

## **Research Problem Statements, Committee on Intermodal Freight Transport (AT045)**

In May 2001, Tina Casgar, Chair of TRB's Section A1B00 on Multimodal Freight Transportation, proposed that 12 committees and task forces comprising Section A1B00 develop research problem statements for a Cooperative Freight Research Program. Below are the problem statements that were developed for the Intermodal Freight Transport Committee. The full list for all TRB freight committees and task forces can be reviewed in TRB [Electronic Circular E-C048](#), "Freight Transportation Research Needs Statements."

Please note that Problem Statement #6 below, "Policy, Planning, and Programming for Goods Movement and Freight in Small and Mid-Sized Metropolitan Areas," is underway as "Guidebook for Policy, Planning, and Programming in Small- and Medium-sized Metropolitan Areas, NCHRP Project 8-47. For more information, see: <http://www4.trb.org/trb/crp.nsf/All+Projects/NCHRP+8-47>.

Additionally, Problem Statement #7 below, "National Intermodal Connectors Conference," was undertaken as "Workshop in Issues in Intermodal Connectors," Task 30 for NCHRP Project 8-36, "Research for the AASHTO Standing Committee on Planning." The final report for this task is available at: [http://freight.transportation.org/doc/8-36\(30\)connectors.pdf](http://freight.transportation.org/doc/8-36(30)connectors.pdf).

### **#1 Title: Cross-Border Rail Freight Transportation: Barriers and Incentives**

#### **Problem**

The challenges associated with the movement of goods by truck between the NAFTA partner countries have been well documented. Traffic at land border crossings is particularly heavy along the border between Texas and Mexico. Concerns over the safety fitness of trucks and drivers south of the border, along with international security issues suggest that barriers to fully open international borders will exist for the foreseeable future.

One possible alternative to truck traffic and relief of border congestion problems is the expanded use of rail (1 rail car corresponds to 3.5 semi trailers). Potential barriers to and incentives for use of rail for cross-border freight movement may be affected by economic, operational, and political factors. The use of a rail link between truck-based segments of international freight moves between the U.S. and Mexico has the potential to reduce congestion, and thereby delays and poor air quality, at border points, and alleviate the safety concerns associated with the operation of non-U.S. commercial vehicles within the country.

Previous TRB research has categorized economic and operational factors affecting transportation modal decision-making into four groups: commodity characteristics, transport system characteristics, shipper issues, and market factors. Examples of economic and operational factors include commodity type, technology investments, vehicle allocation and availability and market stability and consistency. Political and policy issues such as public infrastructure investment or customs and immigration operations also impact the efficiency and attractiveness of not only rail operations but also other transport modes.

A modest amount of research into trans-border rail freight was conducted in the early-to-mid 1990's. Much of this research focused on traffic levels across the border. The fact that the majority of US-Mexico rail freight movement occurs on the Texas-Mexico border is well documented. Since that time, railroads in the United States have undergone consolidation, Mexican railroads have been privatized, and administrations of both governments have changed. With impending reauthorization of federal transportation programs, a comprehensive examination of barriers to and incentives for cross-border rail freight transportation is key to effective policy development.

## **Objective**

The objectives of this project are to provide a comprehensive and detailed examination of the barriers to and incentives for use of rail for cross-border freight movement, and to develop recommendations regarding use of cross-border rail freight transportation. Examples of rail issues to be considered include market potential, trackage ownership and rights, physical and information infrastructure adequacy and needs, modal safety and security issues, public/private partnerships, or any other issues that might be pertinent to cross-border rail freight movement barriers and incentives. In addition to specifically addressing freight movement by rail, modal transfer (particular for truck-rail movements) issues should be considered, for example whether existing truck-rail transfer facilities on both sides of the border are sufficient to handle increased traffic levels, optimal location of additional facilities that might be needed, facility financing and ownership, and operating rights.

## **Key Words**

Intermodal, Mode-Shift, Safety, Trade, NAFTA, Corridors and Routes, Freight Service.

## **Related Work**

Following are examples of most recent trade journal and research literature on U.S.-Mexico cross-border freight rail transportation:

