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NITC
NATIONAL INSTITUTE for TRANSPORTATION and COMMUNITIES

FINAL REPORT

Integrating Freight into Livable Communities

NITC-RR-752 ■ December 2015

NITC is the U.S. Department of Transportation's national university transportation center for livable communities.

TREC
Transportation Insight for Vibrant Communities

INTEGRATING FREIGHT INTO LIVABLE COMMUNITIES

Final Report

NITC-RR-752

by

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16. Abstract

Where livability is a goal of the planning process, freight runs the risk of not being considered except as an afterthought or as something to be excluded. Yet, freight is an integral part of local economic development. Because economic prosperity is a key characteristic of livable communities, freight must be incorporated into the planning process. This study explores the relationship between freight and livability through a comprehensive literature review and case study research. The final report includes a menu of strategies and case study perspectives that highlight the importance of transportation and land use integration, interagency coordination, and context-sensitivity in freight and livability planning.

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DISCLAIMER

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EXECUTIVE SUMMARY

Freight mobility is critical to the economic success of any community. Efficient freight movement ensures that stores and restaurants are stocked appropriately, that small manufacturers get the raw materials they need, and that local businesses receive packages, office supplies, and other goods. Much of the visible freight activity in urbanized environments involves deliveries destined for local businesses and homes. Often referred to as "last-mile" activity, this is the most costly and problematic phase of freight movement. Last-mile freight activity in urban areas not only competes for public space, but can also create negative externalities (air and noise pollution, congestion, and infrastructure damage).

A paradox is that factors that make a community livable can create conditions that increase freight demand, while reducing freight access. For example, conditions that increase freight demand are increased density and a diverse mix of uses in close proximity – the same factors that contribute to livability. Road diets and changes to street network design and site access to support bicycling and pedestrian activity generally involve wider sidewalks, bicycle lanes, narrower intersections with tight turning radii, and on-street parking. These changes benefit pedestrians, yet make it harder for trucks to navigate turns, leading to congestion, crashes, sidewalk encroachment and curb damage. In addition, livability plans may reduce or fail to accommodate dedicated truck parking areas. A lack of dedicated parking can cause double parking and lead to increased fines for trucks.

Freight can also increase noise, vibrations, emissions and congestion, which adversely affect livability. In light of these negative externalities, freight is often considered a nuisance by area residents. Nonetheless, vibrant urban cores require an appropriate balance between accessibility for freight delivery and pedestrian/bicycle-friendly environments. Communities need to provide efficient access for large trucks, freight rail, and other modes of freight transportation without impeding bicyclists, pedestrians and transit users in urban areas where livability is the goal.

As noted previously, this tension between freight movement and community livability presents a paradox. In communities where livability is a goal of the planning process, freight runs the risk of not being considered except as an afterthought or something to be excluded. This report documents methods that local and regional planning agencies can use to advance freight movement and livability objectives, and minimize potential conflicts between the two. It provides a menu of options for decision makers to consider, recognizing that communities are unique in their mix of vision, target industries, development patterns and transportation systems. These strategies are noted briefly below; each is hyperlinked to the technique summary for further details.

- Infrastructure Planning and Design
    - *Designated Truck Routes.* Designated truck routes guide heavy vehicles toward roadways better equipped to accommodate their size and impacts. This strategy is

compatible with layered network plans, context sensitive solutions and Complete Streets roadway classification schemes.

- *Intermodal Freight Connectors.* Connectors facilitate the movement of high volumes of freight and provide alternative access to major freight facilities, while removing or reducing truck traffic on neighborhood streets. In Tampa, for example, the I-4/Selmon Connector provides direct access for trucks into the Port, removing heavy truck traffic from urban streets in historic Ybor City.
- *Highway Bypasses.* Bypass routes redirect through traffic around populated areas or downtowns to reduce roadway congestion, improve travel times and reduce negative impacts from heavy trucks. Bypassed routes can then be redesigned in urban centers to increase livability and expand modal options. Projects that would improve the downtown business environment include road diets, wider sidewalks, street furniture, bike paths and landscaping. Future land use and network planning scenarios should be developed to address potential indirect land use and mobility impacts of bypasses. Bypass routes should also be carefully access controlled to maintain their through movement function.
- *Geometric Modifications.* Various design strategies can be employed to make roadways and intersections more accommodating to large trucks. Design considerations include curb return radii, exclusive turn lanes, length of turn lanes, horizontal and vertical clearances, and width of travel lanes. Street design in community activity areas can emphasize non-auto functions.
- *Multiuse Lanes.* Multiuse travel lanes can be shared among specific types of vehicles to improve traffic flow. Paris, France allows delivery vehicles to use a portion of its bus lane network to access loading zones during off-peak hours. Special markings indicate where goods vehicles may load and unload, and design strategies allow trucks to straddle the sidewalk so buses can easily pass.

- Parking and Loading
  - *Peak-Hour Clearways/Parking Restrictions.* Parking or stopping for loading and unloading is prohibited on certain roads or sections of roads during periods of high traffic demand. This technique preserves the capacity of the roadway without the cost of creating additional travel lanes.
  - *On-Street Parking and Loading Zones.* Street design is modified and curb space is reallocated to accommodate freight vehicles. When adequate parking and loading space is provided, truck drivers spend less time searching for curb space and can access goods receivers more easily.
  - *Off-Street Parking and Loading Requirements.* Local land development codes can be enhanced to accommodate goods delivery by requiring on-site parking and loading facilities and storage space. New town centers and mixed-use developments need to integrate appropriate access for deliveries and truck movement, which are often not adequately considered in such developments.
  - *Vehicle Parking Reservation Systems.* Truck drivers can reserve parking and loading spaces in advance through the use of wireless communication technology.
- Land Use Management

    - *Preferential Zoning and Tax Relief.* Preferential zoning and tax relief programs encourage the preservation of industrial activity on existing industrial sites and prevent industrial sprawl.
    - *Urban Freight Villages.* Intermodal freight staging facilities enhance connectivity across and between modes, consolidate logistics activities and improve operational efficiency.
- Traffic and Delivery Management
    - *Voluntary Off-Peak Deliveries.* Voluntary off-peak delivery programs can be used to reduce the amount of roadway congestion during peak travel times.
    - *Alternate Pickup/Delivery Locations.* Alternate pickup/delivery locations are a last-mile strategy which specifically targets home deliveries. Deliveries to alternate pickup points help maximize route efficiency, lower freight operating costs and potentially reduce vehicle miles traveled.
- Noise Reduction
    - *Quiet Delivery Schemes.* Strategies that minimize freight-generated noise pollution include changes to vehicle technology, delivery equipment or driver behavior.
    - *Quiet Zones.* Trains are exempted from sounding their horn in advance of grade crossings on certain segments of railroad lines when federally required safety features and technologies are added to these crossings.
- Safety
    - *Truck Side Guards.* Safety barriers are placed between truck tires, preventing vulnerable road users (i.e., bicyclists and pedestrians) from falling under the rear wheels and being injured or killed.
- Incentives
    - *Certification Programs.* Market-based strategies can be designed that encourage freight companies to meet certain performance targets relative to emissions or energy efficiency. Freight carriers can earn recognition or benefits when they meet voluntary standards.
    - *Incentives for Green Vehicles.* Communities and states can offer incentives to freight companies that use environmentally friendly vehicles.
- Stakeholder Engagement
    - *Freight Advisory Committees.* Freight industry representatives and other stakeholders are directly engaged in the planning process to advise transportation planning agencies on freight-related issues.

The report also includes a series of case studies that review local and regional experiences with managing freight and livability in the planning process. Five U.S. metropolitan regions with diverse geographies, industries and planning cultures (Albany, NY; Portland, OR; San Antonio, TX; Savannah, GA; and Tampa, FL) were selected for the case studies to provide varying perspectives on freight challenges and strategies. These case study findings offer important lessons for other communities.

One takeaway is the need to consider the broader context when siting freight-intensive land uses. Failure to do so can generate freight and livability conflicts that are difficult, if not impossible, to resolve after the fact. In Savannah, for example, the siting of industrial uses east of the city stimulated the movement of heavy trucks through the historic city center, causing

additional congestion, bicycle and pedestrian conflicts, noise and air pollution. Alternate routes proposed by the regional planning agency to accommodate this traffic have not proven viable due to added transport time, limited resources and/or neighborhood opposition.

Connector routes have been a useful tool for facilitating the efficient movement of freight and preserving local livability. In Tampa, the I-4/Selmon Connector provides direct access for trucks into the Port and removes heavy truck traffic from urban streets in historic Ybor City. In the suburbs of Savannah, the Jimmy Deloach Connector provides direct access for trucks into the Port, thereby removing heavy truck traffic from congested routes serving suburban commuters.

Another key finding is the importance of integrating long-range transportation and land use planning on a local and regional scale, as exemplified in Tampa, Portland and Albany. Tampa illustrated a host of ways to integrate transportation and land use planning, primarily through its development of Freight Roadway Design Considerations. Establishing context-sensitive street design guidelines generates a better understanding of community characteristics and needs, while guiding transportation engineers on how to incorporate land use into roadway design decisions. Albany's Capital District Transportation Committee is preparing a Regional Goods Movement Study that classifies potential freight strategies according to land use context. In addition, the City of Portland has developed context-sensitive design considerations for trucks and a Central City Sustainable Freight Strategy. By integrating transportation and land use planning, these regions are positioned to coordinate on wise transportation investments, avoid unintended consequences, and address both freight and community needs.

A continuing issue is the need for current freight data that can be readily understood and used by planning agencies so they can better plan for freight trends and needs. In San Antonio, for example regional planners noted that freight data obtained from third-party data providers was voluminous and difficult to navigate for planning purposes. The Alamo Area Metropolitan Planning Organization (MPO) now hopes to benefit from travel survey data from the Texas Department of Transportation Statewide Freight Plan for its regional freight study. Tampa has directly involved freight carriers in data collection. The resulting database of freight hotspots is accessible online to multiple planning agencies for use in future plans and improvement projects.

Ensuring that minority and low-income populations are not disproportionately impacted by freight and livability plans or decisions is another challenge. In Albany, for example, storage of rail cars carrying flammable crude oil in close proximity to low-income housing has raised environmental justice concerns. Strategies to mitigate adverse impacts are being explored, although greater consideration of potential future uses of the rail terminal when locating public housing could have avoided the problem. In Portland, transit access to family-wage jobs is concentrated primarily in central Portland, yet most middle-income families and communities of color cannot afford to live there. Efforts to expand industrial employment near the Port of Portland have met opposition. Planners are examining the issue to determine how to better align the middle-wage job growth potential of freight-related industry with transportation, land use and education through the planning process. The inland Port of San Antonio has been highly successful in this regard, leading to the creation of a Hispanic middle class in the city.

All of the case studies pointed to a need for greater public and policy-maker education on freight benefits and needs, as well as freight stakeholder engagement in local and regional planning. For more than a decade, the City of Portland Freight Advisory Committee has actively participated in the regional planning process, and was instrumental in the development of freight policies and programs in the region. The CDTC's Freight Advisory Committee in Albany has

lent industry perspective to the planning process, raising issues that may not have been addressed. These committees have been a valuable resource for local and regional planners — raising awareness of freight needs and fostering a cooperative relationship between the public and private sectors.

Each community is unique in its size, development patterns, target industries and long-term visions. The cases explored in this study represent unique challenges and diverse strategies related to freight and livability. Many case study participants welcomed suggestions for addressing freight challenges. These case examples, along with the menu of options, should provide planning practitioners with a firmer understanding of how to integrate freight into livable communities.

1.0 INTRODUCTION

Freight mobility is critical to the economic success of any community. Efficient freight movements ensure that stores and restaurants are stocked appropriately, that small manufacturers get the raw materials they need, and that local businesses receive packages, office supplies and other goods. Much of the visible freight activity in urbanized environments involves deliveries destined for local businesses and homes. Often referred to as "last-mile" activity, this is the most costly and problematic phase of freight movement. Last-mile freight activity in urban areas not only competes for public space, but can also create negative externalities (air and noise pollution, congestion and infrastructure damage).

Vibrant urban cores require an appropriate balance between accessibility for freight delivery and pedestrian/bicycle-friendly environments. Communities need to provide efficient access for large trucks, freight rail and other modes of freight transportation without impeding bicyclists, pedestrians and transit users in urban areas where livability is the goal.

1.1 RESEARCH OBJECTIVES

Because communities are relatively unique in their mix of vision, target industries, housing density and public transportation services, an objective of the study is to present a menu of options and opportunities for decision makers to consider rather than a standard guide. The goal is to identify and catalog best practices for public-space policies that improve freight access, support local and regional businesses, and effectively manage the competing uses and demands on public space related to freight.

Another objective of the study is to incorporate the concept of social equity into the freight and livable community discussion. Freight facilities, by and large, tend to have a disproportionate impact on disadvantaged populations. Warehouse districts, ports, commercial vehicle distribution centers, rail switching yards, and other terminals typically are surrounded by lower-valued housing stock. These areas can be subject to lower air quality, more noise and vibration, and other externalities of freight flow. Therefore, the team explored options to incorporate reasonable approaches and mitigation opportunities to improve this perceived, and in many cases, readily evident inequity.

The final objective of this study is to offer the research community a set of case study perspectives combining urban revitalization plans and freight movements. All of the communities identified in this research work have attempted to address urban core revitalization initiatives and have adopted freight mobility strategies or plans. In many cases, the efforts overlap and provide some contradictory recommendations. The research team examined these activities for best practices, as well as any inconsistencies, and presented recommendations or guidance for policy makers.

1.2 OVERVIEW

This report identifies preferred practices for integrating freight considerations into livable communities, and highlights planning, policy and technical decisions that can be transferred to other urban environments. The specific focus is on programs and regulations that affect public spaces, including roadway design and parking policies. In addition, the report explores freight consolidation centers (freight villages), applications of off-hours delivery regulations and social equity considerations.

The report begins with an overview of the paradox between livable communities planning and freight movement needs. It proceeds with a series of case studies. Finally, the report presents a menu of selected options and best practices for achieving an appropriate balance between livability goals and freight movement needs.

1.2.1 The Livability and Freight Movement Paradox

Livability has been defined in a number of ways. According to the American Institute of Architects (2005), "Livability is best defined at the local level. Broadly speaking, a livable community recognizes its own unique identity and places a high value on the planning processes that help manage growth and change to maintain and enhance its community character." Partners for Livable Communities (n.d.) define livability as "…the sum of the factors that add up to a community's quality of life—including the built and natural environments, economic prosperity, social stability and equity, educational opportunity, and cultural, entertainment and recreation possibilities."

The Federal Highway Administration (FHWA, 2014a) notes that livability in transportation "…is about leveraging the quality, location, and type of transportation facilities and services available to help achieve broader community goals such as access to a variety of jobs, community services, affordable housing, quality schools, and safe streets." Former Department of Transportation (DOT) secretary Ray LaHood concisely defines a livable community in the context of transportation as one "where if people don't want an automobile, they don't have to have one," (FHWA, 2014).

The concept of livability is also embodied in contemporary planning literature and practice on sustainable development and Smart Growth. The terms "sustainable" and "livable" are in many cases, including that of this research, used interchangeably. Sustainable communities are considered to be livable communities. Evidence of this includes guidance from the Partnership for Sustainable Communities—composed of the DOT, HUD and EPA—which defines sustainable communities as "places that have a variety of housing and transportation choices, with destinations close to home" (U.S. Department of Housing and Urban Development, n.d.).

In "Livability 101," the American Institute of Architects (2005) identifies "essential elements" that make a community livable:

- A sense of place, such as assets that distinguish it from other areas;
- Mixed-use development, with a variety of uses within walking distance;
- Density, with increases in housing units in support of mixed-use development;

- Effective planning for regional transportation for a viable and coordinated network of public transit, walking paths, bike trails and transit-oriented development;
- Street-savvy design that is pedestrian friendly;
- Physical health and community design by encouraging walkable neighborhoods;
- Public safety and personal security through sensitive planning, design, and the unobtrusive use of technology;
- A sustainable approach to neighborhood and regional development.

As suggested by the absence of freight issues in this summary, where livability is a priority or goal of the planning process, freight runs the risk of not being considered except as an afterthought or as something to be excluded. However, given that livability includes economic prosperity, freight will play a role in the community.

