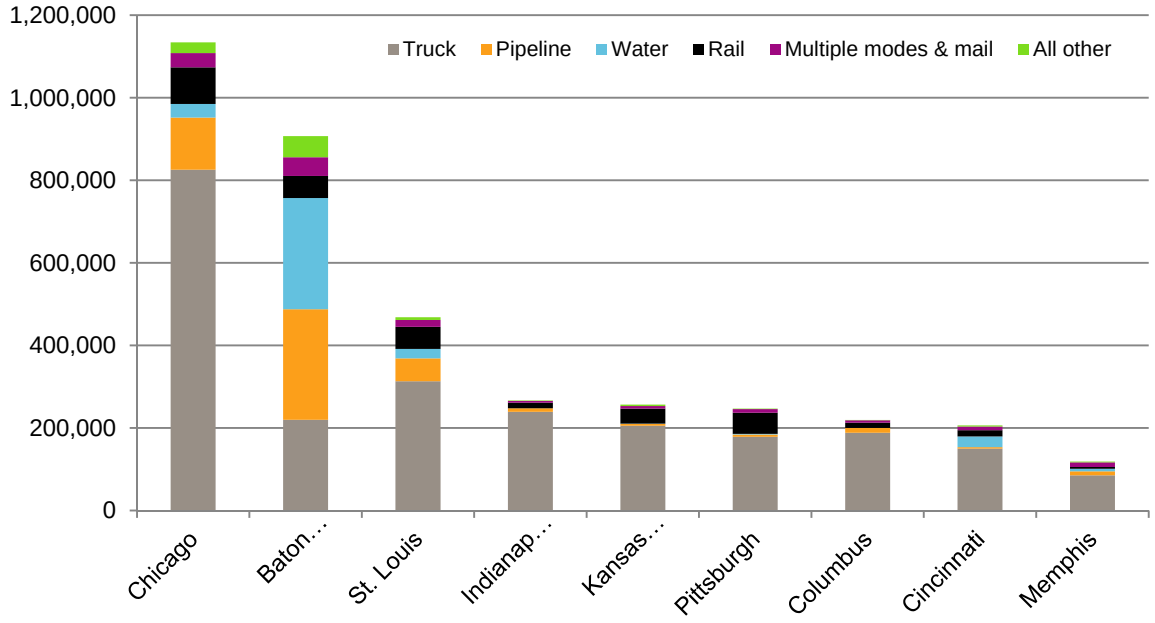


Source: Freight Analysis Framework

It is worth noting the Baton Rouge and New Orleans Region is essentially a combination of two physically separate mid-sized regions, connected by the Mississippi River. If this region were kept separate, St. Louis would fall in between the two in total tonnage; New Orleans would have nearly 100,000 tons more than St. Louis and Baton Rouge would have about 125,000 tons less.

The chart in Figure 2 below highlights changes in total tonnage by transportation mode across the noted metropolitan areas. Although the majority of tonnage is transported by truck in nearly all of the selected regions, regional variation in terms of tonnage by mode is considerable. The Baton Rouge/New Orleans Region is certainly an outlier since it includes robust water and pipeline segments. While total tonnage by rail is most significant in Chicago, Baton Rouge/New Orleans, and St. Louis, the relative share of tonnage by rail across all modes is highest in Pittsburgh (20%) and Kansas City (14%). Ignoring Baton Rouge/New Orleans, St. Louis actually has the lowest share of total tonnage by truck at 67%. Most other benchmark regions have a truck share in the 72 to 80% range. The regions that do not have a major river (Indianapolis and Columbus) have the highest share of tonnage devoted to truck transport.

Figure 2 – Breakdown by Mode Freight Moving Through Noted Regions, 2007

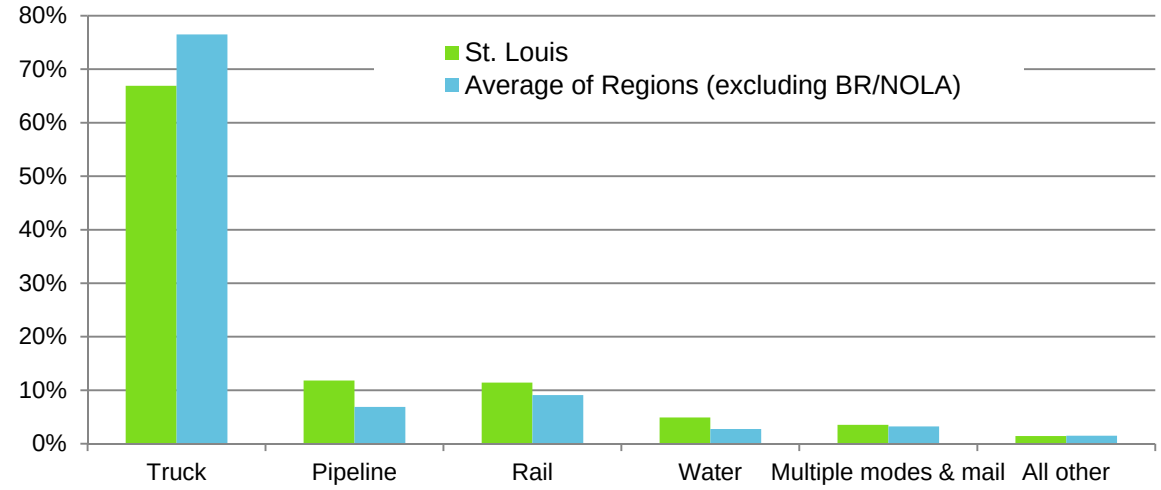


Source: Freight Analysis Framework

St. Louis has a different composition than the other regions. When the total tonnage of the seven other regions (excluding St. Louis and Baton Rouge/New Orleans) are combined and averaged according to transportation mode share for the entire sample, St. Louis shows a somewhat different makeup across nearly all modes. Key points include:

- Reflecting access to a greater number of modes, St. Louis is slightly less reliant on trucking compared to the other regions
- St. Louis is also more reliant on rail and water compared to the average
- Pipeline flows are a notable trend, with St. Louis seeing a recent increase in flows, above the average for the other regions.

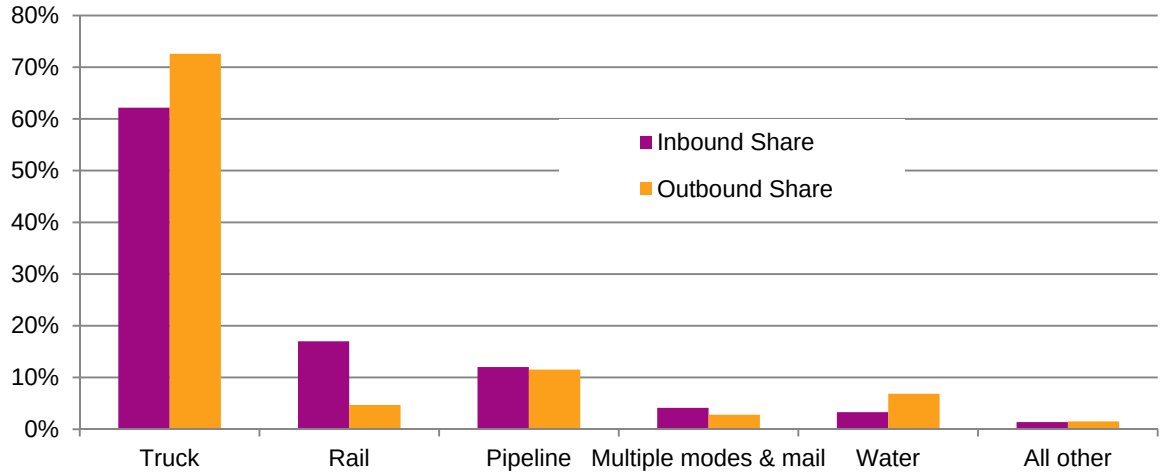
Figure 3 – Modal Share Comparison, St. Louis to Noted Regions, 2007



Source: Freight Analysis Framework

Differences in inbound and outbound tonnage vary by transportation mode in St. Louis. Inbound tonnage is greater than outbound tonnage for each of the various transportation modes, except water, which shows a greater outbound tonnage flow, linked entirely with down-river commodity movement.

Figure 4 – Modal Share Comparison, St. Louis to Noted Regions, 2007



Source: Freight Analysis Framework

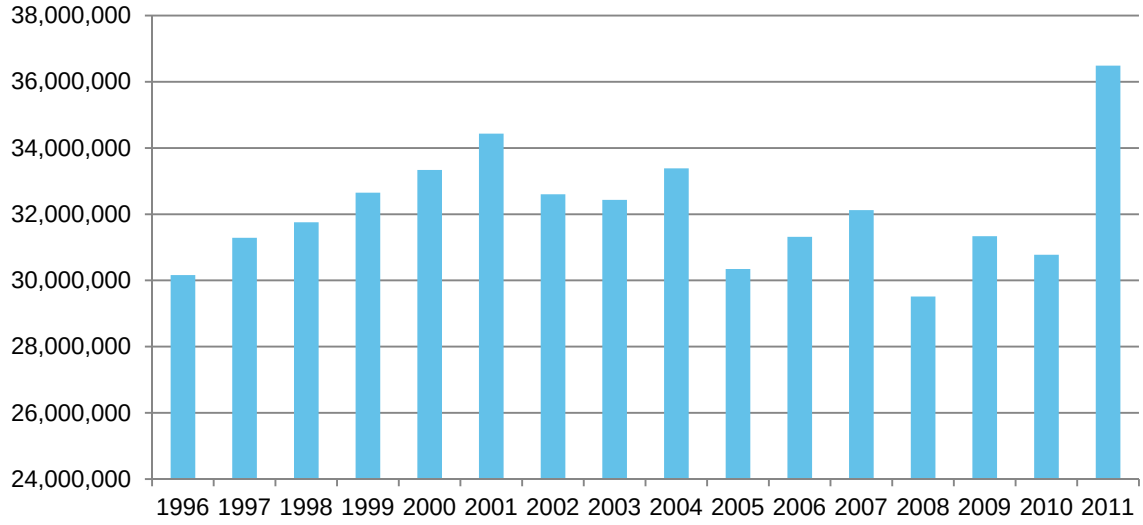
Mississippi River Freight Movement Context

The GIS context for waterborne freight begins with two maps on following pages depicting the locations of key terminals along the Mississippi, Missouri, and Kaskaskia Rivers, along with clarification regarding which port district each terminal is associated with by the U.S. Army Corps of Engineers. Distinctions between public and private terminals are also noted.

Port Tonnage Comparisons

Figure 5 summarizes a 16-year trend for freight tonnage moving through the Port of St. Louis, as defined by the U.S. Army Corps of Engineers. Totals for St. Louis over the noted period (1996 to 2011) were compared against totals for the top 150 port districts in the U.S.

Figure 5 – Waterborne Tonnage Trend, Port of St. Louis

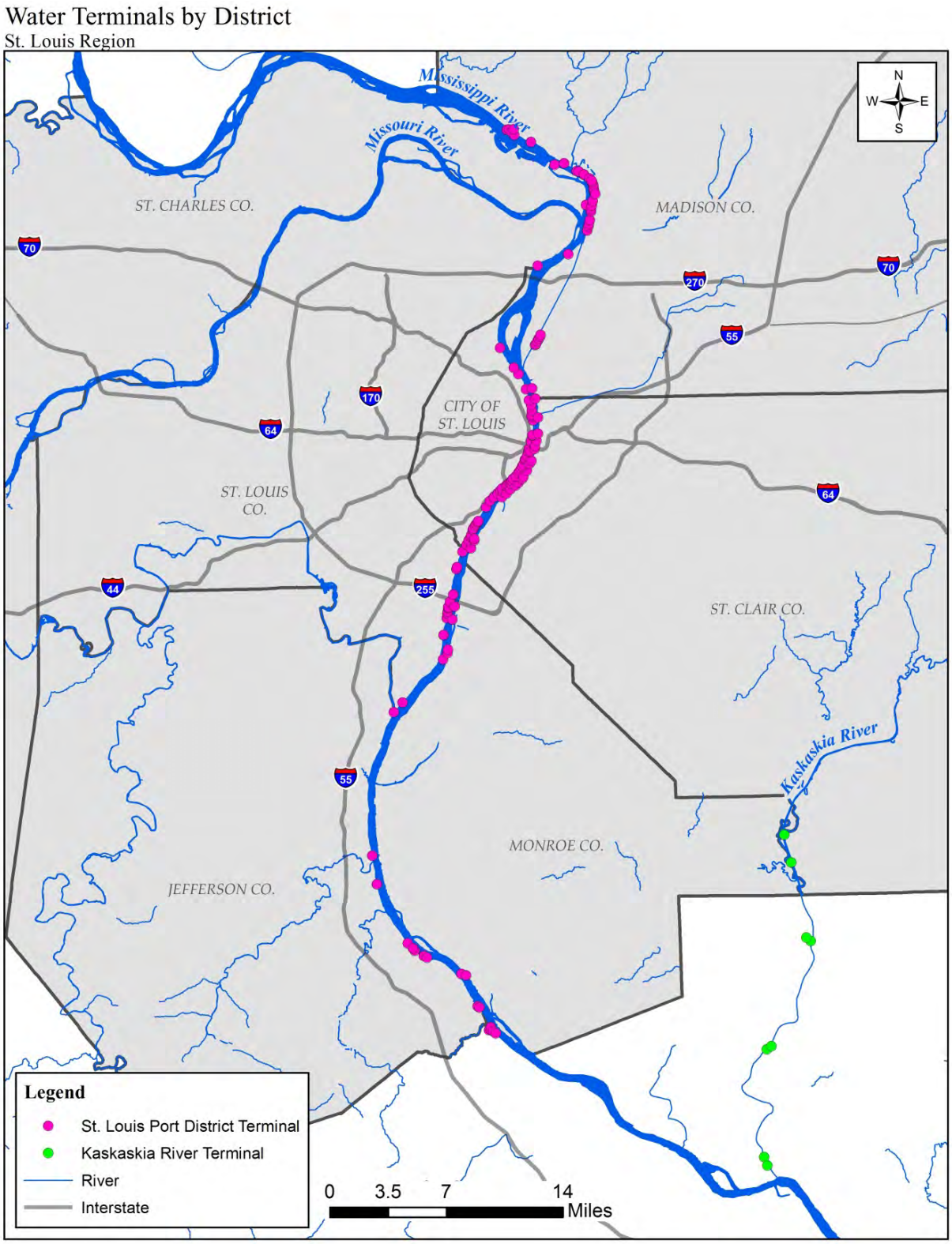


Source: U.S. Army Corps of Engineers Navigation Data Center

Key trends include:

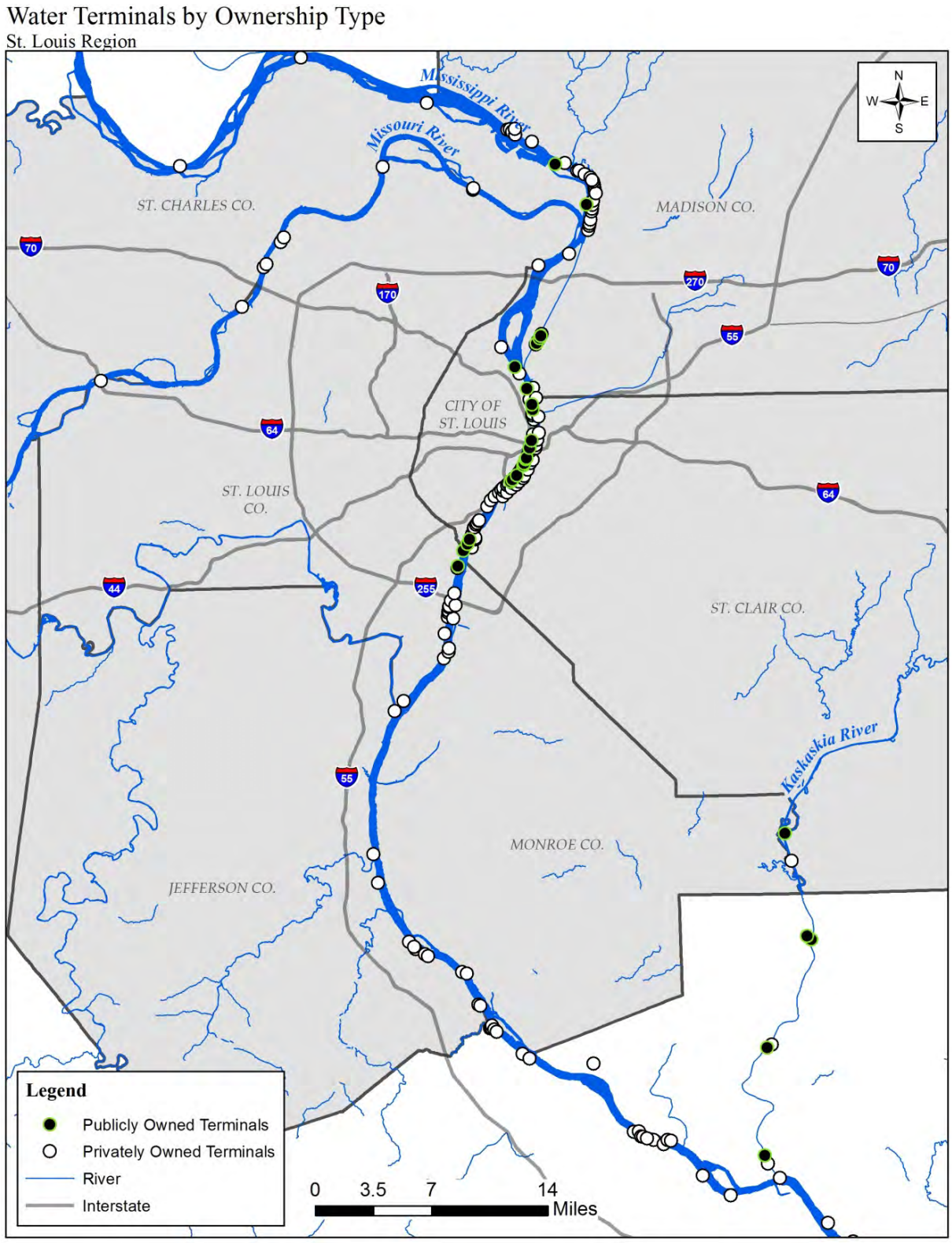
- Between 1996 and 2011, the St. Louis Regional Port District saw notable growth in tonnage, increasing from about 30.1 million tons to about 36 million tons, representing annualized growth of about 1.3% per year. Looking at the top 30 U.S. port districts, the total tonnage grew at an annualized rate of about 0.5% per year by comparison.
- For St. Louis, excluding 2011, where reported tonnage increased significantly, growing from 30.7 million tons to 36.4 million tons, the 15 year annualized growth rate has been much slower, only about 0.13% per year.
- The significance of the tonnage increase for 2011 cannot be understated, moving the St. Louis Regional Port District from 24th up to 18 out of 30. As a top 20 port district, the St. Louis Region would expect to see greater pressure on transportation assets, including rail and road modes that complement the waterway transport.

Figure 6 – St. Louis Port District Terminal Information



Source: U.S. Army Corps of Engineers

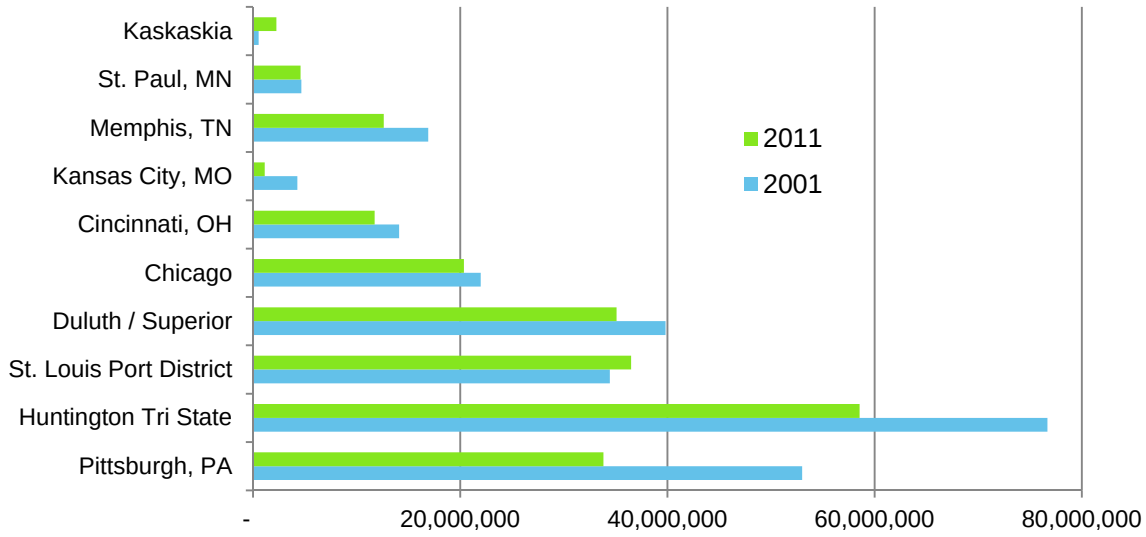
Figure 7 – St. Louis Terminal Ownership Information



Source: U.S. Army Corps of Engineers

Excluding deep water ports, the St. Louis Regional Port District would rank second in total tonnage, with only the Huntington-Tristate area ahead (58,551,459 tons). This port district has been enlarged to cover an extensive geographic area along the Ohio River, covering Ohio, Kentucky, and West Virginia. The following chart summarizes tonnage comparisons for noted port districts.

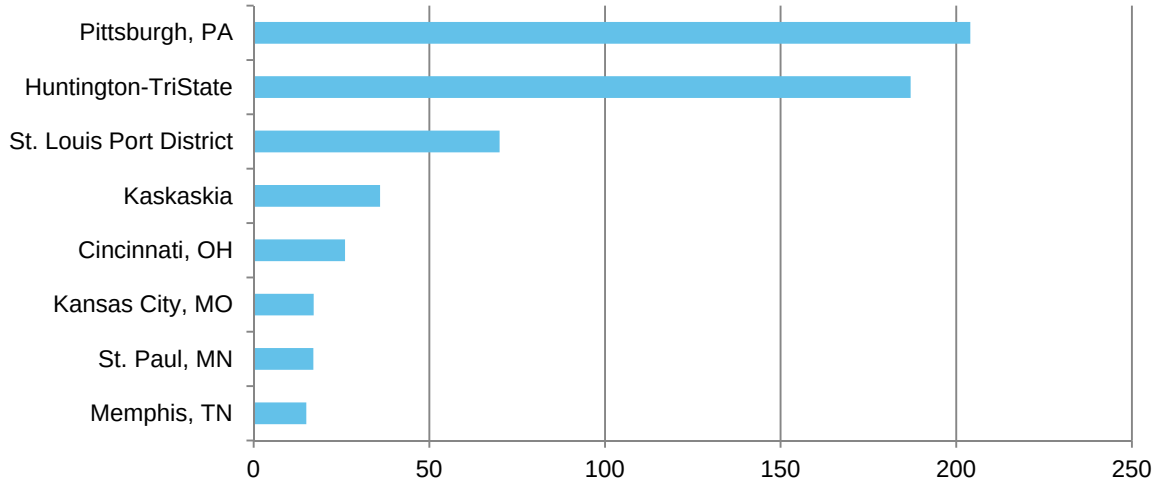
Figure 8 –Waterborne Tonnage Trend, Noted Port Districts



Source: U.S. Army Corps of Engineers Navigation Data Center

The following chart summarizes the number of mileposts for each port district, based on U.S. Army Corps of Engineers GIS data. The table reinforces a basic point, which is that port districts such as Pittsburgh and Huntington-TriState are much larger than districts such as St. Louis and Kaskaskia.

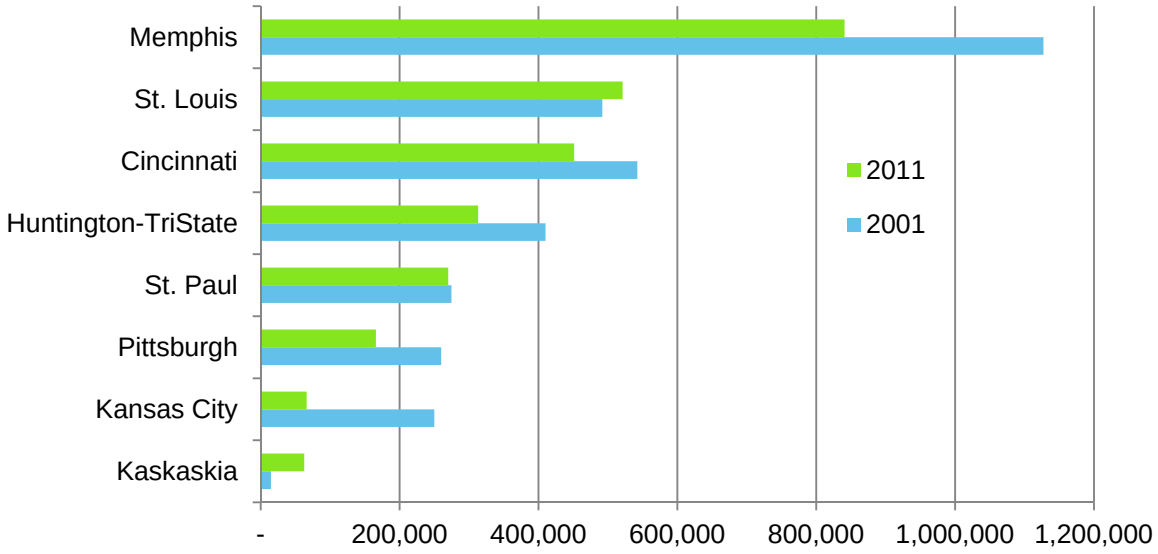
Figure 9 – Port District Length, by Milepost



Source: U.S. Army Corps of Engineers Navigation Data Center

Combining the port district length and tonnage factors to arrive at a metric of tonnage per mile of port district, as shown in the following chart, highlights the point that while Huntington-TriState is the largest port district in terms of tonnage, on a per mile basis, its efficiency is lower than that of St. Louis or Memphis, the latter of which is the most efficient per mile in moving tonnage.

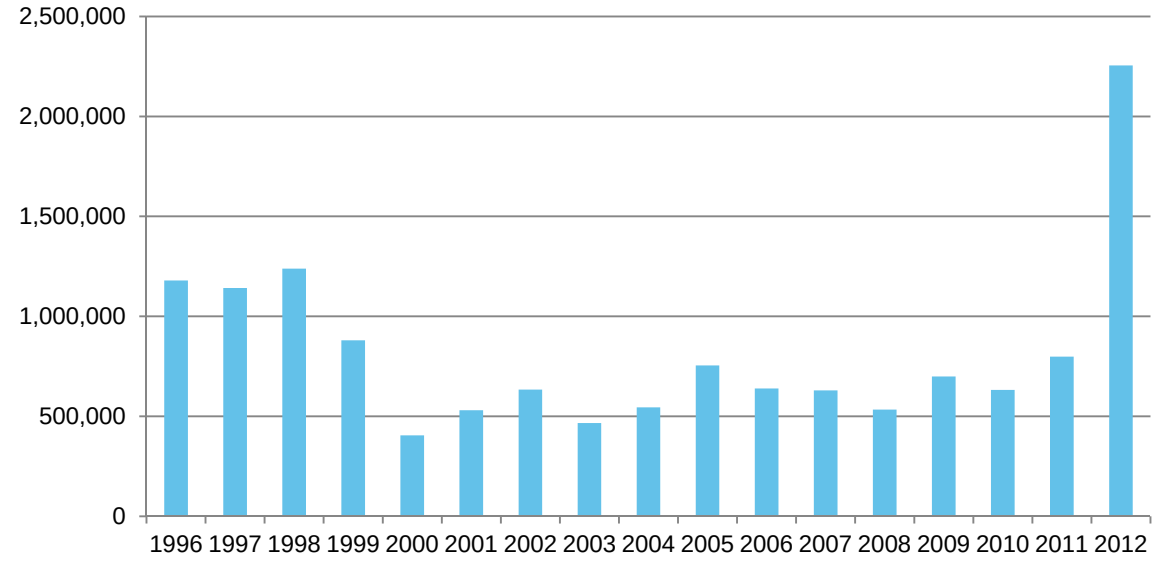
Figure 10 –Waterborne Tonnage per Mile of Port District, Noted Port Districts



Source: U.S. Army Corps of Engineers Navigation Data Center

For the St. Louis Region, it is important to recognize how the recent transload investments along the Metro East riverfront can boost freight movement, both up and down river. These projects begin with the Kaskaskia Port District, which is located along a 35-mile controlled segment of the Kaskaskia River south of St. Louis in Illinois

Figure 11 –Waterborne Tonnage Trend, Kaskaskia Port District, Fiscal Year Basis



Source: Kaskaskia Port District

In 2012, the Kaskaskia Port District received $15 million in federal money for dredging. The Kaskaskia Port District has made other improvements as well, including support for investments to the Kellogg Terminal. As Figure 11 shows, trends for fiscal year 2012 are positive, with further growth expected for 2013 and beyond. Kaskaskia is currently not part of the "Port of St. Louis", nor is defined as an explicit port district by the U.S. Army Corps of Engineers.

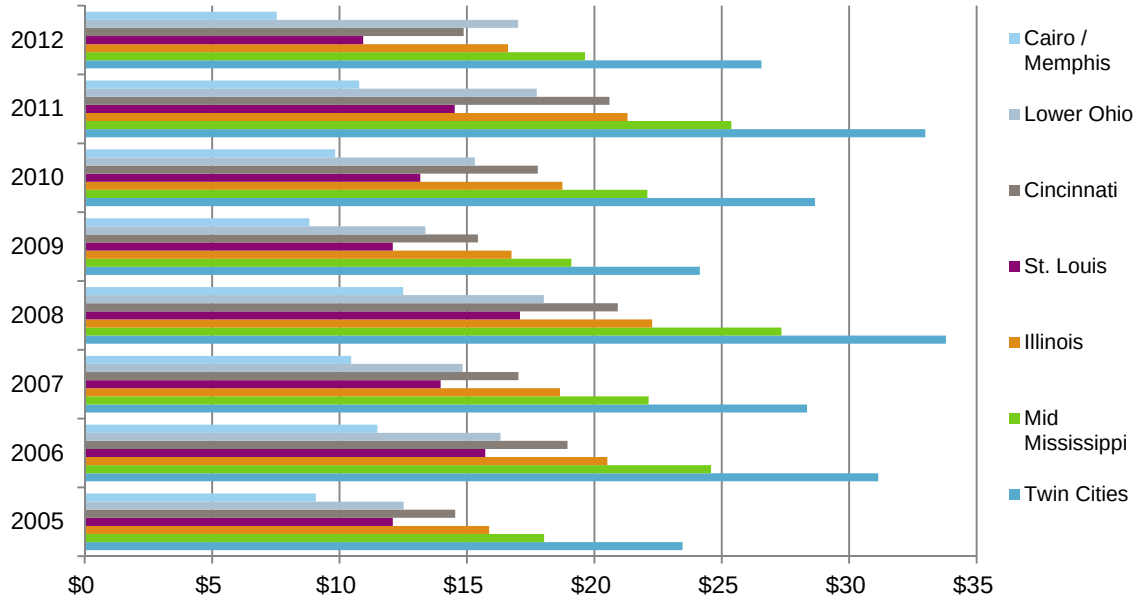
Other port terminals that fall within the Port District of St. Louis and are planning improvements include:

- Bunge North America / SCF Marine / St. Louis – Plans were announced in 2011 to build a $20-million-dollar grain terminal on a 40-acre site that is generally in Fairmont City to receive grains, soybeans, and other commodities for domestic and export markets.
- American Milling – A $13-million-dollar coal terminal expansion on 600 acres is underway that can transfer 10 million tons of coal per year from rail to barge.
- Port of St. Louis / City of St. Louis – About $20 million to upgrade the 27-acre municipal river terminal, focused on specific improvements to two docks, which reportedly handle about 2.2 million tons of bulk freight annually. Plans are underway to reinvest in the northern waterfront, a 3,000-acre levee protected industrial area which includes a number of intermodal yards with access to I-70.
- America's Central Port / Tri-City Port Authority / Granite City, IL. – This port authority across from St. Louis has received TIGER grants to support the South Harbor project. Once completed, the South Harbor will be the most northerly rail, river and roadway freight transfer location south of the Mississippi River lock system. In April of 2013, port officials signed an agreement to support cooperative marketing efforts, share data, and coordinate prospects and opportunities.
- Riverview Commerce Park / Jefferson County Port Authority – Developers are proposing reuse of the Doe Run lead smelter in Herculaneum into an intermodal port facility. As part of the proposal, Doe Run would sell a portion of the roughly 500-acre site to a developer.

Competitive Positioning

While the Mississippi River is a key piece of the U.S. freight transportation system, it is clear that river system infrastructure faces challenges, particularly north of St. Louis where a total of 29 locks are used to ensure navigability. The majority of the locks have exceeded their economic lifespan, while struggling with operational challenges, including lock sizes that are too small for modern barge tows. This factor drives a significant discount in shipping costs for St. Louis and points south, as shown in Figure 12. The analysis shows that transportation costs from the Twin Cities are significantly more expensive compared to St. Louis, at over $25 per ton, compared to slightly over $10 per ton for delivery from St. Louis. Cost differences are also noted for Cincinnati and the Lower Ohio area, both of which are more expensive than St. Louis as origin points. These cost premiums relate to the reality of increased time, operating cost and labor required to traverse the upper Mississippi and Ohio River lock systems. The one origination point that is less expensive than St. Louis is southern Illinois / Cairo, at under $10 per ton in 2012.

Figure 12 – Southbound Barge Rates, Dollars per Ton for Grain, From Noted Starting Points



Source: USDA Agricultural Marketing Service

Implications

For St. Louis, the analysis reinforces several points:

- Although port districts such as Huntington-TriState are larger, St. Louis appears to be more efficient in moving tonnage across the river. Looking to the future, Memphis appears to be a better benchmark for freight movement efficiency.
- As a top 20 port district as of 2011, the St. Louis Region will need to take active steps to sustain this competitive position, as it will require greater cooperation between individual counties on both sides of the Mississippi River.

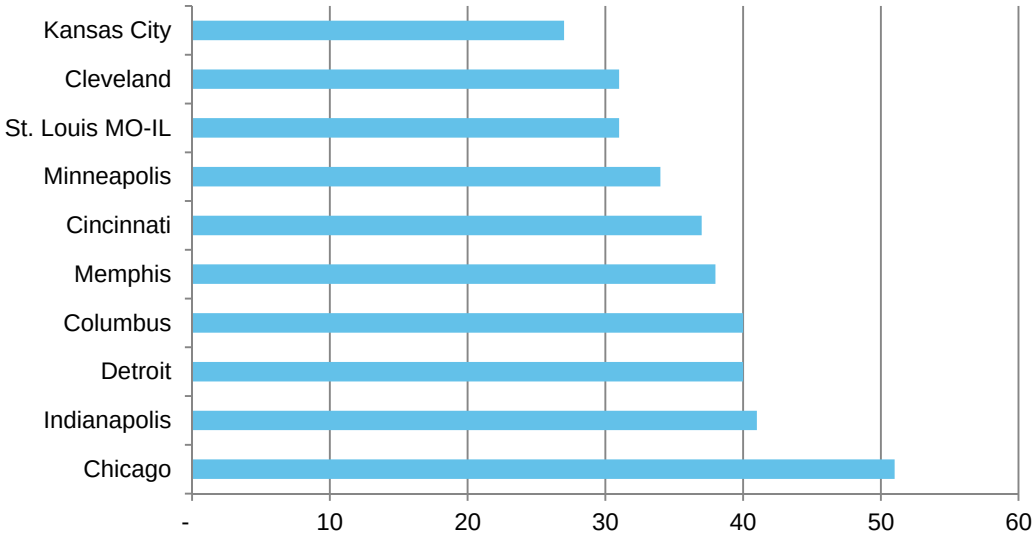
Interstate Congestion

Congestion on local arterials and interstates remains an ongoing topic of conversation locally. For the Freight Study, the analysis initially focused on broader measures of congestion, using data reported by the Texas Transportation Institute's Urban Mobility Report, with trend data through 2011. The analysis focused on three core metrics, with analysis centered on the St. Louis Metropolitan Area against a set of benchmark metropolitan areas:

- Average Hours of Delay per Commuter
- Annualized Growth Rate in Public Transit Annual Passenger Miles
- Growth Rate in Peak Period Travelers

In terms of average hours of delay per commuter, the analysis places St. Louis lower in the overall rankings with just over 30 hours per commuter per year. For perspective, Chicago comes in at an over 50 hours per commuter per year. Growth in public transit was also considered. From this vantage point, St. Louis performs better, due in large measure to its status as a larger metropolitan area with a more extensive public transit system compared to smaller cities. Lastly, the analysis considered the overall growth rate in the number of peak period commuters. This metric pointed to an ongoing deeper concern; a lack of growth in the St. Louis Region.

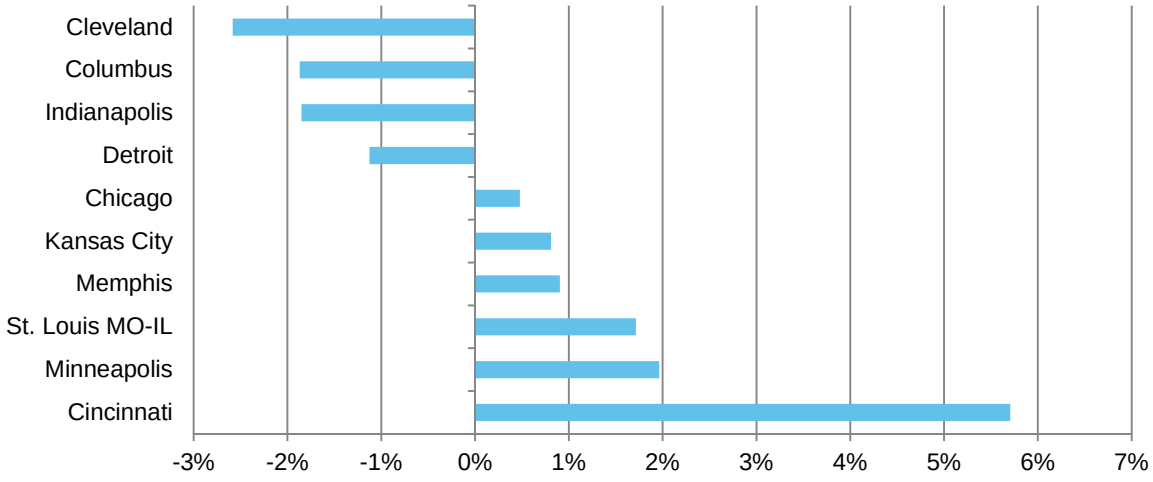
Figure 13 – Average Hours of Delay per Commuter, 2011



Source: Texas Transportation Institute Urban Mobility Report

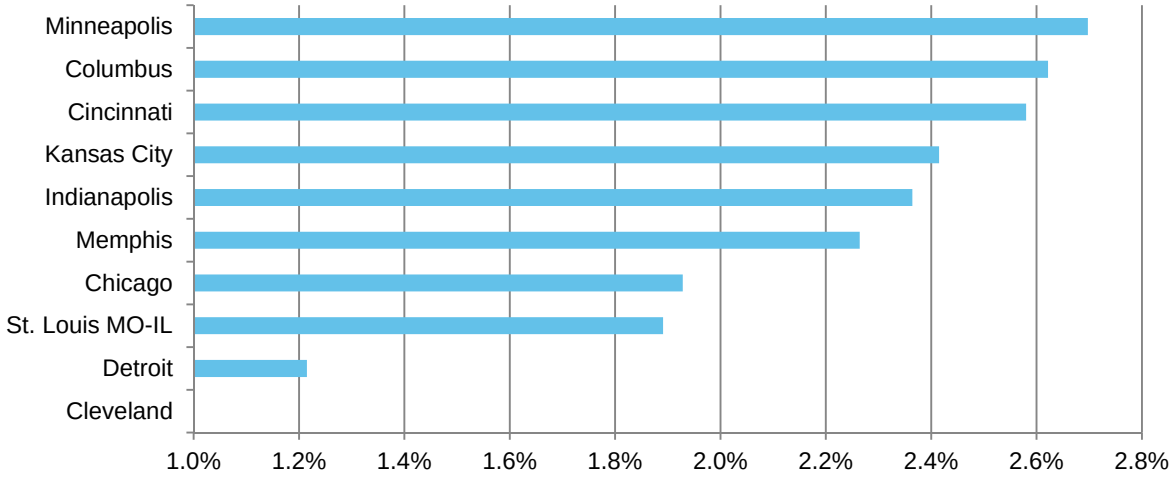
Lastly, the evaluation examined the annual hours of delay per auto metric, comparing the St. Louis Region to the large city average defined by the Texas Transportation Institute. The analysis revealed strong growth in hours of delay per auto commuter between 1995 and 2000. Growth since 2000 has been at rates below the benchmark average.

Figure 14 – Annualized Growth Rate in Public Transit Annual Passenger Miles



Source: Texas Transportation Institute Urban Mobility Report

Figure 15 – Growth Rate in Peak Period Travelers



Source: Texas Transportation Institute Urban Mobility Report

Truck Congestion

The framework for analysis of truck congestion is built from data from the American Transportation Research Institute (ATRI). Through a partnership with the U.S. FHWA (project sponsor) and beginning in 2012, ATRI has created a National Corridor Analysis and Speed Tool, built around billions of truck GPS position points, which include latitude, longitude, and truck speed. The analysis reviewed data from the first 6 months of 2012 to understand specific locations where trucks are slowing down, below posted speeds. Maps on following pages frame the overall interstate transportation system, as well as greater detail regarding average truck speeds for south and westbound travel, as well as north and east bound travel.

Figure 16 – Regional Road Network

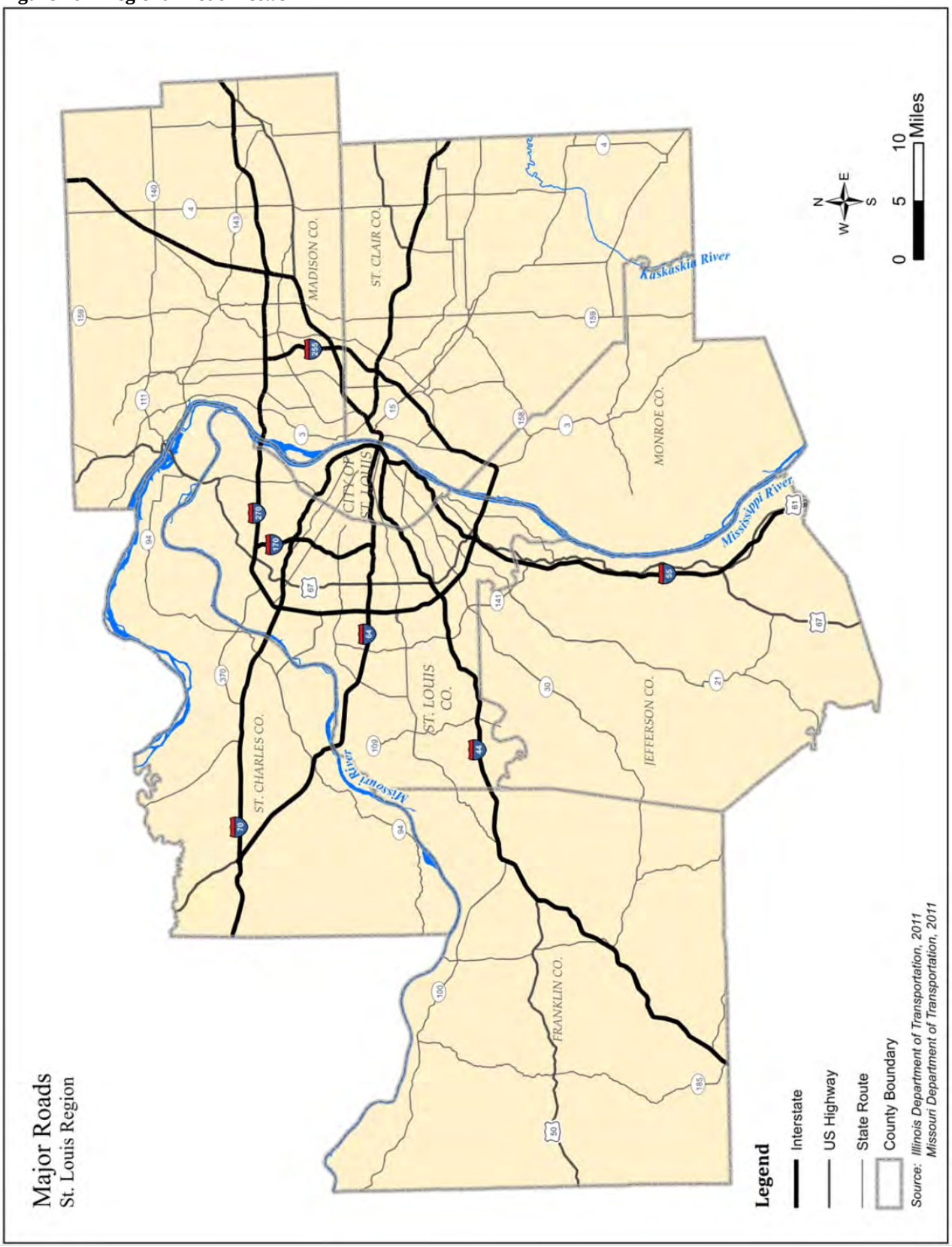


Figure 17 – Average Interstate Truck Speed, Northbound and Southbound

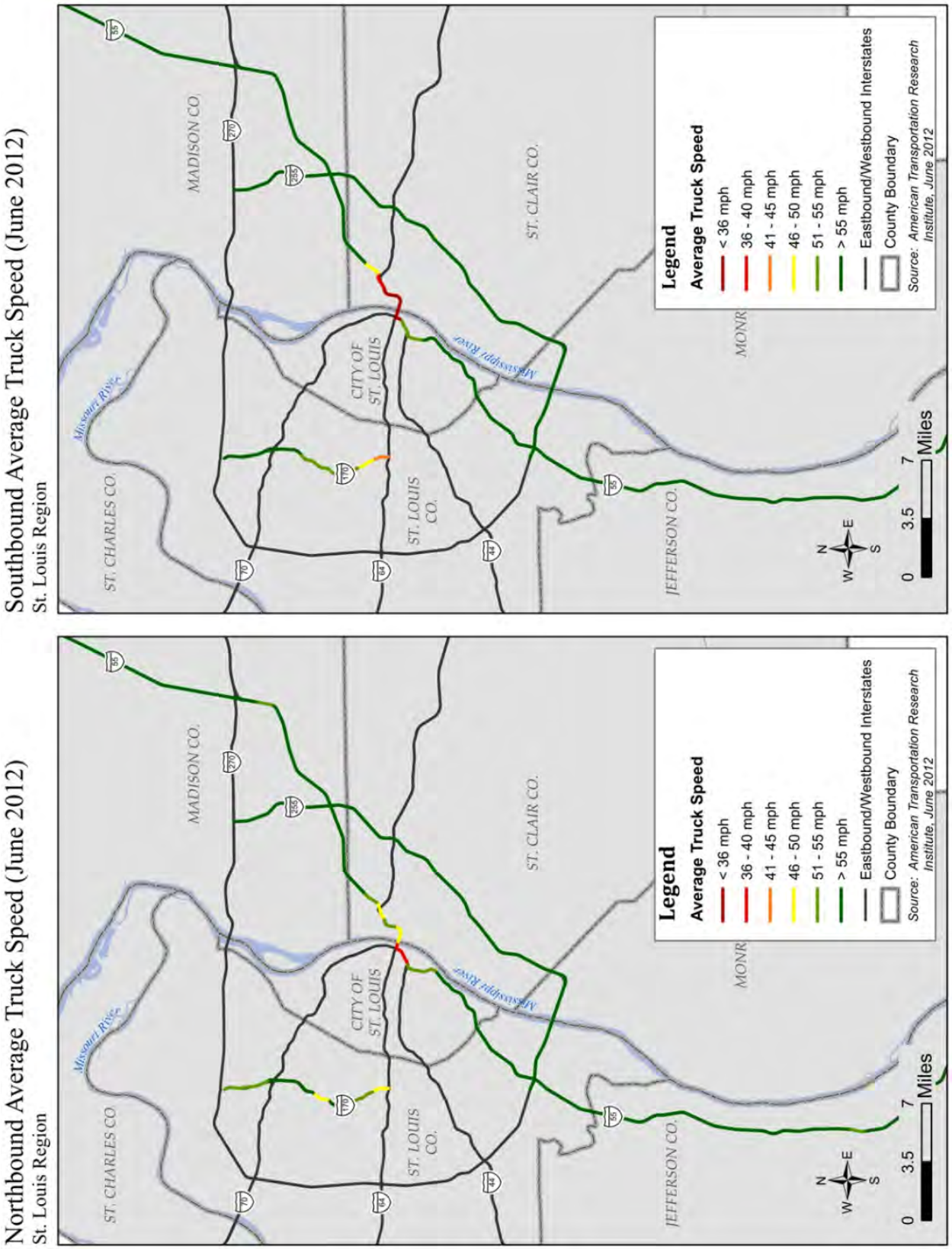
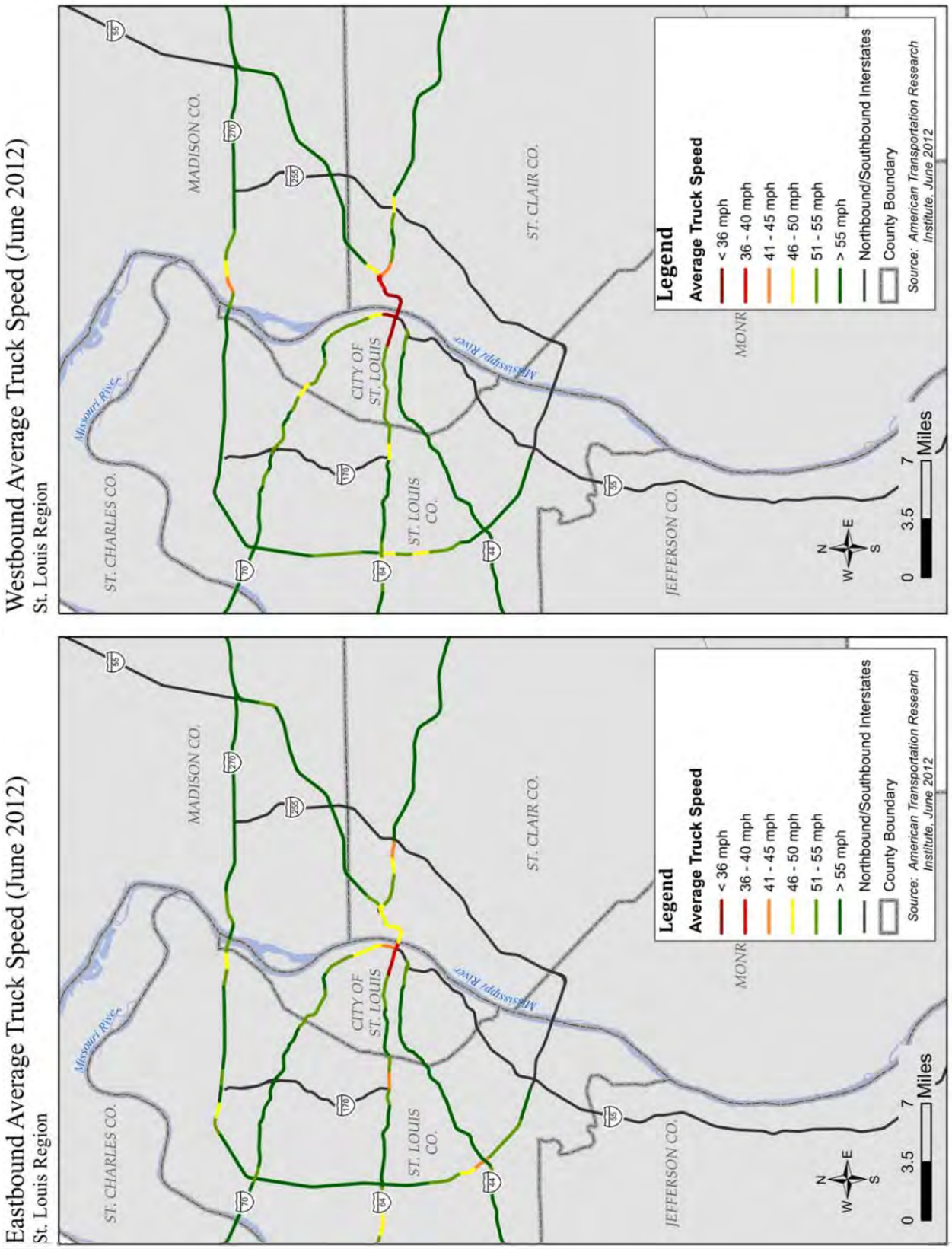


Figure 18 – Average Interstate Truck Speed, Eastbound and Westbound



Implications

- The I-270 bypass north of downtown St. Louis has emerged as a preferred route for truckers trying to avoid downtown congestion due to the unique I-70 geographic positioning. However, the map notes a relevant decrease in speed for trucks approaching the New Chain of Rocks Bridge, which offers two lanes of service in either direction. Importantly, I-270 west of the bridge provides 3 lanes of service in either direction. With expectations that industrial areas such as Gateway Commerce will see additional distribution space development, growth in trucking along this corridor should be anticipated.
- Of evolving concern are arterial and interstate access points that currently serve the St. Louis Region's five existing intermodal yards.

Regional Freight Rail Framework

St. Louis is one of a small number of places in the U.S. where six Class I railroads connect, which is significant given that before industry consolidation over 16 railroads connected through the St. Louis Region to Union Station. Moving forward to today, the regional freight rail network finds itself at a unique moment, beginning with the reality that railroads serving the St. Louis Region are only beginning to achieve pre-recession freight volumes, even as the mix of freight shifts. As well, the St. Louis Region is watching plans being made by IDOT to evaluate High Speed Rail connections between Chicago and St. Louis, with emphasis on the final connection from Alton, IL across the Mississippi River to St. Louis. For the future, the following are key points for the St. Louis Region:

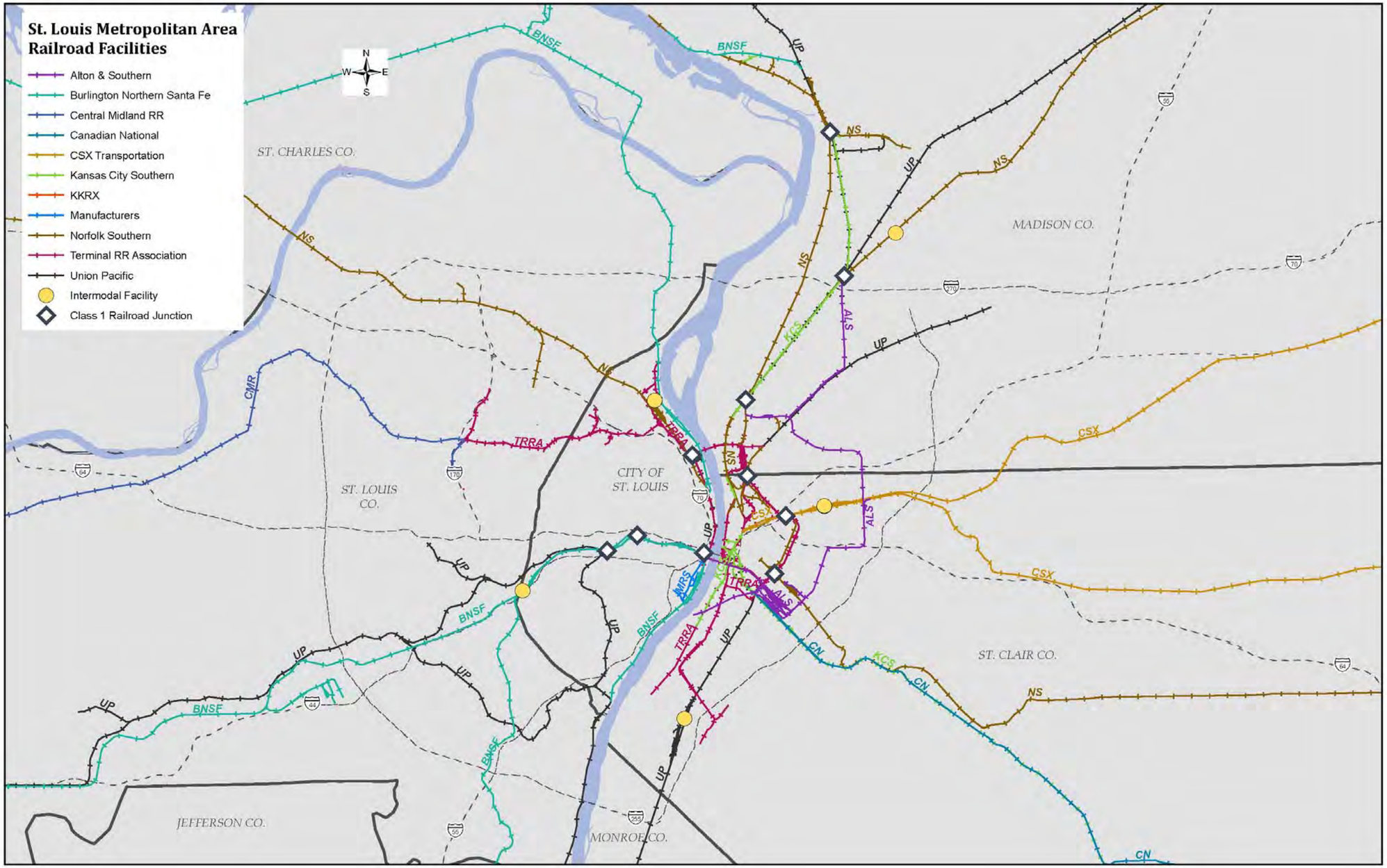
- For St Louis, how rail networks function is a combination of infrastructure (i.e. connections) as well as operational choices (i.e. how railroads choose to operate across a given network). This point is critical for St. Louis, in that the St. Louis Region is dealing with both older infrastructure as well operational choices which may not correlate with known infrastructure conditions.
- Many cities across the country are focused on expansion of passenger rail. While there are many reasons why this is important, adding capacity for passenger rail at the expense of freight rail is not advisable in the long-term.
- Experience in Chicago with CREATE reinforces the evolving need to evaluate those locations across the St. Louis Region where Class I main lines cross at-grade. With future growth in intermodal traffic, it is reasonable to presume that these at grade crossings will become future choke points.

Several Class I railroads have made decisions to close older and smaller hump yards around the U.S., with CP being the most current to announce closures of four facilities. Older yards are being impacted in two ways:

1. They have a harder time managing longer trains; and
2. With increasing intermodal unit train and pre-blocked car activity, the need for hump yards appears to be slowing.

For St. Louis, there are several existing older yards that will likely see increased pressure in coming years. The following map highlights perspectives regarding regional rail infrastructure, with locations of intermodal yards and at grade crossings between Class I and regional railroads noted.

Figure 19 – Regional Rail Infrastructure and Intermodal Yards



Regional Intermodal Framework

One area that has emerged through the study relates to likely growth in intermodal container shipments in, out, and more likely through the St. Louis Region. The 2012 IDOT State Rail Plan provided a clear starting point for the intermodal conversation, by providing 2010 estimated intermodal lifts at each yard, as show below, along with a project estimate for the NS / Triple Crown Yard near the Gateway Commerce Center. The table includes estimates for Twenty-Foot equivalent units (TEU), and average daily trucks visiting each yard. The table identifies about 362,300 container lifts at the five noted yards, or about 652,200 TEU's. Key insights regarding these five yards follow.

Table 1 – Summary of St. Louis Regional Intermodal Yards (Rail to Truck)

Intermodal Yard	Location	2010 Lifts	2010 Estimated TEU	2010 Estimated Truck Visits per Day
NS / Triple Crown Services*	Illinois	50,000*	90,000	137
BNSF Lindenwood Yard	Missouri	58,219	104,794	160
CSX Rose Lake	Illinois	68,016	122,429	186
NS Luther Yard	Missouri	81,973	147,551	225
UP Dupo Yard	Illinois	104,129	187,432	285
Total Lifts		362,337	652,207	993

Notes:*=estimated
1 TEU = 1.8 lifts
Source: Illinois Dept. of Transportation State Rail Plan and AECOM

The NS Luther Yard is located in the City of St. Louis, and offers access to I-70 off Hall Street via Adelaide. While arguably capacity constrained, uses surrounding this intermodal facility are generally supportive and terrain is not a factor. There are a significant number of older distribution centers along Hall Street as well, along with yards that provide container storage. Other factors, identified as part of the St. Louis Development Corporation (SLDC) North Riverfront Commerce Corridor Study included:

- Areas along Hall Street have localized stormwater problems, as well as older combined sewer and stormwater systems.
- There are a number of older brownfield sites with variable environmental conditions.
- Access from Hall Street to I-270 via Riverview needs improvement.
- The area is crossed by many at-grade rail crossings, several of which are in poor shape. Closure of some at grade crossings could also aid assemblage of sites.
- The plan recommended implementation of an intelligent transportation system, which would alert drivers / truckers to blocked at-grade rail crossings.

The UP Dupo Yard is located in the town of Dupo, IL, with access to I-255. The yard is currently planned for an expansion. IDOT has also identified a new interchange (Davis Street Ferry) off of I-255 which will enhance access to the Town of Dupo, and reduce the number of at grade crossings through the yard. A significant distribution project, Discover Business Park has been proposed in this area, aligned with planned intermodal yard improvements. The project could cover between 1,000 and 2,000 acres and support more than 20 million square feet of distribution and manufacturing space at build out. Although this project would compete with Gateway Commerce Center, immediate proximity to the UP yard and access to I-255 and I-270 would be competitive advantages. From an

intermodal standpoint, according to the Dupo-EC Community Times, the yard averaged about 390 lifts per day (or over 140,000 lifts) in 2012, with between 60 and 80 trains per day moving through the yard. Based on reported lifts in 2010, (104,000) this yard has seen significant growth through 2012.

The BNSF Lindenwood Yard is located in St. Louis. It is arguably the most constrained intermodal yard in the St. Louis Region in terms of growth potential, primarily by topography and adjacent interstate right of way. As well, this yard is located in proximity to a number of residential areas. Truck access is also of concern, with truck count information suggesting that approximately 1000 trucks per day are existing I-44 near this yard, near the intersection of Jamieson and Arsenal. Other factors for this yard relate to the proximity of the site to older existing distribution and manufacturing operations.

The CSX Rose Lake Yard is located in Metro East, accessed off of I-55/70 via Collinswood Road and IL 230. The yard is bounded by residential areas to the north and south, in the jurisdictions of Fairmont City and Washington Park. This yard appears to have only limited potential areas for expansion, with a limited amount of modern distribution space in proximity to the yard.

The Triple Crown Services Intermodal Yard is located north of the Gateway Commerce Center off of IL Route 111. The six-acre yard is the newest intermodal asset in the St. Louis Region, having been opened in 2000. When it first opened, there was a reported expectation for perhaps up to 50,000 lifts per year. The yard is adjacent to Gateway Commerce Center, which currently includes about 9 million square feet of distribution space, with room for an additional 14 million square feet.

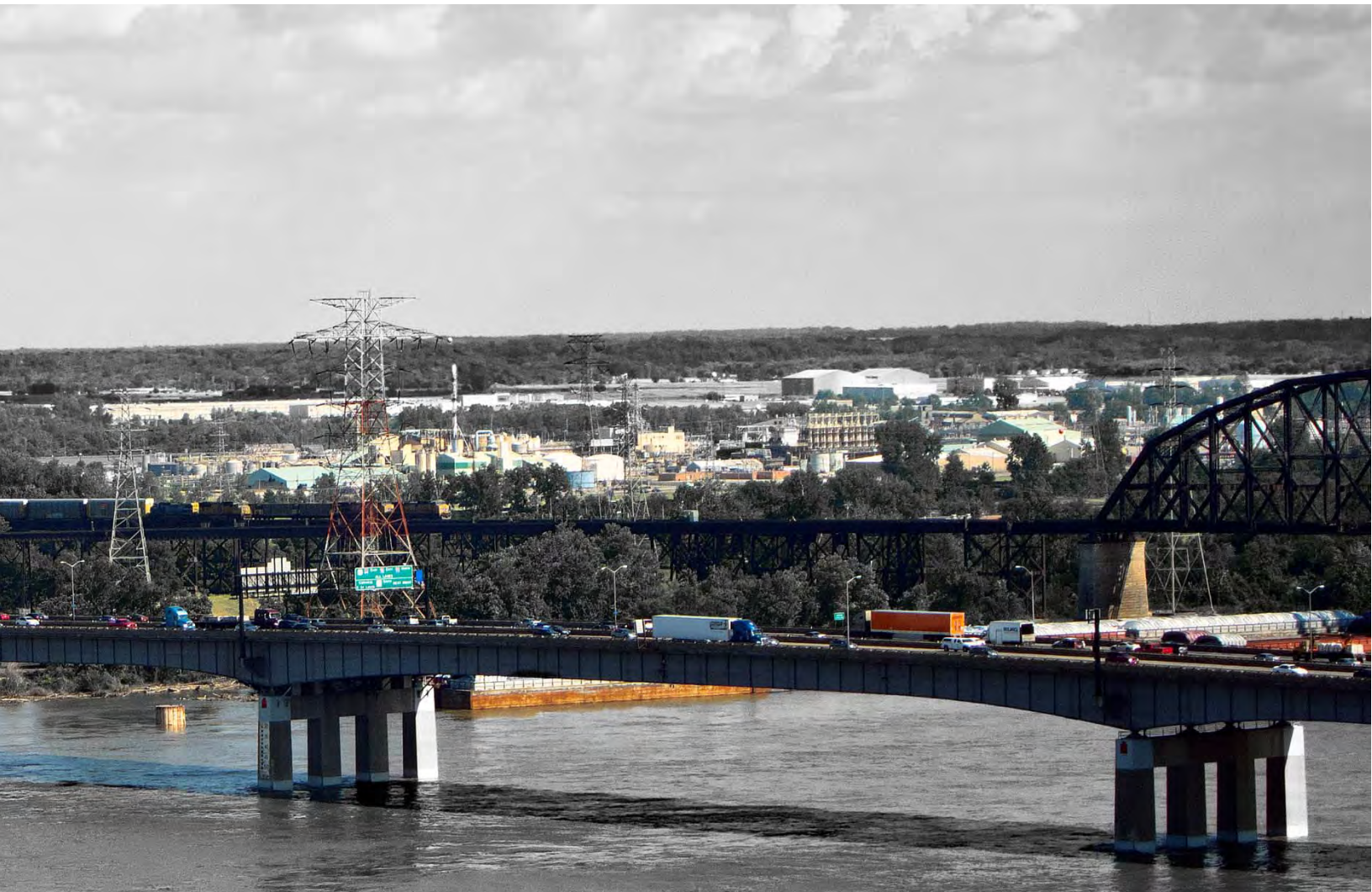
One core area of concern for intermodal arises in expectations for growth in domestic container shipments through the St. Louis Region, given that a majority of existing yards appear constrained. Later sections of this report will summarize expectations for growth in intermodal, with corresponding impacts for the constellation of existing yards.

Implications

- From a rail standpoint, concern should be focused on capacity of existing local intermodal yards, two rail bridges, and other emerging choke points where Class I railroads cross at-grade. As it will take time to reach capacity, the St. Louis Region should focus on how local railroads choose to operate over their networks.
- From a trucking standpoint, the St. Louis Region will begin to appreciate the impacts of a new Mississippi River Bridge. It is still unclear exactly how freight will shift once this bridge opens. More broadly, while the St. Louis Region has invested heavily in new bridge capacity in the last several years, looming choke points remain, possibly including the I-270 New Chain of Rocks Bridge, as well as local intermodal yards.
- From a water standpoint, the St. Louis Region became a top 20 inland port in 2011, with opportunities for additional growth tied to new transloading facilities which have recently opened. Sustaining a top 20 port district will require deliberate infrastructure investments to be made.

05

Regional Economic Context



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Introduction

While the overarching focus of the St. Louis Regional Freight Study is attuned to understanding (and ultimately extracting) greater value from supply chains that currently traverse the St. Louis Region, the effort also must place the St. Louis Region in a broader economic context. This section of the report focuses on three elements:

1. A broader perspective regarding the state and regional economy
2. Summary of economic indicators that frame the pace of recovery from the "Great Recession"
3. A more focused Regional economic analysis, looking at population, labor force, employment, gross domestic product, and similar economic metrics, which are evaluated over three basic timelines: pre-recession growth, recessionary decline, and post-recession recovery.

As well, based on research by Brookings and similar organizations that job creation is focused at the metropolitan area level, rather than within individual cities and counties, comparative economic performance metrics for peer metropolitan areas are also provided. The peer metros discussion considers both a core set of geographic peers, including places such as Chicago, Indianapolis, Memphis, Cleveland, Cincinnati, Columbus, and Detroit. In specific cases, the analysis also looks to a broader set of metropolitan areas, all of which tend to fall in a top 20 ranking, in part to reinforce the point that the St. Louis Region is currently a top 20 metropolitan area, albeit one that has been growing at a slower pace.

Regional Economic Context

Statewide Perspective - Missouri

Missouri benefits from a diverse economy which has provided a margin of resiliency to economic shocks in any one industry. The State's central location, low cost of living, and low business and property taxes have made it attractive as a corporate location. Port and rail facilities in St. Louis and Kansas City help support the transportation sector, with coal, chemicals, petroleum, and grain being key commodities. Health care and education sectors are adding jobs and appear to have strong future prospects. Concerted efforts to invest in education and biotechnology are also expected to support future growth.

At the same time, the Missouri economy does face apparent headwinds. Most immediately, slower population growth and a tepid recovery in housing and real estate markets (and the construction sector) limit potential economic growth. It is also important to note that Missouri's currently diverse economy is in part a reflection of major losses in manufacturing since the 1990s. Manufacturing used to make up 21% of gross state product, but now accounts for only about 13%. The extent of this restructuring that has occurred should not be understated, and reflects the level of underlying resiliency in the statewide economy.

While the recession had major impacts on manufacturing, Missouri's economy was slightly less vulnerable than its neighboring states to the south, which are more dependent on manufacturing. In particular, Missouri's food and beverage manufacturing sector proved to be more resilient than other

industries during the recession. Analysis suggests that manufacturers are beginning to rehire workers to ramp-up output.

Statewide Context - Illinois

The Illinois economy has demonstrated tepid growth over the past year, adding payroll but still struggling to regain peak employment levels achieved prior to the Great Recession. Like Missouri and much of the Midwest, there is an expectation that employment, income, and productivity growth will slightly lag U.S. averages in the near-term. At a broader level, there is more basic concern about the health of state finances in Illinois, which are linked concern over funding for state pensions and health care. Illinois is expected to regain previous peak employment levels by 2015, led primarily by professional business services and, to a lesser extent, by a rebound in manufacturing.

Like Missouri, Illinois' economy is relatively diverse relative to its Midwestern peers, with manufacturing making up less than 10% of total non-farm employment. While this makes Illinois less susceptible to shocks in manufacturing, it also will prevent the State from enjoying current upsides being felt in Ohio, Indiana, and Michigan, all linked in part with auto industry recovery. While not as dominant a sector in percentage terms compared to neighboring states, manufacturing in Illinois is still formidable in scale and diversity, with emphasis on machinery, electrical equipment, fabricated metals, food processing, printing and publishing, chemicals, and rubber and plastics.

The St. Louis Metropolitan Area Economy

Consistent with the experiences of the states of Missouri and Illinois, the St. Louis Region has experienced only a mild recovery from the Great Recession. Employment, economic output, and income growth continue to lag national and state averages. At the same time, the analysis shows that the St. Louis Region has demonstrated considerable resiliency in weathering numerous economic shocks over the past 30 years, including:

- Stockyards closure in East St. Louis (1970's)
- Initial auto industry decline and broader manufacturing losses (1980's)
- Defense adjustment (1990's)
- Loss of Chrysler and Ford (2000's)

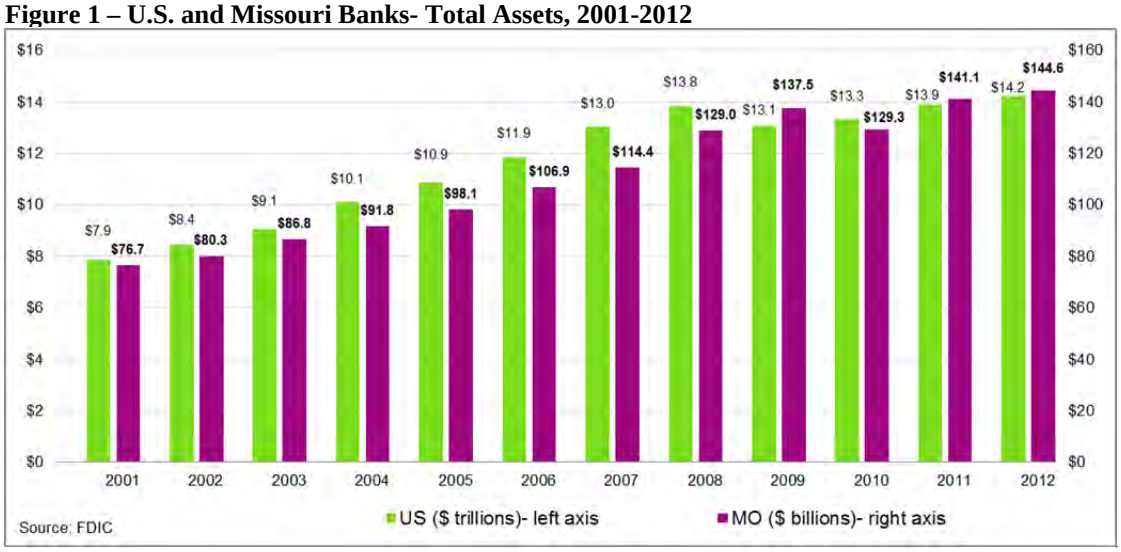
The analysis speaks to numerous economic attributes that could support future economic growth. Central geography and access to the navigable Mississippi River continues to make St. Louis an important distribution hub for both agricultural and manufacturing products. When combined with generally business friendly tax policies and a lower cost of living, the St. Louis Region has remained attractive for corporate headquarters, including Monsanto, Emerson, and Express Scripts. Large medical and education institutions, such as the BJC Health System, St. Louis University, and Washington University, support a diversifying economic base and are expected to lead contributors to regional economic and employment growth in the future. As importantly, the St. Louis Region has embraced entrepreneurship, and has achieved success in attracting venture capital to support and incubate new companies, particularly in the IT space. Lastly, in the context of ongoing reductions in federal / defense spending, there is an evolving concern about the future status of Boeing's operations in the St. Louis Region, as well as Scott Air Force Base, both of which are major regional employers.

Recovery from the Recession

The Great Recession has had a massive impact on the U.S. Economy. While the recovery is underway, it is important to appreciate the magnitude of the economic damage that occurred, and to appreciate that full recovery will take several years. To frame these realities, the analysis focused on trends regarding total bank assets, under-performing loans, and consumer borrowing.

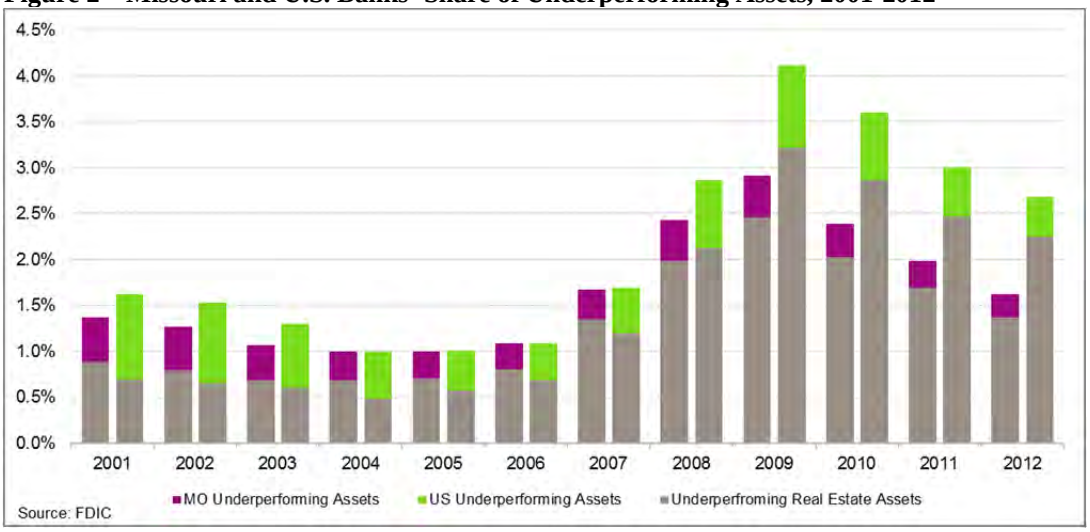
Regarding bank assets, as shown in Figure 1, the analysis focused on the total amount of assets in FDIC-insured financial institutions in the U.S. and Missouri. After growing between 2001 and 2008 (annualized rate of nearly 8.5%), the nation witnessed a sudden decline in total assets between 2008 and 2009. Since then, total assets have steadily increased, but at a much slower annualized rate. Missouri experienced similar trends as the nation, witnessing a steady growth period (at an annualized rate of more than 7.5%) followed by a significant one-year decline. It is important to note that the State's total assets peaked, and subsequently declined, one year later than the nation. Since their respective declines, Missouri has seen a stronger rate of recovery (annualized rate of nearly 6%) compared to the nation.

Figure 1 – U.S. and Missouri Banks- Total Assets, 2001-2012



The health of financial institutions is measured by a number of factors, including the amount of bad debt a single bank or financial institution is carrying, primarily loans or leases that are delinquent and characterized as underperforming. Figure 2 illustrates underperforming assets as a share of total FDIC-insured bank assets as well as the relative share of underperforming real estate assets for banks in Missouri and the U.S. A major factor behind the growth in underperforming assets was the increase in real estate assets. Although the rapid rise in underperforming real assets was quite troubling, the data have shown continued improvement over the past few years as the economy and housing market remain in recovery mode, and have yet to recover to pre-recession levels.

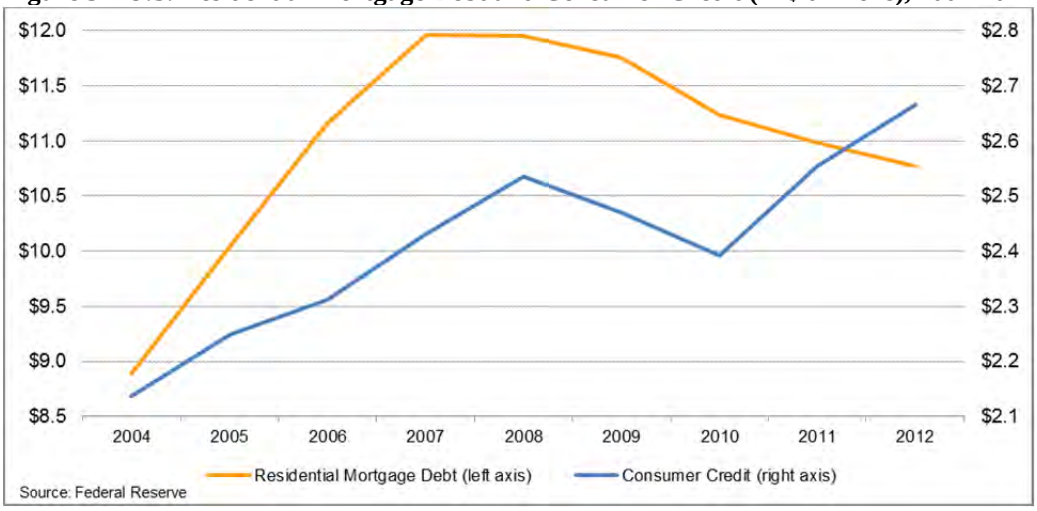
Figure 2 – Missouri and U.S. Banks- Share of Underperforming Assets, 2001-2012



Although underperforming real estate assets remained well under 1% of total assets between 2001 and 2006 in both the U.S. and Missouri, these shares more than tripled between 2006 and 2009 as the recession and overall housing market caused major financial impacts. Since peaking in 2009, the share of total underperforming assets and underperforming real estate assets has continued to decline as the economy and housing market slowly recover.

Lastly, in terms of consumer borrowing, the arduous process of deleveraging has continued, as individuals and financial institutions slowly reduce what were massive amounts of debt. The analysis, shown below, focused on consumer borrowing, in part because consumer spending has direct bearing on growth of the freight and logistics system, primarily through demand for consumer goods and services, many of which are shipped by intermodal containers.

Figure 3 – U.S. Residential Mortgage Debt and Consumer Credit (in $ trillions), 2004-2012

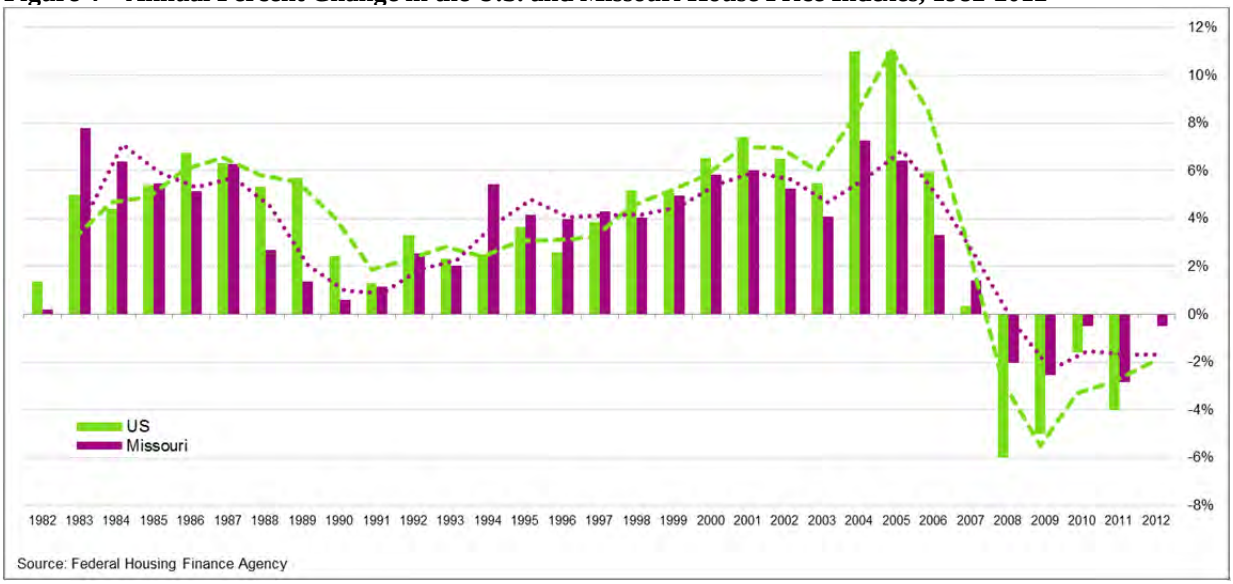


Residential mortgage debt grew extremely fast from 2004 to 2007 (annualized rate of over 10%) as mortgage lending practices remained generous, but has declined at about a -2% rate since peaking in 2007. A number of factors, including the spike in foreclosures and the tightening of mortgage lending standards throughout the industry, have caused the total residential mortgage debt to shrink.

Housing

Housing market conditions provide a strong indication of overall economic health and the pace of recovery. An all-inclusive measure of the housing market is home values and the cost paid at transaction. The House Price Index (HPI), tracked by the Federal Housing Finance Agency, measures the movement of single family house prices. Noteworthy national trends begin with the well-known upward acceleration in HPI through 2005, representing an unprecedented appreciation in home values. Home values declined between 2007 and 2011, the HPI dropped over 15%. Between 2011Q3 and 2012Q3, home values dropped a mere 0.03%. In other words, home values have essentially stabilized and are on track to start increasing in value for the first time since 2005-2006 as the economy continues to improve.

Figure 4 – Annual Percent Change in the U.S. and Missouri House Price Indexes, 1982-2012



The Missouri HPI exhibited similar general trends compared to the nation over the past few decades: The major spike in home values before the recession was more pronounced at the national level. Missouri's annual change in HPI was lower than the national rates for years 2000 to 2006. This difference is especially highlighted for 2004, 2005, and 2006, where the national growth rate outpaced the state growth rate by about 3% to 5%. Home values are a focus in part because as home values increase and new homes are built supply chain impacts are immediate and positive.

Regional Economic Base- Regional Indicators

Population

The following table looks at population growth rates by county for the St. Louis Region, illustrating geographic population redistribution since 2000. The data show the St. Louis Region continuing to decentralize, as the City of St. Louis and St. Louis County lost a combined total of nearly 50,000 people between 2000 and 2011. Meanwhile, outlying counties of Franklin, Jefferson, and St. Charles saw continued population growth, offsetting losses in St. Louis City and County. Overall, the total

Region grew slowly at an annualized rate of 0.4%, below rates for peer Regions, reinforcing a broader concern of only modest growth.