- a) Roop, S.S., J.E. Warner, F. Zambrano, R. Ismailova and D.H. Kang, The Impact of Mexican Rail Privatization on the Texas Transportation System, Report 2128-2, Texas Transportation Institute, Texas A&M University, February 2001. Provides information on current and future infrastructure and operational plans conducted by the U.S. and Mexican railroad private sectors and their impact on Texas highway infrastructure needs.
- b) Kaufman, L.H., "Mexico: Land of Opportunity," Railway Age, February 2001. Examines economic advantages generated by U.S.-Mexico rail traffic.
- c) Weissman, A.J. and R. Harrison, "On The Origins, Destinations, and Gateways of U.S.-Mexico Overland Commerce" Proceedings of Transportation Research Forum 38<sup>th</sup> Annual Meeting, October 1996. Paper discusses trade flows, with emphasis on origin/destination and highway/rail mode shares, and makes recommendations for further research on U.S.-Mexico trade policy issues.
- d) Roop, S.S., R.W. Dickinson, F. Saad, R. T. Bartoskewitz, Intermodal Freight Movement in South Texas: Transportation Challenges and Emerging Research Needs, Texas Transportation Institute, Texas A&M University, March 1996. Documents changes that need to occur in the transportation landscape to facilitate intermodal transport and identifies research challenges to be faced for the future of increased intermodal traffic, including an examination of institutional impediments at federal, state and local levels.
- e) Weissman, A.J., Texas-Mexico Multimodal Transportation and Socioeconomic Indicators, Center For Transportation Research, University of Texas at Austin, February 1996. Includes Texas-Mexico multimodal traffic data and socioeconomic indicators, and discusses data collection procedures sources, and practical applications.

## **Urgency/Priority**

Significant continued growth of U.S.-Mexico trade traffic is anticipated in the future. Given congestion of major highway corridors that have the predominant role in cross-border freight transport, the potential rail-freight to play a role in this arena will likely become increasingly important. With impending reauthorization of federal transportation programs, a comprehensive examination of barriers to and incentives for cross-border rail freight transportation is key to effective policy development.

## **Cost**

\$250,000-\$300,000

## **User Community**

The user community would include a broad range of public and private transportation system users and policy makers at the local, state, regional, and federal levels. Examples of these users include railroads, local planning groups, state transportation departments, the U.S. Department of Transportation (Federal Highway Administration and Federal Railroad Administration), U.S. Department of Treasury (Customs) and state and federal legislators.

**Implementation**

The recommendations regarding use of rail for trans-border freight transportation, along with the identified barriers and incentives might be used in several areas, such as development of legislation, policy, financing mechanisms, public/private partnerships, or international agreements.

**Effectiveness**

Implementation of study recommendations, particularly when integrated with federal and state transportation programs, might have a range of societal implications, including expenditure of public transportation funds, roadway congestion, safety, or air quality. Effectiveness could be measured in several ways following implementation, such as comparison of modal traffic levels of themselves or relative to funding efforts, congestion indices on major corridors, or changes in air quality indices around transportation corridors.

## **#2 Title: Evaluating the Effectiveness of Multi-state and Multi-regional Freight Planning**

### **Problem**

Intermodal freight shipments, particularly international shipments, commonly cross more than one state line while moving from shipper to receiver. Individual states are facing increasingly complex planning and investment decisions for freight and freight capacity, as freight improvement projects must compete side-by-side with other proposed transportation improvements for scarce federal, state, and local funding. As intermodal freight movements become increasingly regional, national, and global in scope, there is a need for multi-state and multi-regional planning coordination in order to achieve necessary synergies.

The most difficult freight planning projects to program and fund are the often ones which accommodate freight which merely passes through the state. In Chicago, for example, freight comes from many domestic and international origins where it is transferred from a train and trucked to a neighboring state for final delivery. A similar process can be seen in the Northeast, where freight arriving at the Port of New York/New Jersey intermodal terminals might pass through several New England states before it arrives at its final destination. Because such through movements provide little added value to the states through which they pass, transportation decision-makers in those areas are often reluctant to fund projects that improve such movements.

ISTEA, TEA-21, and the National Highway Designation Act of 1995 provided positive first-steps in recognizing the importance of regional freight corridors through the designation of 43 essential corridors, which span 163,000 miles. In response to this legislation, regional coalitions such as the I-95 Corridor Coalition, the Latin American Trade and Transportation Study, and the CANAMEX Corridor are playing an important role in identifying projects of regional significance. Despite increased policy and planning activity, state and regions often do not collaborate effectively and lack methods to fund and implement regional priorities. Moreover, improvements that are implemented sometimes stop at state lines due to regional and state differences in funding priorities and other considerations. Without the authority to propose, plan, fund, and implement freight improvement projects at multi-state and multi-regional level, investment synergies may never be realized.

### **Objective**

The objective of this research is to a) evaluate the current state of multi-state and multi-regional freight planning, how the process is evolving, what works, what doesn't, and b) provide examples of success and failure. The benefit of this investigation is to provide states with "best practice" tools to launch collaborative freight management programs, corridor planning groups, and regional councils to help address the issues of interstate freight movements, including movements through intermodal terminals. Case studies will be used to illustrate examples of an evolving process.

### **Key Words**

Freight, intermodal, multi-state, multi-regional, corridor, planning

### **Related Work**

Armstrong, C.S., "MPO-State-Local Government Partnership Results in a Statewide Plan that Works." In the Spotlight: MPO Best Practices, Association of Metropolitan Planning Organizations (1995).