A paradox is that factors such as those noted above that make a community livable can create conditions that increase freight demand, while reducing freight access. For example, conditions that increase freight demand are increased density and a diverse mix of uses in close proximity – the same factors that contribute to livability. Road diets and changes to street network design and site access to support bicycling and pedestrian activity generally involve wider sidewalks, bicycle lanes, narrower intersections with tight turning radii and on-street parking. These changes benefit pedestrians yet make it harder for trucks to navigate turns, leading to congestion, crashes, sidewalk encroachment and curb damage.

Additionally, livability plans may reduce or fail to accommodate dedicated truck parking areas. A lack of dedicated parking can cause double parking/fines or truck delays (Giuliano et al., 2013). Freight also can increase noise, vibrations, emissions and congestion, which adversely impacts livability. Figure 1 illustrates the generalized relationship between livability and freight.

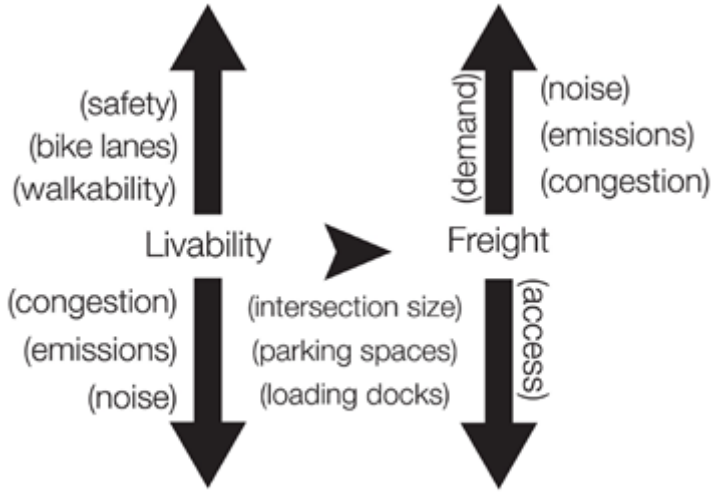

Figure 1. Livability and freight movement paradox

1.3 METHODOLOGY

The methodology for the study involved two key tasks: 1) A comprehensive review of the literature related to freight planning, as well as literature relative to Smart Growth and livability planning; and 2) Case studies in five urban areas known to have livability and freight initiatives. These are discussed briefly below.

1.3.1 Literature Review

An extensive body of literature and agency documents has been produced in recent years on Smart Growth, as well as freight planning. The research team gathered and reviewed relevant literature from numerous sources, including information from published and unpublished reports, to prepare the broad synthesis of best practices related to goods movement and its relationship to Smart Growth policy. The literature review included a comprehensive overview of existing works on these two topics. The literature on freight movement included studies completed in the U.S. and abroad, including information from published reports, as well as selected statewide or regional freight plans, and MPO initiatives for key observations and challenges related to freight movement in urban environments.

In addition to literature, the team examined online resources, such as the Smart Growth Network database, and best practices for freight mobility in urban environments identified by the European community through its Best Urban Freight Solutions (BESTUFS) program.

1.3.2 Case Study Locations and Approach

A handful of cities were identified based on their location on key trade corridors or accommodation of freight hubs, such as major ports, and local urban revitalization and livability plans. The research team then worked with the project advisory committee to confirm the final set of five cities for case study review. They are as follows:

1. Tampa, FL, where the freight network is a major contributor to the region's economy. Active freight planning is ongoing, as is an increased focus on livability issues and plans.
2. Savannah, GA, has a major freight network, is home to the fourth-busiest container port in the U.S. and also has livability concerns, including the maintenance of beloved historic districts.
3. San Antonio, TX, is at the crossroads of a network that connects the West Coast to the East Coast and Mexico to Canada. The city is also in the process of updating its comprehensive plan to focus on several areas, including growth and urban form, transportation, connectivity and sustainability.
4. Albany, N.Y., is a strategically located freight hub and has a major role in regional and international trade and the global economy. The designated MPO for the region actively supports goods movement while working to preserve local livability.
5. The Portland, OR/Vancouver, WA, region is the fourth-largest freight hub on the West Coast, and the City of Portland has developed a freight master plan that aims to establish strategies to facilitate efficient goods movement and maintain the community's livability.

Each community was reviewed individually with generalizations and recommendations offered only after a thorough content analysis and review of all cases. The case studies included a review of available planning documents, interviews with key stakeholders in each community, and a comparison of existing plans to current operating environments. The intent of the case studies is to explore each of the variables noted in Figure 1 as they relate to the planning and activities in each case study community. The research team highlighted these inconsistencies and present recommendations or guidance for policy makers. The case study set should be a valuable tool for other researchers and for other communities.

1.4 KEY FINDINGS FROM THE LITERATURE

A comprehensive literature review was conducted to provide a solid foundation for this study. It was intended to explore the various approaches used to study urban freight from a planning perspective and to answer the following questions:

- What is the nature of the relationship between freight and livability?
- How do local officials perceive urban freight issues? How do freight stakeholders perceive local responses to freight issues?
- If conflicts exist between urban freight and livability, what are some potential strategies to mitigate those conflicts?

Major sources include:

- NCFRP 23: Synthesis of Freight Research in Urban Planning
- NCFRP 24: Smart Growth and Urban Goods Movement
- NCFRP 14: Guidebook for Understanding Urban Goods Movement
- Volvo Research and Education Foundation Sustainable Urban Freight Systems
- European Commission Best Urban Freight Solutions (BESTUFS) I & II

Public officials have only recently begun to appreciate the importance of freight in the urban economy, partly due to policy goals contained within the SAFETEA-LU and MAP-21 legislation (Bassok et al., 2013). As cities attempt to enhance livability by promoting mixed land uses, compact development and multimodal environments, so too do they increase demand for goods and services. However, the trucks that make these deliveries are rarely accounted for in the planning process. This trend is evident in the literature, as not only do authors note the relative lack of awareness of and data related to urban freight issues, but a significant amount of the relevant literature on this topic was written within the past decade (Ballantyne et al., 2013; Dablanc et al., 2013).

The research premise is generally consistent throughout the literature: that livability and freight demand have a positive relationship, while livability and freight access have an inverse relationship (Cherrett et al., 2012). This means that aspects that make a community livable increase the need for goods movement, yet make it more difficult for goods movement to take place. Much of the literature reviewed attempts to explore this relationship and identify methods for supporting goods movement in urban areas (Giuliano et al., 2013).

Many studies adopted a qualitative approach to study freight and livability, primarily in the form of case studies (Best Urban Freight Solutions, 2004b; Rhodes et al., 2012). This is partly due to the difficulty in obtaining the necessary data to conduct quantitative analysis. Additionally, it has been emphasized in throughout the literature that strategies to address freight and livability conflicts should be context-sensitive (Giuliano et al., 2013). Therefore, general conclusions deduced from a quantitative study may not be universally applicable.

The research community has expressed concern over the lack of communication between the public and private sectors on freight issues (Ballantyne et al., 2013; Lindholm, 2012). Many local authorities perceive freight transport issues to be private sector rather than public sector concerns. This outlook may lead to the exclusion of freight from the planning process or the implementation of regulations that have unintended consequences for trucks. Meanwhile, freight carriers are often frustrated with measures that limit freight mobility and operational efficiency. Freight stakeholders also feel disengaged from the planning process due to the relatively long time frames within which planners operate.

The literature review exposed several other freight and livability conflicts that are common in urban communities. Key issues include:

- *Vehicle congestion.* Freight vehicles both increase and are impacted by roadway congestion, the costs of which are ultimately passed on to the consumer (Lindholm, 2012; Dablanc, 2009).
- *Vehicle emissions*. Freight vehicles emit large quantities of harmful emissions that negatively impact air quality, public health and environmental sustainability (Ambrosino, 2015; Anderson et al., 2005; Dablanc et al., 2013).
- *Parking and loading.* Lack of available parking and loading zones can result in three unfavorable outcomes: 1) Truck drivers must circulate to find available parking/loading space, thereby increasing roadway congestion and emissions; 2) Drivers must park farther away from their final destination and transport goods manually over longer distances, increasing delays and creating safety concerns; or 3) Drivers must park illegally (e.g., in a transit-only lane or a travel lane), which increases traffic congestion and creates unnecessary frustration among other roadway users (Lindholm, 2012).
- *Undesirable environmental effects.* Unwanted noise, smells and vibrations from freight vehicles and facilities are a significant challenge in urban and mixed-use areas, even though deliveries are necessary to ensure the continued functionality of local businesses (Ballantyne et al., 2013; Lindholm, 2012). Increases in e-commerce (i.e., online ordering and home delivery, such as through Amazon.com) require trucks to travel through residential areas more frequently, creating concerns over unwanted noise and other sensory offenses. The siting of industrial uses is also challenging due to conflicts with adjacent uses. In addition to minimizing adverse impacts overall, communities are tasked with upholding environmental justice principles and ensuring no populations are disproportionately impacted by freight movement.
- *Intermodal conflicts.* Livable urban centers often have multimodal environments that support walking, cycling and transit. However, interaction between freight and other modes can be hazardous. One study found that many truckers had difficulties reacting to and maneuvering around pedestrians and bicyclists (Bassok et al., 2013). Additionally, the roadway treatments

that support multimodal environments (e.g., slighter travel lanes, smaller intersections, street trees, etc.) can be difficult for trucks to negotiate.

- *Policy-related problems.* Many communities implement policies such as weight or time restrictions designed to limit freight's negative externalities. Though well-meaning, these restrictions often have unintended consequences, such as a loss in freight productivity or efficiency (Dablanc, 2009). Restrictions that result in added fees or charges (such as low emission zones or congestion charges) rarely change truck behavior. Rather, logistics companies internalize the costs and continue their normal operations (Dablanc, 2009). Those costs, however, are ultimately passed on to the consumer.

The literature review uncovered a variety of strategies to address freight and livability conflicts. Although there was general consensus within the literature on the validity of certain approaches, there was some divergence on others. The research team chose to highlight strategies that were generally supportive of freight and had some applicability to the United States. These strategies are discussed in-depth in Chapter 3.0 of this report.

The strategies presented in the report may have varying levels of success depending on community context. Therefore, the first step in planning for freight within a community should involve stakeholder engagement and identification of the issues. By collaborating with the private sector on what works and what does not, communities can develop effective strategies to enhance freight mobility and access while preserving local quality of life.

2.0 CASE STUDIES

2.1 TAMPA, FLORIDA

2.1.1 Introduction & Background

Tampa is a major freight hub, and a community that is actively working to increase community livability. Freight-related activity has long been a cornerstone of the local and regional economy, with over 10,000 establishments in the Tampa Bay area reliant on a functioning and reliable freight network (Florida Department of Transportation, 2012; Hillsborough MPO, 2009). Port Tampa Bay is Florida's largest seaport and the nation's 12th-largest port in terms of gross cargo weight (Hillsborough MPO, 2009). In 2009, cargo was transported to and from the port by over 11,000 heavy trucks per day, and the total tonnage carried by truck is projected to increase 60 percent by 2040 (Florida Department of Transportation, 2012).

Meanwhile, Tampa is taking steps to make its streets and neighborhoods more livable by improving walkability, supporting denser development, encouraging mixed uses and enhancing neighborhood character (City of Tampa, 2012). The combination of increasing truck traffic and livability goals provides an important opportunity to examine how freight and livability intersect, how they conflict and how Tampa is working to integrate them.

2.1.2 Context

Livability Plans & Initiatives

GO Hillsborough

GO Hillsborough is an initiative of the Transportation for Economic Development Policy Leadership Group to perform meaningful community engagement, and create a comprehensive mobility plan that enhances livability and economic prosperity in the Tampa Bay area. Using input gathered from over 20,000 citizen participants, the draft plan contains recommendations to address maintenance backlogs, improve public transportation options and service, and enhance pedestrian and bicycle facilities (*GO* Hillsborough, 2015b). Through smart transportation investments, the plan is intended to increase connectivity, improve safety, encourage economic development, and meet the transportation needs of current and future residents.

InVision Tampa Center City Plan

The InVision Tampa Center City Plan, approved in 2013, outlines an overall vision of the city as a "community of livable places, connected people, and collaborative progress" (City of Tampa, 2012). This vision rests on five broad goals, all of which

embrace livability principles, such as sense of place, neighborhood-oriented streets, multimodal transportation and mixed-use development. Specific objectives include encouraging mixed-use and residential development in the predominantly commercial downtown core, improving the pedestrian environment with Complete Streets, and improving transit accessibility. Action items include the designation of pedestrian priority streets and transit/mobility streets, the implementation of road diets along key corridors, and encouragement of mixed-use and retail development to support the growing residential community in the Channel District (City of Tampa, 2012).

2040 Long Range Transportation Plan

The Hillsborough MPO recently adopted the 2040 Long Range Transportation Plan. The plan, informed by extensive public comments, outlines a series of goals and objectives to enhance safety, mobility and connectivity on the regional transportation system. Among the objectives listed in the plan are reducing reliance on single-occupancy automobiles, integrating land use and transportation planning, and encouraging sustainable growth patterns (Hillsborough MPO, 2014).

Tampa Comprehensive Plan

The City of Tampa is currently updating its comprehensive plan. The plan was drafted in conjunction with the long-range transportation plan update and with the comprehensive plan updates for the City of Temple Terrace, the City of Plant City, and unincorporated Hillsborough County. This unified planning process is intended to better coordinate planning decisions within the Tampa Bay area. The draft plan envisions Tampa as a livable city that (City of Tampa, 2015):

- "Feels safe;
- Offers economic opportunity;
- Is attractive;
- Values its natural areas and areas of heritage;
- Supports a choice of lifestyles;
- Integrates a complete mix of uses;
- Provides mobility options; [and]
- Fosters a sense of place and community."

Stemming from this vision is a series of guiding principles, goals and objectives that center around making Tampa more livable. The land use approaches contained therein promote investment within the existing urban fabric. This is complemented by the plan's mobility objectives that promote a multimodal transportation system.

ONE BAY Regional Vision

ONE BAY: Livable Communities formed in 2007 as a partnership of public and private leaders designed to create and implement a regional vision for the Tampa Bay area. The initiative included vast public outreach to assess current trends and establish goals for Tampa's future. Goals were established relative to the natural environment, the

built environment, mobility, the economy and energy. Each of these goals supports the broader vision to enhance livability for the entire region. The Vision's overall recommendations include (ONE BAY, 2010):

- Supporting environmentally sustainable growth and protecting natural resources;
- Creating jobs through sustainable economic development practices and fostering quality communities;
- Supporting a variety of housing options;
- Encouraging compact and mixed-use development;
- Promoting transit and transit-oriented development; and
- Encouraging preservation of open space and agricultural land.

Channelside Redevelopment

Port Tampa Bay is currently drafting a Master Plan for Channelside, one of Tampa's primary tourist and entertainment districts that abuts the port. With the limited access of larger cruise ships into Tampa Bay, there is a unique opportunity for the community to transition part of the cruise area to other uses, such as mixed-use and residential development (F. Kalpakis, personal communication, March 12, 2015). The plan will be coordinated with other revitalization efforts and is envisioned to be developed into a multimodal street with bicycle, pedestrian and enhanced streetcar service (F. Kalpakis, personal communication, March 12, 2015).

Freight Plans & Initiatives

Tampa Bay Regional Strategic Freight Plan

In an effort to support a more efficient freight transportation network and sustain economic growth, the Florida Department of Transportation (FDOT) created a Regional Strategic Freight Plan for the Tampa Bay area. The plan seeks to identify freight challenges; identify strategic freight transportation investments; respond to tension between freight and livability; take advantage of growth and funding opportunities; and integrate freight considerations into the broader planning process (Florida Department of Transportation, 2012).

The plan also identifies potential strategies to address freight needs. These strategies are categorized according to their appropriateness for different types of roadways and land use contexts.

Figure 2 depicts the applicability of various strategies on freight activity center streets, which are the local "last-mile" in the goods distribution process (Florida Department of Transportation, 2012). Together with the roadway design guidelines discussed below, this sets forth a system-wide approach to integrate land use and transportation planning and clearly addresses freight needs while considering public livability goals.