Table 1 – Population Growth in the Expanded St. Louis Region, 2000-2011

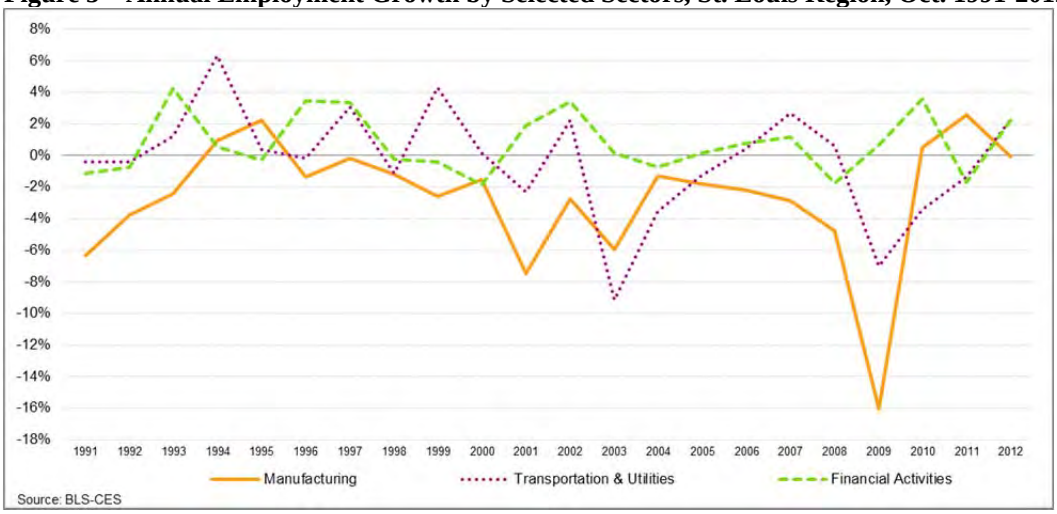
	Total Population					MSA Share			
				2000-2011					2000-2011
Geography	2000	2010	2011	Net Change	CAGR	2000	2010	2011	Point Shift
St. Louis City, MO	348,189	319,294	318,069	(30,120)	-0.8%	12.90%	11.35%	11.29%	-1.6%
St. Louis County, MO	1,016,315	998,954	998,692	(17,623)	-0.2%	37.66%	35.51%	35.45%	-2.2%
Franklin County, MO	93,807	101,492	101,938	8,131	0.8%	3.48%	3.61%	3.62%	0.1%
Jefferson County, MO	198,099	218,733	219,480	21,381	0.9%	7.34%	7.78%	7.79%	0.4%
Lincoln County, MO	38,944	52,566	53,076	14,132	2.9%	1.44%	1.87%	1.88%	0.4%
St. Charles County, MO	283,883	360,485	365,151	81,268	2.3%	10.52%	12.82%	12.96%	2.4%
Warren County, MO	24,525	32,513	32,515	7,990	2.6%	0.91%	1.16%	1.15%	0.2%
Washington County, MO	23,344	25,195	25,076	1,732	0.7%	0.87%	0.90%	0.89%	0.0%
Bond County, IL	17,633	17,768	17,727	94	0.0%	0.65%	0.63%	0.63%	0.0%
Calhoun County, IL	5,084	5,089	5,048	(36)	-0.1%	0.19%	0.18%	0.18%	0.0%
Clinton County, IL	35,535	37,762	37,956	2,421	0.6%	1.32%	1.34%	1.35%	0.0%
Jersey County, IL	21,668	22,985	22,916	1,248	0.5%	0.80%	0.82%	0.81%	0.0%
Macoupin County, IL	49,019	47,765	47,687	(1,332)	-0.3%	1.82%	1.70%	1.69%	-0.1%
Madison County, IL	258,941	269,282	268,459	9,518	0.3%	9.60%	9.57%	9.53%	-0.1%
Monroe County, IL	27,619	32,957	33,306	5,687	1.7%	1.02%	1.17%	1.18%	0.2%
St. Clair County, IL	256,082	270,056	270,259	14,177	0.5%	9.49%	9.60%	9.59%	0.1%
Regional Total	2,698,687	2,812,896	2,817,355	118,668	0.4%	100%	100%	100%	

Sources: US Census Bureau- Population Estimates and ACS

Employment Trends

A comparative look at annual employment rate changes in the St. Louis Region in selected sectors for the month of October follows. The Transportation and Utilities sector fared well in the 1990s, exhibiting positive growth over the decade and peaking in 2000. While employment in the sector fluctuated year-to-year, these changes were relatively minor and closely mirrored the annual shifts in total jobs. Employment in the Transportation & Utilities industry has trended downward since 2000, highlighted by major drops between 2002 - 2003 and 2008 - 2009. Manufacturing employment in the St. Louis Region has shown considerable decline over the past two decades and was dealt a major blow at the peak of the recession, losing over 16% of the sector's workforce in a single year (2008-2009). Since 1990, the finance industry in the St. Louis Region has performed relatively well. The three major sectors in the chart all experienced significant employment losses during the recession. Although the St. Louis Region is recovering from the recession, employment took a major hit between 2007 and 2009, losing about 80,000 jobs. While 35,000 jobs have been added since October 2007, there is still work to be done during this recovery period to help sustain a positive and lasting impact on the St. Louis Region's economy.

Figure 5 – Annual Employment Growth by Selected Sectors, St. Louis Region, Oct. 1991-2012



Location Quotients

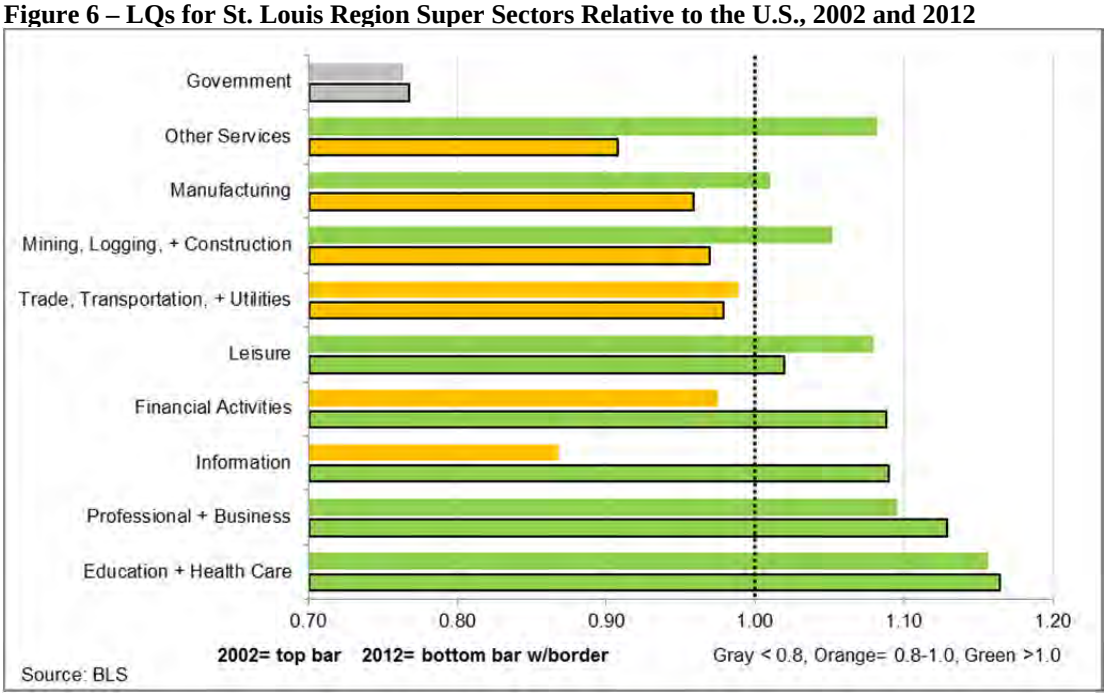
Location quotients compare levels of employment between a defined market area to that of a larger base in order to gauge the concentration of a particular good or service. Underlying a location quotient is the premise that, all things being equal, a local market should have the same distribution of workers as the state or nation, which is obviously not always the case as factors such as climate, local tradition or specialization influence demand. A location quotient higher than 1.0 means the local economy has a larger than expected share of jobs and indicates that the sector is likely exporting those goods and services outside of the local market; in other words, the industry is more concentrated in the St. Louis Region than the larger study area. In general, higher location quotients point to industry sectors that are more integrated in the local economy, and have a greater influence on growth and job creation. A location quotient that is less than 1.0 indicates that the number of jobs is proportionally lower than the larger market and is likely importing goods and/or services to meet local demand; the industry is less concentrated in the study area than the comparison area.

Here employment in the St. Louis Region relative to the U.S. is examined for selected sectors. Location quotient comparisons over time (2002 to 2012) show whether a sector has become more or less concentrated in the St. Louis Region relative to the industry. Highlights include:

- Education & Health Care, as well as Professional & Business Services, are sectors that remain regionally significant.
- The top four super sectors, in terms of location quotients in 2012, witnessed growth between 2002 and 2012. Conversely, the next five super sectors saw declines in location quotient over the same time period. Government stayed static and remained, by a considerable margin, the least significant super sector with regard to regional versus national employment.
- Information and Financial Activities are two sectors that have shown a sharp increase in location quotients and are considerably above 1.0 today. It is important to note that the Information super sector employs the fewest people, at only about 2% at the regional and national level. Financial Activities are also a relatively small super sector, employing about 6% of the total nonfarm workforce.

- Manufacturing, as well as Mining, Logging, & Construction, both saw declines in location quotients between 2002 and 2012, causing them to dip below the national average.
- Although the Trade, Transportation, & Utilities super sector remained in line with the national average, the Wholesale subsector increased significantly from 0.98 to 1.13.

Figure 6 – LQs for St. Louis Region Super Sectors Relative to the U.S., 2002 and 2012



The regional manufacturing industry lost 46,000 jobs between 2002 and 2012. Despite this dramatic decline, manufacturing remains a relatively prominent industry in the St. Louis Region, with more than 111,000 people employed, translating into an 8.6% share of total regional employment, which is just short of the national average of 9%. Recent plant openings and the presence of industries with extensive markets outside the St. Louis Region help significantly. The regional Transportation & Utilities subsector was relatively strong in 2002, posting a location quotient of 1.1. This location quotient has decreased by 2012, reflecting in part national trends, which point to transportation and logistics having a slightly lover direct impact on the economy, linked with companies working hard to reduce transportation costs.

Value of Exports

The U.S. Census Bureau tracks and reports data on U.S. exports by state of origin. The following table shows the top ten countries Illinois and Missouri export to, as well as the value of those goods, according to the recent figures. Canada, Mexico, and China receive the largest share of exports from both Illinois and Missouri. Over this four-year span, exports from Illinois to these top three countries increased in share, from about 45% of total exports, as all three witnessed growth greater than 30%. On the other hand, exports from Missouri to the top three countries have dipped below a 50% share, falling slightly to 48.6% over this period with exports to Canada and Mexico remaining relatively static and exports to China growing about 20%. The value of total foreign exports increased 20% in Illinois and 10% in Missouri between 2008 and 2011. It is important to note that values dropped

approximately 25% for both states between 2008 and 2009, but rebounded to post similar figures in 2010 as 2008, one of few areas where recovery to pre-recession levels has occurred.

The 2010 to 2011 period witnessed significant growth in export values as the economy rebounded. In Illinois, exports to China and Australia increased over 50% during this 4-year span while Japan was the only Top 10 country to see a decline in trade values. In Missouri, the value of exports to Singapore tripled and also grew over 60% to Belgium; meanwhile, exports to Japan declined slightly (similar to Illinois) and dropped significantly (40%) to South Korea.

Table 2 – Value of Exports from Illinois and Missouri, 2009-2011 ($ millions)

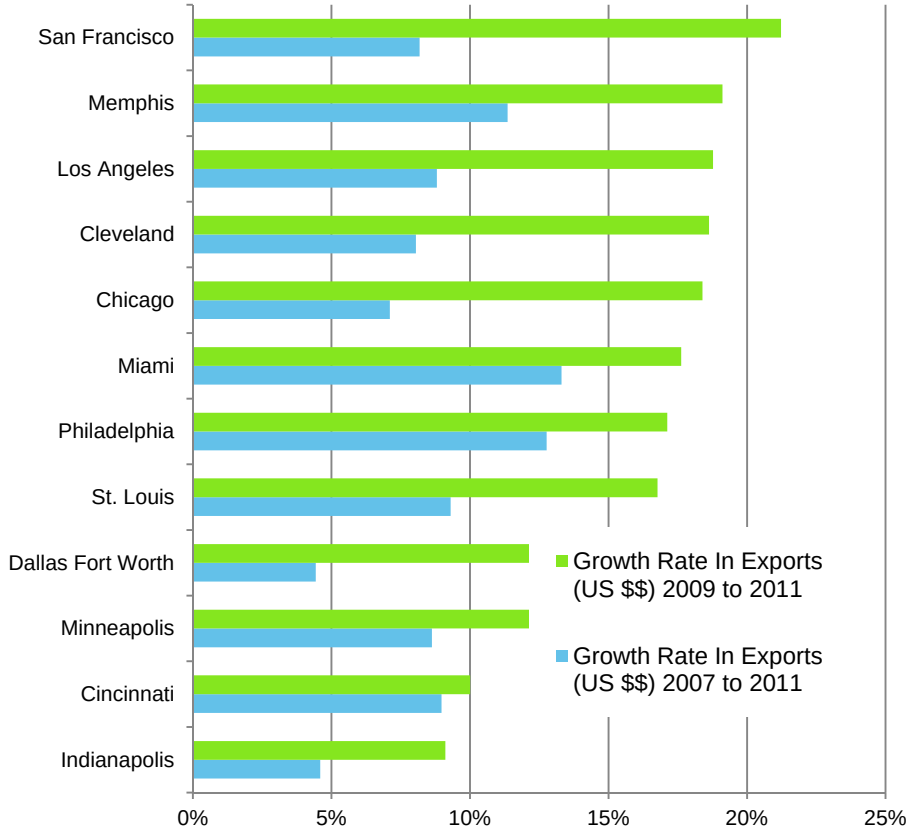
Rank	Country	2008	2009	2010	2011	2011 Share
	Total Illinois Exports	**$53,677**	**$41,626**	**$50,058**	**$64,823**	
1	Canada	$14,925	$12,125	$15,021	$19,472	30.0%
2	Mexico	$4,260	$3,550	$4,268	$5,722	8.8%
3	China	$2,513	$2,470	$3,178	$3,892	6.0%
4	Australia	$2,424	$1,595	$2,373	$3,699	5.7%
5	Brazil	$1,907	$1,246	$2,066	$2,553	3.9%
6	Germany	$2,224	$2,009	$2,187	$2,489	3.8%
7	United Kingdom	$1,852	$1,991	$1,695	$2,365	3.6%
8	Japan	$2,365	$1,779	$1,841	$2,041	3.1%
9	Belgium	$1,652	$929	$1,158	$1,654	2.6%
10	Singapore	$1,201	$877	$1,146	$1,515	2.3%
	Total Missouri Exports	**$12,852**	**$9,522**	**$12,926**	**$14,154**	
1	Canada	$4,331	$3,240	$3,996	$4,282	30.3%
2	Mexico	$1,327	$1,034	$1,304	$1,441	10.2%
3	China	$944	$688	$987	$1,161	8.2%
4	South Korea	$1,007	$275	$655	$608	4.3%
5	Japan	$696	$531	$596	$591	4.2%
6	Belgium	$333	$232	$476	$544	3.8%
7	Singapore	$141	$190	$372	$422	3.0%
8	Germany	$386	$385	$345	$396	2.8%
9	Netherlands	$312	$183	$254	$383	2.7%
10	Brazil	$256	$262	$329	$323	2.3%

Source: US Census Bureau

Looking at the value of exports since bottoming out in 2009, all Top 10 countries for both states showed growth as of 2011. Illinois grew at an annualized rate of 25%, thanks to very similar growth levels to Canada, Mexico, and China; growth of export values to Australia and Brazil was even greater. The value of total export values grew at a similar rate (22%) for the State of Missouri since 2009, despite slower growth from the highest ranked countries of Canada and Mexico; exports to China and South Korea (the third and fourth-ranked countries) grew faster than the state as a whole.

Figure 7 summarizes similar export growth rate trends for noted metropolitan areas from 2007 to 2011. The sample includes core geographic peer areas already defined, as well as broader set of metropolitan areas that would be expected to show leadership in exports, linked principally with their costal locations. The analysis shows that cities such as Peoria have shown considerable strength in export growth rates since 2009, with a lower overall rate since 2007. Since 2009, the St. Louis Region has shown notable strength in export growth, comparable to larger areas such as Chicago, Miami, and Memphis, which is significant given the differences in economic scale and breadth of transportation infrastructure.

Figure 7 – Growth Rate in Metro Area Exports, 2007 to 2011



Source: BLS

Peer Cities - Population Rankings

The following table shows the top 30 metropolitan areas in the U.S. as of 1990 and their future population projections based on 1990-2010 compound annual growth rates. In other words, if each region continues to grow for the next 20 years at the same annualized rate it has for the past 20 years, how would these metropolitan areas change in terms of total population rank? The St. Louis MSA added over 230,000 people between 1990 and 2010, growing from 2.58 million to 2.81 million people over this 20-year span, growing at an annualized rate of 0.43%. Detroit, Pittsburgh, and Cleveland (as well as Providence, RI) were the only other regions in this sample that did not grow faster than St. Louis over the past two decades. In other words, St. Louis has not kept pace with most other large metropolitan areas in terms of population growth. If the current pace of population change is sustained, the St. Louis region would fall from the 14th position in 1990, to 18th position today, to the 27th slot by 2030 and would end up just ahead of regional competitors Kansas City and Cincinnati as they close the gap in population.

Figure 8 – Top 30 Regions by Population and Projected Population, 1990-2030

MSA	1990 Rank	2000 Rank	2010 Rank	2020 Rank	2030 Rank	CAGR
New York	1	1	1	1	1	0.58%
Los Angeles	2	2	2	2	2	0.65%
Chicago	3	3	3	3	3	0.73%
Philadelphia	4	4	5	9	11	0.47%
Detroit	5	9	12	14	16	0.06%
Boston	6	10	10	12	14	0.48%
Washington, DC	7	7	7	8	9	1.53%
Miami	8	6	8	7	8	1.59%
Dallas	9	5	4	4	4	2.37%
Houston	10	8	6	5	5	2.31%
San Francisco	11	12	11	13	13	0.82%
Atlanta	12	11	9	6	6	2.74%
Riverside	13	13	13	11	10	2.48%
St. Louis	***14***	***18***	***18***	***21***	***27***	***0.43%***
Seattle	15	15	15	15	15	1.49%
Minneapolis	16	16	16	16	17	1.29%
San Diego	17	17	17	17	19	1.08%
Pittsburgh	18	20	22	29	35	-0.23%
Baltimore	19	19	20	22	26	0.65%
Phoenix	20	14	14	10	7	3.19%
Cleveland	21	23	28	33	37	-0.06%
Tampa	22	21	19	18	20	1.50%
Cincinnati	23	24	27	30	30	0.72%
Denver	24	22	21	20	18	2.14%
Kansas City	25	26	29	31	29	1.10%
San Jose	26	28	31	35	36	0.90%
Portland	27	25	23	24	24	1.91%
Providence	28	32	37	38	40	0.29%
Sacramento	29	27	24	26	25	1.88%
Virginia Beach	30	33	36	37	39	0.71%

Key:

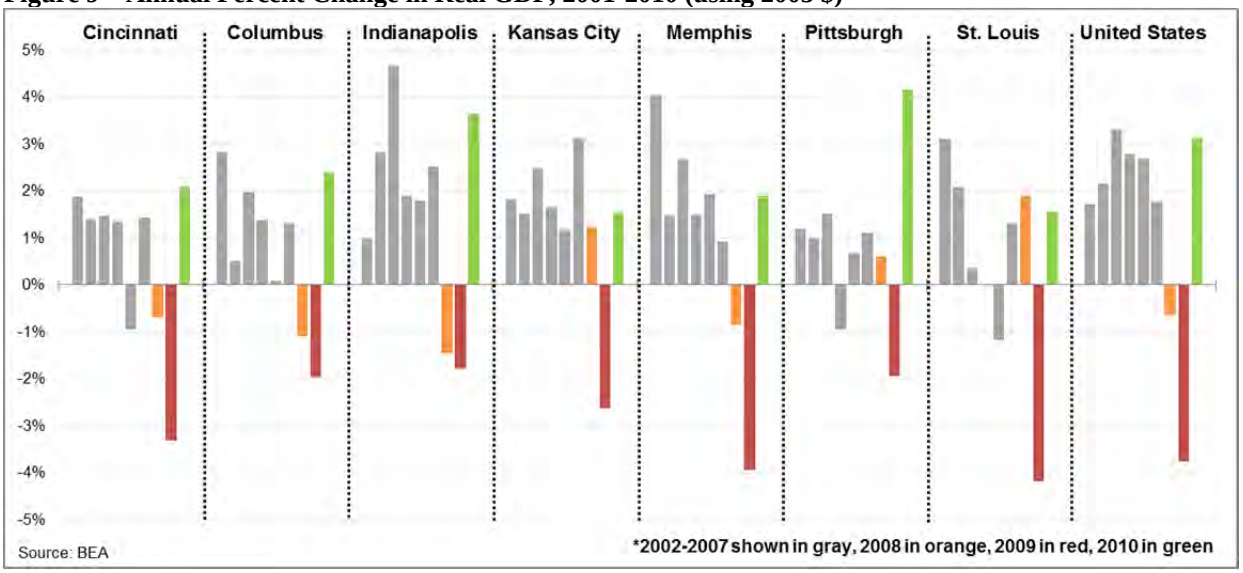
White	Lowest Value/Highest Rank (Region = Rank 1)
Blue	Midpoint Value/Midpoint Rank (Region = Rank 15)
Green	Highest Value/Lowest Rank (Region = Rank 30)

Source: US Census Bureau

Peer Cities – Gross Domestic Product (GDP)

Typically, GDP tends to grow consistently, rarely declining from the previous year's level. For example, St. Louis Regional GDP grew at an annualized rate of 1.1% between 2001 and 2008, which was slightly faster than Cincinnati and Columbus. From 2008 to 2009, GDP declined 4.2% in the St. Louis Region, which was higher than all other regional benchmarks surveyed, although less than the State's decline. But, it is important to mention that St. Louis also grew faster than all benchmarks during the previous year (2007-2008). Looking at the 2007-2009 period, St. Louis exhibited an annualized rate (-1.19%) that outperformed all of its peers except Kansas City (-0.72%) during this span. But, St. Louis also saw very little growth in 2009-2010 as it rebounded more slowly than nearly all other benchmark areas. Overall, St. Louis witnessed the second lowest annualized growth rate in real GDP between 2001 and 2010, only beating out Cincinnati.

Figure 9 – Annual Percent Change in Real GDP, 2001-2010 (using 2005 $)



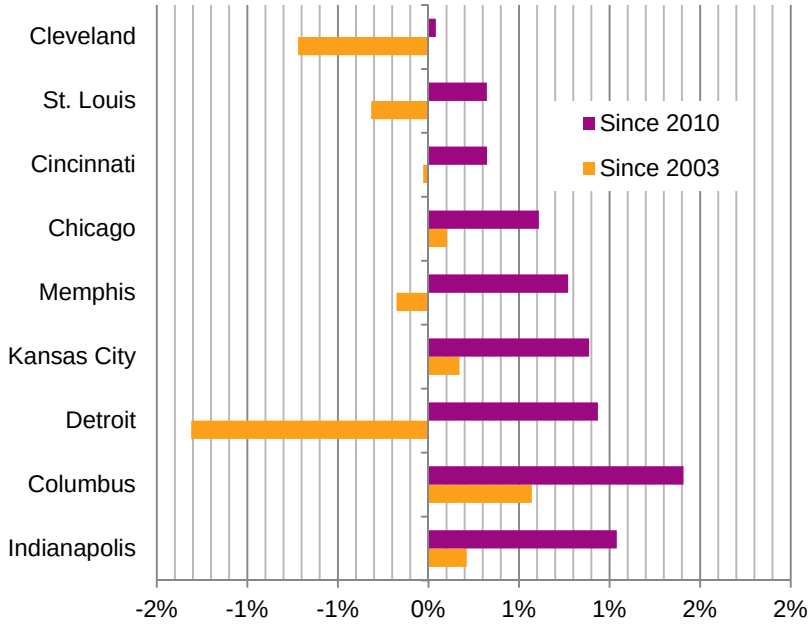
The St. Louis Region has seen minimal growth in GDP since 2003. In fact, St. Louis was the only region in the geographic peer group that actually declined in real GDP between 2003 and 2010; this occurred at an annualized rate of -0.05%. Indianapolis (1.58%) led the group and grew faster than the nation. Kansas City (1.2%) was just behind the national pace thanks to only witnessing a single annual decline over this period. Pittsburgh (0.7%), Columbus (0.6%), and Memphis (0.6%) all grew considerably faster than St. Louis.

Peer Cities – Total Employment

Building from above analyses, the analysis also explored overall growth in employment, as shown below. Figure 10 compares peer region employment growth rates, looking at the overall 2003 to 2013 period, as well as the more recent 2010 to 2013 post recession time period (in all cases extending from march to march of the noted year). Key points include:

- Regions for which the 2003 to 2013 growth rate is negative point to an area that has yet to recover to pre-recession employment levels. St. Louis is one of these areas.
- Looking since 2010, while employment growth across the St. Louis is occurring, the pace of growth is generally lower than geographic peers.
- Cities such as Indianapolis and Columbus have exhibited the strongest overall employment growth rates since 2010.

Figure 10 – Peer Region Employment Growth, 2003 /2010 to 2013

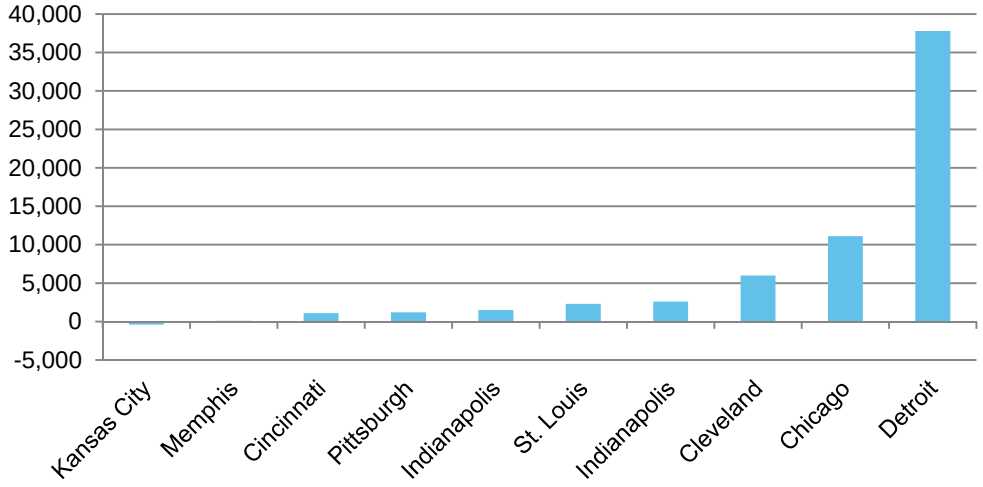


Source: BLS

Peer Cities – Manufacturing Employment

The following analysis provides greater focus on manufacturing trends for the noted peer metro areas. Figure 11 highlights the total number of jobs created in manufacturing for each metro area between 2010 and 2013, with areas such as Chicago, Cleveland, and Detroit leading in total job creation. St. Louis is one of several metro areas that also saw growth in manufacturing over the noted period, with a total of about 2,500 new manufacturing jobs created.

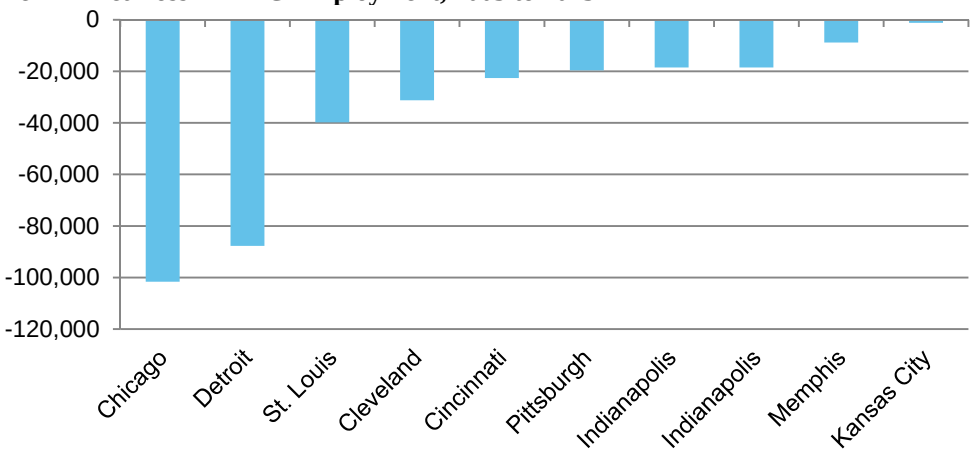
Figure 11 – New MFG Job Creation 2010 to 2013, Noted Metro Areas



Source: BLS

Figure 12 frames the broader net decline in manufacturing seen in many of these same areas from 2003 to 2013, with every area having fewer manufacturing positions in 2013 compared to 2003. Importantly, while areas such as Detroit and Chicago are seeing growth in manufacturing employment since 2010, these same areas are still recovering from massive loss in manufacturing since 2003. St. Louis is notable in this respect, with total net loss of about 40,000 positions since 2003, placing it third behind Chicago and Detroit. The extent of the damage to local manufacturing points to the need to take active steps to sustain local growth in manufacturing as the economic recovery builds.

Figure 12 – Net Loss in MFG Employment, 2003 to 2013



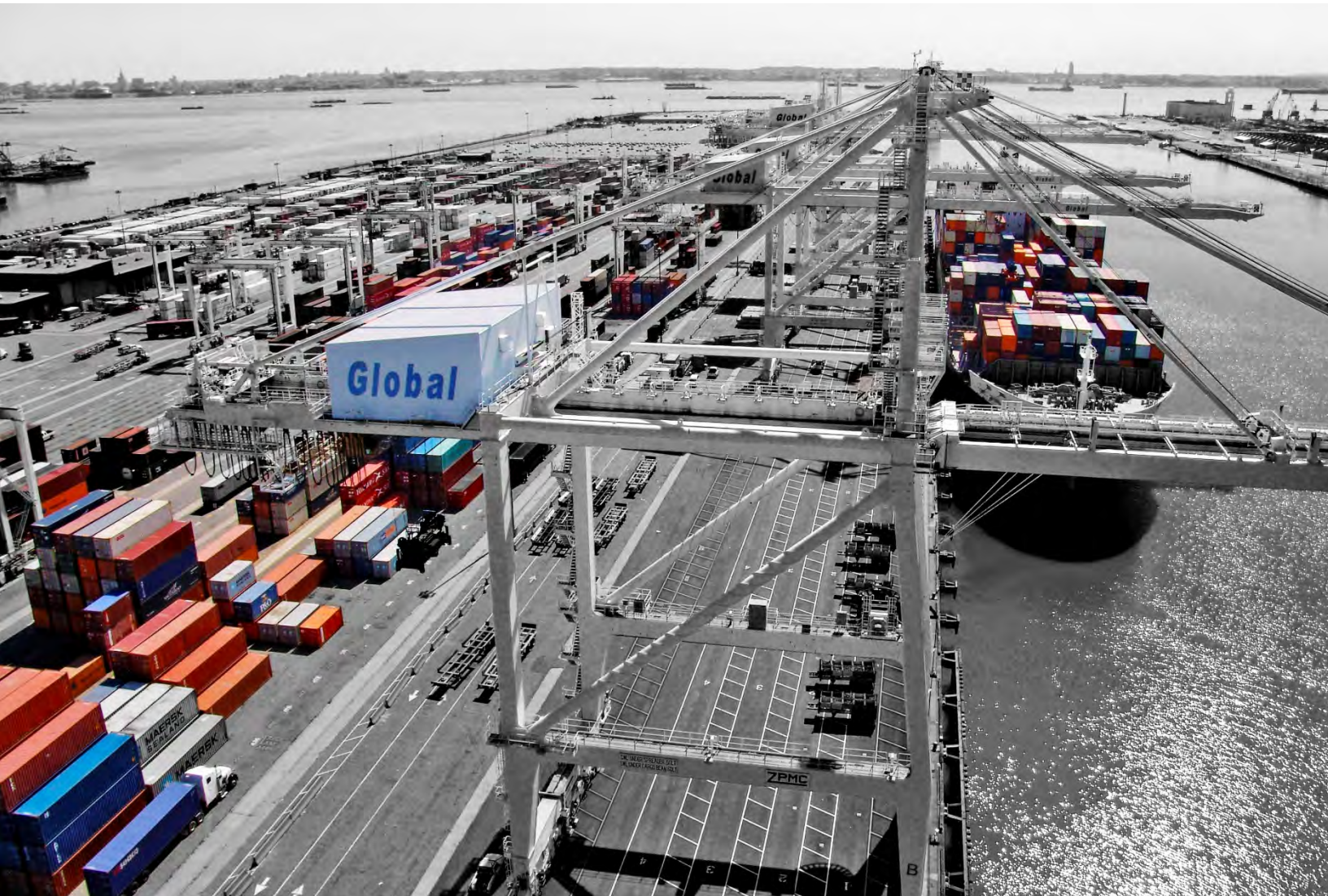
Source: BLS

Implications

- Although total bank assets, both on a gross and per capita basis, have returned to pre-recession levels in the U.S. and Missouri, unemployment rates for the U.S. and the St. Louis Region have yet to recover sufficiently to reach pre-recession levels.
- If the current pace of population change occurs, the St. Louis region will fall from the 14th position in 1990, to 18th position today, to the 27th slot by 2030 and would end up just ahead of regional competitors Kansas City and Cincinnati as they close the gap in population.
- While overall rates of job creation since 2010 have been modest, behind geographic peer metropolitan areas, the analysis showed that the St. Louis Region is adding manufacturing jobs at a faster rate, compared to the overall economy.
- The regional labor force has also remained relatively stable, witnessing only minor shifts since 2000. Limited labor force growth is a concern, reflected in lower rates of population growth compared to peer metropolitan areas.
- The total value of foreign exports from Illinois and Missouri have shown strong growth since the bottom of the recession (2009) thanks to steady increases from North American neighbors (Canada and Mexico) as well as key Asian partners (in particular, China and South Korea). As supply chains link with these export markets, identifying local opportunities to add value is important.

06

Economic Value of the Transportation System



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Introduction

Understanding the economic value of freight movement to the St. Louis Region is more than a simple conversation. The analysis in this report suggests that the economic value of freight can be defined initially in terms of the direct employment supported in these sectors, which generally include distribution, trucking, rail, barge, and air related activities. Beyond employment, while freight movement is generally viewed as a cost of doing business, its inexorable connection to manufacturing comes to the forefront. In St. Louis, manufacturing directly sustains about $55.5 billion or 24% of total Regional output (about $227 billion). In this context, understanding supply chains, and the ability to add value locally become critical elements of the conversation. Last but not least, as freight volumes grow, local challenges related to diesel emissions and other so called "negative externalities" also come into play, raising the need to value freight movement from a broader sustainability and social justice perspective.

Sustainability and Freight Movement

With the likelihood of increased pressure on existing infrastructure, the analysis also reinforces the broader sustainability (i.e. environmental impact) questions associated with growth in freight movement. The specific challenge is that as freight tends to concentrate (achieving considerable economies of scale along the way) in metropolitan areas, several "negative externalities" tend to also emerge. These factors all generally relate to:

- The impact of freight movement in terms of air emissions / air quality, including particulates associated with diesel emissions (PM 2.5 or PM 10)
- Congestion resulting from "run-through" freight movements
- Congestion resulting from "last-mile" deliveries in core areas
- Broader social justice and equity concerns

These factors also link with the realty of EPA Non-Attainment Status, which many U.S. regions contend with. According to EPA, counties in the St. Louis Region are listed as follows, with some pollutants (pm=particulates or Ozone) identified as marginal or moderate versus non-attainment status:

- St. Clair County, IL: PM 2.5 (1997) and 8-Hr Ozone (2008)
- Madison County, IL: Lead (2008), PM 2.5 (1997) and 8-Hr Ozone (2008)
- St. Louis City / County - MO: PM 2.5 (1997), 8-Hr Ozone (2008), 8-Hr Ozone (1997)
- St. Charles County - MO: PM 2.5 (1997), 8-Hr Ozone (2008), 8-Hr Ozone (1997)
- Jefferson County - MO: PM 2.5 (1997), Lead (2008), 8-Hr Ozone (2008), 8-Hr Ozone (1997)
- Franklin County - MO: PM 2.5 (1997), 8-Hr Ozone (2008), 8-Hr Ozone (1997)

While sustainability arguments have not gained universal traction, our experience does reinforce the reality of how higher fuel prices are gradually pushing freight from air and truck toward rail and water. From an efficiency standpoint:

- One barge can generally carry 1,500 tons of cargo, or 52,500 bushels of volume
- One rail car can generally carry 112 tons of cargo, or 4,000 bushels of volume
- One truck can generally carry 26 tons of cargo or 910 bushels of volume

In simple terms, one typical Mississippi River barge can carry the same weight as about 13 rail cars or almost 60 trucks. These metrics are driving greater interest in locations along the inland river system where commodities can be transloaded from unit trains to barges. As well, for metropolitan areas like St. Louis, since trucks will never go away, there are strategies for dealing with the generally higher emissions associated with truck traffic.

Other metropolitan areas are beginning to discuss regional strategies for compressed natural gas (CNG) as a fuel for trucks and trains. The driver from an infrastructure standpoint are fueling stations that can built through partnerships with trucking companies and other, generally public sector operators of fleet vehicles. Hybrid diesel trucks are also being explored, along with electric powered vans. Regions are pursuing the formation of “low emissions zones”, with one example in London (UK) beginning to achieve a shift toward lower emissions vehicles for deliveries.

Lastly, from an economic development standpoint, if host regions are impacted by freight moving through, the ultimate question is how the host region is able to capture and add value to what is flowing through. For this reason, our approach relied on sector specific output data to better understand how each transportation mode is used as an input in the production process, the details of which are explained below.

Impact of Transportation and Industry Linkage

In this section, an overview is presented of the transportation industry in the St. Louis Region and examines the changing transportation needs of the goods producing sectors. Data from IMPLAN, software primarily used for economic impact modeling, was used for this analysis. The IMPLAN model contains extensive data regarding how well firms and sectors are linked to other sectors in a local economy. IMPLAN’s system of social accounts shows how dollars flow among various institutions: firms, households, government agencies as well as exports and imports. As defined for this project, the transportation sector contains air, rail, water and truck transportation as well as transportation by pipeline, couriers and messengers, warehousing and storage as well as other support services. Missing from this definition is transit and ground passenger transportation (NAICS 485) which includes urban and interurban transportation, taxi and limousine service, school and employee bus transportation, charter buses and other transit and ground passenger transit services.

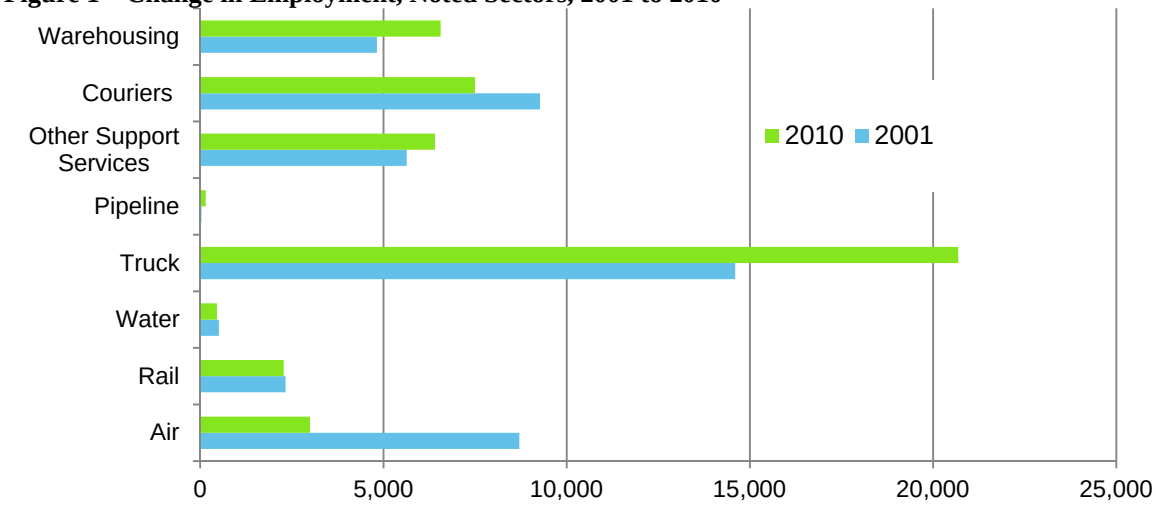
- Air Transportation (NAICS 481): This industry is comprised of air transportation for passengers and cargo on both scheduled and non-scheduled routes. Scheduled air transportation covers the largest part of the industry, including air cargo operations. Non-scheduled service can include both cargo and passengers and comprises general aviation for special, corporate, personal or other unscheduled aviation. This industry does not include courier services; see below.

- Rail Transportation (NAICS 482): This industry includes both short line and line haul railroads. Line haul railroads operate networks over wide geographic areas with multiple facilities throughout the U.S. Short line railroads are often confined to a small geographic area. This industry also includes passenger rail service.
- Water Transportation (NAICS 483): This industry includes firms that provide deep sea, great lakes, intra-coastal and inland water transportation, including freight.
- Truck Transportation. (NAICS 484): The truck transportation industry includes firms that provide over the road freight transportation by truck, semi-trailer or container, including local pickup and delivery, sorting, line haul and terminal operations.
- Transportation by Pipeline (NAICS 486): This industry uses transmission pipelines to transport products, such as crude oil, natural gas, refined petroleum products and slurry. Industries are identified based on the products transported (i.e., pipeline transportation of crude oil, natural gas, refined petroleum products, etc.).
- Other Support Services (NAICS 487 & 488): This sector is dominated by industries that offer support services to airports, rail yards, ports and roads. This includes airport operations, air traffic control, port and harbor operations, marine cargo handling, navigational services to shipping, motor vehicle towing, pacing and crating as well as arranging freight transportation.
- Couriers and Messengers (NAICS 492): These firms provide parcel delivery, whether in one city or among different cities. A courier service primarily handles small parcels that can be picked up and delivered by hand. Firms in this industry can range from a messenger on bicycle in one city to a large international shipping network like UPS or FedEx. It excludes the postal service.
- Warehousing & Storage (NAICS 493): Firms in this industry primarily provide warehousing and storage to other firms; they do not sell goods to consumers or other businesses. Specialized warehousing is also included (such as refrigeration). These firms can sometimes provide a range of warehouse-related services, such as sorting, packing, and order fulfillment.

Employment Impact

IMPLAN data, as described below, is used to evaluate transportation sectors that support the local economy, defined in this case as counties within the St. Louis Region. The analysis covered employment, earnings, and output by sector on an annual basis from 2001 to 2010. The following charts summarize key changes in these sectors. For employment, the defined transportation sectors saw a modest increase in employment, growing from about 45,900 positions to about 47,000 positions. The modest overall increase conceals a significant decrease in air related employment, which decreased significantly over the noted period.

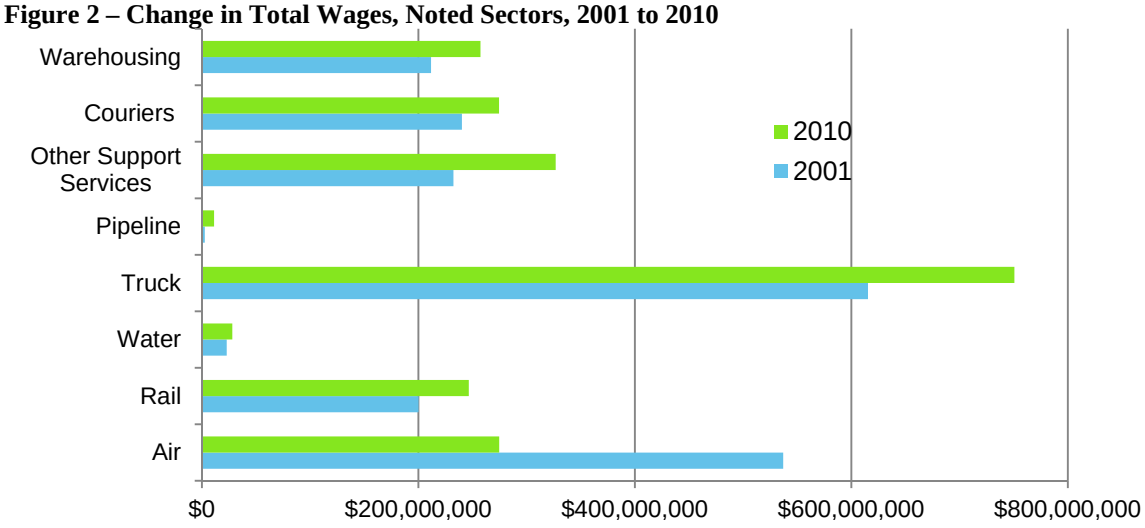
Figure 1 – Change in Employment, Noted Sectors, 2001 to 2010



Source: Implan

The following chart highlights a comparison of total wages by transportation sector. Notable are the decrease in wages for air transportation (decline at a 7.2% annualized rate) offset by strong growth in the pipeline sector, with total wages that increased at a 17.6% annualized rate.

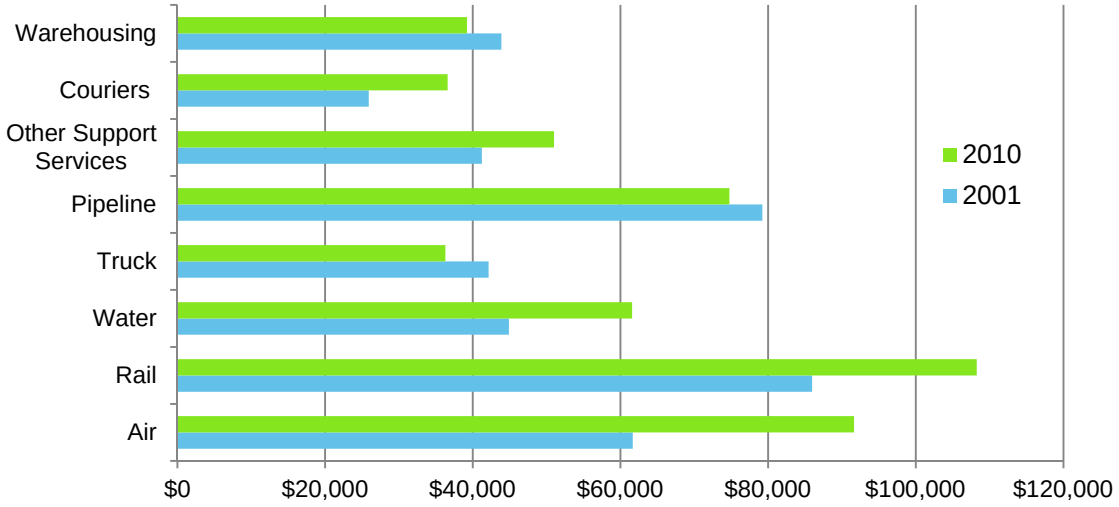
Figure 2 – Change in Total Wages, Noted Sectors, 2001 to 2010



Source: IMPLAN

Figure 3 combines employment and wage metrics to highlight average wages per employee over the noted period. The chart speaks to general expectations, with higher average wages in sectors such as air and rail, and lower average wages in warehousing and other support services. Also notable are growth in average wages over the noted period for air and rail, offset by a decline in wages for warehousing over the noted period.

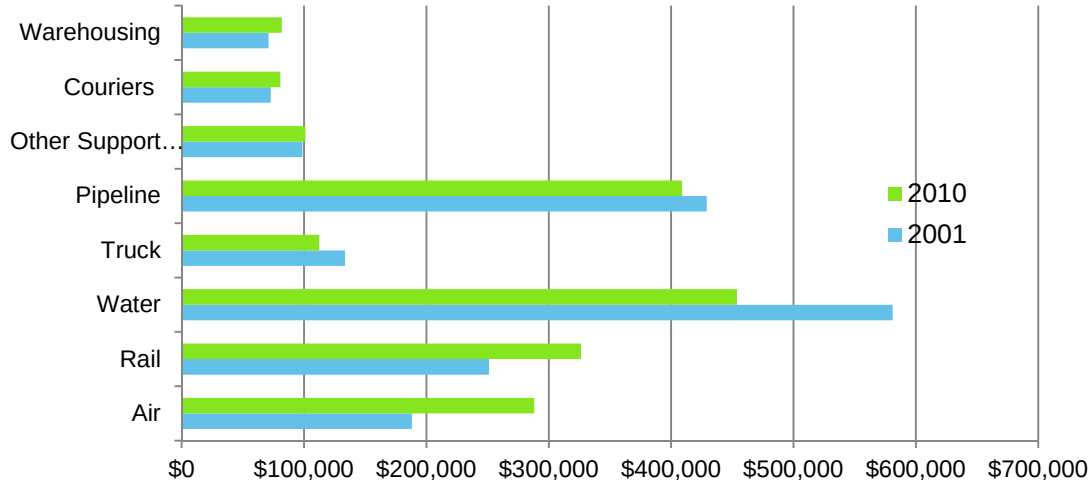
Figure 3 – Change in Average Wages, Noted Sectors, 2001 to 2010



Source: IMPLAN

Metrics for total sector output per worker were also evaluated for each sector. The general trajectory for the analysis points to sectors such as rail, pipeline, and water, with fewer employees responsible for moving significantly more freight around, generating greater output per worker as a result. From this standpoint, truck and warehousing stand out for relatively low output per worker

Figure 4 – Change in Total Output Per Worker, Noted Sectors, 2001 to 2010



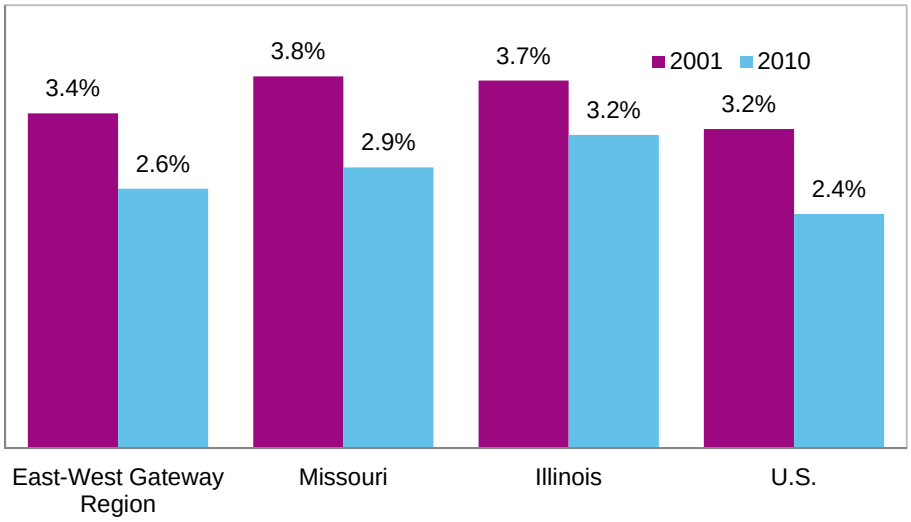
Source: IMPLAN

Transportation Sector Summary

In 2010, the transportation sector had an estimated $6 billion in economic output, down slightly from the nearly $6.1 billion in economic output in 2001. As a share of the total economy, transportation sector output declined similar to regional and national trends as shown below. In 2001, transportation sectors generated 3.4% of the total economic output of the St. Louis Region. This fell to 2.6% by 2010, reflecting growing efficiencies in transportation sectors which lowered cost. Although the

transportation sector makes up a relatively small share of the local economy, it performs a vital role in the moving of goods in, out and through the St. Louis Region.

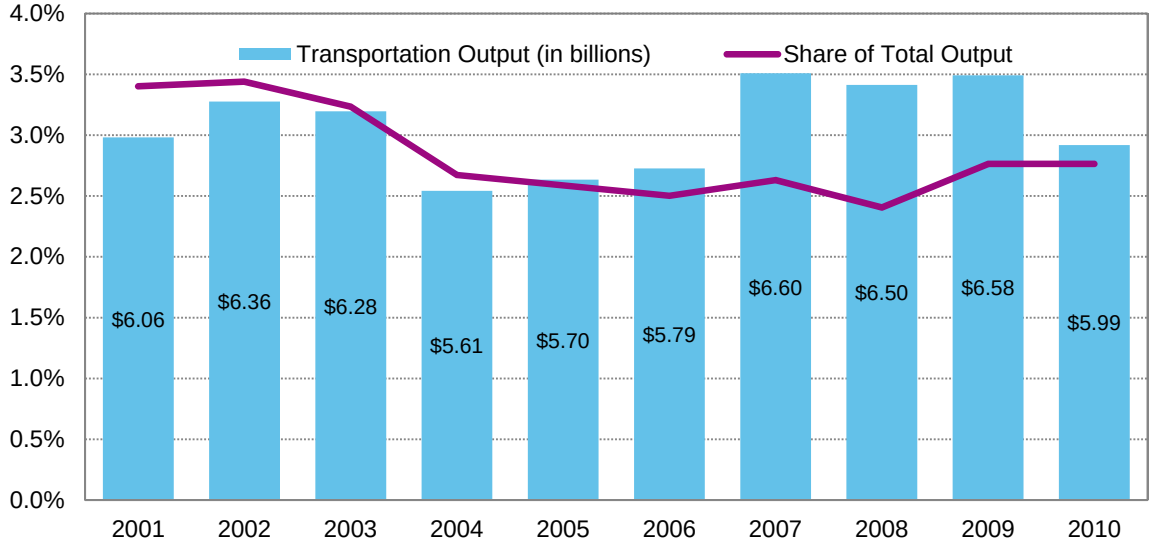
Figure 5 – Transportation as a Share of Total Output



Source: IMPLAN

The following chart shows the total transportation output for the St. Louis Region and its share of total output since 2001.

Figure 6 – East-West Gateway Transportation Output

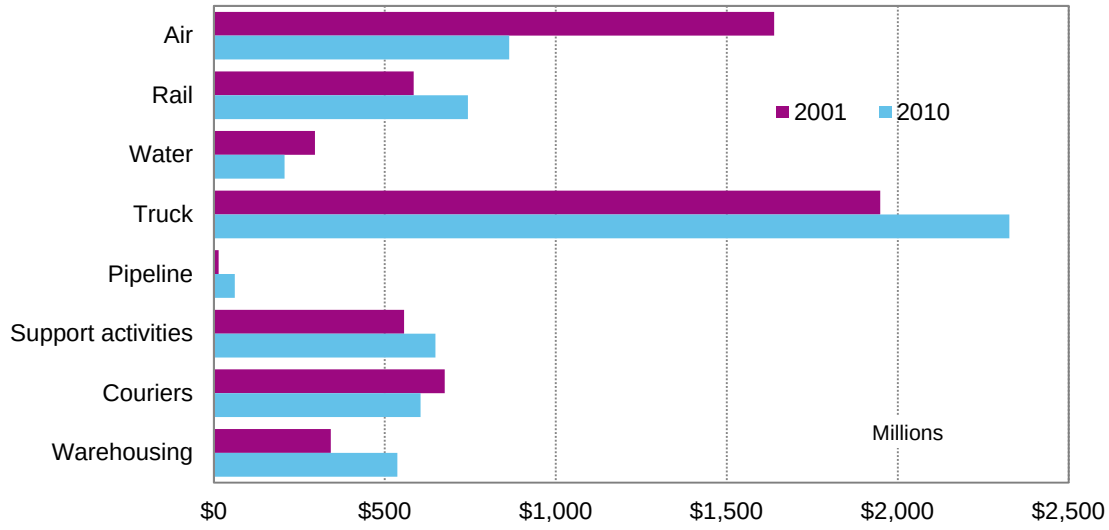


Source: IMPLAN

Not all transportation sectors fared equally in the St. Louis Region. The significant loss in air transportation, both passenger and freight, started in 2003 but was offset by gains in truck, rail and warehousing over this time period as shown below. Truck transportation makes up the largest share of the sector as defined in this study, growing significantly since 2001. This sector grew 2% annually since 2001 reaching more than $2 billion in total output. Its share of the transportation grew from 32% in 2001 to 39% in 2010. Alhough it is the smallest transportation sector, the pipeline

transportation component more than tripled in total output over this timeframe, which can be attributed to connections with the Alberta oil sands, linked with local refinery capacity improvements, as well as pipeline export volumes of refined products.

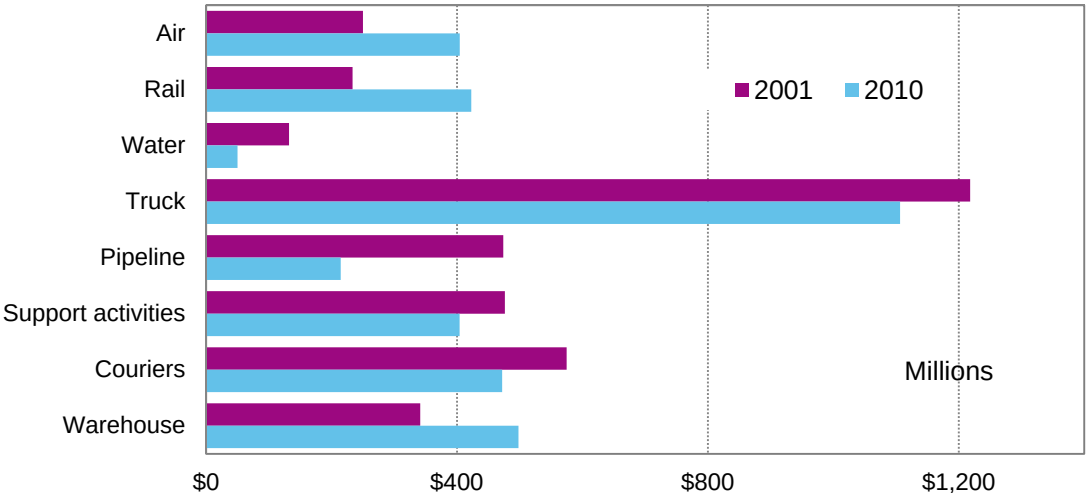
Figure 7 – Share of Transportation Industry Output by Sector



Source: IMPLAN

Next, how much each industry sector within the St. Louis Region spent on transportation was reviewed. In 2001, these sectors in the St. Louis Region spent nearly $4 billion on transportation, which shrank to $3.6 billion by 2010. However, within the totals, it is interesting to see which transportation sectors changed over this time period. The following chart shows what each regional industry sector spent on transportation services, including local, national and international purchases.

Figure 8 – Industry Spending on Transportation by Sector



Source: IMPLAN

While the regional air transportation sector declined in the chart above, as measured by output, the amount of spending on air transportation by local companies grew from $250 million in 2001 to $404 million in 2010. Though less air transportation was being produced locally, demand actually grew.

This trend reinforces both the small size of the air market locally, as well as growth in demand for these services, which appear to be largely met by other airports in the Midwest Region.

There was a decline in spending on water transportation. This sector is comprised of coastal and Great Lakes freight transportation as well as inland water freight transportation. The sector with support services to the transportation industry includes port and harbor operations which may include some of the activity on the Mississippi River. It also includes support for the other sectors (air, rail, truck, etc.).

Transportation Sector Industry Linkage

The economic linkages between select transportation sectors with the St. Louis Region were evaluated to understand the interdependence between industries. Specifically, these linkages were analyzed within the local economy for the air, rail, water and truck transportation sectors among goods producing sectors in the St. Louis Region. This includes agriculture, mining, utilities, construction, manufacturing and wholesale trade sectors. The analysis first focused on the top 25 goods producing sectors in terms of total output, shown below. Of the nearly $2 billion spent on transportation by local companies, 56% was spent for trucking, 21% on rail and 20% on air. Water transportation made up less than 3% of all transportation costs.

Six tables follow. In the first, the transportation costs for goods producing sectors with the largest economic output are examined. The second presents sectors with the largest share of total output spent on transportation. The remaining four tables look at goods producing sectors that spend the largest share of their transportation budgets on air, rail, water and truck transportation, respectively. Note that purchases of transportation can be made anywhere, not just within the local economic region. This distinction will be discussed later.

Goods Producing Sectors with the Most Output

Among goods producing sectors, the wholesale trade sector was the largest in 2010 with $10.2 billion in total output, with about, 0.4%, $36.2 million spent on transportation (Table 1 below). Truck transportation made up nearly 59% of all transportation costs for wholesale trade businesses in the St. Louis Region, followed by air transportation with 37% of spending on transportation. Petroleum refineries, the third largest economic sector, spent $26.4 million on transportation, of which 24.5% was on rail. Also note that this data reflects cost, not volume. The top sectors in terms of total output include:

- Wholesale Trade Activity
- Aircraft manufacturing
- Petroleum refineries / petrochemicals
- Breweries
- Light truck / utility vehicle manufacturing
- Soap and cleaning compound mfg
- Pharmaceutical preparation manufacturing
- Dog and cat food manufacturing

From the above list, companies such as Dial Soap, General Motors and Boeing, along with several breweries should come to mind.

Table 1 – Transportation Costs by Goods Producing Sectors with the Most Output, 2010

Industry	Output (millions)	Transp. Share of Output	Transp. Spending (millions)	Share of Transportation Spending			
				Air	Rail	Truck	Water
Wholesale Trade Activity	$10,249	0.4%	$36.2	37%	3.8%	59%	0.4%
Aircraft manufacturing	$6,938	0.6%	$38.4	26%	7.8%	65%	1.1%
Petroleum refineries	$6,463	0.4%	$26.4	10%	24%	60%	5.5%
Construction of nonresidential structures	$3,895	1.4%	$53.3	9%	11%	78%	1.9%
Breweries	$2,793	2.6%	$72.4	3%	36%	61%	0.4%
Light truck and utility vehicle manufacturing	$2,733	1.0%	$28.5	7%	22%	70%	0.2%
Soap and cleaning compound mfg	$2,348	2.0%	$47.2	22%	38%	39%	0.4%
Construction of commercial and health care structures	$2,196	1.1%	$24.7	18%	9%	71%	0.7%
Pharmaceutical preparation manufacturing	$2,006	0.8%	$16.2	9%	16%	75%	0.3%
Dog and cat food manufacturing	$1,916	3.7%	$70.5	2%	47%	49%	1.4%
Petrochemical manufacturing	$1,748	1.5%	$26.1	13%	42%	43%	1.7%
Construction of other new residential structures	$1,672	1.6%	$27.4	10%	11%	77%	1.3%
Maintenance and repair of nonresidential structures	$1,479	1.7%	$24.9	8.5%	12%	78%	2.0%
Iron and steel mills and ferroalloy manufacturing	$1,414	5.6%	$79.3	3.1%	54%	40%	2.1%
Electric power generation, transmission	$1,273	1.3%	$16.1	2.8%	85%	11%	0.9%
Copper rolling, drawing, extruding and alloying	$1,232	1.8%	$22.4	10%	40%	46%	3.9%
Oil and natural gas extraction	$1,224	0.2%	$2.2	6%	44%	46%	3.9%
HVAC Equipment mfg	$1,119	1.3%	$14.6	17%	13%	69%	0.8%
Distilleries	$821	1.3%	$10.3	1.2%	27%	65%	6.8%
Basic organic chemical mfg	$818	2.1%	$17.4	11%	44%	43%	2.4%
Printing	$812	1.5%	$12.4	32%	13%	55%	0.1%
Natural gas distribution	$808	0.2%	$1.9	26%	32%	42%	0.1%
Construction of new residential structures	$789	2.2%	$17.2	6%	11%	82%	1.0%
Soft drink ice mfg	$709	2.0%	$14.2	7%	19%	73%	1.2%
Paperboard container mfg	$683	3.4%	$23.5	8%	41%	51%	0.2%

Source: IMPLAN

Goods Producing Sectors with the Most Transportation Output

Of the top 25 economic sectors noted below, 8 sectors spend more than $10 million per year on transportation (see Table 2 below). The sector with the highest share of output spent on

transportation was flour milling at 15.7%. This sector, with $316 million in total output, spent $49.6 million on transportation costs, of which 53% was on rail. Ready-mix concrete manufacturing is the second largest consumer of transportation as measured as a share of total economic output. In 2010, this sector generated $267.5 million in output of which 12.2% was spent on transportation. The majority of its transportation spending was on trucks, 82%. For these types of sectors, changes in transportation costs can have large impacts on their profitability, particularly when goods are produced for other markets. Top sectors include:

- Flour milling and malt manufacturing
- Ready-mix concrete, lime, gypsum, and fertilizer product manufacturing
- Nonmetallic / treated mineral products, including carbon and graphite
- Cut stone and stone product manufacturing

Table 2 – Goods Producing Sectors with the Largest Share of Output Spent on Transportation

Industry	Output (millions)	Transp. Share of Output	Transp. Spending (millions)	Share of Transportation Spending			
				Air	Rail	Truck	Water
Flour milling and malt manufacturing	$316.4	15.7%	$49.6	3.8%	53.0%	20.9%	22.3%
Ready-mix concrete manufacturing	$267.5	12.2%	$32.6	2.7%	14.3%	82.2%	0.7%
Lime and gypsum product manufacturing	$11.0	11.0%	$1.2	0.4%	32.1%	66.7%	0.8%
Broom, brush, and mop manufacturing	$4.4	9.3%	$0.4	0.3%	1.2%	98.5%	0.0%
Fertilizer manufacturing	$114.5	9.0%	$10.3	0.5%	16.1%	82.7%	0.7%
Miscellaneous nonmetallic mineral product mfg	$8.9	8.1%	$0.7	6.0%	30.2%	63.4%	0.5%
Ground or treated mineral and earth manufacturing	$11.5	7.6%	$0.9	3.2%	20.3%	75.2%	1.3%
Carbon and graphite product manufacturing	$1.3	7.1%	$0.1	0.6%	41.7%	56.3%	1.4%
Mineral wool manufacturing	$9.4	6.2%	$0.6	4.8%	27.4%	67.5%	0.2%
Commercial hunting and trapping	$3.5	6.2%	$0.2	0.3%	0.5%	98.8%	0.3%
Cut stone and stone product manufacturing	$34.3	6.0%	$2.1	7.5%	22.3%	69.1%	1.0%
Other animal food manufacturing	$194.4	5.8%	$11.3	2.4%	48.3%	47.1%	2.1%
Iron and steel mills mfg	$1,413.6	5.6%	$79.3	3.1%	54.2%	40.6%	2.1%
Soybean/oilseed processing	$180.2	5.5%	$9.9	6.9%	46.0%	42.1%	4.9%
Sawmills and wood preservation	$3.4	4.5%	$0.2	3.1%	26.1%	70.8%	0.0%
Engineered wood member and truss manufacturing	$7.8	4.2%	$0.3	8.6%	33.9%	57.6%	0.0%
Wood windows and doors and millwork mfg	$46.1	4.2%	$1.9	7.0%	29.6%	63.4%	0.0%
Coffee and tea mfg	$76.1	4.2%	$3.2	7.1%	4.8%	86.2%	1.9%
Snack food manufacturing	$23.4	4.2%	$1.0	4.4%	21.6%	72.4%	1.5%
Frozen food manufacturing	$166.0	4.2%	$6.9	2.8%	22.3%	73.9%	1.0%

Industry	Output	Transp.	Transp.	Share of Transportation Spending			
Poultry and egg production	$47.9	4.1%	$1.9	1.0%	33.2%	63.8%	2.0%
Concrete pipe, brick, and block manufacturing	$29.0	3.9%	$1.1	8.7%	27.1%	63.9%	0.3%
Pressed and blown glass and glassware mfg	$81.7	3.8%	$3.1	4.3%	53.0%	41.7%	1.0%
Animal slaughtering, rendering, and processing	$422.0	3.7%	$15.6	9.5%	2.6%	87.9%	0.1%
Dog and cat food manufacturing	$1,916.4	3.7%	$70.5	1.7%	47.3%	49.6%	1.4%

Source: IMPLAN

Goods Producing Sectors - Largest Share of Output Spent on Air Transportation

Air transportation makes up 20% of all spending on transportation by local goods producing sectors. However, as shown in Table 3, below, air transportation makes up a significant share of transportation spending for many sectors. Typically these products are smaller and lighter to ship, and carry significantly higher values. As well, they may have to be shipped greater distances than goods that are heavier. They also tend to be higher value such as electronics items. For example, the sector that produces industrial process variable instruments, that is instruments that measure, display, indicate, record, transmit and/or control industrial process variables such as temperature, humidity, pressure, vacuum, combustion, flow, level, viscosity, density, acidity, concentration and rotation, is relatively small ($34 million in output), spends $0.4 million on transportation of which 55% is on air transportation and 39% is on trucking. These sectors with high share of air transportation costs rely heavily on trucking as well and relatively little on rail and water transportation. The top sectors that spend their largest shares on air transportation include:

- Industrial process instruments
- Analytical laboratory instrument and electricity / signal testing instruments manufacturing
- Optical instruments, watches, clock, and measuring device manufacturing
- Machine shops, ship building and repairing
- Printing and packaging machinery
- Wholesale trade businesses

Table 3 – Goods Producing Sectors with the Largest Share of Transportation Costs on Air Transport

Industry	Output (millions)	Transp. Share of Output	Transportation Spending (millions)	Share of Transportation Spending			
				Air	Rail	Truck	Water
Industrial process variable instruments mfg	$33.9	1.1%	$0.4	54.9%	6.4%	38.7%	0.0%
Electricity and signal testing instruments mfg	$13.5	0.8%	$0.1	51.2%	1.2%	47.6%	0.0%
Analytical laboratory instrument mfg	$3.4	0.9%	$0.0	50.8%	2.9%	46.3%	0.0%

Industry	Output	Transp.	Transpor	Share of Transportation Spending			
Watch, clock, and other measuring device mfg	$26.9	0.6%	$0.2	50.8%	6.1%	43.2%	0.0%
Machine shops	$155.7	1.1%	$1.7	42.1%	7.6%	49.7%	0.6%
Optical instrument and lens mfg	$47.2	0.9%	$0.4	42.0%	5.2%	52.7%	0.0%
Ship building and repairing	$17.6	1.0%	$0.2	41.4%	8.7%	49.7%	0.2%
Support activities for printing	$65.8	0.7%	$0.5	41.4%	8.9%	49.7%	0.0%
Packaging machinery mfg	$41.1	1.2%	$0.5	37.4%	2.8%	59.8%	0.0%
Wholesale trade businesses	$10,249.4	0.4%	$36.2	37.0%	3.8%	58.8%	0.4%
Broadcast / wireless communication equip mfg	$14.8	0.6%	$0.1	34.7%	2.5%	62.8%	0.0%
Search, detection, and navigation instruments mfg	$119.0	0.7%	$0.8	34.6%	3.4%	61.9%	0.0%
Industrial process furnace and oven mfg	$108.2	0.9%	$1.0	33.4%	7.3%	59.3%	0.0%
Mining and oil and gas field machinery mfg	$59.6	1.6%	$1.0	32.9%	10.0%	57.1%	0.0%
Electromedical and electrotherapeutic mfg	$4.0	0.9%	$0.0	32.2%	8.0%	59.7%	0.1%
Other communications equipment mfg	$33.6	0.6%	$0.2	32.1%	2.2%	65.7%	0.0%
Printing	$812.4	1.5%	$12.4	31.9%	13.2%	54.7%	0.1%
Bare printed circuit board mfg	$3.6	0.8%	$0.0	31.0%	7.9%	60.7%	0.3%
Coating, engraving, heat treating and allied activities	$337.2	1.4%	$4.8	30.8%	24.0%	43.8%	1.5%
Commercial, industrial, and office machinery mfg	$59.3	1.1%	$0.6	30.4%	8.6%	60.8%	0.2%
Sign mfg	$64.8	1.4%	$0.9	30.0%	14.0%	56.1%	0.0%
Other leather and allied product mfg	$5.7	1.2%	$0.1	29.4%	1.4%	69.2%	0.0%
Aircraft engine and engine parts mfg	$7.5	0.5%	$0.0	28.0%	5.3%	66.0%	0.7%
Polystyrene foam product mfg	$56.8	1.5%	$0.9	26.8%	40.0%	33.2%	0.0%
Crown and closure mfg and metal stamping	$68.6	1.8%	$1.3	26.6%	21.3%	51.2%	0.9%

Source: IMPLAN

Goods Producing Sectors - Largest Share of Output Spent on Rail Transportation

As shown in Table 4 below, sectors that rely more heavily on rail transportation include producers of bulk items such as coal, grains, and petrochemicals. Sectors that produce coal spent two-thirds of their transportation expenditures on rail. Of the $16 million spent by electric power generation, transmission and distribution companies, 85% was spent on rail in 2010. Top sectors include:

- Electric power generation & transmission
- Glass containers, plastics, pipe and pipe fitting manufacturing
- Cement, brick, tile, and structural clay manufacturing

- Synthetic dye and pigment manufacturing
- Fats and oils refining and blending
- Iron and steel mills and ferroalloy manufacturing

Table 4 – Goods Producing Sectors with the Largest Share of Transportation Costs on Rail Transport

Industry	Output (millions)	Transp. Share of Output	Transp. Spending (millions)	Share of Transportation Spending			
				Air	Rail	Truck	Water
Electric power generation, transmission, and distribution	$1,273.4	1.3%	$16.1	2.8%	85.1%	11.2%	0.9%
Mining coal	$81.2	3.1%	$2.5	0.5%	67.2%	31.1%	1.2%
Plastics pipe and pipe fitting mfg	$12.4	1.3%	$0.2	4.8%	61.8%	33.3%	0.1%
Glass container mfg	$56.9	3.7%	$2.1	4.2%	61.6%	33.4%	0.8%
Brick, tile, and other structural clay product mfg	$27.5	1.2%	$0.3	7.2%	58.4%	33.7%	0.7%
Synthetic dye and pigment mfg	$175.9	1.6%	$2.8	7.8%	57.3%	32.4%	2.5%
Cement mfg	$84.0	2.9%	$2.4	4.2%	55.3%	38.5%	2.0%
Unlaminated plastics profile shape mfg	$5.4	1.0%	$0.1	7.2%	54.5%	38.4%	0.0%
Fats and oils refining and blending	$14.0	3.5%	$0.5	2.6%	54.4%	41.4%	1.6%
Iron and steel mills and ferroalloy mfg	$1,413.6	5.6%	$79.3	3.1%	54.2%	40.6%	2.1%
Plastics bottle mfg	$311.1	1.4%	$4.2	6.9%	53.6%	39.4%	0.2%
All other chemical product and preparation mfg	$310.2	2.0%	$6.2	11.0%	53.4%	34.3%	1.3%
Other pressed and blown glass and glassware mfg	$81.7	3.8%	$3.1	4.3%	53.0%	41.7%	1.0%
Flour milling and malt mfg	$316.4	15.7%	$49.6	3.8%	53.0%	20.9%	22.3%
Artificial and synthetic fibers and filaments mfg	$5.9	1.8%	$0.1	7.9%	51.4%	39.7%	1.0%
Breakfast cereal mfg	$111.5	3.5%	$3.9	1.7%	50.6%	42.7%	5.0%
Plastics packaging materials and unlaminated film and sheet mfg	$274.5	1.4%	$3.8	14.4%	49.4%	36.2%	0.0%
Ferrous metal foundries	$164.2	1.9%	$3.1	9.6%	48.4%	39.6%	2.5%
Other animal food mfg	$194.4	5.8%	$11.3	2.4%	48.3%	47.1%	2.1%
Dog and cat food mfg	$1,916.4	3.7%	$70.5	1.7%	47.3%	49.6%	1.4%
Nonchocolate confectionery mfg	$1.2	2.6%	$0.0	3.7%	47.2%	49.0%	0.1%
Cookie, cracker, and pasta mfg	$210.0	2.5%	$5.2	8.5%	46.9%	39.8%	4.8%
Bread and bakery product mfg	$338.4	1.7%	$5.9	12.9%	46.7%	40.1%	0.3%
Soybean and other oilseed processing	$180.2	5.5%	$9.9	6.9%	46.0%	42.1%	4.9%
Industrial gas mfg	$20.5	2.0%	$0.4	5.5%	46.0%	45.4%	3.1%

Source: IMPLAN

Goods Producing Sectors - Largest Share of Output Spent on Truck Transportation

For sectors that spend the majority of their transportation budgets on trucking, they rely very heavily on this sector more so than other modes, as shown in Table 5 below, among the top 25 goods producing sectors with large share of spending on trucks, all 25 spend 85% or more of their budgets on trucking. Among the top 25 sectors that rely heavily on trucking, there are agricultural goods, apparel, bulk items, large equipment and construction materials, among other large items. Top sectors include:

- Cheese, milk, and butter manufacturing
- Curtain and linen mills and knit fabrics
- Biological product manufacturing
- Audio and video equipment manufacturing
- Animal slaughtering, rendering, and processing
- Apparel accessories and other apparel manufacturing

Table 5 – Goods Producing Sectors with the Largest Share of Transportation Costs on Tuck Transport

Industry	Output (millions)	Transp. Share of Output	Transp. Spending (millions)	Share of Transportation Spending			
				Air	Rail	Truck	Water
Commercial hunting and trapping	$3.5	6.2%	$0.2	0.3%	0.5%	98.8%	0.3%
Broom, brush, and mop manufacturing	$4.4	9.3%	$0.4	0.3%	1.2%	98.5%	0.0%
Cheese manufacturing	$0.5	3.4%	$0.0	3.6%	3.1%	93.2%	0.2%
Curtain and linen mills	$11.6	2.3%	$0.3	5.5%	2.3%	92.2%	0.0%
Fluid milk and butter manufacturing	$211.5	3.4%	$7.3	6.0%	4.4%	89.6%	0.1%
Biological product (except diagnostic) manufacturing	$36.8	0.6%	$0.2	6.2%	4.0%	89.3%	0.5%
Audio and video equipment manufacturing	$16.5	1.0%	$0.2	9.3%	1.4%	89.3%	0.0%
Knit fabric mills	$2.5	2.1%	$0.1	8.9%	2.4%	88.7%	0.0%
Animal slaughtering, rendering, and processing	$422.0	3.7%	$15.6	9.5%	2.6%	87.9%	0.1%
Apparel accessories and other apparel manufacturing	$26.7	1.4%	$0.4	10.5%	1.9%	87.6%	0.0%
Women's and girls' cut and sew apparel manufacturing	$19.6	1.9%	$0.4	11.4%	1.2%	87.3%	0.1%
Turbine and turbine generator mfg	$47.7	1.0%	$0.5	3.4%	8.9%	87.3%	0.3%
Power-driven hand tool manufacturing	$18.8	1.1%	$0.2	6.8%	5.9%	87.3%	0.0%
Medicinal and botanical manufacturing	$437.3	0.8%	$3.3	4.0%	7.8%	87.1%	1.0%
Other cut and sew apparel manufacturing	$76.3	1.9%	$1.5	11.7%	1.2%	87.1%	0.0%
Men's and boys' cut and sew apparel manufacturing	$4.5	1.7%	$0.1	10.3%	2.7%	87.0%	0.0%

Industry	Output	Transp.	Transp.	Share of Transportation Spending			
Condensed, and evaporated dairy product mfg	$230.6	3.0%	$7.0	3.5%	9.4%	87.0%	0.1%
Footwear manufacturing	$54.5	1.2%	$0.7	9.8%	3.4%	86.8%	0.0%
Coffee and tea manufacturing	$76.1	4.2%	$3.2	7.1%	4.8%	86.2%	1.9%
Ophthalmic goods manufacturing	$50.5	0.6%	$0.3	6.3%	7.6%	86.1%	0.0%
Mining and quarrying stone	$204.9	3.3%	$6.7	1.5%	11.3%	85.9%	1.3%
Textile and fabric mills	$19.0	2.5%	$0.5	8.1%	6.6%	85.2%	0.0%
Cut and sew apparel contractors	$0.7	0.9%	$0.0	12.8%	2.0%	85.2%	0.0%
Wineries	$41.8	3.3%	$1.4	6.5%	7.1%	85.0%	1.3%
Forest products production	$8.2	0.2%	$0.0	9.4%	4.8%	84.9%	1.0%

Source: IMPLAN

Goods Producing Sectors - Largest Share of Output Spent on Water Transportation

Overall, spending on transportation by water made up 2.5% of transportation spending in the St. Louis Region during 2010, as shown in Table 6 below. This form of transportation is used more frequently to move raw or semi-finished materials, rather than finished goods. As such, its "cost" as an input to the production process is generally going to be lower compared to other modes of transportation, particularly compared to truck transportation. Companies in the flour milling and malt manufacturing sector spent nearly $50 million on transportation with 22% via water. Petroleum products, agriculture, metal manufacturing and food manufacturing sectors have the highest share of their transportation costs in water. Top sectors include:

- Crop / grain farming, flour milling and malt manufacturing
- Petroleum refining and coal product processing
- Asphalt and block manufacturing
- Distilleries

Table 6 – Goods Producing Sectors with the Largest Share of Transportation Costs on Water Transport

Industry	Output (millions)	Transp Share of Output	Transp. Spending (millions)	Share of Transportation Spending			
				Air	Rail	Truck	Water
Flour milling and malt manufacturing	$316.4	15.7%	$49.6	3.8%	53.0%	20.9%	22.3%
All other petroleum and coal products mfg	$99.3	0.5%	$0.5	3.9%	15.6%	67.6%	12.9%
Petroleum lubricating oil and grease manufacturing	$352.4	0.7%	$2.6	6.0%	23.1%	60.4%	10.4%
Asphalt paving mixture and block manufacturing	$38.4	1.0%	$0.4	6.1%	20.5%	65.6%	7.8%
All other crop farming	$22.2	2.6%	$0.6	3.7%	24.4%	64.4%	7.6%
Distilleries	$820.8	1.3%	$10.3	1.2%	26.8%	65.3%	6.8%

Industry	Output	Transp	Transp.	Share of Transportation Spending			
Grain farming	$189.5	2.4%	$4.5	4.2%	33.0%	56.4%	6.4%
Asphalt shingle and coating materials manufacturing	$22.9	1.2%	$0.3	3.6%	26.0%	64.3%	6.1%
Petroleum refineries	$6,463.3	0.4%	$26.4	10.3%	24.5%	59.7%	5.5%
Greenhouse, nursery, and floriculture production	$53.8	0.6%	$0.3	9.5%	8.6%	76.6%	5.3%
Cattle ranching and farming	$34.1	2.6%	$0.9	4.1%	15.8%	74.9%	5.2%
Breakfast cereal manufacturing	$111.5	3.5%	$3.9	1.7%	50.6%	42.7%	5.0%
Soybean and other oilseed processing	$180.2	5.5%	$9.9	6.9%	46.0%	42.1%	4.9%
Cookie, cracker, and pasta manufacturing	$210.0	2.5%	$5.2	8.5%	46.9%	39.8%	4.8%
Oil and natural gas extraction	$1,223.5	0.2%	$2.2	5.9%	44.0%	46.1%	3.9%
Copper rolling, drawing, extruding and alloying	$1,232.2	1.8%	$22.4	10.2%	39.8%	46.1%	3.9%
Aluminum product manufacturing from purchased aluminum	$148.2	2.1%	$3.2	8.3%	32.0%	56.2%	3.5%
Oilseed farming	$209.5	0.8%	$1.8	10.0%	32.5%	54.3%	3.2%
Industrial gas manufacturing	$20.5	2.0%	$0.4	5.5%	46.0%	45.4%	3.1%
Dairy cattle and milk production	$17.9	1.8%	$0.3	2.5%	28.8%	65.7%	3.0%
Nonferrous metal foundries	$98.0	1.3%	$1.3	14.3%	32.3%	50.4%	2.9%
Nonferrous metal rolling, drawing and alloying	$184.2	2.2%	$4.0	6.0%	37.3%	53.8%	2.8%
Ferrous metal foundries	$164.2	1.9%	$3.1	9.6%	48.4%	39.6%	2.5%
Synthetic dye and pigment manufacturing	$175.9	1.6%	$2.8	7.8%	57.3%	32.4%	2.5%
Primary smelting and refining of nonferrous metal	$221.9	2.1%	$4.6	5.1%	22.0%	70.5%	2.4%

Source: IMPLAN

Change in Share – Transportation Spending

Table 7 presents the top 25 goods producing sectors with the largest growth in transportation spending as a share of output. The flour milling and malt manufacturing sector experienced the largest shift. In 2001, this sector spent 6.9% of the $167.4 million in total output on transportation, $11.5 million. By 2010, this share had increased to 15.7%, up to $49.6 million. Another sector that is a large consumer of transportation, ready-mix concrete manufacturing, increased the share it spent on transportation from 10.8% of its total output in 2001 to 12.2% in 2010. Top sectors include:

- Soybean processing, flour milling and malt processing
- Fertilizer processing
- Ground or treated minerals; mining and quarrying stone and ready-mix concrete processing
- Fluid milk, butter & cheese manufacturing

Table 7 – Top Goods Producing Sectors with the Largest Growth in Share of Transportation Spending

Industry	2001			2010			Change in Share
	Output (millions)	Transp. Spending (millions)	Share	Output (millions)	Transp. Spending (millions)	Share	
Flour milling and malt mfg	$167.4	$11.5	6.9%	$316.4	$49.6	15.7%	8.8%
Broom, brush, and mop mfg	$21.1	$0.5	2.4%	$4.4	$0.4	9.3%	6.9%
Fertilizer mfg	$37.1	$1.3	3.6%	$114.5	$10.3	9.0%	5.4%
Ground or treated mineral and earth mfg	$0.8	$0.0	4.4%	$11.5	$0.9	7.6%	3.2%
Miscellaneous nonmetallic mineral product mfg	$33.0	$1.6	5.0%	$8.9	$0.7	8.1%	3.2%
Soybean and other oilseed processing	$86.9	$2.1	2.4%	$180.2	$9.9	5.5%	3.1%
Fluid milk and butter mfg	$288.4	$2.5	0.9%	$211.5	$7.3	3.4%	2.6%
Cheese mfg	$114.6	$1.0	0.9%	$0.5	$0.0	3.4%	2.5%
Commercial logging	$8.4	$0.0	0.2%	$7.6	$0.2	2.1%	1.9%
Industrial gas mfg	$23.3	$0.0	0.1%	$20.5	$0.4	2.0%	1.8%
Condensed, and evaporated dairy product mfg	$1.2	$0.0	1.2%	$230.6	$7.0	3.0%	1.8%
Mining and quarrying stone	$160.0	$2.5	1.5%	$204.9	$6.7	3.3%	1.7%
Ready-mix concrete mfg	$201.9	$21.8	10.8%	$267.5	$32.6	12.2%	1.4%
Carbon and graphite product mfg	$13.3	$0.8	5.8%	$1.3	$0.1	7.1%	1.2%
All other basic inorganic chemical mfg	$124.4	$2.4	1.9%	$352.5	$11.2	3.2%	1.2%
Other aircraft parts and auxiliary equipment mfg	$257.7	$5.1	2.0%	$477.4	$15.4	3.2%	1.2%
Engineered wood member and truss mfg	$29.4	$0.9	3.1%	$7.8	$0.3	4.2%	1.1%
Nonchocolate confectionery mfg	$31.4	$0.5	1.5%	$1.2	$0.0	2.6%	1.1%
Grain farming	$129.9	$1.7	1.3%	$189.5	$4.5	2.4%	1.0%
Musical instrument mfg	$6.1	$0.0	0.8%	$3.8	$0.1	1.8%	1.0%
All other forging, stamping, and sintering	$41.0	$0.4	1.1%	$12.2	$0.3	2.1%	1.0%
Wood cabinet mfg	$36.9	$0.7	1.8%	$34.1	$0.9	2.8%	1.0%
Other cut and sew apparel mfg	$3.5	$0.0	1.1%	$76.3	$1.5	1.9%	0.9%
Other pressed and blown glass and glassware mfg	$19.4	$0.6	2.9%	$81.7	$3.1	3.8%	0.9%
Animal slaughtering, rendering, and processing	$310.6	$8.9	2.9%	$422.0	$15.6	3.7%	0.8%

Source: IMPLAN

Pipeline Sector

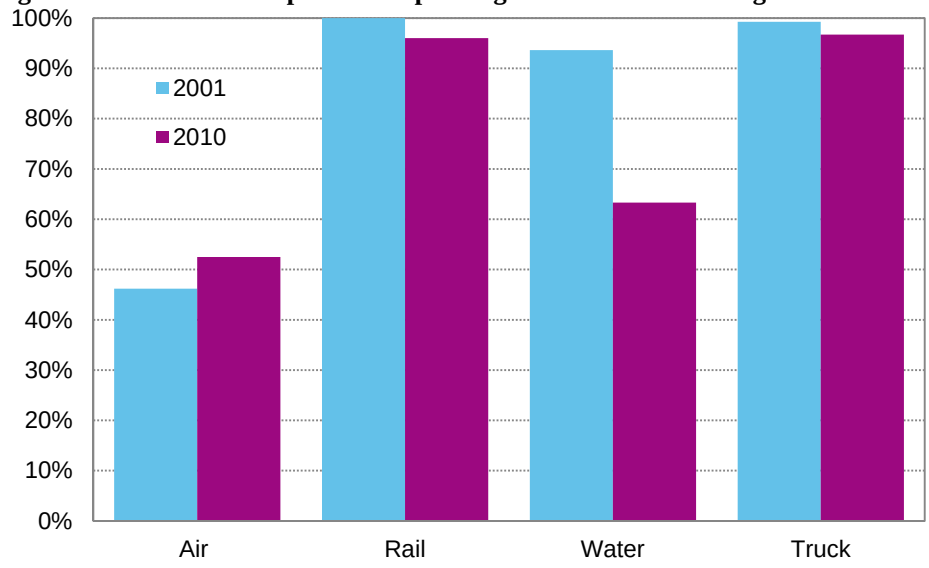
In regard to transportation by pipeline, two sectors are the primary consumers. Combined, petroleum refineries and natural gas distribution companies account for 77% of all spending in the St. Louis Region on pipeline by transportation. In 2010, spending on pipeline transportation reached nearly $215 million of which $165.9 million was spent by these two sectors combined.