Bragdon, C.R., "Intermodal Transportation Planning for the 21st Century. A New Paradigm: An Urgent Call for Action." TRB 74th Annual Meeting, Jan. 27, 1995, Washington, D.C.

Brich, S.C. and Hoel, L.A., "Multimodal Transportation Planning in Virginia: Past Practices and New Opportunities," Technical Assistance Report, Virginia Transportation Research Council in cooperation with the U.S. Department of Transportation (September 1994).

Capelle, R.B. Jr., Planning and Managing Intermodal Transportation Systems: A Guide to ISTEA Requirements. U.S. Department of Transportation Publication No. DOT-T-95-03

Dittmar, H. and Bender, C., "Transportation Partnerships." TR News, Number 175, (Nov.-Dec., 1994), pp. 2-5.

### **Urgency/Priority**

TEA 21 and other federal legislation recognize the importance of multi-state corridor planning. The proposed research would identify successes and challenges and provide useful input to future federal and state policy and funding legislation.

### **Cost**

\$250,000

### **User Community**

AASHTO, APTA, FHWA, NHTSA, AAR, IANA

### **Implementation**

This work would contribute to groups working to secure funding for projects of regional and national significance. Heavily traveled corridors could be planned and engineered to withstand heavier shipments. Corridors could be designed and designated to handle long combination vehicles and tri-axle trailers.

### **Effectiveness**

Society would benefit by a more coordinated approach to freight planning, congestion could be reduced, and interstate freight corridors could potentially be separated from local traffic, improving community lifestyles. Measures of success would include reduced congestion and air quality improvements. Freight capacity investments would be more effective.

## **#3 Title: Shared Intermodal Terminals**

### **Problem**

The Chicago Area Transportation Study (CATS - MPO for the Chicago area) has identified 28 intermodal terminals in the greater Chicago region. These terminals are operated by various national, regional and beltway railroads, and often generate significant amounts of drayage (truck) movements to and from local container depots and truck terminals in the area. The activities of the various container depots, truck terminals, and intermodal facilities in the region are often fragmented, resulting in unnecessary congestion, shipment inefficiency, and increased transportation costs to shippers and carriers.

International intermodal shipments are often more coordinated than domestic intermodal shipments. Since steamship carriers often operate proprietary facilities, they are able to more easily obtain a chassis, dispatch a relay to the port to pick up the box, deliver the goods to a railroad terminal or a customer, and repeat the process until the box and the chassis are separated again and the empty chassis is returned to the terminal. A typical domestic intermodal movement is more fragmented. In the domestic freight scenario, an inbound load might come in loaded in a green box and the outbound shipment may need to be loaded in a yellow box. The boxes are nearly identical except for the color and the leaseholder of the equipment. This means the green box must return empty to the rail terminal and a yellow box must be positioned in its place. Each box goes to and from a different terminal and further inefficiencies result. These additional drayage movements often result in additional traffic on local roadways, and decrease the number of "turns" a drayage operator can perform in a day, increasing transportation costs. The efficiency of domestic intermodal movements, particularly to and from major metropolitan areas such as Chicago, may be improved if intermodal activity could be concentrated at a single location. In addition, co-location offers an opportunity to provide value-added services to the various facility users.

In Detroit, shippers and developers joined together with state and city officials to plan for a common user facility. This planned facility will centralize the domestic and international activity in a concentrated area. Interstate freeway interchanges will be within blocks of the facility. Depots for containers and chassis will be located next to each other, eliminating intercity repositioning moves.

## **Objective**

The project should explore examples of metropolitan areas, such as Detroit, that have made attempts to centralize local intermodal shipments through the construction of shared intermodal facilities or other such mechanisms. Case studies should be used to identify both successful and unsuccessful strategies and develop a set of lessons learned for other states and metropolitan planning organizations (MPOs). A holistic survey should be completed looking at the issues and needs of carriers, customers, suppliers, and transportation planners. A secondary objective should include a study of three different metropolitan areas, mapping all current movements and then modeling the same traffic managed through a common user facility. To the extent possible, the study should attempt to quantify the potential benefits to shippers, carriers, and government agencies.

The benefit of this project is to compile the lessons learned from the steamship companies' depot operations and apply them to the railroad terminal ownership and planning, thereby providing planners with a toolkit for developing public-private dialogue about shared-use facilities. The results of the three case studies should be useful for land use justification of terminals and joint ventures.

## **Key Words**

Intermodal, railroad, common use, shared use, public private partnership.