Table 9-4: Applicability of Selected Freight Mobility Strategies for Freight Activity Center Streets

Freight Activity Center Streets				
Strategies	Context Areas			
	Low Activity	Community Oriented	Freight Oriented	Diverse Activity
Increase roadway lane widths	2	3	1	2
Signal timing optimization	2	3	1	2
Geometric improvements	2	3	1	2
Access and circulation plan	3	1	1	1
Way-finding signage program	3	3	2	1
Pedestrian street crossing protection	3	1	3	1

Legend: 1 - Applicable
2 - Somewhat Applicable
3 - Limited Applicability

Figure 2. Applicability of freight mobility strategies for freight activity center streets

Source: Florida Department of Transportation, 2012

Comprehensive Freight Improvement Database

As part of its Tampa Bay Regional Goods Movement Study, the Florida Department of Transportation created the Comprehensive Freight Improvement Database (CFID), which stores and organizes freight operational hot spots within an online mapping application (Figure 3). Hot spots include lane width, turn radii, substandard pavement and other issues. The CFID is intended to provide planners, engineers and other freight stakeholders access to an inventory of transportation infrastructure conditions and needs that impact goods movement (Florida Department of Transportation, n.d.).

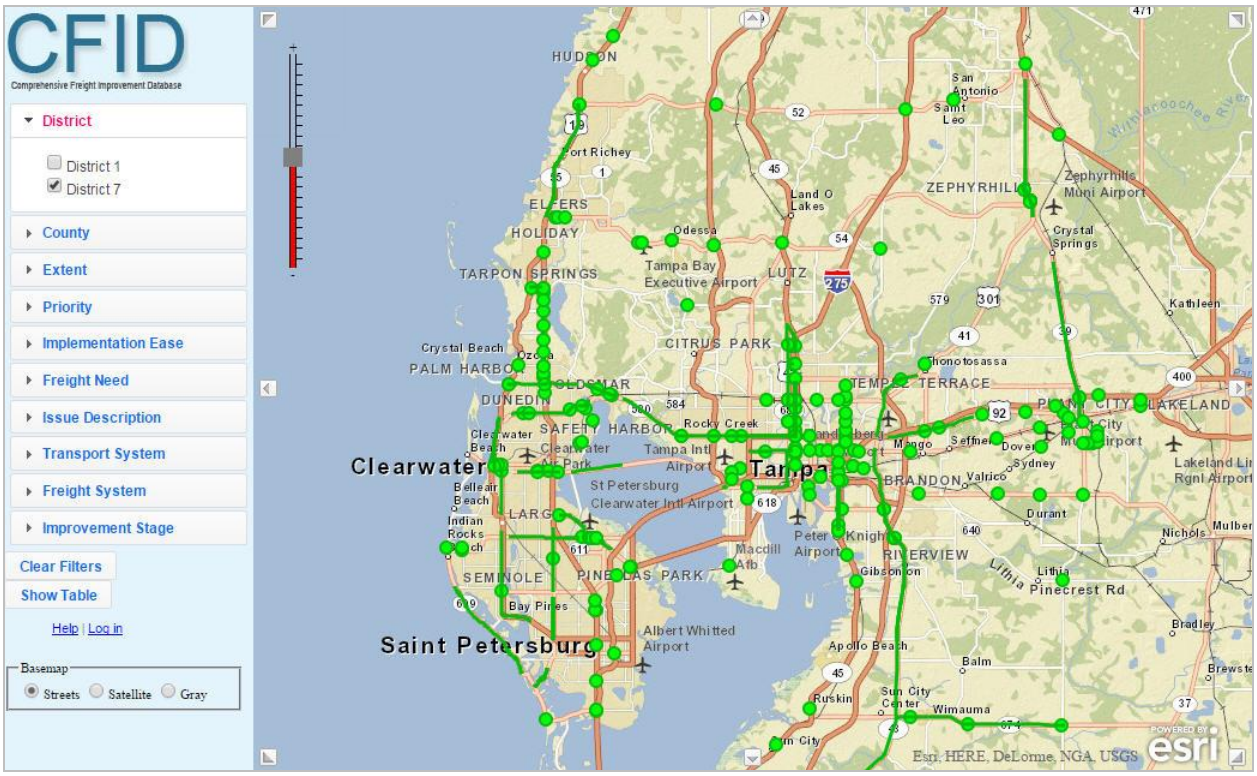

Figure 3. FDOT comprehensive freight improvement database

Source: https://cfid.ursokr.com/mapViewer/default.aspx

Port Tampa Bay

Port Tampa Bay has invested $24 million to purchase two 65-ton post Panamax gantry cranes to expand its cargo container business. The investment is designed to coincide with the Panama Canal expansion and will allow the port to handle larger vessels of up to 9,000 TEUs (Port Tampa Bay, 2015). The port also plans to quadruple the size of the terminal, expanding its capacity to an estimated one million container movements annually (Port Tampa Bay, 2015). The port currently supports over 80,000 jobs and has a $15 billion annual impact on the region's economy.

Freight Roadway Design Considerations

This document expands on the concepts in the Tampa Bay Regional Strategic Freight Plan, and can be used as a resource for planners and engineers accommodating trucks in a broad range of land use contexts. The considerations for these guidelines include not only right-of-way, but also roadway function, shared uses, land use context, and freight and land use compatibility (Florida Department of Transportation, 2015c). A freight and land use compatibility analysis was performed to understand the geography of freight and livability activity centers, and identify areas where they intersect. Geographic areas were then classified as either low freight activity, freight-oriented, community-oriented or diverse (Figure 4). The roadway design guidance is intended to assist planners

and engineers to develop design strategies for freight movement for different land use contexts (Florida Department of Transportation, 2015c).

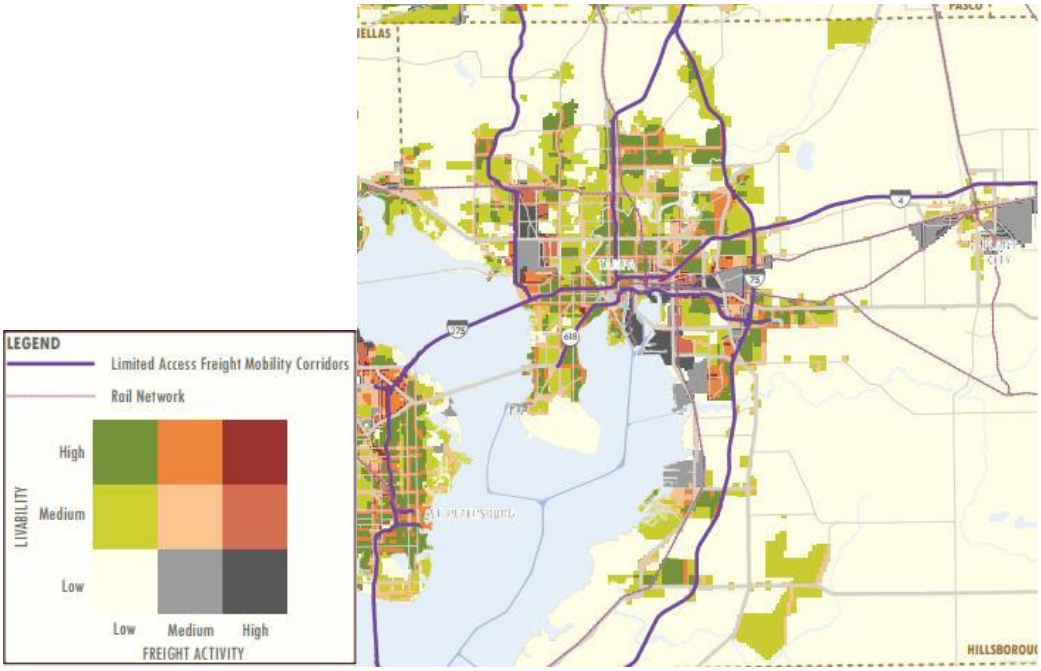

Figure 4. Freight and land use compatibility analysis

Source: Florida Department of Transportation, 2015c

2040 Long Range Transportation Plan

Freight issues and needs are discussed throughout the Hillsborough MPO's 2040 Long Range Transportation Plan. The MPO recognizes the importance of freight to the local and regional economy, and included several policy objectives intended to enhance freight access and mobility in the short and long term. These include (Hillsborough MPO, 2014):

- Improving access to and from designated freight activity centers;
- Planning transportation improvements on designated freight corridors and truck routes; and
- Promoting efficient roadway design standards for designated truck routes.

The plan also reviewed existing plans to identify, prioritize and allocate funding towards recommended projects that improve freight mobility. Projects include (Hillsborough MPO, 2014):

- Adding truck-related signage
- Adjusting lane widths to accommodate heavy trucks
- Corner radii adjustments

- Traffic signal retiming
- Adding left-/right- turn lanes where appropriate
- Adjusting turn-lane lengths to accommodate large trucks
- Railroad grade separations at key locations

1-4/Selmon Expressway Connector

In collaboration with Florida's Turnpike Enterprise and the Tampa-Hillsborough County Expressway Authority, FDOT constructed a mile-long highway connecting Interstate-4 and the Lee Roy Selmon Expressway. The limited-access tolled interchange was completed in 2014 and serves to improve regional traffic flow and provide truck access directly into Port Tampa Bay (Florida Department of Transportation, 2009b; Willman, 2012). The connector allows trucks to bypass historic Ybor City en route to the port, which improves truck mobility and reduces the impacts of heavy vehicles on surface streets and neighborhoods (Florida Department of Transportation, 2009b; Willman, 2012).

City of Tampa Truck Routes

In 2011, the City of Tampa updated its truck route system based on the Citywide Truck Route Study (City of Tampa, 2011b). The study's recommendations are based on changes in land use and transportation since the system was originally enacted in 1989, as well as various enforcement and signage needs. The system was updated to designate "specific roads in the central business district as truck routes, rather than the prior blanket inclusion of all CBD roads" (City of Tampa, 2011a). For more information on Tampa's truck routes, see Section 3.1.1 "Designated Truck Routes").

Stakeholder Involvement

Stakeholder involvement has been an integral component of the freight planning process in Tampa. The Goods Movement Advisory Committee provides a forum to discuss freight mobility and economic development issues and initiatives. The committee meets quarterly and is comprised of planners, intermodal agency representatives, economic developers, corporate retailers and the private freight community (Florida Department of Transportation, 2012).

The City of Tampa Truck Route Study was also developed with extensive stakeholder input in the form of interviews with freight carriers, stakeholder meetings, public input meetings, email commenting and workshops (City of Tampa, 2011a). Stakeholder groups included various city departments, county departments, freight carriers, intermodal agencies, economic development groups, and homeowners associations (City of Tampa, 2011a).

Issues & Strategies

The Tampa Bay region has taken important steps to engage the freight community and incorporate freight interests into the broader planning process. Through active

communication with goods movement stakeholders, planning agencies have been able to identify needs and develop strategies to enhance freight mobility locally and regionally.

One noted challenge is the general lack of understanding of the relationship between freight and livability within both the public and private sectors. Freight objectives and land use objectives are often pursued independently, which can increase the potential for inconsistencies. Local planners are addressing this challenge by fostering better integration of transportation and land use planning. The Florida DOT's Tampa Bay Regional Strategic Freight Plan is a testament to this effort. The plan outlines a host of potential strategies to enhance freight mobility and defines land use contexts where these strategies may be appropriate (Florida Department of Transportation, 2012). Some of the strategies being explored include roadway widening, geometric improvements, wayfinding signage and signal retiming (Florida Department of Transportation, 2012).

The recently constructed I-4/Selmon Expressway Connector has had a positive impact on both freight and livability. The connector provides trucks direct access into the Port of Tampa. This improves traffic flow and safety for trucks by reducing conflicts with traffic signals, intersection geometry, and pedestrian and bicycle traffic (Willman, 2012). It also benefits the local community by removing heavy truck traffic from historic Ybor City, thereby reducing neighborhood exposure to unwanted noise and vibrations, and improving walkability (Willman, 2012).

The City of Tampa and Hillsborough County truck route systems are another approach that serves both freight and livability interests (Figure 5). By directing trucks to use roadways suitable to their size and weight, planners can accommodate freight movement while preserving quality of life and character in sensitive areas (City of Tampa, 2011a). Although a designated truck route system provides many benefits, public feedback was a challenge during the Hillsborough County truck route designation process. Some residents expressed concern that designated truck routes would encourage heavy trucks to use local roads in their community. Public outreach and education ultimately addressed these concerns and demonstrated to the residents that they would be unaffected by the truck routes (R. Clarendon, personal communication, February 26, 2015).

The development of Freight Roadway Design Considerations is another key project underway which serves freight and livability interests. The guidelines encourage transportation planners and engineers to consider land use context when implementing street design techniques. In areas with high levels of freight activity, for example, roadway treatments would be designed to accommodate large trucks. This may include wider lanes, paved shoulders, exclusive turn lanes, larger turning radii and fewer multimodal amenities (Florida Department of Transportation, 2015c). Alternatively, in livable community areas there would be fewer truck-friendly designs and more multimodal amenities such as smaller travel lanes, reduced curb return radii, wider sidewalks and landscaping (Florida Department of Transportation, 2015c). In areas with a diverse mix of community and freight activity, compromises in design may be required to accommodate the key users of the roadway (Florida Department of Transportation, 2015c). This context-sensitive approach can ensure roadways are designed with the primary users and intended function in mind.

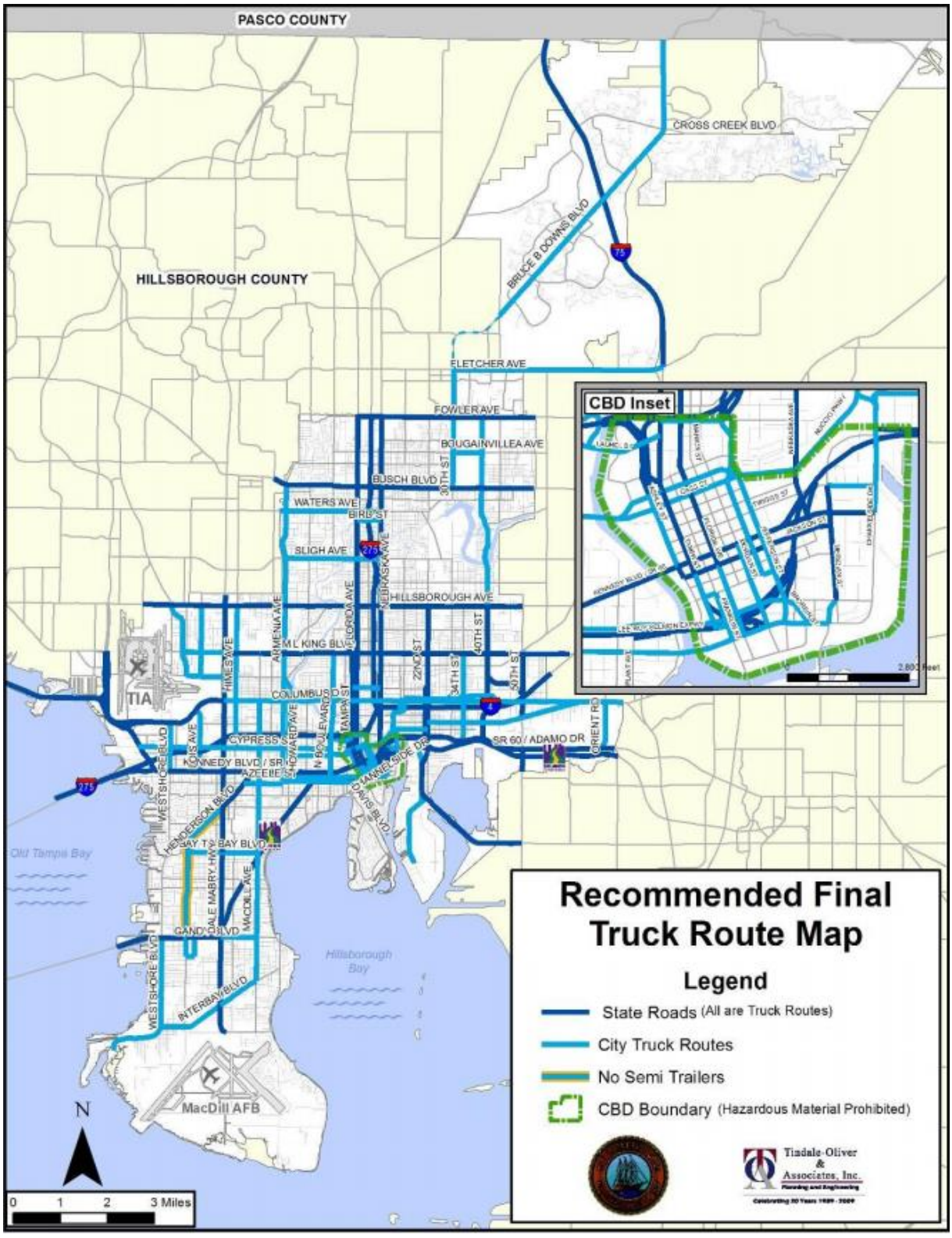

Figure 5. City of Tampa designated truck route system

Source: http://www.tampagov.net/sites/default/files/transportation/files/TruckRts.pdf

2.1.3 Lessons Learned

The Tampa case study has provided several useful lessons. One main takeaway is that integrating freight considerations into the planning process can enhance freight mobility while also promoting livability objectives. For example, the development of the I-4/Selmon Expressway Connector directly benefited trucks by providing direct access into the Port of Tampa. Yet, it also was extremely beneficial to historic downtown Ybor City, which experienced fewer truck volumes as a result. The establishment of designated truck routes also served both freight and livability interests. By directing truck traffic towards specific routes, there is greater potential for enhancing livable aspects of non-truck routes.