Regional Share of Purchases

As mentioned earlier, the transportation costs analyzed above represent purchases made within the St. Louis Region as well as outside. In this section, the share of the costs that were made by local transportation providers is broken down. In 2001, local companies spent $1.8 billion on air, rail water and truck transportation. This increased to nearly $2 billion in 2010. However, the share spent within the St. Louis Region declined from 92% to 87%.

Spending on truck transportation made up the majority of the transportation spending, $1.1 billion in 2010, down slightly from $1.2 billion in 2001. Of particular interest is the shift in air transportation spending. Local firms spent $404.3 million on air transportation, an increase of $154.3 million from 2001. In addition to increased spending, a larger share of their air transportation dollars was spent within the St. Louis Region increasing from 46% of all purchases to 53%. The remaining three sectors experienced declining shares within the St. Louis Region.

Figure 9 – Share of Transportation Spending Made in St. Louis Region



Source: IMPLAN

Implications

It is also apparent that U.S. transportation infrastructure has struggled to keep pace with the vast increases in shipping in recent decades in addition to the changes in origins and destinations and more rigorous logistics management. Deregulation of freight railroads led to considerable consolidation in rail lines, which increased efficiency and lower rates, but also dramatically reduced capacity to widely dispersed industrial sites. Today, although rail providers are investing heavily to increase capacity along main lines and key intermodal hubs like LA / Long Beach, Kansas City, Memphis, Chicago, Columbus, and North Baltimore (OH), infrastructure in many other secondary markets (like St. Louis) remains arguably unprepared for anticipated growth in freight volumes.

- Across the St. Louis Region, there are an estimated 47,000 jobs in transportation sectors according to IMPLAN data in 2011, paying about $2.1 billion in wages, and generating about $5.9 billion in total output.
- Consistent with national trends, transportation makes up a smaller share of overall regional output in 2010 compared to 2001. The decrease in output reflects growing efficiencies in transportation sectors which reduced their cost as an input to the production process. One clear outcome is that the transportation sector is also very sensitive to relative changes in cost; supply chains can shift quickly as a result.
- While trucking is the largest sector from an employment standpoint, average wages are lower compared to the overall average wages in transportation.
- Transportation by water, while highly efficient, also generates lower output relative to other sectors (trucking for example). Goods moved by water are largely used as inputs to local production processes, or sent down river for export, both of which are generally more cost sensitive activities.
- In total, although the transportation sector makes up a relatively small share of the local economy, it performs a vital role in the moving of goods in, out and through the St. Louis Region, while connecting industries to their markets and suppliers.
- Local firms spent $404.3 million on air transportation, an increase of $154.3 million from 2001. In addition to increased spending, a larger share of their air transportation dollars was spent within the St. Louis Region increasing from 46% of all purchases to 53%.

07

Freight Corridors and Land Use Alignment

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Introduction

The Industrial Land Use context is shaped by clear expectations that freight volumes through metropolitan areas such as St. Louis will only increase over time. Nationally, federal research reinforces expectations for a 60% increase in freight volumes nationally over the next 25 years, which is driving considerable debate about funding strategies and solutions that maximize alignment of modes, while increasing operating efficiencies, and reducing costs.

While expectations for growth in freight volumes are clear, challenges associated with an all-too-common misalignment of land use and transportation in addition to capacity constraints and modal disconnects, are equally apparent. While growing freight volumes and congestion create conflicts, the reality is that "freight doesn't vote", and as a result, transportation planning may not fully account for freight impacts and vice versa. Looking forward, it is apparent that the connection between freight movement, land use and climate change will become increasingly important, with growing awareness of air quality impacts on adjacent / at risk populations.

The study drilled down into 23 specific areas in the St. Louis Region where transportation modes align with industrial land use, assembled from groups of Transportation Analysis Zone (TAZ) blocks. For each area, core characteristics related to total industrial space, employment, train counts, truck counts, crashes, and similar factors were identified. Outputs from this section will inform the discussion of critical performance indicators for system monitoring in the future. The resulting data is presented in matrix form to help identify how industrial areas in the St. Louis Region are performing, and how the transportation system is performing.

Industrial Real Estate Context

In the past, industrial real estate was in large part tied to the business function(s) performed there. Manufacturers of goods custom-fitted their industrial properties with specialized machinery and re-location was often not a viable option due to transaction costs. This dynamic is changing, however. As the pace of change in the economy quickens, industrial space has become less specialized more readily adaptable to changing market factors. Implications include:

- Companies involved in the production, distribution, and final sale of goods have been paying close attention to logistics costs for years. Over time, these costs as a share of overall US economic activity have decreased steadily. For example, according to the Council of Supply Chain Management, logistics costs have fallen from an estimated at 16% of total US economic activity in 1981 to about 8.5% in 2012.
- There is vastly greater opportunity in the distribution and transportation of goods today than ever before. Industrial real estate now caters to business parks that ship and receive goods more than those that manufacture them.
- Reflecting a need to control costs, distribution uses are increasingly focused in immediate proximity to intermodal yards. For customers, immediate adjacency reduces drayage costs.
- Also reflecting a need to control costs, distribution buildings have gotten much larger, with 500,000 SF to 1,000,000 SF buildings being more prevalent. Building designs are also increasingly favoring clear ceiling heights of 32 feet, along with secure truck courts.

- Unlike distribution, manufacturing buildings are tending to get smaller, as specific manufacturing processes are increasingly aligned with supply chain requirements.
- There is more of a market for industrial real estate. In the days when industrial properties were highly customized for the tenant, the market for industrial real estate was relatively quiet. Today, however, many new industrial buildings are more generic and adaptable to different uses.
- The growth in REIT linked ownership of buildings has also generated in interest in ensuring that industrial buildings / parks are maintained to consistent standards, which has led to interest in design standards related to open space requirements and building setbacks.
- One additional outgrowth of cost pressure is increasing reliance on part-time workers to sustain seasonal spikes demand.

In addition to the above, significant research has begun to focus more closely on industrial land use, and how freight modes need to better align with industrial assets. For example, in 2012, FHWA identified core challenges associated with industrial land use and freight movement:

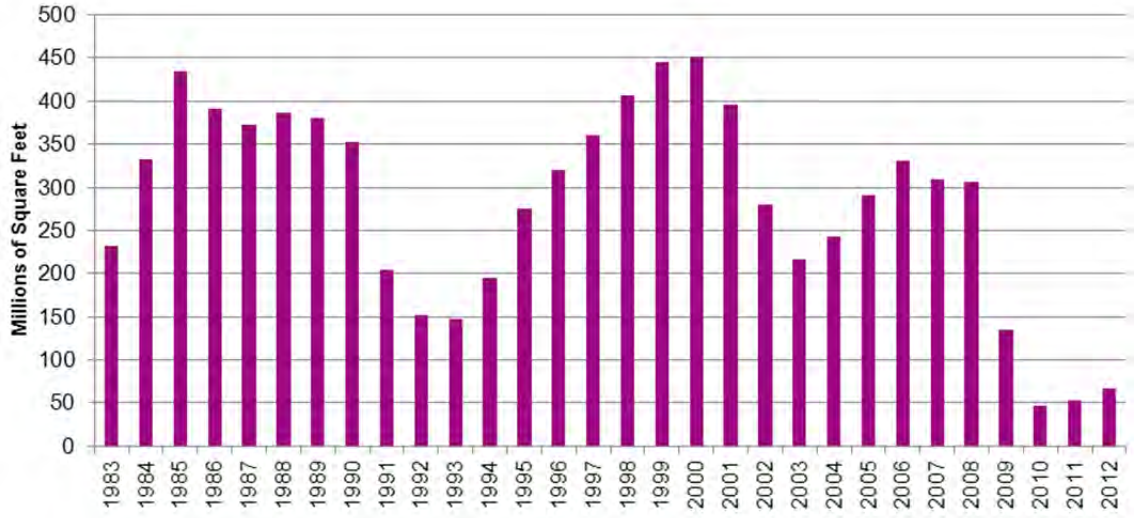
- Urbanization leads to encroachment of non-compatible land uses
- Growing freight volumes and congestion create conflicts
- "Freight doesn't vote" problem
- Transportation planning does not fully account for freight impacts and vice versa
- Economic development and transportation planning are disconnected
- Understanding of stakeholder issues and needs
- The connection between freight, land use and climate change is increasingly important

Industrial Real Estate Metrics

The intent of this analysis is to place the local industrial market in context, given the obvious connection between industrial space and the broader movement of goods and commodities through the St. Louis Region. Research indicates that the regional industrial market has improved since the recession, particularly since 2010. According to the St. Louis Federal Reserve, firms in the paper product, agriculture, chemical, paint, and military and police equipment manufacturing industries reported plans to decrease operations or close plants in the St. Louis Region; in contrast, firms in the automobile parts, wood product, solar panel, and steel product manufacturing industries reported plans to hire workers and increase operations.

This analysis relies largely on data from CoStar, as well as from broker interviews. The financial crisis and resulting economic downturn has had severe ramifications for U.S. industrial real estate markets. The chart below shows total U.S. deliveries of industrial space since 1983, framing the significant drop off in construction since 2008, as well as the beginnings of recovery in new construction, albeit from a particularly low base.

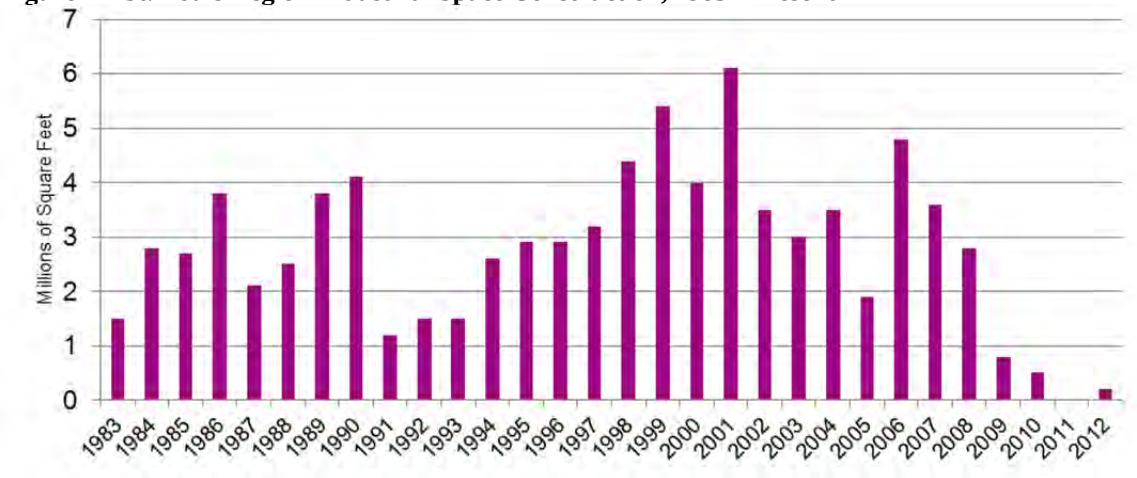
Figure 1 – National Industrial Space Construction, 1983 - Present



Source: CoStar

Patterns for the St. Louis industrial market are similar, with a less clear path for recovery through 2012, as shown below. Since 1983, the St. Louis Region has added about 2.78 million square feet of industrial space per year to existing inventory on average.

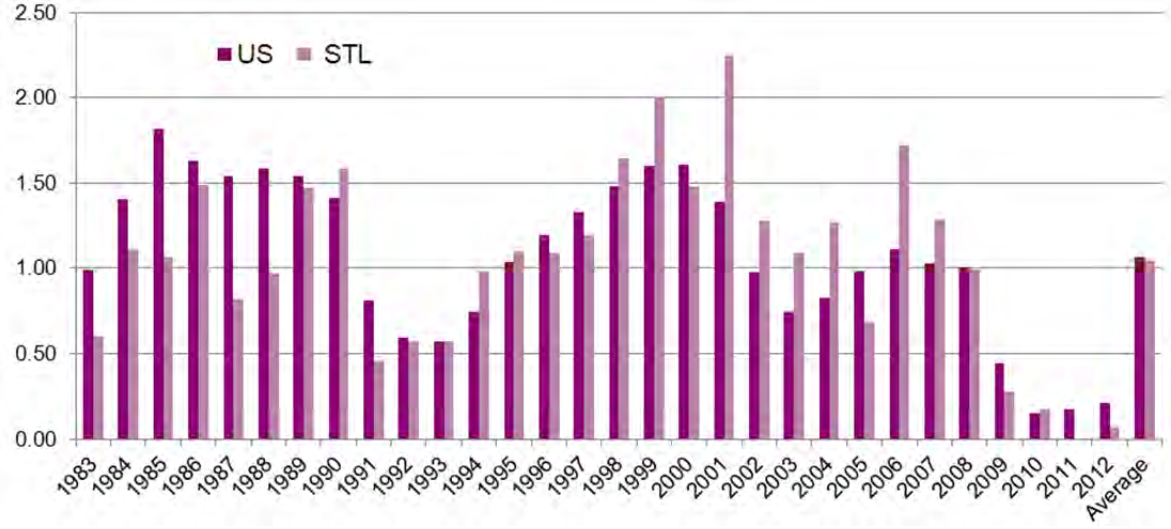
Figure 2 – St. Louis Region Industrial Space Construction, 1983 - Present



Source: CoStar

To better place the St. Louis Region in perspective with regard to the pace of new industrial development, the following chart highlights construction of new industrial space on a per capita basis (total resident population in relation to total new industrial construction). The chart identifies a relevant trend for the St. Louis Region, which added new industrial space at a faster rate compared to the nation between 1999 and 2007. This notion of above standard performance is one that will be revisited again.

Figure 3 – Population per Square Foot of New Industrial Space



Source: CoStar

As of the first quarter of 2012, the current inventory of industrial space was approximately 267 million square feet in nearly 6,100 buildings. Of the roughly 267 million square feet of industrial space, nearly 244 million square feet was occupied during the first quarter of 2012, leaving approximately 23 million square feet vacant, a resulting vacancy rate of 9%.

Table 1 – St. Louis Industrial Market Summary, Q1, 2012

Buildings	6,059	Vacant (%)	9%	Net Absorption	-914,140
RBA	267,402,256	Occupied (%)	91%	Deliveries (SF)	149,000
Avg Year Built	1968	Lease Rate	$3.76	Under Construction (SF)	98,000

Source: CoStar

The industrial market will continue to recover slowly as vacancy remains higher than average. In the first quarter of 2012, net absorption reported a negative figure from the year prior, at 139% decrease from the first quarter of 2011. Additionally, the St. Louis Region experienced a slowdown in construction, reaching the lowest first quarter total in the past ten years, and lease rates fell at an annualized rate of 3% from the first quarters of 2011 to 2012.

Table 2 – St. Louis Key Metrics

Year	Vacancy Rate	RBA	Net Absorption	Construction	Rental Rate
2002	8.2%	244,477,375	(1,269,581)	3,763,433	$4.39
2003	8.4%	247,510,178	2,273,623	3,032,803	$3.74
2004	7.6%	250,764,737	5,013,182	3,254,559	$3.67
2005	7.1%	254,514,809	4,701,519	3,750,072	$3.62
2006	6.6%	256,732,395	3,392,735	2,217,586	$4.18
2007	7.0%	260,682,443	2,650,656	3,950,048	$4.38
2008	7.2%	263,761,575	2,229,975	3,079,132	$4.48
2009	8.4%	266,466,432	(681,349)	2,704,857	$4.17
2010	8.9%	266,949,956	(935,160)	483,524	$3.99
2011	8.2%	267,211,256	2,330,655	261,300	$3.86
2012	8.6%	267,402,256	(914,140)	191,000	$3.76

Source: CoStar

Maps on the following pages summarize industrial properties by year of construction and building size. In general, the regional industrial inventory is largely comprised of buildings which are smaller than 50,000 square feet, nearly 79%, while 19% of buildings are between 50,000 and 250,000 square feet, and 2% of industrial buildings are larger than 250,000 square feet, with the largest exceeding 4,000,000 square feet (GM Assembly Center in Wentzville), alone, accounting for nearly 2% of all industrial space in the St. Louis Region.

In the St. Louis Region, the vast majority of industrial buildings are below 25,000 square feet (i.e., traditional bulk), accounting for nearly 60% share of the industrial market. What's more compelling, upwards of 90% of the existing inventory of industrial buildings are less than 100,000 square feet. Another noted trend is the progressive increase of ceiling heights as buildings grow in size, indicating a shift from traditional bulk to modern bulk, allowing property owners / users a more flexible industrial product. Buildings with the highest average ceiling height are those above 500,001 square feet, at an average ceiling height of 25 feet. Current industry standards favor buildings with more than 30 feet of clear ceiling height.

Figure 4 – Industrial Building Size Range, Q1 2012

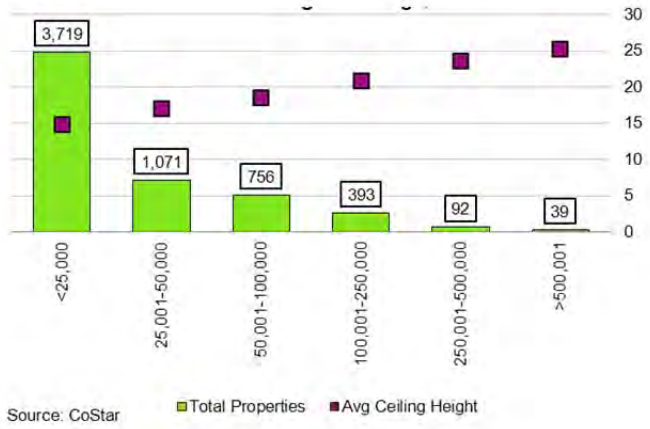
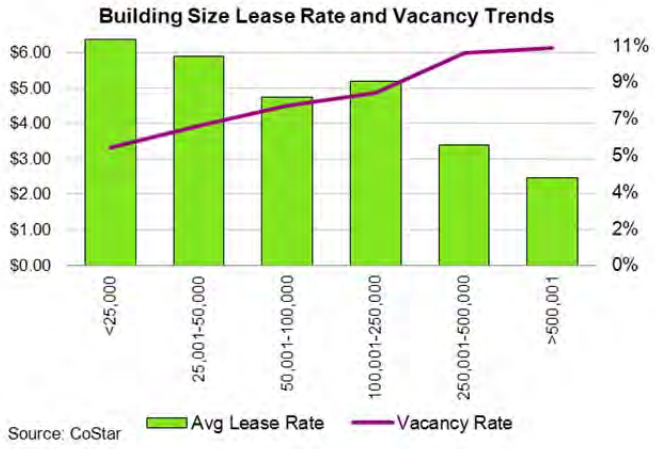


Figure 5 – Building Size Leas Rate and Vacancy Trends



As industrial buildings increase in size vacancy rates increase as well, while average lease rates trend in an opposite direction. For example, properties below 25,000 square feet lease at $6.38 per square foot with a vacancy rate of 6%, and buildings above 500,001 square feet lease at $2.46 per square foot with a vacancy rate of 11%.

Figure 6 – St. Louis Region Map - Industrial Inventory Date of Construction

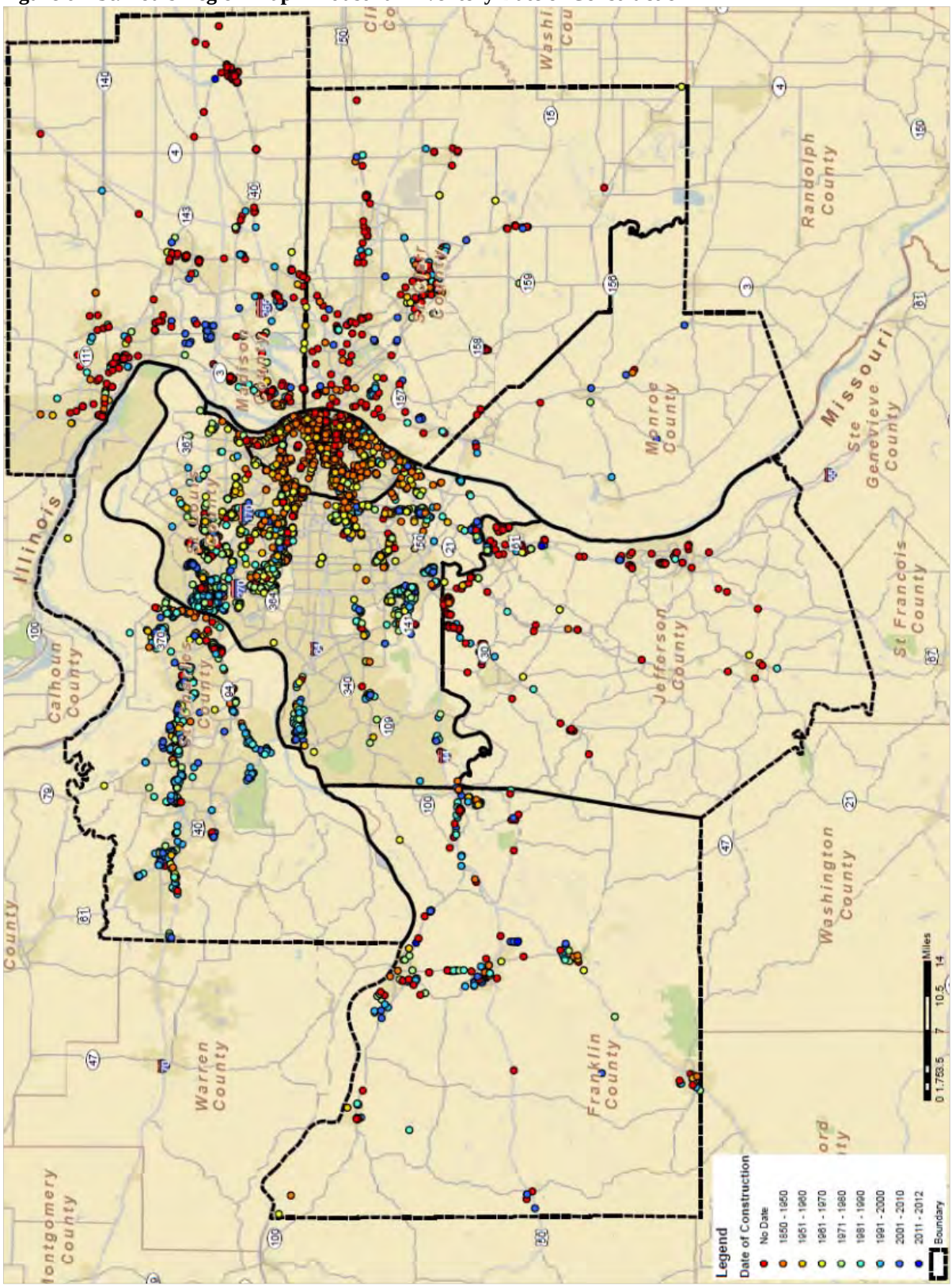
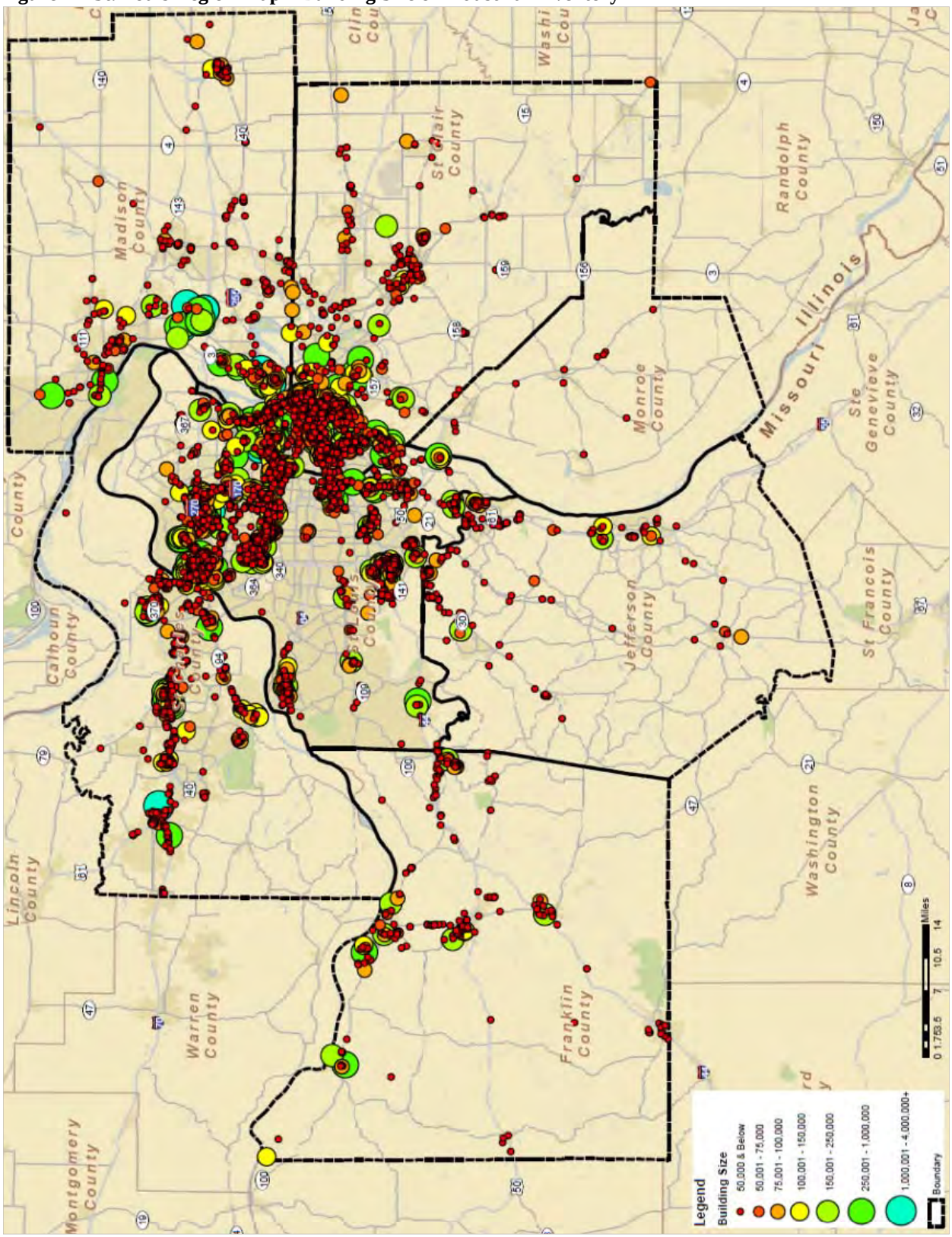


Figure 7 – St. Louis Region Map – Building Size of Industrial Inventory



St. Louis Industrial Space Profile – County Analysis

There are currently 42 industrial buildings above 500,000 square feet in size with a total of approximately 42 million square feet of space throughout the St. Louis Region throughout the regional industrial market. These buildings have a vacancy rate of 10% and an average lease rate of $2.60 per square foot. Most buildings of this size were constructed in the 1970s in the City of St. Louis and St. Louis County; however, there has been a resurgence of newly constructed buildings in Madison County (IL). For example, since 1995 there have been 11 buildings, over 500,000 square feet in size built in Madison County (IL), representing nearly 75% of all buildings in the past two decades.

Table 3 – Industrial Buildings Above 500,000 SF - Profile 2012

County	Buildings	RBA	Vacant	Vacancy Rate	Average Rent	Average Year Built
St. Charles	3	5,962,900	0	0%	N/A	1971
Madison	13	13,564,888	416,379	3%	N/A	2004
St. Louis City	13	11,674,700	2,296,378	20%	$2.06	1928
St. Louis	12	9,845,940	1,532,561	16%	$3.19	1981
St. Clair	1	502,500	0	0%	$3.25	2008
Franklin	N/A	N/A	N/A	N/A	N/A	N/A
Jefferson	N/A	N/A	N/A	N/A	N/A	N/A
Monroe	N/A	N/A	N/A	N/A	N/A	N/A
Total	42	41,550,928	4,245,318	10%	$2.58	1971

Source: CoStar

More noticeable in the adjacent chart is the distribution of larger buildings throughout the St. Louis Region. Primarily, buildings above 500,000 square feet in size are located in Madison County (IL), the City of St. Louis and St. Louis County. The average building size in St. Charles County is heavily influenced by the presence of a GM Assembly plant.

Figure 8 – Buildings > 500,000 SF by County

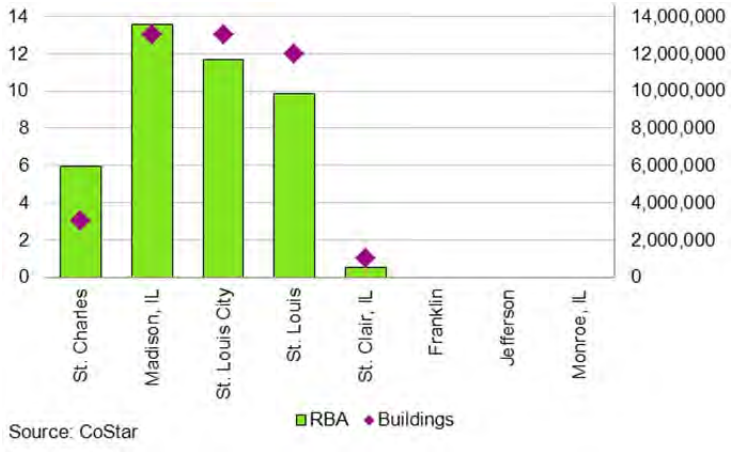
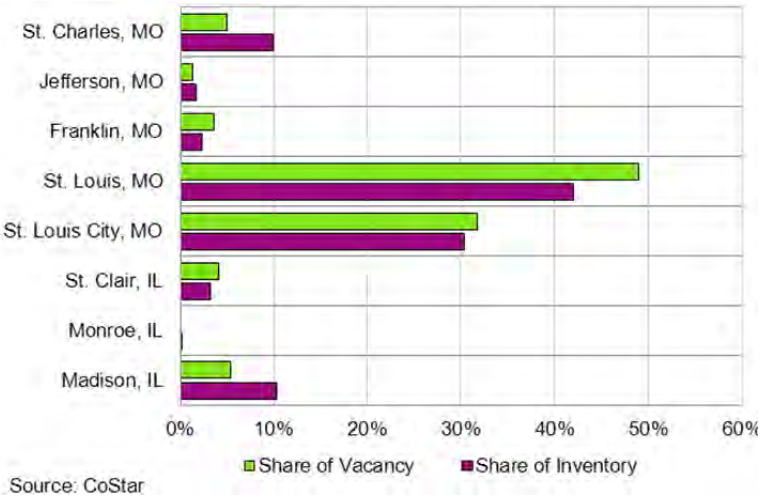


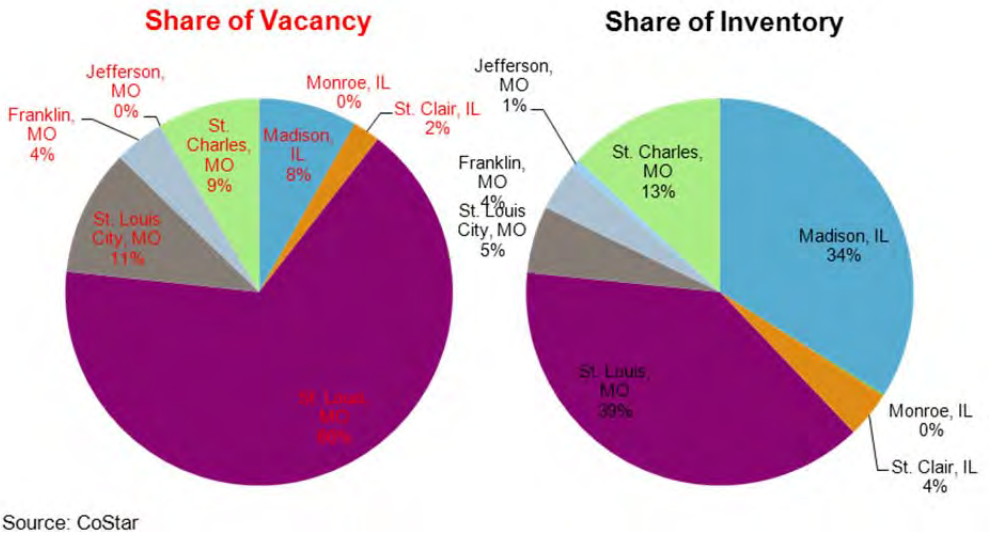
Figure 9 evaluates the share of total inventory as well as vacancy in counties throughout the St. Louis Region. For example, St. Louis County constitutes the largest share of industrial space inventory, at approximately 42%, with a larger share of vacant space (nearly 49%). The City of St. Louis represents another place within the St. Louis Region with a significant share of industrial inventory (30%) with a similar share of vacant space (32%). Madison and St. Charles Counties also sustain relevant shares of industrial inventory.

Figure 9 – Regional Share of Vacancy / Share of Inventory



From 2000 to 2012, more than 33 million square of industrial space was delivered to the St. Louis industrial market, with the larger share being built in St. Louis County (MO), which equates to 39% of the total industrial inventory delivered during this time period. Additionally, Madison County (IL) accounted for approximately 34% of industrial space deliveries from 2000 to 2012.

Figure 10 – Share of Vacancy and Share of Inventory



Industrial Market Comparisons

The following charts summarize comparative industrial market metrics for similar Midwestern Metropolitan Areas that compete / complement St. Louis, including Kansas City, Memphis, Cincinnati, Columbus, and Indianapolis. The peer cities were selected on the basis of size and proximity to a freight transportation network as close as practicable to St. Louis. In terms of overall occupied inventory, the chart reinforces the St. Louis Region's competitive position generally in the middle of the competitive peers, with about 240 million square feet of occupied industrial space. In terms of occupied space, St. Louis and Kansas City have comparable occupied inventories, which is notable. Similar patterns are reflected in vacancy rates, which for St. Louis falls in the middle of the set, with a current (q3 2012) rate of 8.7%. Lower vacancies in Kansas City account for similar occupied inventories.

Figure 11 – Industrial Vacancy Rates, Q3 2012

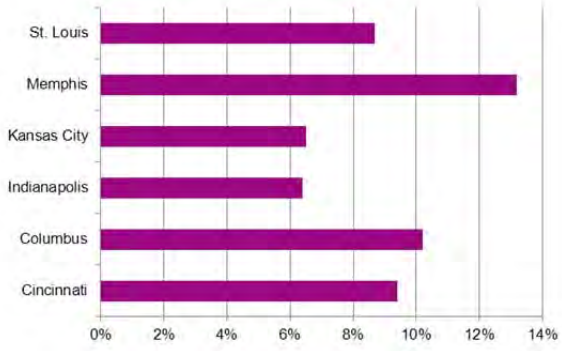


Figure 12 – Occupied Industrial Space, Q3 2012

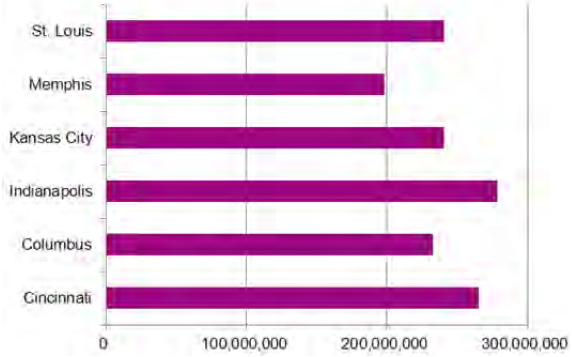


Figure 13 – Industrial Space per Capita, 2012

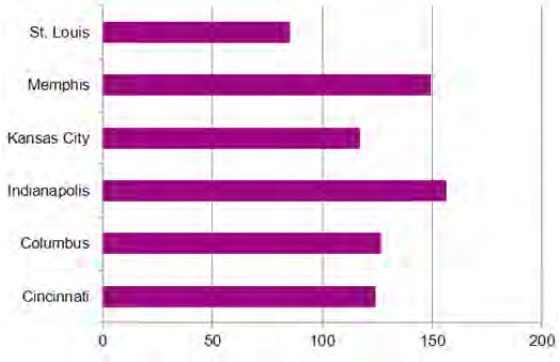
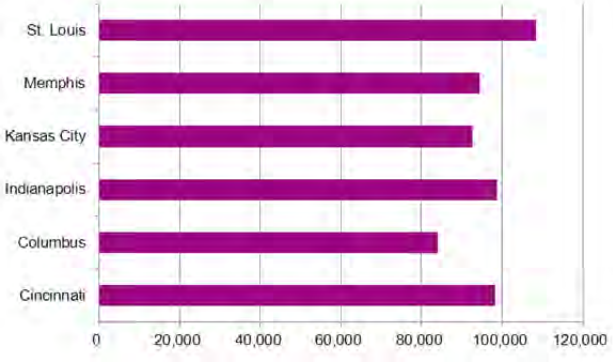


Figure 14 – Jobs - Wholesale/Transportation



The following charts reinforce these trends, with St. Louis exhibiting a relatively larger share of employment in wholesale and transportation activities compared to the benchmarks. The challenge here is that the St. Louis region is significantly larger than its noted peers in terms of population. The St. Louis Metropolitan Area 2011 population estimate is about 2.8 million residents, which is significantly larger than Cincinnati (2.13 million residents) or Kansas City (2.05 million residents). The clear point here speaks to under-performance in some respects, with industrial space per capita below its noted peer cities.

Table 4 summarizes growth in noted metropolitan area industrial markets since 2000, focused on construction of new industrial space compared to long term averages (since 1982). The table shows that Indianapolis has been the leader among noted cities in adding industrial space since 2000, with about 60 million square feet (sf) added. What is interesting in the comparison is that the St. Louis Region outperformed in one way, adding space since 2000 at a rate of about 3.3 million sf per year, well above its long term average (about 2.85 million sf of new construction per year). Since 2000, the Kansas City, Memphis, Columbus, and Cincinnati metropolitan areas under-performed adding space on a yearly basis since 2000 relative to their long-term paces of new industrial space construction.

Table 4 – Analysis of Industrial Space Additions Since 2000, Noted Cities

Market	Space Added Since 2000	Avg / Year Since 2000	Long Term Annual Average	Difference
Cincinnati	41,900,000	3,223,077	4,050,000	-826,923
Columbus	41,900,000	3,223,077	3,950,000	-726,923
Indianapolis	60,800,000	4,676,923	4,500,000	176,923
Kansas City	29,300,000	2,253,846	2,950,000	-696,154
Memphis	49,300,000	3,792,308	4,050,000	-257,692
St. Louis	44,100,000	3,392,308	2,850,000	542,308

Source: COSTAR

Implications

- The City of St. Louis and St. Louis County support both regionally significant levels of industrial space (in excess of 190 million square feet), as well as vacancy (9%). These industrial markets include a significant share of older industrial buildings, many with clear ceiling heights well below current industry standards.
- Average lease rates for industrial space in the St. Louis Metropolitan Area have decreased significantly over the past several years, falling from $4.48 per square foot in 2008 down to $3.76 in 2012. The overall rate decrease (16%) is significant at a regional level. For comparison, average lease rates in the greater St. Louis MSA decreased by 12% over the same period, and are likely weighted down by industrial inventory in the Metropolitan Area.
- While occupancy is high among buildings constructed between 1980 and 1999, more recently constructed buildings, especially those constructed later than 2000, are on average 65,000 square feet in RBA, have ceilings nearing 21 feet high, and yet are operating at an occupancy rate of 90%. Key demand drivers include companies related to freight distribution as well as those who provide logistics services, together with larger real estate oriented companies such as Centerpoint and AMB / ProLogis.

Land Use and Transportation Alignment

Freight hinges on the classic definition of vertical integration; at all times needing to focus on the big picture through to local intersection configurations. One aspect of this vertical integration is the need to periodically drill down and evaluate the actual performance of transportation within the St. Louis Region and smaller subareas. This allows the evaluation of the interaction between land use, freight flow and transportation. An example of this interaction can be seen with the interstate roadways and their ramps together with the adjacent arterial roads. Another example is evident with unit trains approaching waterfront sites and the functional performance of this multimodal connecting infrastructure.

For road and water, the infrastructure is open to all; at the same time, railroads are privately owned. Operating conditions dictate the use and availability of railroads as a transportation mode. The rail "how" and "why" are shaped by the individual carrier and connecting networks. Therefore, the rail-land use discussion starts with the network ahead of the site. Intermodal yards and transload facilities bring the transportation and site land use together.

Within the St. Louis region, there are several industrial areas situated in the denser urban setting of the City of St. Louis and newer sites located around the periphery of the St. Louis Region while remaining close to the Interstate System. Because sites were developed at different times and possibly for different purposes, the sites have similar and differing characteristics. Individually and as a whole, these industrial areas influence the freight industry in St. Louis.

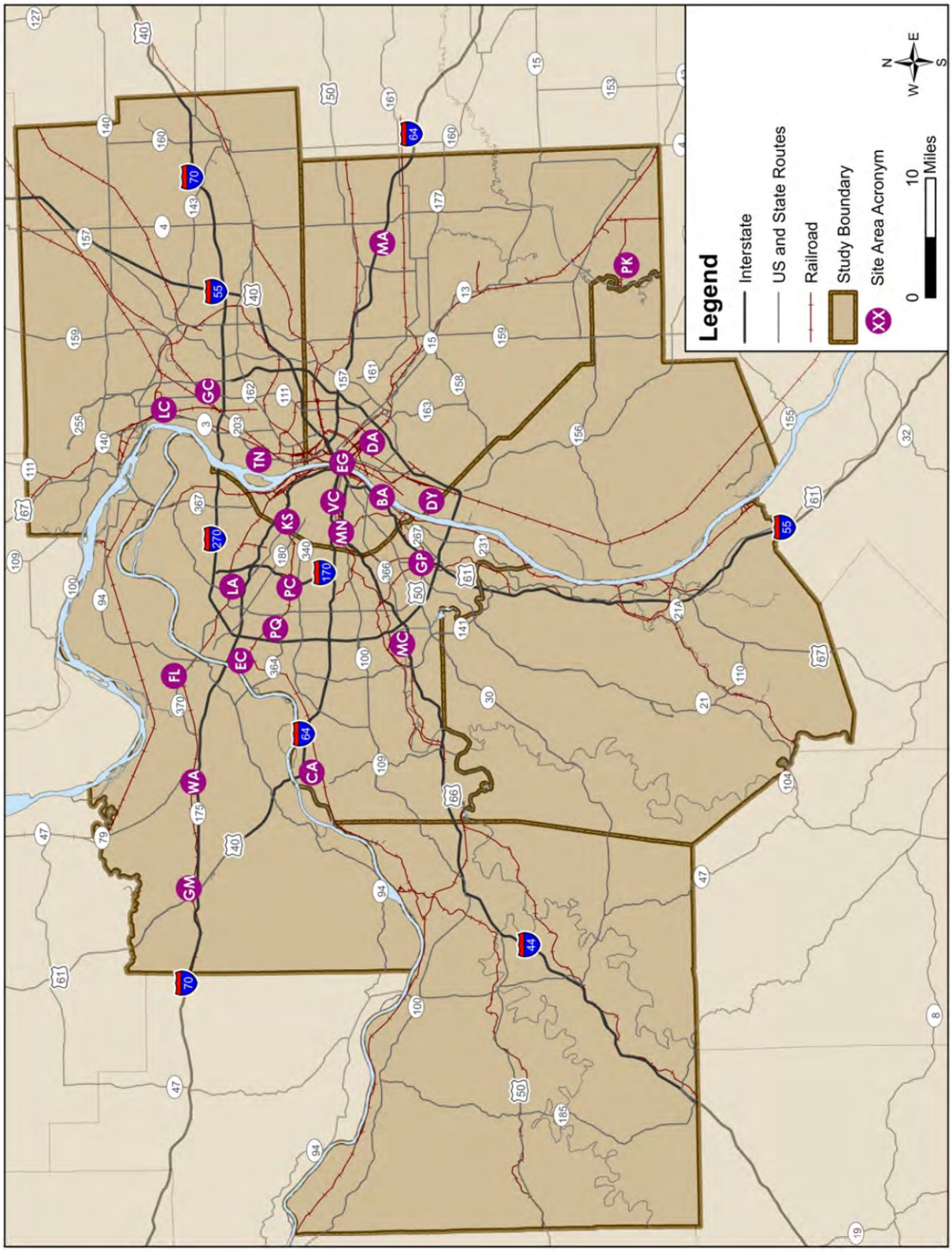
Choosing the industrial areas to focus on was driven by known industrial complexes, review of land use data and aerials, field visits and input provided by the Steering Committee. With this information, the site area boundaries were ultimately defined based on the Transportation Area Zones (TAZs) that best encompassed the industrial areas. TAZs are used for long-range transportation planning. Each TAZ is typically associated with population and employment projections. A total of twenty-three (23) industrial site areas were defined across the St. Louis Region. Refer to Table 5 for the site names.

Table 5 – Industrial Site Areas

Site Acronym	Site Name	Site Acronym	Site Name
BA	Broadway – Arsenal	**LA**	Lambert Airport
BH	Broadway – Hall	**LC**	Lewis and Clark North
CA	Chesterfield Airport	**MN**	Manchester 44
DA	Downtown Airport	**MC**	Meramec - 44
DY	Dupo Yard	**MA**	MidAmerica Airport
EC	Earth City	**PQ**	Page - 270 Quadrant
EG	East Industrial Gateway	**PC**	Page Corridor
FL	Fountain Lake - Elm Point	**PK**	Port Kaskaskia
GC	Gateway Commerce	**TN**	Route 3 North
GM	GM Plant	**VC**	Vandeventer - Chouteau
GP	Green Park	**WA**	West 70 - Arrowhead
KS	Kingshighway – 70		

Figure 15 shows the approximate locations of these industrial site areas. The appendix A1 contains a map depicting the site boundaries in addition to a more detailed description of the individual areas. The site areas as defined by a compilation of multiple TAZ boundaries as described in more detail in the appendix. With defined boundaries, the site areas were assessed based on a variety of data. The comparative metrics focused on socio, economic and transportation data, including political boundaries, Industrial properties and acreage, population and employment, freight facilities, crash data, and traffic Volumes. Six tables were used to present the site information.

Figure 15 – Industrial Site Area Locations



Political Boundaries

A challenge for any project is to reach consensus among stakeholders on important elements. This includes items such as the purpose and need, specific improvements and funding. As the number of stakeholders involved in or affected by a project increases, so may the difficulty in obtaining a consensus. For the industrial site areas identified, the number of municipal boundaries crossed by the site area can pose a challenge to implementing improvements which would benefit freight movement within and through the St. Louis Region. The multiple jurisdictions may also affect continuity in speed limits, truck route designation, roadway classification, etc.

As an example, some of the site's industrial properties may be located within one municipality and the interstate access to the site may be located in another. Upgrading the interchange may benefit freight movements to/from the industrial properties, but may not be favored by the municipality where the interchange is located.

Figure 16 presents the number of municipalities intersected by the individual site areas. Almost half of the sites are contained within the boundary of a single municipality. In Figure 17, the acreage of the industrial sites is presented. Except for a few sites located within the City of St. Louis, the larger site areas tend to cross multiple political boundaries.

Figure 16 – Number of Municipalities Intersected by Site

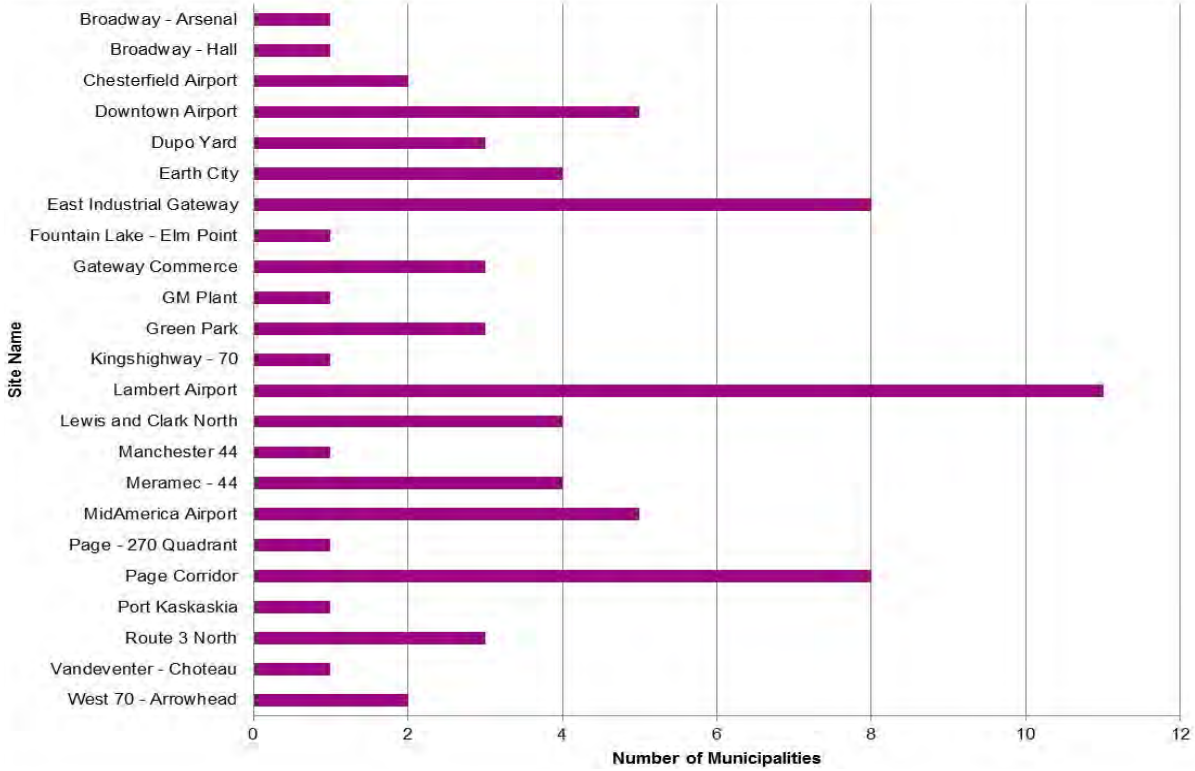
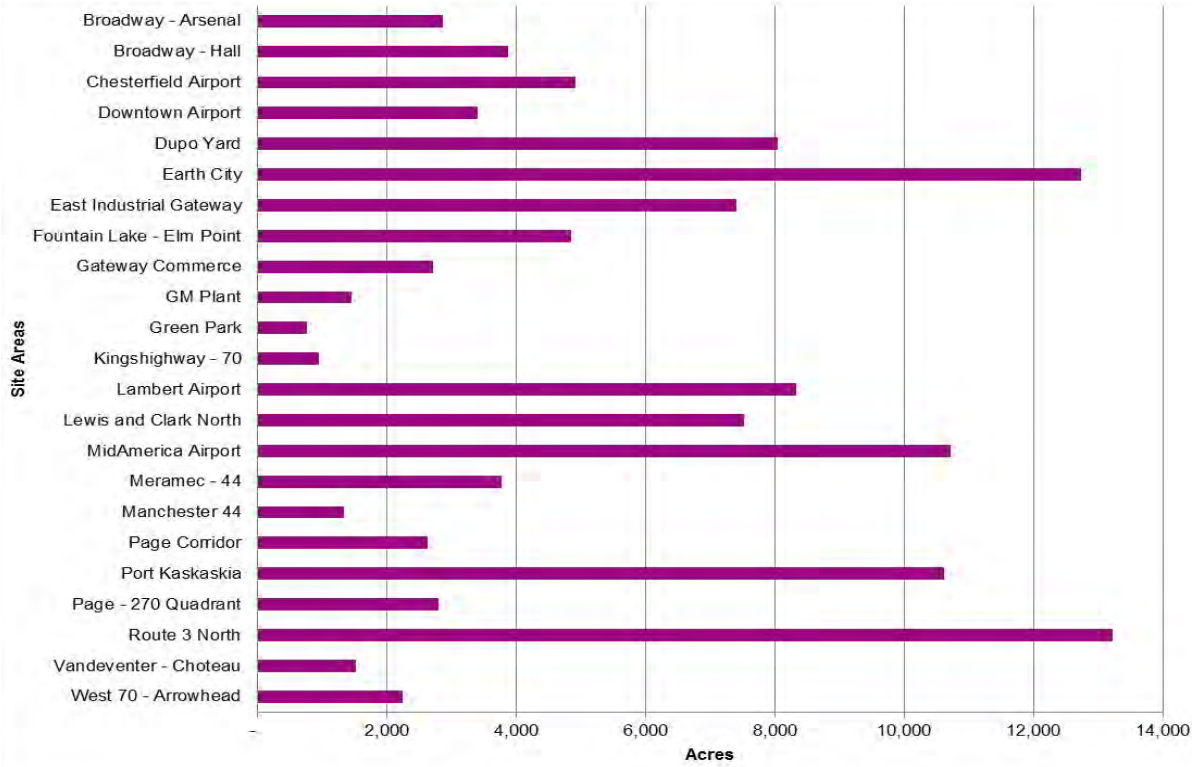


Figure 17 – Industrial Site Size



At a local level, the need to gain consensus is most apparent for those sites intersecting three (3) or more municipalities, which are also experiencing high vacancy rates as compared to the other industrial sites. Efforts to improve the area to foster freight movement and increase industrial utilization rates will require an aligned effort across multiple jurisdictions.

Table 6 presents those sites intersecting three (3) or more municipalities. The sites are sorted in the table based on the industrial vacancy rates; from highest to lowest. As seen towards the bottom of the table six sites have low (less than 5%) to no vacancy rates with an average of 3.6 municipal jurisdictions per site. These are also sites where consensus among stakeholders is high. The top half of the table includes the sites with larger vacancy rates and an average of 6.3 municipal jurisdictions per site. A challenge for the sites intersecting a large number of municipalities and high vacancy rates will be to obtain consensus among the multiple jurisdictions. Industrial areas located within multiple political jurisdictions may be impacted by different sets of local decisions in land use, zoning and traffic management. Arterial roadways, often managed or impacted by local decisions, are important avenues for freight and figure prominently in the first / last mile of freight movement, as well as in spillover congestion.

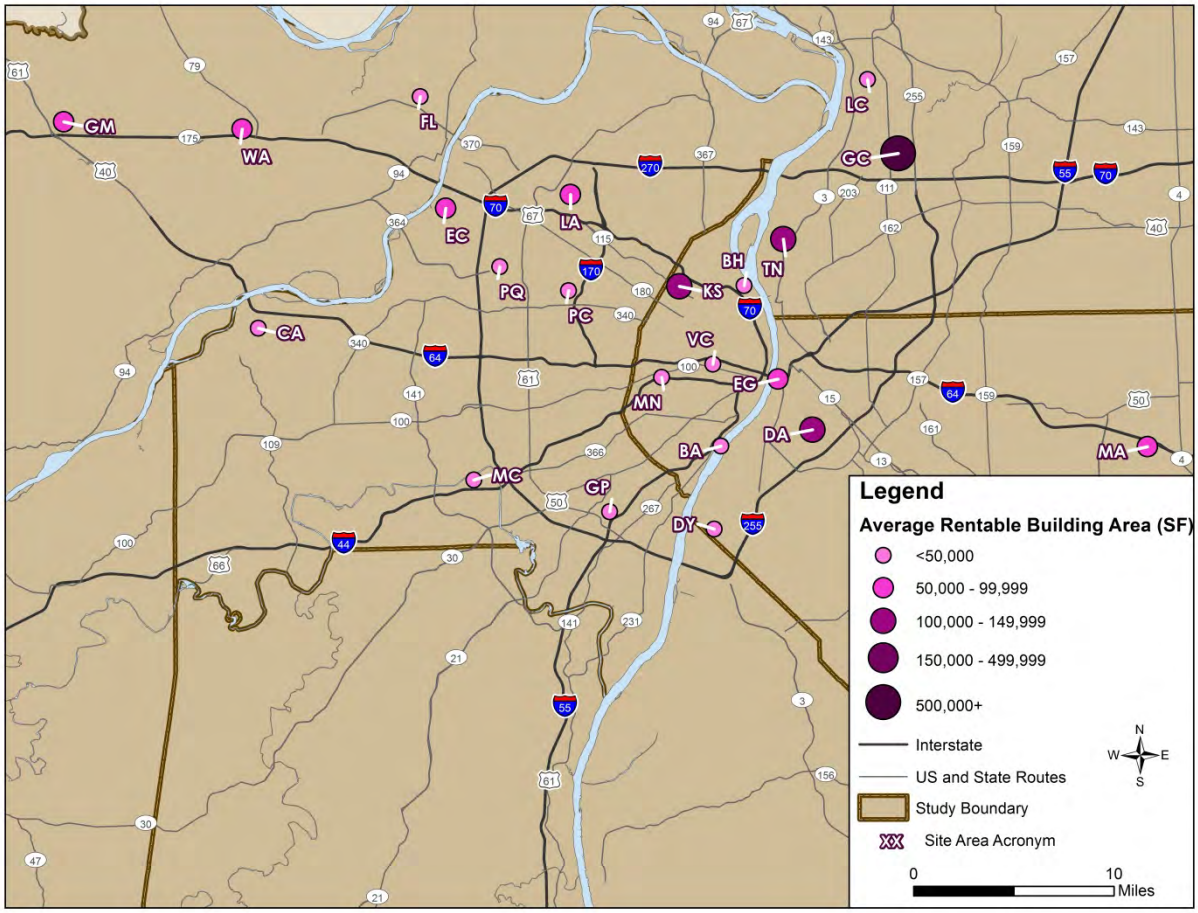
Table 6 – Industrial Site Areas Intersecting Three (3) or More Municipalities

Site Name	Number of Municipalities Intersected	Site Area (Acres)	Industrial Vacancy Rate
Earth City	4	12,700	12.4%
East Industrial Gateway	8	7,500	11.4%
Meramec - 44	4	3,800	10.7%
Green Park	3	800	9.4%
Page Corridor	8	2,700	8.9%
Lambert Airport	11	8,400	8.3%
Route 3 North	3	13,300	4.4%
Gateway Commerce	3	2,800	0.7%
Downtown Airport	5	3,500	0.0%
MidAmerica Airport	5	8,100	0.0%
Lewis and Clark North	4	7,600	0.0%
Dupo Yard	3	10,800	0.0%

Building Size and Site Location

Figure 18 highlights the dependence on the freight industry and the industrial site areas on the Interstate System. Except for three sites (FL, LC and TN), the geographic centers of the industrial site areas are located adjacent to or within close proximity to an interstate.

Figure 18 – Average Rentable Building Area (RBA) in Square Feet



The Gateway Commerce (GC) site has the largest average RBA (~ 500,000 sf) and is one of the newest industrial developments in the St. Louis Region as shown in Figure 18. Most of the older site areas within ring of I-70/I-270/I-255 have on average smaller building sizes. While the Downtown Airport (DA), Route 3-North (TN) and the Kingshighway-70 (KS) sites are located within densely developed areas of the St. Louis Region, history may explain why they are showing higher average rentable building area (RBA).

The Downtown Airport (DA) site has experienced more recent developments included larger building sizes, which contributes to the larger average RBA. Route 3-North (TN) site was formerly an Army base and currently includes a steel plant and supplier network. These previous and current uses for the site likely contribute to the large floor space for properties within the site area. Similarly, the average RBA for the Kingshighway-70 (KS) is driven by older industrial plant space.

Truck Crashes

Trucking is a major component of freight movement. In addition to the costs and effects on the motorists involved in the crash, vehicular crashes may result in direct and indirect costs to other roadway travelers, the transportation facility and adjacent property owners. Such as, the cost to repair damaged roadway facility or adjacent property and the lost time for drivers due to traffic delays from the crash.

Within each of the site boundaries, the number of crashes involving commercial motor vehicles with trailers was compiled. The data was obtained from IDOT and MoDOT for the three-year period from 2009 and 2011. In Table 7, the sites are sorted from highest to lowest based on the number of crashes. As shown, the metric quantifies the total number of crashes. In the future, it may be possible to stratify the data based on an accumulated awareness from a root-cause analysis.

One of the implications of this data is to focus on a strategy to reduce the number and severity of truck crashes. This involves post-incident root-cause assessment; examining traffic flow, geometrics, existing crash reporting metrics, and any additional factors. An assessment of this information can generate preferred solutions to avert crash related outcomes in the future. In lieu of completing the root-cause analysis, a surrogate analysis may be undertaken with existing data for the rankings of the sites according to the number of crashes per acre and the number of crashes per trade employee.

Table 7 – Commercial Motor Vehicle w/ Trailers Crashes (Sorted highest to lowest)

Site Name	Total CMV Crashes (2009 - 2011)	Site Area (Acres)	Goods Producing and Trade Jobs	CMV Crashes Per Goods Producing and Trade Employee
East Industrial Gateway	178	7,500	2,290	0.08
Broadway - Hall	161	3,900	9,000	0.02
Lambert Airport	124	8,400	12,640	0.01
Earth City	108	12,700	17,960	0.01
Broadway - Arsenal	87	2,900	2,520	0.04
Route 3 North	78	13,300	4,320	0.02
Meramec - 44	76	3,800	10,460	0.01
Vandeventer - Chouteau	63	1,600	6,460	0.01
Manchester 44	60	1,400	7,430	0.01
Page - 270 Quadrant	43	2,900	14,290	0.01
Chesterfield Airport	41	5,000	7,160	0.01
Page Corridor	38	2,700	10,920	0.01
West 70 - Arrowhead	34	2,300	5,030	0.01
Kingshighway - 70	28	1,000	3,550	0.01
Fountain Lake - Elm Point	26	4,900	3,970	0.01
Gateway Commerce	20	2,800	370	0.06
MidAmerica Airport	15	10,800	320	0.05
Dupo Yard	13	8,100	220	0.06
Lewis and Clark North	13	7,600	3,140	0.01
Downtown Airport	8	3,500	2,340	0.01
GM Plant	6	1,500	570	0.02
Green Park	5	800	2,310	0.01
Port Kaskaskia	0	10,700	0	N/A
Total	***1,225***	***120,100***	***127,270***	

Note: Goods producing and trade jobs include agriculture, Forestry, Fishing and Hunting; Mining, Quarrying and Oil and Gas Extraction; Construction; and Manufacturing

While temporary in nature, construction zone safety has increased in visibility over the last several years. It is the responsibility of the driver to travel at a safe speed through a construction site. However, further assessment of traffic management around construction zones may also be valuable to the St. Louis Region in promoting safe traffic flow.

Information that may not be available within a crash report is the origin and destination of the truck(s) involved in the crash. Differentiating between crashes occurring on the interstates for vehicles passing through the site versus crashes for vehicles which are entering/exiting the industrial site area may lead to the identification of a solution to reduce the crashes involving vehicles accessing the different industrial sites.

Rail/Highway At-Grade Crossings

At-grade crossings affect both modes (road and rail). Based on the freight forecasts, increased volumes are anticipated for both modes. If there are current challenges at the locations of road/rail at-grade crossings, these will grow in the future unless changes/improvements are made today. At-grade crossing concerns include crashes and infrastructure conditions. Solutions to the conflict points may come from any or several stakeholders. Everyone gains from the outcome to reduce incidents at rail/highway at-grade crossings.

Crashes

The number of public at-grade crossings and number of incidents at these locations were calculated based on data in the National Grade Crossing Inventory maintained by the Federal Railroad Administration. There are a total of 245 at-grade crossings in 18 of the 23 industrial site areas. Over a five-year period, 14 incidents occurred at rail/highway at-grade crossings within the industrial site areas.

Conditions

Over time, the conditions of any facility or piece of infrastructure can deteriorate. Similar to any transportation facility, rail/highway at-grade crossings require maintenance and reconstruction. If left unimproved, it can cause difficulties to motorists traveling over the tracks. For instance, Grand Ave. near Hall St. has rutting occurring on the pavement approaching the rubber pad at the grade crossing. The degrading roadway conditions can cause issues for vehicles, including trucks, traveling over the railroad tracks.

Airports

Of the 23 site areas, four include an airport as shown in Table 8. For the sites with airports, over time it will be important to track metrics such as parcels delivered and if they are domestic or international delivery, which will assess the performance of the infrastructure. Further, it may be important to expand the number of arterial roadways included in the evaluation. Note that goods producing and trade jobs include agriculture, Forestry, Fishing and Hunting; Mining, Quarrying and Oil and Gas Extraction; Construction; and Manufacturing.

Table 8 – Industrial Site Areas with Airports

Site Name	Number of Municipalities	Acres	Total Industrial RBA (SF)	Goods Producing and Trade Jobs	Truck % on Arterial w/ Highest Truck Vol.
Chesterfield Airport	2	5,000	3,928,000	7,160	7.7
Downtown Airport	5	3,500	1,678,000	2,340	4.9
Lambert Airport	11	8,400	16,453,000	12,640	7.1
MidAmerica Airport	5	10,800	50,000	320	6.3

Ports

The industrial sites with terminals are listed in Table 9. As with airports, metrics tracking the performance of the facilities should be monitored over time. These metrics may include tons by product class, types of delivery (i.e. unit trains or barges) and a measure of overall freight velocity. Commodity and volume information needs to be accumulated for the terminals. Over time, the commodities, volume and modal transfers can be tracked to assess the performance and changes over time. Some of the terminals are under the jurisdiction of a port authority and others are not. Port authorities may also provide management support to encourage potential re-use of former industrial sites.

Table 9 – Industrial Site Areas with Terminals

Site Acronym	Site Name	Number of Municipalities	Port Authorities	Terminals within Site Area	Arterial with Highest Total Truck Volume
BA	Broadway - Arsenal	2	2	36	910
BH	Broadway - Hall	1	1	11	5,940
EC	Earth City	4	0	2	6,090
EG	East Industrial Gateway	8	0	17	2,950
LC	Lewis and Clark North	4	0	18	1,975
PK	Port Kaskaskia	1	1	1	480
TN	Route 3 North	3	1	6	2,500

Regional Implications/Recommendations

The new I-70 bridge, together with the East Side roadway realignment and the existing waterway terminals and railroad assets presents the St. Louis Region with a unique and strategic opportunity to redefine land use and transportation with evolving markets while restoring communities and mitigating what would otherwise be intractable conditions. The four interstate roadway lanes will, in effect, add approximately 20% additional access to industrial properties near and adjacent to the capacity increases. Further, the St. Louis Region's industrial areas, particularly those with bulk handling assets, are in a position to leverage these attributes, facilities and locational advantages in bulk handling to grow a more diversified transportation network across all modes.

Table 10 – Site Areas: Categories Ranked Greatest Value (1) to Least Value (23)

Site Name	Goods Producing and Trade Employment	Good Producing / Trade Employment as % of Total	Truck % on Arterial w/Highest Trk Volume	Total Industrial Properties	Industrial Vacancy %
Broadway - Arsenal	15	16	16	8	9
Broadway - Hall	6	2	1	**22**	3
Chesterfield Airport	8	13	**22**	9	10
Downtown Airport	16	1	13	1	**19**
Dupo Yard	**22**	10	7	2	**20**
Earth City	1	18	8	**21**	4
East Industrial Gateway	18	5	5	**19**	17
Fountain Lake - Elm Point	12	9	9	12	12
Gateway Commerce	**20**	**19**	6	5	18
GM Plant	**19**	12	3	7	16
Green Park	17	14	14	16	15
Kingshighway - 70	13	7	17	15	13
Lambert Airport	3	8	11	13	6
Lewis and Clark North	14	3	4	3	**21**
MidAmerica Airport	7	15	18	10	8
Meramec - 44	5	6	**21**	18	7
Manchester 44	**21**	**22**	12	4	**22**
Page Corridor	2	**21**	15	17	2
Port Kaskaskia	4	17	**19**	14	1
Page - 270 Quadrant	**23**	**23**	10	**23**	**23**
Route 3 North	11	11	2	11	14
Vandeventer - Chouteau	9	**20**	**20**	**20**	5

Note: Goods producing and trade jobs include agriculture, Forestry, Fishing and Hunting; Mining, Quarrying and Oil and Gas Extraction; Construction; and Manufacturing

All modes of freight transportation (water, road, and rail) are accessible within the East Industrial Gateway site area. It is a site with one of the highest vacancy rates. Restoring the unique combination of transportation assets across the three modes creates an opportunity to add freight related land use. Based on existing and planned transportation facilities, the freight corridor(s) within the larger site area can be identified. By moving to redefine land use and zoning in support of industrial development along these freight-prioritized corridors a number of performance metrics are anticipated to show a marked improvement.

One avenue to restore the East Industrial Gateway communities is by moving from a site-by-site management approach to a consolidated jurisdictional framework. A pragmatic master plan for the most challenged areas together with their municipalities continues the move from accidental to deliberate. This has taken place in the Dupo Yard and Downtown Airport sites. Both are sites with high utilization of their industrial buildings (100%).

The 23 areas represent a total of 120,100 acres with 160,623,500 square feet of rentable building area (RBA). The St. Louis Region may be well served to balance land use and transportation attributes to capture economies of scale wherever possible. Kingshighway -70 (22.6%), Vandeventer – Chouteau (17.6%), Page Corridor (11.0%), Manchester-44 (10.6%) and Page -270 (10.1%) each have RBA to Total Area ratios above 10% and well served by road and rail transportation infrastructure. Route 3 North, Earth City and MidAmerica Airport represent the largest sites and Earth City, Lambert Airport and Broadway Hall are the sites with largest RBA. Each of these areas are now evaluated in greater detail.

Industrial Site Areas

Broadway-Arsenal (BA)

The Broadway Arsenal Site refers to an area bounded by the Popular Street Bridge to the North, The Mississippi River to the East, Broadway Ave to the West, and ends in the South at Gark Rd. Primarily industrial with multimodal access for numerous sites including extensive rail and barge access, the site also has a strong access to the regional road network via I-55. Properties are mixed with smaller buildings being more tightly packed along Broadway while closer to the river the properties tend to be larger with single buildings and parking lots. The Anheuser-Busch Brewery lies outside but adjacent to the site area, and benefits from rail access, which occasionally crosses Broadway. Implications include:

- This area falls “in the middle of the pack”, with a number of larger industries present to anchor the area
- To move forward, this area is a clear case of moving from accidental to deliberate
- The St. Louis Region may be well served by a closer investigation of site availability, local truck routing and ramp access.

Broadway-Hall (BH)

The Broadway-Hall site area is the northern portion of the Saint Louis waterfront along the Mississippi River. The site area has approximately seven miles of riverfront access. The Broadway-Hall site area is characterized by its north-south alignment with extensive rail and river access for the large properties along the Mississippi River. Implications include:

- The numerous rail road lines and at-grade crossings within the site create unique opportunities and challenges to accessibility of portions of the site.
- Opportunities for infill development are limited as there are few open sites; however, it has the highest vacancy rate of all the site areas.

Chesterfield Airport (CA)

The Chesterfield Airport site represents a concentration of commercial and industrial land uses, separated by the airport, from vacant and agricultural properties near Howell Island and the Missouri River. Industrial land uses are concentrated in the center of the site and include the airport and supporting properties. The eastern portion of the site is anchored by large commercial buildings, with smaller commercial buildings filling in most of the gaps. A rail line runs along the southern border of the site. Implications include:

- While this roughly triangular area is enclosed by hard boundaries (the interstate, river, and railroad tracks), there are a number of vacant sites available near the airport as well as a large swath of agricultural land between the airport and river that could be developed. Floodplains are a factor.

Downtown Airport (DA)

North of Jerome Lane, east of Upper Cahokia Road, south of Bond Avenue, and west of I-255 lays an industrial area speckled with a few large warehouses and manufacturing buildings, which are located between the Saint Louis Downtown Airport to the south and a major rail yards on the north and west sides of the site. Although the airport and railroad yard account for the majority of the site, there are non-industrial uses within the site including residential, institutional and a baseball stadium (GCS Ballpark, home of the Gateway Grizzlies). The area was announced as the site for a new FedEx distribution center in the spring of 2013. Implications include:

- Well located, with capacity to handle additional truck traffic
- Additional land is available for development, with master plans in place to ensure quality outcomes

Dupo Yard (DY)

The Dupo Yard site includes the small town of Dupo, as well as a large and regionally important rail yard owned by Union Pacific. The area will benefit from a new interchange off of I-255, which is aligned with plans by local developers for a large scale industrial park. UP also reportedly has plans to expand their yard, adding a more robust intermodal component. Implications include:

- Local authorities are modifying the road network to accommodate industrial development.
- Interstate 255 has capacity to absorb additional truck traffic, presuming the project goes forward.

Earth City (EC)

The Earth City site is larger than the community from which its name is derived, encompassing a portion of Bridgeton and Champ as well. The site contains numerous industrial facilities, as well as office complexes, limited residential subdivisions, agricultural land, and entertainment facilities. The site has approximately 9 miles of river frontage, 0.4 miles of which is used for river barge shipping. Implications include:

- A relatively large concentration of industrial properties, in proximity to other uses, increase the need for local outreach.
- Four municipalities overlap in this area

East Industrial Gateway (EG)

The East Industrial Gateway is a site encompassing the eastern side of the Mississippi from Brooklyn to Cahokia, as well as a western portion of East St. Louis. The area is characterized by the multitude of freight infrastructure, including rail lines, the Mississippi River, the Poplar Street Bridge carrying the currently joined I-70, 55, and 64, as well as the Martin Luther King and Eads bridges. Development and the transportation infrastructure are more concentrated at the northern end of the site, while to the south exists little development west of Route 3. Implications include:

- Although there is a massive amount of undeveloped land in this area, a number of sites have suspected brownfield issues. There are also an extensive number of rail lines crossing through the area which makes portions of the site area inaccessible for active land uses.
- A total of 8 municipal boundaries divide up this area, which has immediate proximity to downtown.
- Construction of new I-70 bridge should make land in the East St. Louis / Fairmont City available for potential development.
- The area could benefit from geothermal opportunities associated with the Tri-Level interchange dewatering operation. On paper, there is sufficient capacity to heat or cool about 1 million square feet of industrial space at competitive rates.

Fountain Lake - Elm Point (FP)

Generally north of MO-370, east of Huster Road, south of State Hwy B, and west of the Missouri River and Route 94 lays an area with a diverse mix of uses. Commercial, industrial, residential, and agricultural uses are intermixed throughout the area. Located at the periphery of urban development, expansion opportunities abound west, north, and east of the site. Implications include:

- Residential uses primarily extend north from the highway along Boschertown Road and large vacant sites are scattered throughout the area. Most agricultural uses are located at the edges of the site and continue for miles, allowing future development to expand away from MO-370 if these properties are deemed suitable for development.
- There are still a number of large vacant sites located relatively close to the highway that could be developed.

Gateway Commerce (GC)

The Gateway Commerce Center is a 2,300 acre master-planned business park located in Pontoon, Illinois, and north of I-270, split by Illinois Route 255 running north/south. Gateway Commerce Center is three times the size of Earth City. This is an advantageous location given the access these two major interstate highways, providing access to the entire St. Louis Region. Total build-out at the Gateway Commerce Center is expected to be more than 25 million square feet. Details include:

- Nearly a quarter the St. Louis Region's industrial buildings larger than 500,000 are located in the Gateway Commerce area.
- Nearly half of all warehouse facilities are over 500,000 square feet, while more than half of all distribution facilities were greater than 500,000 square feet in size.
- In total, five warehouse facilities had building envelopes greater than 500,000 square feet, with the largest at 1.26 million square feet, also the largest building in the area.
- Six distribution facilities had building envelopes greater than 500,000 square feet, with the largest at 1.16 million square feet.
- The area has immediate access to the newest intermodal yard in the St. Louis Region (built in 2000) operated by Triple Crown Services.

Implications include:

- Substantial opportunities for expansion of industrial development exist within and surrounding this area.
- Large distribution facilities such as those found in the area drive significant volume but require relatively low employment totals in comparison to other industrial types.
- Identify manufacturers that can utilize the capacity of adjacent warehouses and distribution chain economies of scale to drive growth in localized employment.
- Further review of interchange and intersection performance and potential roadway improvements may be necessary if there further development at Gateway Commerce
- Investigating the geometry and intersection type of IL-111 and Chain of Rocks Road because of the number of crashes involving trucks at this intersection.
- Examine opportunities for rail access to the Gateway Commerce site to further enhance multimodal opportunities.

GM Plant (GM)

Located in the northeast quadrant of the I-64 and I-70 interchange in Wentzville, MO is the General Motors Assembly Plant. Rail tracks divide the site between the main plant and the surrounding properties, with rail spurs extending into the plant. Implications include:

- A majority of warehouse properties outside the GM assembly plant are related to GM. As this plant seems to be in a growth mode, understanding where suppliers can locate in proximity is a question.
- There is extensive agricultural land to the north and east of the site allowing for future expansion of the area if needed. Flood plans in the area need to be understood as well.

- Obtain traffic volume counts on exit ramps at MO A from U.S. 61 and also at the MO A.
- The supporting freight transportation infrastructure available via I-70, I-64 and the rail line passing through the site are ideal for shipment of goods.

Green Park (GP)

Most uses are well-divided and are clearly separated from each other in Green Park site located just north of the I-55/I-270 interchange. The site is segmented in terms of uses, with Clydesdale County Park located in the northwest quadrant, large industrial buildings in the northeast quadrant, and dense single family housing developments dominating the southern quadrants. A mix of small and large auto-oriented commercial buildings line Lindbergh Boulevard on the southern border and a mix of relatively smaller commercial and industrial buildings are sandwiched between I-55 and the railroad near the east side of Green Park. Implications include:

- The surrounding area is almost completely built up, with little room for further development
- With 56 industrial properties, the area may be too small to generalize transportation needs

Kingshighway – 70 (KS)

As its name implies, this site is bounded by I-70 to the northeast and Kingshighway to the east. The site primarily includes industrial properties; however, some residential properties are included in the southwestern portion of the site due to the TAZ boundary. Implications include:

- Area is smaller, but with a larger number of properties, with rail access
- Some assemblage may need to be required
- A larger number of properties within 1 jurisdiction points to a need to develop detailed plans for this area

Lambert Airport (LA)

The Lambert Airport site includes the airport as well as the industrial properties adjacent to the airport and bounded by I-270 and I-170. The site boundary includes an extensive number of properties that are either currently being redeveloped, or being planned for future redevelopment. Project areas such as Northpark and the former Ford plant are currently active, with additional land in Bridgeton being evaluated for redevelopment. Implications include:

- 11 jurisdictions come into play, raising questions about how this currently underutilized asset can be pushed towards its highest and best use.
- Significant employment in the area.
- Uncertain transportation access to some sites

Lewis and Clark North (LC)

Located in Illinois, along the Mississippi River, the Lewis & Clark North site encompasses an area dominated by the Conoco Philips Refinery. The Lewis & Clark North Site includes the former BP Wood River redevelopment parcels of 472.6 acres which are in various stages of regulatory approval with 80.6 acres along the Mississippi River (http://bpwoodriver.com/site/redevelopment.php). BP is retaining operations on 112.8 acres with a further 191.8 acres of land support and set aside. The central portion of the site is primarily in industrial land uses characterized by the numerous storage

tanks related to the refinery complex, pipeline network and bulk liquid movements by rail and barge. Throughout this site, there are large areas of undeveloped and agricultural land use both of which represent potential for growth and expansion of this site. Undeveloped land use pockets are located adjacent to active barge terminals along the Mississippi River allowing for the addition or expansion of these existing terminals. Implications include:

- The Lewis & Clark North site area is ideally placed within the St. Louis Region to continue to expand its industrial capacity along with its multimodal assets to help further integration between modes.
- The area has numerous industrial infrastructure assets including barge terminals, rail and road access.
- Areas for further industrial development are currently available within the site area. Several parcels are the site of former industrial operations with some having cleared previous industrial space. As a result, the supporting infrastructure in the north is more accessible for development than in the vicinity of the southern agricultural land.
- A detailed industrial survey of the existing buildings and land which can be utilized for industrial purposes should be performed to rectify existing lack of clear industrial property data within the site area.
- Future plans and objectives of the refinery should be understood to see if future expansions are planned or if any issues related to the refinery could dramatically change the freight transportation moving through the area.
- Railroads that cross this site include Norfolk Southern (NS) and Union Pacific (UP).

Manchester-44 (MN)

The Manchester-44 site outline follows the alignment of the railroads located between I-64 and I-44. The site is comprised primarily of industrial uses and also includes the BNSF intermodal facility at the southern end of the site. Residential properties border the majority of the site and some are included within the site boundary towards the north end of the site. Implications include:

- Difficult for trucks to get in and out of the BNSF intermodal facility due to site topography and roadway geometrics.
- This intermodal yard is heavily used, raising questions about how it will manage anticipated future growth in domestic intermodal shipments.
- MoDOT traffic data points to a significant flow of trucks entering and exiting the interstate at Arsenal. However, local traffic counts do not paint a clear picture as to how these trucks arrive and depart.

Meramec – 44 (MC)

The Meramec-44 site is located in the northwest quadrant of the I-44/I-270 interchange. It is also the site of the former Chrysler plant, which has been demolished and is available for redevelopment. The site benefits from rail access. The Chrysler Plant itself remains in the ownership of the bankruptcy entity, with unclear implications for reuse. The Chrysler site is strategic for the St. Louis Region. Implications include:

- Interstate ramps were built to serve Chrysler (one-way pairs). Existing configurations are not as effective, particularly to encourage other reuse concepts.
- Higher percentage of truck traffic on arterials is a concern
- Area has a significant amount of flat land for infill redevelopment
- Other jurisdictional influences come into play north of the river

MidAmerica Airport (MA)

The site is focused around the MidAmerica Airport and Scott Air Force Base. Most of the land within the site area is undeveloped land. Implications include:

- The airport continues to pursue an air cargo strategy, which over time, will drive demand for development of surrounding acreage.
- IDOT has additional interchanges planned for the area to enable access
- Opportunities associated with growth of the I-64 corridor eastward should be examined.

Page - 270 Quadrant (PQ)

This large concentration of industrial and commercial uses is bounded to the east and west by two major highways: I-270 to the west and U.S.-67/Lindbergh Boulevard to the east. Page Avenue, which runs east-west through the middle of the site area connects these two highways. The Page Avenue corridor is dotted with hotels, large office towers, and other various commercial and industrial buildings. Implications include:

- Site has relatively easy access to I-55S, I-70W and I-44W. The proximity to these interstates provides this site with links to western and southern cities such as Kansas City, Oklahoma City and New Orleans to name a few.
- Commercial land use is located along the major roads while the industrial areas are tucked in the interior of this site.
- Although the surrounding area is completely built up, there are a few vacant sites currently available within the Page 270 Quadrant.
- Only one railroad line, Central Midland Railroad (CMR) traverses this site.
- Strong employment business and employment density within the site area, distributed between many employment sectors.
- Obtaining traffic volume data on ramps for I-270 and MO 364 interchange to get more information specifically on trucks entering the site.
- Perform additional crash analysis to determine if crashes occurring in weaving areas are related to roadway geometry and identify countermeasures.
- Utilize targeted infill and retention of businesses located in the Page 270 Quadrant, continuing focus on expanding and adding small manufacturers.
- Consider modification of TAZ boundaries that include residential development in order to remove those areas from employment and business focused TAZs.