## **Related Work**

Neomodal facility in Ohio; MIRTS project in Minnesota; Detroit Intermodal project; Port of Jacksonville and Port Authority of NY/NJ work on drayage triangulation using shared facilities and information; FHWA Chicago area study; Freight movement studies in Tampa and Orlando, FL; Examples in the maritime industry.

## **Urgency/Priority**

As congestion builds, more motorists are looking at freight and insisting on new freight management programs. Metropolitan areas are also struggling with the traffic, air quality and economic development impacts of freight terminals located in urban areas. Freight is going to receive a higher priority in the future; this baseline approach should be helpful for other metropolitan areas considering industrial development and public-private partnerships for freight terminals and ports.

## **Cost**

\$300,000

## **User Community**

AASHTO, APTA, FHWA, NHTSA, IANA, AAR, TRB.

## **Implementation**

The quantitative results of the modeling effort should be helpful in bringing carriers and planners to the table to discuss the efficiencies, which could be possible in a shared-use environment. Identification of carriers, customers, suppliers and planners objections should be helpful in developing strategies necessary to meet and eliminate user concerns.

## **Effectiveness**

Better land use by concentrating fragmented terminals, improved terminal efficiency, less congestion and noise, lower crime, better security, increased truck productivity and fewer intercity trips to position equipment. Measurements of effectiveness would include improved air quality, fewer bright lights, lower intermodal costs.

## **#4 Title: Public Benefits of Intermodal Freight Transportation Improvements**

### **Problem**

Intermodal projects that specifically address freight movement are often not given due consideration by states and metropolitan planning organizations (MPOs) for several reasons. First, these organizations have traditionally focused on planning and completing highway improvements, and have only recently begun to consider intermodal freight projects during their transportation planning processes. Second, the fixed jurisdictional boundaries of states and MPOs make it difficult to consider freight movements, which are increasingly regional, national, and global, rather than local. Finally, many states and MPOs have trouble quantifying the benefits of dedicated freight corridors or other freight-specific improvement projects. As a result, these benefits may be underestimated, making it more difficult for states and MPOs to program projects that specifically benefit freight movements.

There is a need to reexamine the methodology for identifying and computing the benefits offered by freight-specific improvement projects. By better understanding and quantifying the potential benefits of intermodal freight projects, transportation planners, decision-makers, and the general public may be more willing to invest in projects that specifically benefit freight movements.

### **Objective**

To quantify the real and/or potential benefits to the public of representative intermodal freight transportation improvement investments, including:

- reduction in congestion and pollution caused by trucks;
- enhanced mobility and safety for people and goods; and
- increased attraction of business investment and tax revenue.

### **Key Words**

Intermodal, freight, planning, public sector, benefits, investment

### **Related Work**

Washington State's Freight Mobility Strategic Investment Board (FMSIB) is an independent state agency that recommends freight improvement projects to the Washington State Legislature for funding. In the late 1990s, the FMSIB developed a set of 10 criteria to measure the potential benefits of proposed freight improvement projects. These criteria are used to evaluate potential projects and rank them in priority order. The FHWA conducted an intermodal connectors study, and has been developing a freight analysis framework to examine demand and capacity with regard to movement of intermodal freight. NCHRP project on Financing and Improving Land Access to US Cargo Hubs. EPA work on the environmental impacts of intermodal freight transportation.

### **Urgency/Priority**

For many years the focus of transportation planning in the public sector has been on planning and completing highway improvements. These improvements have allowed commuters and shippers unprecedented mobility. However, the realization is now dawning that there is a limit to how many roads can be built. ISTEA and TEA-21 helped focus attention away from capacity improvements and toward the efficient movement of people and goods. One possible solution that may improve the movement of both passenger and freight is to completely separate goods shipment from passenger movement by planning, approving, funding, and constructing freight-specific projects.

The Alameda Corridor from the Ports of Los Angeles and Long Beach to intermodal rail yards located in downtown Los Angeles is an example of such a freight-specific project. Upon completion, the Alameda Corridor may help remove trucks from local roadways, reducing congestion and pollution. Safety and mobility could be enhanced as local roads may become less congested. Further enhancing safety along the corridor is the fact that many at-grade rail crossings will be eliminated. Shippers may be able to move their products more rapidly, improving their profit margins. These and other benefits of non-highway transportation solutions need to be evaluated and quantified during the public sector planning process so

that freight-specific projects can compete more equally with traditional highway projects and other transportation improvements.

**Cost**

\$250,000 – 350,000

**User Community**

NCHRP

**Implementation**

Planners would use the findings in making the case for funding freight improvements.

**Effectiveness**

This research would allow a better evaluation of the balance between passenger and freight-specific needs and would allow innovative intermodal projects to be considered for funding.