Another important lesson is the value of freight stakeholder involvement in the planning process. Directly involving freight carriers in data collection promotes a clearer understanding of freight needs and enables decision makers to better address them. Tampa's development of an online Comprehensive Freight Improvement Database that is accessible to multiple planning entities increases the likelihood that freight needs will be taken care of in an efficient manner.

The final key takeaway is the importance of integrating long-range transportation and land use planning on a local and regional scale. Tampa illustrated a host of ways to integrate transportation and land use planning, primarily through its development of Freight Roadway Design Considerations. Establishing context-sensitive street design guidelines not only generates a better understanding of community characteristics and needs, but also provides guidance to transportation engineers on how to incorporate land use into roadway design decisions. By identifying land use context and roadway function in the street design process, planners and engineers can establish priority modes, make wise transportation investments, and better serve the needs of the community.

2.1.4 Contacts

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2.2 SAVANNAH, GEORGIA

2.2.1 Introduction & Background

Savannah, GA is one of the most beloved cities in the United States, achieving broad acclaim for its livability and character. In 2011, Savannah was rated #5 on Livability.com's list of best downtowns. With over 14 historic districts and 94 historic properties, it was rated second in a list of the best cities for historic preservation (Livability.com, 2012). In 2008, it was rated second in a list of best southern cities (City of Savannah, n.d.). Its walkability, historic charm and sense of place all make it a desirable place to live.

Savannah also has unique challenges in addressing local and regional goods movement, as it is one of the two largest freight generators in the state of Georgia, contributing about 10 percent of the state's freight traffic (Georgia Department of Transportation, 2011b). The city is home to the fourth-busiest container port in the United States, the intersection of two major highways, an airport, and major rail yards (Coastal Region MPO, 2014c). The Port of Savannah generates roughly 8,000 truck trips per day, 60 percent of which travel to and from local warehouses (Figure 6) (Georgia Department of Transportation, 2013). Truck traffic is expected to increase due to expansion of the Savannah Harbor and growth in retail distribution space.

Savannah is facing and will continue to face unique challenges as truck travel demand and rail freight movement increases. The region will need to take proactive steps to facilitate efficient freight movement while also maintaining its livability.

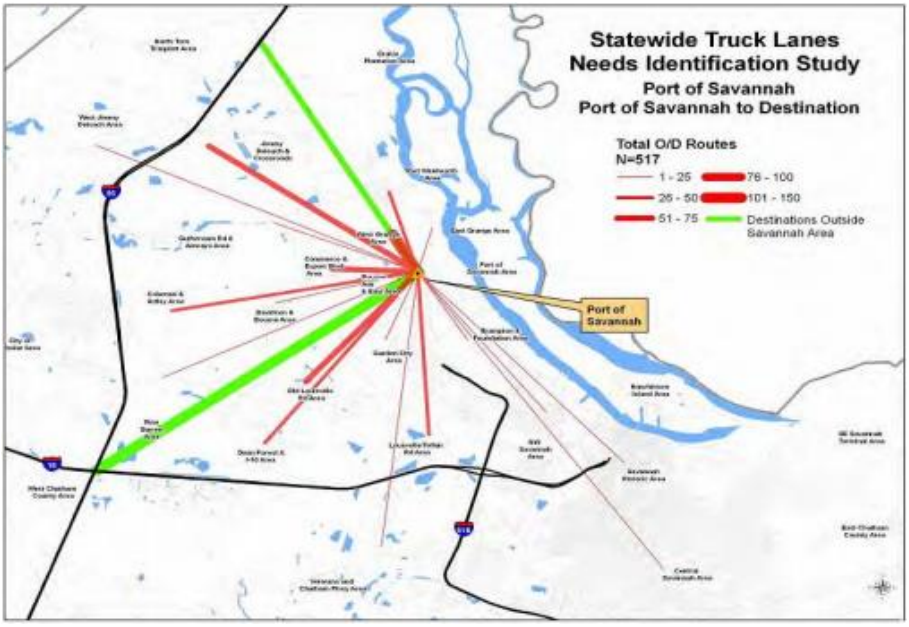

Figure 6. Distribution of Chatham County truck trips from port

Source: Georgia Statewide Freight & Logistics Plan, 2010-2050

2.2.2 Context

Livability Plans & Initiatives

Comprehensive Plan

The City of Savannah and Chatham County jointly adopted the Tricentennial Comprehensive Plan in 2006. The plan outlines a community vision which includes Smart Growth principles such as compact and mixed-use development, walkable communities, sense of place and multimodal transportation (Chatham County-Savannah MPC, 2006). In addition, the city and county are drafting a new, unified zoning ordinance to implement the goals stated in the comprehensive plan (Chatham County-Savannah MPC, 2011).

Complete Streets

Savannah is often considered a model for walkability and bikeability. To maintain that character, the nonprofit group Healthy Savannah, Inc. collaborated with local leaders to develop a Complete Streets Ordinance, which was adopted by the Savannah City Council in January 2014. Per the ordinance, any new road construction will be designed, to the extent practical, with amenities such as sidewalks and bicycle lanes that support multimodal transportation (City of Savannah, 2014).

2040 Total Mobility Plan

In August 2014, the Coastal Region Metropolitan Planning Organization (Coastal Region MPO) adopted a Total Mobility Plan. The plan expands on the Framework Mobility Plan adopted in 2009 and emphasizes sustainability, Complete Streets, context-sensitivity and non-motorized transportation. It represents a continued shift from auto-centric transportation planning towards a multimodal approach. The plan's goal is to address transportation issues more comprehensively by considering community values, land use context, modal options and the broader roadway network.

Thoroughfare Plan

The Thoroughfare Plan is a key feature of the adopted 2040 Total Mobility Plan (M. Wilkes & T. Thomson, personal communication, April 2, 2015). The Thoroughfare Plan, coordinated with the Non-motorized Transportation Plan, is intended to increase accessibility, mobility and connectivity; promote safe and efficient travel; support community development and land use goals; and establish clear expectations for transportation infrastructure (Coastal Region MPO, 2014c). It incorporates context-sensitive design by identifying typical sections based on roadway function, land use context and community character. By establishing context-sensitive design parameters, the plan can support multimodal transportation and enhance community livability. However, the plan has not yet been adopted by the local municipalities (T. Thomson, personal communication, April 2, 2015).

Context-Sensitive Design and Complete Streets

In response to growing concerns about the impact of transportation projects on Savannah's renowned tree canopy and overall quality of life, the CORE MPO adopted the *Context-Sensitive Design Manual* in 2007 to guide future road construction. The manual creates unique roadway design guidelines for various community settings, including the Landmark Historic District, the neighborhood historic district, the traditional neighborhood, suburban communities, gated communities, scenic corridors, and rural or undeveloped corridors (Chatham County-Savannah MPC, 2007). The guidelines show sensitivity to Savannah's character by providing for tree canopies, landscaping, and pedestrian and bicycle facilities in addition to automobiles (Chatham County-Savannah MPC, 2007). The *Context-Sensitive Design Manual* has been adopted by the MPO, but has not been codified by local implementing agencies (T. Thomson, personal communication, April 2, 2015).

The Georgia Department of Transportation (GDOT) has had a context-sensitive design process since 2006. The process emphasizes interdisciplinary cooperation, community involvement, environmental sensitivity, design flexibility, and continuous application of context-sensitive design principles throughout the planning and implementation process (Georgia Department of Transportation, 2006). GDOT also adopted a Complete Streets policy in 2012 (Seskin, 2012).

Connecting Savannah

Connecting Savannah is a transportation planning process initiated in 2004 that aims to identify and develop solutions to key transportation issues by performing meaningful public outreach with stakeholders and the broader community. After several working group sessions, three main transportation problems were identified: east-west connectivity, traffic congestion and lack of alternative modes of travel. Twelve specific actions were proposed to address these issues, including:

- Modifying subdivision and zoning regulations to support multimodal transportation;
- Developing a specified allotment in the MPO annual budget for pedestrian and bicycle improvements;
- Retiming traffic signals to improve traffic flow on key corridors;
- Implementing transportation demand management (TDM) measures;
- Constructing a new parallel roadway connection to relieve traffic congestion on DeRenne Avenue;
- Initiating studies to extend Truman Parkway around Savannah to decrease congestion on east-west routes; and
- Initiating studies to construct a second bridge over the Savannah River (Georgia Department of Transportation, 2010).

These strategies aim to enhance livability by improving bicycle/pedestrian facilities and reducing traffic congestion. The measures also benefit freight movement. By improving east-west connectivity and relieving congestion, freight can move more efficiently (Coastal Region MPO, 2005; Georgia Department of Transportation, 2010).

Freight Plans & Initiatives

Freight Transportation Plan

The CORE MPO is developing a new Freight Transportation Plan to document existing assets and needs and plan for future improvements in accordance with existing community goals. Currently, the MPO has completed several assessments regarding goods movement, performance measures, modal profiles, future growth, and safety and security issues (Coastal Region MPO, 2014b). By incorporating freight into the planning process, Savannah hopes to increase efficiency, promote economic growth and preserve unique neighborhood characteristics (Coastal Region MPO, 2013).

Jimmy Deloach Connector

The Georgia Department of Transportation and the Georgia Ports Authority are developing a new roadway to connect Interstate-95 directly to the Port of Savannah entrance (Figure 7). The Jimmy Deloach Connector, as it was named, would allow trucks to bypass approximately three miles of State Road 21 (Georgia Department of Transportation, 2009). The purpose of the project is to facilitate faster truck movement to and from the port and accommodate increasing truck traffic resulting from the port expansion. It would also improve livability by redirecting heavy vehicles to a more appropriate route and reducing traffic congestion on State Road 21 (Georgia Department of Transportation, 2009). Ideally, the connector would be a limited-access roadway to better expedite truck traffic. However, it will not be access-controlled and will have a traffic signal, reducing its potential benefits to trucks.

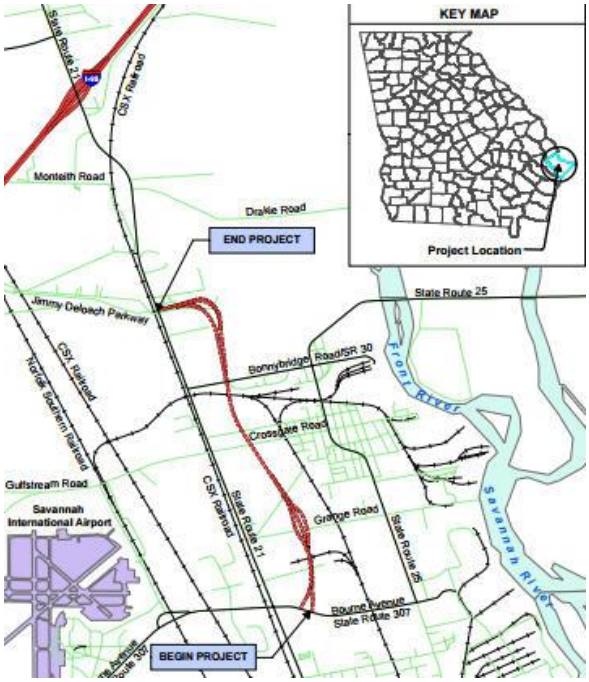

Figure 7. Project concept for Jimmy Deloach Connector

Source: Georgia Department of Transportation, 2009

Cordele Intermodal Center

In 2010, the Georgia Ports Authority and Cordele Intermodal Services formed a partnership to develop the first of a network of intermodal facilities connecting to the Port of Savannah (Georgia Ports Authority, 2014). The new intermodal center, which opened in 2012, links to Savannah by rail and is in close proximity to Interstate 75, Georgia Route 300 and the Heart of Georgia Railroad (Figure 8) (Georgia Department of Transportation, 2011a; State of Georgia Senate Research Office, 2007). The intent of the intermodal center is to promote greater use of rail instead of trucks, thereby allowing the Port of Savannah to increase its throughput of containers without increasing truck traffic. This would help reduce greenhouse gas emissions from trucks, improve air quality and reduce freight costs (Georgia Department of Transportation, 2011a). Cordele has grown rapidly since its inception. In 2014, it railed nearly 5,000 containers, compared to 3,500 in 2013, 1,400 in 2012, and 18 in 2011 (Heart of Georgia Railroad, 2015). Cordele's documented success coupled with the growth in container traffic has prompted the Ports Authority to develop a second intermodal center in Northwest Georgia (Mayle, 2015).

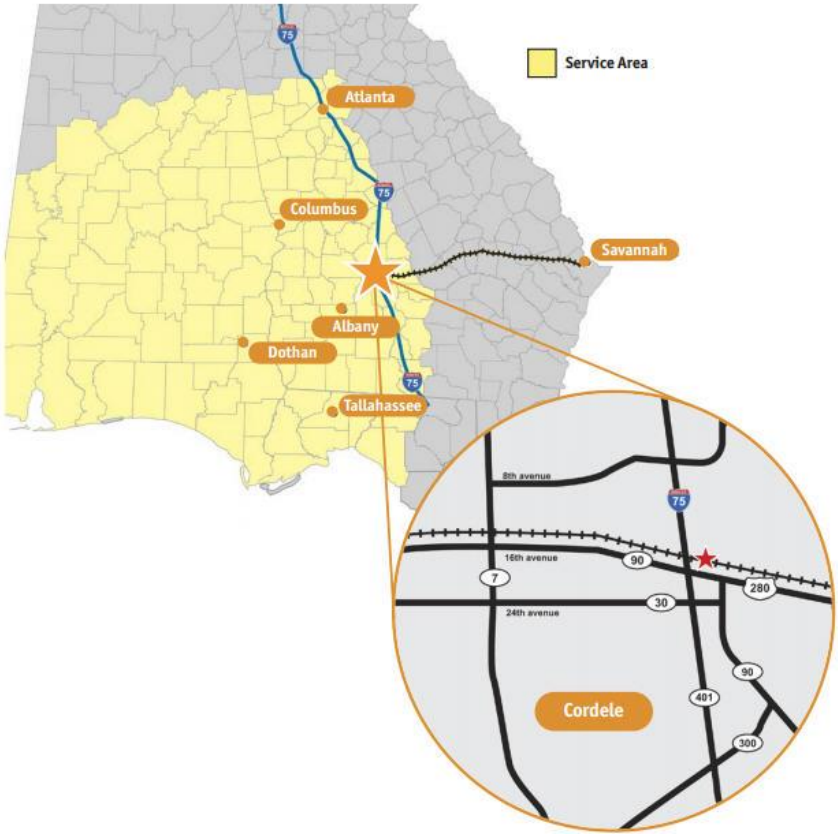

Figure 8. Cordele Intermodal Center

Source: Georgia Ports Authority, 2014

Stakeholder Involvement

In accordance with MAP-21 recommendations, the Coastal Region MPO formed the Freight Advisory Committee in 2014 (Coastal Region MPO, 2013; Coastal Region MPO, 2014b). Comprised of various freight stakeholders from the Port Authority, Intermodal Cargo Services, the City of Garden City, the Savannah Airport Commission and others, the committee can provide valuable perspectives during the freight planning process (Coastal Region MPO, 2014b).