Page Corridor (PC)

South of Page Ave, west of Lindbergh Blvd, north of Olive Blvd, and west of I-170 lays a section of industrial warehouses, and commercial buildings in an established concentration. Small, densely packed smaller warehouses are concentrated along the western portion of the site between Page Ave and the rail line running through the site. Commercial warehouse space is located in the southwest leg of the site. The eastern end of the site area is a mix of uses. Implications include:

- These properties are surrounded by dense residential properties with little opportunity for expansion within the existing footprint.
- The corridor has a relatively high employment base and a large number of industrial properties**.** Such a combination raises congestion concerns.

Port Kaskaskia (PK)

Port Kaskaskia KRPD1 is within the Metropolitan Planning Organization (MPO) boundary, while the other parts of the port are outside the MPO boundary. The site consists of the Port, the surrounding agricultural land, a portion of Baldwin Lake, and the Kaskaskia River. The area is expected to benefit from recent river dredging, as well as proximity to Illinois grain and coal shipments.

- Changes in customers and bulk product types at one or more of the Port and industrial facilities in the area may have a significant impact on local traffic circulation
- Support greater inclusion and alignment of the Port of Kaskaskia with the overall St. Louis Region

Route 3 North (TN)

This area sits adjacent to the Mississippi River and immediately south of Interstate 270. Route 3 North is served by truck, rail and barge as shown in the map below. The Route 3 North site area is a combination of America's Central Port and the surrounding industrial properties in the area, as well as the other infrastructure found in close proximity to the port such as the multiple rail tracks. A significant part of the area represents legacy and new industries east of Route 3, many of which are associated with the steel sector. Route 3 North is an industrial area with multiple rail infrastructure lines running through it that also includes the Chain of Lakes Canal and Mississippi River. America's Central Port is a privately-owned port within the Route 3 North site area.

<u>America's Central Port</u>

- Encompassing over 75 miles of shoreline on the banks of the Mississippi River and the Chain of Rocks Canal in southwestern Madison County, in Granite City, Madison and Venice.
- America's Central Port is located in Foreign Trade Zone #31, partnering with the Gateway Commerce Center in Edwardsville, IL.
- The port operates commercial warehouses, truck and rail facilities, harbor facilities, industrial plants, and office space.
- America's Central Port transfers upwards of 4 million tons of goods between river barges, railcars and trucks. Additionally, 80 million tons of goods are shipped past the Port's harbor facility on the Chain of Rocks Canal.
- The port straddles Lock and Dam #27, the last lock on the Mississippi River, allowing vessels to free-flow to the Port of New Orleans.

Implications include:

- Given the infrastructural and geographic constraints placed upon the area, small targeted development could be possible for parcels west of Route 3 and more generally north of Pontoon Road.
- Evaluating at-grade rail crossings to improve safety and reduce the number of crashes.
- Obtaining traffic count data at ramps to have more information about trucks entering Route 3 North.
- Determine the truck traffic volumes on the McKinley Bridge because of the difference in volumes between the Missouri traffic data and the Illinois traffic data.
- Determine long term needs of America's Central Port for improvements and increased access for multi-modal opportunities.

Vandeventer – Chouteau (VC)

Vandeventer Chouteau is located west of downtown St. Louis, essentially following a corridor along I-64. Located within St. Louis City, this site is surrounded by mid-rise multi-family and tightly-packed single-family housing as well as numerous commercial properties. A considerable amount of railroad infrastructure traverses the site on an east-west alignment. Implications include:

- MoDOT and TRRA are evaluating rail capacity improvements for this area
- The Great Rivers Greenway has plans for a larger greenway through a portion of this area
- Although there are very few vacant properties located within the boundaries of this site, there is a considerable amount of land that is under-utilized
- The City of St. Louis and SLDC can lead industrial development efforts
- Proximity to redevelopment areas including CORTEX

West 70 – Arrowhead (WA)

The West 70 Arrowhead site includes a mix of different land uses. For the most part, industrial uses are concentrated along the railroad and commercial uses are located along the interstate. The majority of properties north of I-70 are easily able to access the interstate via TR Hughes Boulevard or MO-79 while a service road south of I-70 provides a link to the industrial center and a number of commercial properties. Implications include:

- 54% of the jobs in this area are dedicated to manufacturing
- There are a considerable number of vacant properties scattered throughout this area that could be redeveloped.
- The site is full of single family residential developments in the southern section, preventing further development to the south.
- There is plentiful agricultural land north of Tom Ginnever Avenue, MO-79, and Salt River Road that could accommodate expansion, provided there are no limitations in terms of flooding concerns.

08

Freight Flows and Forecasts by Mode

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Introduction

For the study, a detailed analysis was completed of freight movement in and through the St. Louis Region, with discussion of mode specific trends and implications, all broken down between in-bound, out-bound, and thru traffic. The analysis relies on the IHS Transearch Database as well as rail waybill data. Transearch is an annual, nationwide database of freight traffic flows between U.S. county markets, with an overlay of flow volumes across transportation infrastructure. Cross-border freight volumes with Canada and Mexico markets are also covered. The database draws from a wide variety of sources covering commodity volume and modal flow, including a long term, proprietary motor carrier traffic sample, proprietary railroad data, and numerous commercial and federal government surveys, samples, and census sources. To compose the database, these multiple and diverse information sources are cast together in a single, consistent format. The database enumerates commodity flows in short tons between geographic entities, typically states, counties, business economic areas (BEA's) by mode (rail carload, rail intermodal, truck load, less than truck load, private truck, air and water) for current and forecast years.

The Transearch database was augmented by the restricted versions of the Surface Transportation Board (STB) Carload Waybill Sample for Missouri and Illinois. This data was made available by the state departments of transportation for both states for the sole purpose of conducting this research project. Railroads are required to submit a stratified sample of carload waybills to the STB each year. A simplified and heavily-aggregated sample Public Use File is also created and made public, while the larger data set is heavily restricted. Non-government entities may request and gain confidential access to the full sample at the discretion the STB or state boards, generally for the purposes of completing government studies. For this study, the full Carload Waybill Sample was imported and synthesized into Transearch data to obtain more detailed and precise rail commodity routing.

This section evaluates freight movement through the St. Louis Region in two ways:

1. Discussion of freight movement broken down by mode (rail, water, air, and road), covering in-bound, out-bound and thru-traffic
2. Discussion of freight movement broken down by geographic origins and modes, focused on areas in the U.S. that connect with or through St. Louis.

Geography

The geography of St. Louis in the middle of the continental United States and, specifically, along the confluence of the Missouri and Mississippi rivers makes the St. Louis Region an ideal logistical hub for transporting agricultural, mining, and manufacturing products from the Heartland to and from domestic and international markets. Nearby connections to the Illinois and Kaskaskia Rivers also contribute to the centrality of St. Louis as a North American freight transportation hub. St. Louis is, of course, not simply a conduit of trade but also a producer and consumer. Inter-regional goods movement traversing the St. Louis Region's transportation infrastructure falls into four primary categories:

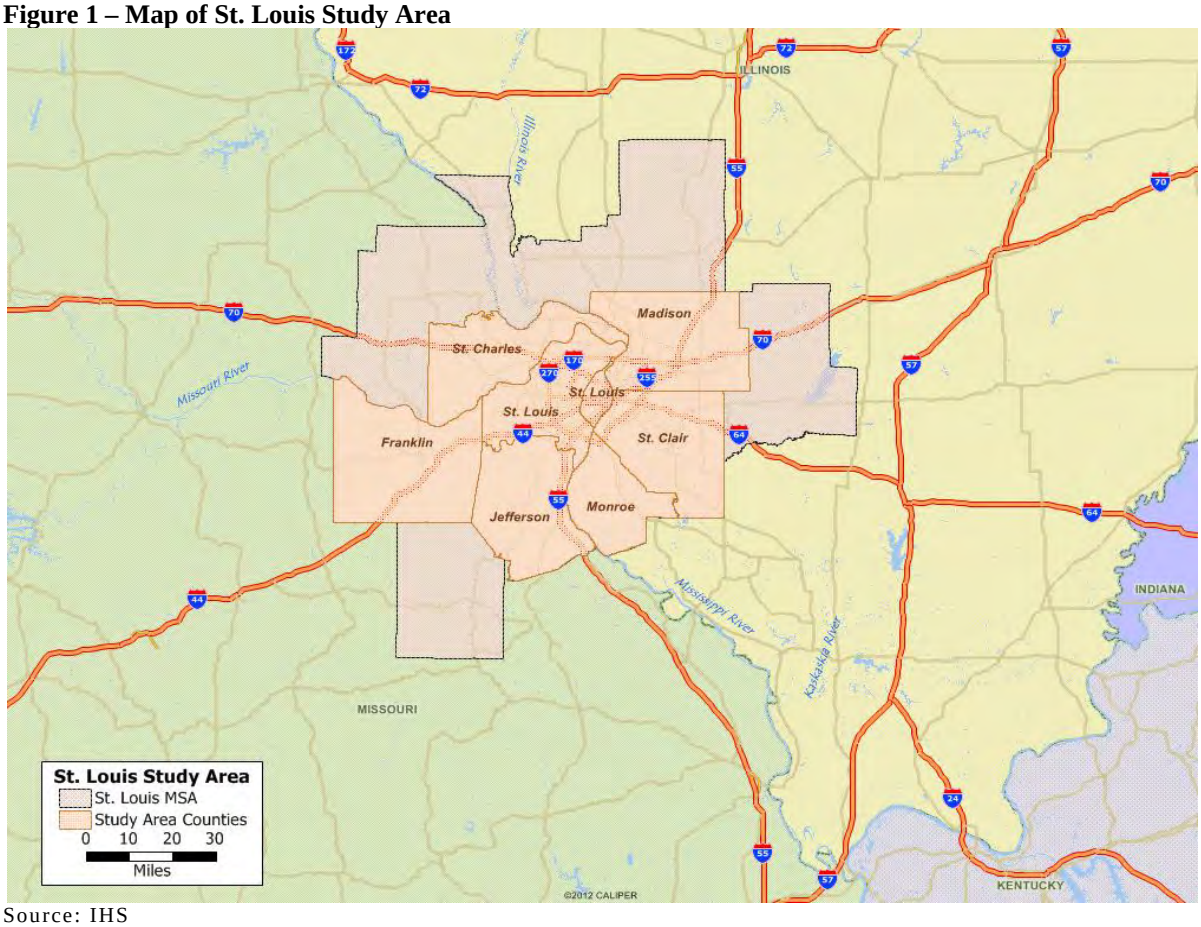
- Through traffic consists of goods moving between origin and destination pairs that are both located outside the St. Louis Region, but traversing metropolitan St. Louis while en route.

- Inbound traffic consists of goods shipped into the St. Louis Region, for local consumption or trans-shipment to other destinations.
- Outbound traffic consists of goods either produced locally or trans-shipped through St. Louis to destinations outside the St. Louis Region.

A fourth type of freight movement, intra-regional traffic, affects mainly local transportation infrastructure and logistics and warehousing operations. This freight traffic consists of goods both produced and consumed within St. Louis, as well as the movement of goods between regional intermodal and distribution centers and local businesses and households. Regional intermodal and distribution centers will be discussed in the context of inbound and outbound traffic.

This study focuses on the City of St. Louis and seven counties in the St. Louis Region, including St. Louis, Jefferson, Franklin, and St. Charles in Missouri and Madison, St. Clair, and Monroe counties in Illinois. These counties comprise a subset of the larger metropolitan area. The data associated with the St. Louis study area will be limited to the City and seven counties. Therefore, the analysis of truck, waterborne, rail, and airborne freight movements will treat other outlying areas of the metropolitan area as separate origin/destinations for tracking cargo moving inbound, outbound, and through the study area.

Figure 1 – Map of St. Louis Study Area



Source: IHS

Truck Freight Perspective

Truck traffic carries by far the largest modal share of freight by total tonnage in the United States, accounting for 70% of the total. Truck, and by extension general roadway traffic, has the attribute of flexibility enabling door-to-door deliveries to and from specific places of business, households, and warehouse and distribution centers. Furthermore, trucks can be used to ship bulk goods to intermodal centers, where such goods can be consolidated and loaded onto other modes of transportation. This consolidation and trans-shipment via intermodal centers occurs particularly for heavy, lower-value bulk freight, which can benefit from transportation economies by moving via rail, waterway, or pipeline for long-distance trip legs. Goods that are higher-value and lower-weight are less easily consolidated in bulk, and/or move shorter distances (i.e., from St. Louis to other Lower Midwest and Central Plains cities). For these types of goods, trucks are often more practical.

Over 200 million tons of truck freight moved within the boundaries of the St. Louis Region in 2010. The following table shows that about 45% of the tonnage represented through traffic, with the remaining shares roughly split between outbound (18%), inbound (20%), and local traffic (17%). Through traffic is expected grow at a faster pace than other categories, registering an average annual growth rate of 2.5%. The result is that through traffic will constitute 54% of all freight tonnage in 2040. Additionally, the rate of growth in inbound traffic is expected to exceed outbound traffic, suggesting that St. Louis is expected to increasingly consume more goods than it will produce for other markets, which is not surprising given anticipated growth of "knowledge industries" within the St. Louis Region, which produce more services than goods.

Table 1 – St. Louis Truck Flows, 2010-2040 (Thousand Tons)

Segment	2010	2015	2020	2025	2030	2040	CAGR
Through	90,920	106,389	120,783	135,333	149,804	189,495	2.5%
Outbound	36,193	37,828	38,686	39,991	41,561	46,099	0.8%
Inbound	41,720	48,718	53,524	57,920	61,661	70,243	1.8%
Local	34,361	37,905	39,511	40,806	42,542	47,848	1.1%
Total	203,194	230,840	252,505	274,051	295,568	353,685	1.9%

Source: IHS

Additional patterns emerge when viewing truck movements from the perspective of commercial value. IHS estimates the commercial value of 2010 truck freight movement in St. Louis at just under $350 billion. Through traffic represents an even higher percentage of the total share when measured by market value rather than by weight, accounting for about 61% of all cargo in 2010 and growing to 71% by 2040. Since the percentage share by value is higher than the percentage share by weight, the data suggests that cargo moving through St. Louis is generally of higher value (per ton) than other goods moving into and out of St. Louis. If one assumes that through traffic is likely long-haul transport, then the data supports a more general observation of truck freight. Long-haul transport by truck is more likely where cargo carries higher value since transportation costs for these goods make up a less important share of overall costs of producing and bringing goods to market. The data suggests the dominance of through traffic as a share of truck cargo movements in St. Louis, the fact that through-traffic freight on average tends to consist of higher-value goods, and the relative evolution of St. Louis towards the consumption of goods and the production of services. The following sections will drill down deeper into the truck freight data to lend additional insight on the

economic and transportation factors driving these trends and the implications for the St. Louis economy and infrastructure.

Table 2 – St. Louis Truck Flows, 2010-2040 ($ Millions)

Segment	2010	2015	2020	2025	2030	2040	CAGR
Through	209,314	260,641	316,698	383,956	454,629	668,880	3.9%
Outbound	51,356	56,812	60,439	65,397	70,100	83,046	1.6%
Inbound	56,055	67,413	75,388	86,113	96,424	121,991	2.6%
Local	28,827	34,926	40,287	47,174	54,570	71,004	3.1%
Total	345,552	419,791	492,813	582,640	675,722	944,922	3.4%

Source: IHS

Trucking - Through Traffic

Through traffic offers economic benefits to regional economic growth, although these benefits are largely confined to transportation and transportation-serving industries. Knowledge of the sources of and trends in through traffic might suggest future opportunities for St. Louis to play a more prominent role in product supply chains, thus deriving greater regional economic benefits. Perhaps of more immediate importance, high volumes of through traffic supporting inter-state and national scope can help justify federal funding for supporting infrastructure. The following figure illustrates the flows of truck freight by weight through St. Louis to and from key destinations and origins.

Figure 2 – St. Louis Through Traffic Truck Flows, 2010

Source: IHS

The following table illustrates that truck through traffic is dominated by goods moving eastbound from Los Angeles to Business Economic Areas (BEA) [1] in the Northeast and the Lower Midwest[2] . The highest-volume relationship is for tonnage moving from Los Angeles to New York. Significant volumes of freight also move in the opposite direction, but the total tonnage moving from New York to Los Angeles is less than half of that moving in the opposite direction. The next most important origin-destination pairs are Los Angeles and Detroit, where tonnage is more closely balanced in terms of the direction of flows. St. Louis appears several times as both a top origin and, more often, a top destination, including key pairings with Kansas City and Chicago, which represents through traffic moving to or from areas within the wider St. Louis BEA but outside the study area. Hence, this traffic may originate or terminate in parts of eastern Missouri of Southern Illinois, but there is no handling or significant value added within the study region.

Table 3 – Through Traffic Truck Flows by Top O/Ds and Tonnage, 2010

Origin BEA	Destination BEA	Tons (000's)
Los Angeles, CA	New York, NY	3,201,625
New York, NY	Los Angeles, CA	1,547,805
Detroit, MI	Los Angeles, CA	1,348,688
St. Louis, MO*	St. Louis, MO*	1,249,676
Los Angeles, CA	Detroit, MI	1,141,369
Los Angeles, CA	Boston, MA	919,259
Los Angeles, CA	Philadelphia, PA	878,190
Kansas City, MO	St. Louis, MO*	696,486
Chicago, IL	St. Louis, MO*	635,446
San Antonio, TX	Chicago, IL	628,711

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

The dominance of eastbound through traffic originating in Los Angeles is more pronounced when measured by the value of goods (see the next table). The total value for shipments from Los Angeles to New York is over seven times that for freight moving in the opposite direction. The top four and six of the top ten origin-destination pairs have origins in Los Angeles and move to East Coast and Lower Midwest destinations. Movement of truck freight from major BEAs in southern Texas to the lower Midwest also takes on a more prominent role when analyzed by value. Goods movement from El Paso to Detroit and from San Antonio to Chicago factor prominently. Taken together, these data illustrate two important trends.

- Imports from Asia into Southern California and from Mexico into Texas are major factors driving goods movement through St. Louis in an eastbound and northbound direction.
- Imported goods and freight traveling longer distances tend to exhibit higher overall value.

[1] BEAs, as defined by the Census Bureau, are economic zones, including urban and non-urban areas, which wholly partition the United States. Waterborne and rail activity is typically reported by BEA. For the sake of consistency, truck data will also be reported by BEA rather than Metropolitan Statistical Area (MSA), as is often the case.

[2] For the purposes of this analysis, the Northeast includes New England, New Jersey, New York, Pennsylvania, and Delaware; the Lower Midwest Includes Ohio, Indiana, Michigan, and Southern Illinois; the Upper Midwest includes Northern Illinois, Iowa, Wisconsin, and Minnesota.

Table 4 – Through Traffic Truck Flows by Top O/Ds and Value, 2010

Origin BEA	Destination BEA	$ Millions
Los Angeles, CA	New York, NY	24,481
Los Angeles, CA	Detroit, MI	7,611
Los Angeles, CA	Boston, MA	5,097
Los Angeles, CA	Philadelphia, PA	4,551
Detroit, MI	Los Angeles, CA	3,700
El Paso, TX	Detroit, MI	3,518
New York, NY	Los Angeles, CA	3,333
Los Angeles, CA	Washington, DC	2,715
Los Angeles, CA	Indianapolis, IN	2,604
San Antonio, TX	Chicago, IL	2,205

Source: IHS

An examination of truck freight through traffic tonnage by both origin-destination pair and commodity offers additional insight. The data suggests a higher degree of diversity of freight tonnage moving from Los Angeles to both the Northeast and Lower Midwest. The following table illustrates that only the soft drinks and mineral water category of goods achieves sufficient aggregate tonnage on any route to be included in the top ten. Detroit and New York ship large quantities of manufacturing inputs such as chemicals and plastics to Los Angeles, much of is then exported to Asia. Consumer goods manufactured in the industrial Midwest (Chicago and Kansas City), move south and east to outlying areas of the St. Louis BEA. For the purposes of this study the commodity type "Warehouse & Distribution Center" includes a wide variety of consumer products that are typically shipped in boxes or other similar units. Although the origin-destination pairs do not appear in the top ten, Dallas and Atlanta also receive a large share of Midwestern manufactured consumer goods, which is not surprising given the recent strong economic growth in the Southeast. The presence of empty rail cars in the top ten from Erie to Los Angeles again suggests the dominance of freight movement in an eastbound direction, as railroad cars often return to the West Coast empty.

Table 5 – Through Traffic Truck Flows by Top O/Ds and Commodity (Tonnage), 2010

Origin BEA	Destination BEA	Commodity	Tons (000's)
Detroit, MI	Los Angeles, CA	Plastic Material or Synthetic Fiber	593,345
Kansas City, MO	St. Louis, MO*	Warehouse & Distribution Center	588,206
New York, NY	Los Angeles, CA	Misc. Industrial Organic Chemicals	501,836
St. Louis, MO*	St. Louis, MO*	Grain	496,146
Chicago, IL	St. Louis, MO*	Warehouse & Distribution Center	482,557
Los Angeles, CA	New York, NY	Soft Drinks or Mineral Water	457,246
Dallas, TX	Detroit, MI	Natural Gas	304,303
Champaign, IL	Los Angeles, CA	Soybean Oil or By-products	274,764
Erie, PA	Los Angeles, CA	Railroad Cars	264,708
Los Angeles, CA	Philadelphia, PA	Soft Drinks or Mineral Water	256,975

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

Analyzing top combined commodity and origin-destination rankings by value sheds greater light on the drivers of eastbound goods movement originating in Los Angeles. Eight of the top ten origin-destination and commodity combinations involve trade from Los Angeles to the Northeast and Great Lakes, with trade is dominated by high-end manufactured goods, and in particular electronic and data processing, televisions and radios, apparel, and furniture. This conforms to trends in world trade where high-value goods manufactured in Asia are imported into Southern California, and then

shipped across the country via St. Louis to distribution centers in the Northeast and the Lower Midwest.

Table 6 – St. Louis Through Traffic Truck Flows by Top O/Ds and Commodity (Value), 2010

Origin BEA	Destination BEA	Commodity	$ Millions
Los Angeles, CA	New York, NY	Electronic Data Proc. Equipment	6,243
Los Angeles, CA	New York, NY	Women's or Children's Clothing	1,824
Los Angeles, CA	Boston, MA	Electronic Data Proc. Equipment	1,461
Detroit, MI	Los Angeles, CA	Plastic Material or Synthetic Fiber	1,220
Los Angeles, CA	New York, NY	Radio or TV Transmitting Equipment	1,184
Los Angeles, CA	New York, NY	Leather Footwear	1,152
Los Angeles, CA	Detroit, MI	Electronic Data Proc. Equipment	1,100
El Paso, TX	Detroit, MI	Misc. Office Machines	1,053
Los Angeles, CA	Philadelphia, PA	Electronic Data Proc. Equipment	975
Los Angeles, CA	New York, NY	Furniture or Fixtures	908

Source: IHS

From a logistics perspective, St. Louis is located along key Interstate routes connecting the West Coast to several major population centers in the Northeast and Lower Midwest. The combination of I-40 and I-44 (via Albuquerque, Amarillo, Oklahoma City) offers the most likely path for Los Angeles truck freight moving through St. Louis, although it is possible that some cargo is routed via I-15 and I-70 (via Las Vegas, Denver, and Kansas City). Traffic originating from Denver, San Francisco, and points north would almost certainly use I-70. Since Los Angeles is the dominant through traffic origin, this study will focus on through traffic from Southern California to the East Coast and Lower Midwest.

Generally-speaking, St. Louis is the most likely path for through traffic moving from Los Angeles to the East Coast from approximately the Philadelphia BEA to points north. This option offers a shorter path than the next most likely route to the south, I-40 via Memphis. There are no major tolled highways along either path until reaching connecting highways in East Coast states. There is the possibility for congestion on either route through St. Louis or Memphis, but it is not clear that there are major differences. The Texas A&M Transportation Institute's (TTI) most recent edition (2011) of its annual Travel Time Index ranks Memphis as slightly less congested than St. Louis in terms of average travel speeds through the metropolitan area[3], while St. Louis offers slightly cheaper diesel costs. All else equal, St. Louis would in in most cases be favored over Memphis when it offers a shorter distance to the destination, as it does as far south as approximately the Baltimore and Washington, DC areas.

Interstate 80 offers another alternative path for freight movements originating in Los Angeles and serving destinations in the Northeast and Lower Midwest; it is situated several hundred miles north of St. Louis and intersects Chicago and other cities near Lake Michigan, Lake Ontario, and Lake Erie. For many destinations, especially in the Lower Midwest, I-80 offers a shorter path than either I-44 or I-70 routes through St. Louis. Additionally, there are only minor differences in terms of distance from Los Angeles to New York, Boston, and Cleveland.

While the I-80 alternative appears plausible on the surface, a number of factors suggest that the I-44 to I-70 route through St. Louis offers, on balance, a more attractive path for truck freight moving from Southern California to the Northeast and parts of the Lower Midwest. According to TTI, average congestion levels for St. Louis and Chicago in 2011 were similar; however, freight would also have to

[3] Texas A&M Transportation Institute, *Urban Mobility Information,* Accessed 5 May 2013 at: http://mobility.tamu.edu/ums/congestion-data/.

move through a series of densely populated and high-traffic areas along the Great Lakes. Additionally, I-80 / I-90 eastbound from Chicago is tolled nearly throughout, including the Indiana Toll Road, the New York State Thruway, and the Massachusetts Turnpike. Interstate 70 is only briefly tolled in western Pennsylvania, although connections in Northeast states from I-70 to coastal cities will often require toll payments. Perhaps most critically, diesel fuel was about $0.20 less per gallon in St. Louis than Chicago in 2011. Overall, the combination of financial savings (tolls and diesel) and possible congestion cost savings favors I-44/I-70 over I-80 / I-90 for freight movement especially to the Northeast.

Opportunities to leverage through traffic for regional economic development may be limited for St. Louis as they would be for almost all metropolitan areas. Current data suggests the dominance of eastbound coast-to-coast trade, and much of this cargo is likely produced outside of the United States. If there were advantages for trans-shipping this cargo onto other modes, this would likely take place closer to the origins or U.S. points of entry. St. Louis could seek to bolster local manufacturing of products to substitute for goods currently moving longer distances, though opportunities would be minimal for goods produced in low-labor-cost countries. If St. Louis were to play a more active role in the value chain for goods currently moving through the study area, however, through traffic would not disappear so much as be replaced by inbound and outbound traffic. The St. Louis Region would then see a net growth in Regional employment.

Outbound Truck Traffic

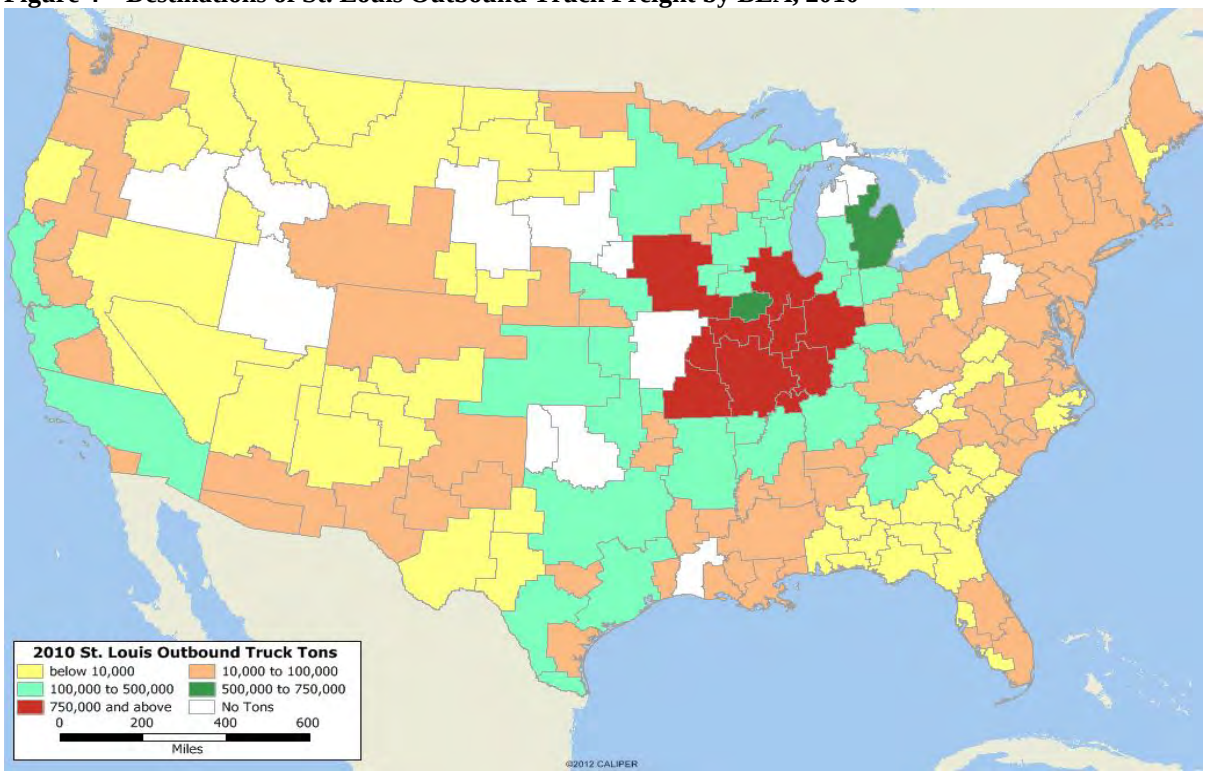
St. Louis plays an important role within the Midwest as a freight origination point for goods produced regionally or trans-shipped. The following figures and tables illustrate that the overwhelming volume of outbound truck freight by weight and value moves to nearby BEAs. This observation is consistent with the tendency of goods to follow a gravity pattern, where the volume of goods movement between an origin and various destinations is a function of the inverse of the square of distance or some measure of generalized cost. Hence, all else equal, flows decline rapidly the further the destination from St. Louis.

Not surprisingly, Chicago, the largest nearby BEA, receives the lion's share of tonnage. Kansas City measures a distant second, while Indianapolis and Memphis are included in the top ten. The rest of the top ten includes the St. Louis BEA (but outside the study area) and less-populated BEAs in Missouri and Illinois. More distant BEAs become slightly more important when freight is measured by value; Dallas, Tulsa, and Little Rock are all ranked in the top ten. This is because lower-value bulk products tend to move longer-distances via rail, waterway, and pipeline modes, leaving mostly higher-value goods for long-distance truck (or airborne) transportation.

Figure 3 – St. Louis Outbound Truck Flows, 2010

Source: IHS

Figure 4 – Destinations of St. Louis Outbound Truck Freight by BEA, 2010



Source: IHS

Table 7 – Outbound Truck Flows by Top Destination, 2010

Destination BEA	Tons (000's)	Destination BEA	$ Millions
Chicago, IL	7,973	Chicago, IL	9,835
St. Louis, MO*	4,582	Kansas City, MO	5,371
Kansas City, MO	2,934	St. Louis, MO*	2,855
Springfield, IL	2,080	Memphis, TN	1,937
Champaign, IL	1,485	Springfield, MO	1,861
Springfield, MO	1,245	Tulsa, OK	1,790
Evansville, IN	1,041	Dallas, TX	1,349
Indianapolis, IN	1,020	Springfield, IL	1,336
Columbia, MO	860	Little Rock, AR	1,297
Memphis, TN	824	Indianapolis, IN	1,285

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

The relative rankings of the top destinations for St. Louis outbound truck freight in 2040 are broadly consistent with 2010 rankings. A key point of relative divergence emerges, however, as high-value flows grow substantially on the north-south axis roughly served by I-44 and I-55. The total tonnage of outbound goods shipped to Chicago remains relatively flat, but the value increases significantly. Moreover, Dallas and Tulsa move rapidly up the rankings by 2040 as measured by value.

Table 8 – Outbound Truck Flows by Top Destination, 2040

Destination BEA	Tons (000's)	Destination BEA	$ Millions
St. Louis, MO*	8,933	Chicago, IL	11,060
Chicago, IL	7,747	Kansas City, MO	7,236
Kansas City, MO	3,272	St. Louis, MO*	6,380
Springfield, IL	2,604	Dallas, TX	4,194
Springfield, MO	1,900	Tulsa, OK	3,418
Champaign, IL	1,669	Springfield, MO	3,090
Indianapolis, IN	1,258	Memphis, TN	2,797
Columbia, MO	1,163	Little Rock, AR	2,219
Evansville, IN	1,044	Nashville, TN	1,879

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

Over 60% of all truck freight tonnage moving outbound from St. Louis can be described by ten major product groups. The breakdown by commodity and tons is summarized in the next table. By far the largest group is classified as Warehouse & Distribution Center goods, which are mostly consumer goods of various kinds moving through logistics networks to retail outlets. These goods can be produced within the St. Louis Region or they can be produced elsewhere and then warehoused and redistributed in St. Louis. For the purposes of this report, Warehouse & Distribution Center goods will be alternatively referred to as "consumer goods," although shipments might also contain intermediary goods used by other businesses or goods sold to governments and non-profits, etc.

Table 9 – Outbound Truck Flows by Commodity and Tonnage, 2010

Commodity	Tons (000's)	% of Total
Warehouse & Distribution Center	14,740	40.7%
Ready-mix Concrete, Wet	1,262	3.5%
Petroleum Refining Products	1,033	2.9%
Misc Industrial Organic Chemicals	980	2.7%
Soft Drinks or Mineral Water	869	2.4%
Broken Stone or Riprap	862	2.4%
Flour or Other Grain Mill Products	713	2.0%
Processed Milk	689	1.9%
Fertilizers	577	1.6%
Liquefied Gases, Coal or Petroleum	569	1.6%
All Others	13,899	38.4%
Total	36,191	

Source: IHS

There is no other dominant product in terms of tonnage per se, but several broad patterns can be observed. Much of the outbound-moving freight is produced in nearby BEAs. Concrete, stone, and similar construction inputs are among the highest-volume outbound truck freight by tonnage. These products tend to be mined nearby and move via truck only short distances. Agricultural and food & beverage products also make up a substantial share of truck cargo by weight; this is not surprising given the prevalence of both agricultural and food and beverage manufacturing industries in and around St. Louis.

St. Louis has a strong petroleum refining industry, whose products represent the third largest outbound commodity by tonnage aboard trucks. The regional industry is centered on Conoco-Phillips/Cenovus Wood River facility in Madison County. The facility has recently expanded to take advantage of increased low-cost Canadian oil sands production. Refined products are typically marketed regionally and in nearby BEAs.

The St. Louis Region also has a sizable chemicals industry specializing in a number of sub-sectors including pharmaceuticals; soap, cleaning, and beauty compounds; basic chemicals; agricultural chemicals; and paints, coatings, and adhesives. The chemicals industry also benefits from proximity to Canadian oil and gas extraction and could benefit from increased shale-based production in North Dakota, as many chemicals require derivatives of oil and gas as basic inputs. Many of these goods are exported to other regions of the U.S. and abroad. Chemicals make up a significant share of outbound truck tonnage, as the industrial organic chemicals group alone is the fourth largest commodity group. Some of this regional chemical production also supplies valuable inputs to other regional industries, such as manufacturing (e.g., automotive paint) and agriculture (e.g., fertilizer).

Not surprisingly, higher-value products such as cosmetics, pharmaceuticals, chemicals, machinery, and plastics make up a larger share of outbound freight when measured by total value, as illustrated in the following table. Petroleum and chemicals products, including drugs, cosmetics and perfumes, make up at least one-sixth of total outbound goods by value. In fact, chemicals are the State of Missouri's second leading foreign export in terms of value. The persistence of Warehouse & Distribution Center and Rail Intermodal Drayage commodity groups further illustrates the importance to the regional truck industry of consumer and durable goods in terms of both tonnage and value.

Table 10 – Outbound Truck Flows by Commodity and Value, 2010

Commodity	$ Millions	% of Total
Warehouse & Distribution Center	15,644	30.5%
Cosmetics, Perfumes, Etc.	2,167	4.2%
Drugs	1,975	3.8%
Rail Intermodal Drayage from Ramp	1,173	2.3%
Misc Agricultural Chemicals	1,138	2.2%
Refrigeration Machinery	1,054	2.1%
Misc Industrial Organic Chemicals	980	1.9%
Copper or Alloy Basic Shapes	966	1.9%
Petroleum Refining Products	942	1.8%
Misc Plastic Products	896	1.7%
All Others	24,416	47.5%
Total	51,350	

Source: IHS

Not all items shipped outbound from St. Louis will necessarily be produced regionally. For example, much of the substantial quantities of rail intermodal drayage, which by definition represent trans-shipment, are manufactured outside of the study area. Other goods such as chemicals follow complex supply chains where goods are imported and exported into the St. Louis Region as a factor of regional specialization. These supply chains will be discussed in greater detail later in this section. Regardless of the origin of production, trade in these goods is important to the regional transportation industry.

Current forecasts point to both increasing and diversifying outbound tonnage through 2040. The Warehouse & Distribution Center segment remains the top commodity group, but declines in both percentage and absolute terms. Consumer goods and petroleum products lose ground, but a wider variety of outbound freight more than compensates for these reductions. Much the overall gain comes from concrete, stone, scrap, and similar construction products likely produced and consumed within St. Louis and adjacent BEAs. With respect to petroleum products, the decline in total outbound tonnage stems not from reduced regional production but rather increased regional consumption of regionally-refined products.

Table 11 – St. Louis Outbound Truck Flows by Commodity and Tonnage, 2040

Commodity	Tons (000's)	% of Total
Warehouse & Distribution Center	10,711	23.2%
Ready-mix Concrete, Wet	2,941	6.4%
Broken Stone or Riprap	2,525	5.5%
Paper Waste or Scrap	1,885	4.1%
Soft Drinks or Mineral Water	1,043	2.3%
Misc Waste or Scrap	1,022	2.2%
Processed Milk	1,018	2.2%
Textile Scrap or Sweepings	935	2.0%
Misc Industrial Organic Chemicals	830	1.8%
Rail Intermodal Drayage from Ramp	824	1.8%
All Others	22,366	48.5%
Total	46,099	

Source: IHS

Total outbound freight value increases by about 60% by 2040. Semiconductors, biotechnology, plastics, and motor vehicle parts become more prevalent. Thus, there will be a slight reorientation of outbound truck traffic in favor of high technology, biotechnology, and manufactured parts. Some of these gains will be driven by regional production of goods such as pharmaceuticals and motor vehicle parts. A substantial percentage of the outbound technology traffic, however, represents trans-shipments. As will be discussed in the discussion of inbound truck flow, many of these goods are produced in Minnesota, Texas, and other center of technology manufacturing.

Table 12 – St. Louis Outbound Truck Flows by Commodity and Value, 2040

Commodity	$ Millions	% of Total
Warehouse & Distribution Center	11,368	13.7%
Solid State Semiconductors	5,470	6.6%
Rail Intermodal Drayage from Ramp	4,634	5.6%
Drugs	4,319	5.2%
Cosmetics, Perfumes, Etc.	2,933	3.5%
Copper or Alloy Basic Shapes	1,890	2.3%
Orthopedic or Prosthetic Supplies	1,681	2.0%
Misc Plastic Products	1,621	2.0%
Motor Vehicle Parts or Accessories	1,600	1.9%
Chemical Preparations	1,419	1.7%
All Others	46,110	55.5%
Total	83,046	

Source: IHS

Taken together, the trends by tonnage and value suggest that St. Louis will, in relative terms, possibly see less outbound shipment of heavier and manufactured goods and greater quantities of lighter, high-value added products. The primary exception might be heavier construction products, which are not necessarily higher-value goods but are forecasted to grow in the future.

Combining top destination and commodity pairs by tonnage reveals no surprises. The vast majority of outbound freight shipped to Chicago is consumer goods produced and/or warehoused in St. Louis. These goods also dominate outbound truck tonnage destined for other nearby BEAs such as Kansas City, Champaign, IL, and Evansville, IN. As expected, lower-value / higher-weight sand, gravel, concrete, and stone ostensibly for construction is directed to areas within the St. Louis BEA but just outside the study area boundaries. The breakdown of top combinations of tonnage and destination is summarized below.

Table 13 – St. Louis Outbound Truck Flows by Destination and Commodity (Tonnage), 2010

Destination BEA	Commodity	Tons (000's)
Chicago, IL	Warehouse & Distribution Center	6,565
St. Louis, MO*	Broken Stone or Riprap	843
Kansas City, MO	Warehouse & Distribution Center	789
St. Louis, MO*	Ready-mix Concrete, Wet	754
St. Louis, MO*	Warehouse & Distribution Center	557
St. Louis, MO*	Gravel or Sand	518
Champaign, IL	Warehouse & Distribution Center	473
Springfield, IL	Petroleum Refining Products	426
Springfield, IL	Ready-mix Concrete, Wet	418
Evansville, IN	Warehouse & Distribution Center	350

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

The outbound freight picture becomes more complete by summarizing top destinations and commodity pairs by commercial value. Other commodity groups emerge more prominently including pharmaceuticals shipped to Kansas City and refined petroleum shipped to Springfield, IL.

Table 14 – St. Louis Outbound Truck Flows by Destination and Commodity (Value), 2010

Destination BEA	Commodity	$ Millions
Chicago, IL	Warehouse & Distribution Center	6,968
St. Louis, MO*	Rail Intermodal Drayage from Ramp	1,033
Kansas City, MO	Warehouse & Distribution Center	837
Kansas City, MO	Rail Intermodal Drayage to Ramp	696
St. Louis, MO*	Warehouse & Distribution Center	591
Kansas City, MO	Drugs	567
Champaign, IL	Warehouse & Distribution Center	502
Springfield, IL	Petroleum Refining Products	389
Evansville, IN	Warehouse & Distribution Center	371
Indianapolis, IN	Warehouse & Distribution Center	368

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

Looking into the future, existing origin-destination relationships with nearby BEAs remain strong and the dominance of consumer goods and construction materials remains steady. The following table illustrates changes in absolute tonnage, but relative stability in terms of the most important origin-destination and commodity combinations in 2040. One notable exception is the increase in trans-shipped containers (i.e., drayage) within the St. Louis BEA which is consistent with the expected overall growth in rail containerized cargo. This trend will be further discussed in the section on rail.

Table 15 – Outbound Truck Flows by Destination and Commodity (Tonnage), 2040

Destination BEA	Commodity	Tons (000's)
Chicago, IL	Warehouse & Distribution Center	5,746
St. Louis, MO*	Broken Stone or Riprap	2,501
St. Louis, MO*	Ready-mix Concrete, Wet	1,982
Springfield, IL	Ready-mix Concrete, Wet	772
St. Louis, MO*	Rail Intermodal Drayage from Ramp	746
St. Louis, MO*	Gravel or Sand	685
St. Louis, MO*	Paper Waste or Scrap	445
Springfield, IL	Paper Waste or Scrap	405
St. Louis, MO*	Warehouse & Distribution Center	403
Kansas City, MO	Warehouse & Distribution Center	371

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

The forecasted combination of origin-destination pairs and commodities for 2040 reveals a more dramatic shift towards higher-end products moving towards more distant destinations. St. Louis' position as a both a manufacturer and warehousing and distributor for pharmaceutical and biotechnology products is driving the growth of trade of these high-value products to not only to nearby BEAs but also destinations such as Dallas and Little Rock. As previously described, St. Louis' central position in the supply chain between high -technology producing BEAs and technology consuming knowledge economies is driving outbound truck shipments of goods such as semiconductors to places like Minneapolis and Detroit.

Table 16 – St. Louis Outbound Truck Flows by Destination and Commodity (Value), 2040

Destination MSA	Commodity	$ Millions
Chicago, IL	Warehouse & Distribution Center	6,098
St. Louis, MO*	Rail Intermodal Drayage from Ramp	4,196
Kansas City, MO	Drugs	1,099
Dallas, TX	Orthopedic or Prosthetic Supplies	843
Kansas City, MO	Rail Intermodal Drayage to Ramp	761
Springfield, MO	Drugs	734
Tulsa, OK	Motor Vehicle Parts or Accessories	714
Little Rock, AR	Drugs	706
Minneapolis, MN	Solid State Semiconductors	697
Detroit, MI	Solid State Semiconductors	641

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

In summary, outbound truck freight is expected to increase at a steady pace in terms of both tonnage and, especially, value from 2010 to 2040. This trend is accompanied by increased capacity requirements for southwest-bound truck traffic on I-44 and northbound volumes on I-55 between St. Louis and Chicago and other Great Lakes regions. St. Louis outbound traffic is currently heavily weighted towards consumer goods that are either produced locally and/or trans-shipped from west of the Mississippi River via St. Louis to primarily Chicago. Much of the outbound traffic moves northbound on I-55. This traffic will likely continue, but at lesser volumes. Meanwhile forecasted growth in outbound truck tonnage and values for chemicals, pharmaceuticals, and technology will drive increased flows along southwest, northbound, and southbound routes, increasing the importance of I-44 and I-55 northbound towards the Great Lakes and southbound towards the Gulf Coast. Several other trends appear in the outbound flow data and forecasts.

- Significant quantities of bulk construction goods move to outlying areas of the St. Louis metropolitan area. Flows should grow in the future.
- Growth in vehicle parts outbound traffic towards Tulsa will also support the possible increased flows in a southwest-bound direction on I-44.
- High technology/ biotechnology products will grow substantially as a share of outbound traffic.

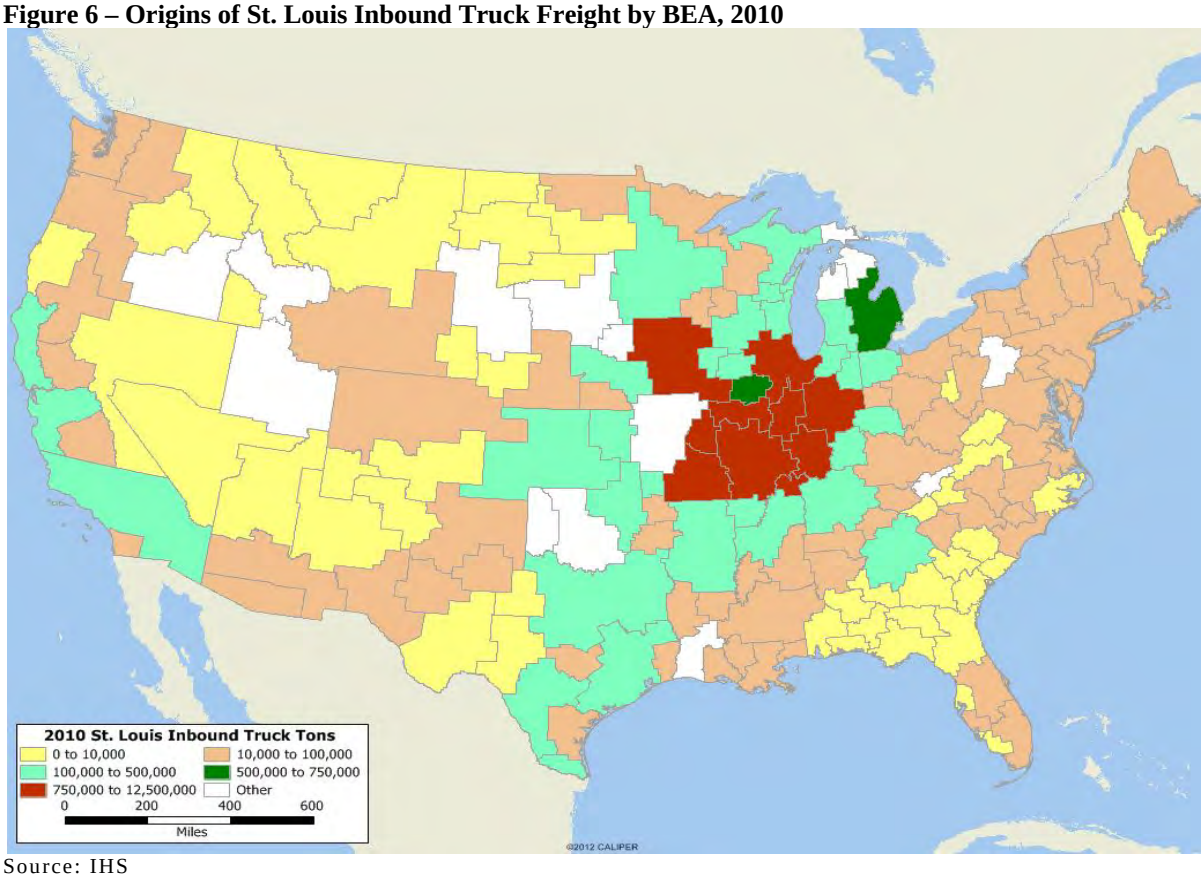
Inbound Truck Traffic

An analysis of inbound freight movements helps complete the picture for truck cargo transportation in St. Louis. The following figures and tables summarize inbound truck traffic. Areas outside the study area but within the St. Louis metropolitan area contribute the highest share of goods by tonnage. Beyond the borders of the St. Louis metropolitan area, Chicago and Kansas City are the largest origins of inbound truck freight, particularly when considering the actual value of goods. The data suggests a similar pattern as that which emerges outbound traffic. Higher quantity, lower-value goods move via truck from more proximate locations, and higher-value, more specialized goods are imported for larger and more distant metropolitan areas.

Figure 5 – St. Louis Inbound Truck Flows, 2010

Source: IHS

Figure 6 – Origins of St. Louis Inbound Truck Freight by BEA, 2010



Source: IHS

Table 17 – St. Louis Inbound Truck Flows by Origin, 2010

Origin MSA	Tons (000's)	Origin MSA	$ Millions
St. Louis, MO*	12,305	Chicago, IL	9,769
Kansas City, MO	3,884	Kansas City, MO	5,046
Chicago, IL	3,877	St. Louis, MO*	3,472
Columbia, MO	2,184	Indianapolis, IN	2,794
Springfield, IL	1,700	Dallas, TX	1,763
Evansville, IN	1,476	Los Angeles, CA	1,665
Springfield, MO	1,225	Milwaukee, WI	1,640
Paducah, KY	1,184	Evansville, IN	1,621
Champaign, IL	1,148	Minneapolis, MN	1,490
Indianapolis, IN	1,039	Nashville, TN	1,311

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

The next table summarizes the relative rankings of the top origins for St. Louis inbound truck freight in 2040, illustrating a significant shift in importance of connectivity to Texas, Southern California, and Mexico. This section will highlight some of the key drivers of truck traffic originating in these locations and driving future growth of freight flows on the I-44 corridor, particularly when measured by value. Additionally, large BEAs in the Upper Midwest take on elevated importance and, again, particularly when measured by value. Similar to the case of outbound truck flows, therefore; both I-44 and I-55 take on elevated importance for inbound freight in the future.

Table 18 – St. Louis Inbound Truck Flows by Origin, 2040

Origin MSA	Tons (000's)	Origin MSA	$ Millions
St. Louis, MO*	19,244	Chicago, IL	17,255
Chicago, IL	7,212	Dallas, TX	17,197
Kansas City, MO	4,480	Mexico	7,324
Columbia, MO	2,946	St. Louis, MO*	6,491
Springfield, IL	2,034	Kansas City, MO	6,439
Des Moines, IA	1,954	Los Angeles, CA	4,669
Mexico	1,865	Indianapolis, IN	4,642
Peoria, IL	1,678	Minneapolis, MN	3,082
Champaign, IL	1,600	Des Moines, IA	2,956
Evansville, IN	1,594	Nashville, TN	2,434

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

Like outbound traffic, the majority of inbound freight tonnage shipped to St. Louis can be described by ten major product groups. As illustrated previously, total inbound tonnage and value is higher than similar measures for outbound goods movement. Inbound freight is, however, currently more diverse, as top commodity groups generally account for lower overall shares of totals. A breakdown by top commodity groups in 2010 by tonnage is summarized in the following table.

Table 19 – St. Louis Inbound Truck Flows by Top Commodity and Tonnage, 2010

Commodity	Tons (000's)	% of Total
Warehouse & Distribution Center	8,904	21.3%
Broken Stone or Riprap	4,000	9.6%
Ready-mix Concrete, Wet	2,635	6.3%
Misc. Field Crops	2,343	5.6%
Gravel or Sand	2,106	5.0%
Asphalt Paving Blocks or Mix	1,107	2.7%
Misc Industrial Organic Chemicals	1,028	2.5%
Concrete Products	844	2.0%
Grain	680	1.6%
Petroleum Refining Products	611	1.5%
All Others	17,453	41.8%
Total Tons	41,713	

Source: IHS

Warehouse & Distribution Center goods still make up the largest share of total freight tonnage, but inbound tonnage is less than outbound tonnage in 2010. Although this might then appear that St. Louis is currently a net producer of consumer goods, forecasted data (as well as rail data presented later in this study) will suggest otherwise. The same can be said for economically important chemicals and petroleum products. For these commodities, inbound truck tonnage in 2010 was lower than that for outbound flows, but truck forecasts and analyses of other modes will demonstrate more complex supply chains. In contrast, St. Louis does register higher inbound than outbound flows of stone, concrete, and other construction materials, which is not altogether surprising given the size of the construction industry in a large urban region such as St. Louis.

Top commodities driving inbound truck freight totals by value include field crops, plastics, electrical equipment, and aircraft parts; all important to local food, automotive, and aviation manufacturing. Pharmaceutical inbound traffic is relatively balanced with outbound traffic. This suggests that while St. Louis is a major producer of pharmaceuticals, it is also a consumer and distributor. The data also again highlights the importance of high-value chemicals and petroleum products.

Table 20 – St. Louis Inbound Truck Flows by Top Commodity and Value, 2010

Commodity	$ Millions	% of Total
Warehouse & Distribution Center	9,451	16.9%
Rail Intermodal Drayage to Ramp	1,664	3.0%
Drugs	1,621	2.9%
Misc. Field Crops	1,278	2.3%
Misc. Plastic Products	1,143	2.0%
Misc. Electrical Industrial Equipment	1,073	1.9%
Misc. Industrial Organic Chemicals	1,003	1.8%
Electronic Data Proc. Equipment	900	1.6%
Rail Intermodal Drayage from Ramp	853	1.5%
Aircraft Propellers or Parts	766	1.4%
All Others	36,268	64.7%
Total	56,021	

Source: IHS

Inbound truck data forecasts for 2040 suggest a steadily increasing share of inbound goods in absolute terms. In particular, St. Louis is expected to see a near tripling of inbound consumer goods by 2040. Since Warehouse & Distribution Center tonnage is forecasted to decline on the outbound side, the data illustrates that St. Louis will eventually become a net consumer of consumer goods moving via truck. This imbalance will be somewhat mitigated by trends in rail container flows, where increases in outbound shipments may contain consumer products. The rail section of this report will show a slightly opposite trend in container movement, but not of great enough magnitude to invalidate the observation of St. Louis becoming a net consumer of goods, which is consistent with the St. Louis Region's anticipated transition toward a service-based and knowledge economy and the general trend towards increased import of manufactured goods from Asia.

Table 21 – St. Louis Inbound Truck Flows by Top Commodity and Tonnage, 2040

Commodity	Tons (000's)	% of Total
Warehouse & Distribution Center	23,340	33.2%
Gravel or Sand	5,625	8.0%
Broken Stone or Riprap	4,558	6.5%
Ready-mix Concrete, Wet	3,935	5.6%
Misc. Field Crops	2,333	3.3%
Petroleum Refining Products	1,603	2.3%
Concrete Products	1,238	1.8%
Misc Industrial Organic Chemicals	1,132	1.6%
Rail Intermodal Drayage to Ramp	876	1.2%
Soft Drinks or Mineral Water	778	1.1%
All Others	24,824	35.3%
Total Tons	70,243	

Source: IHS

The value of inbound goods also increases substantially over the long term, more than doubling in total value by 2040. In particular, semiconductors and electronic data equipment grow substantially. Although these commodities also grow on the outbound side, inbound traffic grows more rapidly. This further reinforces the previous observations of St. Louis' evolution as a net consumer of technology to support service and research sectors such as health care, education, and biotechnology. Pharmaceuticals inbound and outbound traffic remains more or less in balance, reiterating that St. Louis will continue to be a producer, consumer, and distributor of these goods. Overall, the pattern suggests the continued importance of I-70 eastbound from Kansas City to St. Louis and I-55 northbound from St. Louis to Chicago.

Table 22 – St. Louis Inbound Truck Flows by Top Commodity and Value, 2040

Commodity	Millions USD	% of Total
Warehouse & Distribution Center	24,772	20.3%
Solid State Semiconductors	16,332	13.4%
Drugs	4,390	3.6%
Rail Intermodal Drayage to Ramp	3,520	2.9%
Electronic Data Proc Equipment	3,502	2.9%
Radio or TV Transmitting Equipment	2,669	2.2%
Rail Intermodal Drayage from Ramp	1,902	1.6%
Misc Plastic Products	1,501	1.2%
Petroleum Refining Products	1,463	1.2%
Aircraft Propellers or Parts	1,395	1.1%
All Others	60,545	49.6%
Total	121,991	

Source: IHS

Analysis of the top ten origin and commodity combinations reveals a number of similar patterns as observed for the top ten destination and commodity pairs. Inbound tonnage is led by a combination of construction-related materials sources from areas of the St. Louis BEA outside of the study area and consumer goods originating in Chicago and Kansas City. A key divergence from outbound trends is the fact that inbound container tonnage originating in Kansas City far exceeds outbound tonnage in the opposite direction. At the same time, the opposite is true for goods originating in Chicago, where outbound tonnage originating in St. Louis far exceeds inbound tonnage moving in the opposite direction. Thus, much like the case of through traffic, the supply chain for consumer goods traffic moving on trucks is trending from west to east and from south to north.

Table 23 – St. Louis Inbound Truck Flows by Top Origin and Commodity (Tonnage), 2010

Origin BEA	Commodity	Tons (000's)
St. Louis, MO*	Broken Stone or Riprap	3,765
Kansas City, MO	Warehouse & Distribution Center	2,399
St. Louis, MO*	Ready-mix Concrete, Wet	2,109
St. Louis, MO*	Gravel or Sand	2,067
Chicago, IL	Warehouse & Distribution Center	1,893
Columbia, MO	Misc. Field Crops	1,057
Paducah, KY	Misc. Industrial Organic Chemicals	717
Springfield, MO	Misc. Field Crops	543
St. Louis, MO*	Asphalt Paving Blocks or Mix	506
St. Louis, MO*	Concrete Products	489

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

An analysis of the top ten combinations of destination and commercial values tends to validate the insight derived from analyzing consumer goods flows by weight. However, several additional interesting trends emerge, the largest of which is a large quantity of pharmaceuticals that moves inbound from Indianapolis and Chicago. Given that a relatively high quantity also moves outbound from St. Louis to Kansas City, a possible pharmaceutical supply chain southbound from I-55 and westbound along I-70 through St. Louis could help balance some of the large quantities of consumer goods traffic moving in the opposite direction.

Table 24 – St. Louis Inbound Truck Flows by Top Origin and Commodity (Value), 2010

Origin BEA	Commodity	$ Millions
Kansas City, MO	Warehouse & Distribution Center	2,546
Chicago, IL	Warehouse & Distribution Center	2,009
St. Louis, MO*	Rail Intermodal Drayage to Ramp	1,273
Indianapolis, IN	Drugs	893
Paducah, KY	Misc. Industrial Organic Chemicals	699
Chicago, IL	Aircraft or Missile Engines	623
Columbia, MO	Misc. Field Crops	576
Chicago, IL	Drugs	570
Kansas City, MO	Rail Intermodal Drayage from Ramp	545
Chicago, IL	Aircraft Propellers or Parts	538

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

Additionally, large quantities of aircraft material move inbound from Chicago, linked with the regional aerospace industry centered on Scott Air Force Base and Boeing's manufacturing facilities. Presumed Long-term growth in the aviation industry should also ensure steady if modest growth in inbound aircraft parts freight movements southbound along I-55 from northern Illinois. It will be important, however, to monitor forecasted commercial aircraft orders, federal defense spending for aircraft, and funding for operations at Scott AFB.

The forecasted top combinations by origin and commodity illustrated in the following table suggest substantial increases in inbound flows of construction materials originating within the St. Louis BEA but outside the study area. Although inbound tonnage nearly triples, consumer goods aboard truck from Kansas City remains flat, while other origins for consumer goods such as Des Moines and Wichita enter the top ten. At the same time, inbound consumer goods tonnage from Chicago more than doubles, which suggests that the expected major increases of inbound consumer goods tonnage will affect all Interstate corridors, especially I-44 westbound, I-70 in all directions and I-55 southbound.

Table 25 – St. Louis Inbound Truck Flows by Top Origin and Commodity (Tonnage), 2040

Origin BEA	Commodity	Tons (000's)
St. Louis, MO*	Gravel or Sand	5,601
Chicago, IL	Warehouse & Distribution Center	4,628
St. Louis, MO*	Broken Stone or Riprap	4,269
St. Louis, MO*	Ready-mix Concrete, Wet	3,117
Kansas City, MO	Warehouse & Distribution Center	2,359
St. Louis, MO*	Petroleum Refining Products	1,479
Columbia, MO	Misc. Field Crops	1,056
Des Moines, IA	Warehouse & Distribution Center	1,037
Wichita, KS	Warehouse & Distribution Center	981
Peoria, IL	Warehouse & Distribution Center	831

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

The following table provides the forecasts of top combinations of origin and value for 2040. The major difference between the 2040 forecasts and the 2010 data is the increased importance of technology products produced in Texas and Minnesota traveling inbound to St. Louis, mostly displacing aircraft parts in the top ten, which is not due to any decline in forecasted aviation manufacturing but, rather, the rapid growth of high-value technology products moving into St. Louis. This will lead to increased demand for truck traffic on I-44 eastbound into St. Louis and I-55 southbound from the Upper Midwest.

Table 26 – St. Louis Inbound Truck Flows by Top Origin and Commodity (Value), 2040

Origin BEA	Commodity	$ Millions
Dallas, TX	Solid State Semiconductors	12,969
Chicago, IL	Warehouse & Distribution Center	4,912
St. Louis, MO*	Rail Intermodal Drayage to Ramp	2,836
Kansas City, MO	Warehouse & Distribution Center	2,504
Chicago, IL	Drugs	2,395
Rochester, MN	Electronic Data Proc. Equipment	2,027
Indianapolis, IN	Drugs	1,633
Dallas, TX	Radio or TV Transmitting Equipment	1,554
St. Louis, MO*	Petroleum Refining Products	1,351
Austin, TX	Solid State Semiconductors	1,200

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

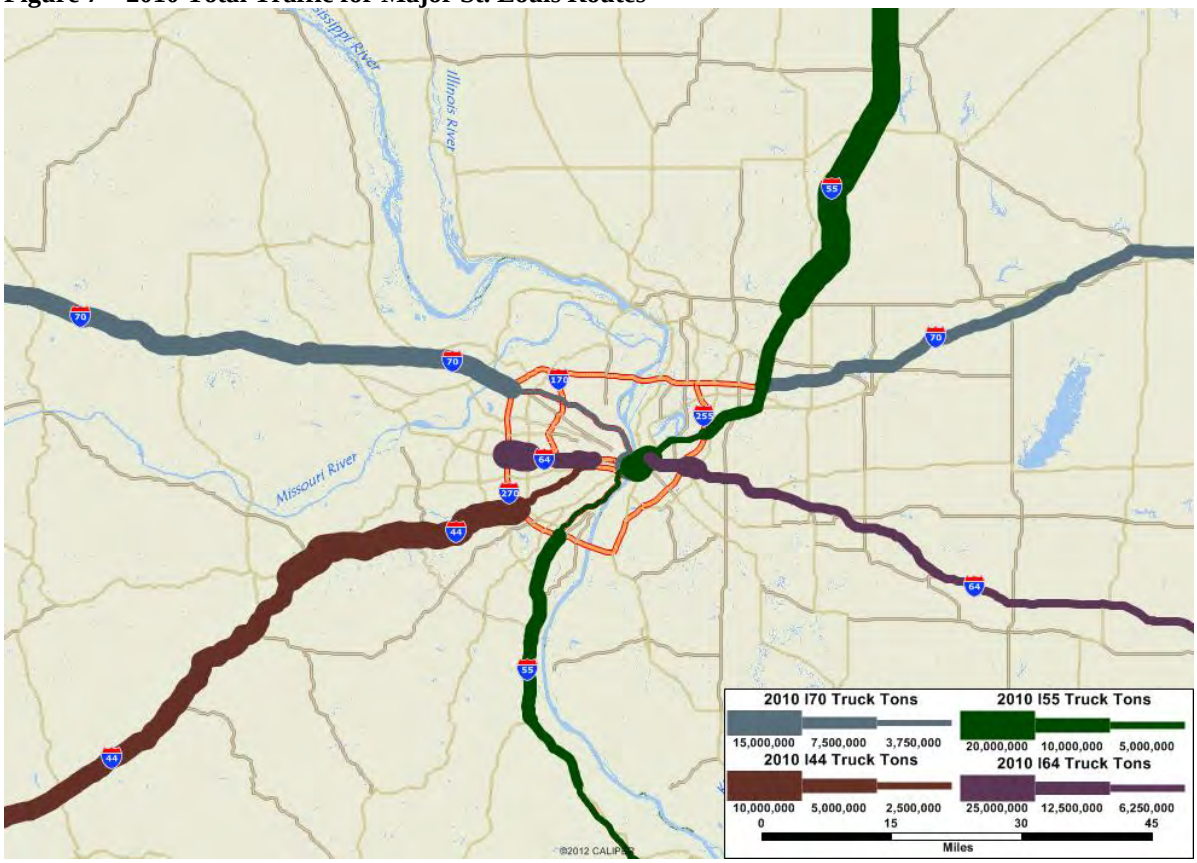
Summary of Major Truck Traffic Routes for St. Louis Region

With over 200 million tons of combined truck cargo currently moving inbound, outbound, and through St. Louis each year, the regional Interstate system is heavily utilized. The following figure illustrates the combined impact of through, inbound, outbound, and local truck trips on the Interstate radial highways serving the St. Louis region (by tonnage). Currently, several highway network segments experience high volumes of long-haul truck freight traffic. These include:

- I-44 between St. Louis and Tulsa (and connecting with Interstates serving Texas and Southern California),
- I-55 between St. Louis and Chicago
- I-70 between St. Louis and Kansas City.

Freight volumes moving on Interstates south and east of St. Louis tend to have lower volumes of traffic, with the notable exception of I-64. Local and connecting truck traffic, however, accounts for a substantial share of this tonnage. As the figure illustrates, I-64 often facilitates truck freight flows with origins and/or destinations along I-44, I-55, and I-70. Interstate 64 also extends westbound beyond the metropolitan limits, providing the critical link to Nashville and major BEAs in the Southeast.

Figure 7 – 2010 Total Traffic for Major St. Louis Routes



Source: IHS

The following table breaks down total truck freight movement on each corridor by weight and value. It is important to note that freight will be double-counted in this table if a given shipment travels over multiple routes, which is certainly the case for beltway and connecting routes I-270, I-255, and I-270 which are included in the table, as well as segments of radial Interstates serving as intra-regional radial expressways.

Table 27 – Impacts of Truck Flows on the St. Louis Regional Interstate Highway Network

Interstate	Total Traffic -2010 (000's Tons and $ Mil)		Total Traffic -2040 (000's Tons and $ Mil)		Annualized Percent Change (CAGR)	
I-70	91,105	169,597	162,321	471,324	1.9%	3.5%
I-64	76,063	97,790	121,325	242,248	1.6%	3.1%
I-44	59,554	163,893	131,785	565,114	2.7%	4.2%
I-55	58,981	110,514	111,769	305,081	2.2%	3.4%
I-270	95,908	208,604	185,194	641,094	2.2%	3.8%
I-255	65,775	168,045	147,666	569,547	2.7%	4.2%
I-170	9,542	18,810	14,079	25,219	1.3%	1.0%

Currently, I-70 carries the highest total tonnage, which is not surprising as I-70 provides the key link with not only Kansas City to the west but also various BEAs to the east in the Northeast and Lower Midwest. I-64 carries the second most tonnage, although, again, much of this is local traffic or cargo utilizing I-64 for downtown expressway legs only. There is a more rapid drop off in I-64 volume measured to the east. Although I-44 carried about 50% less tonnage than I-70 in 2010, the total

value of freight is approximately equal; which links with the important point that products moving on I-44 tend to be higher-value goods. Interstate 44 also exhibits the fastest growth rate of the Interstate radials serving St. Louis. This is driven in part by its enabling of connections to Central Texas, Mexican border areas, and Southern California and its import-export markets. Interstate 55 carries about the same quantity of tonnage as I-44, mostly serving flows between St. Louis and Chicago. The I-55 corridor will experience the second fastest growth in tonnage, led by continued strong ties with Chicago and the Upper Midwest and, increasingly, growing markets in the Southeast (e.g., Little Rock) accessed by southbound (from St. Louis) segments of I-55.

Beltway and downtown connector route traffic is largely driven by inbound, outbound, and through traffic flows originating or terminating outside the study area. These highways can serve as feeders or collectors for regional manufacturing and warehouse and distribution center goods ultimately moving on I-44, I-55, I-64, and I-70. Total tonnage and value on I-255 and I-270 will grow proportionately to the fastest and second fastest growing radial segments, respectively.

Synthesizing this highway corridor data with the previous sub-section analyses enables a comprehensive understanding of the drivers of truck flows into, out of, and through St. Louis. Northbound and eastbound through traffic from Southern California, Central Texas, and Mexican-border areas accounts for much of the tonnage growth on I-44. There are also significant and growing flows in the opposite direction, including chemicals and plastics through traffic originating in the New York and Detroit, respectively, and moving westbound through St. Louis to Southern California for export. The data also illustrates increased outbound shipments of vehicle parts, pharmaceuticals, and biotechnology from St. Louis towards centers of commerce and manufacturing in the Southwest, and inbound shipments of high technology moving inbound from Central Texas. Given the preponderance of high-value goods, it is not surprising that I-44 carries the highest average goods value per ton of any radial segment.

Heavy volumes of truck traffic move between St. Louis and Chicago on I-55. These flows are driven primarily by northbound consumer goods traffic originating in the Southwest, including Asian and Mexican imports, ultimately destined for Chicago and Great Lakes regions. Consumer goods traffic is also forecasted to grow rapidly in the opposite direction, ostensibly for local consumption. Additionally, inbound heavy machinery, pharmaceuticals, and aircraft parts from Chicago and high technology form Minnesota will help balance truck volumes on I-55 southbound between the Great Lakes and St. Louis.

Freight moving on I-70 westbound from St. Louis is dominated by goods originating in St. Louis and throughout the Lower and Upper Midwest and destined for consumption or trans-shipment in Kansas City. Like St. Louis, Kansas City is an important central node for warehousing and distribution activities, as well as intermodal logistics. Chief among the key drivers are consumer goods and pharmaceuticals.

Other major radial highways corridors of importance are I-55 southbound connecting St. Louis and the Gulf Coast, I-64 connections to the Southeast, and eastbound (from St. Louis) segments of I-70 providing access to the Lower Midwest and Northeast. This section has discussed the importance of I-64 as both a downtown expressway and access route to the expanding markets for production and consumption of goods in the Southeast. For the other segments, total tonnage figures are generally

lower; however, these routes are important to overall supply chains and they will experience increased future flows.

St. Louis Truck Freight Summary

Having reviewed through, outbound, and inbound freight data and forecasts, it is possible to make several inferences about the current and likely future trajectory of truck freight logistics for the St. Louis study area.

- Through traffic is the largest share of truck freight moving through St. Louis. This traffic will continue to grow, primarily on account of increased movement of goods imported from Asia via Southern California and shipped eastbound via principally I-44 to the Northeast and Lower Midwest and I-55 northbound towards Chicago.
- Inbound and outbound traffic is currently relatively balanced, but the former will grow faster than the latter in the coming decades. This is partially explained by the St. Louis Region's shift to a more service-based economy. Manufacturing and agriculture will still grow in absolute terms, but St. Louis will increasingly consume goods produced elsewhere while producing more knowledge-based-economy services such as health care, education, and corporate management.
- On average, higher-value products move longer distances by truck. Some of the key commodities moving long distances via truck include consumer goods, electronic technology and biotechnology, pharmaceuticals, aviation automotive parts, plastics, and chemicals.
- Construction-related materials such as concrete and sand and gravel move in large quantities by weight but short distances in both inbound and outbound directions. These goods are mined near the study area, consolidated regionally, and either redistributed locally of shipped out of St. Louis via truck, rail, or barge.
- Consumer goods transport is dominated by long-distance through traffic between the West Coast and the Northeast and Lower Midwest, as well as high degrees of commercial activity between St. Louis, Chicago, and Kansas City in all directions.
- Consumer goods also account for the dominant share of inbound and outbound freight, with Kansas City and Chicago being the primary origins and destinations. Inbound consumer goods flows will triple by 2040, driven in large part by freight movement in the eastbound direction on I-70 from Kansas City to St. Louis and in the southbound direction on I-55 from Chicago to St. Louis. Meanwhile, outbound consumer goods freight will slightly decline.
- High technology goods such as semiconductors and electronic data equipment will, after consumer goods, account for the largest shares of inbound goods by value by 2040. This observation supports the trend towards greater capital intensity in manufacturing and a growing knowledge economy. Much of this inbound traffic will arrive in St. Louis from Texas and Minnesota via I-44 eastbound and I-55 southbound, respectively. Some of this cargo will be trans-shipped, especially in a northbound direction on I-55 toward Upper Midwest and in an eastbound direction (likely, I-70) to the Lower Midwest.
- Pharmaceuticals supply chains tend to move in a southbound and westbound direction from Chicago, Indianapolis, and St. Louis towards Kansas City, the Gulf Coast, and the Southwest. This is an important trend to monitor as the State of Missouri continues to make investment to

support biotechnology, life science, related industries. Pharmaceuticals could help drive increased truck traffic southbound on I-55 between Chicago, St. Louis, and the Gulf Coast as well as westbound on both I-44 and I-70.

- For the economically important aviation manufacturing industry, airplane products tend to enter St. Louis southbound from the Chicago area, with I-55 serving as the critical link.
- St. Louis may have opportunities to play a growing role in oil refining to serve regional markets, as evidenced by the expansion of Conoco-Phillips/Cenovus Wood River Facility. Proximity to relatively inexpensive crude oil and natural gas feed stocks in Canada and North Dakota could be beneficial. Opportunities will depend in large part on the location of future pipeline investments to transport crude oil and gas mined in Alberta oil sands and Dakota shale areas.
- The same factors supporting possible increases in regional oil refining could also boost the regional chemicals industry. Proximity to cheap oil and gas feed stocks could enhance chemicals industries in which St. Louis is already strong, especially soaps, detergents, and beauty products; veterinary medicines and pharmaceuticals; and basic chemicals.
- As suggested in the previous paragraphs, analyzing flows of chemicals and oil and petroleum products by truck traffic alone is inadequate. These commodities and their inputs also move by pipeline, rail, water, and rail, thus a comprehensive analysis of supply chains requires consideration of inter-modal logistics. Subsequent modal sections will address these industries in order to provide a comprehensive inter-modal perspective.

In summary, the major Interstate highways will likely be constrained to efficiently service the anticipated future growth in freight traffic in nearly all radial directions. Moreover, increased traffic flows on radial segments will congest beltway interstate segments as well as downtown expressways. According to the TTI congestion levels in St. Louis are on average roughly equivalent to those experienced in Chicago. Improvements may be required to efficiently service these volumes of truck freight movements in the future.

In prioritizing possible investments in the highway network, it is important to consider not just the quantities of flows but also the contents of those flows. The regional economy may depend more on some types of freight movement than others. For example, inbound and outbound traffic offer greater opportunities for regional warehousing, distribution, and logistics industries than through traffic. Understanding supply chains for high value-added regional industries that depend on trucks such as chemicals, pharmaceuticals, aircraft manufacturing, education, and health care should also factor in prioritizing investments. For these industries, certain patterns emerge including:

- In general the pharmaceutical supply chain tends to flow in a southbound and westbound direction on I-55, I-44, and I-70.
- Chemicals tend to flow in a westbound direction on I-70 linking New York and Los Angeles, as well as points in between. Much of this freight, however, is through traffic destined for export markets. Chemicals produced in St. Louis, however, serve a wide variety of markets in all directions, and especially Kansas City (via I-70 westbound). The availability of cheaper feed stocks sources in North Dakota and Canada could alter supply chains, although basic inputs tend to travel via pipeline or rail rather than truck.

- St. Louis' regional aircraft manufacturing industry is heavily dependent on aircraft parts sourced from Chicago and the Great Lakes region, which move on I-55 southbound.
- High technology products and machinery tend to follow and north-south logistics pattern in both directions linking Texas and Mexican Border areas with St. Louis, Chicago, the Lower Midwest, and the Upper Midwest. I-44 is particularly important to these supply chains, especially in the eastbound direction, as are segments of I-55 north of St. Louis and in both directions, and I-70 eastbound from St. Louis towards Detroit and the Lower Midwest.

Regional Rail Freight Perspective

Railway infrastructure provides the backbone for goods movement in the North America. Rail offers a mix of speed and value for transporting goods long distances. Today, overall tonnage is higher on trucks, due in large part to their flexibility and the fact that goods shipped by other means often must be trucked the "last mile." Waterborne transportation and, for some liquid goods, pipeline transportation hold the distinction of being the overall cheapest modes of bulk freight movement. Nevertheless, rail plays a critical role specializing in moving bulk goods long distances and across land routes that lack sufficient access to inland waterway infrastructure, and at much cheaper rates than for truck transportation. Many of the raw materials required to produce energy, supply food, and construct buildings and infrastructure depend on rail transportation.

St. Louis is a major hub for rail freight. The St. Louis Region is centrally located in the United States and has access to six Class I railroads, including Burlington Northern Santa Fe (BNSF), Union Pacific (UP), CSX, Norfolk Southern (NS), Kansas City Southern (KCS), and Canadian National (CN). Moreover, St. Louis' location as the northernmost year-round major terminal area on the Mississippi River creates unique inter-modal opportunities. The combination of central geography, endowment of rail (and highway) infrastructure, and inter-modal options makes the St. Louis region an important destination, origin, and trans-shipment point for rail goods movement in the United States.

Almost 150 million tons of rail cargo (excluding intermodal, which will be analyzed in a separate sub-section) was transported within the St. Louis region in 2010. The following table illustrates that roughly two-thirds of this tonnage was through traffic. Inbound traffic accounted for roughly 30% of the total, while outbound traffic accounted for only 3%.

Table 28 – St. Louis Rail Flows, 2010-2040 (Thousand Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Outbound	4,373	5,057	5,449	5,634	6,030	1.1%
Inbound	43,763	48,470	48,735	47,688	48,000	0.3%
Through	96,830	107,303	109,190	108,728	111,387	0.5%
Local	311	431	457	502	568	2.0%
Total	147,287	163,275	165,851	164,582	168,025	0.4%

Source: IHS

Local rail transport within the St. Louis Region makes up a very small percentage of the total, as truck transport is typically a more flexible and appropriate method for moving freight to destinations within the study area. This distribution is projected to remain relatively constant through 2040. While rail tonnage is expected grow somewhat rapidly by 2015, largely making-up for lost trade on account of the Great Recession, beyond the expected short-term recovery, traffic growth will be mostly flat over

the long term. In fact, compound annual growth of tonnage will be only 0.4% per year from 2010 to 2040, and only about 0.06% from 2015-2040.

A slightly different picture emerges when rail freight is measured by value of cargo. Value grows at a higher rate than tonnage, suggesting that the value of per ton is increasing in time, particularly for through traffic. This is consistent with trends suggesting increases in higher-value imported goods from Asia moving across the country as well as possibly among NAFTA signees.

Table 29 – St. Louis Rail Flows, 2010-2040 ($ Millions)

Segment	2010	2015	2020	2030	2040	CAGR
Outbound	4,847	6,123	6,476	6,745	7,202	1.3%
Inbound	9,308	11,121	11,981	13,084	14,732	1.5%
Through	47,201	61,406	65,369	71,749	81,540	1.8%
Local	1,597	2,516	2,613	2,857	3,192	2.3%
Total	64,963	83,181	88,459	96,465	108,705	1.7%

Source: IHS

Additional trends bear mentioning. Through traffic accounts for the lion's share of the St. Louis Region's rail cargo traffic whether measured by tonnage or value. This demonstrates St. Louis' particular importance in national goods movement. Essentially, St. Louis handles more than three times as much through traffic as all other rail freight combined. Since rail must cross the Mississippi River and, often, change rail lines, the pressure on rail freight yards and the two bridge crossings will continue to build through the planning period.

It is also interesting to note that inbound cargo tends to be, overall, less valuable (per ton) than other goods movement. Whereas inbound rail freight makes up 30% of total tonnage, it only accounts for about 14% of value, which should not be too surprising given that St. Louis is a major manufacturing and business center where ostensibly cheaper raw goods are converted into value-added products and services. As this section will demonstrate, much of this inbound cargo tonnage is coal, reflecting the St. Louis Region's important role as a coal distribution gateway.

The dominance of through traffic and the trends in relative value are consistent with similar analyses and forecasts for truck freight movements delivered in a separate study for this project. Essentially, large quantities of goods are moving across the country via St. Louis. Tonnage will increase, but cargo values will increase even more rapidly, on average. As this section will illustrate, these trends for rail can be attributed in large part to St. Louis's role in the movement and distribution of steel and motor vehicles and parts to and from Midwest locations.

The St. Louis region will be challenged to handle this additional demand while maintaining current levels of service on rail infrastructure. It will become critical to alleviating congestion over time on a number of segments of the St. Louis Region's rail system. The 2012 Missouri State Rail Plan suggests that regional rail congestion levels are currently below capacity, at least on the Missouri side of metropolitan St. Louis, but that congestion will begin to affect throughput if no additional investments or interventions are undertaken. Otherwise, some rail line segments will be at or above

capacity by 2031.[4] The State Rail Plan also suggests that the impacts will be felt unevenly throughout the system, with some rail lines and segments still operating below capacity.

The following sub-sections will drill deeper into the rail freight data to lend additional insight on the economic and transportation factors driving these trends and the implications for the St. Louis economy and infrastructure.

Through Rail Traffic

Through traffic dominates rail goods movement in the St. Louis region. Its economic contribution is significant, as 45,000 regional jobs are directly tied to transportation, warehousing, and utilities industries in the St. Louis Metropolitan Statistical Area (MSA). Track and infrastructure maintenance and construction, railroad company employment, and other operational jobs are supported in part by this freight rail through traffic. Estimating the quantity and value of commodities passing through the St. Louis Region and forecasting future trends is critical to understanding the economic opportunities for the St. Louis region as well as the potential employment impacts made possible by these opportunities. The following figure illustrates the relative share of rail freight tonnage passing through St. Louis between key origins and destinations. By far the heaviest tonnages of through traffic in 2010 moved between eastern Wyoming through St. Louis and on to regions within close proximity to the study area.

Figure 8 – St. Louis Through Traffic Rail Flows, 2010

[4] HNTB Corporation, Missouri State Rail Plan, Prepared for the Missouri Department of Transportation, 2012. Last accessed 25 March, 2012 at: http://www.modot.org/othertransportation/rail/documents/Missouri_State_Rail_Plan_FINAL.pdf.

Source: IHS

To better understand these flows it is helpful to break these figures down by origin and destination pairs. The top ten origin-destination pairs by freight tonnage are listed in the following table. What emerges is a clear pattern of goods movement from the west to St. Louis, before being redistributed widely to the west and, to a lesser extent, north to Chicago and south to Houston. In fact about 50% of the total tonnage can be described by cargo movements from Casper, WY to Paducah, KY, St. Louis (i.e., areas of metropolitan St. Louis outside the study area), and Little Rock, AR.

Table 30 – Through Traffic Rail Flows by Top O/Ds and Tonnage, 2010

Origin BEA	Destination BEA	Tons (000s)
Casper, WY	Paducah, KY	21,043
Casper, WY	St. Louis, MO*	19,030
Casper, WY	Little Rock, AR	7,305
Denver, CO	Paducah, KY	5,908
Duluth, MN	Birmingham, AL	2,938
Casper, WY	Springfield, IL	2,617
St. Louis, MO*	Chicago, IL	1,973
Chicago, IL	Houston, TX	1,164
Denver, CO	Biloxi, MS	1,101
Houston, TX	Chicago, IL	1,005

Note: *Denotes areas outside the study area in the BEA
Source: IHS

As will be described in this section, much of the freight moving from Wyoming through St. Louis is coal originating in the Powder River Basin. Denver, also a key origin for coal and related products, not surprisingly is also well represented. Otherwise, the numbers generally represent a variety of goods moving between Chicago, St. Louis, and Houston.

Ranking origin-destination pairs by value rather than weight reveals very different patterns. This is not altogether surprising, as coal has a very low value per ton. Chicago accounts for three of the top destinations and four of the top origins. There is a clear trend of north-to-south and south-to-north flows between Chicago and several metropolitan areas in Texas. High-value goods also flow between Chicago and other southwestern cities (Tucson, Oklahoma City) in both directions. The commodity flows between St. Louis and Tucson and Texas highlights the importance of these border regions as gateways for NAFTA trade with Mexico. Rail service is offered from Tucson through Nogales and in Texas through Laredo. Higher-value goods also move in somewhat smaller quantities through St. Louis on east-to-west paths from Kentucky and Indiana to Kansas City.

Table 31 – St. Louis Through Traffic Rail Flows by Top O/Ds and Value, 2010

Origin BEA	Destination BEA	$ Millions
San Antonio, TX	Chicago, IL	4,004
Houston, TX	Chicago, IL	2,221
Tucson, AZ	Chicago, IL	1,673
Chicago, IL	Houston, TX	1,190
Chicago, IL	Dallas, TX	1,002
Chicago, IL	Oklahoma City, OK	991
Cleveland, OH	Houston, TX	962
Evansville, IN	Kansas City, MO	921
Louisville, KY	Kansas City, MO	799
Dallas, TX	Chicago, IL	727

Source: IHS

Combining top origin-destination-commodity combinations by tonnage further illustrates that coal is driving most of the rail through traffic in St. Louis. Nine out of the top ten combinations involve bituminous coal originating in Mountain states and the greater St. Louis area. Coal is shipped by rail from the Powder River Basin mines via Casper, Wyoming, to final destinations across the country. Colorado, Utah and, to a lesser extent, Missouri, are also home to large active coal mines. Iron ore mined in northern Minnesota is shipped south to supply Birmingham's iron and steel industry.