**#5 Title: Increasing Capacity in Rail Corridors****Problem**

Railroad transportation has not historically been part of the transportation planning process. There are two reasons for this. First, railroad corridors are generally owned by private corporations, and serve exclusively as routes for trains run by those private corporations. Second, transportation-planning organizations have not often paid much attention to goods movement. Only since the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1992 has the government required that Metropolitan Planning Organizations (MPOs) explicitly consider freight as well as passenger traffic in the planning process. If freight is included, railroads (as movers of large quantities of freight) must be included as well.

Railroads can, of course, carry passengers as well as freight. Passenger trains are operated exclusively by public agencies (Amtrak and commuter railroads). Passenger and freight trains can, and often do, share facilities. However, the differing objectives of the public and private sectors can produce conflicts. At the same time, the freight railroad industry is entering an era of new constraints on its financial performance. The US rail network has places and routes with too little rail capacity and other places and routes with too much rail capacity. As the demand for both freight and passenger transportation grows, and the available land and funding resources dwindle, policy makers and carriers are facing changing roles and relationships. There is a need to maximize the use of all existing transportation facilities, even those now privately owned.

In the past, railroad capital spending plans had to stand alone as pure private investments. Today there are a few examples of public/private partnerships, but there is a need for more. After a generation of shedding excess capacity, railroads now find themselves capital-constrained, but without the financial resources to add capacity. At the same time, public agencies face the same situation: highways are over capacity, and financial resources are limited. It may be less expensive (as well as less environmentally disruptive) to add rail capacity than highway capacity for both freight and passenger transportation. However, this will require a change in the way things are done. Shared or open access often creates a polarized debate. Carriers fear losing control of their property, while gaining unwelcome competition for freight traffic. Shippers lobby heavily for open access. Public agencies seek to use freight rights-of-way for commuter or high-speed passenger trains.

The US needs to analyze the benefits and liabilities of a more “open” to “multiple train types” rail network. There is a need to understand why rail capacity is different than other forms of freight capacity and how available capacity can be measured. The US needs to understand the direct and variable costs of train capacity so that users and owners of a shared rail facility are appropriately charged and compensated for usage.

## **Objective**

The primary objective of this project is to quantify the costs and benefits of an open access system that treats railroad rights of way more like public highways. To do this, it will be necessary to:

- Develop methods for determining the current capacity of the rail network and identifying locations where capacity constraints exist
- Quantify the cost of adding capacity
- Develop a transparent charging mechanism so that both owners and users of rail facilities (public and private) are properly charged and properly compensated.
- Quantify the costs and benefits to the U.S. economy at large from the implementation of an open/competitive access policy on the U.S. rail network

## **Key Words**

Intermodal, railroad, railways as highways, public private partnerships, cost analysis, rail freight capacity; railway train capacity, open access, competitive access.

## **Related Work**

I-95 corridor between New York and the Carolinas involving CSX, NS, Amtrak, and the States of Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Virginia, and North Carolina.

A1B10: Committee on Local and Regional Rail Freight Transport

Chairman: Mark S. Bennett, CSX Transportation, Inc.

Local and Regional Rail Freight Transport

DAVID B. CLARKE, Clemson University

Bell, D., "Multimodal Terminals—An Approach to Modal Cooperation." ITE Journal, (October 1984), PP. 27-28.

## **Urgency/Priority**

In the current environment with private ownership of most rail right-of-way, public investment in rail freight projects is difficult to justify. Yet, highway congestion is mounting. As the global economy grows, capacity demand to move both people and freight is ever increasing. Could shared or open access projects along railways allow the US to improve land utilization and better leverage our existing rail networks?

## **Cost**

This project should be approximately in the \$250,000 to \$400,000 range

## **User Community**

AAR, AASHTO, APTA, FHWA, NHTSA, I-95 collations, MPO's, and individual Railroad Companies

## **Implementation**

The results of this study would help freight planners (logisticians), commuter planners, high-speed passenger train authorities, and railroad freight carriers define key elements for structuring public private partnerships. Cost sharing strategies would be developed to illustrate examples of how both freight and passenger transportation would benefit from new capacity created though a shared access environment.

## **Effectiveness**

Societal impacts might include reduced highway congestion, streamlined freight networks, more competitive rail freight service, and increased passenger movement by rail. Reduced rail infrastructure costs might result in economic decisions to shift modes, and therefore a more efficient transportation network.

## **#6 Title: Policy, Planning, and Programming for Goods Movement and Freight in Small and Mid-Sized Metropolitan Areas \***

### **Problem**

The Intermodal Surface Transportation Efficiency Act (ISTEA) and the Transportation Equity Act for the 21<sup>st</sup> Century (TEA 21) emphasized the need for state and metropolitan multimodal and intermodal transportation policy, planning, and programming activities, including those for goods movement. During the 1990s, a number of large Metropolitan Planning Organizations (MPOs) developed new, or strengthened existing, goods movement and freight programs. Despite federal requirements and guidelines, concerns remain about the effectiveness of MPO planning efforts for freight, as illustrated in a recent Traffic World article (January 22, 2001) on “Call Your MPO.”