Issues & Strategies

While Savannah's core is community-oriented, it is flanked on the west and east by industrial development. Therefore, freight vehicles must traverse Savannah's core during the first and last miles of their trip (Coastal Region MPO, 2014a; T. Thomson & M. Wilkes, personal communication, April 2, 2015).This creates a number of issues related to freight and livability. These include east-west mobility, traffic congestion, safety concerns and noise pollution. A variety of solutions have been discussed over the past two decades, but issues related to regional coordination, political climate and lack of resources have limited most efforts (T. Thomson & M. Wilkes, personal communication, April 2, 2015).

The three primary corridors for east-west travel are DeRenne Avenue, Victory Drive and President Street (which turns into Bay Street). These routes cannot sufficiently accommodate the volume of east-west traffic and are frequently congested. DeRenne Avenue is an extension of Interstate 516, and is a major east-west commercial corridor that links two major hospitals, employment centers and the Hunter Army Airfield (Georgia Department of Transportation, 2010). Peak-hour traffic congestion and resulting safety issues were identified as major public concerns during the Connecting Savannah public engagement process (Coastal Region MPO, 2005; Love, 2011c).

To address these issues, the City of Savannah and Georgia DOT completed a signal retiming project to facilitate traffic flow, and the Chatham County-Savannah Metropolitan Planning Commission launched the Coastal Commuters ride-matching system. Additionally, the MPO and City launched Project DeRenne, which involves the construction of the four-lane Hampstead Avenue Connector (also known as the "Boulevard Option") to provide a parallel reliever route for the western portion of DeRenne Avenue (Figure 9) (Love, 2011c). However, public concerns over displacement and declining property values have impeded the project (T. Thomson & M. Wilkes, personal communication, April 2, 2015).

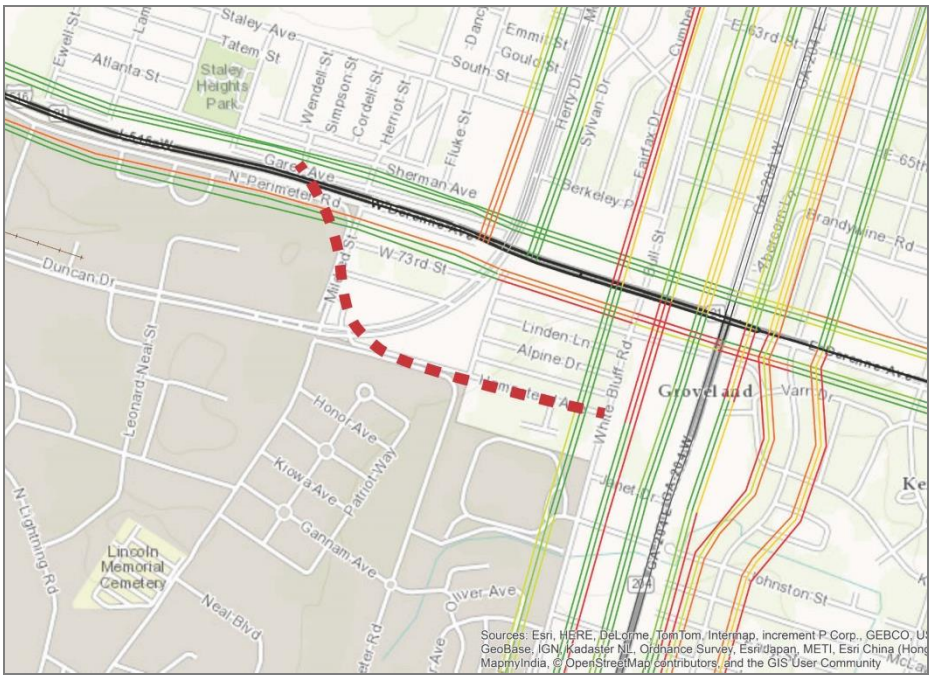

Figure 9. Proposed Hampstead Avenue Connector ("Boulevard Option")

Victory Drive and President Street are the only routes that connect downtown Savannah with the coastal island communities (T. Thomson & M. Wilkes, personal communication, April 2, 2015). Congestion along these corridors is a significant issue due to traffic volumes and delays at railroad crossings. Approximately six trains carrying roughly 6,000 rail cars cross President Street and Victory Drive daily to reach the industrial areas east of downtown (Georgia Department of Transportation, 2010). The City of Savannah reached an agreement with the rail operator to prohibit trains crossing during peak hours. However, the rail operator cannot always honor this agreement and the problem persists. There are limited options to address this issue on Victory Drive as it is a constrained corridor lined with historic trees and buildings (Figure 10). A grade separation was proposed for the rail crossing at President Street, but its proximity to the Truman Parkway overpass made it impossible to engineer (T. Thomson, personal communication, April 2, 2015).

Figure 10. Victory Drive
Source: CORE MPO, 2015

Another proposed solution to improve east-west mobility involved extension of both ends of Truman Parkway to loop around Savannah and provide additional east-west corridors (Figure 11) (Coastal Region MPO, 2005). Thus far, the southern end of the extension has been completed (T. Thomson, personal communication, April 2, 2015). However, the northern extension, which would involve the construction of a bridge over the Savannah River, has yet to be studied due to insufficient resources (Love, 2011b).

Another challenge is the volume of truck traffic around the Port of Savannah. In 2009, State Road 21 carried approximately 24,000 vehicles per day, 35 percent of which were trucks (Georgia Department of Transportation, 2009). An estimated 76 percent of those trucks were destined for the Port (Georgia Department of Transportation, 2009). With the projected increase in truck traffic due to the Savannah Harbor Expansion Project, congestion on SR 21 and elsewhere would only worsen (Georgia Department of Transportation, 2009).

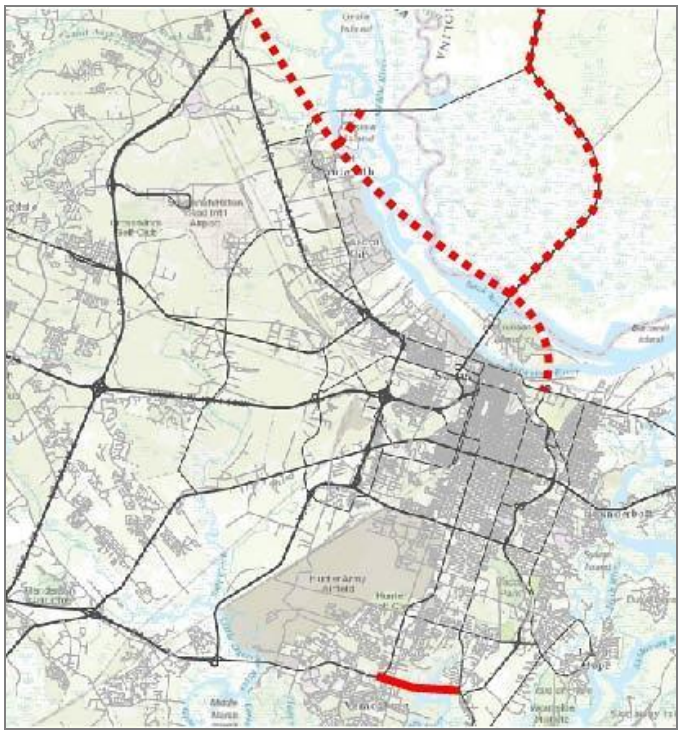

Figure 11. Map of the Truman Parkway extension

To address this issue, the Georgia Department of Transportation and the Georgia Ports Authority proposed the construction of a connector route between the Jimmy Deloach Parkway and Bourne Avenue/SR 307 (Figure 12). The Jimmy Deloach Connector would allow trucks to bypass a three-mile section of SR 21, improve truck travel times, reduce congestion and reduce harmful emissions.

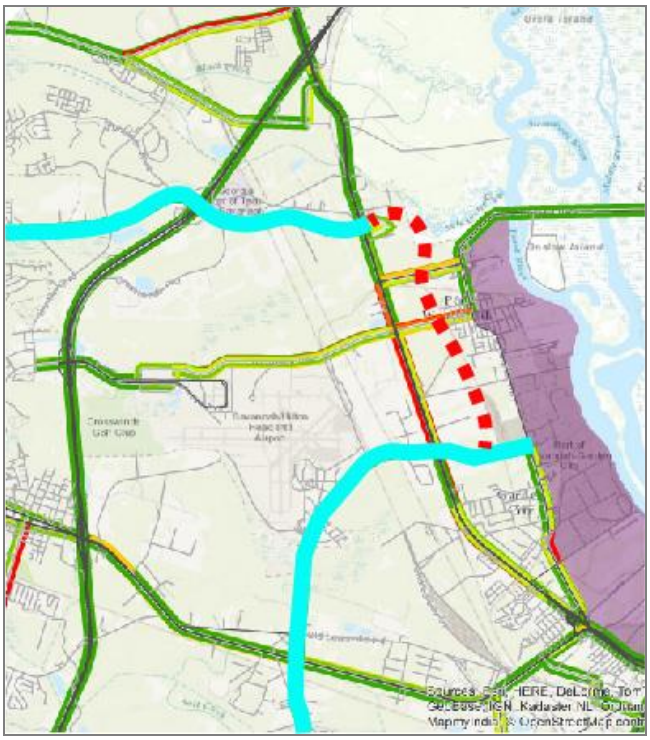

Figure 12. Proposed Jimmy Deloach Connector outside the Port of Savannah

Bay Street is a prime example of conflicts between freight and livability. Bay Street is a tourist-oriented, walkable boulevard in the heart of the historic district. However, it is also the primary east-west route for trucks traveling across downtown to and from I-95 and I-16 (Figure 13). In 2002, Bay Street carried a volume of 22,000 to 24,000 vehicles per day, of which more than 10 percent were heavy vehicles (Chatham County-Savannah MPC, 2002). The City has implemented some measures to address these conflicts, including lowering the speed limit and directing trucks to use inside lanes to reduce conflicts with parked cars and pedestrians (Love, 2011a). However, this volume of heavy vehicle activity remains incompatible with the desired ambience of the historic district and creates major safety concerns (Figure 14) (Chatham County-Savannah MPC, 2002).

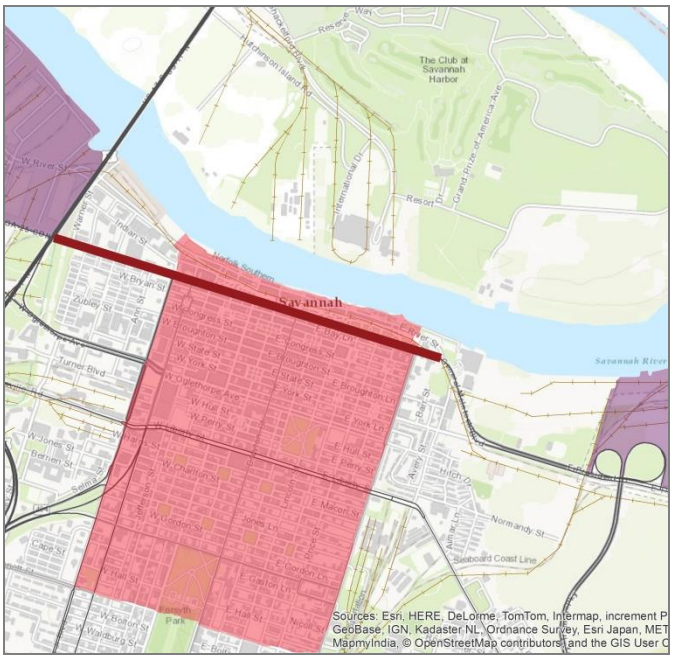

Figure 13. Bay Street

Figure 14. Freight movement along Bay Street

Not only is the volume of truck traffic in the historic downtown core problematic, but the cargo being transported creates issues as well (T. Thomson, personal communication, April 2, 2015). Southern LNG is located on Elba Island on the Savannah River approximately five miles east of downtown. The facility imports and stores liquefied natural gas mainly via pipeline. In 2010, Southern LNG applied to the Federal Energy Regulatory Commission for approval to reopen its truck-loading facility to transport an estimated 58 truckloads per day of liquefied natural gas through Chatham County (Figure 15) (Landers, 2010). This prompted local opposition over concerns about public safety in the event of a spill or fire. Ultimately, the company rescinded the proposal and now plans to abandon and remove its truck-loading facilities at Elba Island, and instead to utilize pipelines and tanker ships for LNG transport (Landers, 2014). However, recent efforts to convert the import facility to an export facility have prompted new concerns over truck traffic. The project will require approximately 200 truck trips per month to deliver gasoline and refrigerants for the ongoing liquefaction process (Landers, 2015).

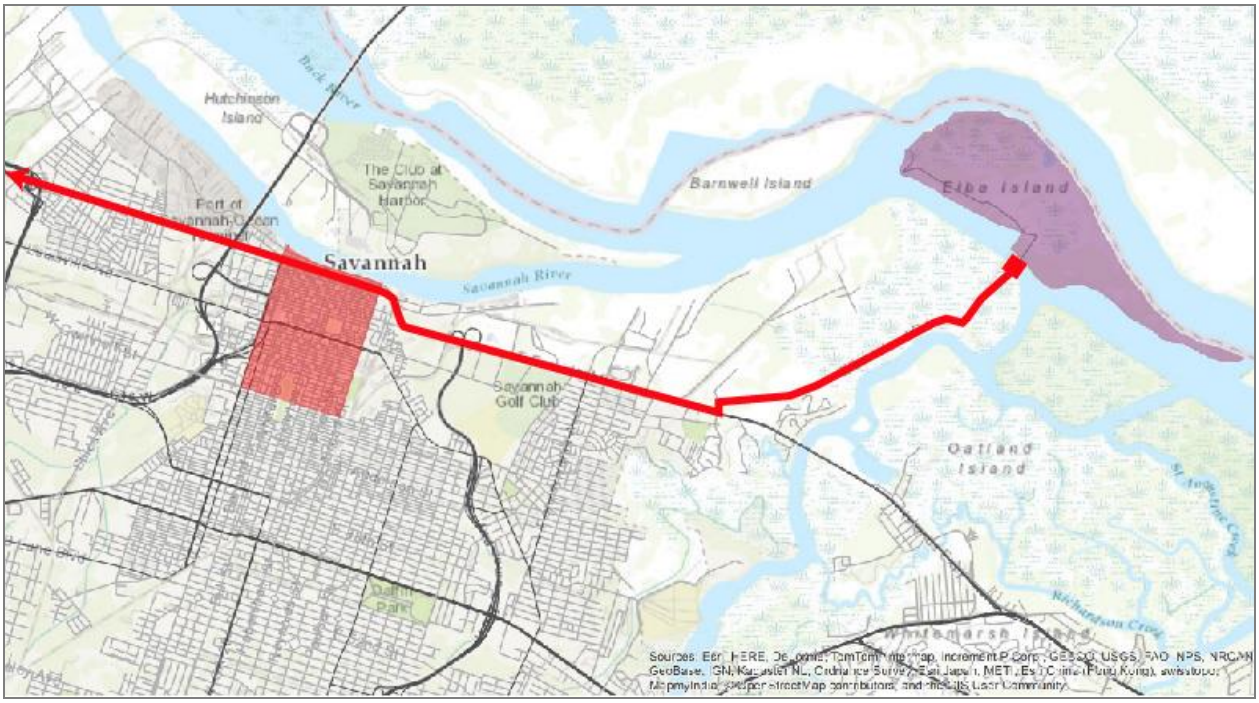

Figure 15. Truck route for liquefied natural gas drayage

Savannah also faces challenges related to railroad conflicts. Several railroads, including CSX, Norfolk Southern and Georgia Central, traverse Chatham County and Savannah's historic neighborhoods and downtown core (Figure 16). There are, therefore, dozens of grade crossings. The Federal Railroad Administration requires trains to sound their horns prior to approaching each crossing for safety purposes, which creates unwanted noise and vibrations (Curl, 2013). To mitigate these impacts, the city reached an agreement with the train operator that trains would not run between 11 p.m. and 5 a.m. (Curl, 2013). However, noise remains an issue during other hours of the day. To address

this ongoing challenge, the City of Savannah is considering a quiet zone study for the future (T. Thomson, personal communication, April 2, 2015).