Table 32 – St. Louis Through Traffic Rail Flows by Top O/Ds and Commodity (Tonnage), 2010

Origin BEA	Destination BEA	Commodity	Tons (000s)
Casper, WY	Paducah, KY	Bituminous Coal	21,043
Casper, WY	St. Louis, MO*	Bituminous Coal	18,995
Casper, WY	Little Rock, AR	Bituminous Coal	7,305
Denver, CO	Paducah, KY	Bituminous Coal	5,908
Duluth, MN	Birmingham, AL	Iron Ores	2,938
Casper, WY	Springfield, IL	Bituminous Coal	2,613
St. Louis, MO	Chicago, IL	Bituminous Coal	1,893
Denver, CO	Biloxi, MS	Bituminous Coal	1,101
Salt Lake City, UT	Paducah, KY	Bituminous Coal	902
Denver, CO	St. Louis, MO*	Bituminous Coal	689

Note: *Denotes areas outside the study area in the BEA
Source: IHS

Despite the overall pessimistic outlook for the U.S. coal industry as a whole, the relative competitiveness of Powder River Basic and the opportunities to move commodities on barge to the Gulf Coast for export means that St. Louis should still play a prominent role in coal trans-shipment. The most likely scenario is that St. Louis will experience flat or slightly declining growth in coal volumes in the foreseeable future. Coal has become a global commodity much the same as oil.

An examination of top origin-destination-commodity combinations by value helps explain the divergence in logistics patterns vis-à-vis tonnage measures. The following table illustrates the importance of rail for high-value automobile shipments, mostly between the Lower and Upper Midwest (and especially Chicago) and the U.S. Southwest, in both directions. The renaissance of automobile manufacturing in the Midwest and new production in Mexico will help drive these trends in the future. Coal appears twice near the bottom of the top ten, but this is more a function of total volumes along two particularly high-volume pairs: Casper-Paducah and Casper-St. Louis (again, areas in the St. Louis MSA but not in the study area). Shipments of high-value plastics from the Gulf Coast (Houston) to the Midwest (Chicago) and iron and steel manufactures moving from the Midwest (Cleveland) to the Gulf Coast (Houston) are consistent with typical production and trade patterns within the United States.

Table 33 – Through Traffic Truck Flows by Top O/Ds and Commodity (Value), 2010

Origin BEA	Destination BEA	Commodity	$ Millions
San Antonio, TX	Chicago, IL	Motor Vehicles	3,670
Tucson, AZ	Chicago, IL	Motor Vehicles	1,628
Chicago, IL	Oklahoma City, OK	Motor Vehicles	987
Houston, TX	Chicago, IL	Plastic Material or Synthetic Fiber	924
Evansville, IN	Kansas City, MO	Motor Vehicles	920
Cleveland, OH	Houston, TX	Primary Iron or Steel Products	902
Chicago, IL	Dallas, TX	Motor Vehicles	788
Casper, WY	Paducah, KY	Bituminous Coal	720
Casper, WY	St. Louis, MO	Bituminous Coal	650
Kansas City, MO	Louisville, KY	Motor Vehicles	599

Source: IHS

An emerging trend in recent years is the movement of crude oil via rail from the North Dakota and Canada to Gulf Coast refineries. At this time rail is often the most cost efficient mode, as adequate pipeline supply is not available. Railroads are investing in extending lines and purchasing new rail cars; however, in approximately five years, many shipments will be diverted to pipelines once the requisite capacity is in place. This will slow the recent rapid increase in rail activity for petroleum transportation.

In summary, substantial quantities of rail freight move through St. Louis, but the main drivers of these of this trend are relatively few. Coal is by far the most important driver of rail freight by weight, and the transport of manufactured motor vehicles is the major source of goods movement by value. The dependence on coal appears to carry greater downside than upside risks, as U.S. energy plants increasingly retire coal-fired plants in favor of natural gas facilities. Motor vehicle transportation offers more upside potential, as the re-shoring of automobile manufacturing to Mexico, the U.S. Southeast, and the Midwest places St. Louis in the center of inter-regional trade.

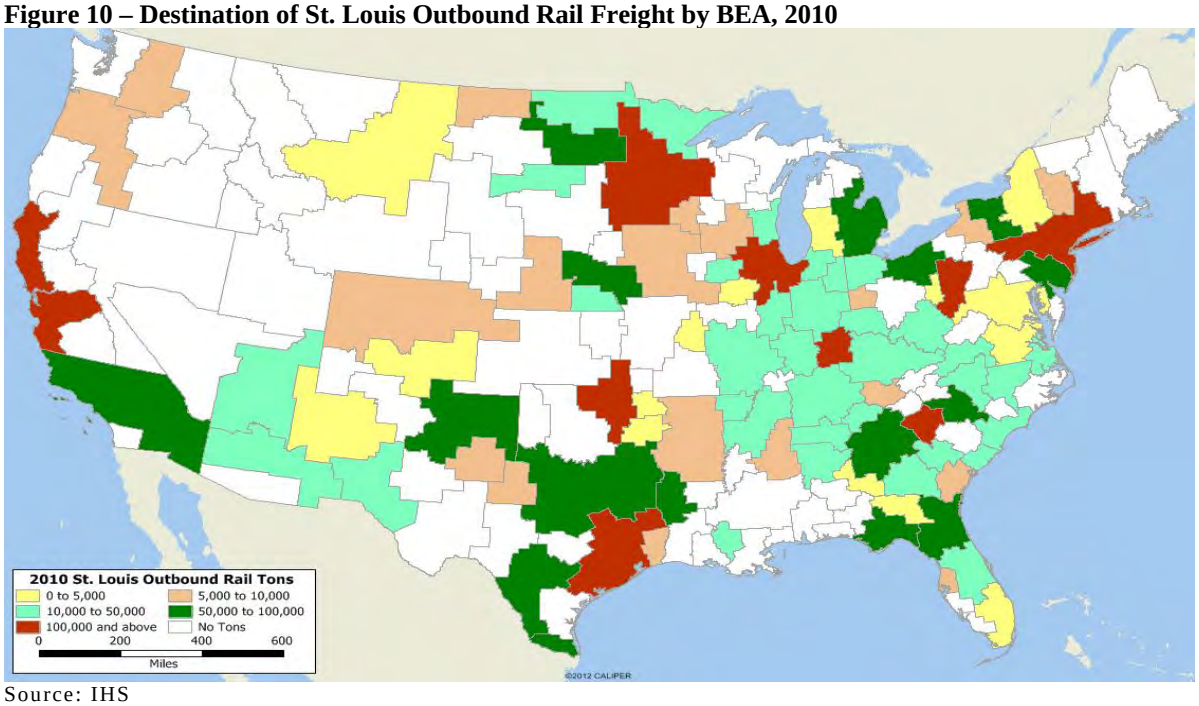
Outbound Rail Traffic

Although outbound freight makes up a relatively small percentage of total regional rail transportation, it is nonetheless an important mode of transport for numerous St. Louis industries. Rail freight moves in large quantities to nearby Midwestern and Appalachian states. Texas, the New York metropolitan area, and Northern California and the Pacific Northwest are also major destinations for commodities originating in and/or trans-shipped via St. Louis. The following figures illustrate the routing associated with these tonnages and the relative quantities of outbound goods.

Figure 9 – St. Louis Outbound Rail Flows, 2010

Source: IHS

Figure 10 – Destination of St. Louis Outbound Rail Freight by BEA, 2010



Source: IHS

The following table summarizes the top outbound rail freight destinations, ranked by both weight and value. As is the case with truck freight, Chicago receives the largest share of the total weight of outbound rail freight. However, outbound rail freight is more evenly distributed across geographies than outbound truck freight. Houston receives the second largest tonnage while the San Francisco

BEA (including Oakland) ranked third. New York is the only East Coast BEA in the top ten. The remaining top destinations are Midwestern, Appalachian, or Plains-state BEAs. Hence, beyond major centers of international trade on the coasts, outbound tonnage tends to move towards nearby regional BEAs.

Table 34 – St. Louis Outbound Rail Flows by Top Destination, 2010

Destination BEA	Tons (000s)	Destination BEA	$ Millions
Chicago, IL	308	Kansas City, MO	604
Houston, TX	276	Chicago, IL	593
San Francisco, CA	255	San Francisco, SF	340
Greenville, SC	183	Houston, TX	310
Minneapolis, MN	154	New York, NY	184
Louisville, KY	148	Greenville, SC	168
Kansas City, MO	139	Minneapolis, MN	156
Tulsa, OK	132	Tulsa, OK	153
Pittsburgh, PA	121	Louisville, KY	128
New York, NY	120	Philadelphia, PA	123

Source: IHS

When the outbound destinations are ranked by freight value, a slightly different pattern emerges. Kansas City jumps from seventh to first, pushing Chicago into second by a slight margin. Kansas City, the destination for only 3.2% of outbound rail freight by weight, accounts for 12.5% of the value of rail freight leaving St. Louis. Chicago receives 7.0% of outbound rail freight by weight but 12.3% of the outbound freight by value. New York and Philadelphia also move up in the rankings, while Houston, Greenville, Minneapolis, Louisville, and Pittsburgh fall. No discernible geographic pattern emerges from the top ten destinations by value.

The following table summarizes the forecasted top rail outbound destinations by both tonnage and freight in 2040. Similar top origin-destination pairs persist, with minor reshuffling at the top. For example San Francisco moves ahead of Houston by tonnage, but the reverse occurs by value.

Table 35 – St. Louis Outbound Rail Flows by Top Destination, 2040

Destination BEA	Tons (000s)	Destination BEA	$ Millions
Chicago, IL	418	Kansas City, MO	1,442
San Francisco, CA	307	Chicago, IL	921
Houston, TX	296	Houston, TX	414
Canada	254	San Francisco, CA	408
Kansas City, MO	209	New York, NY	369
Minneapolis, MN	193	Minneapolis, MN	194
Louisville, KY	192	Philadelphia, PA	192
New York, NY	189	Tulsa, OK	181
Pittsburgh, PA	174	Pittsburgh, PA	163
Amarillo, TX	170	Louisville, KY	156

Source: IHS

As this section will illustrate, this occurs because liquid oil and gas have greater values per ton than steel, so tonnage will grow faster to San Francisco (steel), while value will grow faster to Houston (oil and gas). Otherwise, NAFTA partner Canada is the only major new destination appearing in the top ten, ranking fourth by tonnage.

More than 85% of St. Louis's outbound rail freight tonnage falls into 12 major commodity groups as shown in the following table. Primary iron and steel products make up the largest share with about

23% of the total. Much of this freight is accounted for by rolled steel sheets produced at U.S. Steel facilities in Granite City, IL, although some products may be trans-shipped via St. Louis from major steel producing areas along the Great Lakes and then trans-shipped to other destinations.

Table 36 – St. Louis Outbound Rail Flows by Commodity and Tonnage, 2010

Commodity	Tons (000s)	% of Total
Primary Iron or Steel Products	1,022	23.4%
Petroleum Refining Products	774	17.7%
Misc Industrial Organic Chemicals	450	10.3%
Gravel or Sand	271	6.2%
Misc Indus Inorganic Chemicals	245	5.6%
Flour or Other Grain Mill Products	214	4.9%
Liquefied Gases, Coal or Petroleum	184	4.2%
Malt Liquors	179	4.1%
Metal Scrap or Tailings	148	3.4%
Portland Cement	132	3.0%
Fertilizers	106	2.4%
Motor Vehicles	90	2.1%
All Others	560	12.8%
Total	4,373	

Source: IHS

Petroleum refining products, organic chemicals, fertilizers, and liquefied energy products combine to account for about 40% of the total outbound freight. As previously summarized, the St. Louis area is home to significant petroleum refining at the Wood River facility and some niche chemicals industries, although much of this volume also originates from larger centers of petroleum and chemicals production and trans-shipped through St. Louis. Low value bulk commodities such as gravel, sand, cement, and metal scrap make up about 14% of the total by weight. Other smaller but significant product groups include flour and grain mill products, malt liquors, and motor vehicles.

The following table helps illustrates the divergence between tonnage and value for outbound rail cargo originating or trans-shipped through St. Louis, with ten categories accounting for 93% of value. As in the case of top commodities by tonnage, primary iron and steel products makeup the largest share of outbound commodities by volume at 29%.

Table 37 – St. Louis Outbound Rail Flows by Commodity and Value, 2010

Commodity	$ Millions	% of Total
Primary Iron or Steel Products	1,392	28.7%
Motor Vehicles	822	17.0%
Petroleum Refining Products	707	14.6%
Misc. Industrial Organic Chemicals	438	9.0%
Misc. Industrial Inorganic Chemicals	418	8.6%
Misc. Aircraft Parts	216	4.5%
Malt Liquors	164	3.4%
Liquefied Gases, Coal or Petroleum	150	3.1%
Chemical Preparations	140	2.9%
Flour or Other Grain Mill Products	83	1.7%
All Others	318	6.6%
Total	4,847	

Source: IHS

This share, noted above, is slightly higher than that for tonnage; iron and steel are relatively high-value products but they are also relatively heavy. The same can be said for petroleum refining products and organic and inorganic chemicals, which each fall only one spot in the rankings by value. Overall petroleum and chemicals products make up about 38% of outbound cargo by value, approximately in line with their collective share of tonnage.

The major difference between the top ten commodities by tonnage and value occurs with several higher-value manufacturing products. In particular, the motor vehicles group skyrockets to the second spot by value on account of both high value-materials and high manufacturing value-added. Motor vehicles account for only a 2% share of the total tonnage but 17% of the total by value. Some of the outbound motor vehicles are produced at the Wentzville General Motors assembly facility in St. Charles County, which has a Norfolk Southern rail connection. Production at this facility, which is currently undergoing an expansion, is likely to increase.

St. Louis' central location and connection to major railroads also makes it a particularly prime location for motor vehicle trans-shipment. Rail is the primary means of transporting vehicles through the interior of North America. St. Louis serves as a trans-shipment point for motor vehicles produced in nearby regions such as Ford and GM plants in Kansas City, as well as motor vehicles manufactured in more distant facilities in the Great Lakes region, the Southeast, and Mexico. The other major commodity group with a significantly higher market share by value than tonnage is aircraft parts, accounting for fewer than 5% of total value of outbound shipments. Many of these products are produced at the St. Louis-area Boeing facility or are trans-shipped from Northern Illinois.

As illustrated previously, outbound rail tonnage is expected to grow through 2040. The distribution across commodities will remain relatively similar to the 2010 distribution. Primary iron and steel, miscellaneous organic chemicals, and petroleum refining products will be the top three outbound commodities by weight. The share of weight attributed to petroleum refining products is expected to decrease from 17.7% in 2010 to 10.1% in 2040, which can be explained in part by the fact that increased production at Wood River should first serve growing regional markets. Gulf Coast refineries will likely fill the gap in other markets. Also contributing to the displacement of rail is the building of pipeline infrastructure to carry crude oil to expanding refineries in the Gulf Coast. Moreover, gravel, sand, cement, and various types of scrap will remain important lower-value bulk outbound commodities through 2040, as will malt food and beverage products.

Table 38 – St. Louis Outbound Rail Flows by Commodity and Tonnage, 2040

Commodity	Tons (000s)	% of Total
Primary Iron or Steel Products	1,230	20.4%
Misc Industrial Organic Chemicals	718	11.9%
Petroleum Refining Products	606	10.1%
Metal Scrap or Tailings	463	7.7%
Gravel or Sand	443	7.3%
Flour or Other Grain Mill Products	328	5.4%
Misc Indus Inorganic Chemicals	257	4.3%
Paper Waste or Scrap	250	4.1%
Portland Cement	250	4.1%
Malt Liquors	226	3.8%
All Others	1,259	20.9%
Total	6,030	

Source: IHS

Fertilizer somewhat surprisingly falls out of the top ten, but this may have more to do with altering supply chains than falling demand. The waterborne modal section of this report suggests that inbound shipments of fertilizer up the Mississippi River from the Gulf Coast will decline, possibly due to greater production in the Upper Midwest on account of proximity to shale gas and oil development in North Dakota and Canada. Thus, the Upper Midwest will be more self-sufficient with local production from cheap, proximate feed stocks, reducing the demand from downriver manufacturers.

The total value of outbound shipments from the St. Louis area is expected to increase by about 50% between 2010 and 2040. Primary iron and steel products remains the top commodity group, fueled by continuing industrial growth in the U.S. South and exports to Asia, but will account for a slightly smaller share of the overall value. Total value of outbound steel grows in absolute terms by about 20%, but loses ground as a share of the total due to the rapid growth of motor vehicle transportation. The total value of motor vehicles shipments doubles between 2010 and 2040, increasing its share of the total from 17% to 23%. Meanwhile, the value of aircraft parts more than triples, more than doubling its market share from 4.5% in 2010 to 9.6% in 2040

Table 39 – St. Louis Outbound Rail Flows by Commodity and Value, 2040

Commodity	$ Millions	% of Total
Primary Iron or Steel Products	1,675	23.3%
Motor Vehicles	1,665	23.1%
Misc. Industrial Organic Chemicals	700	9.7%
Misc. Aircraft Parts	688	9.6%
Petroleum Refining Products	554	7.7%
Chemical Preparations	470	6.5%
Misc. Industrial Inorganic Chemicals	439	6.1%
Malt Liquors	208	2.9%
Railroad Cars	143	2.0%
Flour or Other Grain Mill Products	126	1.8%
All Others	534	7.4%
Total	7,202	

Source: IHS

Combining the top destination and commodity pairs provides further insight on how these forecasts impact overall freight movement originating in or trans-shipped through St. Louis. Primary iron and steel heading to the San Francisco / Oakland BEA tops the list. Although San Francisco is an anomaly among the top destinations in terms of relative lack of proximity to the study region, its inclusion highlights the importance of St. Louis as a connecting point between St. Louis and the Midwest manufacturers and export markets on the West Coast. Although it is a net importer of steel, the United States does export significant quantities of steel, particularly higher-grade varieties. The Bay Area is home to the United States Steel – POSCO (USS-POSCO) manufacturing facilities, which specializes in creating high high-strength steel used in automobile manufacturing. POSCO is a former Korean state-owned company. Steel produced in on the Illinois side of the Mississippi River in Granite City is shipped to USS-POSCO facilities in the Bay Area, processed into higher-end steel products, and often exported out of the Port of Oakland to Asian car manufacturers.

Table 40 – St. Louis Outbound Rail Flows by Destination and Commodity (Tonnage), 2010

Destination BEA	Commodity	Tons (000s)
San Francisco, CA	Primary Iron or Steel Products	242
Houston, TX	Liquefied Gases, Coal or Petroleum	178
Greenville, SC	Petroleum Refining Products	172
Minneapolis, MN	Malt Liquors	121
Chicago, IL	Primary Iron or Steel Products	96
Tulsa, OK	Primary Iron or Steel Products	88
Amarillo, TX	Portland Cement	86
McAllen, TX	Primary Iron or Steel Products	84
Sioux Falls, SD	Misc. Industrial Organic Chemicals	83
Tallahassee, FL	Petroleum Refining Products	82

Source: IHS

Large quantities of steel also move to more proximate destinations (Chicago and Tulsa) as well as distant but fast growing areas in such as Texas. Steel moving to the Southeast and Texas border areas is driven in part by automobile manufacturing and to supply construction and engineering industries.

The top commodity-destination pairs also highlight the importance of St. Louis in the energy supply chain. Liquefied petroleum products are shipped to Houston, much of which will be exported through the Gulf of Mexico. Greenville, SC and Tallahassee, FL receive large quantities of refined petroleum products, much of which is produced at Wood River. Much of the refined petroleum originating in or trans-shipped through St. Louis moves down the Mississippi River to destinations in the Southeast on barge, but Greenville's and Tallahassee's locations on the opposite side of the Appalachian Mountains accounts for the need for rail.

Ranking the destination-commodity pairs by value reiterates two key patterns evidenced in previous tables. First, St. Louis has a strong connection to major U.S. centers of commerce in all directions, including New York, Chicago, San Francisco/Oakland, and Houston. These shipments typically consist of high-value products produced locally or elsewhere in the Midwest that are shipped to key consuming and exporting areas. Motor vehicles move in large quantities to major consumer areas such as New York and Chicago. Iron and steel move in large quantities to San Francisco for export to China, while not surprisingly, large quantities of liquefied energy products move to Houston and Gulf Coast refineries. Second, St. Louis has strong connections to other Midwest and Plains-state areas shipping high-value goods such as iron and steel, motor vehicles, and aircraft parts to Kansas City, Tulsa, and, as previously mentioned, Chicago.

Table 41 – St. Louis Outbound Truck Rail by Destination and Commodity (Value), 2010

Destination BEA	Commodity	$ Millions
Kansas City, MO	Motor Vehicles	353
San Francisco, SF	Primary Iron or Steel Products	329
Chicago, IL	Motor Vehicles	277
Kansas City, MO	Misc. Aircraft Parts	216
Greenville, SC	Petroleum Refining Products	157
Houston, TX	Liquefied Gases, Coal or Petroleum	145
Chicago, IL	Misc Indus Inorganic Chemicals	135
Chicago, IL	Primary Iron or Steel Products	131
Tulsa, OK	Primary Iron or Steel Products	120
New York, NY	Motor Vehicles	118

Source: IHS

The following table summarizes the top-ranked combinations of destination and commodity for 2040 by tonnage. Overall there is a slight re-shuffling of the top ten rankings from 2010. Other than the entrance of Canada, however, similar top origin-destination pairs persist.

Table 42 – St. Louis Outbound Truck Rail by Destination and Commodity (Tonnage), 2040

Destination BEA	Commodity	Tons (000s)
San Francisco, CA	Primary Iron or Steel Products	288
Minneapolis, MN	Malt Liquors	152
Amarillo, TX	Portland Cement	151
Houston, TX	Liquefied Gases, Coal or Petroleum	148
Sioux Falls, SD	Misc Industrial Organic Chemicals	132
Greenville, SC	Petroleum Refining Products	131
Shreveport, LA	Gravel or Sand	115
Chicago, IL	Primary Iron or Steel Products	115
Tulsa, OK	Primary Iron or Steel Products	105
Canada	Natural Gasoline	103

Source: IHS

Table 43 summarizes the top-ranked combinations of destination and commodity for 2040 by value. Again, regional origin-destination pairs remain stable, although the rankings change slightly. This is mostly driven by the increased importance of motor vehicles to various destinations.

Table 43 – St. Louis Outbound Truck Rail by Destination and Commodity (Tonnage), 2040

Destination BEA	Commodity	$ Millions
Kansas City, MO	Motor Vehicles	714
Kansas City, MO	Misc Aircraft Parts	687
Chicago, IL	Motor Vehicles	561
San Francisco, CA	Primary Iron or Steel Products	392
New York, NY	Motor Vehicles	238
Chicago, IL	Primary Iron or Steel Products	156
Tulsa, OK	Primary Iron or Steel Products	143
Chicago, IL	Misc. Indus Inorganic Chemicals	142
Minneapolis, MN	Malt Liquors	140
McAllen, TX	Primary Iron or Steel Products	136

*Denotes areas outside the study area in the BEA
Source: IHS

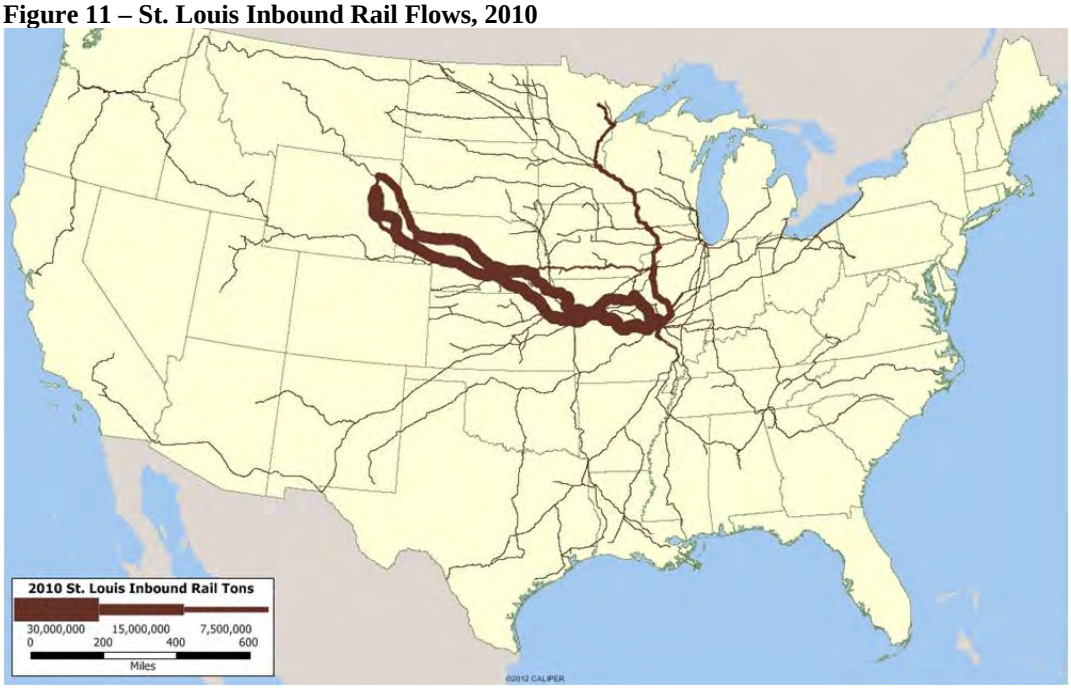
In summary, outbound freight movements are expected to increase at a slow pace in terms of total weight but at a slightly faster rate in terms of value from 2010 to 2040. The growth is being driven by primarily steel and iron, petroleum and petrochemical products, and, especially in the case of value, motor vehicles and aircraft parts. This growth is important to the St. Louis Region; it contributes to the health of the region's transportation sector and related employment. It also creates demand for capital investments in infrastructure and a stronger regional manufacturing base. St. Louis is certainly a trans-shipment hub for all of these products, but it is also a producer, which is particularly the case for motor vehicle manufacturing, petroleum refining, and several types of chemicals. Therefore, efficient rail connections to a wide variety of destinations both nearby and to more distant but major trading centers of the U.S. can support numerous industries throughout the St. Louis region.

Inbound Rail Traffic

Analyzing inbound rail freight transport patterns helps complete the logistics picture of rail freight movement in the St. Louis region. The following figures illustrate the primary routing of inbound cargo and the relative quantities of rail cargo flows from origin BEAs to the St. Louis Region, respectively.

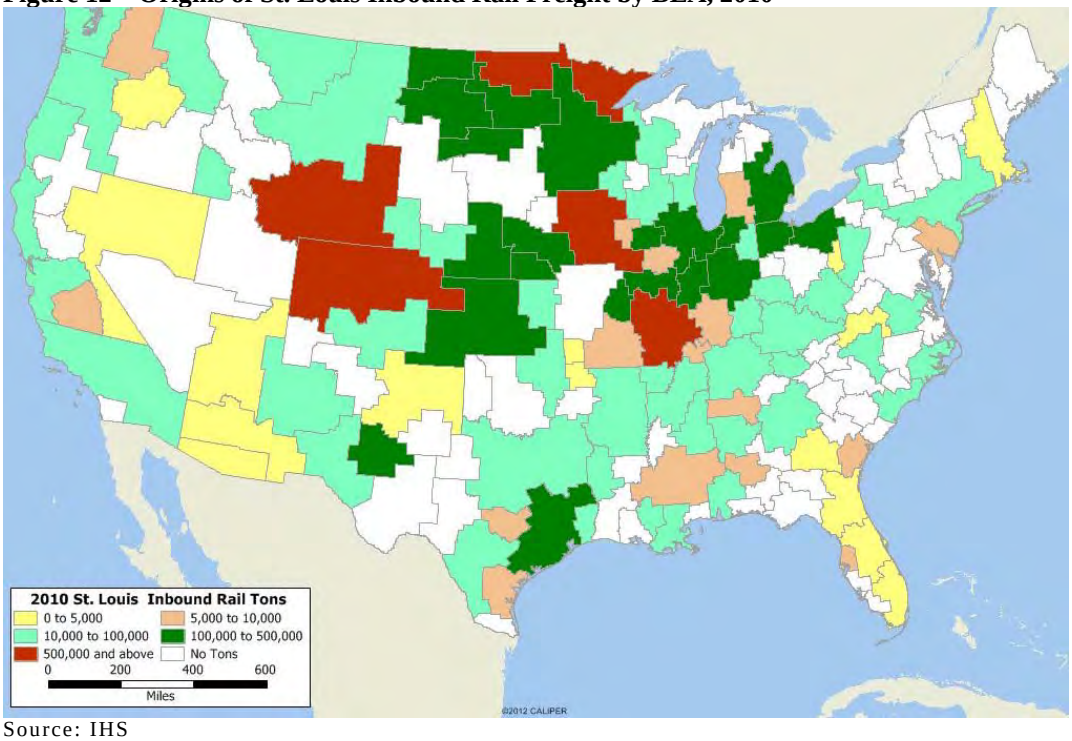
The picture that emerges is much different than that for outbound rail. Essentially, substantial quantities of inbound freight come from the interior of the U.S., particularly from mining regions such as Wyoming and Northern Minnesota. Otherwise, much of the inbound cargo comes from more proximate areas, as would be expected in an inter-regional goods movement model.

Figure 11 – St. Louis Inbound Rail Flows, 2010



Source: IHS

Figure 12 – Origins of St. Louis Inbound Rail Freight by BEA, 2010



Source: IHS

Casper, WY, is easily the largest inbound shipping origin by weight, accounting for 66.8% of total inbound freight. Duluth is a distant second, with 8.6% of the total. The remaining origins are each responsible for less than 2% of the total. The value of inbound freight is more evenly dispersed across origins. Casper retains the top ranking, but its share is only a fraction higher than Detroit, the next largest origin. Mexico is among the top ten origins by both weight and value. Most of the remaining top origins are in the Midwest and Plains states, especially when measured by weight. However if Mexico as a whole were treated like a BEA, it would rank in the top ten inbound origins by both tonnage and value. Texas BEAs also factors more prominently when viewed through the lens of value rather than tonnage.

Table 44 – St. Louis Inbound Rail Flows by Origin, 2010

Origin BEA	Tons (000s)	Origin BEA	$ Millions
Casper, WY	29,231	Casper, WY	1,063
Duluth, MN	3,743	Detroit, MI	842
St. Louis, MO*	592	Chicago, IL	519
Grand Forks, ND	586	Salt Lake City, UT	487
Denver, CO	528	Des Moines, IA	409
Des Moines, IA	517	Houston, TX	350
Champaign, IL	499	Lincoln, NE	349
Mexico	492	Duluth, MN	316
Chicago, IL	402	Mexico	299
Wichita, KS	397	San Antonio, TX	236

Note: *Denotes areas outside of the study area in the St. Louis BEA
Source: IHS

The following table summarizes the relative rankings of the top destinations for St. Louis inbound rail freight in 2040. One of the more interesting differences compared to 2010 data is that Canada rises to the top spot by value as well and the third spot by tonnage. In some ways this is misleading, as it is difficult to compare growth in trade for an entire country with that of a domestic BEA. As this sub-section will demonstrate, much of this tonnage and value is the result of increased export of lumber and minerals. Detroit and Salt Lake City both overtake Casper, WY when measured by value. This sub-section will demonstrate that the ascendancy of Detroit will be on account of increased motor vehicle production (also the case with Canada, especially Ontario) and Salt Lake City is the source of large quantities of high-end chemical and copper smelter products.

Table 45 – St. Louis Inbound Rail Flows by Origin, 2040

Origin BEA	Tons (000's)	Origin BEA	$ Millions
Casper, WY	27,636	Canada	2,154
Duluth, MN	4,257	Detroit, MI	1,604
Canada	3,541	Salt Lake City, UT	1,051
Grand Forks, ND	851	Casper, WY	1,006
Champaign, IL	828	Houston, TX	705
Des Moines, IA	824	Chicago, IL	695
Denver, CO	670	Des Moines, IA	646
Lincoln, NE	610	Lincoln, NE	556
Wichita, KS	583	San Antonio, TX	449
Kansas City, MO	581	Hobbs, NM	381

Note: *Denotes areas outside of the study area in the St. Louis BEA
Source: IHS

Over 90% of the total inbound tonnage falls into ten major product categories. Bituminous coal dominates inbound rail freight shipments, making up more than two-thirds of the total. Roughly 25% of the inbound coal shipment is trans-shipped onto waterborne transit bound for the Gulf and other southern states, with the rest consumed locally in energy generation, primarily, and manufacturing. Iron ores, ostensibly used in the production of the outbound primary steel and iron rail shipment, comprises 8.4% of the total. Finished primary iron and steel products are also among the top ten inbound goods, as St. Louis is both a producer and consumer. Grain, soybean oil, distilled and blended liquors, and other agricultural products serve as inputs in the St. Louis Region's strong food and beverage manufacturing industry or are trans-shipped downriver to centers of maritime export in Louisiana. These goods constitute about 11% of total inbound rail cargo. Chemicals needed as regional industry inputs (or possibly trans-shipment) also constitute a major share of inbound goods at about 5% of the total.

Table 46 – St. Louis Inbound Rail Flows by Top Commodity and Tonnage, 2010

Commodity	Tons (000s)	% of Total
Bituminous Coal	29,921	68.4%
Iron Ores	3,671	8.4%
Grain	2,763	6.3%
Misc. Industrial Organic Chemicals	1,113	2.5%
Soybean Oil or By-products	852	1.9%
Potassium or Sodium Compound	641	1.5%
Primary Iron or Steel Products	528	1.2%
Distilled or Blended Liquors	442	1.0%
Oil Kernels, Nuts or Seeds	348	0.8%
Flour or Other Grain Mill Products	285	0.7%
Misc. Industrial Inorganic Chemicals	266	0.6%
All Others	2,932	6.7%
Total	43,763	

Source: IHS

The importance of St. Louis' role in industrial chemical logistics suggested by the St. Louis Region's outbound shipment data is also evident in the following table, which shows the top inbound commodities by value. Industrial organic chemicals account for 11.7% of total inbound freight value, edging coal for the top spot in the rankings. Industrial organic chemicals tend to have high values per ton, whereas coal carries much lower values per ton. Chemicals, in general, account for about 23% of the total.

Table 47 – St. Louis Inbound Rail Flows by Top Commodity and Value, 2010

Commodity	$ Millions	% of Total
Misc. Industrial Organic Chemicals	1,085	11.7%
Bituminous Coal	1,023	11.0%
Motor Vehicles	953	10.2%
Primary Iron or Steel Products	719	7.7%
Chemical Preparations	558	6.0%
Distilled or Blended Liquors	486	5.2%
Misc. Industrial Inorganic Chemicals	454	4.9%
Motor Vehicle Parts or Accessories	449	4.8%
Plastic Materials or Synthetic Fibers	441	4.7%
Grain	363	3.9%
All Others	2,777	29.8%
Total	9,308	

Source: IHS

Motor vehicles, automotive parts and accessories, and plastic materials and synthetic fibers account for 20% of the value of inbound rail freight, which fits with the pattern observed for outbound motor vehicle shipments. St. Louis is a hub for both motor vehicle manufacturing and trans-shipment via rail to large centers of trade throughout the country. The St. Louis region is ideally situated in close proximity to heavy auto-producing states and serves as an important manufacturing and trans-shipment node. Agricultural and food and beverage products again factor prominently, particularly higher-value distilled and blended liquors.

In the future, bituminous coal will continue to account for the majority of inbound rail freight by weight, albeit a smaller share. Although still the top commodity, inbound coal shipments are forecasted to decrease in absolute terms and as a share of the total. Coal will continue to decline relative to gas as a source of domestic energy generation, and while export markets have helped support the industry in recent years it is not clear that these trends will continue in the future. Moreover, about 75% of the coal movement serves local demand in St. Louis. Meanwhile, iron ores and primary iron and steel products continue to grow, consistent with gains in outbound tonnage. Inbound primary iron and steel product tonnages are and will continue to be slightly lower than outbound, with St. Louis manufacturing accounting for the overall net positive outbound balance. Increased regional manufacturing of iron and steel products is further evidenced by the growth in iron ore inbound rail freight. Grains, soybeans, and other agricultural inbound freight shipments will increase, feeding high growth in outbound shipments of these products via barge down the Mississippi River for export.

Table 48 – St. Louis Inbound Rail Flows by Top Commodity and Tonnage, 2040

Commodity	Tons (000s)	% of Total
Bituminous Coal	28,269	58.9%
Iron Ores	4,169	8.7%
Grain	4,088	8.5%
Misc. Industrial Organic Chemicals	1,800	3.8%
Potassium or Sodium Compound	1,735	3.6%
Soybean Oil or By-products	1,413	2.9%
Lumber or Dimension Stock	1,043	2.2%
Primary Iron or Steel Products	940	2.0%
Distilled or Blended Liquors	742	1.5%
Chemical Preparations	621	1.3%
All Others	3,179	6.6%
Total	48,000	

Source: IHS

The following table summarizes the top inbound rail commodities by value forecasted for 2040. The increase in the share of chemicals complements a similar trend in outbound rail traffic. Inbound motor vehicle shipments will also increase in absolute and relative terms. This is consistent with gains in outbound shipments of motor vehicles. The growth in motor vehicle parts and accessories supports the previous analysis that at least some of the net increase in vehicle throughput will be manufactured in the St. Louis region. Consistent with the drop in inbound cargo tonnage, the share of inbound freight value attributed to bituminous coal is also expected to decline by 2040.

Table 49 – St. Louis Inbound Rail Flows by Top Commodity and Value, 2040

Commodity	$ Millions	% of Total
Chemical Preparations	2,002	13.6%
Motor Vehicles	1,930	13.1%
Misc. Industrial Organic Chemicals	1,754	11.9%
Primary Iron or Steel Products	1,280	8.7%
Bituminous Coal	967	6.6%
Motor Vehicle Parts or Accessories	869	5.9%
Distilled or Blended Liquors	815	5.5%
Plastic Material or Synthetic Fibers	786	5.3%
Soybean Oil or By-products	548	3.7%
Grain	537	3.6%
All Others	3,243	22.0%
Total	14,732	

Source: IHS

To further illustrate the dynamics of commodity supply chains, the following table illustrates the top combinations of origins and commodities for inbound rail cargo. Not surprisingly, bituminous coal from Casper, WY contributes by far the largest inbound share, consisting of Power River Basin Coal. Coal mines outside the St. Louis study region but in the St. Louis BEA also contribute more than 500,000 tons. Iron ores, from the vast iron range in northeastern Minnesota are both used in steel and other durables manufacturing in St. Louis. Grain and soybean products are transported from smaller regions in nearby states with a large agricultural presence, ostensibly to be manufactured by the St. Louis food and beverage industry or trans-shipped down the Mississippi River by barge to international markets.

Table 50 – St. Louis Inbound Rail Flows by Top Origin and Commodity (Tonnage), 2010

Origin BEA	Commodity	Tons (000s)
Casper, WY	Bituminous Coal	29,055
Duluth, MN	Iron Ores	3,671
St. Louis, MO*	Bituminous Coal	577
Grand Forks, ND	Grain	564
Lincoln, NE	Misc. Industrial Organic Chemicals	345
Champaign, IL	Soybean Oil or By-products	331
Wichita, KS	Grain	315
Denver, CO	Grain	300
Minot, ND	Grain	276
Springfield, IL	Soybean Oil or By-products	245

Note: *Denotes areas outside the study area in the St. Louis BEA
Source: IHS

An analysis of the top ten origin-commodity pairs by value yields further confirmation of St. Louis's role as a convenient trans-shipment point for high-value goods. Bituminous coal from Casper is still the top commodity-origin combination, based almost entirely on massive volume. However, motor vehicles and parts from Detroit (and, to a lesser extent, San Antonio) make up a major share of the total inbound freight value. This is not surprising given the fact that Detroit and Mexico, which often ships goods via Texas such as San Antonio, are large producers of motor vehicles and the fact that St. Louis serves as a convenient trans-shipment point to points east and west. As summarized in a previous table, top outbound destinations for motor vehicles include Kansas City, Chicago, and New York. Some of the inbound shipments are, of course likely sold within the St. Louis Region, while other outbound motor vehicle volumes are produced within the region. Chemicals factor prominently among the top ten, but with a less-clear geographic pattern of goods movement.

Table 51 – St. Louis Inbound Rail Flows by Top Origin and Commodity (Value), 2010

Origin BEA	Commodity	$ Millions
Casper, WY	Bituminous Coal	994
Detroit, MI	Motor Vehicles	465
Lincoln, NE	Misc. Industrial Organic Chemicals	336
Duluth, MN	Iron Ores	300
Detroit, MI	Motor Vehicle Parts or Accessories	243
Salt Lake City, UT	Primary Copper Smelter Products	235
Salt Lake City, UT	Chemical Preparations	230
Des Moines, IA	Misc. Industrial Organic Chemicals	204
San Antonio, TX	Motor Vehicles	197
Elkhart, IN	Distilled or Blended Liquors	197

Source: IHS

The following table summarizes the forecasted top-ranked combinations of destination and commodity for 2040. As previously discussed, Canada dramatically enters the top ten, with mineral compounds and lumber leading the way. Powder River Coal shipped via Casper, WY falls slightly, while volumes of trade with top origins for agricultural, iron ore, and chemical products expand.

Table 52 – St. Louis Inbound Rail Flows by Top Origin and Commodity (Tonnage), 2040

Origin BEA	Commodity	Tons (000s)
Casper, WY	Bituminous Coal	27,451
Duluth, MN	Iron Ores	4,169
Canada	Potassium or Sodium Compound	1,326
Canada	Lumber or Dimension Stock	924
Grand Forks, ND	Grain	817
Lincoln, NE	Misc. Industrial Organic Chemicals	551
Champaign, IL	Soybean Oil or By-products	548
St. Louis, MO*	Bituminous Coal	544
Wichita, KS	Grain	455
Denver, CO	Grain	434

Note: *Denotes areas outside the study area in the St. Louis BEA
Source: IHS

The following table summarizes the top-ranked combinations of destination and commodity for 2040 by value, illustrating the increases importance of motor vehicle and chemical freight as a share of total inbound rail. Top origins for these products in 2010 further solidify their positions in 2040. Houston and Hobbs, NM enter the top ten on account of significant increases in chemicals shipments to St. Louis. Additionally, the data points towards the importance of St. Louis within supply chains for steel, as large quantities of inbound iron and steel products originating in Canada help supply regional steel manufacturing in St. Louis.

Table 53 – St. Louis Inbound Rail Flows by Top Origin and Commodity (Value), 2040

Origin BEA	Commodity	$ Millions
Detroit, MI	Motor Vehicles	942
Casper, WY	Bituminous Coal	938
Salt Lake City, UT	Chemical Preparations	774
Lincoln, NE	Misc. Industrial Organic Chemicals	537
Canada	Primary Iron or Steel Products	503
Detroit, MI	Motor Vehicle Parts or Accessories	471
San Antonio, TX	Motor Vehicles	399
Canada	Potassium or Sodium Compound	390
Houston, TX	Chemical Preparations	349
Hobbs, NM	Chemical Preparations	345

Source: IHS

The dynamics of chemicals transportation emerging from this analysis warrants further discussion. It is difficult to follow the supply chain for chemicals, which factor prominently in both inbound and outbound shipments across all modes of transportation and contribute to production and consumption figures across numerous commodity groups. In the case of rail, reported inbound chemicals rail shipments are double those of outbound shipments; however, outbound chemicals volumes exceed inbound quantities by truck and waterborne freight modes. The relative mixes of chemical types are also very different by mode and direction. Thus, St. Louis sits in the middle of a dynamic supply chain for chemicals, bringing in many items for local manufacturing and/or trans-shipment, while also manufacturing some chemical products locally for both consumption and export to other regions. The complex supply chain, in part, benefits from bulk transportation in rail and water as well as the ability to integrate these freight flows and add value.

As previously described, the Missouri Department of Economic Development (MDED) has published data on the state of chemicals industry in Missouri, including types of chemicals produced, quantities

of jobs associated with this employment, and the destinations of manufactured products.[5] MDEC suggests that Missouri is particularly strong in soap and cleaning compounds and pharmaceutical chemicals, especially veterinary pharmaceuticals. Other strengths include, in descending order of employment, basic chemicals manufacturing (mostly inorganic compounds used to make other chemical products); agricultural chemical manufacturing; and paints, coatings, and adhesives. St. Louis can possibly leverage its proximity to relatively cheap petrochemical feed stocks from North Dakota and Canada to enhance chemicals manufacturing and exports to other regions and countries.

Chemicals supply chains are highly complex, but a closer look at the inter-modal data can help illustrate the opportunities for St. Louis to add value to raw materials and, thus, enhance the regional economy and employment outlook. The following table summarizes the inter-modal flows of both chemical compounds as well as various goods that often require chemical inputs for manufacturing. Although St. Louis has a small basic chemicals manufacturing industry, the St. Louis Region is a slight net consumer of basic organic and inorganic chemicals (labeled "Chemicals")[6]. These trends will persist in part because other growing industries in St. Louis require chemical feed stocks. For example, St. Louis is a net producer of cosmetics and will become a slight net producer of fertilizer. Pharmaceuticals, for which St. Louis is both a producer and consumer, may or may not require chemical inputs. Pharmaceutical industry shipments, both inbound and outbound, will more than double over the next 30 years. Plastics tend to be produced outside the St. Louis Region, as illustrated by the high net inbound flows.

Table 54 – St. Louis Chemicals Industry and Related Industry Flows, All Modes

Commodity Group	2010 Tons	2010 $ Millions	2040 Tons	2040 $ Millions
Liquid Bulk Chemicals	13,170	$18,501	22,691	$36,561
Inbound	2,995	$4,009	4,410	$6,766
Outbound	2,816	$4,289	3,684	$6,217
Through	7,359	$10,204	14,597	$23,577
Cosmetics	784	$3,224	1,281	$5,757
Inbound	116	$464	145	$579
Outbound	540	$2,167	730	$2,934
Through	128	$593	406	$2,244
Fertilizer	3,966	$1,311	3,086	$1,021
Inbound	946	$313	609	$201
Outbound	802	$265	655	$216
Through	2,218	$734	1,822	$604
Pharmaceuticals	262	$4,770	718	$12,945
Inbound	89	$1,636	243	$4,456
Outbound	107	$1,976	232	$4,323
Through	66	$1,159	243	$4,165
Plastics	7,197	$16,703	14,069	$32,109
Inbound	656	$1,777	754	$1,960
Outbound	437	$1,238	535	$1,544
Through	6,104	$13,688	12,780	$28,606
Total	345,552	419,791	492,813	582,640

Source: IHS

[5] Missouri Department of Economic Development, *Pattern Industry Insight: Chemical Manufacturing*.
[6] For the purposes of this discussion, the specific term "chemicals" refers to industrial organic, industrial inorganic, chemical compounds; where other chemicals products will be referred to by the common finished-form product terminology (e.g., "fertilizer").

Rail Intermodal Traffic

This section analyzes intermodal, or container, goods movement separately for other rail commodity flows. Intermodal traffic is an important additional source of rail freight movement into, out of, and through St. Louis. Moreover, it represents the most significant source of long-term rail freight growth. Absent further capital investment and/or improvements in rail infrastructure management and operations, growth in container traffic could lead to increased network congestion and bottlenecks.

The following table illustrates the current and long-term forecasts of intermodal rail for St. Louis. As the table suggests, container tonnage is forecasted to grow at approximately 3.3% per year over the next 30 years. Over half of this will be through traffic, although inbound and outbound traffic will grow faster. The net gain in container tonnage growth between 2010 and 2040 nearly equals all other rail cargo combined.

Table 55 – St. Louis Intermodal Rail Flows, 2010-2040 (Thousand Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Outbound	**2,089**	**2,492**	**2,914**	**4,003**	**6,050**	**3.6%**
Inbound	**1,636**	**1,979**	**2,338**	**3,265**	**4,988**	**3.8%**
Through	**5,202**	**6,375**	**7,291**	**9,302**	**12,767**	**3.0%**
Total	**8,926**	**10,847**	**12,543**	**16,570**	**23,805**	**3.3%**

Source: IHS

The importance of rail intermodal container traffic takes on even greater economic significance when viewed through the prism of value. That containers tend to carry higher-value consumer and business products is evidenced by the fact that the total value of intermodal rail goods associated with St. Louis will approximately equal that of all other rail freight combined by 2040.

Table 56 – St. Louis Intermodal Rail Flows, 2010-2040 ($ Millions)

Segment	2010	2015	2020	2030	2040	CAGR
Outbound	**7,530**	**9,015**	**10,665**	**15,119**	**23,772**	**3.9%**
Inbound	**6,211**	**7,539**	**8,980**	**12,811**	**20,256**	**4.0%**
Through	**26,134**	**34,153**	**38,739**	**49,328**	**66,883**	**3.2%**
Total	**39,875**	**50,706**	**58,384**	**77,259**	**110,911**	**3.5%**

Source: IHS

For inbound and outbound traffic, much of this container freight volume moves from the West Coast to the East Coast, and to a lesser extent in the opposite direction. Los Angeles and New York are by far the highest-volume origins and destinations for inbound and outbound cargo, although other major cities in the Northeast, Mid-Atlantic, Pacific Northwest, and Northern California are also important. This should not be surprising, as these regions represent major international port and trade gateways on both the East and West coasts. For through traffic, however, the North-South connection takes on greater importance with Chicago and various BEAs in Texas, especially, serving as key origins and destinations.

Table 57 – St. Louis Outbound Intermodal Rail Flows by Top Destination, 2010

Destination BEA	Tons (000s)	Destination BEA	$ Millions
Los Angeles, CA	**691**	**Los Angeles, CA**	**2,288**
New York, NY	**395**	**New York, NY**	**1,523**
Harrisburg, PA	**164**	**Harrisburg, PA**	**677**
San Francisco, CA	**162**	**San Francisco, CA**	**581**
Norfolk, VA	**111**	**Norfolk, VA**	**429**
Boston, MA	**96**	**Boston, MA**	**410**
Portland, OR	**64**	**Detroit, MI**	**245**
Seattle, WA	**52**	**Portland, OR**	**244**
Jacksonville, FL	**52**	**Atlanta, GA**	**183**
Atlanta, GA	**51**	**Syracuse, NY**	**175**

Source: IHS

Combined, New York and Los Angeles receive over 50% of the intermodal freight originating or trans-shipped through St. Louis whether measured by weight or value. Eastbound and westbound destinations are well-represented among the top ten, with a slightly higher proportion (by value) of outbound intermodal freight headed east out of St. Louis. The West Coast port cities (Los Angeles, San Francisco, Seattle, and Portland) account for 46.6% of outbound intermodal tonnage while the port cities on the East Coast (New York, Norfolk, and Boston) account for 28.8% of the total (36.7% if Harrisburg, PA is considered an entry point to the Philadelphia market).

The following table presents forecasts that the top intermodal outbound freight destinations in 2040, suggesting a similar geographic distribution as in 2010. Intermodal freight will be slightly more concentrated among the top ten destinations in 2040. The top destinations will receive 90% of the total tonnage and 91% of total freight value compared with 88% and 90%, respectively, in 2010.

Table 58 – St. Louis Outbound Intermodal Rail Flows by Top Destination, 2040

Destination BEA	Tons (000s)	Destination BEA	$ Millions
Los Angeles, CA	2,047	Los Angeles, CA	7,457
New York, NY	1,194	New York, NY	4,908
Harrisburg, PA	508	Harrisburg, PA	2,214
San Francisco, CA	436	San Francisco, CA	1,708
Norfolk, VA	358	Norfolk, VA	1,492
Boston, MA	285	Boston, MA	1,266
Portland, OR	191	Portland, OR	796
Detroit, MI	149	Detroit, MI	756
Seattle, WA	141	Atlanta, GA	550
Atlanta, GA	135	Syracuse, NY	528

Source: IHS

Many of the top outbound intermodal freight destinations are also top origination points for inbound intermodal containers bound for St. Louis. However, Los Angeles plays a much larger role, accounting for more than half of total inbound intermodal freight value and over 40% of total tonnage. A majority of this inbound tonnage, along with freight originating in Seattle and San Francisco (i.e., the Port of Oakland), represents imports from China and other Asian countries.

Table 59 – Top Ten Origins for St. Louis Inbound Intermodal Rail Freight by Weight and Value, 2010

Origin BEA	Tons (000s)	Origin BEA	$ Millions
Los Angeles, CA	693	Los Angeles, CA	3,178
New York, NY	182	New York, NY	681
Seattle, WA	151	Seattle, WA	674
Harrisburg, PA	123	Norfolk, VA	380
San Francisco, CA	89	Detroit, MI	309
Norfolk, VA	87	San Francisco, CA	194
Detroit, MI	67	Harrisburg, PA	191
Jacksonville, FL	40	Jacksonville, FL	118
Philadelphia, PA	38	San Antonio, TX	106
Kansas City, MO	31	Portland, OR	60

Source: IHS

The following table illustrates similar trends for forecasted freight values, with West-to-East and, to a lesser extent, East-to-West traffic expected to dominate inbound intermodal rail flows in 2040. Similar to the outbound intermodal freight forecasts, the total tonnage and value of inbound freight will become more concentrated among the top origins.

Table 60 – St. Louis Inbound Intermodal Rail Flows by Top Origin, 2040

Origin BEA	Tons (000s)	Origin BEA	$ Millions
Los Angeles, CA	2,248	Los Angeles, CA	10,466
New York, NY	574	Seattle, WA	2,317
Seattle, WA	508	New York, NY	2,299
Harrisburg, PA	322	Norfolk, VA	1,309
Norfolk, VA	289	Detroit, MI	978
Detroit, MI	215	Harrisburg, PA	604
San Francisco, SF	197	San Francisco, CA	534
Jacksonville, FL	93	Jacksonville, FL	309
Philadelphia, PA	90	San Antonio, TX	205
Kansas City, MO	83	Syracuse, NY	185

Source: IHS

In contrast to the trends in outbound and inbound intermodal traffic patterns, container through traffic is dominated by northbound and southbound movement of goods between primarily Chicago and Texas BEAs. Much of this traffic is NAFTA-related, with goods moving between Canada, the United States, and Mexico along major North-South rail lines that terminate and/or move through St. Louis. The following figure illustrates this trend.

Figure 13 – St. Louis Intermodal Rail Through Flows, 2010

Source: IHS

A large share of the intermodal rail freight passing through St. Louis either originates in or is destined for Chicago. Flows between Chicago and San Antonio alone account for 33% of total container tonnage and 31% of total freight by value. Dallas, El Paso, Houston, and Tucson are additional destinations and origins that link the United States with Mexico and serve as gateways for North American trade.

Table 61 – St. Louis Intermodal Through Traffic Flows by Top O/D Pairs, 2010

Origin	Destination	Tons (000s)	Origin	Destination	$ Millions
Chicago, IL	San Antonio, TX	1,074	Chicago, IL	San Antonio, TX	6,992
San Antonio, TX	Chicago, IL	629	San Antonio, TX	Chicago, IL	3,265
Chicago, IL	Dallas, TX	562	Chicago, IL	Dallas, TX	2,044
Chicago, IL	Houston, TX	255	El Paso, TX	Chicago, IL	1,507
Chicago, IL	Tucson, AZ	217	Chicago, IL	Tucson, AZ	1,421
El Paso, TX	Chicago, IL	201	Chicago, IL	Houston, TX	985
Dallas, TX	Chicago, IL	163	San Francisco, CA	Birmingham, AL	831
Seattle, WA	Memphis, TN	154	Seattle, WA	Memphis, TN	668
Chicago, IL	El Paso, TX	140	Tulsa, OK	Wilmington, NC	601
Memphis, TN	Seattle, WA	120	Dallas, TX	Chicago, IL	598

Source: IHS

The overall pattern of North-to-South and South-to-North flows is expected to continue, with traffic between Chicago and both Southwest border regions and Gulf Coast BEAs expected to dominate. By 2040, flows of container through traffic between Chicago and four major Texas BEAs is expected to account for more than 50% of intermodal traffic by value through St. Louis.

Table 62 – St. Louis Intermodal Through Traffic Flows by Top O/D Pairs, 2040

Origin	Destination	Tons (000s)	Origin	Destination	$ Millions
Chicago, IL	San Antonio, TX	2,352	Chicago, IL	San Antonio, TX	14,933
San Antonio, TX	Chicago, IL	1,562	San Antonio, TX	Chicago, IL	7,862
Chicago, IL	Dallas, TX	1,296	Chicago, IL	Dallas, TX	5,481
Chicago, IL	Houston, TX	688	San Francisco, CA	Birmingham, AL	3,222
Seattle, WA	Memphis, TN	514	El Paso, TX	Chicago, IL	3,136
El Paso, TX	Chicago, IL	435	Chicago, IL	Tucson, AZ	2,863
Chicago, IL	Tucson, AZ	426	Chicago, IL	Houston, TX	2,856
Kansas City, MO	Louisville, KY	367	Tulsa, OK	Wilmington, NC	2,318
Memphis, TN	Seattle, WA	362	Seattle, WA	Memphis, TN	2,278
Dallas, TX	Chicago, IL	348	Kansas City, MO	Louisville, KY	1,707

Source: IHS

Rail Freight Summary

Having reviewed the long-term rail forecasts for the St. Louis region, several key trends emerge. Combined with the truck and waterborne analyses, a more complete picture emerges. The key takeaways from the rail analysis are described as follows.

- Through traffic makes up the largest share of rail freight movement within the St. Louis area, accounting for about two-thirds of both non-container and container cargo tonnage.
- Container traffic is expected to grow much faster than non-container traffic by far over the next thirty years. Container tonnage will grow by 3.3% per year between 2010 and 2040 (total value will grow by 3.5%); while all other freight tonnage will grow by only 0.4% (total value will grow by 1.7%).
- Non-container inbound traffic significantly exceeds outbound traffic by tonnage and value, although in the latter case the gap between the two flows is significantly smaller. This is mostly due to the significant quantities of heavy, low-value coal moving inbound from the Powder River basin to St. Louis. Much of this coal is consumed locally, while the remainder is typically shipped via barge down the Mississippi River to other domestic and international demand centers.
- Non-container outbound traffic is dominated by steel and iron products, petroleum and petrochemical products, and motor vehicles. St. Louis serves as both a key manufacturing center for these goods as well as an important trans-shipment hub.
- Canada grows in importance as an origin for minerals, lumber, and iron and steel products. Increased production of crude petroleum and gas from oil sands and shale in and around Alberta should help perpetuate this trend.
- St. Louis rail freight will experience increased rail flows to and from Texas. Some of these flows, such as chemicals and petroleum relate to production in Texas, while others such as increased flows of motor vehicles and container goods may include trans-shipped cargo from Mexico.
- With the exception of coal, most other inbound non-container traffic originates from nearby states in the Midwest and Plains states, while non-container outbound cargo follows a different pattern. More proximate BEAs are still among the most important destinations, especially Chicago and Kansas City, but other large international trade centers such as New York, the Bay Area, and Houston receive substantial flows originating in St. Louis. The top outbound goods, respectively by these destinations, are motor vehicles, steel and iron, and petroleum products.

- Chemicals constitute an important and share of non-container freight, especially when measured by value (accounting for approximately one quarter of the total value). St. Louis plays an important role in chemical supply chains as a consumer of chemical feed stocks as manufacturing inputs (e.g., fertilizer and cosmetics); a producer of consumer (soaps and detergents), pharmaceutical, and basic, agricultural, and painting/adhesive chemicals; and as a trans-shipment point.

From this summary several key observations can be made.

- St. Louis must be prepared for possible major increases in rail intermodal cargo, both in terms of intermodal container handling facilities as well as general rail capacity. Congestion will increase as existing tracks in the St. Louis region reach or exceed capacity over the next 20-30 years. Efficient movement by rail across the Mississippi River will place particular strain on the two existing rail bridges.
- St. Louis could position itself to benefit economically from the "re-shoring" of motor vehicle manufacturing in North America. Not only is St. Louis an important trans-shipment point for motor vehicles produced in the Midwest and Mexico for markets in all directions, the St. Louis Region also can seek to expand its role in the motor vehicle supply chain for manufacturing and assembly.
- St. Louis can also explore opportunities for expanding high-value petroleum refining and chemicals manufacturing. The St. Louis Region's proximity to growing cheap sources of petroleum and petrochemical feed stocks from Canada and North Dakota positions St. Louis to potentially play a larger role in these industry supply chains. These industries tend to support high-paying jobs.
- Within the context of declining U.S. coal demand and natural gas replacement, it is unlikely that inbound and outbound coal shipments will grow substantially. Nonetheless, the relative competitiveness of Powder River Basic coal (and, to a lesser extent, Illinois River Basin coal) and the opportunities to move coal on barge to the Gulf Coast for export means that St. Louis' position is less at risk. It is likely that St. Louis mostly sees flat or slightly declining growth in coal volumes in the foreseeable future. Therefore, while there is little evidence supporting expansion of rail infrastructure for handling coal, current levels of capacity should still be maintained.
- Steel production is an important manufacturing sector in the St. Louis region, and steel constitutes one of the most important commodities shipped to, from, and through St. Louis. Steel freight will continue growing in absolute terms, but the logistics may shift if the trend toward re-shoring of manufacturing to North America continues (especially automobile manufacturing). For now, the key network link is between Madison County and the Bay Area.

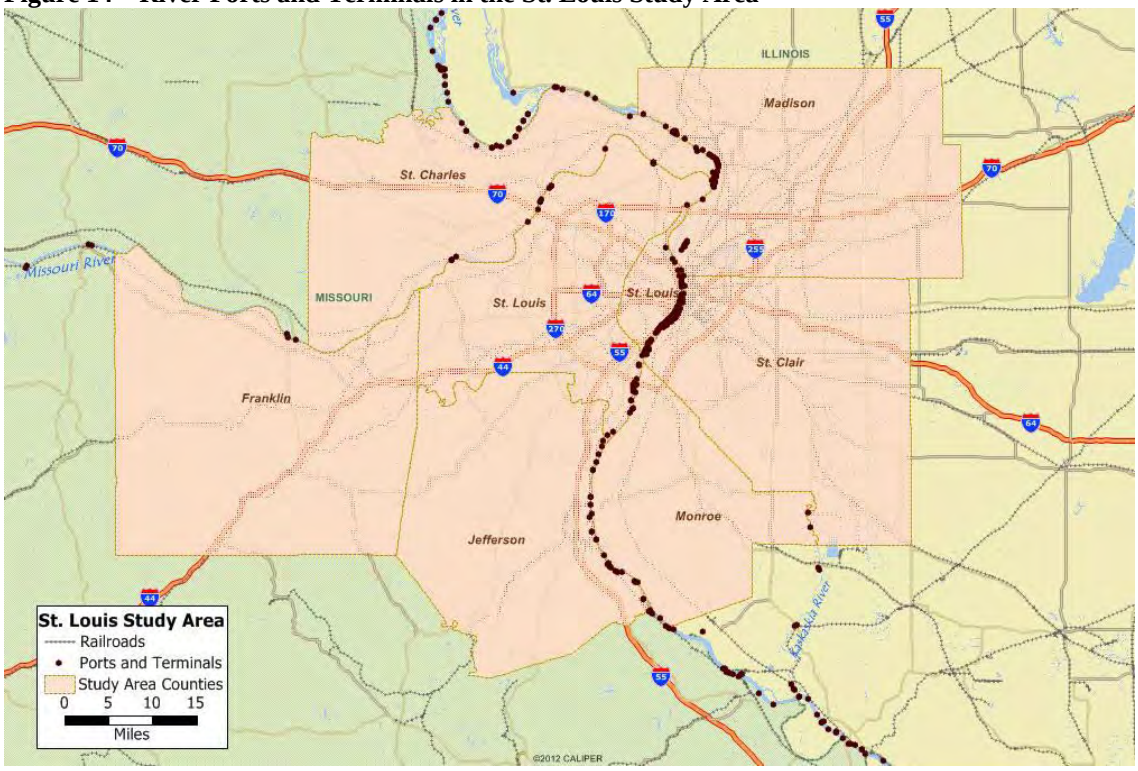
Regional Waterborne Freight Perspective

Inland waterborne transportation is a key component of regional goods movement in St. Louis, owing in part to the St. Louis Region's unique geography. It is also the long time transportation mode for the St. Louis Region defining its legacy. In 2010, about 31.8 million tons of cargo valued at approximately $9.5 billion moved to, from, and through river ports in the St. Louis study area. St.

Louis is strategically located both in central location within the United States and along the Mississippi River. Moreover, St. Louis is the northernmost point along the Mississippi River providing winter access. Thus, St. Louis is ideally situated as a year-round, central node for consolidating agricultural and mining goods produced in the Midwest and northern Great Plains and shipping this cargo in bulk down the Mississippi River.

St. Louis benefits from superior connectivity to regional markets via its intermodal transportation infrastructure. The study area also includes 194 port terminals, docks, fleeting areas, locks, and dams. The majority of terminals belong to the St Louis Port Authority. Bulk cargo is transported to St. Louis area river ports via the St. Louis Region's extensive freight rail and highway networks or along major waterways feeding the Mississippi from the north such as the Northern Mississippi and Illinois rivers. St. Louis is the western terminus of two major eastern railroads (CSX and Norfolk Southern) and the eastern terminus of two major western railroads (BNSF and Union Pacific). The study area contains six Class I railroads, four major intermodal facilities, and four major Interstate radials. The St. Louis Region enjoys a unique and significant position in leveraging the bulk transportation value in its Rivers.

Figure 14 – River Ports and Terminals in the St. Louis Study Area



After reaching river ports in St. Louis, freight is typically consolidated and trans-shipped (or in the case of waterborne cargo originating upriver, trans-loaded) downriver to BEAs on the Lower Mississippi, Ohio, Cumberland, and Tennessee rivers. Much of this freight will terminate in the Gulf Coast, mostly for export. Agriculture, coal, and steel made up a large share of southbound bulk movements, although the latter has declined in recent years. Freight also moves in smaller quantities upriver to and from St. Louis, typically consisting of higher-value goods such as petroleum products, fertilizers, and chemicals, much of which originates on the Gulf Coast.

Waterborne freight is dominated by outbound traffic. There is nearly five times as much waterborne outbound freight tonnage as there is inbound tonnage, as summarized in the following table. Outbound traffic will increase slowly between 2010 and 2040.

Table 63 – St. Louis Waterborne Flows, 2010-2040 (Thousand Tons)

Segment	2010	2015	2020	2025	2030	2040	CAGR
Outbound	24,432	24,996	25,763	26,454	27,939	34,680	1.2%
Inbound	5,199	5,433	5,394	5,192	4,904	4,665	-0.4%
Local	2,163	1,840	1,605	1,422	1,289	1,160	-2.1%
Total	31,794	32,269	32,762	33,068	34,132	40,505	0.8%

Source: IHS

The gap between inbound and outbound freight is less severe when measured by freight value. Outbound freight value is only about 50% higher than that for inbound freight in 2010 due to the higher overall value per ton of the latter, although this gap will grow over the study period. Otherwise, the general growth trends are more or less the same as when measured by weight.

Table 64 – St. Louis Waterborne Flows, 2010-2040 ($ Millions)

Segment	2010	2015	2020	2025	2030	2040	CAGR
Outbound	5,525	5,928	6,167	6,392	6,678	7,847	1.2%
Inbound	3,353	3,276	3,329	3,319	3,244	3,299	-0.1%
Local	612	427	349	280	230	178	-4.0%
Total	9,489	9,632	9,845	9,991	10,153	11,324	0.6%

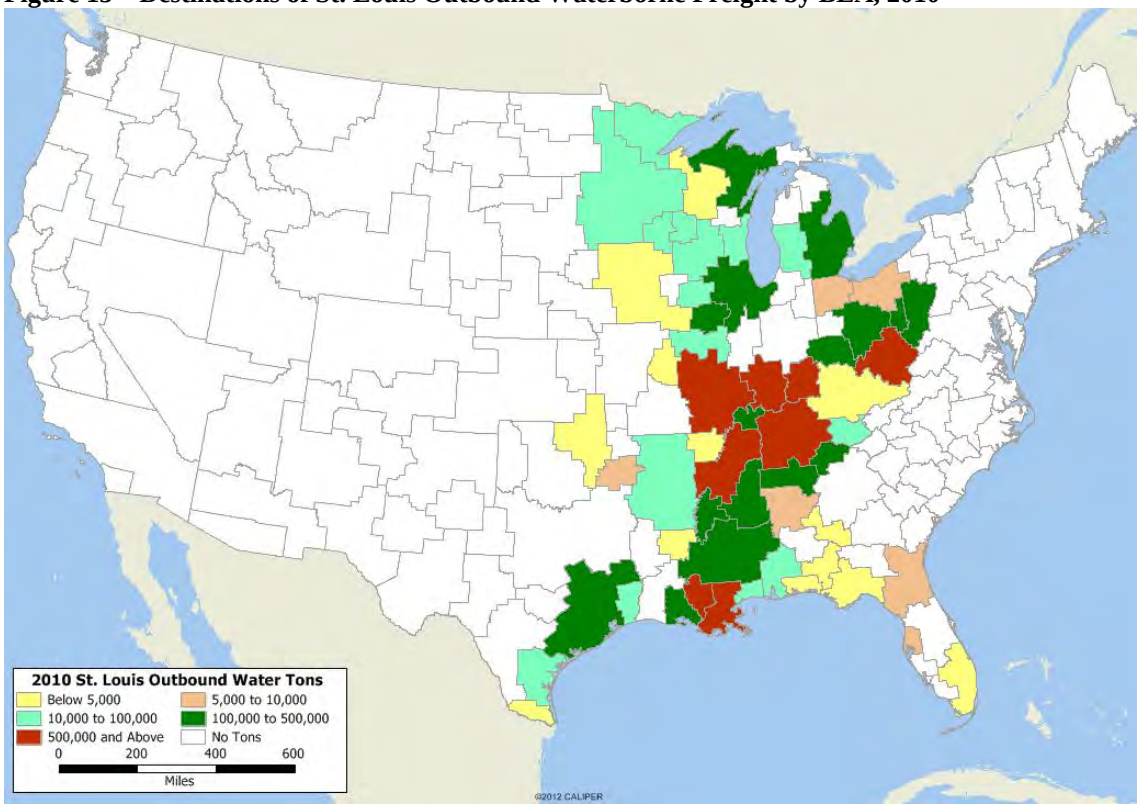
Source: IHS

Although it is possible to roughly calculate through traffic from U.S. Army Corps data, IHS excludes this analysis from the study. The cargo volumes that travel downriver on the Missouri and Illinois rivers, when navigable, are less important in terms of port infrastructure needs. Barge-to-barge trans-loading does not generally require infrastructure. Moreover, waterborne traffic appears to be growing at only a modest pace. Likewise, local freight is also relatively insignificant. Since there are no known congestion problems with through and local traffic, this study will focus on outbound and inbound freight.

Waterborne Outbound Traffic

Just over half of the approximately 25 million tons of outbound waterborne freight tonnage originating in St. Louis is destined for ports in New Orleans (8.3 million tons) or Baton Rouge (4.8 million tons) near the mouth of the Mississippi River. Louisiana ports are also the destination of just over 40% of freight when measured by value. This overall picture, summarized in the following figure and table, is not surprising given the fact that the Louisiana ports are key trans-shipment centers for bulk freight ultimately moving on ocean-bound maritime vessels via the Gulf of Mexico. Much of this bulk freight is then moved to international markets. The remaining freight moves mostly downriver to other ports in the St. Louis BEA but outside of the study area, to other key trans-shipment hubs along the Mississippi River, or to BEAs along the Ohio, Cumberland, Tennessee, and other intersecting rivers. The only notable exception to this trend is that about half a million tons of cargo moves northbound to Chicago, by way of the Illinois River.

Figure 15 – Destinations of St. Louis Outbound Waterborne Freight by BEA, 2010



Source: IHS

Table 65 – St. Louis Outbound Waterborne Flows by Top Destination, 2010

Destination BEA	Tons (000's)	Destination BEA	$ Millions
New Orleans, LA	8,351	New Orleans, LA	1,571
Baton Rouge, LA	4,873	Baton Rouge, LA	701
Nashville, TN	1,633	Nashville, TN	616
St. Louis, MO*	1,175	Houston, TX	446
Evansville, IN-KY	921	Jackson, MS	205
Memphis, TN	898	Wheeling, WV	205
Louisville, KY	568	Charleston, WV	204
Charleston, WV	561	Memphis, TN	188
Chicago, IL	488	Pittsburgh, PA	152
Cincinnati, OH	484	St. Louis, MO*	138

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

New Orleans will cement its role as the dominant domestic destination for outbound river freight originating in St. Louis. By 2040, total New Orleans-bound volume will grow to 21.1 million tons carrying a value of $4.4 billion, accounting for almost two-thirds total outbound tonnage over half of total outbound value. The Port of Southern Louisiana offers massive export facilities, particularly for grain and coal. There is no other forecasted trend for waterborne transportation of comparable significance, although there are several minor shifts in market share. For example, the forecast suggests a relative decline in long-distance shipments along the Ohio River towards Pittsburgh and

West Virginia ports, a general increase in tonnage moving in a southbound direction, and increasing total values of shipments towards the Chicago and Peoria BEAs.

Table 66 – St. Louis Outbound Waterborne Flows by Top Destination, 2040

Destination BEA	Tons (000's)	Destination BEA	$ Millions
New Orleans, LA	21,089	New Orleans, LA	4,360
Baton Rouge, LA	2,055	Baton Rouge, LA	461
Nashville, TN	1,996	Nashville, TN	458
St. Louis, MO*	1,376	Chicago, IL	420
Memphis, TN	1,367	Peoria, IL	276
Evansville, IN-KY	948	Lake Charles, LA	251
Louisville, KY	608	Cape Girardeau, MO-IL	207
Cape Girardeau, MO-IL	533	Evansville, IN-KY	155
Jackson, MS	503	Clarksburg, TN	128
Atlanta (incl. E. TN), GA	469	St. Louis, MO*	115

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

Most of the outbound tonnage can be classified as bulk cargo, for which waterborne transit is most economical. Top commodities by tonnage and value are summarized in the following table. Top classes of freight include coal (31.6%), agricultural products (i.e., grain, oil kernels, nuts, and seeds; 36.6%), and liquid bulk (crude petroleum, refined petroleum, and industrial organic chemicals; 16.1%). Fast growing and industrializing economies in Latin America and Asia are driving much of this demand, as suggested by the relative growth of freight movements from St. Louis to New Orleans.

Table 67 – St. Louis Outbound Waterborne Flows by Commodity and Tonnage, 2010

Commodity	Tons (000's)	% of Total
Bituminous Coal	7,723	31.6%
Grain	6,111	25.0%
Oil Kernels, Nuts or Seeds	2,828	11.6%
Petroleum Refining Products	2,276	9.3%
Asphalt Paving Blocks or Mix	1,176	4.8%
Crude Petroleum	1,128	4.6%
Concrete Products	572	2.3%
Misc. Industrial Organic Chemicals	526	2.2%
Broken Stone or Riprap	477	2.0%
Gravel or Sand	368	1.5%
All Others	1,246	5.1%
Total Tons	24,432	100%

Source: IHS

St. Louis' geographical advantages also help explain the volume of outbound shipment. Powder River Basin and Illinois River Basin coal often moves by rail to St. Louis, before being transported down the Mississippi River towards domestic and international destinations. When pipeline capacity is not available, crude oil from Alberta is often shipped to St. Louis via rail before being trans-shipped down the Mississippi River to Gulf Coast storage facilities and/or refineries. Midwestern agriculture exports often first move via truck or rail to St. Louis for trans-shipment southbound down the Mississippi River to maritime export facilities in the Port of Southern Louisiana.

Top commodities in 2010 measured by value reveal no surprises in terms of composition. The relative rankings of top commodities shift as a function of commercial values. For example, high-value

petroleum refining products move to the top and bituminous coal falls (relative to its ranking by tonnage) due to its relatively low value per unit of weight.

Table 68 – St. Louis Outbound Waterborne Flows by Commodity and Value, 2010

Commodity	$ Millions	% of Total
Petroleum Refining Products	2,079	36.1%
Grain	803	14.0%
Oil Kernels, Nuts or Seeds	626	10.9%
Crude Petroleum	621	10.8%
Misc. Industrial Organic Chemicals	513	8.9%
Bituminous Coal	264	4.6%
Misc. Coal or Petroleum Products	166	2.9%
Misc. Industrial Inorganic Chemicals	129	2.3%
Asphalt Paving Blocks or Mix	110	1.9%
Concrete Products	80	1.4%
All Others	361	6.3%
Total Tons	5,752	100%

Source: IHS

By 2040, grains, oil kernels, nuts, and seeds collectively become the largest outbound cargoes measured by weight; comprising 58.3% of the total. This is driven primarily by export demand for soybeans in emerging markets. Meanwhile, coal and petroleum product outbound traffic declines.

Table 69 – St. Louis Outbound Waterborne Flows by Commodity and Tonnage, 2040

Commodity	Tons (000's)	% of Total
Oil Kernels, Nuts or Seeds	11,841	34.1%
Grain	8,383	24.2%
Bituminous Coal	5,199	15.0%
Crude Petroleum	2,128	6.1%
Broken Stone or Riprap	1,539	4.4%
Concrete Products	1,083	3.1%
Petroleum Refining Products	1,007	2.9%
Asphalt Paving Blocks or Mix	912	2.6%
Misc. Industrial Organic Chemicals	812	2.3%
Gravel or Sand	418	1.2%
All Others	1,357	3.9%
Total	34,680	100%

Source: IHS

Coal will remain important in absolute terms; however, its share of outbound traffic falls from 31.6% in 2010 to 15% in 2040. This trend is driven in part by lower domestic demand due to substitution of cheaper natural gas, and loss of export markets to lower-cost competition. In recent years, booming exports have offset lower domestic demand. However, projected world prices are below production costs in the Appalachian Basin and among most producers in the Illinois Basin. Forecasts anticipate that falling shares of European export markets (75% of total United States coal exports) and increased coal self-sufficiency in China will halve U.S. exports from about 44 million metric tons in 2012 to 23 million metric tons by 2030.

Other factors will support the continued viability of waterborne coal movements through and outbound from St. Louis. Coal moving from St. Louis down the Mississippi River is mined in the Power River Basin of Wyoming and Montana and, to a lesser extent, in the Illinois River Basin. The Power River Basin produces the most competitive coal in the United States in terms of cost, quality, and

environmental friendliness. Coal mining operations in the Power River Basin will likely be the last to be affected by reductions in domestic consumption and foreign export. The Illinois Basin produces the next most competitive coal in the United States. Illinois River Basin coal tends to have a high energy yield and blends well with Russian coal for European markets. New scrubbing technologies have reduced some of the environmental constraints of coal mined in the Illinois Basin, which tends to have high sulfur content. Thus, while coal production will decline in the United States, especially in Appalachia, the impacts on cargo movements down the Mississippi River will be less severe.

Outbound refined petroleum product traffic also falls in relative terms over the study period from 9.3% in 2010 to 2.9% in 2040. This trend does not necessarily reflect a decline in regional refining activity. In fact, as summarized in the truck modal section, regional refining capacity is expanding. The primary regional producer is Conoco Phillips, produces up to 350,000 barrels per day of refined products at the Wood River facility in Madison County, IL (near the confluence of the Illinois and Missouri rivers). Regional production will not keep pace with growth in regional demand; however, and outbound petroleum product movement is expected to decline. Meanwhile, southbound crude petroleum traffic will continue to grow, which is consistent with increased production in Canada and North Dakota and massive expansion of refining capacity in the Gulf Coast. The ascendency of soybeans and crude petroleum is particularly evident when analyzing forecasted outbound goods movement by commercial value, as summarized in the following table.

Table 70 – St. Louis Outbound Waterborne Flows by Commodity and Value, 2040

Commodity	$ Millions	% of Total
Oil Kernels, Nuts or Seeds	2,622	33.4%
Crude Petroleum	1,171	14.9%
Grain	1,101	14.0%
Petroleum Refining Products	920	11.7%
Misc. Industrial Organic Chemicals	791	10.1%
Bituminous Coal	178	2.3%
Concrete Products	151	1.9%
Solid State Semiconductors	103	1.3%
Metal Scrap or Tailings	96	1.2%
Misc. Industrial Inorganic Chemicals	88	1.1%
All Others	627	8.0%
Total	7,847	100%

Source: IHS

Oil kernels, nuts or seeds and crude petroleum combine for nearly half of the total. Despite declining tonnage, grain and petroleum products remain in the top four, the former due to still-high absolute volumes and the latter due to high commercial value per unit of weight. Also of note, industrial organic chemicals outbound flows grow from just under $500 million to nearly $800 million by 2040.

Understanding outbound waterborne freight logistics is aided by combining top destination and commodity pairs. The following table illustrates that just under half of the 7.7 million tons of outbound bituminous coal, by the far the largest single commodity in 2010, was shipped to Louisiana ports in Baton Rouge (2.8 million tons) and New Orleans (650,000 tons). Nearly all oil kernels, nuts, and seeds (essentially, soybeans) and grains (8.9 million tons) are shipped to Louisiana ports, mostly for export. Coal moves in large quantities to industrial centers along the Mississippi such as Memphis and along intersecting rivers, including destinations such as Evansville and Louisville along the Ohio River. Most coal reaching New Orleans (but not necessarily Baton Rouge) is exported. A mix of

products, including asphalt and crude petroleum moves in smaller quantities via the Ohio and Cumberland Rivers to Nashville.

Table 71 – St. Louis Outbound Waterborne Flows by Destination and Commodity (Tonnage), 2010

Destination BEA	Commodity	Tons (000's)
New Orleans, LA	Grain	4,683
Baton Rouge, LA	Bituminous Coal	2,847
New Orleans, LA	Oil Kernels, Nuts or Seeds	2,339
Baton Rouge, LA	Grain	1,074
Evansville, IN-KY	Bituminous Coal	766
New Orleans, LA	Bituminous Coal	650
Memphis, TN	Bituminous Coal	475
Louisville, KY	Bituminous Coal	473
Nashville, TN	Asphalt Paving Blocks or Mix	451
Nashville, TN	Crude Petroleum	381

Source: IHS

A review of top destination and commodity pairs measured by value helps provide a more complete picture of outbound freight logistics. Due in part to sheer volume, agricultural products moving to Louisiana still rank near the top; however, coal does not appear in the top ten. Refined petroleum products and chemicals (generally higher-value) are more pronounced, with large quantities moving to Louisiana and Texas, which is not surprising given the mass of petroleum and petrochemical infrastructure along the Gulf Coast and the possibilities for consolidation and trans-shipment to international markets. It is important to point out that most refined petroleum traffic moves to domestic markets, especially medium-sized cities on the Lower Mississippi River, the Ohio River (Wheeling, WV) and the Cumberland River (Nashville, TN). Therefore, the drivers of markets for liquid bulk are much more dispersed and more domestic than those for agricultural products.

Table 72 – St. Louis Outbound Waterborne Flows by Destination and Commodity (Value), 2010

Destination BEA	Commodity	$ Millions
New Orleans, LA	Grain	615
New Orleans, LA	Oil Kernels, Nuts or Seeds	518
Nashville, TN	Petroleum Refining Products	300
Houston, TX	Misc Industrial Organic Chemicals	226
Nashville, TN	Crude Petroleum	209
New Orleans, LA	Petroleum Refining Products	188
Baton Rouge, LA	Petroleum Refining Products	177
Wheeling, WV	Petroleum Refining Products	148
Jackson, MS	Petroleum Refining Products	146
Baton Rouge, LA	Grain	141

Source: IHS

The 2040 forecast for outbound freight by destination and tonnage helps clarify the dynamics behind the observed ascension of agricultural products and, to a lesser, extent liquid bulk. Not only does nearly all of the forecasted 20.2 million tons of grains, oil kernels, nuts, and seeds move to Louisiana ports, this cargo is increasingly routed to the New Orleans rather than Baton Rouge. Thus, it appears that a strong and fast-growing supply chain for grain and soybeans will drive growth in future southbound waterborne freight. Essentially, agricultural bulk will be loaded, trans-shipped, or trans-loaded in St. Louis, routed to the Port of Southern Louisiana via the Mississippi River, and exported.

Table 73 – St. Louis Outbound Waterborne Flows by Destination and Commodity (Tonnage), 2040

Destination BEA	Commodity	Tons (000's)
New Orleans, LA	Oil Kernels, Nuts or Seeds	11,300
New Orleans, LA	Grain	7,227
New Orleans, LA	Bituminous Coal	1,067
St. Louis, MO*	Broken Stone or Riprap	916
Baton Rouge, LA	Grain	883
Evansville, IN-KY	Bituminous Coal	861
Memphis, TN	Bituminous Coal	720
Nashville, TN	Bituminous Coal	717
New Orleans, LA	Crude Petroleum	599
Louisville, KY	Bituminous Coal	551

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

While coal shipments to Baton Rouge fall from second in the 2010 rankings (2.8 million tons) to outside the top ten, coal tonnage increases to New Orleans. Proximity to cheap natural gas in Texas and Gulf Coast will displace some domestic coal demand. Meanwhile, exports and, hence, outbound tonnage to New Orleans, increases due primarily to the viability of Powder River Basin coal. Otherwise, the data suggests limited change in the growth or distribution of other key commodities, except that New Orleans and its rapidly expanding and modernizing oil refinery infrastructure replaces Nashville as the top destination for crude petroleum by 2040. Petroleum refining operations will increasingly concentrate along the Gulf Coast, where facilities operate at greater scale and efficiency than elsewhere in the United States. Thus, crude petroleum produced in the North American inland will in the future increasingly be routed to Gulf Coast facilities by pipeline.

The 2040 forecast by destination and commodity as measured by freight value further clarifies some of the underlying supply chain trends for outbound traffic. Agriculture freight movements to New Orleans still dominate the rankings due to sheer volumes and, especially, growth in soybean exports. Crude petroleum and chemicals, however, also show dramatic increases from 2010, with Gulf Coast BEA's of New Orleans and Houston being the leading destinations. As expected, the data suggests the emergence of oil refining supply chain beginning with crude production in Alberta that moves via pipeline and, when pipeline supply is unavailable, rail to St. Louis for trans-shipment to the Gulf.