Results of goods movement and freight programs in some of the nation’s large metropolitan areas have been presented at meetings and in publications of federal agencies, the Transportation Research Board, and other organizations. Information is sketchy, however, about goods movement and freight policy, planning, and programming activities in small (less than 500,000 population) and mid-sized (500,000-1 million population) metropolitan areas.

This research would systematically collect information about goods movement and freight programs for small and mid-sized MPOs. The scope would include goods movement on intermodal connector roads and through intermodal facilities and terminals. The research is needed to help identify and evaluate how MPOs are implementing federal provisions for goods movement and freight policy, planning, and programming. Research results could suggest better ways to accomplish goods movement and freight objectives in small and mid-sized MPOs.

### **Objective**

To collect, evaluate, and summarize information about goods movement and freight policy, planning, and programming activities in small and mid-sized metropolitan areas, and to develop a “best-practices” manual.

### **Key Words**

Intermodal, legislation, best practices, legislation, Unified Planning Work Programs.

### **Related Work**

Several recently published documents describe goods movement or freight programs in large metropolitan areas. Examples include the following respectively for a) Baltimore, b) Chicago, c) the Puget Sound (Washington) area, and d) Toronto:

- a) Plumeau, Peter and Jocelyn Jones, “Incorporating Freight Issues into Baltimore’s Regional Transportation Planning Agenda: Progress to Date and Lessons Learned,” Transportation Research Record, Number 1613 (1998): 20-26.
- b) Zavertero, David, F. Gerald Rawling, and Daniel Rice, “Mainstreaming Intermodal Freight into the Metropolitan Transportation Planning Process,” Transportation Research Record, Number 1613 (1998): 1-11.
- c) Transmanagement, Inc., Matthew Coogan, and Michael Meyer, “Case Study C: Freight Planning in the Puget Sound,” in Innovative Practices for Multimodal Transportation Planning for Freight and Passengers, National Cooperative Highway Research Program Report 404, Washington, D.C., National Academy Press, 1998, pp. 26-28.
- d) Gorys, Julius, and Imants Hausmanis, “A Strategic Overview of Goods Movement in the Greater Toronto Area,” Transportation Quarterly, 53, No. 9 (Spring 1999): 101-114.

With a few exceptions such as the following for Albany, New York, relatively little documentation has occurred for goods movement and freight programs in small and mid-sized metropolitan areas:

---

\* also supported by A1B07

Poorman, John, and Kristina Younger, "Integrating Freight Concerns into Metropolitan Planning Processes at Medium-Sized MPO," in National Conference on Intermodalism: Making the Case, Making It Happen, Conference Proceedings 11, Washington, D.C., National Academy Press, 1996.

### **Urgency/Priority**

The proposed work would help federal, state, and metropolitan policy makers better understand how small and mid-sized MPOs are implementing goods movement and freight provisions of TEA 21, other federal initiatives, and state and regional planning and programming requirements and guidelines. The work is especially relevant given upcoming efforts to shape legislation to reauthorize federal transportation funding programs. Understanding how small and mid-sized MPOs are currently addressing goods movement and freight considerations would help policy makers improve the process and results.

### **Cost**

\$250,000

### **User Community**

The primary user community would be small and mid-sized metropolitan planning organizations. Other users would include the Federal Highway Administration, state transportation agencies, local jurisdictions, legislators, and contractors.

### **Implementation**

This research would be implemented through a survey of small and mid-sized MPOs to identify which have established ongoing goods movement or freight programs. If feasible, recent Unified Planning Work Programs (UPWPs) in small and mid-sized MPOs would be reviewed to identify specific freight-related (including intermodal) policy, planning, and programming activities. The end product would be a document

- a) summarizing results of MPO surveys and UPWP reviews,
- b) evaluating how small and mid-sized MPOs are conducting goods movement or freight policy, planning, and programming according to TEA 21 and other federal requirements and guidelines,
- c) recommending ways, including federal incentives and programs, to improve goods movement of freight policy, planning, and programming activities in small and mid-sized MPOs, and
- d) reporting best practices and/or other procedures that small and mid-sized MPOs could use to bolster their freight programs.

### **Effectiveness**

This research would, for the first time, provide comprehensive information on the extent to which small and mid-sized MPOs are incorporating goods movement and freight considerations into overall multimodal policy, planning, and programming activities. Federal and state policy makers could use this information to develop outreach, training, funding, and other programs to help small and mid-sized MPOs more effectively incorporate goods movement and freight considerations into planning and programming activities and meet the intent of TEA 21 and other federal transportation requirements and initiatives. Effectiveness could in part be measured by comparing and evaluating goods movement and freight activities documented in Unified Planning Work Programs before and after outreach, training, funding, and other efforts that would be implemented following the completion of this research.