Figure 16. Railroad crossing in central Savannah

Conflicts have also occurred between industrial and non-industrial land uses in smaller cities on the western outskirts of Savannah. These areas are experiencing residential development and industrial development in the form of distribution centers and warehouses. Residents of these areas have expressed concerns regarding the growth in noise pollution and truck traffic (T. Thomson, personal communication, April 2, 2015). These conflicts could be avoided or minimized through proactive attention to freight and other transportation considerations in land use planning and zoning decisions. Enhanced coordination on regional land use and transportation planning could also be beneficial.

2.2.3 Lessons Learned

The Savannah case study provided several valuable lessons. One key takeaway is the importance of regional coordination in achieving community goals. Savannah is characterized by strong citizen engagement in neighborhood issues, yet exhibits relatively little evidence of

coordination on regional land use and transportation issues. This has increased the difficulty of achieving viable solutions to the growing freight needs and issues in the area.

Another critical lesson is the need to integrate transportation and land use planning decisions and to think proactively about freight. Growing conflicts between truck traffic from industrial sites and residential neighborhoods northwest of Savannah and near the Port are a prime example. By coordinating local land use decisions with regional planning objectives, these conflicts can be minimized or avoided. The freight and livability conflicts on Bay Street are another example. Siting industrial uses east of the city has stimulated truck traffic across the historic downtown and imposed negative externalities on the local community. Consideration of the broader context in the siting of truck-dependent industrial uses could have minimized conflicts on Bay Street and other livable corridors in Savannah.

Another valuable lesson is the high cost of mitigating freight and livability conflicts after the fact. With many communities facing limited resources, high-cost projects are often infeasible. Such is the issue in Savannah: the Truman Parkway northern extension might improve east-west connectivity, but is too costly for the region to explore further. The high cost and difficulty of engineering a grade-separated rail crossing at President Street to resolve traffic congestion at the crossing is another example. Should the efficiency of the transportation system in moving people and freight continue to deteriorate, this will adversely affect both the livability and economy of the area.

2.2.4 Contacts

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- Tom Thomson, P.E., AICP, Executive Director, Chatham County-Savannah MPC
- Wykoda Wang, Transportation Administrator, Chatham County-Savannah MPC
- Randy Weitman, Manager of Engineering Services, Georgia Ports Authority
- Tom McQueen, Office of Planning, Georgia Department of Transportation

2.3 SAN ANTONIO, TEXAS

2.3.1 Introduction & Background

In 2013, San Antonio was the seventh most populous city in the United States with over 1.4 million people (U.S. Census Bureau, 2014). The city joins Dallas-Fort Worth, Austin and Houston in the "Texas Triangle," a commonly cited U.S. mega-region with social, economic, demographic, environmental and cultural ties (FHWA, 2014b). San Antonio is a key crossroads and crossrail location at the junction of an international transportation network connecting the West Coast to the East Coast and Mexico to Canada (Alamo Area MPO, 2014; Texas Department of Transportation, 2008). The city is home to three interstate highways, five major rail lines, multiple airports and an inland port (Texas Department of Transportation, 2008). Freight, therefore, plays a central role in the strength of the local and regional economy (Alamo Area MPO, 2014).

Figure 17. Automotive industry corridor

Source: Automotive News Data Center, TIP Strategies, Inc., (cited in Texas Department of Transportation, 2008)

Over the next 20 years, the San Antonio region is expected to double its freight tonnage due to increased NAFTA trade, which will further strain the already-congested roadway network (Alamo Area MPO, 2014; Texas Department of Transportation, 2008). This places enormous pressure on the region to develop strategies to support freight mobility. San Antonio is making

strides to address these challenges by incorporating freight needs into its metropolitan transportation plan and developing a regional freight study with the Texas Department of Transportation (Alamo Area MPO, 2014; Texas Department of Transportation, 2008).

San Antonio is also encountering tremendous growth. The San Antonio region is expected to attract over one million new residents by the year 2040 (Alamo Area MPO, 2014), presenting both a challenge and an opportunity to address issues of density, mobility and quality of life. The MPO recently updated its metropolitan transportation plan, emphasizing expansion of multimodal options to serve the growing population (Alamo Area MPO, 2014). The City of San Antonio is updating its comprehensive plan, which supports multimodal transportation as well as sustainability, efficient land use and improved quality of life (City of San Antonio, 2015). Additionally, Mayor Julian Castro declared this period the "Decade of Downtown," initiating a public reevaluation of the future of San Antonio's urban core.

To maintain economic competitiveness, San Antonio will need to accommodate the growing demand for efficient movement of people and freight. Yet as freight traffic and population simultaneously increase, conflicts between freight movement and livability goals are likely to arise. Planning experiences in San Antonio can provide useful perspective on balancing freight and livability objectives.

San Antonio's Place in the Automotive Industry

San Antonio is part of an international vehicle manufacturing and automobile parts supply network. Of the 18 vehicle assembly plants planned or built in the United States since 1990, 12 are located along a corridor that spans from Mexico City to Atlanta (Figure 17). *In 2006, Toyota opened a factory in San Antonio that has increased the level of freight- and distribution-related activity in the region.*

2.3.2 Context

Livability Plans & Initiatives

Mobility 2040 Plan

The Alamo Area MPO updated its metropolitan transportation plan in 2014. The plan, titled "Mobility 2040," identifies a variety of issues facing San Antonio over the next 20 years. Anticipated population growth is expected to overburden an already-congested roadway network, funding shortfalls delay needed capacity projects, and overemphasis on automobiles contributes to unsustainable development patterns (Alamo Area MPO, 2014). In response to these challenges, the plan outlines a variety of strategies to advance walking, cycling and transit use, including public education, bicycle/pedestrian network improvements, and integration of transportation and land use planning (Alamo Area MPO, 2014). This multimodal approach is designed to support improved mobility while stimulating economic development, promoting healthier lifestyles, and enhancing environmental quality and community livability.

Pedestrian Safety Action Plan

The Alamo Area MPO prepared a pedestrian safety action plan in 2012 in response to growing concerns regarding pedestrian safety. In 2010, one in five roadway fatalities in Bexar County was a pedestrian, compared to one in eight nationally (Alamo Area MPO, 2012). The plan includes a variety of goals and best practices to address pedestrian safety issues, but also to promote more walking in general. Goals include increasing sidewalk connectivity, educating the public on pedestrian behavior and safety, and maintaining appropriate pedestrian facilities. Recommended strategies include sidewalk buffers, driveway consolidation, road diets, high-visibility crosswalks, and improved pedestrian amenities such as street trees and proper lighting.

SA2020

SA2020 is a nonprofit organization that initiated a series of public forums in 2010 to establish goals for the future of San Antonio. SA2020's vision is the outcome of the ideas and needs of the thousands of people who participated in visioning process, and represents a significant step towards enhancing San Antonio's livability. The SA2020 Report outlines performance targets for several focus areas, including transportation, downtown development, growth management, arts and culture, and environmental sustainability (SA2020, 2011). It also lists potential partners, ways to get involved, personal commitments, and how the focus areas interrelate (SA2020, 2011). The SA2020 vision is the foundation for SA Tomorrow, San Antonio's comprehensive plan.

SA Tomorrow

SA Tomorrow is the City of San Antonio's multifaceted planning effort to guide the city toward smart, sustainable growth. It is based on the SA2020 vision and includes three separate plans. The Comprehensive Plan, San Antonio's first since 1997, will address a variety of policy areas, including land use, urban design, economic development and housing (SA Tomorrow, 2015b). The Sustainability Plan will be grounded in social, economic and environmental sustainability, and will address issues such as environmental quality, economy, energy, food security, solid waste and transportation (SA Tomorrow, 2015d). The Multimodal Transportation Plan will address all modes of transportation, including auto, freight, rail, transit, biking and walking, and will develop a transportation strategy centered on sustainability (SA Tomorrow, 2015c). Together, these plans are intended to implement the SA2020 vision, preserve San Antonio culture, and increase community livability (SA Tomorrow, 2015a). The SA Tomorrow planning process began in 2015 and is expected to conclude in mid-2016.

Strategic Framework Plan for the Center City

The Strategic Framework Plan for the Center City was developed and adopted in 2011 as a guide for future downtown planning and development decisions by the City, business leaders and private investors in downtown San Antonio. Currently, the Center City faces several challenges, including a limited residential population, lack of coherence and quality in urban design, and limited commercial activity. There is also an imbalance between resident and visitor destinations, with downtown retail catering

mainly to tourists. To increase livability and promote greater economic development, the plan outlines a series of recommendations. These include catalyzing growth through housing investments, creating pedestrian-oriented retail and cultural corridors, creating a Complete Streets network, enhancing public open space, promoting mixed-use development, and capitalizing on existing community assets such as the River Walk.

Downtown Design Guide

San Antonio's Downtown Design Guide was developed in 2014 in the wake of renewed commercial, residential and cultural activity in the urban core (City of San Antonio, 2014). The guide is intended to encourage design consistency, enhance quality of life, increase sustainability and foster economic development in downtown. It incorporates key livability principles such as walkability, mixed uses, compact development, environmental quality and sense of place by requiring streetscape improvements, promoting pedestrian-scaled design, standardizing architectural treatments and supporting low-impact development.

Complete Streets

In 2009, the Alamo Area MPO adopted a resolution supporting a Complete Streets Policy to guide roadway design, construction, operation and maintenance to promote safe and convenient access for all users (Alamo Area MPO, 2009). In 2011, the San Antonio City Council adopted a similar policy to implement the SA2020 vision for a multimodal environment (City of San Antonio, 2011). The City is also incorporating other strategies in its Complete Streets framework by implementing traffic calming measures and emphasizing access management (City of San Antonio, 2012). San Antonio's investment in Complete Streets represents a context-sensitive approach to transportation planning, and is intended to decrease congestion, expand travel options, improve public health, and support vital neighborhood and commercial centers (City of San Antonio, 2011; City of San Antonio, 2012).

Freight Plans & Initiatives

2040 Metropolitan Transportation Plan

The 2040 Metropolitan Transportation Plan, recently adopted by the Alamo Area MPO, includes a chapter dedicated to freight. The plan identifies and maps a variety of issues related to congestion, safety, deliveries, rail crossings, physical barriers and conflict points (Alamo Area MPO, 2014). However, the plan does not yet include goals to improve freight mobility. During the plan's preparation, the MPO worked with the Texas Department of Transportation (TxDOT) to develop freight performance measures for the Texas Freight Mobility Plan. When these measures are established, the MPO, as a member of the Texas Freight Advisory Committee, will continue to work with TxDOT to define policies and investments to support freight movement (Alamo Area MPO, 2014).

San Antonio Region Freight Study

The San Antonio Region Freight Study was developed by TxDOT in 2008. The study provides a regional freight profile and evaluates alternatives to improve freight mobility (Texas Department of Transportation, 2008). However, the primary focus of the study is on rail issues. The Alamo Area MPO plans to conduct another freight study that also incorporates truck-related issues through the Unified Planning Work Program (I. Martinez, personal communication, June 30, 2015).

Texas Freight Mobility Plan

In 2014, TxDOT developed the state's first comprehensive and multimodal Freight Mobility Plan. The plan is intended to improve the state's economic competitiveness by enhancing freight mobility while maintaining local livability. According to the plan, key issues that must be addressed include congestion on key freight corridors, aging infrastructure, dimensional issues, poor roadway geometry, poor connectivity, and lack of understanding of freight needs (Texas Department of Transportation, 2013d).

Port San Antonio

Port San Antonio is an inland port located approximately six miles southwest of downtown (Port San Antonio, 2015; Texas Department of Transportation, 2013c). It is a privately managed, publicly supported redevelopment initiative that converted the former Kelly Air Force Base into an international logistics platform (Port San Antonio, 2015; Texas Department of Transportation, 2013c). The 1,900-acre complex houses over 70 public and private organizations, employs approximately 13,000 people and contains facilities such as warehouses, offices, hangars, training centers and workforce housing. It is strategically located within a foreign trade zone with direct air, rail and highway access (Port San Antonio, 2015).

Though privately managed, the port has received much support from the local government (Port San Antonio, 2014a). The City of San Antonio allows the port to conduct its own plan review and issue building permits, thereby expediting the permitting process and encouraging new development within the complex (Port San Antonio, 2014a). The city and county also provide certain tax exemptions and abatements for port businesses (Port San Antonio, 2014a). In turn, the port has provided immense economic benefits to the region. In 2010, Port San Antonio delivered more than $4.2 billion in economic benefits to the San Antonio region. It has also provided education and training opportunities and has generated a large, Hispanic middle class (P. Felici, personal communication, July 1, 2015).

Stakeholder Involvement

The Alamo Area MPO invited stakeholder participation during development of its long-range transportation plan. The MPO Freight Advisory Committee held a workshop to catalog freight issues, which were then spatially and categorically organized using GIS. The resulting map allows agencies to identify freight needs and incorporate them

into regular maintenance projects (Figure 18) (I. Martinez, personal communication, June 30, 2015).

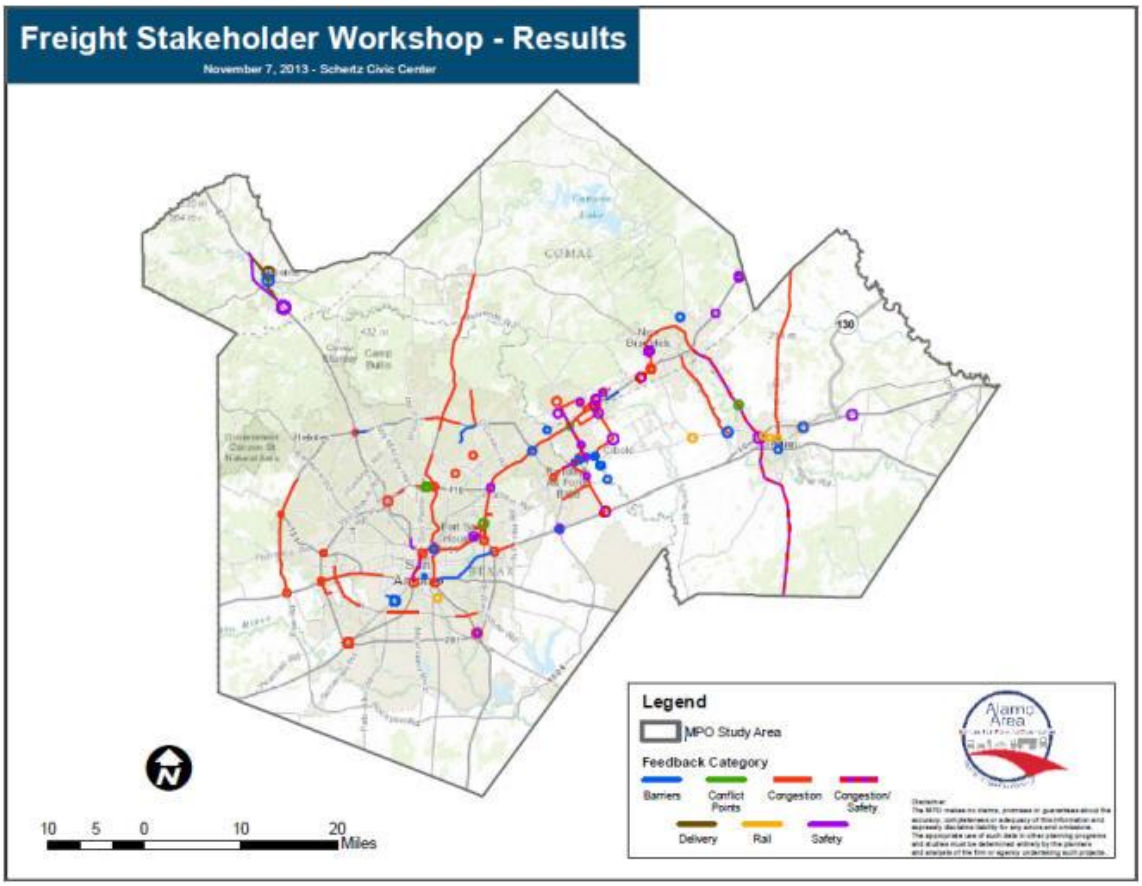

Figure 18. Freight hotspots as reported by stakeholders

Source: Alamo Area MPO, 2014

Issues & Strategies

The San Antonio region is currently grappling with a number of issues, the most prominent of which relates to roadway congestion. Interstate 35, which serves as the major artery for the state of Texas, is the busiest corridor in the region for both cars and trucks, partly due to goods movement from Mexico (Figure 19). These traffic delays create economic losses for freight movers, and have environmental and quality of life impacts for residents (Texas Department of Transportation, 2013b). Traffic congestion is expected to worsen with projected population growth, thereby increasing delays for trucks and hampering local livability (Figure 20) (Texas Department of Transportation, 2013b). Several strategies are currently being explored to address this challenge.