Table 74 – St. Louis Outbound Waterborne Flows by Destination and Commodity (Value), 2040

Destination BEA	Commodity	$ Millions
New Orleans, LA	Oil Kernels, Nuts or Seeds	2,502
New Orleans, LA	Grain	949
New Orleans, LA	Crude Petroleum	330
New Orleans, LA	Misc Industrial Organic Chemicals	329
Houston, TX	Misc Industrial Organic Chemicals	309
Nashville, TN	Crude Petroleum	247
Jackson, MS	Crude Petroleum	138
New Orleans, LA	Petroleum Refining Products	127
Memphis, TN	Petroleum Refining Products	121
Baton Rouge, LA	Grain	116

Source: IHS

The forecasted modest increase in chemicals traffic measured by value is mostly a function of increased demand in markets typically supplied by St. Louis regional chemicals manufacturers. This trend will be supported by the availability of petrochemical feed stocks from shale gas development in

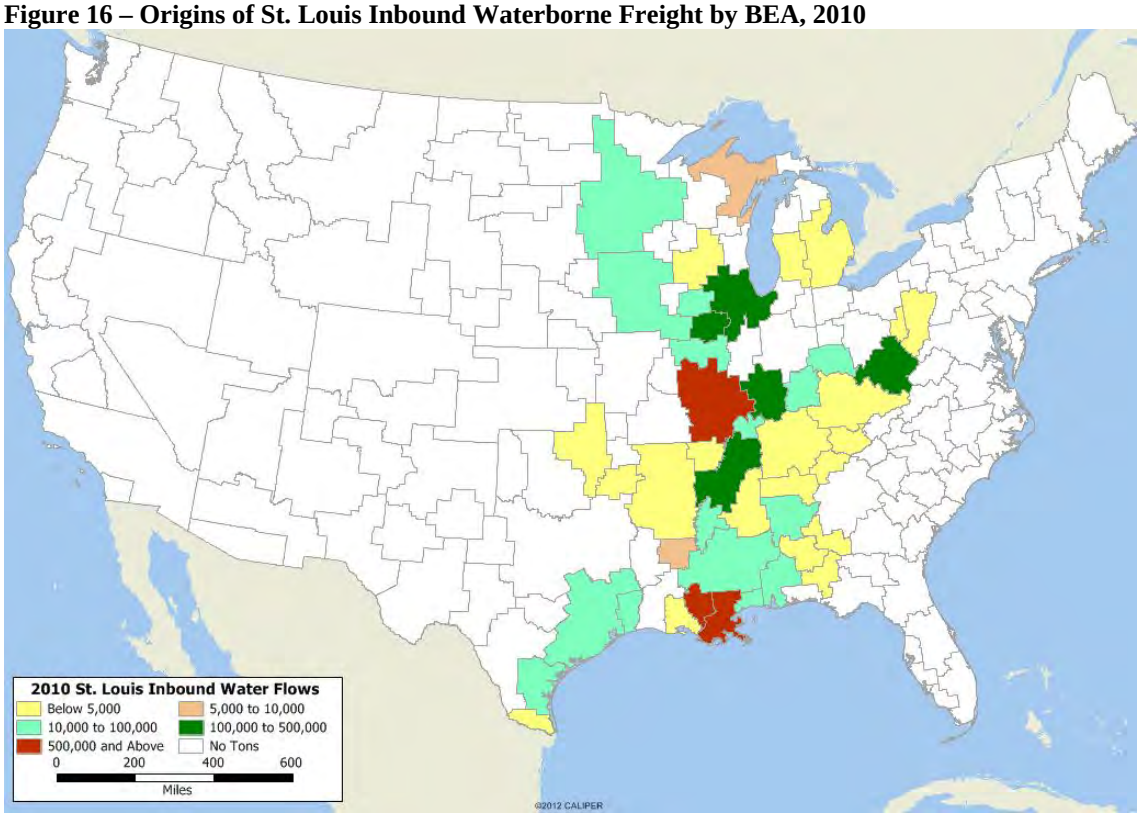
North Dakota. However, the largest commercial opportunities for leveraging these cheap, domestic petrochemical feed stocks to expand the chemicals industry are in the production of ethylene and, ultimately, the production of plastic resins. Most of the raw materials will move towards the Gulf Coast and other coastal areas with major chemicals manufacturing industries.

While outbound waterborne chemicals movements from St. Louis to the Gulf Coast cities of New Orleans and Houston are expected to increase, it is important to understand these numbers within the context of broader trends in U.S. chemicals production and transportation. Ethylene tends to move via pipeline and plastic resins typically move by rail, limiting the potential for increased waterborne traffic. Moreover, total chemicals production in St. Louis equals only about 150,000 tons per year, consisting primarily of bleach and cleaning products and IHS forecasts flat regional growth in chemicals production in the near term. St. Louis also has vibrant pharmaceuticals and personal cleaning and beautification products manufacturing industries, which can be considered chemicals but are classified separately.

St. Louis Waterborne Inbound Traffic

St. Louis inbound waterborne traffic is much smaller than outbound traffic, especially when measured by tonnage. Nevertheless, there are still significant inbound flows. In contrast to outbound flows; however, the vast majority of inbound traffic moves in a northbound direction to and through St. Louis.

Figure 16 – Origins of St. Louis Inbound Waterborne Freight by BEA, 2010



Source: IHS

As summarized in the following information, waterborne inbound freight tends to originate downriver in New Orleans and Baton Rouge or in other BEAs on the Lower Mississippi and Ohio rivers. Between 35-40% of total tonnage (2 million out of 5.2 million tons) and value ($1.2 billion out of $3.4

billion) originates in Louisiana ports. The next largest shares originate within the St. Louis BEA but outside the study region and in neighboring states.

Table 75 – St. Louis Inbound Waterborne Flows by Origin, 2010

Origin BEA	Tons (000's)	Origin BEA	$ Millions
New Orleans, LA	1,147	New Orleans, LA	783
Baton Rouge, LA	875	Baton Rouge, LA	403
St. Louis, MO*	556	St. Louis, MO*	367
Cape Girardeau, MO-IL	518	Evansville, IN-KY	241
Evansville, IN-KY	421	Chicago, IL	215
Chicago, IL	384	Memphis, TN	178
Memphis, TN	218	Lake Charles, LA	155
Peoria, IL	208	Peoria, IL	140
Charleston, WV	136	Corpus Christi, TX	130
Corpus Christi, TX	87	Houston, TX	87

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

While outbound traffic is forecasted to grow slowly but steadily by 2040, inbound traffic will contract modestly. The 2040 forecast suggests that St. Louis will see a slight increase in inbound traffic as measured by weight and value from New Orleans, but flat or declining flows from other top origins. There are several exceptions to this rule, such as increased cargo tonnage from Corpus Christi, TX and Alpena, MI, and increased cargo by value from Houston, TX and Lake Charles, LA. Nonetheless these origins tend to be relatively less important from an overall waterway use perspective.

Table 76 – St. Louis Inbound Waterborne Flows by Origin, 2040

Origin BEA	Tons (000's)	Origin BEA	$ Millions
New Orleans, LA	1,342	New Orleans, LA	1,295
Baton Rouge, LA	823	Baton Rouge, LA	458
Evansville, IN-KY	483	Peoria, IL	249
Cape Girardeau, MO-IL	370	Lake Charles, LA	237
Peoria, IL	346	Corpus Christi, TX	168
Chicago, IL	234	Evansville, IN-KY	118
St. Louis, MO-IL*	157	Chicago, IL	109
Memphis, TN	121	St. Louis, MO*	106
Alpena, MI	120	Houston, TX	106
Corpus Christi, TX	102	Memphis, TN	101

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

The following table illustrates that over half of 2010 inbound waterborne tonnage consisted of liquid bulk and solid mined commodities, such as refined petroleum products, coal, nonmetallic minerals, and iron ores. Fertilizers were also important, owing to the fact that St. Louis is an important center of commerce for agriculture. Most of the remaining key commodities could be classified as construction-related manufactured products such as cement, ceramics, and asphalt.

Table 77 – St. Louis Inbound Waterborne Flows by Top Commodity and Tonnage, 2010

Commodity	Tons (000's)	% of Total
Petroleum Refining Products	1,446	27.8%
Fertilizers	814	15.7%
Misc. Nonmetallic Minerals	582	11.2%
Bituminous Coal	548	10.5%
Potassium or Sodium Compound	261	5.0%
Misc. Coal or Petroleum Products	255	4.9%
Portland Cement	238	4.6%
Blast Furnace or Coke Oven Products	156	3.0%
Asphalt Paving Blocks or Mix	138	2.7%
Iron Ores	82	1.6%
All Others	680	13.1%
Total	5,199	100%

Source: IHS

The relative importance of higher value-added products is more pronounced when evaluated from the perspective of commercial value. Liquid petroleum-based products such as refined petroleum and various chemical-based products make up about half of the total cargo by value. The quantity of inbound refined petroleum (1.4 million tons) is smaller than outbound volumes by weight (2.3 million tons) due in part to regional refinery activities at the Wood River facility, which helps satisfy regional demand and currently supports outbound trade. Fertilizers and coal remain near the top of the rankings but at much lower percentages of total cargo as when measured by weight. Iron, steel, and manufactured machinery becomes more important when measured by value relative to lower-cost construction materials such as cement.

Table 78 – St. Louis Inbound Waterborne Flows by Top Commodity and Value, 2010

Commodity	$ Millions	% of Total
Petroleum Refining Products	1,321	42.9%
Fertilizers	269	8.7%
Chemical Preparations	249	8.1%
Misc. Coal or Petroleum Products	218	7.1%
Blast Furnace or Coke Oven Products	174	5.6%
Primary Iron or Steel Products	100	3.2%
Misc. Indus Inorganic Chemicals	91	2.9%
Misc. Machinery or Parts	84	2.7%
Potassium or Sodium Compound	77	2.5%
Misc. Metal Ores	75	2.4%
All Others	426	13.8%
Total	3,083	100%

Source: IHS

The most striking insight from inbound commodity tonnage forecasts for 2040 is that much of the declining volume is attributed to refined petroleum. The following table illustrates the sharp decline of petroleum refining inbound traffic in both absolute and relative terms. Total tonnage falls from 1.4 million in 2010 to 700,000 in 2040, while the share of total cargo falls from 28% to 15%. Forecasted reductions in fertilizer and coal inbound traffic also contribute to declining inbound volumes. Slight increases in chemicals and iron ores help offset these losses. Nonetheless, fuel and energy products and fertilizer are presumed to decline from inbound traffic, while other goods remain relatively stable.

Table 79 – Inbound Waterborne Flows by Top Commodity and Tonnage, 2040

Commodity	Tons (000's)	% of Total
Petroleum Refining Products	684	14.7%
Misc. Nonmetallic Minerals	638	13.7%
Bituminous Coal	495	10.6%
Fertilizers	494	10.6%
Portland Cement	298	6.4%
Potassium or Sodium Compound	265	5.7%
Blast Furnace or Coke Oven Products	218	4.7%
Iron Ores	192	4.1%
Chemical Preparations	180	3.9%
Misc. Coal or Petroleum Products	165	3.5%
All Others	1,036	22.2%
Total	4,665	100%

Source: IHS

The overall decline in inbound refined petroleum occurred despite the fact that regional demand for petroleum products is expected grow at a faster rate than regional production at Wood River. To understand this trend requires an intermodal supply chain perspective. First, it is important to understand that oil and gas will only move on surface or water transportation modes where pipelines are unavailable. Over the long term, it is expected that pipeline networks will continue to expand. In particular, the Keystone XL pipeline will provide more direct access from Canadian oil sands and Bakken shale gas from North Dakota and Montana to the Gulf Coast. Wood River is connected to the existing Keystone pipeline connecting Canadian oil sand production areas.

Second, waterborne freight flows are not necessarily representative of overall regional trends in oil production, refining, and consumption. The following table sums all refined petroleum and liquid gas flows across water, truck, and rail modes, providing a more holistic inter-modal perspective. The data illustrates the expected trend towards increased inbound flows of oil and gas products and reduced outbound flows of refined products, as production at Wood River increasingly supplies growing regional demand.

Table 80 – St. Louis Refined Petroleum and Natural Gas Commodity Flows, All Modes

Commodity Group	2010 Tons	2010 $ Millions	2040 Tons	2040 $ Millions
Oil & Gas	9,888	$8,756	7,823	$6,906
Inbound	2,369	$2,149	2,810	$2,552
Outbound	4,862	$4,361	2,758	$2,455
Through	2,658	$2,245	2,255	$1,898

Source: IHS

Although overall inbound tonnage will decline, inbound flows of chemicals to St. Louis will increase. By 2040 the combined value of chemical preparations and industrial inorganic chemicals will approximately equal the total value of petroleum products despite much lower quantities when measured by weight. Thus, chemicals will be increasingly important for inbound waterborne traffic, supporting manufacturing and agriculture industry growth.

Table 81 – St. Louis Inbound Waterborne Flows by Top Commodity and Value, 2040

Commodity	$ Millions	% of Total
Petroleum Refining Products	624	18.9%
Chemical Preparations	580	17.6%
Blast Furnace or Coke Oven Products	244	7.4%
Fertilizers	163	4.9%
Aluminum or Alloy Basic Shapes	163	4.9%
Primary Iron or Steel Products	155	4.7%
Misc. Machinery or Parts	148	4.5%
Misc. Coal or Petroleum Products	141	4.3%
Misc. Indus Inorganic Chemicals	107	3.2%
Manufactured Products	104	3.1%
All Others	869	26.3%
Total	3,299	100%

Source: IHS

Interestingly, the forecast suggests that inbound flows of fertilizer, which can be considered a chemical, actually declines. Proximity to cheaper oil and gas byproduct feed stocks could certainly support increased regional production in St. Louis or a shifting of urea and other key inputs to the Northern Plains and Canada; however, the impact on regional logistics is expected to be modest. Again, an intermodal perspective lends insight. The following table considers all fertilizer flows across water, truck, and rail modes, suggesting an overall modest shift in shipments in favor of greater net regional production.

Table 82 – St. Louis Fertilizer Commodity Flows, All Modes

Commodity Group	2010 Tons	2010 $ Millions	2040 Tons	2040 $ Millions
Fertilizer	3,966	$1,311	3,086	$1,021
Inbound	946	$313	609	$201
Outbound	802	$265	655	$216
Through	2,658	$2,245	2,255	$1,898

Source: IHS

The top ten combinations of origin and commodity groupings measured by weight are currently In contrast to fertilizers, inbound shipments of aluminum, iron, steel, and other machine products will grow. This trend suggests the continued local demand for structures and equipment to support manufacturing.

The top ten combinations of origin and commodity groupings measured by weight are currently dominated by refined petroleum, fertilizers, and nonmetallic minerals. Much of the inbound refined petroleum is shipped from within the St. Louis BEA but outside the study region, Memphis, and Chicago. Together, these three origins accounted for about one million of the 1.4 million tons of inbound refined petroleum in 2010, which was by far the largest commodity by weight in that year. Nearly all of the 800,000 tons of fertilizers, the next most important inbound cargo by weight in 2010, were shipped from Louisiana ports. Most of the remaining inbound cargo originated within outlying areas of the St. Louis BEA, except for some nonmetallic minerals and coal shipped from Louisiana.

Table 83 – St. Louis Inbound Waterborne Flows by Top Origin and Commodity (Tonnage), 2010

Origin BEA	Commodity	Tons (000's)
St. Louis, MO*	Petroleum Refining Products	565
Baton Rouge, LA	Fertilizers	371
New Orleans, LA	Fertilizers	351
St. Louis, MO*	Misc Nonmetallic Minerals	262
New Orleans, LA	Misc Nonmetallic Minerals	239
Baton Rouge, LA	Bituminous Coal	215
St. Louis, MO*	Portland Cement	187
Memphis, TN	Petroleum Refining Products	181
Chicago, IL	Petroleum Refining Products	172
St. Louis, MO*	Bituminous Coal	164

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

The following table suggests that the trends observed in inbound volumes by weight are mostly confirmed when measured and ranked by commercial value. Due to the combination of high commodity value and large volume by weight, it is not surprising that refined petroleum originating in St. Louis, Memphis, and Chicago top the list. After these combinations, the Gulf Coast dominates the rankings. This is also expected due to the combination of high volumes (by weight) of fertilizer inbound traffic in 2010 and the relatively high value of the commodity.

Table 84 – St. Louis Inbound Waterborne Flows by Top Origin and Commodity (Value), 2010

Origin BEA	Commodity	$ Millions
St. Louis, MO*	Petroleum Refining Products	516
Memphis, TN	Petroleum Refining Products	166
Chicago, IL	Petroleum Refining Products	157
Baton Rouge, LA	Fertilizers	123
New Orleans, LA	Petroleum Refining Products	120
New Orleans, LA	Fertilizers	116
New Orleans, LA	Blast Furnace or Coke Oven Products	93
Corpus Christi, TX	Chemical Preparations	92
Lake Charles, LA	Misc. Machinery or Parts	83
Peoria, IL	Petroleum Refining Products	81

*Denotes areas outside the study area in the St. Louis BEA
Source: IHS

In summary, analyzing top inbound cargo origin-commodity combinations by commercial value in 2010 elevates the importance of petroleum, chemical, and fertilizer shipped upriver (and to a lesser extend downriver from Chicago), whereas the same analysis when measured by tonnage elevates the importance of regionally sourced mined products such as nonmetallic minerals and coal.

The 2040 forecast of top inbound origin-commodity combinations measured by weight confirms the expected decline in refined petroleum volumes moving into St. Louis. Petroleum products originating in Peoria, IL and Memphis, respectively, remain in the top ten rankings. However, St. Louis and Chicago, formerly top origins for refined petroleum, fall out of the top ten. Fertilizers and nonmetallic minerals shipped from New Orleans and Baton Rouge, respectively, are still important in 2040; however, the combined quantity of fertilizers originating from the Louisiana ports falls from about 700,000 tons in 2010 to about 400,000 tons in 2040. The Evansville BEA becomes a much more important origin, routing about 400,000 tons of coal and potassium and sodium compound westbound on the Ohio River and northbound to St. Louis via the Mississippi River. In fact, Evansville is responsible for over half of the (slightly declining overall) share of coal moving into St. Louis.

Table 85 – St. Louis Inbound Waterborne Flows by Top Origin and Commodity (Tonnage), 2040

Origin BEA	Commodity	Tons (000's)
New Orleans, LA	Misc. Nonmetallic Minerals	335
Evansville, IN-KY	Bituminous Coal	278
New Orleans, LA	Fertilizers	271
Baton Rouge, LA	Misc Nonmetallic Minerals	207
Cape Girardeau, MO-IL	Portland Cement	199
Peoria, IL	Petroleum Refining Products	174
Baton Rouge, LA	Fertilizers	163
New Orleans	Blast Furnace or Coke Oven Products	157
Evansville, IN-KY	Potassium or Sodium Compound	116
Memphis, TN	Petroleum Refining Products	104

Source: IHS

The forecasted top combinations by both origin and commercial values emphatically illustrate the ascension of inbound flows of chemicals freight originating in the Gulf Coast. About 80% of the $580 million in forecasted inbound chemicals cargo originates in Louisiana and Texas, which is consistent with the hypothesis that fertilizer production may grow, albeit slightly, in St. Louis. Urea is a major input to fertilizer, and the chemical tends to be imported through the Gulf Coast. Moreover, only a relatively small amount of fertilizer sourced from New Orleans remains in the top rankings, consistent with the commodity's forecasted declining shares of overall inbound traffic.

Table 86 – St. Louis Inbound Waterborne Flows by Top Origin and Commodity (Value), 2040

Origin BEA	Commodity	$ Millions
Baton Rouge, LA	Chemical Preparations	227
New Orleans, LA	Blast Furnace or Coke Oven Products	175
New Orleans, LA	Aluminum or Alloy Basic Shapes	162
Peoria, IL	Petroleum Refining Products	159
Corpus Christi, TX	Chemical Preparations	152
Lake Charles, LA	Misc. Machinery or Parts	144
New Orleans, LA	Manufactured Products	101
Memphis, TN	Petroleum Refining Products	95
New Orleans, LA	Chemical Preparations	90
New Orleans, LA	Fertilizers	89

Source: IHS

The data also confirms trends previously observed with respect to refined petroleum freight movements. The previous table suggests the declining importance of refined petroleum at least as waterborne traffic, with only a combined $250 million shipped to St. Louis from Peoria, IL and Memphis appearing in the top ten rankings.

Waterborne Freight Summary

Having reviewed outbound and inbound freight data and forecasts, it is possible to make several inferences about the current and likely future trajectory of waterborne freight logistics for the St. Louis Region:

- The vast majority of waterborne traffic originates in or is trans-shipped through St. Louis, and moves southbound along the Mississippi River.
- The largest and most important waterborne growth segment is grains and other agricultural products such as soybeans, which move in heavy volumes southbound to Louisiana ports. Outbound grains, oil kernels, nuts and seeds will more than double in volume by weight from 8.9

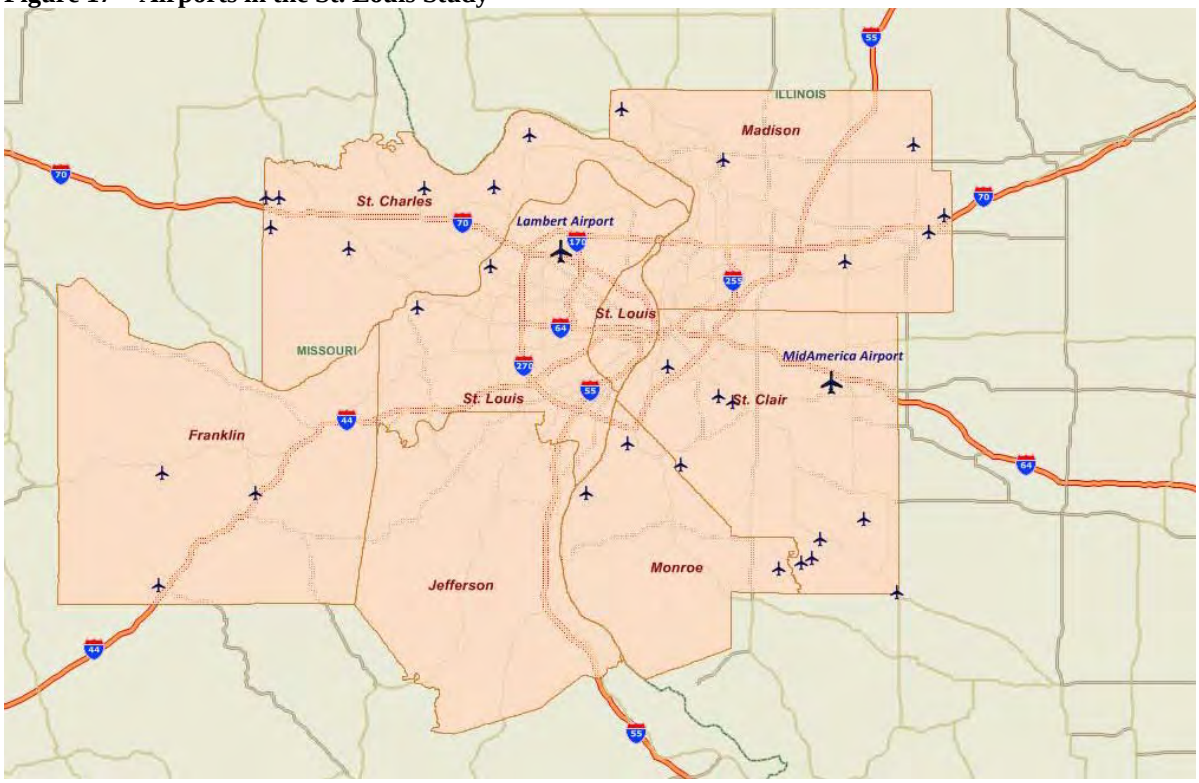
million tons in 2010 to 20.2 million tons in 2040, with New Orleans serving as the primary destination port. Most of this cargo will ultimately serve international markets.

- While currently a top commodity when measured by weight, coal flows both inbound and outbound are forecasted to decline. Much of this is attributed to declining outbound flows to Baton Rouge, currently the top destination for this cargo. This trend is more a function of substitution of natural gas for energy generation in the Gulf than falling export markets for coal. Although U.S. coal exports will decline, the relative competitiveness of Powder River Basin and Illinois River Basin coal (compared to Appalachia Basin coal) will help stabilize coal movement southbound.
- St. Louis sits in the middle of an evolving petroleum and gas supply chain, whereby increased production of crude oil and natural gas in Canada and North Dakota is transported via pipeline to expanding Gulf Coast facilities for refining. A branch of the existing pipeline infrastructure also serves the Wood River facility. Expansion of regional refining could be a boost to the regional economy, but will primarily impact pipeline infrastructure. To the extent that pipeline capacity is inadequate, petroleum products produced in St. Louis for sale to BEAs adjacent to the Mississippi will move via regional waterborne infrastructure.
- The growth of inbound chemicals from the Gulf Coast coincides with decreased inbound and increased outbound fertilizer movements, which suggests an altering of supply chain, with local agriculture companies consuming Gulf Coast chemicals for fertilizer production in the St. Louis BEA, some of which subsequently moves back downriver to other demand centers.
- Bulk movements of material in, out and through St. Louis will also be affected by changes in railroad networks and their traffic distribution. The use in petroleum by rail has shifted inbound marine petroleum markets, as well as outbound coal markets where coal is carried by rail directly to the Gulf Coast.

Regional Airborne Freight Perspective

The St. Louis study area includes 32 airports from multi-runway, full instrument landing systems (ILS) to visual flight rules (VFR) and grass runways. Of these, two airports are responsible for most airborne cargo – Lambert-St. Louis International Airport (Lambert Airport) in St. Louis, MO and MidAmerica St. Louis Airport (MidAmerica Airport) in Belleville, IL. This section primarily focuses on freight moving through these two airports. The Downtown St. Louis and Chesterfield Airports are sewing a number of industries, customers and tenants as well.

Figure 17 – Airports in the St. Louis Study



Source: IHS

There are two types of air freight – Freight only carriers such as FedEx and UPS, and air freight carried within passenger airframes, such as its larger aircraft used in international flights.

Context

For commercial aviation and air freight in the St. Louis Region, it has been difficult to separate the past and present from the future. To understand where commercial aviation can go in the future, it is important to appreciate the tumultuous history of the Airline Industry since deregulation. Although the world has changed profoundly since deregulation, many of the issues that the industry faces today remain arguably the same: the impact of deregulation; the pace of global growth, higher fuel prices, low cost carriers; and industry consolidation.

Clearly, deregulation allowed individual airlines to make route and fare decisions on the basis of economics and competitive advantage. As a result, national carriers began to rethink access to, or withdraw completely from short-haul markets. This pattern began soon after deregulation, as aviation fuel prices escalated due in part to the Persian Gulf in 1979. Since the average cost of fuel used per mile for all aircraft decreases as distance traveled increases, the rapid increase in jet fuel costs, primarily after December 1978, made short-haul flights in smaller markets increasingly unprofitable. More importantly, as fuel prices increased, operating costs for older, inefficient aircraft increased substantially, rendering a reported 25% of jet aircraft capacity in the country obsolete by 1980.

The 1985 to 1989 period was marked by additional refinement of the airport hub concept. One innovation was code-sharing, which allowed regional airlines to associate themselves with a national carrier by sharing computer reservation codes, which streamlined the reservation process. The

national carriers further integrated themselves with regional carriers through acquisition of equity positions or outright purchase. As a result, national carriers were able to improve efficiency by allocating a greater share of their short-haul markets to associated regional carriers. Re-allocation of air routes to regional carriers, particularly after 1985, allowed the regional airlines to grow rapidly as travel demand increased.

Overall, the first 12 years after deregulation were marked by dramatic growth in the airline industry as demand for air travel expanded rapidly in response to increased personal income and strong overall economic growth nationwide. Scheduled airport enplanements increased from around 300 million in 1980 to roughly 450 million in 1990. Growth in regional carrier enplanements was more dramatic, increasing from roughly 13 million in 1980 to almost 38 million by 1990. The dramatic increase in enplanement activity drove demand for both new aircraft and increased market share. By 1990 the eight largest national carriers (United, Delta, American, Northwest, Continental, USAir, TWA, and Pan Am) had placed orders for over 2,700 new aircraft at a cost of roughly $141 billion. Several airlines, including Northwest, were also purchased by investment groups during the late 1980's as airline industry expansion continued.

Even as travel demand increased, the airline industry was slowly consolidating and adjusting to market forces. Consolidation among regional airlines was strongest as national carriers integrated operations with short-haul regional carriers. Of the 250 regional carriers operating in 1981, only about 159 were operating by 1989. Two national carriers also fell victim to consolidation by 1990; Republic was absorbed by Northwest Airlines, and Braniff went bankrupt.

1990 proved to be one of several watershed years, beginning with the national recession, which slowed economic activity and reduced demand for air travel beginning in 1990. The invasion of Kuwait in 1990 reportedly increased jet fuel prices from fifty-five cents per gallon during the late-1980's to roughly $1.40 a gallon in mid-October of 1990. Although the airlines tried to pass a reported 150% increase in fuel costs onto the consumer via higher ticket prices, a recessionary economy and the fear of terrorism made such increases unrealistic, since the public was generally unable or unwilling to travel. Although individual airline companies responded by sharply reducing ticket prices to induce travel, the initial result was to plunge the industry into serious debt.

These factors drove a second round of industry consolidation, with Pan American, Eastern, and Midway Airlines being dissolved, and Continental, America West, and Trans World Airlines entering bankruptcy. The major full-service carriers, Delta, American, and United, survived primarily because their larger size allowed for increased resiliency against economic downturns. Even so, all carriers were forced to cut costs and delay or cancel new aircraft orders after 1990.

Increasing fuel costs and airfare wars proved to be only the first of several closely related challenges that the industry would face by 1995. The new challenges, including overcapacity and significant changes in the public's air travel tendencies, combined to alter the economics of air travel to a large extent and allowed a new type of airline to enter the marketplace: the "low cost" carrier.

Overcapacity emerged in the 1970's when the introduction of wide-body aircraft increased the number of available seats in relation to demand. The problem of overcapacity re-emerged by 1990 for several reasons:

- Between 1990 and 1993, Delta, United, and American increased capacity by a reported 35%, and smaller carriers on generally less stable financial ground increased capacity by roughly 10%.
- Rapid oil price increases and airfare wars forced several airlines into bankruptcy protection. Roughly one-fourth of total industry capacity was reportedly under Chapter 11 by 1993.
- The surplus of aircraft on the market after 1991 drove acquisition and lease prices for older aircraft down considerably.

Overcapacity was magnified by a basic change in the public's air travel tendencies. Historically, the airlines relied on business travelers paying full fares to subsidize leisure travelers using discount fares. According to the Economist, such "high-yield" passengers would typically make up only about 20% of passengers on any given plane but provide about 66% of total revenue. By 1990, however, the business travel market was getting consistently smaller as the recession forced companies to down-size and cut costs. New advances in teleconferencing and fax communications also reduced the number of overall business trips. The full-service airlines' financial state began to deteriorate as the costs of providing full service were increasingly unsupported by the lower fares paid by price sensitive leisure travelers. Although the number of leisure travelers as a percentage of total airline traffic increased to fill the gap after 1990, the increased price sensitivity of leisure travelers did not allow established airlines the flexibility to increase fares, because competitive forces in the industry had strengthened, linked with the interaction of overcapacity and increased leisure travel price sensitivity, which created an environment for "low cost" airlines such as Southwest, to emerge.

Clearly, since 2000 the airline industry has continued to evolve, with industry consolidation and mergers, new pricing strategies, and on-going challenges of managing fuel costs. In many ways, challenges that have unfolded since 2000 are no different from issues faced by the Airline Industry after deregulation, particularly during the 1990's. Looking to the future, experience suggests the following key themes will impact future opportunities:

- The gradual evolution of low cost carriers (LCCs) such as JetBlue, Frontier, and Southwest into mature mainline carriers. For Southwest in particular, its recent acquisition of AirTran and ATA reinforce this trend.
- The evolving impact of recent mainline carrier mergers (Delta / Northwest and United / Continental) on host airports.
- Evolution of smaller regional carriers (Comair, United Connection, Mesaba, etc.), and relationships with their mainline carriers.
- Impact of higher fuel costs on airline industry competitiveness
- Emergence of new and significantly quieter and more fuel efficient aircraft, as well as initial debate about the environmental impact of air travel. In this context, an American Airlines plan to replace their existing MD-80 fleet with newer and quieter Boeing 737's is notable.
- Tacit recovery in global air cargo between 2009 and 2010, linked with initial recovery in export markets, with likely competition with other U.S. airports for expected growth in Asian cargo flights.

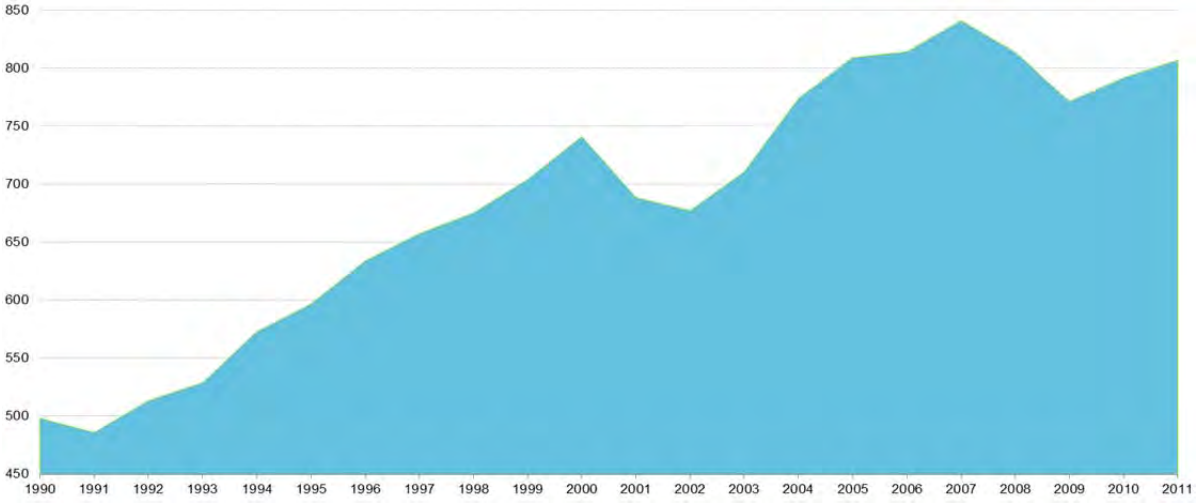
- For domestic air cargo, the extent to which companies such as Fed Ex and UPS are able to move an increasing share of freight by expedited ground versus air, reducing the rate of growth in domestic air freight.
- Policy debate over high speed rail implementation in the Midwest, and its plausible ability to capture market share from air travel for regional trips.

One clear factor that ties all of these elements together is the rate of recovery from the recession. For the airlines, aside from specific concerns about fuel prices, the industry appears to be in a better position to recover now compared to past years, with less over-capacity and more fuel efficient aircraft, which should bode well for revenue growth as the recovery strengthens.

Aviation Analysis

Looking at national trends in passenger enplanements, it is hard to ignore the impacts of 9/11 and the "Great Recession". While annualized growth rates of 4% were witnessed before and after 9/11, with the end of the recession, aviation demand has only grown at an annualized rate of about 2% between 2009 and 2011.

Figure 18 – Total Passenger Enplanements (in millions) in the U.S., 1990-2011

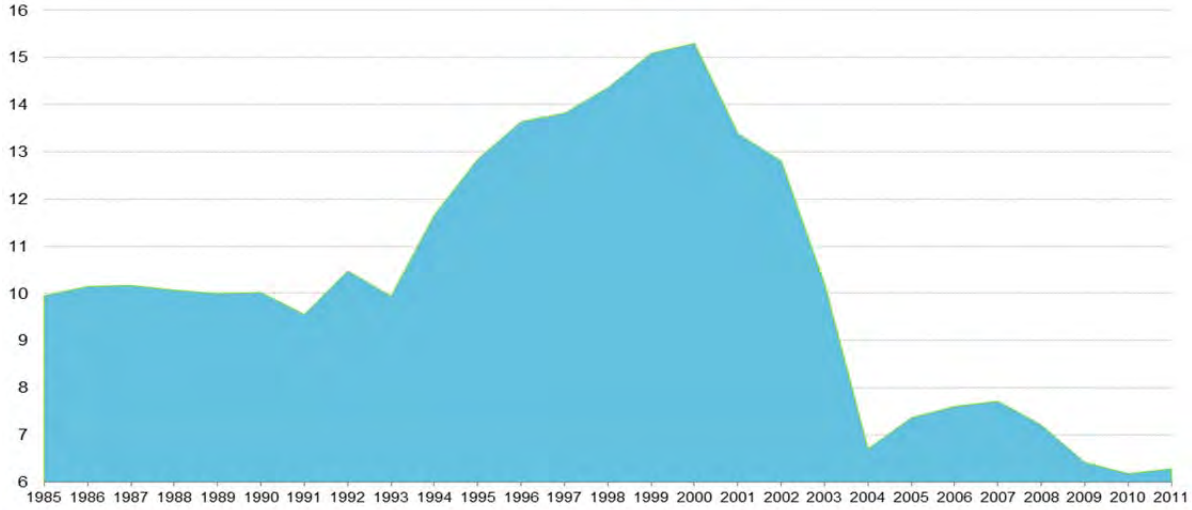


Source: BTS

Local Aviation Perspectives

Lambert's high passenger volumes changed dramatically after TWA went bankrupt and merged with American Airlines in 2001. After the merger, there was a noticeable decline in passenger enplanements, as international flights were removed and hub status was lost. Enplanements increased significantly between 1993 and 2000 (to 15+ million), and subsequently declined at an even greater rate between 2000 and 2004. Lambert has seen a recent uptick in enplanements, with growth in 2011 and 2012.

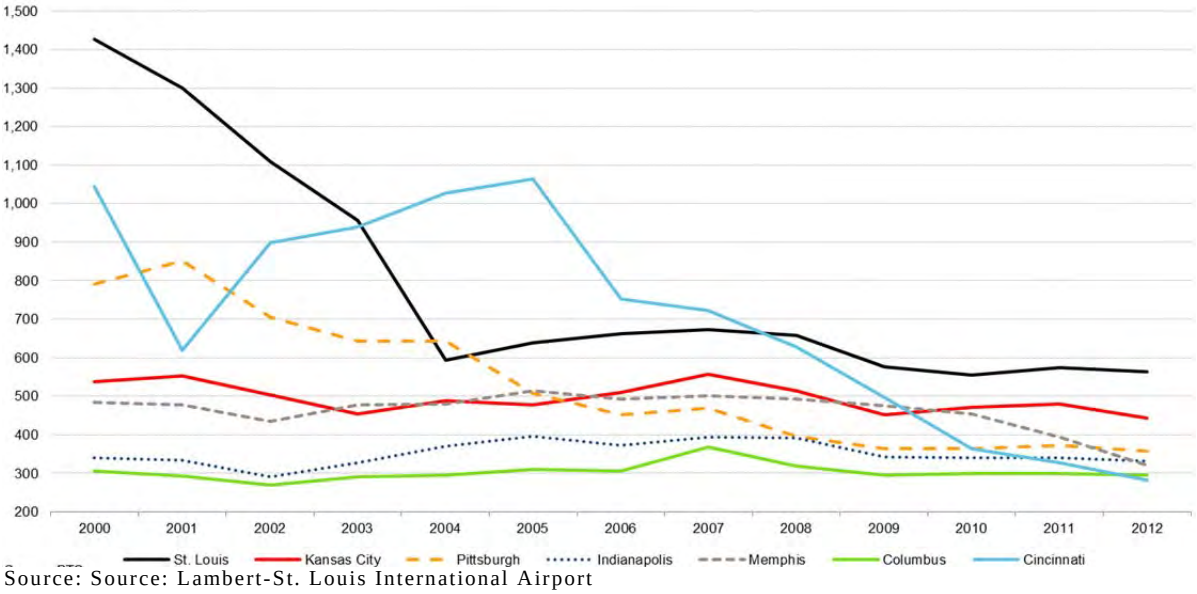
Figure 19 – Passenger Enplanements at Lambert-St. Louis International Airport, 1985-2011 (millions)



Source: Lambert-St. Louis International Airport

To place Midwest regional passenger service in context, the following chart illustrates recent growth trends across the benchmark airports. National trends are muted compared to the impact of major operational changes that took place in St. Louis and Cincinnati since 2000.

Figure 20 – Passenger Enplanements by Airport in June (in thousands), 2000-2012



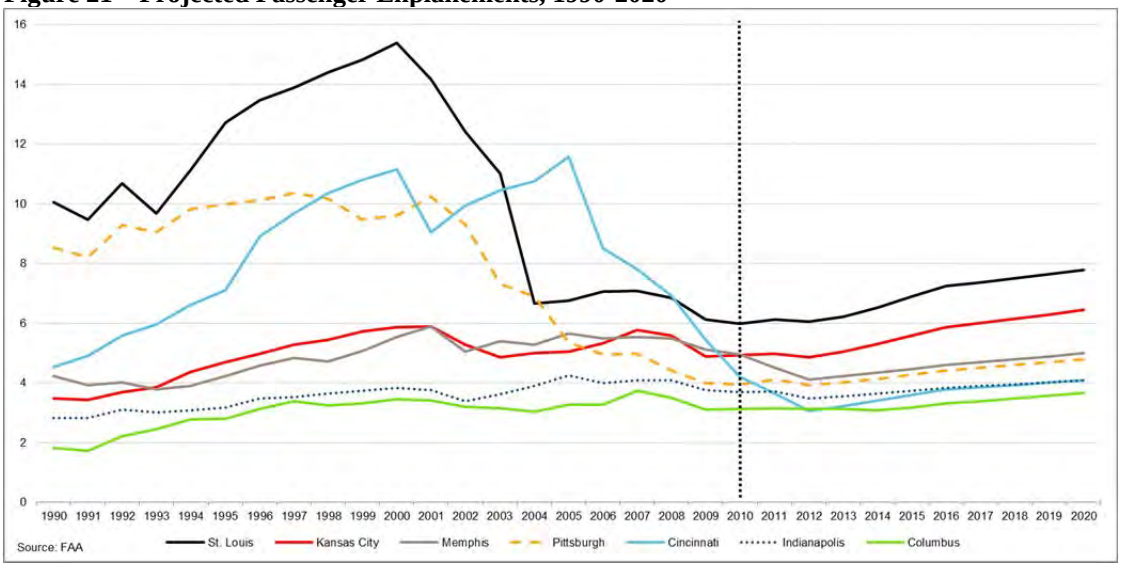
Source: Source: Lambert-St. Louis International Airport

From the chart above, the most recent data show how St. Louis remains a clear leader in the pool of selected airports in terms of passenger enplanements despite the major declines witnessed between 2000 and 2004, along with airport such as Kansas City. Indianapolis is notable in part because they just recently opened a new airport terminal.

FAA's Terminal Area Forecast (TAF) system estimates future passenger enplanements by facility and currently provides forecasts out to 2040. The following figure displays actual passenger enplanement statistics between 1990 and 2010 and forecasted totals for 2011 to 2020. The 2011 TAF forecasts

provided do not reflect any potential impacts resulting from the bankruptcy filing by American Airlines in November 2011 as well as the merger with U.S. Air.

Figure 21 – Projected Passenger Enplanements, 1990-2020



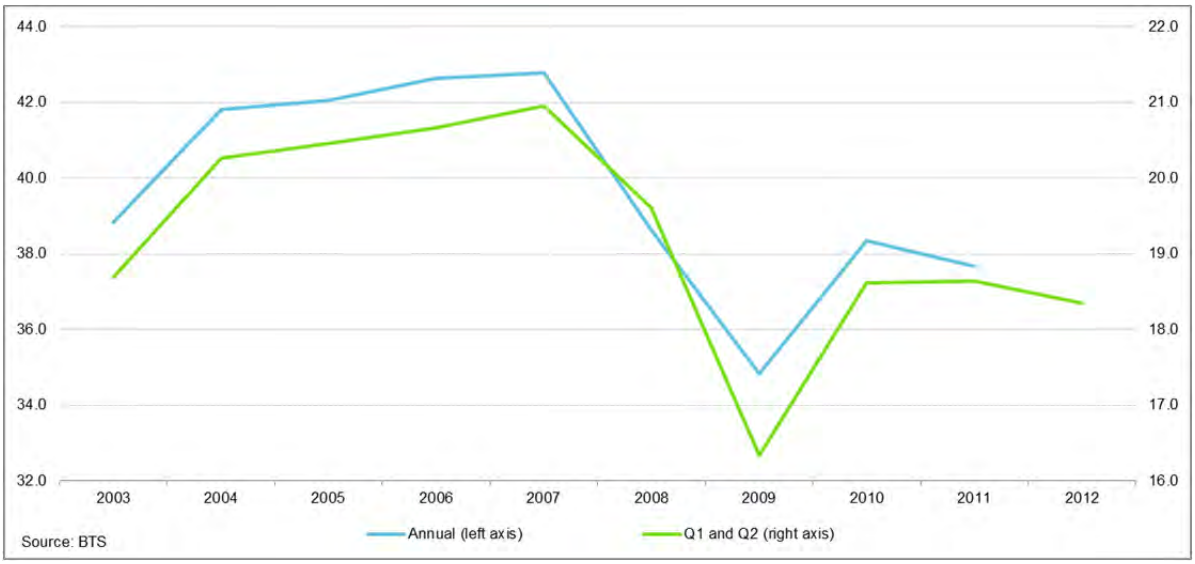
Due to major cuts, STL and CVG were the only airports that had fewer passenger enplanements in 2010 than 1990. After leading the St. Louis Region by a wide margin in 2005, Cincinnati took a precipitous decline and was actually expected to have the fewest enplanements of all benchmark airports in 2012. Major cuts were made by Delta at their hub in Cincinnati in 2008 as a result of their merger with Northwest Airlines; this happened (to a smaller extent) in Memphis as well. The other four benchmark regions all witnessed very slow growth over the past two decades, with CMH growing at the fastest annualized rate (of less than 3%) between 1990 and 2010.

Air Freight Context

Air freight is generally used to move high-value and/or time-sensitive products, such as electronics or perishables as well as products than need to move quickly to end users and points of sale. According to Boeing's world air cargo forecast, apparel, telecommunication equipment, and general industrial machinery and equipment account for more than two-thirds of Asia-to-North America air cargo traffic. On the opposite route, general industrial equipment, documents and small packages, electrical machinery, scientific and specialized equipment, and chemical materials make up over half of the air cargo traffic.

According to BTS, after major declines in 2008 and 2009, the nation has yet to recover to pre-recession levels and is actually still below the 2003 figure of total freight enplaned. The following figure shows change in freight enplaned in the U.S. over the past decade during the first half of the year (Q1 and Q2) and also on an annual basis. The figure helps illustrate how freight enplanements over the first half of the year mirror trends in annual figures, although combined totals from Q3 and Q4 are consistently higher than in Q1 and Q2. The total volume of freight enplaned in the U.S. fell at an annualized rate of 10% between 2007 and 2009, but rebounded in 2010.

Figure 22 – Freight Enplaned (in billions of pounds) in the U.S. (Annual vs. Q1 and Q2), 2003-2012



A few of St. Louis's regional competitors (Memphis, Indianapolis, and Cincinnati) are home to significantly larger freight operations, including FedEx's Hub in Memphis, which continues to handle the largest cargo volume of any airport in the U.S. and was passed by Hong Kong as the busiest cargo airport in the world only a few years ago. FedEx's second largest hub is located in Indianapolis, which is one of the top 10 largest cargo operations in the country. DHL's main U.S. facility is located in Cincinnati (CVG) and after relocating to Wilmington (OH) in 2005, they re-opened their package-sorting hub in 2009; this explains the major swing in freight volume over the past decade in Cincinnati. Both Memphis and Cincinnati have shown a healthy increase in the landed weight of all-cargo operations since 2000, growing at an annualized rate of approximately 4% since then.

Regional Performance

Air freight and passenger information is presented individually for both Lambert Airport and MidAmerica Airport, primarily because regional airborne freight is orders of magnitude smaller than volumes moving on other modes, and volume is very sensitive to operational decisions of the airlines and airports. These characteristics render aggregate statistical comparisons with other modes less informative. The economic importance of and the regional opportunities for airborne freight in St. Louis region, however, greatly outpace relative tonnage counts. Therefore, this section focuses on broader factors impacting airborne freight in the St. Louis region and how these forces may affect future opportunities.

As a general rule, air cargo is oriented towards high-value, low-weight, time-sensitive goods. The volume of air cargo tonnage is relatively small, but airborne freight plays a crucial role in today's shipping industry because of its significant value. Moreover, airborne cargo plays a disproportionately important role in the regional economy, supporting just-in-time supply chains, critical business communications (e.g., overnight mail and document delivery), and numerous jobs.

Airborne cargo is shipped two ways – in dedicated air-cargo carriers or in the cargo compartment or belly of passenger aircraft. Parcel services such as UPS, FedEx, and DHL are the primary dedicated

air-cargo carriers with an international and nationwide presence. Other air-cargo companies specialize in transporting certain products and or servicing specific routes and commercial networks. Lambert Airport receives airborne cargo from the three primary parcel carriers. Additionally, the China Cargo Airlines began operating freight service between St. Louis and China in 2011, but has discontinued this route on account of insufficient volumes. In recent years, Lambert has increasingly focused its attention on increasing passenger aircraft service and enhancing cargo opportunities stored in the cargo compartments of these planes. MidAmerica Airport has limited passenger service. The airport has, however, recently entered into a partnership with Ningbo Airport in China that may it hopes will lead to significant future volumes of airborne cargo between St. Louis and Asia.

The following sub-sections will describe the historical and the current state of airborne freight flows at Lambert Airport and MidAmerica Airport, respectively. Major factors driving current flows will be summarized. Risks and opportunities for future airborne cargo operations will be discussed.

Lambert Airport

St. Louis' geographic centrality and size make it an attractive location for an air hub. Lambert Airport has historically played an important role in the air transportation system; however, its relative position in the national network has, to an extent, been eclipsed in recent decades by larger airport hubs. Lambert Airport serves connecting flights to and from larger hubs such as Chicago and Dallas, where passengers connect to other destinations in the United States and abroad. Despite aggressive marketing, Lambert Airport does not currently offer any direct international service.

Since 2004, Lambert Airport total enplanements have generally hovered in the range of 6-8 million passengers per year. Meanwhile, total annual cargo flows have fallen from a high of about 135,000 tons in 2002 to as lows as about 75,000 tons in 2010. Much of this decline is directly attributable to reductions in passenger service, as fewer passenger aircraft arrivals and departures naturally reduce opportunities for vessel cargo compartment freight services.[7] Since 2009 Southwest Airlines has been rapidly expanding passenger services in St. Louis. The result is that total annual passenger enplanements and total cargo tonnage has been essentially flat over the past several years.

Table 87 – Total Annual Passenger Enplanements and Cargo Tons for Lambert Airport, 2009-2012

Segment	2009	2010	2011	2012	CAGR
Passengers Enplaned	6,418,490	6,718,819	6,282,919	6,355,073	-0.2%
Cargo (Tons)	81,753	75,718	76,695	76,290	-1.7%

Source: Lambert St. Louis International Airport

Although reliable commodity breakdowns are not available, it is possible to construct a general profile of air freight departing and arriving via Lambert Airport. The Missouri Economic Research and Information Center conducted a study in 2007 of inbound and outbound airborne cargo departing and arriving through Missouri airports, for which Lambert Airport and Kansas City International Airport are the primary assets. According to the report, pharmaceuticals, chemicals, and electrical machinery constitute 83% of all outbound shipments by value. Most of this cargo moves eastward to other hubs, especially Chicago which receives about half the value of all outbound shipments. This profile is consistent with the previously-reported strengths of these industries in the St Louis region and

[7] Lambert-St. Louis International Airport Master Plan Update, Chapter 2 Aviation Activity Forecast, Preliminary Draft, 2009, Accessed 14 May 2013 at: http://www.airportsites.net/lambert-stl/assets/ STL%20Draft%20Aviation%20Activity%20Forecasts.pdf.

interviews with regional airport officials where connections with Chicago were identified as important. The report suggests that inbound cargo tends to originate in California and the west, with precision instruments and apparatus leading the way[8]. Mail also constitutes a small but important source of inbound and outbound cargo.

Lambert Airport management reports that freight tonnage is again growing in 2013, and that there are opportunities for expansion of cargo operations. Moreover, Lambert Airport is equipped to handle significant additional tonnage with minimal capital investment. Officials suggested, however, that expectations must be tempered due to a number of persistent factors hampering expansion of cargo operations. The following paragraphs summarize the strengths and weaknesses identified for Lambert Airport cargo operations. Strengths:

- Lambert Airport management claims that the airport could comfortably handle double the current cargo throughput without major investment.
- Air cargo shipments by UPS and FedEx continue to hold steady.
- St. Louis is trying to secure a 5-day per week direct service with a European counterpart, which would open up new cargo markets.
- The previous relationship with China Cargo Airlines could be rekindled once the global economic recovery firmly takes hold and if trade between the U.S. and China grows as expected.
- New wide-bodied passenger planes offer more cargo space.

Weaknesses:

- The air cargo industry as a whole has struggled in recent years by a combination of low demand due to the global recession and increasing operating costs, especially for fuel.
- The reality is that only about a dozen airports receive most air cargo throughput in the United States, and Chicago O'Hare's cargo operations are dominant in the wider region.
- One of the impediments to competing for air cargo are the wider regional shipping network requirements, including a critical mass of freight forwarders, shipping logistics arrangements, etc. It is difficult to change industry behavior once networks have been developed.
- Regional shippers often move international airborne freight to and from Chicago via truck.

The path forward for airborne freight operations at Lambert Airport will be affected by a number of factors, some outside airport management control. Aggressive marketing for international passenger service and for China Cargo Airlines and other air-cargo companies remains necessary. However, these efforts may not be sufficient to generate the critical mass of land-side logistics networks to establish St. Louis as a major air cargo hub. The Missouri Legislature considered a bill in 2011 that would have provided $360 million in subsidies and tax incentives to help support the development of an "Aerotropolis" at Lambert Airport. Perhaps more importantly, a return to rapid growth in global trade is necessary to motivate shipping networks to consider alternatives to current practices. Essentially, until air cargo volumes grow to the point of creating critical bottlenecks and cost

[8] Missouri Economic Research and Information Center. Missouri Freight Transportation, Economy on the Move: Air Freight, 2007, Accessed 15 May 2013 at: http://www.missourieconomy.org/pdfs/air_freight.pdf.

impediments at Chicago O'Hare and other major cargo hubs, the industry will mostly maintain the status quo.

MidAmerica Airport

MidAmerica Airport is located at Scott Air Force Base and has for many years served as an important air base for military aviation activities. Since the mid-1990s, MidAmerican Airport's civilian commercial industry has operated jointly with military services. In the past year, Allegiant Air reinstated twice-weekly passenger service to Orlando, and the airport received its first international cargo shipment, and MidAmerica entered into a partnership with Ningbo Lishe International Airport in Zhiezhang, China to form a trade route between the two regions.

Reliable 3rd party data on freight cargo operations at MidAmerica Airport is unavailable, due to the small size of the facility. MidAmerica Airport management, however, was willing to provide several high-level metrics and details on current and forecasted future cargo operations. This information is summarized in the following paragraphs.

Currently air cargo throughput is mostly limited to charter services. Currently, most freight shipped into and out of MidAmerica Airport is in a North-South direction, and 80% of that cargo is perishable. In 2012, North Bay Produce signed a lease for a 36,000-square-foot refrigeration facility on site, enhancing the airport's attractiveness for international shipments of flowers and perishable foods. Up until 2010 MidAmerica serviced inbound shipments of flowers from Columbia. North Bay Produce's operations should help replace this lost business. MidAmerica has since received chartered shipments for goods such as produce from Lima, Peru en route to Asia and trout from Quito, Ecuador. The partnership with Ningbo Airport has led to approximately 180 tons per week of cargo.

MidAmerica Airport hopes to expand its cargo operating footprint through a combination of strategic partnerships, low costs, and leveraging its authorization as a free-trade zone. Airport management suggests that joint operations with the Department of Defense allows civilian service to essentially operate on two runways for the price of one, while Scott AFB also handles much of the security costs. The foreign trade zone to which MidAmerica Airport is a part includes America's Central Port on the Mississippi River as well as connecting rail and road infrastructure. Management's near-term goal is to leverage the Ningbo Airport partnership and North Bay Produce operations to generate enough cargo for twice-weekly East-West shipments and thrice-weekly North-South shipments, for which it suggests sufficient capacity currently exists.

MidAmerica Airport shares many of the same challenges as Lambert Airport in attracting air-cargo freight. Principally, the airport must market its services despite a tepid economic recovery and in the face of industry inertia that funnels most freight to a few large airport hubs. Moreover, the lack of significant passenger vessel traffic further limits opportunities for servicing cargo freight. Further, MidAmerica would need to displace and fill in service gaps between existing air cargo hub airports that may take time to overcome.

The potential for expansion of freight operations at MidAmerica Airport warrants cautions optimism. The airport has experienced a string of successes and management believes that there are potential new opportunities for perishable cargo moving between Florida and the U.S. West Coast and for exports from the U.S. to Brazil and China. Many key attributes are in place, however, key factors such as the behavior of freight forwarding and shipping networks are to an extent beyond the airport's

control. Additionally, while growth in air cargo handling at MidAmerica Airport is certainly positive for the regional economy, it must be understood in context. The scale of airborne perishables pales in comparison to production and trade of dry bulk goods moving on other modes. Thus the impact on non-transportation sectors, especially agriculture, is consequential but relatively small.

Summary of St. Louis Airborne Freight

Having reviewed outbound and inbound freight data and forecasts, the following points were noted about the current and likely future trajectory of airborne freight logistics for the St. Louis study area.

- Airborne cargo transportation is important to global supply chains, particularly for high-value commodities and perishable foods. Enhancing the St. Louis Region's air service, helps serve not only the transportation industry but other key export industries such as pharmaceuticals, chemicals, and technological products.
- Although direct service would be preferable, connectivity with large hub airports is important for the St. Louis Region's high-value products to reach domestic and international destinations. Traditionally, Chicago and Los Angeles are the most important hubs, but new relationships are also developing both domestically and, potentially, internationally.
- For the most part, Lambert Airport and MidAmerica Airport have the requisite physical infrastructure to handle major increases in cargo traffic. Most of the challenges to airborne freight industry growth are economic (e.g., the global economy) and industry and public policy (i.e., inertia within the shipping industry and government incentives).
- The best opportunities for expansion of airborne freight industries in St. Louis will likely involve a return to strong global economic and trade growth, which pushes-up costs and creates bottlenecks at major hubs directly competing with St. Louis-region airports (e.g., O'Hare) and, when a critical mass of supporting industries, such as freight forwarders and shipping logistics companies, can be assembled in or convinced to expand networks through the St. Louis region.
- The extent to which Lambert Airport and MidAmerica Airport work together as regional partners rather than competitors benefits both in the effort to showcase the St. Louis Region's potential for airborne cargo operation and to attract the requisite critical mass of support industry networks.

Freight Corridor Analysis

This section synthesizes the individual modal analyses and forecasts of goods movement through the St. Louis region into a set of more fine-grained multi-modal corridor analyses. Current and forecasted data are presented in order to gauge both the current and emerging trends that affect or will affect various segments of the St. Louis regional transportation infrastructure network. The result is a comprehensive analysis of how key global, national, and regional factors are driving goods movement through various freight corridors and the economic opportunities and risks for the St. Louis region associated with these trends. This analysis will feed the evaluation of the infrastructure requirements to leverage these opportunities and mitigate risks in order to support regional economic objectives.

The purpose of partitioning the data into corridors is to associate goods movement with geographies both exhibiting broadly similar sensitivities to trends in key economic factors and sharing common infrastructures that provide connectivity with St. Louis. The data associated with each corridor includes all freight flows that either originate or terminate within the given geography and moves into, out of, or through St. Louis.[9] Once the data and forecasts are organized by economically and geographically similar regions, it is possible to analyze how key economic, political and other factors will affect demand for freight infrastructure typically serving these inter-regional flows of goods.

For the purposes of this study, corridors are defined by geographic origin and/or destination of goods movement associated with St. Louis freight infrastructure. To the extent possible, corridors are aligned with the most-likely infrastructure links to and from St. Louis. Some goods moving between origin and destination points in a given corridor, however, may be routed on different links for any number of logistical reasons. Additionally, freight originating in each corridor will begin to share the same infrastructure as the cargo approaches the St. Louis region itself (e.g., Interstate beltways, downtown expressways, Mississippi River ports, and highway and rail river bridges over the Mississippi River, etc.).

The decision to define the corridor by origin and destination rather than by infrastructure segments *per se* represents an analytical choice. The freight forecasts are commodity based and, hence, demand driven. It is logical to define the corridors consistent with the sources of production and consumption for these goods. Once a strong understanding is established of the trends driving freight flows associated with each corridor, it is then possible to analyze the contribution of each corridor to the various requirements for regional transportation infrastructure. Priorities can then be established regarding how to best allocate scare resources to optimally align investment and policy decisions with regional economic objectives. For example, if a particular corridor is responsible for growth of inbound shipments of goods considered important to the downtown St. Louis economy, it might present a higher priority to invest in links connecting the key origins and destinations to the city center.

[9] It is important to note that through traffic will be reported multiple times across the various corridor analyses, as inbound through traffic originating in one corridor becomes outbound through traffic in another. Hence, the sum of freight data across all six corridors is greater than the actual total.

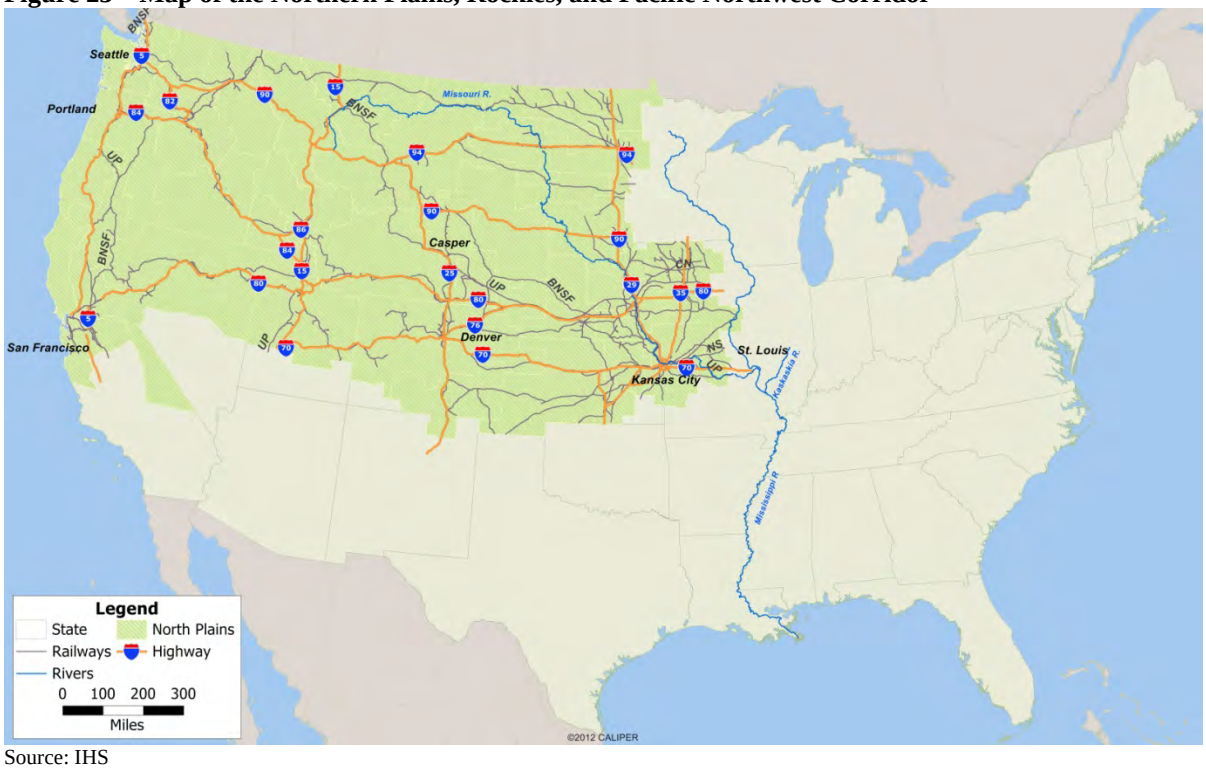
Northern Plains, Rockies, and Pacific Northwest

The Northern Plains, Rockies, and Pacific Northwest Corridor includes an expansive geography located primarily to west and northwest of St. Louis. The area is approximately bounded as follows:

- **North:** the Canadian border
- **East:** The approximate eastern reaches of the Missouri River basin
- **South:** Southern borders of Kansas, Colorado, and Utah; Nevada BEAs north of Las Vegas; and California BEAs north of Fresno
- **West:** the Pacific Ocean

The following map situates the Northern Plains, Rockies, and Pacific Northwest Corridor within the continental United States. Included in the map are the key Interstate highways, Class I rail lines, and waterways serving freight flows through the corridor.

Figure 23 – Map of the Northern Plains, Rockies, and Pacific Northwest Corridor



Source: IHS

Freight moving through the Northern Plains, Rockies, and Pacific Northwest corridor would primarily connect to the St. Louis study area via the following regional infrastructure:

- Highways: I-70, westbound from St. Louis and eastbound into St. Louis
- Class I Railroad Network Infrastructure: BNSF, UP, CN, and KCS
- Waterways: the Missouri River

There are a number of Interstate highways serving various BEAs in the corridor, but nearly all freight moving on these links will ultimately connect with the St. Louis region via I-70. Route I-70 provides

direct access to several major origins and destinations west of the St. Louis Study region, including Kansas City and Denver. Interstate 90, as well as I-84 and I-80 connect from Route I-70 westbound to Seattle, Portland, and San Francisco, respectively. Other Interstates provide northbound-southbound access through the corridor to and from I-70. For example, I-35 plays an important role connecting Des Moines and Wichita to I-70. Ultimately, I-70 is the key link for trucks operating in this corridor, and growth in corridor freight will increase demand primarily on this segment of the St. Louis regional radial highway network as well as, of course, the beltways and downtown expressways.

BNSF and UP rail infrastructure will service most freight moving through the Northern Plains, Rockies, and Pacific Northwest Corridor. Both operators serve most major BEAs in the corridor. CN and KCS offer Class I service for freight moving along segments of the corridor in the Northern Plains and within Missouri, generally along the I-29 highway corridor. NS has limited infrastructure west of St. Louis, but that infrastructure does connect to (and terminate in) Kansas City. There is limited waterborne traffic moving through the Northern Plains, Rockies, and Pacific Northwest corridor. The Missouri River is essentially non-navigable for most freight. Waterborne traffic within this corridor is mostly associated with Missouri BEAs along the Upper Mississippi River.

Primary Inter-regional Commercial Relationships

The tables in this sub-section summarize the top origin and destination BEAs for freight flows moving through the Northern Plains, Rockies, and Pacific Northwest Corridor. This data includes flows across all modes. Subsequent sub-sections will analyze the modal shares, the top commodities, and the general logistics of flows.

Casper, WY is by far the most important origination point in terms of tonnage on account of Powder River Basin coal. Denver ships large quantities of both coal and grain. Kansas City and Columbia, MO share strong inter-regional ties with St. Louis for many commodities, especially agriculture, chemicals, and various manufactured consumer products. Freight originating in Kansas City also carries a disproportionately high share of freight value in 2010 and beyond, which is due to Kansas City's role in the manufacturing and trans-shipment of consumer goods and motor vehicles. Portland, Seattle, and San Francisco account for relatively limited tonnage; however, these BEAs rise to the top of the rankings by value in 2040 on account of the growth of high-value containers, semiconductors, and other high technology equipment produced in or imported through the West Coast.

Table 88 – Top 5 Origins – Northern Plains, Rockies, and Pacific Northwest Corridor, All Traffic

BEA	K Tons, 2010	Rk	K Tons, 2040	Rk	$ Mil., 2010	Rk	$Mil., 2040	Rk
Casper, WY	**79,916**	**1**	**75,496**	**1**	**3,005**	**5**	2,834	
Denver, CO	**10,452**	**2**	**11,110**	**3**	2,423		**8,450**	**5**
Kansas City, MO	**9,555**	**3**	**13,040**	**2**	**14,192**	**1**	**24,119**	**1**
Des Moines, IA	**3,896**	**4**	**7,477**	**4**	**3,306**	**3**	7,115	
Columbia, MO	**2,873**	**5**	4,484		2,040		3,830	
Wichita, KS	2,652		**5,323**	**5**	2,687		6,201	
San Francisco, CA	1,572		1,572		**3,298**	**4**	**10,449**	**4**
Seattle, WA	819		2,850		**5,469**	**2**	**16,524**	**3**
Portland, OR	779		1,693		1,890		**24,112**	**2**

Source: IHS

Freight moving from St. Louis to destinations in the Northern Plains, Rockies, and Pacific Northwest Corridor is substantially smaller that freight moving in the opposite direction. This is primarily driven by the fact that coal and grain tends to flow from west to east to and through St. Louis rather than in the opposite direction. The relationship with Kansas City is most critical, driven by a mix of consumer goods, pharmaceuticals, chemicals, and motor vehicles produced in St. Louis and/or moving from the Northeast and Upper and Lower Midwest through the study region. San Francisco just misses the top five ranking as a destination. As described in the rail modal section, however, the East Bay and its steel manufacturing and export infrastructure are a critical market for the regional steel industry.

Table 89 – Top 5 Destinations – Northern Plains, Rockies, and Pacific Northwest Corridor, All Traffic

Region	K Tons, 2010	Rk	K Tons, 2040	Rk	$ Mil., 2010	Rk	$Mil., 2040	Rk
Kansas City, MO	7,088	1	10,501	1	14,624	1	26,856	1
Denver, CO	2,318	2	4,123	2	3,984	2	7,855	3
Columbia, MO	1,510	3	2,413	3	2,102		3,688	
Des Moines, IA	1,502	4	1,791		2,709	4	4,630	5
Portland, OR	1,409	5	2,180	4	2,382	5	5,017	4
Seattle, WA	1,178		2,149	5	3,198	3	8,548	2

Source: IHS

Detailed Corridor Logistics

The previous sub-sections established the primary origins and destinations and the critical infrastructures associated with the Northern Plains, Rockies, and Pacific Northwest Corridor. The following tables provide a fine-grained breakdown of freight movement through the corridor by several key dimensions: mode, direction, and time (i.e., current and forecasted flows).

Table 90 – Northern Plains, Rockies, and Pacific Northwest Corridor, Total Tonnage (000's)

Segment	2010	2015	2020	2030	2040	CAGR
Through	**110,440**	**121,715**	**125,696**	**131,618**	**141,562**	**0.8%**
Truck	38,447	43,567	47,835	55,583	64,725	1.8%
Rail	71,992	78,147	77,861	76,035	76,837	0.2%
Waterborne	-	-	-	-	-	N/A
Outbound	**6,730**	**7,254**	**7,688**	**8,021**	**8,511**	**0.8%**
Truck	5,528	5,850	6,139	6,315	6,527	0.6%
Rail	1,143	1,358	1,512	1,681	1,963	1.8%
Waterborne	58	44	36	24	20	-3.5%
Inbound	**42,791**	**46,528**	**47,096**	**47,735**	**49,688**	**0.5%**
Truck	7,985	9,092	9,900	11,461	13,186	1.7%
Rail	34,777	37,409	37,171	36,253	36,485	0.2%
Waterborne	28	27	24	19	16	-1.8%
Total	**159,962**	**175,498**	**180,481**	**187,376**	**199,762**	**0.7%**

Source: IHS

Overall tonnage is projected to grow modestly at less than 1% per year, which is driven in large part by a decline in coal. As well, over two-thirds of total tonnage is through traffic, which more often moves from west to east. Additionally, the data illustrates how St. Louis is a net consumer of goods flows in the corridor when measured by tonnage, as inbound flows in 2010 (42.8 million tons) were over six times larger than outbound flows (6.7 million tons);. this gap only slightly narrows in the future. Trends are consistent with the fact that the economies of the Northern Plains and Rockies rely heavily on agriculture and mining, which tend to be relatively high-tonnage, low-value goods that are shipped in high volumes to large manufacturing and commercial centers such as St. Louis. This last

observation is further evidenced by the disproportionate reliance on rail for inbound and through traffic, since rail tends to carry heavy bulk commodities.

In contrast to inbound (and to a lesser extent, through traffic), the relatively limited outbound tonnage originating in St. Louis tends to move through the corridor via truck. This is because key industries located in St. Louis include pharmaceuticals, chemicals, and high-value manufactured products. When corridor flows are measured by value, truck becomes the dominant mode in all directions and the total value of outbound goods nearly equals that of inbound flows. Moreover the annual growth rate by value is higher, which is driven in large part by through traffic, which includes high-value technology and consumer moving via truck generally from west-to-east and high-value manufactured goods such as motor vehicles and chemicals generally moving from east-to-west.

Table 91 – Northern Plains, Rockies, and Pacific Northwest Corridor, Total Values ($ Mil.)

Segment	2010	2015	2020	2030	2040	CAGR
Through	**82,223**	**100,831**	**112,957**	**145,598**	**192,199**	**2.9%**
Truck	59,120	70,046	79,755	106,858	143,768	3.0%
Rail	23,103	30,784	33,201	38,739	48,431	2.5%
Waterborne	-	-	-	-	-	N/A
Outbound	**11,635**	**13,386**	**14,510**	**16,103**	**18,108**	**1.5%**
Truck	9,232	10,231	11,026	11,902	12,637	1.1%
Rail	2,399	3,151	3,481	4,198	5,467	2.8%
Waterborne	2	2	2	2	2	-0.1%
Inbound	**14,188**	**16,284**	**17,978**	**21,767**	**26,936**	**2.2%**
Truck	9,495	11,011	12,155	14,951	18,353	2.2%
Rail	4,673	5,255	5,808	6,807	8,576	2.0%
Waterborne	19	16	13	9	5	-3.9%
Total	**108,047**	**130,501**	**145,445**	**183,469**	**237,243**	**2.7%**

Source: IHS

Corridor Commodity Supply Chains and Implications for St. Louis

This sub-section considers the top commodities moving into, out of, and through St. Louis in the Northern Plains, Rockies, and Pacific Northwest Corridor. Top commodities contributing to total corridor tonnage and value will be highlighted in overall logistics profiles that will illustrate important infrastructure and logistics requirements. These profiles will help show where and how St. Louis plays in the supply chain, which will help inform the prioritization of possible interventions to support freight flows through the corridor.

Excluded from these analyses will be general consumer goods previously categorized in this study as "Warehouse & Distribution Center Goods." The heterogeneity and small individual quantities of goods included in this classification make it difficult to formulate meaningful insight from the products individually. Collectively, however, flows of these goods will constitute a significant share of goods movement in all corridors and will be the primary driver of overall corridor truck flows in all directions.

For the Northern Plains, Rockies, and Pacific Northwest Corridor, Warehouse & Distribution Center goods accounted for 10.4 million tons of total flows in 2010 (6.5% of the total), and are forecasted to grow rapidly at a rate of 2.9% per year to 23.4 million tons by 2040 (11.7% of the total). Besides general consumer goods, top commodities by tonnage for the Northern Plains, Rockies, and Pacific Northwest Corridor include coal, agriculture, and chemicals. Coal is clearly the most important commodity moving through the Northern Plains, Rockies, and Pacific Northwest Corridor in terms of

total tonnage. As the data suggests, essentially all of the 89 million tons of cargo moving through the corridor travels aboard rail and in an eastbound direction. The development of low-cost natural gas in North America combined with increased environmental regulations of carbon and particulate matter will slow demand for coal. The Powder River Basin produces the most competitive coal in the United States.

Table 92 – Coal Logistics, Northern Plains, Rockies, and Pacific Northwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	59,914	63,866	62,235	58,674	56,673	-0.2%
Truck	175	141	144	207	231	0.9%
Rail	59,739	63,724	62,090	58,467	56,441	-0.2%
Waterborne	0	0	0	0	0	N/A
Outbound	7	6	6	7	7	0.1%
Truck	4	4	5	6	7	2.3%
Rail	-	-	-	-	-	N/A
Waterborne	3	2	1	0	0	-8.3%
Inbound	29,269	31,223	30,424	28,650	27,658	-0.2%
Truck	-	-	-	-	-	N/A
Rail	29,266	31,218	30,417	28,643	27,650	-0.2%
Waterborne	3	5	6	7	8	3.1%
Total	89,190	95,095	92,664	87,330	84,338	-0.2%

Source: IHS

Agricultural products constitute the next most important commodity group for the corridor, with over 40% of agricultural products terminate in St. Louis for consumption, manufacturing. Agriculture transport is important to the St. Louis regional economy, in particular the large food and beverage manufacturing establishments, as well as transportation and trade industries.

Table 93 – Agriculture Logistics, Northern Plains, Rockies, and Pacific Northwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	6,840	7,298	7,528	7,802	8,282	0.6%
Truck	4,520	4,693	4,745	4,698	4,766	0.2%
Rail	2,320	2,605	2,783	3,104	3,516	1.4%
Waterborne	-	-	-	-	-	N/A
Outbound	167	162	165	167	169	0.1%
Truck	130	123	122	119	114	-0.4%
Rail	36	40	43	49	55	1.4%
Waterborne	<1	<1	<1	<1	<1	-2.8%
Inbound	4,828	5,284	5,579	6,012	6,471	1.0%
Truck	1,712	1,787	1,860	1,894	1,847	0.3%
Rail	3,116	3,497	3,718	4,118	4,624	1.3%
Waterborne	<1	<1	<1	<1	<1	-4.0%
Total	11,834	12,744	13,272	13,982	14,922	0.8%

Source: IHS

Chemicals[10] represent both high-tonnage and high-value freight. Regional chemicals manufacturing plays an important role in the St. Louis regional economy. The direction of chemicals flows is highly balanced, as different regions specialize in different types of chemicals, while certain chemicals serve as inputs to the manufacturing of other chemicals and value-added products (e.g., fertilizer).

[10] For the purposes of the corridor commodity analyses, the classification "chemicals" includes various types of industrial organic chemicals, industrial inorganic chemicals, agricultural chemicals, and chemical preparations. Fertilizers, pharmaceuticals, and plastics are considered separately.

Outbound flows to nearby agricultural and manufacturing centers tend to move by truck. The preferred long-distance transportation mode for chemicals is rail.

Table 94 – Chemicals Logistics, Northern Plains, Rockies, and Pacific Northwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	3,770	4,149	4,852	5,395	5,802	1.4%
Truck	2,807	3,123	3,668	4,025	4,172	1.3%
Rail	963	1,026	1,184	1,370	1,629	1.8%
Waterborne	-	-	-	-	-	N/A
Outbound	1,081	1,131	1,254	1,232	1,172	0.3%
Truck	819	855	935	877	776	-0.2%
Rail	262	276	319	355	396	1.4%
Waterborne	<1	<1	<1	<1	<1	-1.2%
Inbound	1,182	1,253	1,446	1,623	1,858	1.5%
Truck	172	189	188	159	128	-1.0%
Rail	1,010	1,064	1,257	1,464	1,730	1.8%
Waterborne	-	-	-	-	-	N/A
Total	6,032	6,534	7,551	8,250	8,832	1.3%

Source: IHS

Several other commodities contribute significantly to overall freight tonnage moving through the Northern Plains, Rockies, and Pacific Northwest Corridor. The next sub-section will analyze several of the more high-value commodities. Other top commodities by tonnage include food and beverage products such as juices, malt liquors, and pet food. The industries manufacturing these goods have a strong presence in St. Louis and will ship these goods by both truck and rail when practicable.

Top Commodities by Value

Several commodity classes are or will be responsible for substantial shares of total freight value moving through the Northern Plains, Rockies, and Pacific Northwest Corridor, including containers, motor vehicles, and high technology products. General consumer goods (i.e., "Warehouse & Distribution Goods") will contribute a high share of this value, accounting for $11.1 billion in 2010 (10.2% of the total) and forecasted to total $24.9 billion (10.5% of the total) by 2040. Additionally, chemicals make up a large share of value, accounting for $8 billion of the total corridor flows in 2010 (7.4% of the total) and forecasted to total $12.6 billion (5.3% of the total) by 2040.

Various classes of goods shipped in containers make up an important share of freight flows through the Northern Plains, Rockies, and Pacific Northwest Corridor. Collectively, container goods represent a fast-growing source and high-value freight. Total tonnage in 2010 was less that 1 million, but these flows will grow at about 3.5% per year and in all directions. Consumer goods produced in St. Louis and the Lower Midwest will be sent to the Pacific Northwest for export, while goods manufactured in Asia will move in the opposite direction. Not surprisingly, most of this tonnage will be through traffic. Nonetheless, over 30% of container goods transportation will represent inbound or outbound traffic, suggesting additional opportunities for regional transportation and logistics industries as well as export opportunities for regional manufacturers. Corridor containers accounted for $8.4 billion in value in 2010 (7.8% of the total) and will grow to $26.3 billion in 2040 (11.1% of the total).

Table 95 – Containers, Northern Plains, Rockies, and Pacific Northwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	1,421	1,695	1,972	2,683	4,021	3.5%
Truck	-	-	-	-	-	N/A
Rail	1,421	1,695	1,972	2,683	4,021	3.5%
Waterborne	-	-	-	-	-	N/A
Outbound	297	351	409	554	808	3.4%
Truck	14	13	17	25	30	2.6%
Rail	284	338	392	529	778	3.4%
Waterborne	-	-	-	-	-	N/A
Inbound	342	411	476	640	933	3.4%
Truck	46	55	59	71	82	1.9%
Rail	296	356	417	568	851	3.6%
Waterborne	-	-	-	-	-	N/A
Total	2,061	2,457	2,856	3,876	5,763	3.5%

Source: IHS

Motor vehicles constitute an important and growing source of demand, especially for regional rail transportation. The re-shoring of automobile manufacturing to North America will affect rail traffic in both directions, including westbound shipments of automobiles manufactured in St. Louis (e.g., at the Wentzville plant) or the Lower Midwest and eastbound shipments manufactured in Kansas City (e.g., the Ford Claycomo or GM Fairfax plants) or in the Southwest and Mexico moving eastbound. Corridor motor vehicles freight transportation accounted for $6.3 billion in value in 2010 (5.8% of the total) and will grow to $18 billion in 2040 (8% of the total).

Table 96 – Motor Vehicles, Northern Plains, Rockies, and Pacific Northwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	646	1,154	1,246	1,563	1,990	3.8%
Truck	147	302	390	646	980	6.5%
Rail	498	852	856	917	1,010	2.4%
Waterborne	-	-	-	-	-	N/A
Outbound	39	66	66	71	78	2.4%
Truck	-	-	-	-	-	N/A
Rail	39	66	66	71	78	2.4%
Waterborne	-	-	-	-	-	N/A
Inbound	2	3	3	3	3	2.2%
Truck	<1	<1	<1	<1	<1	-2.6%
Rail	2	3	3	3	3	2.4%
Waterborne	-	-	-	-	-	N/A
Total	686	1,223	1,315	1,638	2,072	3.8%

Source: IHS

There are opportunities for St. Louis to leverage increased North American production and consumption of motor vehicles to support regional industry. The expanding the GM Wentzville plant offers one example. With respect to the Northern Plains, Rockies, and Pacific Northwest Corridor, motor vehicles freight flows will be mostly through traffic. In the long-run, motor vehicle assembly plants will be designed for flexibility such that multiple makes and models can be manufactured on the same assembly lines, reducing the need for inter-regional transportation. Nonetheless, the broad-based geography of motor vehicle production and demand will increase transportation demand. The overall tonnages are currently modest compared to other commodities but are expected to grow by

almost 4% per year, which will put a strain on regional rail infrastructure and automotive intermodal centers.

High technology[11] represents a fast-growing and highly-valued commodity segment for the Northern Plains, Rockies, and Pacific Northwest Corridor. This growth in tonnage, averaging 12% per year, is highly indicative of broader global and national economic trends. Knowledge economies and advanced manufacturing require constant upgrading and advancement of high technology. Corridor high technology transportation accounted for just $1.7 billion in value in 2010 (1.6% of the total) but will grow to $40.1 billion in 2040 (16.9% of the total).

With respect to the Northern Plains, Rockies, and Northwest Corridor, much of that production (or import) will occur in the Pacific Northwest. Some high technology goods manufactured in Texas may be trans-shipped via Kansas City to St. Louis, although most of this freight will move through the Sun Belt Corridor. Truck will be the dominant mode of transportation for semiconductors and other high technology goods.

The trajectory of the St. Louis economy is consistent with these broader trends. The St. Louis Region, however, will tend to a consumer and distribution and trans-shipment point for technology than a producer. There will be some exceptions, such as biotechnology, where St. Louis is expected to grow. With respect to the Northern Plains, Rockies, and Pacific Northwest Corridor, however, most of the growth in these commodities will be through traffic. Almost all of this through traffic will travel via truck. Although the total tonnage figures are smaller than other commodities, the rapid rate of growth suggests that by 2040, I-70 corridor segments between St. Louis and Kansas City will need to service at least an additional 1 million tons of technology freight.