## **#7 Title: National Intermodal Connectors Conference**

### **Problem Statement**

The purpose of this conference would be for transportation practitioners to share knowledge, experiences, challenges, and opportunities pertaining to financing and making improvements to intermodal connectors, including those on the National Highway System.

### **Research Objective**

The National Highway System Designation Act of 1995 required the U.S. Secretary of Transportation to submit to Congress proposed intermodal connector routes as modifications in the National Highway System (NHS). The Federal Highway Administration worked with state transportation agencies,

Metropolitan Planning Organizations (MPOs), and other groups to identify connectors to major intermodal facilities per FHWA guidelines.

The Transportation Equity Act for the 21<sup>st</sup> Century required the U.S. Secretary of Transportation to submit an Intermodal Freight Connectors Study to Congress within two years after passage of the Act. The study was to 1) review improvements made to NHS connectors since designation of the National Highway System, and 2) identify impediments to improving NHS connectors serving intermodal facilities.

In December 2000, the Secretary of Transportation sent the NHS Intermodal Freight Connectors report to Congress. Among the report's conclusions were:

- a) intermodal connectors that primarily serve freight terminals have significant mileage with pavement deficiencies and generally exhibit inferior physical and operational performance than other similar NHS facilities,
- b) an analysis of investment practices shows a general lack of awareness and coordination for freight improvements within the MPO planning and programming process; and
- c) given the pressing needs for passenger-related related projects, there is little incentive for investing in freight projects that appear to primarily benefit only a small freight constituency.

The proposed conference would bring together intermodal connector professionals from federal and state agencies, MPOs, the private sector, and other organizations from across the U.S. Conference speakers and participants would provide information about past and anticipated actions to improve intermodal connectors in their jurisdictions.

The conference would include information about investment strategies and would build upon National Cooperative Highway Research Program project 08-39: "Financing and Improving Land Access to U.S. Cargo Hubs." Results of the conference could serve as useful input for drafters of transportation funding legislation.

### **Cost**

\$50,000

### **Time Required**

The conference would be two or three days in length. Planning for the conference would require up to one year.

## **#8 Title: Underground Freight Transport by Pipeline: Planning and Design Issues**

### **Problem**

Recent advancement in pipeline technology has made it possible to transport freight (solids in bulk, packaged and pallet forms) by large diameter underground pipelines over long distances. The pertinent technology is pneumatic capsule pipeline (PCP) which uses wheeled vehicles (capsules) rolling through pipe propelled by the air in the pipe. Japan has already used this new technology quite successfully for transporting minerals in a 1-m diameter circular pipeline. Japan also developed and used successfully a PCP system of rectangular cross section for moving materials during the construction of a long tunnel for bullet trains.

The PCP technology is applicable to pipelines of any size, cross-sectional geometry, and length. It can be used for future intercity and interstate freight transport, especially along major corridors having high freight volumes. Use of such a new technology has far-reaching implications to the nation, as it can significantly reduce the number of trucks on highways and streets, thereby alleviating the safety and environmental problems caused by the overuse of trucks. Furthermore, PCP technology can enhance transportation security because it is far more difficult for terrorists to attack an underground freight pipeline and do severe damage to it than damaging above-ground structures, or to hijack a pipeline for use as a weapon.

However, before the PCP technology can be used successfully for such large-scale operation, research is needed to address all the major issues associated with the planning and design of such pipelines, such as whether circular or rectangular pipe should be used, whether PCP can use part of the right-of-way of existing highways and railroads, especially abandoned railroads, how to cross existing roadways from underneath, how to construct such pipelines along highway easement without interrupting traffic on the highway, how to plan and design the terminals of such pipelines so that trucks can easily pick up the freight from the pipeline for short-distance door-to-door delivery, and how to bring cargoes back to the pipeline terminals for long-distance shipment. Other intermodal transfer facilities also need to be considered.

### **Objective**

The research should address all the pertinent issues that may be encountered in the future planning and design of PCPs for intercity and interstate freight transport in the United States. Conclusions should be well supported by scientific evidence, technical data, and sound logic. The results could be valuable to planners and designers of future freight transport systems and related transportation infrastructures.