Figure 19. Texas I-35 corridor

Source: I-35 Corridor Advisory Committee, 2011.

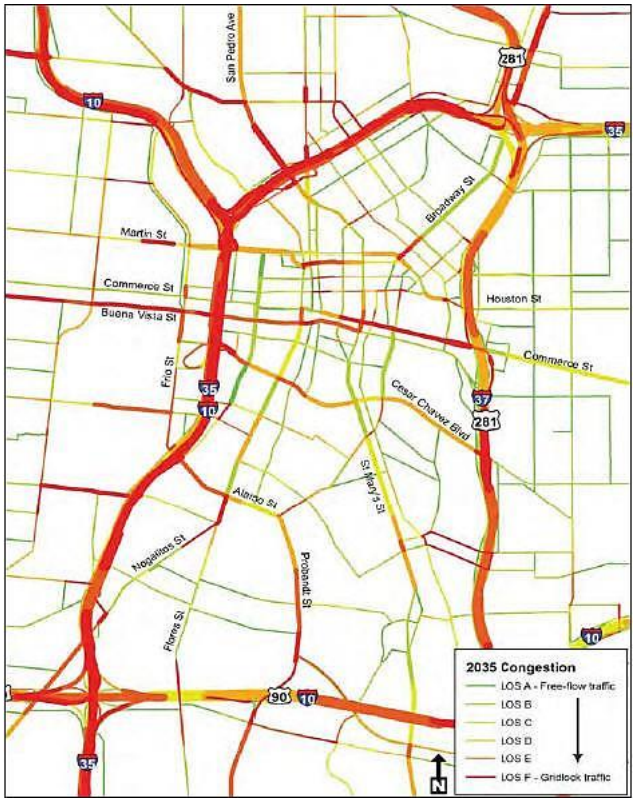

Figure 20. 2035 projected levels of service around central San Antonio

Source: Texas Department of Transportation, 2013a

A variety of strategies along I-35 within central San Antonio are being explored, including travel demand management, intelligent transportation systems, network improvements, capacity enhancements, truck-only lanes and managed lanes (Texas Department of Transportation, 2013a). The redesignation of I-35 as a local rather than a through route, and the addition of elevated lanes to accommodate through traffic in the central core, are also being considered (Figure 21) (Texas Department of Transportation, 2013a). However, Bluetooth trip data indicate that a majority of northbound traffic on I-35 is destined for San Antonio and, therefore, construction of elevated through lanes may not be warranted (I. Martinez, personal communication, June 30, 2015).

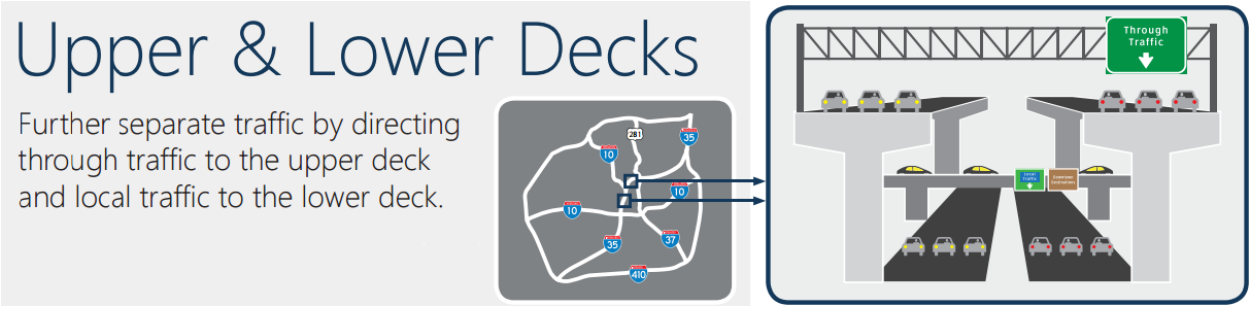

Figure 21. Elevated through lanes under consideration in downtown San Antonio

Source: Texas Department of Transportation, 2013a

Local planning agencies are exploring the possibility of converting the freight rail line that runs along I-35 into a commuter rail line, and diverting the freight rail traffic to a new rail line south of downtown. However, the project is cost prohibitive (estimated at over $2 billion), and could raise environmental justice concerns due to the large population of low-income minority residents in south San Antonio.

Strategies to reduce congestion on I-35 are also being explored outside of downtown San Antonio. A toll road (State Highway 130) was recently constructed to bypass San Antonio and Austin and relieve traffic on I-35 (Figure 22). However, many trips on I-35 are destined for the city and the bypass is 35 miles east of central San Antonio, making it inconvenient for most drivers (Batheja, 2013). Revenue shortfalls on the segment east of the city have prompted increased signage promoting it as an alternative to I-35, as well as discounted tolls for large trucks (Batheja, 2013). Portions of I-10 and I-410 now share the SH130 designation to improve wayfinding.

Planners are considering construction of a connector route from I-35 in New Braunfels to make SH130 a more viable alternative to I-35 (Figure 22), but its precise location is still under discussion (I. Martinez, personal communication, June 30, 2015). Improved arterial connections between SH130 and I-35 are also being considered to improve access to SH130.

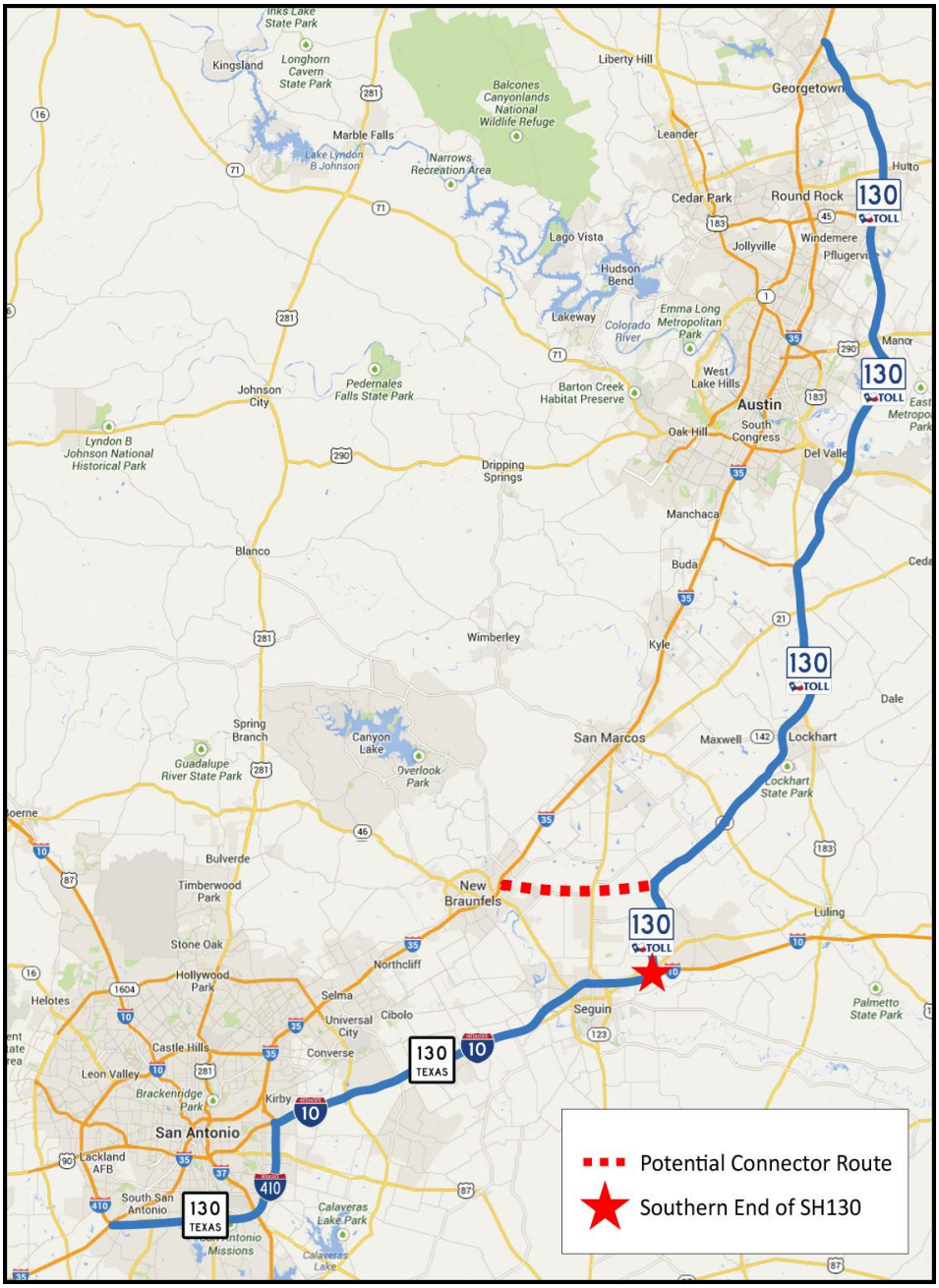

Figure 22. State Highway 130 bypass and possible connector

Source: SH130 Concession Company, LLC, n.d.

Another freight and livability issue is the volume of truck traffic generated by the Port of San Antonio, an inland port sited at the former Kelly Air Force Base. Of particular concern to the community was the heavy truck traffic through school zones and residential neighborhoods on Quintana Road and Cupples Road (P. Felici, personal communication, July 1, 2015). After researching the issue, the Port discovered that many

trucks used these streets to access the highway from the railport and vice versa. To address the unwanted truck traffic, the Port shared the cost of a new overpass that would provide a direct connection between Highway 90 and the railport. A truck route system was also established that guided trucks towards appropriate routes and prohibited truck traffic on Quintana Road and Cupples Road (Figure 23). Wayfinding signage and police enforcement supplemented this strategy and caused a significant reduction in truck traffic on sensitive streets (P. Felici, personal communication, July 1, 2015). This combination of strategies also benefited trucks by enhancing highway access and improving mobility.

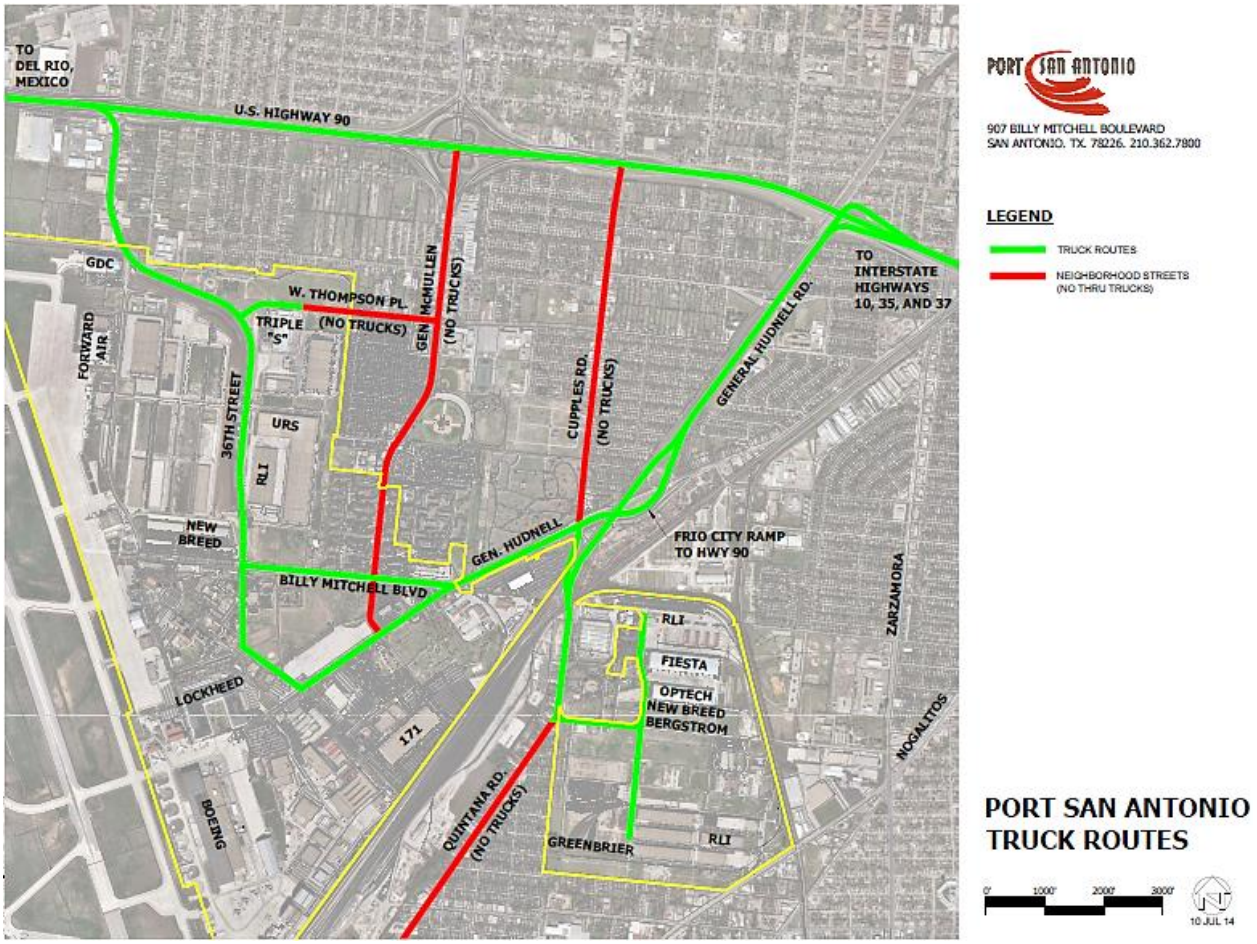

Figure 23. Port San Antonio truck routes

Source: Port San Antonio, 2014b

Truck and neighborhood conflicts also exist outside the Port. In the northwest quadrant of San Antonio, several residential communities were recently developed near a major limestone producer. Trucks hauling the product must therefore travel through new neighborhoods and clash with the desired neighborhood atmosphere (C. Ripps, personal communication, June 30, 2015). There has been some desire to reduce roadway lane widths in the area and add bicycle and pedestrian facilities, though this would reduce

turning radii and diminish freight mobility. Instead, the roadway is being expanded to accommodate both trucks and local residential traffic (C. Ripps, personal communication, June 30, 2015).

An added challenge relates to at-grade rail crossings throughout the city, which create excess noise within residential communities. The City has established some quiet zones where supplemental safety measures are implemented to forego the need to sound train whistles at rail crossings. However, this strategy can be quite expensive and can reduce roadway network connectivity when certain streets need to be closed (T. Wallace, personal communication, June 29, 2015; D. Schipull, personal communication, June 30, 2015).

Finally, one issue that could potentially manifest in the future is the conflict between land uses within downtown San Antonio. Through SA Tomorrow and other livability initiatives, the City is encouraging downtown revitalization and infill development. This could create land use pressures and push industrial uses out of the inner city over time, thereby encouraging logistical sprawl, reducing freight efficiency and eliminating jobs in the central business district.

Fracking and Freight in the San Antonio Region

The fracking boom has had major impacts on freight and livability in the San Antonio region. Oil rigs scatter the landscape in rural counties south of San Antonio, creating thousands of jobs and billions of dollars in economic output. Yet, each oil rig generates approximately 60-70 truck trips daily due to the need for water, sand and waste removal. This has created maintenance challenges on rural roadways not equipped to accommodate such high truck-traffic volumes. It has also raised concerns over roadway safety, environmental impacts and housing affordability (The Texas Tribune, n.d.).