Table 97 – Technology, Northern Plains, Rockies, and Pacific Northwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	43	79	182	594	1,212	12%
Truck	42	78	180	591	1,207	12%
Rail	1	1	2	3	4	5%
Waterborne	-	-	-	-	-	N/A
Outbound	0	0	0	1	2	9%
Truck	0	0	0	1	2	9%
Rail	-	-	-	-	-	N/A
Waterborne	-	-	-	-	-	N/A
Inbound	3	5	10	26	46	9%
Truck	3	5	10	26	46	9%
Rail	-	-	-	-	-	N/A
Waterborne	-	-	-	-	-	N/A
Total	46	84	192	620	1,259	12%

Source: IHS

Other top commodities by value include missile and space parts moving from St. Louis and other aviation and aerospace industries in the Midwest in a westbound direction to Department of Defense facilities within the corridor, goods that mostly move by truck. Additionally, large quantities of meat products move in an eastbound direction from ranches in the Northern Plains and Rockies to

[11] For the purposes of the corridor commodity analyses, the classification "technology" or "high technology" includes semiconductors, electronic data processing equipment, orthopedic and prosthetic supplies, and radio and television transmitting equipment.

consumer markets in the St. Louis and east of the Mississippi River. These goods tend to move by rail when possible (e.g., the availability of refrigerated cars), but more often by truck.

Summary of Goods Movement Trends and Implications for St. Louis

The Northern Plains, Rockies, and Pacific Northwest Corridor is historically dominated by coal and agriculture moving in an eastbound direction towards St. Louis for consumption, value added (in the case of food and beverage manufacturing), and/or trans-shipment down the Mississippi River. Rail has played a disproportionate role in supporting this supply chain. This will continue to be the case in absolute terms. However, slight declines in coal and modest gains in agriculture will pale in relative terms to the growth of other lighter but more valuable freight.

Chemicals and manufactured consumer and other exported goods represent existing and fast-growing opportunities that support regional economic growth. In addition to supporting regional warehousing, distribution, and trans-shipment industries, St. Louis chemicals and manufacturing industries can benefit from being part of supply chains supporting increased flows of these goods through the corridor. However, the infrastructure needs are diverse. Overall, there is not a single area of emphasis for supporting the chemicals industry, but rather all modes must be sufficiently equipped to handle various classes of chemicals, particularly those for which St. Louis can or could play a value-added manufacturing role. Consumer goods moving into and out of warehouse and distribution centers will require road efficient road infrastructure, and containers will require both road and rail infrastructure to support logistics needs. Beyond general rail and roadway capacity needs, the availability of requisite intermodal and handling equipment will be particularly critical to supporting these segments.

Lastly, motor vehicle and high technology are among the fastest growing segments, especially when measured by value. The former will require additional rail capacity, while the latter will require mostly road access. Despite the rapid growth rates, however, total tonnage associated with these segments is much less than the other key commodities highlighted in this section. Moreover, while St. Louis does play a value-added role in both industries, its role is limited with respect to the specific supply chains and freight flows moving through the Northern Plains, Rockies, and Pacific Northwest Corridor.

Sun Belt

The Sun Belt Corridor includes areas of the United States generally situated to the southwest of the St. Louis study area. The area is approximately bounded as follows

- **North:** The northern borders of Arizona, New Mexico, and Oklahoma; Southern Nevada as far north as (and including) the Las Vegas BEA; and Southern California as far north as (and including) the Fresno BEA.
- **East:** Western boundaries of the Houston, Corpus Christi, and Beaumont-Port Arthur BEAs in Texas and the Oklahoma-Arkansas border (plus Fayetteville and Fort Smith).
- **South:** The Mexican border
- **West:** the Pacific Ocean

The following map situates the Sun Belt Corridor within the continental United States. Included in the map are the key Interstate highways, Class I rail lines, and waterways.

Figure 24 – Map of the Sun Belt Corridor

Source: IHS

Freight moving through the Sun Belt Corridor would primarily connect to the St. Louis study area via the following regional infrastructure:

- Highways: I-44, westbound from St. Louis and eastbound into St. Louis
- Class I Railroad Network Infrastructure: BNSF and UP
- Waterways: the Arkansas River

Interstate 44 is the critical eastbound-westbound Interstate highway link for all BEAs connecting with St. Louis in the Sun Belt Corridor. This route connects St. Louis directly to Tulsa and Oklahoma City before terminating at I-40, which runs through Las Vegas en route to Southern California. Other key highways provide northbound-southbound connections to I-40/I-44, including I-17 (Phoenix), I-25 (Albuquerque), and I-35 (San Antonio, Austin, and Dallas). Truck traffic generated between St. Louis and BEAs in the corridor will most likely enter the city via I-44. Furthermore, it is possible that a share of traffic from adjacent BEAs in neighboring corridors might be diverted to I-44. Principal among the potential sources of additional traffic would be Houston, which for the purposes of this study is associated with the Lower Mississippi and Gulf Coast Corridor. This corridor's truck traffic generally is routed to and from St. Louis on I-55, but Houston truck freight may also be routed via Dallas and I-44. BNSF and UP are the primary Class I operators offering service to the Sunbelt Corridor. Most of the major origins and destinations are serviced by both operators. The Arkansas River is the most likely possibility for waterborne freight movement within this corridor. However, barge service is limited and will account for very low shares of corridor freight.

Primary Inter-regional Commercial Relationships

The tables in this sub-section summarize the top origin and destination BEAs for freight flows moving through the Sun Belt Corridor. This data includes flows across all modes. Subsequent sub-sections will analyze the modal shares, the top commodities, and the general logistics of flows.

Los Angeles is the most important origin for freight flows in the Sub Belt corridor. The 10 million tons of freight associated with Los Angeles is nearly five times that of the next largest origin. Accounting for over $210 billion in total annual freight by 2040, Los Angeles also dwarfs all other corridor origins when measured by cargo value. This is primarily due to the fact that Los Angeles and Long Beach are important ports of entry for high-value container goods produced in Asia, which then move eastbound to and through St. Louis. Over the next 30 year Dallas will grow to become the second most important corridor origin by both tonnage and value due primarily to shipments of high technology to emerging "knowledge economies," including St. Louis. San Antonio exhibits similar trends. Moreover, top Texas and Arizona BEAs also represent important trans-shipment points for imports from Mexico, including motor vehicles increasingly manufactured there. Springfield, MO tends to ship agricultural products to St. Louis for manufacturing and trans-shipment down the Mississippi River.

Table 98 – Top 5 Origins –Sun Belt Corridor, All Traffic

BEA	K Tons, 2010	Rk	K Tons, 2040	Rk	$ Mil., 2010	Rk	$Mil., 2040	Rk
Los Angeles, CA	**9,860**	**1**	**24,060**	**1**	**62,009**	**1**	**210,376**	**1**
Springfield, MO	**2,098**	**2**	**2,698**	**5**	**2,307**	**5**	3,394	
San Antonio, TX	**2,004**	**3**	**3,779**	**3**	**8,494**	**2**	**18,059**	**4**
Dallas, TX	**1,841**	**4**	**5,446**	**2**	**5,150**	**3**	**37,445**	**2**
Amarillo, TX	**1,500**	**5**	**3,537**	**4**	2,216		4,902	
Phoenix, AZ	825		2,657		1,504		**25,311**	**3**
Tucson, AZ	347		672		**3,022**	**4**	**9,729**	**5**

Source: IHS

Freight tonnage flows moving westbound from St. Louis to key Sun Belt Corridor BEAs are mostly balanced with eastbound flows in 2010. However, the total value of cargo, especially to Los Angeles, is much lower. Westbound flows will, like eastbound flows, increase in the coming decades in all directions. Manufactured food and beverage products will drive the westbound tonnage, while pharmaceuticals, chemicals, machines, and motor vehicles produced in the Midwest and Northeast contributing to the forecasted increases in value.

Table 99 – Top 5 Destinations – Sun Belt Corridor, All Traffic

BEA	K Tons, 2010	Rk	K Tons, 2040	Rk	$ Mil., 2010	Rk	$Mil., 2040	Rk
Los Angeles, CA	**10,635**	**1**	**22,955**	**1**	**20,859**	**1**	**53,839**	**1**
Dallas, TX	**3,858**	**2**	**7,363**	**2**	**7,525**	**3**	**19,826**	**2**
Springfield, MO	**2,340**	**3**	**4,078**	**4**	**4,541**	**4**	**9,112**	**4**
San Antonio, TX	**2,025**	**4**	**4,130**	**3**	**8,002**	**2**	**16,844**	**3**
Phoenix, AZ	**1,858**	**5**	**3,214**	**5**	2,914		5,323	
Tulsa, OK	1,767		3,139		**3,796**	**5**	**7,877**	**5**

Source: IHS

Detailed Corridor Logistics

The following tables provide a fine-grained breakdown of freight movement through the Sun Belt Corridor by several key dimensions: mode, direction, and time (i.e., current and forecasted flows). Total tonnage grows rapidly through the Sun Belt Corridor over the next 30 years, increasing by 2.3% annually. The vast majority of this freight is through traffic, and most of that cargo moves on trucks. This illustrates a couple of key trends associated with freight movement through the Sun Belt Corridor. First, imports enter the country from Asia and Mexico and are trucked across the country to final destinations. The relatively high value of these imports leads to a relatively higher dependence on trucks. Additionally, the growing demand for high technology products (e.g., semiconductors, computers, and electrical equipment) is increasing truck freight flows between large high-tech manufacturing centers such as Texas and Minnesota to points within the Sun Belt corridor.

Table 100 – Sun Belt Corridor, Total Tonnage (000's)

Segment	2010	2015	2020	2030	2040	CAGR
Through	57,369	67,518	75,896	92,107	115,785	2.4%
Truck	43,961	50,807	57,546	71,192	90,783	2.4%
Rail	13,409	16,712	18,350	20,915	25,002	2.1%
Waterborne	-	-	-	-	-	N/A
Outbound	4,865	5,406	5,836	6,711	8,065	1.7%
Truck	3,463	3,723	3,929	4,377	4,929	1.2%
Rail	1,387	1,670	1,896	2,326	3,130	2.7%
Waterborne	15	13	11	8	6	-2.8%
Inbound	4,047	4,817	5,457	6,876	8,856	2.6%
Truck	2,790	3,319	3,748	4,668	5,679	2.4%
Rail	1,256	1,494	1,704	2,199	3,166	3.1%
Waterborne	1	3	5	9	11	7.5%
Total	66,282	77,741	87,189	105,694	132,706	2.3%

Source: IHS

Total corridor throughput measurements by value provide further evidence of the trends observed for tonnage forecasts. The relative dominance of through traffic becomes even more evident. The relative value of rail freight holds steady with that of truck, however, as rail commodities moving through the corridor also tend to have high values. These include motor vehicles increasingly manufactured in Mexico and the Midwest as a consequence of "re-shoring," which will move through the corridor in both directions. Containers moving into and out of seaports in Los Angeles and Long Beach will tend to be shipped across the country in rail, which helps drive the relatively high value per ton of corridor rail freight.

Table 101 – Sun Belt Corridor, Total Values ($ Mil.)

Segment	2010	2015	2020	2030	2040	CAGR
Through	157,396	202,683	239,719	325,692	458,711	3.6%
Truck	116,946	145,878	178,131	253,859	370,494	3.9%
Rail	40,450	56,805	61,588	71,834	88,217	2.6%
Waterborne	-	-	-	-	-	N/A
Outbound	10,610	12,577	14,129	17,845	23,428	2.7%
Truck	7,659	9,033	9,980	12,223	14,963	2.3%
Rail	2,947	3,541	4,145	5,619	8,462	3.6%
Waterborne	4	4	3	3	3	-0.4%
Inbound	9,891	12,330	15,523	25,169	39,419	4.7%
Truck	5,922	7,438	9,803	17,263	27,299	5.2%
Rail	3,968	4,890	5,715	7,899	12,111	3.8%
Waterborne	1	3	4	8	9	7.9%
Total	177,897	227,590	269,371	368,707	521,558	3.7%

Source: IHS

Primary Corridor Commodity Supply Chains and Implications for St. Louis

This sub-section considers the top commodities moving into, out of, and through St. Louis in the Sun Belt Corridor. Top commodities contributing to total corridor tonnage and value will be highlighted in overall logistics profiles that will illustrate important infrastructure and logistics requirements. These profiles will help show where and how St. Louis plays in the supply chain, which will help inform the prioritization of possible interventions to support freight flows through the corridor.

Excluded from these analyses will be general consumer goods previously categorized in this study as "Warehouse & Distribution Center Goods." The heterogeneity and small individual quantities of goods included in this classification make it difficult to formulate meaningful insight from the products individually. Collectively, however, flows of these goods will constitute a significant share of goods movement in all corridors and will be the primary driver of overall corridor truck flows in all directions.

For the Sun Belt Corridor, Warehouse & Distribution Center goods make up a smaller share of total tonnage than in most other corridors, but flows of these commodities are still high in absolute terms. These goods accounted for 3.5 million tons of total flows in 2010 (5.2% of the total), and are forecasted to grow by 2.6% per year to 7.5 million tons by 2040 (5.7% of the total).

Top Commodities by Tonnage

In addition to general consumer goods, top commodities by tonnage for the Sun Belt Corridor include goods transported in containers, agriculture, and plastics. Containers and plastics also account for large shares of total corridor value as well.

When measured collectively, goods moving in containers represent one of the most important sources of freight flows through the Sun Belt Corridor, accounting for 5.6 million tons of total cargo in 2010. This figure will grow by 3.2% per year to 14.4 million tons by 2040. Much of this container traffic is generated by expanding international trade shipped into and out of Mexico and/or, ultimately, seaports in the Gulf Coast in both directions. Some containers will also be routed to and from Los Angeles/Long Beach. Container traffic tends to move over land via rail, which will strain existing regional rail infrastructure, particularly bridges across the Mississippi River as well as bridge approaches.

Although through traffic makes up the majority of these flows, inbound and outbound flows are account for over 1.5 million tons. These flows are relatively well balanced in both directions, suggesting that the regional economy benefits as both a producer and consumer of these generally high-value goods moving into and out of the St. Louis Region.

Table 102 – Containers, Sun Belt Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	4,146	5,166	5,888	7,399	9,945	3.0%
Truck	-	-	-	-	-	N/A
Rail	4,146	5,166	5,888	7,399	9,945	3.0%
Waterborne	-	-	-	-	-	N/A
Outbound	743	894	1,049	1,434	2,152	3.6%
Truck	-	-	-	-	-	N/A
Rail	743	894	1,049	1,434	2,152	3.6%
Waterborne	-	-	-	-	-	N/A
Inbound	717	869	1,031	1,465	2,305	4.0%
Truck	-	-	-	-	-	N/A
Rail	717	869	1,031	1,465	2,305	4.0%
Waterborne	-	-	-	-	-	N/A
Total	5,605	6,928	7,968	10,298	14,402	3.2%

Source: IHS

Agriculture is an important source of freight flows through the Sun Belt Corridor, which will grow at a modest pace 1.1% annually through 2040. In this case, inbound traffic moves via rail to St. Louis for processing by the large regional food and beverage manufacturing industry or to be trans-shipped down the Mississippi River. Much of the cargo moving through this corridor originates in BEAs close to St. Louis, especially Springfield, MO, Joplin, and areas of eastern Oklahoma. While most shipments move via rail, some will move via roadway adding new demand for truck flows on I-44. The availability of riverside intermodal infrastructure will be important to serve growing export markets serviced via the Mississippi River and New Orleans seaport terminals.

Table 103 – Agriculture Logistics, Sun Belt Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	3,173	3,382	3,604	4,011	4,533	1.2%
Truck	2,198	2,303	2,443	2,721	3,093	1.1%
Rail	975	1,079	1,161	1,290	1,440	1.3%
Waterborne	-	-	-	-	-	N/A
Outbound	236	229	232	233	239	0.0%
Truck	160	148	146	141	138	-0.5%
Rail	64	71	77	87	97	1.4%
Waterborne	12	11	9	6	4	-3.5%
Inbound	3,727	4,079	4,345	4,743	5,180	1.1%
Truck	551	564	583	593	580	0.2%
Rail	3,176	3,515	3,762	4,151	4,600	1.2%
Waterborne	-	-	-	-	-	N/A
Total	7,136	7,691	8,181	8,987	9,952	1.1%

Source: IHS

Corridor flows of plastics are driven in large part by production in both Texas and the Midwest to supply automotive manufacturing. Again, the re-shoring of automotive manufacturing in North America is contributing to this trend. St. Louis is located at a critical geographical node in the automotive supply chain. Flows of plastics commodities will generally move through St. Louis via

truck. Relatively little of these flows, however, will originate or terminate within St. Louis. There is certainly plastics-consuming automotive manufacturing and assembly in the St. Louis Region, but for the most part St. Louis will be a trans-shipment point, and an important one, in the evolving North America vehicle manufacturing supply chain. The explosion of continental automobile manufacturing will help support over 3% annual growth in tonnage flows of plastic through the Sun Belt Corridor.

Table 104 – Plastics Logistics, Sun Belt Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	2,516	2,723	3,296	4,322	6,570	3.3%
Truck	2,087	2,273	2,767	3,717	5,875	3.5%
Rail	429	450	529	604	695	1.6%
Waterborne	-	-	-	-	-	N/A
Outbound	32	36	43	55	77	2.9%
Truck	32	35	42	54	75	2.9%
Rail	0	1	1	1	2	4.2%
Waterborne	-	-	-	-	-	N/A
Inbound	31	34	38	44	52	1.7%
Truck	19	21	23	26	31	1.6%
Rail	13	13	16	18	22	1.8%
Waterborne	-	-	-	-	-	N/A
Total	2,579	2,793	3,378	4,421	6,699	3.2%

Source: IHS

Several other commodities contribute significantly to overall freight tonnage moving through the Sun Belt Corridor. The next sub-section will analyze several of the more high-value commodities. Other top commodities by tonnage include food and beverage products such as soft drinks and malt beverages, sand and gravel, and iron and steel. Iron and steel would move primarily in a westbound direction and via rail. The other goods may move by rail or truck depending upon the distances and logistics requirements.

Top Commodities by Value

Several commodity classes are or will be responsible for substantial shares of total freight value moving through the Sun Belt Corridor. These include chemicals, motor vehicles, and high technology products. Containers will contribute a high share of this value, accounting for $25.6 billion in 2010 (14.4% of the total) and forecasted to total $69.6 billion (13.3% of the total) by 2040. Additionally, plastics make up a large share of value, accounting for $5.5 billion of the total corridor flows in 2010 (3.1% of the total) and forecasted to total $14.5 billion (2.8% of the total) by 2040.

In order to enable consistent comparison of the impact of commodities across and within corridors, flows of high-value goods will be reported by tonnage.

Chemicals constitute an important source of tonnage and value of flows for the Sun Belt Corridor. Moreover, total tonnage will grow rapidly at 2.8% per year. This study has established St. Louis' important role in chemical supply chains, including high-end manufacturing of certain types of chemical products. With respect to the Sun Belt Corridor, however, most of the liquid chemical flows will be through traffic, especially chemicals produces in New York and New Jersey that move through St. Louis en route to Los Angeles and other domestic and foreign destinations. Given the high value and special handling required of these chemicals, most tonnage will move via truck rather than rail. Thus, the I-44 westbound links from St. Louis are likely to see substantial increases in chemical truck

cargo in the coming decades. Corridor chemicals transportation accounted for $4.8 billion in value in 2010 (2.7% of the total) and will grow to $12.8 billion in 2040 (2.5% of the total).

Table 105 – Chemicals Logistics, Sun Belt Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	2,415	2,499	3,006	3,933	5,739	2.9%
Truck	1,951	1,992	2,424	3,213	4,797	3.0%
Rail	464	507	582	720	943	2.4%
Waterborne	-	-	-	-	-	N/A
Outbound	280	320	367	405	443	1.5%
Truck	236	272	312	337	354	1.4%
Rail	44	48	54	67	89	2.4%
Waterborne	-	-	-	-	-	1.3%
Inbound	65	72	86	120	176	3.4%
Truck	3	4	3	3	2	-1.3%
Rail	62	69	83	117	173	3.5%
Waterborne	-	-	-	-	-	N/A
Total	2,760	2,891	3,459	4,458	6,358	2.8%

Source: IHS

Similar to the case of chemicals, the St. Louis economy has an important role in automobile manufacturing supply chains, including manufacturing and, especially, trans-shipment. Also similar to the former case, however, is the fact that most Sun Belt corridor flows will be through traffic. Essentially, automobiles manufactured in growing industrial clusters such as Southern Mexico and the Midwest will move through St. Louis en route to various destinations throughout North America. Most of this cargo will move via rail. Corridor motor vehicles transportation accounted for $13.3 billion in value in 2010 (7.5% of the total) and will grow to $27 billion in 2040 (5.2% of the total).

Table 106 – Motor Vehicles, Sun Belt Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	1,437	2,456	2,469	2,651	2,913	2.4%
Truck	150	255	260	283	305	2.4%
Rail	1,287	2,201	2,210	2,369	2,608	2.4%
Waterborne	-	-	-	-	-	N/A
Outbound	-	-	-	-	-	N/A
Truck	-	-	-	-	-	N/A
Rail	-	-	-	-	-	N/A
Waterborne	-	-	-	-	-	N/A
Inbound	22	37	37	40	44	2.4%
Truck	-	-	-	-	-	N/A
Rail	22	37	37	40	44	2.4%
Waterborne	-	-	-	-	-	N/A
Total	1,459	2,493	2,507	2,691	2,956	2.4%

Source: IHS

The Sun Belt Corridor is expected to see a precipitous increase in the volumes of high technology products in the future. On average, tonnage will increase by 7.6% per year from less than half a million tons in 2010 to over 4 million tons by 2040. Texas, and especially the Dallas BEA, will be responsible for much of the growth in technology freight moving through this corridor on account of its leadership in technology manufacturing. At the same time imports of other electronics via states bordering Mexico and through Southern California ports will help drive future growth.

Since most technology goods move via truck, the growth of this segment will put pressure on I-44, as well as beltways since much of this freight represents through traffic. Inbound shipments will, however, grow at 10.5% annually, with St. Louis' emerging knowledge economy demanding greater volumes of technology goods in the coming years. Thus, while there may be limited direct regional economic impact on account of this segment in terms of manufacturing and trans-shipment, the efficient flow of technological goods will be important for supporting other regional technology-dependent industries in St. Louis.

Table 107 – Technology, Sun Belt Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	412	621	996	2,034	3,446	7.3%
Truck	406	614	986	2,019	3,423	7.4%
Rail	6	8	9	15	23	4.7%
Waterborne	-	-	-	-	-	N/A
Outbound	16	22	29	51	85	5.8%
Truck	16	22	28	50	84	5.8%
Rail	<1	<1	<1	<1	1	4.7%
Waterborne	-	-	-	-	-	N/A
Inbound	26	45	96	279	511	10.5%
Truck	26	45	96	279	511	10.5%
Rail	-	-	-	-	-	N/A
Waterborne	-	-	-	-	-	N/A
Total	454	688	1,120	2,363	4,042	7.6%

Source: IHS

Several other commodities contribute significantly to overall freight tonnage moving through the Sun Belt Corridor. Not surprisingly, these include clothing, footwear, and furniture imports, which are relatively high-value-per-ton commodities.

Summary of Goods Movement Trends and Implications for St. Louis

The Sun Belt Corridor will be responsible for a substantial share of total value flows moving into, out of, and through the St. Louis Region. This trend will be driven by broader national and international trends, including increased trade in high-value commodity goods with Asia and Mexico through southern and southwestern seaports, the re-shoring of automobile manufacturing in Mexico and Midwest, and rapidly growing demands for electrical and computer-related products produced in technology clusters such as Dallas, Austin, and San Antonio. The Sun Belt Corridor is the key medium for transporting these goods to and from St. Louis, which is located at a critical node within the wider national supply and logistics chains for these products.

There are positive and negative consequences of the explosive growth of freight flows through the Sun Belt Corridor. On the positive side, increased flows increase opportunities for regional transportation and logistics industries. If St. Louis can strengthen its automotive and chemical manufacturing industries, the St. Louis Region may be able to play an ever greater value-added role in these supply chains in the future. On the negative side, the rapid growth of flows through this corridor will strain existing infrastructure, especially I-44 and, in the case of container traffic, congest rail infrastructure. This could reduce the efficiency of transporting, for example, agricultural products into St. Louis for food and beverage and Mississippi River trans-shipment industries.

Lower Mississippi and Gulf Coast

The Lower Mississippi and Gulf Coast Corridor includes about 20 BEAs located directly south of the St. Louis BEA. The area is approximately bounded as follows:

- **North:** The Missouri-Arkansas and Tennessee-Kentucky borders
- **East:** The Tennessee River and the Alabama-Mississippi border (plus the Mobile, AL BEA)
- **South:** The Gulf of Mexico
- **West:** The western boundaries of the Corpus Christi, Houston, and Beaumont-Port Arthur BEAs in Texas and the Arkansas-Oklahoma border (except for Northwest Arkansas)

The following map situates the Lower Mississippi and Gulf Coast Corridor within the continental United States. Included in the map are the key Interstate highways, Class I rail lines, and waterways.

Figure 25 – Map of the Lower Mississippi and Gulf Coast Corridor

Source: IHS

Freight moving through the Lower Mississippi and Gulf Coast Corridor would primarily connect to the St. Louis study area via the following regional infrastructure:

- Highways: I-55, southbound from St. Louis and northbound into St. Louis
- Class I Railroad Network Infrastructure: UP, KCS, and CN (BNSF for service to and from Houston or Memphis)
- Waterways: the Mississippi River and the Arkansas River

Nearly all freight moving via truck connects with the St. Louis region via I-55. Route I-55 runs parallel to but east of the Mississippi River providing direct truck access to Memphis, Jackson, Baton Rouge, and New Orleans. I-55 also routes truck flows between St. Louis and both Little Rock and Houston, connecting via Route I-30. Houston truck traffic may also be routed through the Southern California, Texas, and Mexico Border Corridor via I-44 via Dallas; however, for the purposes of this study Houston's connection with Gulf Coast economies is deemed more important. Growth in freight flows

along this corridor will increase demand on I-55 in segments south of downtown St. Louis and, of course, contribute to congestion on regional beltways and downtown expressways.

KCS and CN infrastructure dominates the North-South rail network between the Gulf Coast and St. Louis, with UP's extensive southwestern network also offering services between key origins and destinations. BNSF offers service to and from some but not all key origins and destinations in the Lower Mississippi and Gulf Coast Corridor, including Houston and Memphis.

The Lower Mississippi and Gulf Coast Corridor is serviced by the most important waterborne freight route for the St. Louis region. The Lower Mississippi River carries the majority of all waterborne freight terminating and, in most cases, originating in St. Louis. The Arkansas River also provides limited service for some barge traffic through portions of the corridor.

Primary Inter-regional Commercial Relationships

The tables in this sub-section summarize the top origin and destination BEAs for freight flows moving through the Lower Mississippi and Gulf Coast Corridor. This data includes flows across all modes. Subsequent sub-sections will analyze the modal shares, the top commodities, and the general logistics of flows. Compared to other corridors, there is relatively modest traffic moving northbound into St. Louis from the Lower Mississippi and Gulf Coast Corridor. Houston and its high-value petroleum and chemicals industries play the most important role in the corridor whether measured by tonnage or value. Not surprisingly, New Orleans and Memphis, the two largest river port cities in the corridor, become the two next most important BEAs. Fertilizers and other energy bulk products tend to help drive these numbers. Otherwise, the top five origins remain relatively static in terms of composition and volume.

Table 108 – Top 5 Origins – Lower Mississippi and Gulf Coast Corridor, All Traffic

BEA	K Tons, 2010	Rk	K Tons, 2040	Rk	$ Mil., 2010	Rk	$Mil., 2040	Rk
Houston, TX	3,957	1	6,367	1	7,229	1	12,998	1
New Orleans, LA	2,235	2	2,960	3	3,886	2	6,736	3
Baton Rouge, LA	1,979	3	2,303	5	1,798	4	2,509	4
Memphis, TN	1,895	4	3,228	2	3,798	3	8,175	2
Little Rock, AR	1,883	5	2,513	4	1,575	5	1,883	5

Source: IHS

Freight flowing southbound from St. Louis to destinations in the Lower Mississippi and Gulf Coast corridor is substantially greater that freight moving in the opposite direction. This is primarily driven by bulk commodities consolidated in St. Louis and moving southbound down the Mississippi River to river port destinations and, in many instances, for export through New Orleans. As this sub-section will illustrate, downriver freight tonnage will be dominated by agriculture and coal. Additionally, however, St. Louis's petroleum refining, pharmaceuticals, and chemicals industries will help drive the value of freight movement through the corridor and across multiple modes of transportation, especially to Memphis, Houston, and BEAs in Arkansas.

Table 109 – Top 5 Destinations – Lower Mississippi and Gulf Coast Corridor, All Traffic

BEA	K Tons, 2010	Rk	K Tons, 2040	Rk	$ Mil., 2010	Rk	$Mil., 2040	Rk
New Orleans, LA	**9,814**	**1**	23,535	**1**	**2,238**	**4**	**5,541**	**3**
Little Rock, AR	**9,287**	**2**	10,156	**2**	**2,618**	**3**	**4,597**	**4**
Baton Rouge, LA	**5,042**	**3**	2,454	**5**	**1,218**	**5**	1,178	
Houston, TX	**4,732**	**4**	4,732	**4**	**5,939**	**1**	**11,227**	**1**
Memphis, TN	**4,040**	**5**	6,428	**3**	**5,235**	**2**	**10,148**	**2**
Jonesboro, AR	753		1,205		1,131		**2,168**	**5**

Source: IHS

Detailed Corridor Logistics

The previous sub-sections established the primary origins and destinations and the critical infrastructures associated with the Lower Mississippi and Gulf Coast Corridor. The following tables provide a fine-grained breakdown of freight movement through the corridor by several key dimensions: mode, direction, and time (i.e., current and forecasted flows).

Total tonnage moving through the Lower Mississippi and Gulf Coast Corridor grows at a moderate 1.3% per year. This trend is driven primarily by outbound waterborne cargo, which currently accounts for over a quarter of total flows and grows by about 1.7% per year. Through traffic accounts for about 60% of freight moving within the corridor in 2010. Most of the through traffic is rail freight, although truck freight will grow faster in the future. The slow growth in rail through traffic can be attributed, in part, to the fact that coal moving via rail will decline in future years. Inbound traffic makes up only a small share of total tonnage, as the direction of freight flows between St. Louis and Lower Mississippi and Gulf Coast cities tends to be southbound.

Table 110 – Lower Mississippi and Gulf Coast Corridor, Total Tonnage (000's)

Segment	2010	2015	2020	2030	2040	CAGR
Through	34,726	38,795	41,297	44,320	49,062	1.2%
Truck	7,167	8,094	8,795	10,222	12,042	1.7%
Rail	27,560	30,701	32,502	34,098	37,020	1.0%
Waterborne	-	-	-	-	-	N/A
Outbound	18,598	19,446	20,805	23,447	30,002	1.6%
Truck	2,095	2,286	2,409	2,615	2,850	1.0%
Rail	502	576	618	657	754	1.4%
Waterborne	16,000	16,584	17,779	20,175	26,398	1.7%
Inbound	4,912	5,322	5,552	5,629	5,893	0.6%
Truck	1,651	1,787	1,873	2,040	2,229	1.0%
Rail	670	741	823	907	1,027	1.4%
Waterborne	2,591	2,794	2,857	2,682	2,637	0.1%
Total	58,236	63,564	67,654	73,395	84,957	1.3%

Source: IHS

The slow growth in through traffic tonnage is more than compensated, however, by the rapid growth in total values. Through traffic values will grow at about 2% total per year across all modes and by 2.1% via rail. At the same time, inbound flows by value are much closer to outbound flow, which is due in large part to higher-value northbound truck traffic, including containers imported through the Gulf as well as high-value manufactured goods from the Gulf Coast such as plastics and petroleum- and chemical-related products.

Table 111 – Lower Mississippi and Gulf Coast Corridor, Total Values ($ Mil.)

Segment	2010	2015	2020	2030	2040	CAGR
Through	38,982	47,184	51,873	59,887	71,633	2.0%
Truck	14,019	16,304	18,083	21,527	25,376	2.0%
Rail	24,963	30,880	33,790	38,361	46,257	2.1%
Waterborne	-	-	-	-	-	N/A
Outbound	9,116	10,174	11,064	12,716	15,191	1.7%
Truck	4,955	5,623	6,131	7,154	8,192	1.7%
Rail	524	593	639	708	853	1.6%
Waterborne	3,637	3,958	4,294	4,854	6,147	1.8%
Inbound	5,822	6,569	6,971	7,701	8,779	1.4%
Truck	3,115	3,537	3,691	4,173	4,812	1.5%
Rail	885	968	1,092	1,250	1,500	1.8%
Waterborne	1,821	2,065	2,189	2,278	2,468	1.0%
Total	53,920	63,928	69,909	80,305	95,603	1.9%

Source: IHS

Primary Corridor Commodity Supply Chains and Implications for St. Louis

This sub-section considers the top commodities moving into, out of, and through St. Louis in the Lower Mississippi and Gulf Coast Corridor. Top commodities contributing to total corridor tonnage and value will be highlighted in overall logistics profiles that will illustrate important infrastructure and logistics requirements. These profiles will help show where and how St. Louis plays in the supply chain, which will help inform the prioritization of possible interventions to support freight flows through the corridor.

Excluded from these analyses will be general consumer goods previously categorized in this study as "Warehouse & Distribution Center Goods." The heterogeneity and small individual quantities of goods included in this classification make it difficult to formulate meaningful insight from the products individually. Collectively, however, flows of these goods will make up the plurality of corridor goods movement in all corridors and will be the primary driver of overall corridor truck flows in all directions.

For the Lower Mississippi and Gulf Coast Corridor, however, Warehouse & Distribution Center goods make up a relatively small share of total tonnage flows, accounting for only 1.9 million tons of total flows in 2010 (3.5% of the total. These totals are, however, forecasted to grow by 2.2% per year to 3.6 million tons by 2040 (3.8% of the total).

Top Commodities by Tonnage

Besides general consumer goods, top commodities by tonnage for the Lower Mississippi and Gulf Coast Corridor include coal, agriculture, and chemicals. Coal is the highest-tonnage commodity moving through the Lower Mississippi and Gulf Coast Corridor. A significant share includes coal aboard rail passing from the Powder River Basin to BEAs just south and east of the St. Louis BEA. Of particular importance for the St. Louis transportation and logistics industry is coal moving down the Mississippi River for consumption in domestic energy production or export via New Orleans to foreign markets. Although the Powder River Basin (the source of most coal shipments into and through St. Louis) produces the most competitive coal in the United States, loss of domestic market share to natural gas will reduce the quantities of coal moving down the Mississippi River. Exports via New Orleans will mitigate but not offset the industry-wide impacts of reduced domestic demand. The overall trajectory in regional coal movement is slightly negative, and downriver coal shipments will fall by nearly half over the next 30 years.

Table 112 – Coal Logistics, Lower Mississippi and Gulf Coast Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	9,309	9,930	9,675	9,111	8,795	-0.2%
Truck	-	-	-	-	-	N/A
Rail	9,309	9,930	9,675	9,111	8,795	-0.2%
Waterborne	-	-	-	-	-	N/A
Outbound	4,170	2,898	2,561	2,143	2,226	-2.1%
Truck	-	-	-	-	-	N/A
Rail	-	-	-	-	-	N/A
Waterborne	4,171	2,898	2,561	2,143	2,226	-2.1%
Inbound	261	231	205	154	123	-2.5%
Truck	-	-	-	-	-	N/A
Rail	-	-	-	-	-	N/A
Waterborne	261	231	205	154	123	-2.5%
Total	13,740	13,058	12,441	11,408	11,144	-0.7%

Source: IHS

In contrast, downriver waterborne shipments of agricultural products will rapidly increase at a rate of 2.5% annually, more than offsetting the lost tonnage of coal. Outbound waterway routes will continue to dominate the logistics for agricultural products, growing by almost 2.9% per year. This trend is driven by exports to fast-growing emerging markets, especially in Asia. Most of this freight will be consolidated in New Orleans and trans-shipped via ocean vessel. While waterborne freight dominates freight movement through this corridor, it is important to note that other modes are important to the supply chain. In particular truck and, especially, rail are critical to transporting agricultural bulk from farms to St. Louis for consolidation and trans-shipment.

Table 113 – Agriculture Logistics, Lower Mississippi and Gulf Coast Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	4,163	4,674	5,030	5,658	6,565	1.5%
Truck	855	973	1,064	1,230	1,548	2.0%
Rail	3,308	3,700	3,966	4,429	5,017	1.4%
Waterborne	-	-	-	-	-	N/A
Outbound	8,643	10,294	11,624	14,247	20,105	2.9%
Truck	39	38	39	38	38	-0.1%
Rail	10	11	12	13	15	1.4%
Waterborne	8,594	10,245	11,574	14,196	20,051	2.9%
Inbound	68	74	75	81	87	0.8%
Truck	2	2	3	4	5	3.7%
Rail	24	28	29	33	38	1.5%
Waterborne	42	44	43	44	45	0.2%
Total	12,874	15,041	16,729	19,986	26,757	2.5%

Source: IHS

High-value chemical freight represents an important sector for the St. Louis economy. The Gulf Coast is a major producer of chemicals, shipping many various products northbound by rail up the Lower Mississippi and Gulf Coast Corridor through St. Louis to destinations beyond. As the data illustrates, however, the net flows of outbound to inbound flows are positive for St. Louis, suggesting the Lower Mississippi and Gulf Coast corridor is also a key market for regionally manufactured chemical products. Most of this freight moves via barge down the Mississippi River.

Table 114 – Chemicals Logistics, Lower Mississippi and Gulf Coast Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	2,576	2,744	3,199	3,758	4,540	1.9%
Truck	78	85	89	94	101	0.9%
Rail	2,499	2,659	3,109	3,664	4,439	1.9%
Waterborne	-	-	-	-	-	N/A
Outbound	649	688	786	839	999	1.4%
Truck	22	25	26	24	22	0.0%
Rail	64	70	79	98	129	2.4%
Waterborne	563	593	681	718	848	1.4%
Inbound	332	370	422	501	597	2.0%
Truck	16	18	20	23	25	1.4%
Rail	162	174	200	239	297	2.0%
Waterborne	154	178	201	240	276	2.0%
Total	3,558	3,801	4,407	5,098	6,136	1.8%

Source: IHS

Several other commodities contribute significantly to overall freight tonnage moving through the Lower Mississippi and Gulf Coast Corridor. The next sub-section will analyze several of the more high-value commodities. Other top commodities by tonnage include crude petroleum and iron and steel. These products would move primarily southbound by rail and, when practicable, via barge down the Mississippi River.

Top Commodities by Value

Several commodity classes are or will be responsible for substantial shares of total freight value moving through the Lower Mississippi and Gulf Coast Corridor, including petroleum products, plastics, and general container goods. Additionally, chemicals make up a large share of value, accounting for $5.5 billion of the total corridor flows in 2010 (9.6% of the total) and forecasted to total $10.3 billion (10.8% of the total) by 2040. Other top commodities by value include iron, steel, non-ferrous smelting products, and pharmaceuticals.

Petroleum products[12] are synonymous with the Gulf Coast economies. Pipelines are the most efficient mode of transporting these goods. However, demand often exceeds pipeline infrastructure supply, necessitating rail or, whenever possible, waterborne transportation. The exploding production of crude oil and natural gas in Canada (and to a lesser extent for St. Louis supply chains, North Dakota) has created opportunities for the rail and barge industries to move cargo to and through the St. Louis region. More importantly, Conoco-Phillips has taken advantage of St. Louis' location along pipelines between Canada and the Gulf Coast to increase regional petroleum refining at the Wood River facility. In addition to serving regional demand, petroleum products are often shipped down the Mississippi River to various markets within the Lower Mississippi and Gulf Coast corridor, especially relatively nearby BEAs such as Nashville and Jackson.

Petroleum refining will continue to be important for the St. Louis economy; however, actual flows through the Lower Mississippi and Gulf Coast corridor will decline. As the data suggests, both rail through traffic and waterborne outbound shipments will decline in the future. Two primary factors account for this decline. First, additional pipelines will be built, reducing the need for long-distance

[12] For the purposes of the corridor commodity analyses, the classification "petroleum products" includes refined petroleum as well as various liquefied petroleum and gas products. Crude petroleum is considered separately.

rail transportation. Second, Wood River refining will increasingly serve regional markets, while the build-up of refining infrastructure in the Gulf Coast will increasingly dominate domestic production. Corridor petroleum products transportation accounted for $3.1 billion in value in 2010 (5.8% of the total) but will fall to $2 billion in 2040 (2.1% of the total).

Table 115 – Refined Petroleum, Lower Mississippi and Gulf Coast (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	1,574	1,630	1,612	1,410	1,245	-0.8%
Truck	217	206	203	184	160	-1.0%
Rail	1,357	1,424	1,409	1,226	1,084	-0.7%
Waterborne	-	-	-	-	-	N/A
Outbound	1,342	1,252	1,147	910	710	-2.1%
Truck	-	-	-	-	-	N/A
Rail	199	212	211	185	164	-0.6%
Waterborne	1,143	1,039	936	725	545	-2.4%
Inbound	645	618	579	433	334	-2.2%
Truck	51	33	28	16	12	-4.8%
Rail	79	81	80	69	60	-0.9%
Waterborne	515	505	472	348	262	-2.2%
Total	3,561	3,500	3,339	2,753	2,289	-1.5%

Source: IHS

Plastics make up a large and growing share of both tonnage and value moving through the Lower Mississippi and Gulf Coast Corridor. Most of this freight represents through traffic moving between major industrial centers in Houston and other major centers of plastics production and consumption north and east of St. Louis. Plastics will factor prominently in increasing traffic volumes through corridor rail infrastructure, but will offer limited opportunities for additional regional value added. Corridor plastics transportation accounted for $5.3 billion in value in 2010 (9.9% of the total) and will grow to $8.5 billion in 2040 (8.9% of the total).

Table 116 – Plastics, Lower Mississippi and Gulf Coast Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	2,360	2,476	2,907	3,308	3,770	1.6%
Truck	38	42	47	50	47	0.7%
Rail	2,322	2,434	2,860	3,258	3,722	1.6%
Waterborne	-	-	-	-	-	N/A
Outbound	31	35	42	47	45	1.3%
Truck	26	30	34	37	34	0.9%
Rail	4	4	4	5	6	1.5%
Waterborne	2	2	3	6	6	4.6%
Inbound	134	140	162	183	206	1.4%
Truck	7	7	6	6	6	-0.7%
Rail	127	133	156	177	200	1.5%
Waterborne	-	-	-	-	-	1.6%
Total	2,525	2,650	3,111	3,538	4,021	1.6%

Source: IHS

Various classes of goods shipped in containers make up an important share of freight flows through the Lower Mississippi and Gulf Coast Corridor. Like petroleum products, containers currently account for a large share freight value movement through the corridor, but not necessarily as high a share of tonnage. Total container flows are expected, however, to grow rapidly in the future, following general national economic trends of increased trade. Total corridor tonnage will grow at an annual rate of

3.3% from less that 1 million to about 2.6 million. In the case of St. Louis, nearly all of these freight flows will be rail through traffic, which will increase congestion, particularly at river crossings. However, limited tonnage will originate or terminate within the St. Louis region; therefore, opportunities to leverage these flows to support broader economic development are forecasted to be minimal for this corridor. Corridor container transportation accounted for $3.9 billion in value in 2010 (7.3% of the total) and will grow to $11.1 billion in 2040 (11.6% of the total).

Table 117 – Containers, Lower Mississippi and Gulf Coast Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	987	1,164	1,340	1,789	2,642	3.3%
Truck	-	-	-	-	-	N/A
Rail	987	1,164	1,340	1,789	2,642	3.3%
Waterborne	-	-	-	-	-	N/A
Outbound	38	42	47	63	92	3.0%
Truck	0	0	0	1	1	6.2%
Rail	38	42	47	62	91	3.0%
Waterborne	-	-	-	-	-	N/A
Inbound	28	32	33	39	47	1.7%
Truck	13	14	13	12	12	-0.3%
Rail	15	18	21	27	35	2.9%
Waterborne	-	-	-	-	-	N/A
Total	1,054	1,238	1,421	1,891	2,781	3.3%

Source: IHS

The domestic steel industry has experienced years of restructuring. However, iron, steel, and smelting products still make up a large important share of downriver traffic, particularly when measured by value. Pharmaceuticals and motor vehicles represent other high value-added regional product associated with the Lower Mississippi and Gulf Coast Corridor. The St. Louis regional pharmaceutical industry will find strong markets in this growing corridor, transporting goods primarily along I-55. The proximity of St. Louis to low-cost chemical feed stocks from Canada and expanding markets in the Gulf Coast support enhancement of these opportunities. The increase in motor vehicles transportation is consistent with trends across all corridors.

Summary of Goods Movement Trends and Implications for St. Louis

The Mississippi River is historically the lifeblood of transportation and trade through the Lower Mississippi and Gulf Coast corridor. Coal and agriculture have long dominated freight tonnage through this corridor, primarily downriver. While coal will decline, agriculture will more than offset the lost tonnage, with most of this freight moving to New Orleans for export.

The Mississippi River will also continue to serve as an important outlet for high-value chemical and petroleum products, although the development of pipelines and increased concentration of refining activities in the Gulf Coast will reduce waterborne transport of the latter. Trucks will play an important role in transporting growth in high-value commodities produced regionally, such as chemicals and pharmaceuticals, to relatively nearby BEAs, while rail will support mostly through traffic through the corridor. Plastics and containers are among the fastest growing segments for the Lower Mississippi and Gulf Coast corridor; most of these flows will continue to be through traffic, via rail. Motor vehicles transportation is becoming increasingly important for the Lower Mississippi and Gulf Coast corridor, also impacting regional congestion on St. Louis' rail infrastructure network.

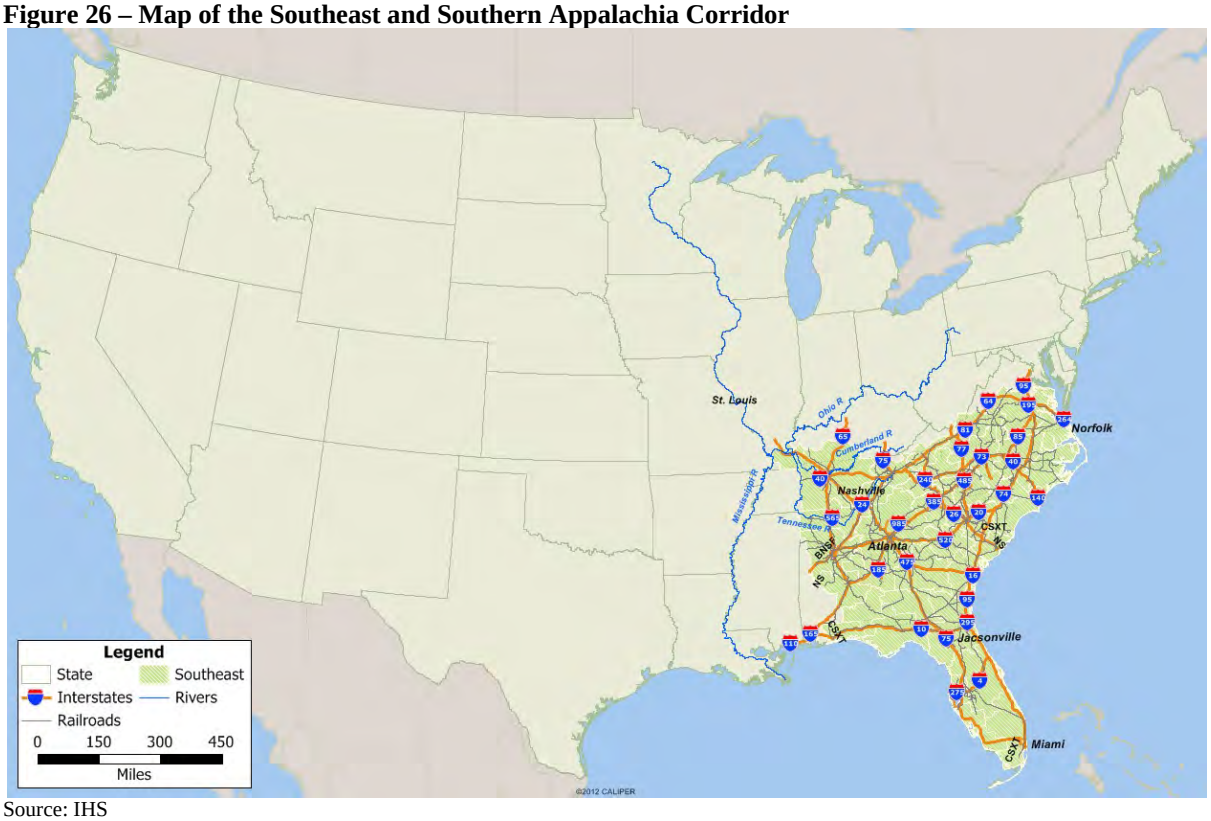
Southeast and Southern Appalachia

The Southeast and Southern Appalachia Corridor includes BEAs located northeast of the St. Louis BEA. The area is approximately bounded as follows:

- **North:** The Shenandoah Valley and the Cumberland River (and all areas of the Nashville BEA north of the Cumberland River)
- **East:** The Atlantic Ocean
- **South:** The Gulf of Mexico
- **West:** The western boundary of Alabama (except the Mobile BEA) and the Tennessee River

The following map situates the Lower Mississippi and Gulf Coast Corridor within the continental United States. Included in the map are the key Interstate highways, Class I rail lines, and waterways serving freight flows through the corridor.

Figure 26 – Map of the Southeast and Southern Appalachia Corridor



Source: IHS

Freight moving through the Southeast and Southern Appalachia Corridor would primarily connect to the St. Louis study area via the following regional infrastructure:

- Highways: I-64, eastbound from St. Louis and westbound into St. Louis
- Class I Railroad Network Infrastructure: CSX, NS, and some BNSF service in western Alabama and Tennessee

- Waterways: the Tennessee River, the Cumberland River, and westernmost stretches of the Ohio River

I-64 is the key radial connecting the BEAs in the Southeast and Southern Appalachia to the St. Louis Region. The interstate runs east from St. Louis through Louisville, Richmond, and Norfolk. I-64 also collects and distributes traffic between St. Louis and numerous other BEAs in the south. For example, Route I-75 connects to major commercial centers in Atlanta on into Florida. Freight originating in these locales would connect with I-24 near Chattanooga, continue past Nashville onto I-57 before connecting with I-64 near Mount Vernon, IL. It is also important to note that large stretches of I-64 also run through the Northeast Corridor (e.g., Louisville, KY and Evansville, IN). Thus, the Southeast and Southern Appalachia is not the only corridor contributing to flows on this Interstate.

CSX and NS operate essentially a duopoly of all Class I freight service between the Southeast and St. Louis. With the exception of limited BNSF rail infrastructure in Northern Alabama, all rail freight would move through the network of the two major eastern Class I railroad companies.

Several major tributaries of the Lower Mississippi River provide barge access to major BEAs in the Southeast and Southern Appalachia. In particular, the Cumberland River provides access from Nashville to St. Louis via the a short stretch of the Ohio River near Paducah, KY and up the Mississippi River via Cape Girardeau, MO. The Tennessee River also branches off the Ohio River through Huntsville, and on to Chattanooga.

Primary Inter-regional Commercial Relationships

The tables in this sub-section summarize the top origin and destination BEAs for freight flows moving through the Southeast and Southern Appalachia Corridor. This data includes flows across all modes. Subsequent sub-sections will analyze the modal shares, the top commodities, and the general logistics of flows. Overall, the flows between St. Louis and top BEAs within the Southeast and Southern Appalachia Corridor are smaller than for other corridors. Birmingham and Miami are the only BEAs contributing over 1 million tons of freight in the westbound direction into St. Louis in 2010. This is due in large part to the fact that through traffic moving between BEAs in the Southeast and Southern Appalachia Corridor and the Sun Belt Corridor would not likely be routed through St. Louis. Freight originating in several nearby BEAs in Tennessee will increase, as will flows originating in fast-growing Atlanta.

Table 118 – Top 5 Origins – Southeast and Southern Appalachia Corridor, All Traffic

BEA	K Tons, 2010	Rk	K Tons, 2040	Rk	$ Mil., 2010	Rk	$Mil., 2040	Rk
Birmingham, AL	**1,272**	**1**	**1,726**	**3**	848		**2,551**	**5**
Miami, FL	**1,252**	**2**	**1,272**	**5**	**2,541**	**1**	**3,749**	**3**
Johnson City, TN	**893**	**3**	**1,875**	**2**	**861**	**5**	1,824	
Atlanta, GA	**815**	**4**	**1,989**	**1**	**1,799**	**3**	**4,085**	**2**
Nashville, TN	**753**	**5**	1,001		**2,099**	**2**	**4,106**	**1**
Norfolk, VA	190		**1,294**	**4**	590		**2,821**	**4**
Jacksonville, FL	138		278		**1,337**	**4**	1,693	

Source: IHS

Freight flows moving eastbound from St. Louis are slightly higher than those traveling in the westbound direction, particularly when measured by value. This is especially the case for freight flows to the Southeast and Southern Appalachia Corridor's two largest BEAs, Atlanta and Miami.

Ostensibly, high-value technology goods originating in the Midwest or the Pacific Northwest will account for much of this growth. The same can be said for fast-growing Orlando. Nearby Nashville and Birmingham appear in the Top 5 by tonnage and value. Petroleum products drive flows towards the former and iron and steel drive flows into the latter.

Table 119 – Top 5 Destinations – Southeast and Southern Appalachia Corridor, All Traffic

BEA	K Tons, 2010	Rk	K Tons, 2040	Rk	$ Mil., 2010	Rk	$Mil., 2040	Rk
Birmingham, AL	**3,431**	**1**	**4,117**	**3**	**1,402**	**5**	**4,007**	**5**
Nashville, TN	**2,672**	**2**	**4,159**	**2**	**2,555**	**3**	**5,026**	**4**
Atlanta, GA	**2,346**	**3**	**4,189**	**1**	**3,660**	**2**	**11,657**	**2**
Miami, FL	**2,008**	**4**	**3,280**	**4**	**4,201**	**1**	**14,319**	**1**
Richmond, VA	**1,108**	**5**	772		1,328		1,007	
Orlando, FL	1,055		**1,978**	**5**	**1,712**	**4**	**6,004**	**3**

Source: IHS

Detailed Corridor Logistics

The previous sub-sections established the primary origins and destinations and the critical infrastructures associated with the Southeast and Southern Appalachia Corridor. The following tables provide a fine-grained breakdown of freight movement through the corridor by several key dimensions: mode, direction, and time (i.e., current and forecasted flows). Total tonnage moving through the Southeast and Southern Appalachia Corridor grows at a moderately strong 1.5% per year. Through traffic accounts for much of the total tonnage flows. Of these flows, over two-thirds move via truck, illustrating the relatively high-value of this tonnage. Additionally, outbound flows from St. Louis are substantially higher than inbound flows, although the gap will close in the coming decades as industrial production in the fast-growing economies of the Southeast persists. Unlike inbound traffic, waterborne flows constitute a significant share of outbound traffic at 45% of the total. This is driven by commodity flows to Nashville and Birmingham of refined petroleum, coal, and some iron and steel products.

Table 120 – Southeast and Southern Appalachia Corridor, Total Tonnage (000's)

Segment	2010	2015	2020	2030	2040	CAGR
Through	32,497	37,550	40,542	45,231	51,548	1.5%
Truck	22,083	24,901	27,209	31,584	37,036	1.7%
Rail	10,415	12,649	13,333	13,646	14,512	1.1%
Waterborne	-	-	-	-	-	N/A
Outbound	5,000	5,098	5,103	5,502	6,021	0.6%
Truck	1,720	1,708	1,654	1,680	1,780	0.1%
Rail	1,045	1,133	1,210	1,294	1,523	1.3%
Waterborne	2,236	2,257	2,240	2,528	2,718	0.7%
Inbound	1,448	1,773	2,076	2,787	3,618	3.1%
Truck	914	1,159	1,402	2,029	2,706	3.7%
Rail	492	565	623	707	864	1.9%
Waterborne	42	48	51	51	47	0.4%
Total	38,945	44,420	47,721	53,520	61,187	1.5%

Source: IHS

Total corridor freight value grows more rapidly at 3.1% per year. Through traffic and inbound traffic will account for much of these gains. In the case of through traffic, high technology through traffic helps drive future flows. For inbound freight, the rapid growth rate in total cargo values is in part reflective of the relatively rapid growth in tonnage for truck. Manufacturing of consumer goods and

motor vehicles in the Southeast and Southern Appalachia will help drive the rapid growth in total value of inbound rail traffic.

Table 121 – Southeast and Southern Appalachia Corridor, Total Values ($ Mil.)

Segment	2010	2015	2020	2030	2040	CAGR
Through	44,937	55,221	62,374	84,248	116,441	3.2%
Truck	34,366	40,352	46,560	65,370	92,640	3.4%
Rail	10,570	14,869	15,814	18,878	23,801	2.7%
Waterborne	-	-	-	-	-	N/A
Outbound	5,485	6,052	6,535	8,012	10,162	2.1%
Truck	3,106	3,523	3,815	4,740	5,936	2.2%
Rail	1,548	1,760	1,967	2,439	3,422	2.7%
Waterborne	831	768	753	832	804	-0.1%
Inbound	3,771	4,533	4,842	6,129	7,983	2.5%
Truck	2,877	3,476	3,625	4,567	5,759	2.3%
Rail	831	985	1,140	1,481	2,141	3.2%
Waterborne	63	72	77	81	83	0.9%
Total	54,193	65,806	73,751	98,389	134,587	3.1%

Source: IHS

Primary Corridor Commodity Supply Chains and Implications for St. Louis

This sub-section considers the top commodities moving into, out of, and through St. Louis in the Southeast and Southern Appalachia Corridor. Top commodities contributing to total corridor tonnage and value will be highlighted in overall logistics profiles that will illustrate important infrastructure and logistics requirements. These profiles will help show where and how St. Louis plays in the supply chain, which will help inform the prioritization of possible interventions to support freight flows through the corridor.

Excluded from these analyses will be general consumer goods previously categorized in this study as "Warehouse & Distribution Center Goods." The heterogeneity and small individual quantities of goods included in this classification make it difficult to formulate meaningful insight from the products individually. Collectively, however, flows of these goods will make up the plurality of corridor goods movement in all corridors and will be the primary driver of overall corridor truck flows in all directions. For the Southeast and Southern Appalachia Corridor, Warehouse & Distribution Center goods accounted for 3.8 million tons of total flows in 2010 (10% of the total), and are forecasted to grow by 3% per year to 9.9 million tons by 2040 (16.1% of the total).

Top Commodities by Tonnage

Besides general consumer goods, top commodities by tonnage for the Southeast and Southern Appalachia Corridor include agriculture, petroleum products, and chemicals. After consumer goods, agriculture accounts for the next most important share of Southeast and Southern Appalachia Corridor. Agriculture accounted for 4.3 million tons of freight through the corridor in 2010. Although agriculture is historically a leading industry in the Southeast and Southern Appalachia Corridor BEAs, tonnage often moves through the corridor in an eastbound direction. This is especially true for grains and certain field crops produced in the Midwest and Great Plains. For BEAs in parts of Tennessee and Alabama River, barge is the primary mode of transportation for these flows, as illustrated by the relatively high waterborne share for outbound flows. Generally there is limited agriculture moving inbound into St. Louis from this area.

Table 122 – Agriculture, Southeast and Southern Appalachia Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	3,896	3,996	4,049	4,130	4,387	0.4%
Truck	2,698	2,664	2,625	2,555	2,631	-0.1%
Rail	1,198	1,332	1,424	1,576	1,756	1.3%
Waterborne	-	-	-	-	-	N/A
Outbound	428	444	412	351	306	-1.1%
Truck	101	98	99	102	105	0.1%
Rail	24	26	28	32	36	1.4%
Waterborne	304	319	284	217	165	-2.0%
Inbound	17	19	20	23	25	1.3%
Truck	0	1	1	1	2	4.4%
Rail	14	15	17	19	22	1.4%
Waterborne	3	3	3	2	2	-0.6%
Total	4,341	4,459	4,482	4,504	4,718	0.3%

Source: IHS

Petroleum product flows are an important source of corridor freight tonnage, providing access to important consumer markets for the regional refining industry based at Wood River. Refined petroleum tends to flow down the Mississippi River on barge before branching (via the Ohio River) onto the Cumberland and Tennessee Rivers and serving markets such as Nashville. The petroleum refining industry in the St. Louis region will remain strong, in part aided by relatively inexpensive Canadian oil sand extraction. Southeast and Southern Appalachia petroleum product flows will decline in the future, however, as demand outside the St. Louis region is increasingly supplied by expanding Gulf Coast refineries. In summary, petroleum refining will continue to be an important source of corridor freight flows, especially for waterborne transportation; however, various shifts in industry infrastructure and plant investment will contribute to slightly negative future growth rates.

Table 123 – Petroleum Products, Southeast and Southern Appalachia Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	640	668	670	603	553	-0.5%
Truck	126	141	150	156	160	0.8%
Rail	514	527	519	447	393	-0.9%
Waterborne	-	-	-	-	-	N/A
Outbound	1,386	1,303	1,306	1,376	1,226	-0.4%
Truck	-	-	-	-	-	N/A
Rail	507	519	512	440	387	-0.9%
Waterborne	879	784	794	935	839	-0.2%
Inbound	6	6	6	5	5	-0.9%
Truck	0	0	0	0	0	-1.3%
Rail	6	6	6	5	5	-0.9%
Waterborne	-	-	-	-	-	N/A
Total	2,032	1,978	1,982	1,984	1,784	-0.4%

Source: IHS

The importance of chemicals for the St. Louis regional economy is now well established, both in terms the transportation industries as well as manufacturing. Like petroleum products, chemicals account for a substantial share of freight tonnage and value moving through the Southeast and Southern Appalachia Corridor. Unlike petroleum products, however, these flows are expected to grow at a rate of 1.9% per year, which will impact congestion on corridor rail and, especially, I-64 and other corridor road infrastructure. Although total throughput will be up, the particular chemical flows associated with this corridor are forecasted to consist of mostly through traffic. Therefore, regional

value-added opportunities may be slightly less than for other corridors. Nonetheless, these opportunities exist and should increase along with the corridor's favorable demographic growth.

Table 124 – Chemicals Logistics, Southeast and Southern Appalachia Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	1,911	2,189	2,670	3,106	3,409	1.9%
Truck	1,244	1,484	1,842	2,140	2,259	2.0%
Rail	667	706	828	966	1,150	1.8%
Waterborne	-	-	-	-	-	N/A
Outbound	163	172	200	224	254	1.5%
Truck	5	6	7	6	6	0.8%
Rail	158	167	193	218	248	1.5%
Waterborne	0	0	0	0	0	-1.6%
Inbound	102	121	149	188	212	2.5%
Truck	48	62	86	124	146	3.8%
Rail	55	59	63	64	66	0.6%
Waterborne	-	-	-	-	-	N/A
Total	2,176	2,483	3,019	3,519	3,875	1.9%

Source: IHS

Top Commodities by Value

Several commodity classes are or will be responsible for substantial shares of total freight value moving through the Lower Mississippi and Gulf Coast Corridor, including high technology, motor vehicles, and general container goods. Additionally, chemicals make up a large share of value, accounting for $2.6 billion of the total corridor flows in 2010 (4.8% of the total) and forecasted to total $4.8 billion (3.6% of the total) by 2040.

High technology products will become the dominant share of regional freight flows by value. Current flows are practically negligible, but an annual growth rate of truck traffic in excess of 11% could eventually contribute to congestion on the I-64 corridor, as well as St. Louis regional beltways. The economic value-added opportunities for the St. Louis region are, however, minimum. Most of these flows will be through traffic from west to east, with a combination of demographic growth and business growth driving demand for high technology goods in the Southeast and Southern Appalachia Corridor. Manufacturing centers and/or import facilities relevant to this corridor would be primarily in the Pacific Northwest (i.e., Seattle and Portland) and the Upper Midwest (i.e., Minnesota). Corridor high technology transportation accounted for just $1.3 billion in value in 2010 (2.4% of the total) but is expected to grow to $29.8 billion in 2040 (22.1% of the total).

Table 125 – Technology Logistics, Southeast and Southern Appalachia Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	35	61	138	452	944	11.7%
Truck	35	61	138	452	944	11.7%
Rail	-	-	-	-	-	N/A
Waterborne	-	-	-	-	-	N/A
Outbound	5	6	7	6	6	0.8%
Truck	5	6	7	6	6	0.8%
Rail	-	-	-	-	-	N/A
Waterborne	-	-	-	-	-	N/A
Inbound	<1	<1	1	1	3	6.7%
Truck	<1	<1	1	1	3	6.7%
Rail	-	-	-	-	-	N/A
Waterborne	-	-	-	-	-	N/A
Total	39	67	145	460	953	11.2%

Source: IHS

Aside from high technology, motor vehicle transportation represents the fastest growing freight segment for the Southeast and Southern Appalachia Corridor at 4.2% per year.

Table 126 – Motor Vehicles, Southeast and Southern Appalachia Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	411	740	826	1,112	1,506	4.4%
Truck	105	216	300	548	885	7.4%
Rail	306	524	526	564	621	2.4%
Waterborne	-	-	-	-	-	N/A
Outbound	4	6	6	7	7	2.4%
Truck	-	-	-	-	-	N/A
Rail	4	6	6	7	7	2.4%
Waterborne	-	-	-	-	-	N/A
Inbound	26	35	26	22	21	-0.6%
Truck	26	35	26	22	21	-0.6%
Rail	-	-	-	-	-	N/A
Waterborne	-	-	-	-	-	N/A
Total	440	781	859	1,141	1,535	4.2%

Source: IHS

The Southeast in particular is emerging as a center of automotive manufacturing. St. Louis will mostly serve as an important node for through-traffic in this corridor. Corridor motor vehicle transportation accounted for $4 billion in value in 2010 (7.4% of the total) and will grow to $14 billion in 2040 (10.4% of the total).

Finally, the various classes of goods shipped in containers make up a small but growing share of freight flows through the Southeast and Southern Appalachia Corridor. Flows of container goods to and from major import and export markets at Los Angeles and Long Beach would not move through St. Louis. Nonetheless, container flows will, consistent with broader national and international production and logistics trends, grow rapidly. For the Southeast and Southern Appalachia Corridor, container flows will grow at a rate of 3.4% per year. The Port of Miami and, to a lesser extent, the ports of Jacksonville and Norfolk will be consequential to these flows of containers, which will generally travel by rail and in both directions.

Table 127 – Containers, Southeast and Southern Appalachia Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	665	780	892	1,182	1,718	3.2%
Truck	-	-	-	-	-	N/A
Rail	665	780	892	1,182	1,718	3.2%
Waterborne	-	-	-	-	-	N/A
Outbound	238	280	325	444	665	3.5%
Truck	-	-	-	-	-	N/A
Rail	238	280	325	444	665	3.5%
Waterborne	-	-	-	-	-	N/A
Inbound	147	178	210	289	440	3.7%
Truck	-	-	-	-	-	N/A
Rail	147	178	210	289	440	3.7%
Waterborne	-	-	-	-	-	N/A
Total	1,050	1,239	1,427	1,915	2,824	3.4%

Source: IHS

Other top commodities by value moving through the Southeast and Southern Appalachia Corridor include iron, steel, and non-ferrous smelting products. Historical ties between the Midwest and centers of steel manufacturing in the south, especially Birmingham, will persist at slow, steady pace.

Summary of Goods Movement Trends and Implications for St. Louis

The Southeast and Southern Appalachia Corridor is a relatively lower-tonnage corridor. However fast-growing consumer markets, expanding industry (especially automotive manufacturing), and increased international trade will contribute to healthy and stable growth. Traditional top corridor commodities such as agriculture and refined petroleum will experience limited opportunities for future growth. These commodities are also typically the most likely to be transported via barge. Thus, future growth in waterborne flows will be limited in the Southeast and Southern Appalachia Corridor.

Chemicals, motor vehicles, and high technology will be driving the future growth of freight flows through the Southeast and Southern Appalachia Corridor. Not only will these goods contribute to tonnage flows, they all represent high-value commodity shipments. This helps explain the high overall growth rate of freight flows by value through the corridor. There are opportunities for the St. Louis economy to play a greater value-added role in these supply chains, especially for chemicals. The forecasts illustrate, however, that regional manufacturing plays a limited role in supply chains for chemicals and other high-value products moving through the Southeast and Southern Appalachia Corridor. Thus, the associated increased freight flows though I-64 and on CSX and NS infrastructure will be mostly through traffic.

Container traffic will grow rapidly, but will not be as important in this corridor in absolute terms. Again, this is largely a consequence of geography, as St. Louis is not a central node in flows between BEAs in the Southeast with export/import nodes in the Sun Belt corridor, especially LA/Long Beach.

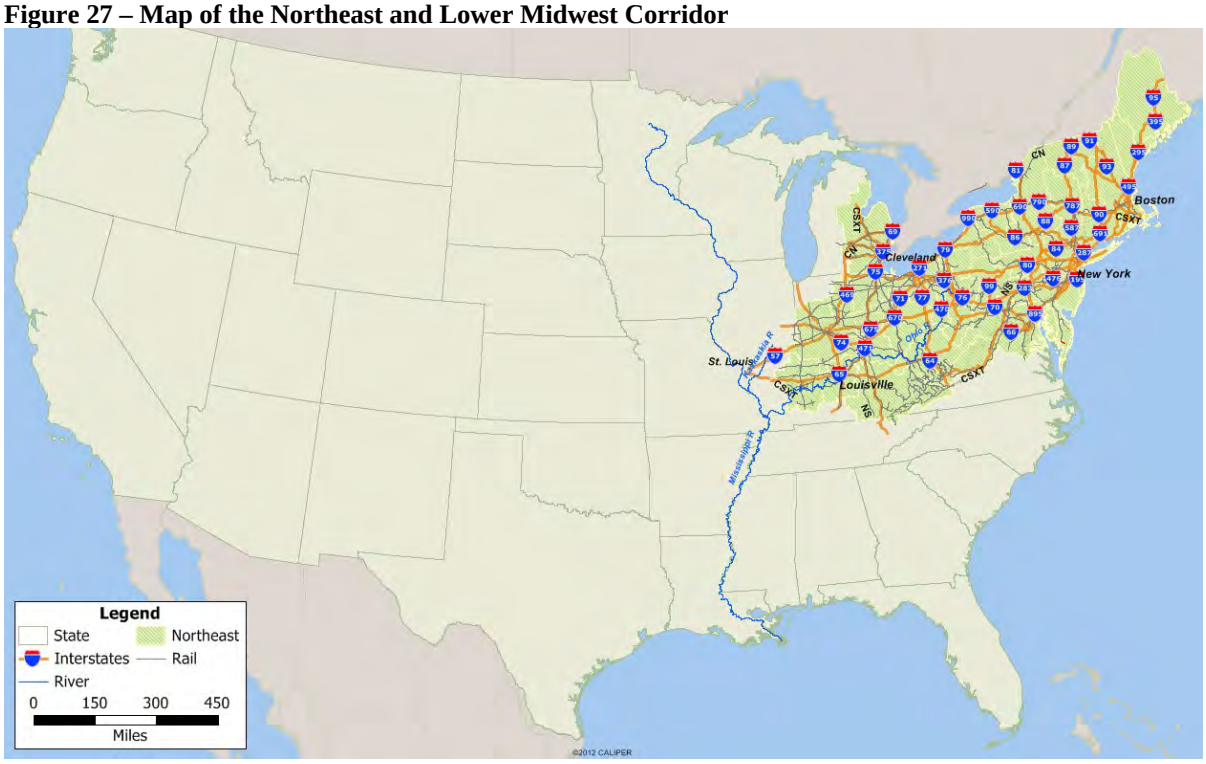
Northeast and Lower Midwest

The Northeast and Lower Midwest Corridor includes BEAs located northeast of the St. Louis BEA. The area is approximately bounded as follows:

- **North:** The Canadian Border
- **East:** The Atlantic Ocean and the Shenandoah Valley
- **South:** The Tennessee River (except area of the Nashville BEA), and the Ohio River segments west of the Tennessee River
- **West:** I-69 in Michigan, and the Indiana-Illinois border in Northern Illinois, and the Kaskaskia River in Southern Illinois

The following map situates the Northeast and Lower Midwest Corridor within the continental United States. Included in the map are the key Interstate highways, Class I rail lines, and waterways serving freight flows through the corridor.

Figure 27 – Map of the Northeast and Lower Midwest Corridor



Source: IHS

Freight moving through the Northeast and Lower Midwest Corridor would primarily connect to the St. Louis study area via the following regional infrastructure:

- Highways: I-70 and I-64, eastbound from St. Louis and westbound into St. Louis
- Class I Railroad Network Infrastructure: CSX, NS, and CN
- Waterways: the Ohio River and the Kaskaskia River

The Northeast and Lower Midwest is densely populated and is served by a wide network of Interstate highways. Most freight moving through this corridor will filter into (or fan out from) Route I-70 for connectivity with St. Louis. BEAs in Kentucky and possibly Southern Ohio are more directly serviced by I-64, which runs through Louisville, KY. Much of the truck traffic filtering through Louisville, however will originate or terminate in the Southeast and Southern Appalachia and thus will not be counted in this section. The Louisville BEA is included in the Northeast and Lower Midwest due to economic similarities and linkages with BEAs in the Ohio River Valley.

As is the case with the Southeast and Southern Appalachia Corridor, CSX and NS are responsible for nearly all Class I freight servicing BEAs in the Northeast and Lower Midwest to and from St. Louis. Additionally, CN offers direct service through Indianapolis and Detroit en route to Ontario. The Ohio River is an important waterway for freight movement and the economic vitality of many BEAs in the Lower Midwest.

Primary Inter-regional Commercial Relationships

The tables in this sub-section summarize the top origin and destination BEAs for freight flows moving through the Northeast and Lower Midwest Corridor. This data includes flows across all modes. Subsequent sub-sections will analyze the modal shares, the top commodities, and the general logistics of flows.

The Northeast and Lower Midwest Corridor carries high volumes of freight traffic whether measured by tonnage or value. Tonnage flowing in a westbound direction tends to be significantly less than eastbound goods movement in the corridor, although these westbound flows will still grow significantly over the next 30 years. The New York BEA accounts for the largest tonnage and volume, which will more than double by 2040. This is driven by a high concentration of manufacturing generally and, in particular, certain high-value goods such as chemicals and plastics. Midwest centers of durable goods manufacturing such as Detroit (automotive and plastics) and Cleveland (automotive and steel) also factor prominently in the top rankings.

BEAs in close proximity to St. Louis, not surprisingly, also factor prominently in the rankings. Evansville, IN is an important origin for agricultural bulk shipped to St. Louis to supply regional food and beverage manufacturing industries or to move down the Mississippi River to export markets. Indianapolis is an important center of production and logistics for agricultural products, general consumer goods, and pharmaceuticals.

Table 128 – Top 5 Origins – Northeast and Lower Midwest Corridor, All Traffic

BEA	K Tons, 2010	Rk	K Tons, 2040	Rk	$ Mil., 2010	Rk	$Mil., 2040	Rk
New York, NY	**3,650**	**1**	**7,876**	**1**	**7,625**	**1**	**19,242**	**1**
Evansville, IN	**2,855**	**2**	**4,672**	**2**	**5.026**	**4**	**9,245**	**4**
Indianapolis, IN	**2,604**	**3**	**4,482**	**3**	**5,822**	**3**	**12,148**	**3**
Detroit, MI	**2,479**	**4**	**4,337**	**4**	**6,116**	**2**	**12,503**	**2**
Cleveland, OH	**2,120**	**5**	**4,047**	**5**	**3,419**	**5**	7,280	
Louisville, KY	1,295		2,756		3,103		**7,330**	**5**

Source: IHS

The Northeast and Lower Midwest Corridor experiences heavier flows of freight in the eastbound direction, driven in large part by imports from Asia via the West Coast moving through St. Louis to large population and business centers. Total tonnage and, especially, total value will increase

substantially in the coming years. Again, New York tops the rankings, with its high population and high concentration of knowledge industries. High-value clothing and high technology will be the driving force for goods movement through the corridor to New York, which will approximate $100 billion annually by 2040. Similar trends will drive high-value goods movement to other major population centers on the East Coast and along the Great Lakes. Coal moves in high but declining volumes to industrial centers on the Ohio River such as Evansville, IN.

Table 129 – Top 5 Destinations – Northeast and Lower Midwest Corridor, All Traffic

BEA	K Tons, 2010	Rk	K Tons, 2040	Rk	$ Mil., 2010	Rk	$Mil., 2040	Rk
New York, NY	**8,451**	**1**	**17,027**	**1**	**32,715**	**1**	**99,989**	**1**
Philadelphia, PA	**3,326**	**2**	**5,835**	**2**	**7,370**	**2**	**21,696**	**3**
Evansville, IN	**3,232**	**3**	**4,121**	**5**	2,992		9,571	
Boston, MA	**2,834**	**4**	**4,969**	**3**	**6,928**	**3**	**19,686**	**4**
Indianapolis, IN	**2,462**	**5**	**4,817**	**4**	**5,704**	**4**	**22,075**	**2**
Detroit, MI	1,513		2,281		**5,138**	**5**	**16,513**	**5**

Source: IHS

Detailed Corridor Logistics

The previous sub-sections established the primary origins and destinations and the critical infrastructures associated with the Northeast and Lower Midwest Corridor. The following tables provide a fine-grained breakdown of freight movement through the corridor by several key dimensions: mode, direction, and time (i.e., current and forecasted flows).

Table 130 – Northeast and Lower Midwest Corridor, Total Tonnage (000's)

Segment	2010	2015	2020	2030	2040	CAGR
Through	58,721	67,214	74,926	89,151	110,257	2.1%
Truck	44,010	50,020	55,832	67,776	85,267	2.2%
Rail	14,711	17,194	19,094	21,374	24,991	1.8%
Waterborne	-	-	-	-	-	N/A
Outbound	9,381	9,667	9,557	9,779	11,069	0.6%
Truck	4,335	4,399	4,317	4,477	4,894	0.4%
Rail	1,692	1,983	2,236	2,725	3,658	2.6%
Waterborne	3,354	3,286	3,004	2,577	2,518	-1.0%
Inbound	6,457	7,474	8,076	8,971	10,013	1.5%
Truck	4,651	5,288	5,657	6,175	6,631	1.2%
Rail	1,507	1,799	1,991	2,337	2,876	2.2%
Waterborne	299	388	429	459	505	1.8%
Total	74,559	84,356	92,559	107,901	131,339	1.9%

Source: IHS

In 2010, nearly 75 million tons of cargo flowed through the Northeast and Lower Midwest Corridor. This figure will grow at a strong annual rate of 1.9% over the next 30 years to over 125 million tons by 2040. Much of this freight is high-value through traffic originating west of the Mississippi River and moving through St. Louis via principally truck en route to large coastal BEAs in the corridor. However, about 20% of the cargo flows also originated or terminated in St. Louis. Although the gap will close in the coming years due in large part to decline of coal shipments up the Ohio River, the St. Louis Region is and will remain a net producer of goods among corridor trading partners. Thus, access to BEAs in the Northeast and Lower Midwest Corridor is important for St. Louis regional industry.

The Northeast and Lower Midwest Corridor also tends to carry on average high-value freight, as evidenced by the total values of annual freight cargo (and forecasts) and the high proportion of truck transportation. The total value of corridor freight will grow at a rate of 3.3% per year over the next 30 years, driven in large part by increased demand for consumer goods, increased international trade, and persistent demands for high technology products in emerging knowledge economies.

Table 131 – Northeast and Lower Midwest Corridor, Total Values ($ Mil.)

Segment	2010	2015	2020	2030	2040	CAGR
Through	140,310	175,458	206,849	277,964	389,157	3.5%
Truck	108,210	134,101	161,293	224,448	322,085	3.7%
Rail	32,101	41,357	45,556	53,516	67,072	2.5%
Waterborne	-	-	-	-	-	N/A
Outbound	10,875	12,152	13,038	15,863	20,970	2.2%
Truck	5,906	6,406	6,602	7,608	9,047	1.4%
Rail	4,070	4,911	5,680	7,628	11,426	3.5%
Waterborne	899	834	756	627	497	-2.0%
Inbound	11,831	14,322	15,548	18,196	21,725	2.0%
Truck	8,545	9,983	10,729	12,339	13,997	1.7%
Rail	3,191	4,234	4,708	5,754	7,634	3.0%
Waterborne	95	105	111	103	94	0.0%
Total	163,016	201,932	235,435	312,023	431,852	3.3%

Source: IHS

Primary Corridor Commodity Supply Chains and Implications for St. Louis

This sub-section considers the top commodities moving into, out of, and through St. Louis in the Northeast and Lower Midwest Corridor. Top commodities contributing to total corridor tonnage and value will be highlighted in overall logistics profiles that will illustrate important infrastructure and logistics requirements. These profiles will help show where and how St. Louis plays in the supply chain, which will help inform the prioritization of possible interventions to support freight flows through the corridor.

Excluded from these analyses will be general consumer goods previously categorized in this study as "Warehouse & Distribution Center Goods." The heterogeneity and small individual quantities of goods included in this classification make it difficult to formulate meaningful insight from the products individually. Collectively, however, flows of these goods will make up the plurality of corridor goods movement in all corridors and will be the primary driver of overall corridor truck flows in all directions.

For the Northeast and Lower Midwest Corridor, Warehouse & Distribution Center goods accounted for 9.5 million tons of total flows in 2010 (12.7% of the total), and are forecasted to grow by 2.6% per year to 20.7 million tons by 2040 (4.8% of the total).

Top Commodities by Tonnage

Besides general consumer goods, top commodities by tonnage for the Northeast and Lower Midwest Corridor include plastics, chemicals, and steel and iron products.

Plastics account for a large share of both tonnage and value flows within the Northeast and Lower Midwest Corridor and will grow at a rapid 2.5% per year over the next three decades. Much of this growth can be attributed to automotive manufacturing, which consumes large quantities of plastics. Almost all flows are through traffic, as there is limited plastics production in the corridor, and currently a relatively small presence of automotive assembly and related plastics-consuming industries. New

York and Detroit have high concentrations of plastics industries, which ship finished goods eastbound through the corridor. As with the case of chemicals, truck will overtake rail as the primary mode by 2040; the I-70 corridor should expect higher demand for truck throughput as a result.

Table 132 – Plastics, Northeast and Lower Midwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	4,491	4,794	5,725	7,044	9,521	2.5%
Truck	1,890	2,072	2,527	3,413	5,399	3.6%
Rail	2,601	2,722	3,198	3,631	4,122	1.5%
Waterborne	-	-	-	-	-	N/A
Outbound	45	50	58	70	81	2.0%
Truck	37	42	47	58	67	2.0%
Rail	8	9	10	12	14	1.7%
Waterborne	0	0	0	0	0	1.8%
Inbound	141	148	171	190	197	1.1%
Truck	96	101	116	127	126	0.9%
Rail	45	47	56	63	71	1.5%
Waterborne	-	-	-	-	-	N/A
Total	4,677	4,993	5,954	7,304	9,800	2.5%

Source: IHS

St. Louis' major role in the chemicals supply chain is well established, as a consumer, manufacturer, and trans-shipment point. With respect to the Northeast and Lower Midwest Corridor, St. Louis serves mostly through traffic, typically moving from, for example, the New York BEA and Philadelphia BEAs to consuming industries and export markets on the West Coast. Flows are currently balanced between truck and rail, but truck flows will grow more rapidly, especially on I-70 through St. Louis, in the coming decades. This is consistent with the trend of higher-value goods moving aboard truck.

Table 133 – Chemicals, Northeast and Lower Midwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	4,312	4,483	5,330	6,629	8,879	2.4%
Truck	2,213	2,251	2,722	3,566	5,183	2.9%
Rail	2,099	2,233	2,607	3,063	3,696	1.9%
Waterborne	-	-	-	-	-	N/A
Outbound	210	227	252	270	301	1.2%
Truck	53	65	69	62	54	0.1%
Rail	133	142	164	193	237	1.9%
Waterborne	24	20	19	15	10	-2.9%
Inbound	327	357	415	444	445	1.0%
Truck	248	271	322	346	338	1.0%
Rail	74	80	86	92	102	1.1%
Waterborne	5	6	7	6	5	-0.4%
Total	4,849	5,067	5,996	7,344	9,624	2.3%

Source: IHS

Steel will continue to be a key commodity driving rail cargo through the Northeast and Lower Midwest Corridor. Much of this steel will be produced in Lower Midwest centers of steel production such as Cleveland and Pittsburgh. U.S. Steel does have a presence in the St. Louis Study Area in Madison County, and there will be flows originating and terminating in St. Louis. Most of the freight flows, however, will be through traffic moving in a westbound direction on CSX and NS railroads.

Table 134 – Steel, Northeast and Lower Midwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	1,870	2,341	2,541	2,430	2,222	0.6%
Truck	55	72	75	67	54	-0.1%
Rail	1,814	2,269	2,467	2,363	2,167	0.6%
Waterborne	-	-	-	-	-	N/A
Outbound	222	279	300	281	251	0.4%
Truck	48	62	63	55	43	-0.4%
Rail	174	217	236	226	208	0.6%
Waterborne	-	-	-	-	-	N/A
Inbound	299	367	394	376	338	0.4%
Truck	84	99	102	97	82	-0.1%
Rail	212	266	289	277	254	0.6%
Waterborne	3	3	3	2	2	-1.2%
Total	2,391	2,987	3,234	3,087	2,810	0.5%

Source: IHS

Several other commodities contribute significantly to overall freight tonnage moving through the Northeast and Lower Midwest Corridor. These include primarily food and beverage industry products moving eastbound from St. Louis manufacturing sites or through St. Louis from the Southern California ports to large population centers in the Northeast and Lower Midwest via rail and roadway.

Top Commodities by Value

Several commodity classes are or will be responsible for substantial shares of total freight value moving through the Northeast and Lower Midwest Corridor, including general container goods, clothing and footwear, and high technology. Additionally, the high-tonnage commodities discussed in the previous sub-section (plastics, chemicals, and steel and iron) also represent significant contributions to total overall corridor freight values. Collectively these commodities accounted for $20.1 billion in total corridor value flows in 2010 (15.3% of the total) and are forecasted to make up for $40.6 billion in total corridor value flows in 2040 (9.4% of the total).