### **Key Words**

freight, freight pipeline, intermodal freight transport, pipeline, PCP, pneumatic capsule pipeline, underground freight transport

### **Related Work**

In 1976, the U.S. Department of Transportation sponsored a comprehensive study of freight pipeline at the University of Pennsylvania, with Professor Iraj Zandi as the Principal Investigator. That study produced a 5-volume comprehensive report on various aspects of freight pipelines including history, technology development, economics, environment and social impacts, and the planning of a 6-ft diameter PCP from Philadelphia to Chicago. It was concluded that it is technically and economically feasible to use PCP for interstate freight transport, the environmental and social impacts of PCP will be highly positive, and that a 6-ft diameter PCP can transport 70 percent of the freight normally transported by truck. Although to date this remains to be the most comprehensive and authoritative study of freight pipelines, it is outdated by technology change since 1975.

In 1991, the U.S. Congress passed the Intermodal Surface Transportation Efficiency Act (ISTEA). Section 6020 of the act is entitled "Underground Pipelines." It states: *"The Secretary of the Department of Transportation shall conduct a study to evaluate the feasibility, costs, and benefits of constructing and operating pneumatic capsule pipelines for underground movement of commodities other than hazardous liquids and gas."*

As a response to Section 6020, the Volpe National Transportation Systems Center conducted a study and issued a report in 1994 entitled "**Tube Transportation.**" The report reaffirmed the technical and economic feasibility, and confirmed environmental and safety benefits of PCP. Dr. Larry Vance at the Volpe Center is the principal author of the report. Although this study was an update of the UP's study, its scope is limited to answering the mandate (general questions) of Section 6020 of ISTEA. The study did not address many important technical issues such as whether square pipe or round pipe should be used, what would be the preferred type of linear electromagnetic pumps for PCP, how should the capsules be loaded/unloaded, how to inject capsules into pipe and eject capsules from pipe, what should be the layout of PCP terminals, how can PCP be constructed along highway easement without interfering with highway traffic, how should PCP cross roads and streets, and how should the capsules for such large systems be designed. All these plus other questions need to be studied in detail before any PCP system can be planned and designed for intercity/interstate transport.

In 1996, the American Society of Civil Engineers (ASCE) held a national workshop on Pipeline Research Needs. Needed PCP research was documented in the workshop report published by ASCE. In 1998, the ASCE Task Committee on Freight Pipelines published a state-of-the-art review report entitled: "**Freight Pipelines: Current Status and Anticipated Future Use.**" It was published in the Journal of Transportation Engineering, Vol. 124, No. 4, pp. 300-310. The report highlighted the potential of PCP for future intercity/interstate freight transport. It constitutes the most authoritative recent review of the freight pipeline technology and its potential.

Since 1991, the Capsule Pipeline Research Center (CPRC) at the University of Missouri-Columbia (MU) has conducted extensive R&D in various types of capsule pipelines including coal log pipeline (CLP), hydraulic capsule pipeline (HCP), and pneumatic capsule pipeline (PCP). In the PCP area, the research has been focused on predicting the behavior of and testing a PCP system powered by linear induction motors (LIMs). At about the same time, the Minnesota Department of Transportation sponsored a study at the University of Minnesota to investigate the use of LIM to transport freight in large-diameter underground pipelines, and the Florida Phosphate Research Institute supported a study and demonstration of using linear synchronous motors for a PCP to transport phosphate ore. All these studies deal with highly specialized technical problems, and they did not address the many questions and issues pertaining to the planning and design of PCP discussed herein.

In 1998, the U.S. Congress passed the Transportation Equity Act (TEA-21). The act authorized \$1.125 million to the Texas Transportation Institute (TTI) to conduct a feasibility study of using freight pipelines in Texas to reduce the upsurge of truck traffic coming from Mexico following the NAFTA treaty. The TTI study was focused on using self-propelled vehicles moving through large underground conduits or pipes, similar to conventional subway systems or electric trains. It did not address PCP in any technical way. So, a need remains to conduct a detailed technical study of PCP for underground freight transport, the study proposed in this problem statement.

### **Urgency/Priority**

This research could help facilitate freight movement and contribute to solutions for traffic congestion and accident problems on highways and streets.

### **Cost**

\$250,000 (approximate).

### **User Community**

FHWA, DOT's Research and Special Programs Administration, Volpe Transportation System Center, and the transportation departments of various states.

### **Implementation**

The research findings could potentially be used by the U.S. DOT and state DOTs in planning new highway corridors and renovation (expansion) of existing highways.

### **Effectiveness**

This research is needed before any major PCP freight pipeline can be built and used in the United States. Research results potentially could help to do the following:

- Streamline freight transport in congested areas and reduce roadway congestion,
- Conserve energy (especially imported oil),
- Reduce accidents, fatalities and injuries, associated with other freight modes.
- Reduce air and noise pollution,
- Reduce highway damage and highway maintenance costs,
- Provide another option for reliable and speedy delivery of freight, and
- Promote national prosperity and security.

The effectiveness of this research could be measured by the frequency with which various transportation planners and state transportation agencies use the report in the future planning of highway and other systems.