The high levels of container growth through the Northeast and Lower Midwest Corridor will become even more important in the future. Total flows will grow by almost 4% annually through the corridor to just over 9 million tons per year by 2040. As evidence by the data, St. Louis plays more than a passive role in this process, serving as a producer and consumer of containerized consumer goods as well as a key rail trans-shipment point. This explosive growth in containers will heavily strain St. Louis regional rail infrastructure and will further congest Mississippi River bridge crossings. Moreover, the regional logistics demands of handling containers, such as intermodal yards, will also be challenged to handle this throughput. Corridor container transportation accounted for $12.2 billion in value in 2010 (7.5% of the total) and will grow to $38.5 billion in 2040 (8.9% of the total).

Table 135 – Container Logistics, Northeast and Lower Midwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	1,823	2,176	2,547	3,518	5,379	3.7%
Truck	-	-	-	-	-	N/A
Rail	1,823	2,176	2,547	3,518	5,379	3.7%
Waterborne	-	-	-	-	-	N/A
Outbound	785	938	1,100	1,533	2,363	3.7%
Truck	-	-	-	-	-	N/A
Rail	785	938	1,100	1,533	2,363	3.7%
Waterborne	-	-	-	-	-	N/A
Inbound	459	557	658	918	1,363	3.7%
Truck	4	5	7	16	28	6.5%
Rail	455	551	650	901	1,334	3.7%
Waterborne	-	-	-	-	-	N/A
Total	3,067	3,670	4,304	5,969	9,104	3.7%

Source: IHS

Clothing and footwear imports from Asia will help drive eastbound truck flows through St. Louis to major consumer markets in the Northeast and Lower Midwest. As suggested by the data, virtually all of these flows are through traffic. Moreover, despite the high contribution to overall corridor value, clothing and footwear make up a relatively small and slow-growing share of tonnage. Thus, future impacts on highway infrastructure should be minimal. Corridor clothing and footwear transportation accounted for $8.8 billion in value in 2010 (5.4% of the total) and will grow to $9.4 billion in 2040 (2.2% of the total).

Table 136 – Clothing and Footwear, Northeast and Lower Midwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	557	524	478	494	611	0.3%
Truck	478	455	422	440	541	0.4%
Rail	78	69	56	54	71	-0.3%
Waterborne	-	-	-	-	-	N/A
Outbound	33	29	23	22	29	-0.5%
Truck	1	1	0	0	0	-7.6%
Rail	33	29	23	22	29	-0.4%
Waterborne	-	-	-	-	-	N/A
Inbound	3	3	3	3	3	0.1%
Truck	1	1	1	1	1	1.5%
Rail	2	2	2	2	2	-0.4%
Waterborne	-	-	-	-	-	N/A
Total	593	556	503	519	643	0.3%

Source: IHS

Consistent with goods movement through most corridors, flows of high technology will grow the fastest of any segment in the Northeast and Lower Midwest Corridor. At 7%, the annual growth rate drives flows to just under 3 million tons by 2040. Virtually all of the high technology flows will be through traffic moving on truck, principally affecting I-70 in an eastbound direction. Corridor high technology transportation accounted for $18 billion in value in 2010 (11% of the total) and will grow to $117.7 billion in 2040 (27.2% of the total).

Table 137 – Technology Logistics, Northeast and Lower Midwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	358	539	849	1,666	2,755	7.0%
Truck	358	538	848	1,664	2,752	7.0%
Rail	1	1	1	2	3	4.7%
Waterborne	-	-	-	-	-	N/A
Outbound	4	6	12	34	62	9.7%
Truck	3	6	11	33	61	10.1%
Rail	0	1	1	1	2	4.7%
Waterborne	-	-	-	-	-	N/A
Inbound	1	2	2	5	9	6.9%
Truck	1	2	2	5	9	6.9%
Rail	-	-	-	-	-	N/A
Waterborne	-	-	-	-	-	N/A
Total	363	547	863	1,705	2,827	7.1%

Source: IHS

Other commodities contribute significantly to overall value moving through the Northeast and Lower Midwest Corridor. Among these are furniture imports from Southern California, which move via truck through St. Louis and into the corridor by way of I-70. Additionally, pharmaceuticals and aircraft and missile engines contribute significantly to overall corridor commodity value flows. St. Louis has a substantial pharmaceuticals industry, although the direction of flows tends to be from east-to-west and north-to-south. Aircraft and missile engines follow a supply chain beginning with parts manufacturing in the Midwest, additional assembly in St. Louis, and shipment out to Department of Defense facilities throughout the country. Pharmaceuticals and aircraft and missile engines will generally move via truck.

Summary of Goods Movement Trends and Implications for St. Louis

The Northeast and Lower Midwest Corridor is one of the largest contributors to inter-modal freight tonnage and value moving into, out of, and, especially, through St. Louis. The growth in demand for high-value plastic and chemical products in domestic and international markets in the Pacific will fuel the rapid growth of truck flows from production centers in the Northeast along I-70 through St. Louis. Similar growth in plastics demand, largely to support domestic and foreign automotive manufacturing, will also contribute to high demand for truck shipments via I-70 westbound. High technology and clothing will contribute to major increases in demand for eastbound truck travel on I-70. In absolute terms, however, eastbound flows will be less than westbound.

Rapidly expanding container traffic in an eastbound direction will place heavy strains on St. Louis regional rail and inter-modal infrastructure. Meanwhile, westbound flows of rail traffic will grow on account of plastics and chemicals, albeit not to the same degree as truck traffic. Steel, currently an important source of westbound rail tonnage will exhibit essentially flat growth in the coming years. Overall, the demands on regional rail infrastructure in both directions will challenge St. Louis' throughput capacity, particularly at river crossings and at inter-modal centers. Moreover, another trend bears mention. Container flows within the corridor are mostly in one direction, which may exacerbate the current trend towards empty containers piling up east of the Mississippi River. To the extent that empty containers are transported back in a westbound direction, rail congestion will increase with minimal additional economic contribution.

The Ohio River is still an important inland waterway for goods movement in the Northeast and Upper Midwest Corridor. However, the primary commodity moving upriver, coal, will decline in the foreseeable future.

From a regional economic perspective, the dominance of through traffic offers limited benefits to the St. Louis region outside of the transportation industry. However, there are opportunities for the regional economy to play an enhanced role in the chemicals industry given the existing regional knowledge base and proximity to relatively cheap natural gas feed stocks (for both energy generation and as a raw input) for chemicals manufacturing.

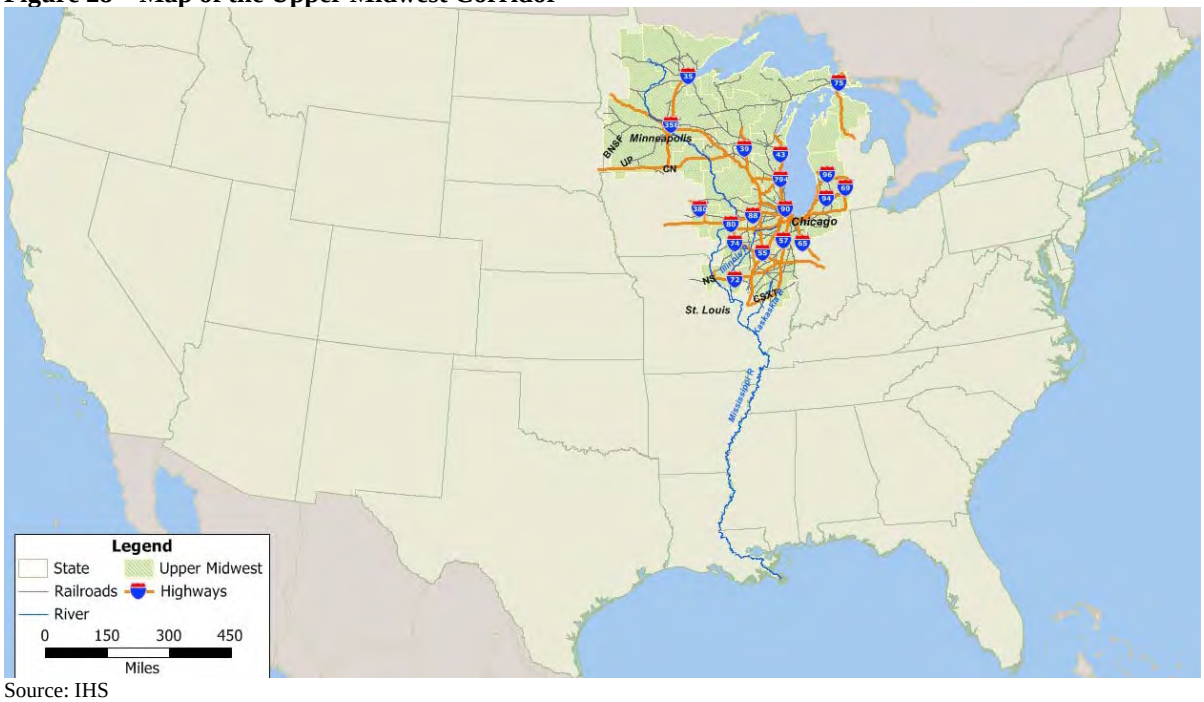
Upper Midwest

The Upper Midwest Corridor includes BEAs located north of the St. Louis BEA. The area is approximately bounded as follows:

- **North:** The Canadian Border
- **East:** I-69 in MI, and the Indiana-Illinois border in Northern IL, and the Kaskaskia River in Southern Illinois
- **South:** The confluence of the Mississippi and Kaskaskia rivers
- **West:** The easternmost reaches of the Missouri River basin

The following map situates the Upper Midwest Corridor within the continental United States.

Figure 28 – Map of the Upper Midwest Corridor



Source: IHS

Freight moving through the Northeast and Lower Midwest Corridor would primarily connect to the St. Louis study area via the following regional infrastructure:

- Highways: I-55, northbound from St. Louis and southbound into St. Louis
- Class I Railroad Network Infrastructure: BNSF, UP, CN, KCS, CSX, and NS
- Waterways: the Upper Mississippi River, the Illinois River, and the Kaskaskia River

Like the Northeast and Lower Midwest Corridor, the Upper Midwest Corridor is densely populated and is served by a wide network of interstate highways. Route I-55 provides the key link for flows moving to, from, and through St. Louis within this corridor. Minneapolis is the one possible exception among the large BEAs in the corridor, where some truck flows might be routed via I-35 through the Northern Plains, Rockies, and Pacific Northwest Corridor. However, the more-likely alternative to I-55 would be would be U.S. Highway 61, which runs parallel to the Mississippi River and merges into downtown expressway links of I-64 just to the west of Downtown St. Louis.

The Upper Midwest is endowed with a vast rail network infrastructure that is served by all six Class I rail lines in the United States. While the rail companies serving any individual BEA may vary, there is generally good competition among these competitors in each major market. The Upper Mississippi, Illinois, and Kaskaskia rivers each provide inland waterway access between St. Louis and important commercial areas in Illinois, Minnesota, and Iowa.

Primary Inter-regional Commercial Relationships

The tables in this sub-section summarize the top origin and destination BEAs for freight flows moving through the Upper Midwest Corridor. This data includes flows across all modes. Subsequent sub-sections will analyze the modal shares, the top commodities, and the general logistics of flows.

Chicago is the dominant origin for goods traveling southbound through the Upper Midwest Corridor in the direction of St. Louis. Chicago is one of the largest industrial centers in the United States and is the closest global mega-city to the St. Louis Region. Flows to and through St. Louis will reflect the diversity of Chicago's manufacturing base, including various consumer goods, industrial machinery, automotive parts, chemicals and pharmaceuticals, and others. Duluth is the next most important in terms of tonnage, driven by the region's iron ore mining industry. Springfield, IL; Davenport, IA; and Champaign, IL are also top origins for tonnage, mostly consisting of agricultural products. When measured by value, however, BEAs such as Peoria, IL; Milwaukee, WI; and Minneapolis, MN enter the top five. Peoria is an important manufacturing center for aircraft parts, which supply St. Louis' aviation industry. Minneapolis is a major production center for high technology goods that are shipped to and, often, through St. Louis towards various destinations throughout the United States.

Table 138 – Top 5 Origins – Upper Midwest Corridor, All Traffic

BEA	K Tons, 2010	Rk	K Tons, 2040	Rk	$ Mil., 2010	Rk	$Mil., 2040	Rk
Chicago, IL	14,058	1	25,989	1	34,242	1	70,186	1
Duluth, MN	6,770	2	7,727	2	631		742	
Springfield, IL	3,561	3	5,126	3	2,342	5	3,295	
Champaign, IL	3,536	4	5,636	4	2,949	3	4,978	3
Davenport, IA	2,094	5	3,172		1,480		926	
Peoria, IL	1,562		3,547	5	2,770	4	6,612	2
Milwaukee, WI	1,467		2,381		3,026	2	4,968	4
Minneapolis, MN	1,320		2,393		2,190		4,589	5

Source: IHS

Chicago's large population also makes it one of the largest consumer markets in the United States, and this fact is reflected in the heavy flows of goods northbound from St. Louis. Thus, the flow of goods between St. Louis and Chicago is substantial in both directions, which is not surprising, as inter-regional trade is heavily influenced by both the sizes (population and production) of origin-destinations pairs and their distances. Chicago, together with Kansas City, provides the most important markets for various consumer goods, food and beverage products, refined petroleum, chemicals, and pharmaceuticals produced in the St. Louis Region. Additionally, substantial volumes of goods produced in the Sun Belt and imported from Mexico move through St. Louis en route to Chicago. Notable, especially from the standpoint of value, are high technology products produced in Texas and motor vehicles produced in the Southeast and Mexico.

The flow patterns of northbound freight from St. Louis to Chicago are similar to those for other major BEAs in the Upper Midwest such as Minneapolis, Peoria, and Grand Rapids. Overall tonnage and value flows will be lower on account of smaller populations. High volumes of flows to smaller BEAs in Illinois are reflective of relative proximity.

Table 139 – Top 5 Destinations – Upper Midwest Corridor, All Traffic

BEA	K Tons, 2010	Rk	K Tons, 2040	Rk	$ Mil., 2010	Rk	$Mil., 2040	Rk
Chicago, IL	17,887	1	23,911	1	32,425	1	72,829	1
Springfield, IL	5,887	2	6,850	2	2,811	3	4,916	5
Champaign, IL	2,216	3	2,728	3	2,319	4	4,897	
Peoria, IL	1,654	4	1,900	5	1,810	5	4,583	
Minneapolis, MN	1,404	5	2,013	4	3,018	2	5,237	4
Grand Rapids, MI	528		1,142		1,581		6,234	2
Elkhart, IN	350		907		1,266		5,249	3

Source: IHS

Detailed Corridor Logistics

The previous sub-sections established the primary origins and destinations and the critical infrastructures associated with the Upper Midwest Corridor. The following tables provide a fine-grained breakdown of freight movement through the corridor by several key dimensions: mode, direction, and time (i.e., current and forecasted flows).

Besides the coal-heavy Northern Plains, Rockies, and Pacific Northwest Corridor, the Upper Midwest carried the most tonnage of any corridor in 2010. Tonnage will grow at modest 1.2% per year through 2040. Strengthening of economic ties between the Upper Midwest and the growing U.S. Southwest and Southeast will help drive future freight flows through this corridor. As is the case in all other

corridors, through traffic accounts for the majority of tonnage; however, inbound and outbound flows collectively accounted for about 30 million tons per year in 2010. The relatively high share on rail for through traffic is in large part reflective of the heavy flows of Powder River Basin coal moving from the Rockies to the Upper Midwest.

Heavy inbound and outbound flows reflect the high level of economic activity occurring between BEAs within the Upper Midwest Corridor. Inbound and outbound traffic tends to move via truck, on account of the high value and short distances between corridor origin-destination pairs. Of note, however, is the slow growth of outbound flows from St. Louis. This in part reflects the relatively slow demographic growth on the Upper Midwest.

Table 140 – Upper Midwest Corridor, Total Tonnage (000's)

Segment	2010	2015	2020	2030	2040	CAGR
Through	60,039	68,104	72,067	79,093	89,331	1.3%
Truck	30,679	33,559	35,778	41,180	48,232	1.5%
Rail	29,360	34,546	36,289	37,913	41,099	1.1%
Waterborne	-	-	-	-	-	N/A
Outbound	15,820	15,625	15,124	15,125	16,241	0.1%
Truck	13,804	13,672	13,270	13,399	14,419	0.1%
Rail	607	721	761	784	830	1.0%
Waterborne	1,409	1,232	1,093	942	992	-1.2%
Inbound	16,069	19,580	21,044	23,204	25,540	1.6%
Truck	9,665	11,460	12,625	15,114	17,614	2.0%
Rail	5,600	7,263	7,543	7,243	7,121	0.8%
Waterborne	804	857	875	847	805	0.0%
Total	91,928	103,309	108,234	117,422	131,112	1.2%

Source: IHS

The total value of Upper Midwest Corridor freight flows will grow at about twice that of tonnage. High-value, low-weight consumer goods and high technology goods contribute to this trend. Overall, total freight value will grow at about 2.4% per year.

Table 141 – Upper Midwest Corridor, Total Values ($ Mil.)

Segment	2010	2015	2020	2030	2040	CAGR
Through	87,531	110,979	123,201	153,434	197,400	2.7%
Truck	47,491	55,571	63,485	85,500	116,715	3.0%
Rail	40,039	55,407	59,716	67,935	80,684	2.4%
Waterborne	-	-	-	-	-	N/A
Outbound	17,021	17,821	17,772	19,135	21,772	0.8%
Truck	15,960	16,486	16,396	17,732	20,310	0.8%
Rail	869	1,158	1,200	1,233	1,286	1.3%
Waterborne	192	177	176	170	176	-0.3%
Inbound	21,754	26,706	28,926	34,125	39,699	2.0%
Truck	19,679	24,273	26,355	31,468	36,920	2.1%
Rail	1,628	1,973	2,098	2,195	2,349	1.2%
Waterborne	447	460	474	463	430	-0.1%
Total	126,306	155,506	169,899	206,695	258,871	2.4%

Source: IHS

Primary Corridor Commodity Supply Chains and Implications for St. Louis

This sub-section considers the top commodities moving into, out of, and through St. Louis in the Upper Midwest Corridor. Top commodities contributing to total corridor tonnage and value will be highlighted in overall logistics profiles that will illustrate important infrastructure and logistics requirements. These profiles will help show where and how St. Louis plays in the supply chain, which will help inform the prioritization of possible interventions to support freight flows through the corridor.

Excluded from these analyses will be general consumer goods previously categorized in this study as "Warehouse & Distribution Center Goods." The heterogeneity and small individual quantities of goods included in this classification make it difficult to formulate meaningful insight from the products individually. Collectively, however, flows of these goods will constitute a significant share of goods movement in all corridors and will be the primary driver of overall corridor truck flows in all directions. For the Upper Midwest Corridor, Warehouse & Distribution Center goods accounted for 15.1 million tons of total flows in 2010 (17% of the total), and are forecasted to grow by 1.8% per year to 25.9 million tons by 2040 (20% of the total).

Top Commodities by Tonnage

Besides general consumer goods, top commodities by tonnage for the Upper Midwest Corridor include coal and agriculture. Additionally, general containers account for a large share of tonnage, as well as value. Coal freight transport in the Upper Midwest is generally through traffic moving via rail in a northbound direction. Powder River Basin coal moves eastbound through St. Louis via rail and on to destinations in the Upper Midwest for energy generation and manufacturing. The combination of expected environmental regulations and the availability of cheap natural gas from Canada and shale from the Northern Plains will lower future corridor demand for coal at a rate of about 0.4% annually. It should be noted that a small but significant share of coal does move northbound via the Mississippi and Illinois rivers, although these flows will be most negatively affected by the future decline in coal.

Table 142 – Coal Logistics, Upper Midwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	9,459	10,090	9,831	9,257	8,937	-0.2%
Truck	-	-	-	-	-	N/A
Rail	9,459	10,090	9,831	9,257	8,937	-0.2%
Waterborne	-	-	-	-	-	N/A
Outbound	873	674	525	361	330	-3.2%
Truck	-	-	-	-	-	N/A
Rail	-	-	-	-	-	N/A
Waterborne	873	674	525	361	330	-3.2%
Inbound	84	87	81	65	54	-1.5%
Truck	-	-	-	-	-	N/A
Rail	-	-	-	-	-	N/A
Waterborne	84	87	81	65	54	-1.5%
Total	10,416	10,851	10,437	9,684	9,321	-0.4%

Source: IHS

Bulk agriculture is and will continue to be one of the most important commodities moving through the Upper Midwest Corridor. Agriculture bulk generally moves over both rail and road infrastructure depending upon the availability or practicality of rail at the origin or destination. Inbound and outbound freight accounts for almost one-third of the total tonnage, with the majority of this cargo moving southbound towards St. Louis as inputs for the regional food and beverage manufacturing industries

or to be trans-shipped by barge via the Mississippi River. Demand for agriculture exports in emerging economies in Asia will help support an annual growth rate of 1.2% for freight flows through the Upper Midwest.

Table 143 – Agriculture, Upper Midwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	5,552	6,113	6,563	7,341	8,328	1.4%
Truck	2,458	2,676	2,869	3,225	3,697	1.4%
Rail	3,094	3,437	3,694	4,116	4,630	1.4%
Waterborne	-	-	-	-	-	N/A
Outbound	618	639	657	684	679	0.3%
Truck	557	568	586	612	603	0.3%
Rail	33	42	41	45	53	1.6%
Waterborne	27	30	29	27	22	-0.7%
Inbound	1,576	1,700	1,778	1,900	2,080	0.9%
Truck	627	646	630	594	570	-0.3%
Rail	942	1,047	1,143	1,301	1,505	1.6%
Waterborne	7	6	6	5	5	-1.2%
Total	7,746	8,451	8,997	9,925	11,086	1.2%

Source: IHS

Consistent with trends in all corridors, flows of container freight tonnage will grow substantially through the Upper Midwest Corridor in the coming decades. Nearly all container flows are through traffic on rail. The limited container tonnage moving northbound from St. Louis, primarily to Chicago, moves via truck. Container imports that enter the United States through Southern California may move via St. Louis to destinations in the Upper Midwest. The same is true of exports moving in the opposite direction. Containers moving to and from the Southeast and Southern Appalachia Corridor ports as well as the Lower Mississippi and Gulf Coast Corridor ports may also be routed via St. Louis. However, there are also alternative routes to for container imports and exports in the Upper Midwest Corridor to reach seaports on the West Coast and the Southeast. In part because of these options, container through traffic flows will grow a slightly less rapid pace than in other corridors.

Table 144 – Container Logistics, Upper Midwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	3,431	4,304	4,882	6,030	7,891	2.8%
Truck	-	-	-	-	-	N/A
Rail	3,431	4,304	4,882	6,030	7,891	2.8%
Waterborne	-	-	-	-	-	N/A
Outbound	13	17	22	33	47	4.5%
Truck	12	17	21	32	46	4.5%
Rail	< 1	< 1	< 1	< 1	< 1	3.0%
Waterborne	-	-	-	-	-	N/A
Inbound	< 1	< 1	< 1	1	2	4.3%
Truck	-	-	-	-	-	N/A
Rail	< 1	< 1	< 1	1	2	4.3%
Waterborne	-	-	-	-	-	N/A
Total	3,444	4,322	4,905	6,064	7,940	2.8%

Source: IHS

Several other commodities contribute significantly to overall freight tonnage moving through the Upper Midwest Corridor. These include iron ore shipments from the Duluth, MN area via rail to St.

Louis for steel manufacturing or trans-shipment, liquefied gas and crude petroleum moving southbound by rail from Canada, and gravel and sand moving to and from BEAs near St. Louis.

Top Commodities by Value

Several commodity classes are or will be responsible for substantial shares of total freight value moving through the Upper Midwest Corridor. General consumer goods (i.e., "Warehouse & Distribution Goods") will contribute a high share of this value, accounting for $16 billion in 2010 (12.6% of the total) and forecasted to total $27.5 billion (10.6% of the total) by 2040. Additionally, containers make up a large share of value, accounting for $18 billion of the total corridor flows in 2010 (14.2% of the total) and forecasted to total $42.5 billion (16% of the total) by 2040. Other top commodities by value include plastics, motor vehicles, and high technology products.

In order to enable consistent comparison of the impact of commodities across and within corridors, flows of high-value goods will be reported by tonnage. Plastics account for a large share of both tonnage and value flows within the Upper Midwest Corridor and will grow on average by 1.7% annually by weight through 2040. Industries in the Upper Midwest consume plastics as inputs for automotive, machinery, consumer goods, and other manufacturing. Plastics manufactured in the Gulf Coast and Southwest will typically move northbound via rail through St. Louis en route to primarily Chicago. Plastics moving through the Upper Midwest Corridor accounted for about $4.1 billion in 2010 (3.2% of the total) and total value is forecasted to grow to $6.8 billion by 2040 (0.5% of the total).

Table 145 – Plastics, Upper Midwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	1,680	1,760	2,059	2,366	2,791	1.7%
Truck	406	426	491	584	762	2.1%
Rail	1,274	1,334	1,568	1,782	2,029	1.6%
Waterborne	-	-	-	-	-	N/A
Outbound	60	70	81	102	118	2.3%
Truck	56	65	77	97	112	2.3%
Rail	4	4	5	5	6	1.5%
Waterborne	0	0	0	0	0	1.4%
Inbound	80	88	96	103	111	1.1%
Truck	68	76	81	87	93	1.0%
Rail	12	12	14	16	18	1.5%
Waterborne	-	-	-	-	-	N/A
Total	1,820	1,917	2,236	2,572	3,020	1.7%

Source: IHS

The re-shoring of automotive manufacturing to North America is increasing automotive and parts manufacturing in Mexico, the Southeast, and legacy industrial areas of the Midwest. In the case of the Upper Midwest, flows will be relatively balanced with certain brands moving into and others moving out of the St. Louis Region, and nearly all via rail. St. Louis will play an important role in overall motor vehicle logistics, with north-south flows across the Mississippi River increasing demands on bridge crossings. Although St. Louis has some automotive manufacturing, most of the motor vehicles traveling through the Upper Midwest Corridor will be through traffic. Motor vehicles transportation accounted for about $12.6 billion in cargo flows through the Upper Midwest corridor in 2010 (9.6% of the total) and is expected to approximately double by 2040 to $25.5 billion (9.9% of the total).

Table 146 – Motor Vehicles, Upper Midwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	1,335	2,286	2,297	2,467	2,717	2.4%
Truck	5	11	13	18	21	5.2%
Rail	1,331	2,275	2,284	2,449	2,696	2.4%
Waterborne	-	-	-	-	-	N/A
Outbound	30	52	52	56	62	2.4%
Truck	-	-	-	-	-	N/A
Rail	30	52	52	56	62	2.4%
Waterborne	-	-	-	-	-	N/A
Inbound	10	17	17	19	21	2.4%
Truck	-	-	-	-	-	N/A
Rail	10	17	17	19	21	2.4%
Waterborne	-	-	-	-	-	N/A
Total	1,376	2,355	2,367	2,541	2,799	2.4%

Source: IHS

Steel was at one time one of the most important manufacturing industries in the Upper Midwest. There is still, however, a significant steel manufacturing industry in the Upper Midwest, as well as within the St. Louis study region in Madison County. Almost half of the steel moving through the Upper Midwest region represents either inbound or outbound flows. Thus, the St. Louis economy benefits more directly from these flows both in terms of regional industrial production and consumption. Steel accounts for about $1.8 billion in total freight flows within the Upper Midwest Corridor (1.4% of the total); however, relatively slow growth in steel industry will increase this total to only about $2 billion by 2040 (0.8% of the total).

Table 147 – Steel, Upper Midwest Corridor (000's Tons)

Segment	2010	2015	2020	2030	2040	CAGR
Through	767	967	1,037	958	845	0.3%
Truck	184	238	245	198	148	-0.7%
Rail	583	729	793	759	696	0.6%
Waterborne	-	-	-	-	-	N/A
Outbound	320	411	433	378	313	-0.1%
Truck	160	210	215	169	121	-0.9%
Rail	160	200	218	209	191	0.6%
Waterborne	-	-	-	-	-	N/A
Inbound	300	352	366	334	293	-0.1%
Truck	167	187	187	162	135	-0.7%
Rail	128	161	175	167	153	0.6%
Waterborne	4	4	5	5	5	0.7%
Total	1,387	1,730	1,836	1,670	1,451	0.2%

Source: IHS

Other commodities contribute significantly to overall value moving through the Upper Midwest Corridor. Among these are high technology equipment moving north-south in both directions between centers of production in Minnesota and Texas to, from, and through consumer markets in the Upper Midwest in between mostly via I-55 aboard trucks. Overall tonnage is relatively small, but high technology will become the highest-value commodity group by 2040. Chemicals, pharmaceuticals, and refined petroleum are also important high-value products moving through the Upper Midwest Corridor, primarily via truck but also via rail where viable.

Summary of Goods Movement Trends and Implications for St. Louis

The Upper Midwest Corridor is an important inter-regional pathway for goods moving into, out of, and through St. Louis. High future growth in the movement of containers, motor vehicles and, to a lesser extent, plastics and agriculture will drive future growth in throughput. Most of this tonnage will move via rail. While the Upper Midwest Corridor benefits from having access to six major Class I railroads, these flows must still all filter through river crossings and congested rail links within the St. Louis BEA. This will challenge the efficient throughput of these and other goods in the future. The decline of coal and steel will, however, mitigate some of the effects of growth in other commodity segments on rail infrastructure.

While most of the top commodities highlighted for discussion in this sub-section mostly move via rail, I-55 will also face increasing demands for freight movement though the Upper Midwest Corridor. The growth of general consumer goods will be the primary driver of these flows. Moreover many of the additional top commodities mentioned in this sub-section, including high technology, pharmaceuticals, chemicals, and sometimes refined petroleum move via truck. With the exception of high technology, these other items represent industries with significant manufacturing in the St. Louis region. Given the high value of these goods, potential opportunities for regional value added could significantly contribute to stimulating economic growth and the creation of high-paying jobs in the St. Louis region. Therefore, ensuring efficient road access is important.

Although the Upper Mississippi and Illinois Rivers flow through the Upper Midwest Corridor, these waterways are not particularly conducive to major commodity throughput. Many goods eventually shipped down the Mississippi River may first travel to St. Louis via rail or truck. Once arriving in St. Louis, bulk freight can then be trans-shipped downriver year round.

Implications

Think Beyond West-East Through Traffic

St. Louis' large transportation and logistics industry benefits from handling large quantities of goods movement from the West Coast to the eastern half of the United States, and this trend is expected to grow with higher imports from Asia. While it is important for St. Louis to make investments to handle this volume, through traffic contributes relatively little to regional economy unless the St. Louis Region can contribute some kind of logistics or supply-chain value-added services. Moreover, there are strong and growing connections north and south along all modes of transportation, with St. Louis potentially serving as a critical value-added point in product supply chains. Efficient intermodal North-South movement should be as much a priority as West-East.

Container Traffic will Grow by 3% Annually through 2030

Containerization will grow at a rapid pace, and St. Louis must have the requisite infrastructure to handle intermodal and cross-river rail traffic. Otherwise, shippers will seek alternate routes, such as Memphis and Chicago. The key requirements are large spaces located near rail connections, and efficient movement of railroads across the river. Old bridges, and five major intermodal facilities nearing capacity may be inadequate. Investments and policies, such as land use plans, should be coordinated to enable more efficient throughput.

Pipelines and New Opportunities for Shale Oil and Gas

The development of cheap, nearby sources of shale oil and gas offer the St. Louis region new opportunities. Most of the new production of oil and gas will move via pipelines west of St. Louis to the U.S. Gulf Coast. The Wood River facility is expanding and has the capability to refine heavy Canadian crude. St. Louis also is strong in several niche chemical markets such as veterinary pharmaceuticals, as well as production of basic chemicals. Moreover, agriculture and manufacturing can gain competitive advantages by securing cheaper input and energy feed stocks. St. Louis will never compete with the U.S. Gulf Coast on volume, but it can become a regional hub for refining and chemical production, creating high-paying local jobs, supporting growth of other industries, and ultimately increasing regional exports to other parts of the country and world. Officials should prioritize the efficient movement of gas, petroleum, and petrochemical raw materials to the region in an efficient and environmentally responsible manner so that St. Louis's economy can maximally benefit.

Re-shoring of Auto Manufacturing Creates New Opportunities

Automotive manufacturers are increasingly making investments in automobile assembly in North America, particularly in Mexico and in the U.S. south but also in legacy areas of the Midwest. St. Louis has not benefitted as much from new assembly plant openings but rather for logistics services. St. Louis is a major "mixing center" or hub where automobiles are arriving from many manufacturing centers to be reloaded on new trains towards final destinations. As North American manufacturing volume increases, and as car makers increasingly adopt flexible "global platforms" allowing the simultaneous production of vehicles for multiple markets, St. Louis stands to benefit from being at the center. Investments in facilitating North-South rail movement are particularly apparent here. Regional governments can also create policies to support the development of major mixing centers such as the Wentzville facility.

Mississippi River

That St. Louis benefits from its position on the Mississippi River is an understatement. However, changing patterns of goods movement will require the right kind of facilities to allow the St. Louis Region to maximally benefit. Coal will decline and grains and soybeans will increase, and appropriate land-side facilities will need to be in place. Moreover the potential for containerization of waterborne freight cannot be overlooked, even if it has been largely unsuccessful to this point. Reducing rail congestion at water terminals is also critical. Minimizing grade crossings and enabling access for multiple rail lines to terminals are important steps, particularly for those terminals that have contemplated investments to handle containers.

Pharmaceuticals

The pharmaceutical industry is a major potential growth area for St. Louis, bringing with it high-paying jobs and valuable commodities to export to other regions of the U.S. and the World. Pharmaceutical shipment requires require special handling, including potentially air cargo opportunities. A return of international passenger service would be a good first step to reconnecting Lambert to the rest of the world, including potential export centers for these valuable products.

Warehouses and Distribution Centers

As intermodal yards move towards more spacious areas outside of cities, they will require warehousing and distribution centers to be nearby. St. Louis still has a high concentration of warehousing and distribution centers near the center, in part due to the connection to the River, but coordinating land use and permitting in logical growth areas for exurban intermodal and rail yards should be considered.

Co-Dependent Regional Economies

Co-dependencies exist with a number of regions in the U.S. and St. Louis needs to be mindful of these economic inter-dependencies. It is evident that Chicago, Los Angeles, San Francisco, Dallas, New York, Atlanta and Miami are critical to the St. Louis' region's trade and transport of cargo domestically and internationally. This very much is evident with respect to airborne cargo and the reliance on connecting with domestic and international airports at the country's key airports. The evolution of the U.S. transportation system, with the emergence of key hubs and "ports-of-call" will remain into the future. Competing to capture divert or capture overflow business will be difficult, but advantages can be achieved by strengthening the infrastructure between the St. Louis Region and these U.S. locations. Other cities where there are strong economic and trade interactions include Indianapolis, Norfolk, Minneapolis and Huntsville, AL, which points to sourcing, manufacturing and final production of hard goods, as well those that are associated with high technology, biotechnology and defense that are occurring in St. Louis and these metropolitan areas.

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Recommendations

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Introduction

This section of the report frames the core conclusions from the study, providing guidance to the St. Louis Region for ways to better manage freight movement in the future. The process begins with broader factors which shape the conclusions:

- The U.S. Federal Highway Administration estimates that U.S. freight traffic (all modes) will increase by more than 60% over the next 25 years. For St. Louis, increases in freight are likely and need to be planned for.
- While logistics and freight movement have always been a cost of doing business, over the last 15 years (led by companies such as Walmart) the level of sophistication and sensitivity to cost have grown immensely. In this context, the consequences of increasing the cost of freight movement locally need to be understood, because freight flows can otherwise shift to lower cost regions.
- Infrastructure is only half of the equation; how transportation companies and railroads in particular choose to operate across networks matters equally.
- The nature of manufacturing and distribution has fundamentally changed. Increasingly, companies' supply chains are dictating their manufacturing processes, with the clear goal being to add value along supply chains while adapting to changing market conditions.
- Freight movement, economic development, and workforce development are all connected. As a result, freight movement can be a strategy for regional economic development but only if companies can add value locally, and sustain supply chain effectiveness.
- Underlying this effort is a concern about the St. Louis Region's slower pace of job creation since 2010, which reflects a longer-term trend of below average growth compared to Midwestern peers.

Broader Forces Shaping Freight Movement

Historically, the St. Louis Region has served as a logistics gateway to the West via the Mississippi River, and as a key rail gateway where at one time more than 16 railroads provided passenger and freight service. Moving forward to today, with the evolving end of the "Great Recession," it is clear that the national freight and logistics framework is undergoing significant change which will ultimately impact the St. Louis Region. As Adlai Stevenson said, "Change is inevitable; change for the better is a full time job." Building pressure for change is being driven by:

- The Panama Canal Expansion, combined with East and Gulf Coast harbor dredging, will shift how freight moves across the county.
- Near-shoring to Mexico, aligned with current infrastructure investment at the Port of Lazaro Cardinas, Mexico's largest seaport, and the ascendance of the Kansas City Southern Railroad (KCS) point to significant increases in freight traffic from Mexico towards the U.S. Midwest.
- Canadian National (CN) rail corridor improvements between the Port of Prince Rupert in British Columbia, Canada and the Midwestern U.S., with the potential to bypass Chicago.

- New intermodal yards in North Baltimore, OH (CSX), Kansas City, MO (BNSF), and Santa Teresa, NM (UP), combined with improvements to high velocity rail corridors, such as the Heritage Corridor (CSX), the Crescent Corridor (NS), and the BNSF TransCon.
- A new rail tunnel between Detroit and Canada to support doublestack intermodal containers.

Nationally, logistics providers are adjusting to structural factors which are equally important:

- Growth in diesel fuel prices, linked in part with more strict air quality requirements for diesel emissions. Growth in jet fuel prices at rates above diesel fuel, which is pressuring a share of domestic air cargo to shift to expedited truck.
- The impact of evolving Federal regulation on the trucking industry (hours of service), combined with improvements in Class I rail intermodal service, have allowed railroads to be more competitive for domestic container movements beyond 800 miles and shorter.
- While the railroads have poured billions into key high volume corridors their local yards and terminals in many cities need considerable investment.
- Facilities built and operated in one economic time period are now being repurposed today, including more than 80 former automotive sites.

There are also factors whose timing and impact are uncertain:

- The impact of the CREATE program in Chicago, to remove choke points in the rail system;
- A generally slower pace of growth and recovery in export markets;
- Emergence of container on barge service on the Mississippi River System;
- Proposed West Coast port expansions to better handle commodity exports;
- New fuels such as natural gas as well as diesel hybrid technologies;
- Marketing agreements, such as the one between Americas Central Port and the Port of New Orleans and the translation into actual freight volume;
- Federal legislative focus on ports and waterways seems to be gaining traction;
- Reduced domestic demand for coal, offset by growth in export markets; and
- Growth in demand for oil shipped by rail rather than pipeline.

These currently unfolding shifts in global supply chains and transportation infrastructure point to the emerging reality that the markets that the St. Louis Region needs to focus on will be increasingly to the east and southwest. As well, local transportation infrastructure will need to adjust, with particular emphasis on rail bridges and the regional rail networks across the Mississippi River; access roads that serve intermodal yards and waterfront terminals; and Interstate by-pass routes, which will remain a core focus for thru-truck traffic.

St. Louis Regional Strengths and Opportunities

- The St. Louis Region is a cost effective location for commodity transloading from truck and unit train to barge, ranking 18th in total tonnage for all U.S. port districts in 2011. The St. Louis Region is also a cost effective location for trucking, linked with the I-44 to I-70 corridor between Mexico,

Los Angeles and New York (least tolled / most direct route), with generally lower diesel fuel prices and tolerable congestion.

- MoDOT and IDOT both completed their state rail plans in 2012, providing insights as to how both states are evaluating statewide rail infrastructure.
- IDOT Higher Speed Rail (HSR) planning includes new rail bridge capacity options for the St. Louis Region.
- MoDOT and the TRRA have partnered to pursue federal grants to support rail capacity enhancements to the western rail approaches across the Mississippi River.
- The Union Pacific Railroad is planning intermodal improvements to their Dupo Yard, even as IDOT plans a new interchange to connect this asset with I-255.
- The St. Louis Region serves as a national gateway for coal traffic; reduced demand at present has lessened pressure on local rail bridges. As well, intermodal traffic through the St. Louis Region has increased since 2010, with expectations for growth.
- The St. Louis Region has seen growth in exports to China, Mexico, and Canada, the latter of which have direct implications for truck and rail access locally. Lambert-St. Louis and MidAmerica Airports have strategies to move forward incrementally.
- The St. Louis Region has substantial vacant land for new development. The primary challenge will be to ensure that transportation investments have been made to unlock the value of sites.

Regional Opportunities:

- The St. Louis Region can maximize the return on infrastructure investments, in particular, investments in interstate bridges.
- The St. Louis Region can provide an alternative rail connection to Chicago, linking Midwest and eastern markets with freight moving from Mexico (near shoring) and west coast traffic.
- City / County economic development alignment is unfolding, even as the St. Louis Region has seen an array of independent and collaborative efforts unfold recently regarding economic development and freight movement.

Freight Movement Trends and Source Markets

Freight is moving within and through the St. Louis Region in ways that depart from market legacies. The following pages summarize the key commodities that move through the St. Louis Region, where they originate from, and where they are heading to.

Corridor Geography and Freight Infrastructure

Modes	2010	2040	CAGR
Tons (000s)	**159,962**	**199,762**	**0.7%**
Truck	51,961	84,440	1.6%
Rail	107,914	115,286	0.2%
Water	87	37	-2.8%
Value ($M)	**108,047**	**237,243**	**2.7%**
Truck	77,848	174,759	2.7%
Rail	30,177	62,476	2.5%
Water	22	8	-3.0%

Direction	2010	2040	CAGR
Tons (000s)	**159,962**	**199,762**	**0.7%**
Through	110,440	141,562	0.8%
Outbound	6,730	8,511	0.8%
Inbound	42,791	49,688	0.5%
Value ($M)	**108,047**	**237,243**	**2.7%**
Through	82,223	192,199	2.9%
Outbound	11,635	16,103	1.5%
Inbound	14,188	26,936	2.2%

BEA (Tons 000s)	2010	#	2040	#
Origins				
Casper, WY	**79,916**	**1**	**75,496**	**1**
Denver, CO	**10,452**	**2**	**11,110**	**3**
Kansas City, MO	**9,555**	**3**	**13,040**	**2**
Destinations				
Kansas City, MO	**7,088**	**1**	**10,501**	**1**
Denver, CO	**2,318**	**2**	**4,123**	**2**
Columbia, MO	**1,510**	**3**	**2,413**	**3**

The Northern Plains, Rockies, and Pacific Northwest Corridor

Freight tonnage moving through the Northern Plans, Rockies, and Pacific Northwest Corridor tends to flow more heavily in an eastbound direction. Total tonnage will grow at a relatively slow 0.7% per year over the next 30 years. This is primarily attributable to the reduction in domestic demand from coal, which typically moves from the Powder River Basin to St. Louis via rail. Agriculture, another long-time staple of corridor rail flows, will also grow only slightly. Growth in manufactured motor vehicles shipments will help sustain rail.

Future growth in corridor flows will center on mainly truck transportation of higher-value goods. These will include general manufactured consumer goods and motor vehicles moving in all directions, chemicals and pharmaceutical supply chains generally moving in a westbound direction, and high-value, high technology products shipped from the Pacific Northwest to and through St. Louis.

St. Louis has a strong presence of pharmaceutical, consumer product, and specialized chemicals industries. Supporting these industries requires efficient highway and local roadway access, specialized warehousing, and, in the case of chemicals, specialized intermodal handling.

Commercial linkages with mining areas in the Rockies such as Casper and Denver will continue to be important in absolute terms. However, strengthening links with Kansas City and the Pacific Northwest, particularly for higher-value, lower-tonnage freight will be important to taking advantage of future regional economic opportunities. The I-70 Corridor and efficient access to local warehousing, distribution, and inter-modal centers will be priorities for this corridor.

Corridor Geography and Freight Infrastructure

Modes	2010	2040	CAGR
Tons (000s)	**66,282**	**132,706**	**2.3%**
Truck	50,213	101,390	2.4%
Rail	16,052	31,298	2.3%
Water	15	17	0.2%
Value ($M)	**177,897**	**521,558**	**3.7%**
Truck	130,526	412,755	3.9%
Rail	47,365	108,790	2.8%
Water	4	12	3.4%

Direction	2010	2040	CAGR
Tons (000s)	**66,282**	**132,706**	**2.3%**
Through	57,369	115,785	2.4%
Outbound	4,865	8,065	1.7%
Inbound	4,047	8,856	2.6%
Value ($M)	**177,897**	**521,558**	**3.7%**
Through	157,396	458,711	3.6%
Outbound	10,610	23,428	2.7%
Inbound	9,891	39,419	4.7%

BEA (Tons 000s)	2010	#	2040	#
Origins				
Los Angeles, CA	**9,860**	**1**	**24,060**	**1**
Springfield, MO	**2,098**	**2**	2,698	
San Antonio, TX	**2,004**	**3**	**3,779**	**3**
Dallas, TX	1,841		**5,446**	**2**
Destinations				
Los Angeles, CA	**10,635**	**1**	**22,955**	**1**
Dallas, TX	**3,858**	**2**	**7,363**	**2**
Springfield, MO	**2,340**	**3**	4,078	
San Antonio, TX	2,025		**4,130**	**3**

The Sun Belt Corridor

The Sun Belt Corridor will experience rapid growth in freight flows over the next 30 years. This is primarily attributable to expansion of international trade with Asia, Mexico, and Latin America, as well as increasing domestic production and consumption of motor vehicles and high technology.

Both rail and truck throughput will double by 2040, as the wide variety of goods shipped through the Sun Belt Corridor will require different infrastructure considerations. Containers and motor vehicles flows will tend to move via rail and will expand rapidly in the coming years on account of growing international trade and the re-shoring of auto manufacturing to North America (and the Midwest, Southeast, and Mexico in particular), respectively. Other commodities experiencing rapid growth include high technology, chemicals, plastics, and agriculture, which will for this corridor require mostly road access.

St. Louis's chemicals industry specializes in several products as well as pharmaceuticals, while agricultural goods from Southwest Missouri and Oklahoma are used to support regional food and beverage manufacturing. Thus, access on I-44 will be important to regional industry. There may be opportunities to enhance the St. Louis Region's position in the automotive supply chain, but for now most motor vehicles flows will be rail through traffic.

Commercial linkages with BEAs in Southern California and Texas will drive corridor freight flows, with the latter supplying explosive demand for high-technology products in St. Louis and beyond. The rapidly expanding and diverse sources of freight in this corridor will put pressure on I-44 and Mississippi River rail crossings, as well as downtown expressways and Interstate beltways.

Corridor Geography and Freight Infrastructure

Modes	2010	2040	CAGR
Tons (000s)	**58,236**	**84,957**	**1.3%**
Truck	10,912	17,121	1.5%
Rail	28,732	38,801	1.0%
Water	18,592	29,035	1.5%
Value ($M)	**53,920**	**95,603**	**1.9%**
Truck	22,089	38,380	1.9%
Rail	26,373	48,609	2.1%
Water	5,459	8,614	1.5%

Direction	2010	2040	CAGR
Tons (000s)	**58,236**	**84,957**	**1.3%**
Through	34,726	49,062	1.2%
Outbound	18,598	30,002	1.6%
Inbound	4,912	4,893	0.6%
Value ($M)	**53,920**	**95,603**	**1.9%**
Through	38,982	71,633	2.0%
Outbound	9,116	15,191	1.7%
Inbound	5,822	8,779	1.4%

BEA (Tons 000s)	2010	#	2040	#
Origins				
Houston, TX	**3,957**	**1**	**6,367**	**1**
New Orleans, LA	**2,235**	**2**	**2,960**	**3**
Baton Rouge, LA	**1,979**	**3**	2,303	
Memphis, TN	1,895		**3,228**	**2**
Destinations				
New Orleans, LA	**9,814**	**1**	**23,535**	**1**
Little Rock, AR	**9,287**	**2**	**10,156**	**2**
Baton Rouge, LA	**5,042**	**3**	4,078	
Memphis, TN	4,040		**6,428**	**3**

The Lower Mississippi and Gulf Coast Corridor

The Lower Mississippi and Gulf Coast Corridor will experience moderate annual growth in tonnage of 1.3% over the next 30 years. Declining flows of coal and petroleum products obscure the larger story, however, as growth in other commodities such as agriculture, general container goods, and chemicals more than offset these losses.

River port infrastructure is critical to flows on this corridor. Coal will notably decline due to domestic natural gas substitution, while refined petroleum shipments will decline on account of increased concentration of production in the Gulf. Agriculture will more than offset this lost tonnage, however, as grains, soybeans, and other crops are shipped by rail and truck to St. Louis for export to emerging economies in Asia. Rail traffic will expand on account of increased container and plastics flows in both directions due to expanding trade and growing domestic manufacturing, respectively. Growing rail flows of chemicals will support St. Louis industries.

Overall, the Lower Mississippi and Gulf Coast Corridor is dominated by southbound river flows of coal and agriculture towards New Orleans. Other important trends include increased volumes of containers moving by rail in both directions, and high-value-added plastics and petrochemicals from Houston moving northbound by rail. St. Louis's chemicals and petroleum products manufacturing will still thrive, but the St. Louis Region may lose market share on the latter.

Rail capacity and port and intermodal facilities will be the most critical assets to support freight flows through this corridor. I-55 may not carry the same volume of flows; however, this Interstate corridor will be important to St. Louis industries such as pharmaceuticals, which will supply markets directly to the south.

Corridor Geography and Freight Infrastructure

Modes	2010	2040	CAGR
Tons (000s)	**38,945**	**61,187**	**1.5%**
Truck	24,717	41,523	1.7%
Rail	11,951	16,899	1.2%
Water	2,278	2,766	0.6%
Value ($M)	**54,193**	**134,587**	**3.1%**
Truck	40,349	104,336	3.2%
Rail	12,949	29,364	2.8%
Water	894	887	0.0%

Direction	2010	2040	CAGR
Tons (000s)	**38,945**	**61,187**	**1.5%**
Through	32,497	51,548	1.5%
Outbound	5,000	6,021	0.6%
Inbound	1,448	3,618	3.1%
Value ($M)	**54,193**	**134,587**	**3.1%**
Through	44,937	116,441	3.2%
Outbound	5,485	10,162	2.1%
Inbound	3,771	7,983	2.5%

BEA (Tons 000s)	2010	#	2040	#
Origins				
Birmingham, AL	**1,272**	**1**	**1,726**	**3**
Miami, FL	**1,252**	**2**	1,272	
Johnson City, TN	**893**	**3**	**1,875**	**2**
Atlanta, GA	815		**1,989**	**1**
Destinations				
Birmingham, AL	**3,431**	**1**	**4,117**	**3**
Nashville, TN	**2,672**	**2**	**4,159**	**2**
Atlanta, GA	**2,346**	**3**	**4,189**	**1**

The Southeast and Southern Appalachia Corridor

The Southeast and Southern Appalachia Corridor is a relatively low-tonnage which will experience moderate annual growth, 1.5 percent through 2040. Historically, agriculture and petroleum products have supported freight flows mostly by rail and inland waterways such as the Cumberland and Tennessee rivers. Agriculture flows will be flat while those for petroleum products will decline. Higher-value products such as chemicals and motor vehicles will drive future rail growth, while general consumer goods and high technology will increase truck flows on I-64.

Demand for rail and river port infrastructure will grow modestly in the coming decades. Agriculture flows in this corridor by rail or water tend to supply domestic consumption rather than growing markets in Asia. Refined petroleum at Wood River should expand its presence in regional production, but will be displaced in the Southeast by Gulf-Coast supplies. Rail flows should be sustained by slower steel supply chains connecting with Birmingham and containers moving through the corridor to and from Norfolk, Miami, and Jacksonville. Moreover, the Southeast is a growing manufacturing center for automotive manufacturing, and St. Louis will be a critical logistics point.

Future growth in flows in the Southeast and Gulf Coast Corridor will be through traffic. There are opportunities for some regional industries such as chemicals to take advantage of emerging supply chains. Demographic growth in places like Atlanta will create new markets for regionally manufactured consumer goods. Rail infrastructure east of the Mississippi River will be important for the former, while road access via I-64 and inter-modal capacity will help support the latter.

Corridor Geography and Freight Infrastructure

Modes	2010	2040	CAGR
Tons (000s)	**74,559**	**131,339**	**1.9%**
Truck	52,996	96,792	2.0%
Rail	17,909	31,524	1.9%
Water	3,653	3,023	-0.6%
Value ($M)	**163,016**	**431,852**	**3.3%**
Truck	122,660	345,129	3.5%
Rail	39,362	86,132	2.6%
Water	994	591	-1.7%

Direction	2010	2040	CAGR
Tons (000s)	**74,559**	**131,339**	**1.9%**
Through	58,721	110,257	2.1%
Outbound	9,381	11,069	0.6%
Inbound	6,457	10,013	1.5%
Value ($M)	**163,016**	**431,852**	**3.3%**
Through	140,310	389,157	3.5%
Outbound	10,875	20,970	2.2%
Inbound	11,831	21,725	2.0%

BEA (Tons 000s)	2010	#	2040	#
Origins				
New York, NY	**3,650**	**1**	**7,876**	**1**
Evansville, IN	**2,855**	**2**	**4,672**	**2**
Indianapolis, IN	**2,604**	**3**	**4,482**	**3**
Destinations				
New York, NY	**8,451**	**1**	**17,027**	**1**
Philadelphia, PA	**3,326**	**2**	**5,835**	**2**
Evansville, IN	**3,232**	**3**	4,121	
Boston, MA	2,834		**4,969**	**3**

The Northeast and Lower Midwest Corridor

The Northeast and Lower Midwest Corridor experiences heavy freight flows across truck and rail modes, whose tonnage will grow by 1.9% per year through 2040. Eastbound flows tend to exceed westbound flows on account of imports from Asia moving via Los Angeles and St. Louis to major population centers in the Northeast and along the Great Lakes. Flows in the westbound direction tend to consist of high-value chemical and plastic products, pharmaceuticals, and motor vehicles.

Regional roadway and rail infrastructure will both experience sharp increases in demand. Apparel and container imports from Asia will require additional eastbound rail capacity, while motor vehicles, plastics and steel from the Lower Midwest and chemicals and plastics from the Northeast will move on rail in the opposite direction. Consumer goods, manufactured food and beverage products, and high technology will drive eastbound flows of trucks, while pharmaceuticals from the East Coast and Indianapolis drive westbound flows.

Commercial linkages for inbound and westbound cargo are strong with New York and nearby centers of agriculture and manufacturing such as Evansville. For outbound and eastbound through traffic, large eastern population centers dominate.

Pharmaceuticals, chemicals, consumer products, and food manufacturing industries are vital to the regional economy. St. Louis' position in the supply chain for moving these goods through this corridor is critical. Increasing flows will contribute to congestion on I-70 and on rail river crossings. Supporting these industries requires efficient highway, rail, and intermodal facilities. Waterborne shipments will, however, decline on account of lower coal shipments on the Ohio River.

Corridor Geography and Freight Infrastructure

Modes	2010	2040	CAGR
Tons (000s)	**91,928**	**131,112**	**1.2%**
Truck	54,149	80,266	1.3%
Rail	35,566	49,049	1.1%
Water	2,213	1,797	-0.7%
Value ($M)	**126,306**	**258,871**	**2.4%**
Truck	83,130	173,945	2.5%
Rail	42,537	84,319	2.3%
Water	639	607	-0.2%

Direction	2010	2040	CAGR
Tons (000s)	**91,928**	**131,112**	**1.2%**
Through	60,039	89,331	1.3%
Outbound	15,820	16,241	0.1%
Inbound	16,069	25,540	1.6%
Value ($M)	**126,306**	**258,871**	**2.4%**
Through	87,531	197,400	2.7%
Outbound	17,021	21,772	0.8%
Inbound	21,754	36,699	2.0%

BEA (Tons 000s)	2010	#	2040	#
Origins				
Chicago, IL	**14,058**	**1**	**25,989**	**1**
Duluth, MN	**6,770**	**2**	**7,727**	**2**
Springfield, IL	**3,561**	**3**	**5,126**	**3**
Destinations				
Chicago, IL	**17,887**	**1**	**23,911**	**1**
Springfield, IL	**5,887**	**2**	**6,850**	**2**
Champaign, IL	**2,216**	**3**	**2,728**	**3**

The Upper Midwest Corridor

The Upper Midwest Corridor will experience modest tonnage growth of 1.2% per year through 2040. Freight flows are generally well-balanced in terms of directionality. There is strong economic interaction between the BEAs in this corridor – a legacy of historical economic development patterns as well as the fact that Chicago serves as the most important market for St. Louis.

The Upper Midwest Corridor is endowed with tremendous rail connectivity to six Class I rail lines. This benefits agriculture, coal, and steel, which historically account for large shares of regional flows. Rail also plays a critical role in the southbound shipment of iron ore from Duluth for use in St. Louis' steel industry and/or trans-shipment. With the exception of agriculture, future growth of these flows will slow. The re-shoring of automotive manufacturing will, however, support rail flows of motor vehicles and plastics. The growth of container transport as well as general demand for chemicals and pharmaceuticals will also increase rail as well as truck traffic.

I-55 is critical to commerce within this region and for supporting the St. Louis economy. The highway experiences heavy flows of consumer goods, in both directions. Additionally, aviation parts used in St. Louis' aircraft manufacturing industry are typically shipped southbound from the Peoria and Chicago areas via truck. High-value, high technology goods produced in Minneapolis and Texas will also rely heavily on I-55 for goods movement in both directions.

The demands on both rail and road infrastructure in the Upper Midwest corridor will be substantial and growing. The connection with Chicago is especially vital for regional industries in St. Louis. Supporting efficient inter-modal throughput on this corridor is of great importance.

Regional Challenges

While places as Indianapolis and Kansas City have established distinct “brands” in logistics, the combined amount of freight that moved in and out of these metro areas in 2010 (366.6 million tons) is less than the amount of freight that moved through the St. Louis Region (455.7 million tons) in 2010. The point here is that while St. Louis as a whole has been emphasizing its impressive location for logistics (four interstates, six Class I railroads, and two major rivers) since the 1960s, the St. Louis Region’s role in national supply chains does not appear to have significantly changed much over that same period. Further, the St. Louis Region’s locational advantages have been less well communicated to the marketplace compared to other cities.

More importantly, there are concerns that linkages between transportation modes across the St. Louis Region remain at best arbitrary, and at worst poorly understood, undocumented, or accidental. These factors may link with the St. Louis Region’s traditional penchant for geographic and political fragmentation, which has tended to create additional challenges that are borne by the regional freight transportation system, primarily through increased inefficiency congestion and cost. Other challenges include:

- Existing rail bridges across the Mississippi and their approaches are a constraint to freight movement. In Missouri, there are plans to enhance capacity leading to the western approach to the MacArthur Bridge, and to rebuild the approach to Merchants Bridge. Illinois concerns relate to how the eastern bridge approaches connect into existing yards, which tend to be smaller, and how run-through traffic impacts overall network efficiency.
- With Regional forecasts pointing to 3% to 4% future growth in domestic intermodal freight movement, there are practical concerns about the ability of local intermodal yards to handle anticipated growth.
- While recent transloading investments in Illinois have significantly increased barge loading capacity for coal and commodities from unit trains, there is concern about local rail infrastructure being able to support longer and more frequent unit trains for multiple commodities that will be served at these locations, particularly with anticipated growth in the Kaskaskia Port District.
- Reduced flows on the Missouri River have placed additional burdens on I-70 between Kansas City and St. Louis. While this interstate is rightfully the current priority of MoDOT, the analysis points to the greater value of freight moved along I-44 from Joplin and points west as a key priority for the St. Louis Region.
- There appear to be several disconnects between land use decisions, which are made at a local level, and broader transportation and freight movement decisions, which are made on a larger regional scale. This point moves to the forefront in dealing with Class I railroads, who view the St. Louis Region in a global supply chain and network context.

While the St. Louis Region has historically struggled with ways to resolve these challenges, projects such as the new Mississippi River Bridge are a clear step in the right direction, the construction of which is very obvious to local residents. However, interviews confirmed that most businesses involved in freight have not thought in detail about how the new bridge and road alignment will impact their business.

Transportation Data Concerns

- MoDOT and IDOT track freight differently.
- For Missouri, there needs to be improved tracking of truck movement on arterial streets near intermodal facilities.
- Federal Railroad Administration (FRA) data on average daily train movements locally may be inconsistent and should be validated.
- Existing Geographic Information Systems (GIS) data for freight infrastructure can be improved.

Policy / Economic Development Concerns

- Regional political / economic development fragmentation impacts the freight network.
- With many freight assets operating across local municipal boundaries, there is concern about how local government policies are impacting the competitiveness and perception of the St. Louis Region.
- There is a disconnect between land use, economic development, workforce development, and transportation planning.
- Existing port authorities in the St. Louis Region function in an isolated political environment.
- County leadership in economic development is not aligned with industry supply chain and transportation demands, which are increasingly global in scope.
- The analysis speaks to a missing piece in the St. Louis Region, which is an organization that can see the big picture, understand the details, and work collaboratively with transportation providers, including trucking companies and Class I Railroads.

Land Use Concerns

- The St. Louis Region has considerable vacant / underutilized land (3,000 to 5,000 acres) in areas such as East St. Louis and Fairmont City in Illinois and Hall St, and around Lambert Airport and riverfront industrial areas in Missouri.
- There is concern regarding increasing pressure on Metro East rail infrastructure, along with HSR impacts. The Metro East rail network includes a number of locations where Class I mainlines cross at grade, leading to eventual growth in congestion and delay.
- While the St. Louis Region has a relative abundance of sites for future economic development, it is not certain that transportation connects equally well to them, particularly in Missouri, where sites like the former Chrysler plants are a concern.
- Areas where rail corridors interact at grade with local streets in older industrial areas, for example Hall St. and Route 3, due to the restrictive infrastructure conditions and freight movement in and out of the areas

General Infrastructure Concerns

- Eastbound I-270 approaching the New Chain of Rocks Bridge is an emerging choke point for thru-truck traffic.
- Funding for infrastructure (state and federal) has yet to be resolved in a cohesive fashion; Local solutions may be needed.
- While the new Mississippi River Bridge has somewhat addressed the long standing requirement to dewater portions of the Tri-Level Interchange, IDOT will continue to pump 16 to 20 million gallons of water per day to maintain this key interchange.

Industrial Land Use Conversation

The core question of how land use should align with freight movement builds from current efforts being led by the Federal Highway Administration (FHWA) regarding the challenges associated with how freight currently interacts with land use in this country. Key challenges include:

- Land use policies that are not coordinated across jurisdictions;
- Urbanization leads to encroachment of non-compatible land uses;
- Growing freight volumes and congestion create conflicts, particularly in residential areas and in downtown core area;
- The challenge that “freight doesn’t vote” argues for a more cohesive strategy for regional engagement with the movers of freight and the local jurisdictions they impact;
- Transportation planning does not fully account for freight attributes and;
- Economic development and transportation planning are disconnected;
- Understanding of stakeholder issues and needs;
- Connection between freight, land use and climate change is increasingly important, both for “last mile” deliveries in the core, as well as for “thru traffic”. In both cases, diesel emissions are a concern, along with congestion.

To help frame how land use and freight are interacting locally, 23 areas across the St. Louis Region were identified where industrial activity tends to connect with the freight transportation system. These are highlighted in a map on the following page. For each of these areas, a core set of 20 core performance characteristics was compiled. The analysis yielded several key findings:

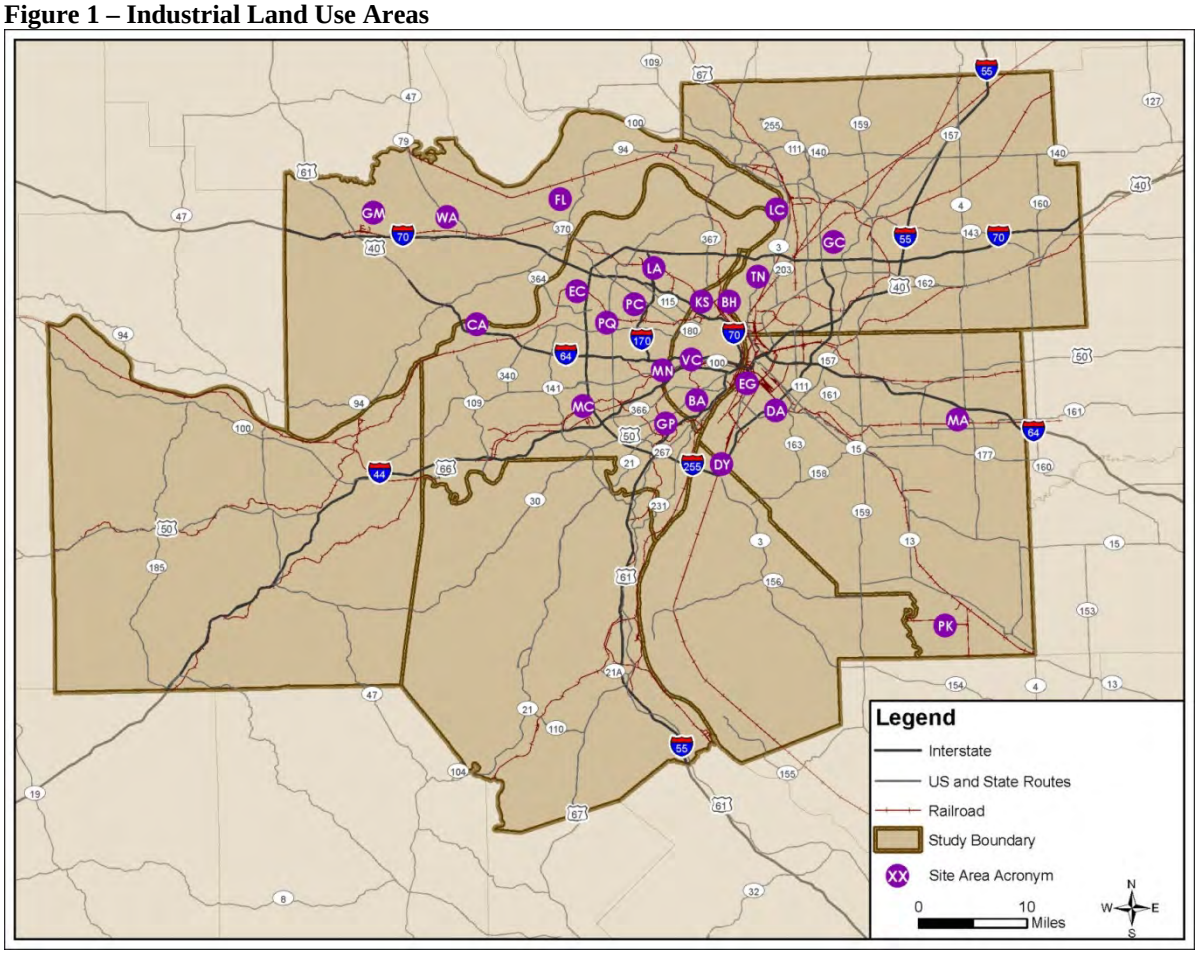
- The new Mississippi River Bridge is expected to add ±20% to combined roadway capacity across the river. In effect, the bridge is adding improved transportation access to industrial sites on both sides of the river where it had been congested or missing before. As a result, the Bridge has the potential to become a transformative event for these properties.
- The St. Louis Region’s industrial areas, particularly those with bulk handling assets, are in a position to leverage these attributes, facilities and locational advantages in bulk handling to grow a more diversified transportation network across all modes.
- The vertically integrated process of land use and transportation planning, infrastructure and operations presents the St. Louis Region with a mix of challenges and opportunities, when solved

as a region, will move the greater St. Louis area to a pivotal position within North America and the global economy.

- Industrial areas located within multiple political jurisdictions may be impacted by different sets of local decisions in land use, zoning and traffic management.
- Arterial roadways are important avenues for freight and figure prominently in the first / last mile of freight movement, as well as in spillover congestion.

The dynamic interplay between industry's supply chains, transportation infrastructure and multi-modal network performance combine to continually shift the cost and success in freight movement. The evaluation of the 23 sites in Section 07 of the report leads to the recognition that the rail, roadway and waterway assets are heavily concentrated at the core of the St. Louis Region. Further, large industrial parcels may be available for consolidation as can be seen in the site size, number of parcels and RBA descriptors for each.

Figure 1 – Industrial Land Use Areas



On the east side, the former and potential industrial properties lie within the municipal and unincorporated areas of Madison and St. Clair Counties. The Regional Freight Study has identified five industrial subzones for the St. Louis Region in areas directly affected by the roadway improvements, as well as new roadway construction. Also, the potential for modifications to the regional freight railroad network may also take place largely on the east side, resulting in more effective freight movement. Industrial development takes place as a result of balancing competing factors that include building costs, access to freight networks, utilities, site and building features and the ability to adapt to changed conditions over time. Additional land use concerns include:

- While intermodal capacity concerns are real, several waterfront transload sites can attract about 500 semi-trailers per day, raising long term sustainability and social justice concerns.
- Site assessments revealed an array of local road conditions that are challenging for trucks. Logistics providers have found solutions to deal with access to older industrial areas (2 smaller trucks instead of 1 larger one).
- How will land use patterns shift when the new bridge opens?

Tough Questions

With the dust from the “Great Recession” now beginning to settle, several “tough questions” that the St. Louis Region will continue to struggle with have been identified:

- How are the railroads thinking about local system growth?
- How does the St. Louis Region maximize the return on infrastructure investments, in particular, investments in interstate bridges?
- If MoDOT and IDOT prioritize rail capacity improvements differently, where will the St. Louis Region end up?
- The St. Louis Region faces significant decisions over infrastructure priorities. How does the St. Louis Region align transportation dollars with regional economic development priorities?
- Should the St. Louis Region encourage greater efficiencies in a smaller number of riverfront transload facilities?
- Presuming the difficulty in creating supply routes between China, St. Louis and South America, how much harder can it be to create scheduled container on barge routes between Peoria, St. Louis, and Memphis?
- The St. Louis Region has considerable vacant / underutilized land (~5,000 acres) in areas such as East St. Louis and Fairmont City in Illinois and Hall St, and around Lambert Airport in Missouri. How can the value of these assets be unlocked?

Recommendations

Organizational Capacity

The St. Louis Region is poised to see increases in freight activity. At the same time, it is clear that there is a missing piece in the regional structure for economic development and transportation planning to effectively manage anticipated increases in freight volume, and more importantly, to benefit from them. The conclusion is that the St. Louis Region needs to implement a regional transportation district, which could have the following capabilities:

- Coordination with public and private sector entities
- Transportation management
- Infrastructure programming and financing

Freight movement relies upon a balance of transportation modes, infrastructure and operations that are supply chain driven. This same freight movement needs a sequence of factors to coincide from "Big Picture" balance of trade aspects and customs clearing to local grade crossings and details such as truck access to loading docks, a true case of vertical integration. The balance between land use and transportation infrastructure must also remain adaptable, responding to changes in supply chains that reflect changing industrial needs and operations. St. Louis, as well as nearly every other metropolitan area participating in the global economy is presented with a number of challenges and opportunities to make this balance work well. Fortunately, there are several examples of successful and sustained efforts across North America to draw from.

One way to create a sustained focus on freight transportation performance is through the formation of a special use district, here referred to as a Freight Transportation District or Regional Freight Transportation Authority. Such an Authority / District has the potential to be formed under existing state legislation as a function of the specific powers and responsibilities assigned to the Authority. Such a District could include capacities to oversee regional transportation management as well as infrastructure programming. The specifics for the Authority / District, as well as the alignment with existing jurisdictions, municipal, county and state governments, the private sector, industries and economic development functions, would be the result of many discussions and deliberate choices. Each of these functions will be examined, together with recommendations for inclusion in the St. Louis Regional Freight Transportation Authority / District Model. Several examples will be identified as well, including specifics for the port authority consolidation effort in Vancouver, British Columbia.

Transportation Management

The St. Louis Region's desire to retain and attract industry, sustain economic growth and improve freight transportation movement provides the impetus to address the mix of land use and transportation decisions facing the St. Louis Region. The St. Louis Region's strengths and challenges contribute to the nature and magnitude for the approach in addressing these same land use and transportation attributes underlying freight movement.

Infrastructure Programming

The combination of federal, state, regional and local land use and transportation programs have a number of periodic cycles for planned and unplanned investments across each of the transportation

modes involved with freight transportation. In many cases these investment directly involve and certainly impact the private sector. The Regional Freight Transportation Authority would be positioned to integrate the existing conditions and operations of the multi-modal freight transportation network into a consolidated network to represent the District in future plans and investment program cycles.

Management Capacities and Features for a Transportation District

Freight transportation involves multiple transportation modes and land use that draws industrial sites and employment to the respective areas within the St. Louis Region. The industrial sites use also impact other land uses and transportation patterns, particularly for residential, commercial and institutional clusters seen within the overall metropolitan and quasi-rural communities that exist within the St. Louis Region. Both Illinois and Missouri have existing state statutes for special transportation districts that have been used to establish ports, railroad infrastructure management areas, special purpose facilities, and economic development zones. Generally these fall within the Missouri Chapter 238 Special Transportation Districts and Transportation Corporations and the Illinois Chapter 70 Special Districts in addition to other relevant statutes. Each state has formed dual and multi-state transportation agreements in St. Louis and other areas of their respective jurisdictions. The proposed Freight Transportation Authority / Freight Transportation District, may include the following features.

Stature

- Established as a political subdivision and municipal corporation on both sides of the Mississippi River, empowered by enabling legislation from Illinois and Missouri.
- District boundaries established to coincide with land areas underlying existing and former industrial sites, public and private sector transportation corridors and facilities, ports and transload facilities, as well as designated industrial development zones.
- District boundaries correspond to the appropriate portions of township, municipal and county boundaries within the East-West Gateway Council of Governments MPO.
- Align an industrial land redevelopment capacity to assemble and repurpose existing and new industrial land, as well as the land necessary for freight transportation infrastructure and operations, often seen in a land clearance and redevelopment authority.
- Establish a balanced two-state representation to the Authority's governing body, reflective of state, county and local representation and special purpose districts that may exist.

Powers

- Ability to issue and place revenue and general obligation bonds, as well as borrow funds, for approved industrial transportation purposes.
- Issue and administer permits in a manner consistent with state and local jurisdictions, and apply / obtain federal permits.
- Ability to assemble land for the purposes of the Freight Transportation Authority in a manner consistent with the respective state enabling legislation.
- Work with existing municipal, county and state units of government in the land use planning, zoning and land management for the implementation of industrial and transportation development within the District areas.
- Carefully define the financial and investment powers of the Authority in relation to existing federal, state and local units of government.

Functions

- Transparency in decision making while maintaining confidential business information
- Establish a five-year business, land use and capital investment plan with bi-annual updates, which will serve as the Authority's input for the St. Louis Region's long range transportation plan and infrastructure programming.
- The Authority / District can be authorized to plan, build, own, operate, maintain and lease the appropriate modal freight transportation infrastructure and equipment within the District necessary to move freight in an effective manner across and through the District and St. Louis Region.
- The Authority / District may acquire, own, construct, lease, operate and maintain terminals, terminal facilities and port, railroad, roadway and airport related facilities, and to fix and collect just, reasonable, and nondiscriminatory charges for the use of such facilities. The charges, fees and payments so collected shall be used to defray the reasonable expenses of the Authority / District and to pay the principal of and interest on any revenue bonds and other financial instruments issued by the Authority / District.
- The Authority / District can be authorized and empowered to establish, organize, own, acquire, participate in, operate, sell and transfer Export Trading Companies, Foreign Trade Zones and other organizations to promote domestic and international trade, whether as shareholder, partner, or co-venturer, alone or in cooperation with federal, state or local governmental authorities, federal, state or national banking associations, or any other public or private corporation or person or persons.

Implementation would likely be a complicated process, given the large number of interested and committed stakeholders in the St. Louis Region. At the core of the process would be the ability to maintain an industrial focus with its essential metric of predictable freight movement velocity. At the same time, the impacts and benefits need to be assessed in light of the affected and participating stakeholders in the St. Louis Region. Past regional agreements and decisions would likely need to be modified or updated for the marketplace and infrastructure realities of today, as well as tomorrow's markets. Achieving a regional co-operation in freight transportation and industrial land use, maintaining competition without collateral damage, would enable to region to move to the deliberate decisions about its future.

Representative Efforts in Regional Freight Transportation Management

There are several examples of existing and emerging regional collaboration that may provide additional insights for the St. Louis Region as it moves from accidental to deliberate in shaping the balance of industrial land use and freight transportation. Each candidate example may have been undertaken due to factors wholly different from local conditions in St. Louis. The relevance lies in the details, past, present and future, for each of the examples.

State to state examples range from the Port Authority of New York New Jersey to efforts closer to the St. Louis Region with the Kansas City Transportation District and the Illinois-Missouri-Iowa Mid America Port District. Newer developments include the Northwest Infrastructure Exchange involving the states of California, Oregon and Washington, as well as the province of British Columbia. The Port Metro Vancouver – Vancouver Fraser Port Authority and the Louisville and Southern Indiana Bridges Authority are additional examples of multi-site, multi-state special transportation districts. The cities of Minneapolis, Denver and Milwaukee have undertaken the necessary area studies to

identify freight transportation needs in select districts, balancing impacts with conflicting and adjacent land use and activity patterns.

The specific structure of this Authority / District, as well as the alignment with existing jurisdictions, municipal, county and state governments, the private sector, industries and economic development functions, would need to evolve from discussions and deliberate choices. In addition, the St. Louis Region needs to seriously consider the adoption of a dedicated "sector champion" for the freight and logistics sector. The emergence of the plant and life sciences sector in St. Louis over the past 20 years is a clear example of the power of a dedicated public-private entity in accomplishing long term goals.

The state departments of transportation for Illinois and Missouri are each taking a more active role in lending their efforts in freight transportation, including infrastructure as well as operations. In this context, the current and evolving roles of East-West Gateway, the Bi-State Development Authority, port authorities in St. Louis (City and County), the Tri-City Port District, Port of Kaskaskia and the Southwest Regional Port District, and in Jefferson County need to be refined. Organizations such as the Port Working Group have the potential to play a role.

Success in freight transportation for the St. Louis Region is shaped in part by equal measures of land use and transportation infrastructure, enabling supply chains to work effectively for regional industries. The Regional Freight Study has examined a wide range of attributes for land use and transportation in this effort, and viewed Region's stakeholders in the broadest possible terms, including owners, operators, users, customers, tenants and an expansive list of adjacent and impacted parties. When taken together, the effort has the potential to weave a regional concept together into one fabric, recognizable from within, as well as from outside the St. Louis Region.

Other project outcomes should include:

- Achieve consistent federal jurisdiction across the Core Region
- Forge a more in-depth understanding with private sector manufacturers and distributors of what the St. Louis Region's priorities are
- Sustain City / County economic development alignment.

Recommendations – Rail

The analysis also demonstrates that the St. Louis Region needs to fashion constructive responses to address constraints to freight movement that are both physical and organizational in nature, particularly for rail movement. For example, interviews reinforced the difficulty faced by shippers who find that it can take more than one day for a rail car to move through the St. Louis Region. Local railroads such as the TRRA and the Alton & Southern figure prominently in these local moves. The study argues for an improved operational paradigm for rail in the St. Louis Region; the railroads themselves will need to shape a majority of this conversation, however.

For rail in particular, the study acknowledges current efforts by MoDOT to partner with the TRRA to use federal grant dollars to rebuild the western approach to the Merchants Bridge, and to fund a third mainline rack from Grand Avenue to Gratiot, near downtown St. Louis. These additions to rail capacity will eventually be important, as forecast growth in intermodal freight begins to push against regional freight rail infrastructure which, at least across Missouri, is limited by terrain, modest in scale,

and approaching capacity as a result. For Metro East, IDOT's plans for new or replacement railroad bridges associated with the implementation of High Speed Rail (HSR) become important as well. While IDOT is exploring several alternatives for passenger rail movement from Alton to downtown St. Louis, it should be emphasized that freight movement ultimately factors more importantly in the St. Louis Region's economic future. Outcomes include:

- Initiate regional rail network study with the Class I railroads and TRRA. The network study can better define the balance of operational improvements as well as system infrastructure requirements.
- Work with elected leaders toward a Regional goal of two modern rail bridges.
- Identify existing at-grade rail crossing conflicts and solutions, including separations and closures; Hall Street and IL Route 3 are of concern.
- Evaluate use of currently dormant rail assets that connect to key freight corridors
- Find capacity improvements in the regional rail system, with one focus on at-grade junctions between Class I mainlines, as well as yard approaches; there will be a need to evaluate future fly-overs which may be linked with HSR.
- Canadian Connection – Talk with CN regarding their access interests, as well as the CP in the future.
- MoDOT should continue to focus on capacity improvement goals for western rail approaches to the St. Louis Region, with a focus on triple track mainline from Grand to the MacArthur Bridge, as well as the likely need for BNSF to have a double track line under I-44.

Recommendations – Trucking

The analysis reinforces the reality that the St. Louis Region will continue to deal with many and varied truck movements, including thru-traffic and intermodal (less heavy / more value added), as well as activity associated with barge loading (heavier / less value added). As such, improved monitoring of truck counts particularly on local arterials and around local intermodal yards will be important locations such as Arsenal and I-44 are viewed with concern, with traffic count data showing about 1,000 trucks per day using these off-ramps to access local arterial streets. More broadly, and in context with federal regulation about to shift the playing field for trucking (hours of service), equally important questions of how trucks move through the St. Louis Region, where they are allowed to stop, rest, and fuel, are important as well. For thru-traffic, which relies on I-270 to access Chicago and points east on I-70, the evolving need to add capacity to the I-270 New Chain of Rocks Bridge need to stay in focus. Possible outcomes include:

- Industry preparations for opening of the new Mississippi River Bridge;
- Consideration of a truck focused interstate way-finding system, which provides specific guidance to thru-trucks regarding real time bridge congestion;
- Develop an outreach program with the trucking industry;
- Develop strategies to stay ahead of demands for looming improvements to truck-heavy intersections, possibly including IL Rt. 111 and I-270 as well as Arsenal and I-44 in MO;

- Improved monitoring of truck traffic levels on key arterials and near intermodal yards;
- Implement studies to widen the I-270 New Chain of Rocks Bridge to three lanes;

Both public and private sector organizations are evaluating the role of natural gas (CNG / LNG) as a truck fleet fuel. While the St. Louis Region already offers affordable diesel fuel prices, consideration should be given to a regional natural gas fueling strategy, aligned with local municipal fleet plans.

Recommendations – Water

Core strategies for water build first from the benefit of the St. Louis Region having a clear price advantages as an initial point for Southern barge traffic compared to other port cities. Strategies also need to contend with the reality that, between 1996 and 2010, the tonnage of freight moving through Greater St. Louis Port District did not appreciably change. For 2011, the analysis noted significant growth in tonnage; sustaining this growth will require active efforts. Outcomes could include:

- Work with the private sector to move toward a smaller number of high capacity transload terminals, with unit train capacity.
- For older riverfront sites, emphasize strategies to assemble / reuse sites for higher value manufacturing activities, as opposed to lower value outdoor storage and transloading uses.
- Leverage MARAD maritime corridor plans with local strategies where markets and infrastructure implementation are feasible.
- Partner with other river cities to explore container on barge (COB) opportunities.

Recommendations – Air

The St. Louis Region has engaged in a fractured conversation about air cargo for several years, in part linked with the reality of two international-ready airports Lambert (MO) and Mid-America (IL) that were expanded and / or built with the best of intentions, but now face relevant financial constraints. At the broadest level, the strategy of aligning these assets with Regional leadership in exports makes eminent sense, particularly with the analysis pointing to apparent local demand for air cargo service.

For Lambert, while the St. Louis Region continues to lament the loss of hub status, the reality is that Lambert today is serving as many or more passengers as its Midwestern peers. The hopeful arrival of international service within the next two years would be a step in the gradual rebuilding of cargo activity, whether or not incentives for freight forwarders are brought to bear. For MidAmerica, the highly entrepreneurial strategy of deliberately creating supply chain links between suppliers in China and South America should yield fruit, but it will take time.

As such, the bottom line for both airports is the simple expectation of incremental progress. Moreover, the analysis points to the clear need to shift the focus of Regional dialogue away from air freight, to focus on other aspects of the freight system, elements which in the long run will have a far bigger impact on the St. Louis Region's future rate of growth. As a long-term goal, the St. Louis Region will need to work toward a future state where the two airports are presented as one integrated logistics hub with complementary logistics characteristics within the St. Louis Region's transportation network.

Recommendations – Land Use and Economic Development

Local regulatory impacts, particularly related to industrial land use are critical. The analysis speaks to the key challenge of working with local units of government to evaluate truck corridors, as well as to sustain and protect industrial land use. Ultimately, the local goal should be to identify and invest in locations where multimodal connections can be improved, with the clear intent to be deliberate rather than accidental, aligning capacity, access and industrial land use. Particularly for communities that support rail infrastructure, emergence (and economic necessity) for longer and more frequent freight trains points to the need to fund additional grade separations. Older industrial areas such as Hall Street and Rt. 3 will need to be areas of focus. For legacy brownfield sites, the St. Louis Region needs a strategy for assembly and repurposing, aligned with Regional transportation funding. For greenfield sites, it will be critical to prioritize locations that maximize rail, truck, and barge connections. As the St. Louis Region evaluates recommendations contained within this document, consideration should be given to a number of near term recommendations, including a defacto regional GIS system, with updated rail network information.

Financial Considerations

One crucial asset that the “public sector” has is an ability to fund and support infrastructure investment. Nationally, the conversation for transportation financing continues to focus on public private partnerships and infrastructure banks. As well, larger regions have come together to better structure local debate about infrastructure projects that have multi-state ramifications; for example, the West Coast Infrastructure Exchange, formed in 2012, is an example. For Missouri, current legislative debate about a transportation sales tax is a step in the right direction, given the array of Regional freight movement needs that are becoming apparent. As well, further analysis of state-level diesel fuel taxes should be undertaken to ensure that rates are competitively benchmarked against other states along the I-70 corridor.