2.3.3 Lessons Learned

The San Antonio case study revealed several important lessons for communities planning for freight and livability. One key takeaway is that lack of readily available data and difficulty processing large amounts of freight data can hinder the development of effective strategies. In the San Antonio example, State Highway 130 was constructed as a bypass route around San Antonio and Austin and was intended to relieve congestion for cars and trucks on Interstate 35. However, there was a lack of awareness of the large proportion of traffic that was destined for the city and, therefore, would not utilize the route (I. Martinez, personal communication, June 30, 2015). As a result, the approach has had limited success.

To increase public knowledge of freight needs and trends, the Texas Department of Transportation is currently developing a Statewide Freight Plan, and the Alamo Area MPO is planning to use TxDOT travel survey data to conduct a freight study through the Unified Planning Work Program. By collecting relevant freight data, the region will be better equipped to develop context-sensitive strategies to integrate freight and livability.

Another lesson relates to the benefits of interagency and public-private cooperation in diagnosing and investing in solutions to freight and livability conflicts. The multilateral approach used to reduce truck traffic on neighborhood streets near the Port proved highly effective in identifying and addressing truck and neighborhood conflicts. In addition, by encouraging industrial development to locate within the inland port area, transportation planning agencies can better serve the infrastructure needs of freight and industry in the area.

The case study also points to the importance of proactively considering freight in land use planning decisions to prevent livability conflicts. The conflicts between residential neighborhoods and nearby limestone quarries could have been avoided or reduced through proactive attention to freight and other transportation considerations in land use planning and zoning decisions. Instead, the community has to make costly retrofits to address roadway congestion on neighborhood streets.

An opportunity to reduce or avoid future conflicts currently exists in downtown San Antonio. San Antonio's comprehensive plan emphasizes the need for urban revitalization and infill development. While this would improve local livability, it could drive out inner-city industrial uses. Consideration for freight-related needs and benefits of these industries early in the planning process would help protect necessary industrial uses and jobs while working to enhance community livability.

2.3.4 Contacts

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- Darcie Schipull, Bicycle/Pedestrian Planner, Texas Department of Transportation
- Clayton Ripps, Advanced Transportation Planning Director, Texas Department of Transportation
- Paco Felici, Vice President of Communications, Port San Antonio

2.4 ALBANY, NEW YORK

2.4.1 Introduction & Background

Freight is an important element of Albany's local and regional economy. Albany is strategically located along Interstate 87 and Interstate 90 between three major international trade points: New York City, Montréal and Boston. New York State is dependent upon the infrastructure in Albany and elsewhere to facilitate goods movement and support economic development (Capital District Transportation Committee, 2007). Additionally, Albany contains three foreign trade zones and an inland port, and is served by multiple Class I railroads, including CSX, Norfolk Southern and Canadian Pacific Railway (Capital District Transportation Committee, 2007). All of these factors strengthen Albany's role in regional and international trade and the world economy (Figure 24).

Albany has implemented a number of initiatives related to freight and livability. The City of Albany's recently adopted comprehensive plan emphasizes livability as a central theme and gives some attention to freight (City of Albany, 2012). Meanwhile, the Capital District Transportation Committee (CDTC) actively supports goods movement through a variety of projects while working to preserve community livability.

Because commercial traffic is expected to increase rapidly in the region over the next 20 years, planners are presented with both a challenge and an opportunity to reconcile freight and livability objectives. The CDTC has answered that challenge by adopting a forward-thinking strategy to support goods movement now and in the future. The growing role of freight in the local and regional economy and the progressive approach to freight planning therefore qualifies Albany as a valuable location to examine the integration of freight and livability.

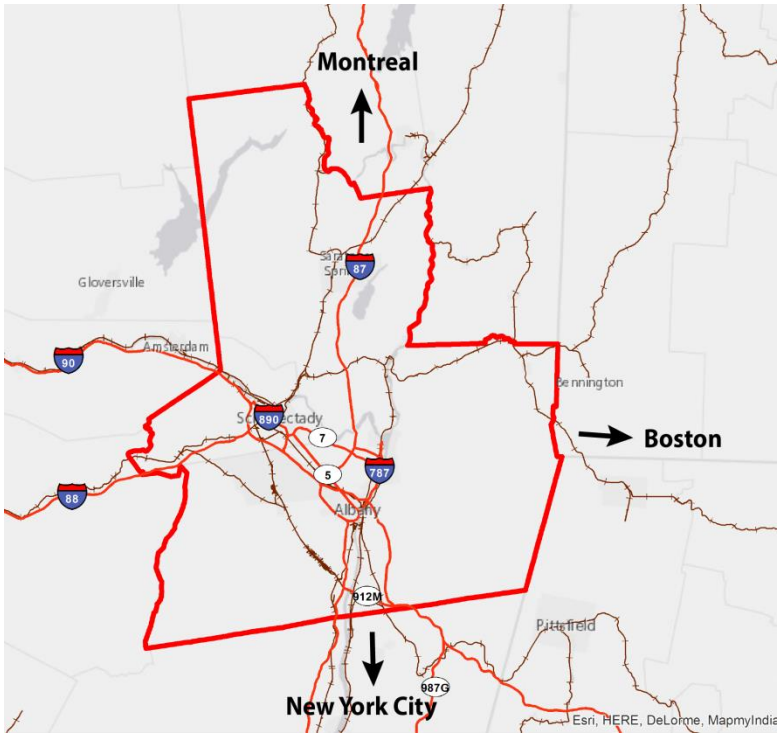

Figure 24. Capital District Transportation Committee boundary

2.4.2 Context

Livability Plans & Initiatives

City of Albany Comprehensive Plan

In 2012, the City of Albany adopted its first comprehensive plan. The plan, titled "Albany 2030," outlines a vision of Albany in 20 years, where the city has built on its history and resources to become a global model for sustainable revitalization and livability. The vision is predicated on six major components: safe livable neighborhoods; a model educational system; a vibrant urban center; a multimodal transportation hub; a green city; and a prosperous economy (City of Albany, 2012). These components are then translated into systems, such as transportation and community form. Heavy emphasis is placed on the interconnectedness of these systems to promote a comprehensive, integrated planning process (City of Albany, 2012).

The Albany 2030 Comprehensive Plan addresses a variety of topics related to livability, including land use patterns, urban design, walkability, neighborhood revitalization, economic development, cultural vibrancy and environmental sustainability (City of Albany, 2012). Recommended actions include creating a context-sensitive design manual and implementing the Bicycle Master Plan and Neighborhood Revitalization Strategic Plan. Action items currently underway include a comprehensive zoning update and the development of multimodal design guidelines (City of Albany, 2012).

New Visions 2040

The CDTC recently updated its long-range regional transportation plan known as New Visions 2040. A central theme of the plan is enhancing livability through targeted transportation investments based on community context and collective vision (Capital District Transportation Committee, 2015c). The plan emphasizes fostering a "quality region" that promotes sustainable development, urban revitalization, multimodal transportation, environmental protection, economic development and sense of place. It also accentuates the importance of integrating transportation and land use planning to reduce conflicts and achieve community goals. The Complete Streets element of the plan is one example of this context-sensitive approach. Recommendations include the development of a Complete Streets policy and training program, use of Complete Streets design guidelines, and encouragement of Complete Streets projects through the Transportation Improvement Program (TIP) Project Candidate Merit Evaluation Process.

Community and Transportation Linkage Planning Program

In 2000, the CDTC initiated the Community and Transportation Linkage Planning Program to perform public outreach and implement the long-range transportation plan. The Linkage Program promotes interagency partnerships by providing technical and financial assistance for local planning studies that support the integration of transportation and land use. Studies must be consistent with a least one of the program strategies (Capital District Transportation Committee, 2015d):

1. Support urban revitalization and redevelopment of existing commercial and/or residential areas;
2. Improve street connectivity and reduce driveway conflicts through access management;
3. Enhance and develop activity centers and town centers;
4. Enhance and develop transit corridors and transit-supportive built environments;
5. Encourage a greater mix and intensity of land uses;
6. Develop bicycle- and pedestrian-friendly site design standards;
7. Create an integrated multimodal transportation network.

The CDTC allocates a portion of its FHWA planning funds to the program, and projects are chosen on a competitive basis with a 25 percent local cash match (Capital District Transportation Committee, 2015d). The studies are managed by CDTC staff and conducted by consultants in order to ensure utility for municipalities and consistency with regional policies. The final reports can then be adopted by local agencies or incorporated into the CDTC's TIP. The Linkage Program has been quite successful, funding 83 planning studies with sponsors representing 40 separate municipalities, counties, nonprofit organizations and other public entities (Capital District Transportation Committee, 2015d). Study topics are diverse, with several addressing freight and livability concerns. The program was also featured as a Context-Sensitive Solutions case study and received a FHWA Transportation Planning Excellence Award in 2010 (FHWA, 2010b; Context Sensitive Solutions, 2005).

Freight Plans & Initiatives

Regional Freight and Goods Movement Study

Due to its strategic location and role in regional goods movement, Albany is faced with a series of challenges related to freight. To proactively address these challenges, the CDTC is currently developing an updated Regional Freight and Goods Movement Study. The study is intended to promote an understanding of freight's role in the local and regional economy, and provide a series of recommendations to maximize its benefits and minimize its adverse impacts on communities. Some key components of the study will include a regional freight profile, an analysis of future conditions, methods for integrating freight needs into the broader planning process, and policy recommendations for enhancing freight access and mobility (Capital District Transportation Committee, 2015a). The final report will replace the earlier Goods Movement Study (discussed below) and serve as the freight element of the updated long-range transportation plan, New Visions 2040.

New Visions 2040

In addition to emphasizing livability, New Visions 2040 highlights the importance of freight in any community. The primary goal of the freight element is to "embrace freight's key contributions to regional prosperity, while also trying to mitigate the negative impacts of all modes of freight movement on local communities" (Capital District Transportation Committee 2015c). The Regional Freight and Goods Movement Study noted above will be incorporated into the final New Visions Plan and provide recommendations that support the following objectives (Capital District Transportation Committee, 2015c):

- Minimize suburban encroachment on freight-intensive land uses;
- Minimize the impact of freight movement on conflicting land uses;
- Strategically locate industrial logistics uses in close proximity to designated freight facilities;
- Ensure commercial vehicles can effectively maneuver local street networks in order to efficiently deliver goods; and
- Ensure commercial and mixed-use areas are designed to accommodate the efficient delivery of goods.

The CDTC is in the process of developing specific strategies to achieve these objectives. Potential strategies are categorized according to roadway function and land use context to maximize freight mobility while promoting livability goals.

Freight & Fuels: Planning for Green Goods Movement Conference

In 2013, the CDTC and the Capital District Clean Communities Coalition hosted the Freight & Fuels: Planning for Green Goods Movement Conference. The one-day conference aimed to highlight efforts by both the public and private sectors to increase fuel efficiency and reduce harmful emissions while moving freight through the Albany

region. It also served as an opportunity to share information related to freight challenges and potential solutions. Many of the conference presentations offered strategies to integrate freight into livable communities, such as off-hour delivery programs, freight routes, certification programs and electrification units to reduce truck idling (Capital District Transportation Committee, 2013). A roundtable workshop was held to discuss increasing the use of alternative fuels in goods movement. Overall, the conference created a forum to increase awareness of the relationship between freight and livability.

CDTC Linkage Program

Though the Community and Transportation Linkage Program has made significant contributions to improving livability in the Capital Region, it has also stimulated a greater awareness of freight planning. Some notable studies produced via the Linkage Program that relate to freight include:

- Wilton Exit 16 Linkage Study
    - The purpose of this study was to proactively identify strategies to address rapid growth along the Town of Wilton's main freight corridor, Ballard Road. The corridor is experiencing increased industrial development with significant truck traffic (Town of Wilton, 2012). Meanwhile, there is a desire to improve multimodal facilities and create a town center (Town of Wilton, 2012). The study proposes a series of implementation measures to appropriately plan for these trends.
- Railroad Avenue Area Transportation and Revitalization Plan
    - The purpose of this plan was to promote compatible redevelopment within an existing industrial center. The intent was to maintain industrial uses as the predominant land use, while also enhancing the multimodal environment (Towns of Colonie and Guilderland, 2012). The plan listed a series of recommendations to reconcile industrial and community uses, and link transportation and land use planning. These included:
        - Establishment of an industrial preservation overlay district;
        - Development of industrial site design standards, which would address aesthetics, buffer requirements and sustainable development techniques; and
        - Implementation of Complete Streets elements that support truck traffic and multimodal transportation where appropriate.

Goods Movement Plan

The Goods Movement Plan was a component of the 2030 long-range transportation plan. It was prepared by the Goods Movement Task Force, which consists of representation from the New York State Department of Transportation (NYSDOT), the Port of Albany District Commission, the New York State Motor Truck Association, and Albany International Airport, among others (Capital District Transportation Committee, 2007). The plan identified changes in goods movement over the past decade, including greater emphasis by NYSDOT on transportation corridors; increasing activity at the port;

trucking deregulation; ITS developments; and an increase in high-cost, low-volume goods (Capital District Transportation Committee, 2007). Because transportation projects are often slow to respond to current needs, the plan emphasizes forward thinking as a crucial ingredient in the support of goods movement. It identifies a variety of trends and opportunities that warrant future consideration, including conflicts between long-distance commercial traffic and regional traffic, increased intermodal conflicts, real-time parking technology, and the creation of a Spot Improvement Program for small transportation improvements (Capital District Transportation Committee, 2007).

Stakeholder Involvement

The Capital Region has performed extensive stakeholder engagement throughout the planning process. The CDTC has an active Freight Advisory Committee (FAC) with representation from a variety of stakeholder groups, including General Electric, the Port of Albany, the New York State Motor Truck Association, the Owner Operator Independent Drivers Association, and various public entities (C. Bauer, personal communication, July 22, 2015). Currently, the FAC is providing input into CDTC's long-range transportation plan update, and is assisting with the development of the Regional Freight and Goods Movement Plan.

Issues & Strategies

The Albany region has several freight and livability challenges. These issues relate to rail traffic, truck traffic, land use conflicts, and balancing freight and livability needs. Local and regional planning agencies are currently developing a variety of strategies to address these challenges and better incorporate freight into the planning process.

One of the most prominent issues in the area relates the transportation of crude oil by rail through the region. Trains carrying highly flammable Bakken crude oil through downtown to the transfer points along the Hudson River have created serious safety concerns among the public as well as concerns related to odor (Figure 25). The Federal Railroad Administration and the New York State Department of Transportation are currently exploring some techniques to reduce safety hazards, such as more frequent inspections, use of electronic braking systems, and phasing in new rail cars that are more capable of withstanding a derailment (M. Franchini, personal communication, July 22, 2015).

Storage of the rail cars also raises environmental justice concerns due to the proximity of the rail terminal to low-income housing (Figure 25; Figure 26). Options to mitigate safety and environmental justice concerns are being considered at the local level. One possibility includes relocating the affected low-income housing away from the rail line. However, many residents have lived there for years and would likely resist displacement. The idea of diverting the crude oil trains to another rail line south of the city has also been considered, although achieving such arrangements among competing railroads can be challenging. Another possible solution is to construct a barrier between the rail terminal and public housing. There has also been greater emphasis on emergency

planning by the Albany County Sheriff's Department and the City of Albany Police Department.

Figure 25. Rail cars carrying Bakken crude oil at the Port of Albany

Source: www.timesunion.com

Figure 26. Rail cars carrying Bakken crude oil sitting near a low-income neighborhood

Source: www.timesunion.com

The Albany region has also experienced conflicts related to truck routes. Trucks often travel on neighborhood streets and create adverse impacts such as noise and emissions. An example is in the City of Saratoga Springs, where heavy truck traffic through the area has impacted multimodal levels of service (Figure 27) (City of Saratoga Springs, 2007). Strategies to address this problem included delivery time restrictions and designated truck routes, though neither has been wholly implemented. Currently, a Complete Streets study is underway to develop cross-section prototypes aimed at reconciling the needs of all roadway users (S. Misiewicz, personal communication, July 21, 2015).

Figure 27. Heavy truck in downtown Saratoga Springs

Additionally, many trucks cause congestion by double parking in downtown areas (Figure 28) (S. Misiewicz, personal communication, July 21, 2015). Communities and neighborhoods within the Albany region have handled this problem differently. Some approaches include restricted delivery hours and facilitation of truck parking in alleys. These approaches have had varying degrees of success. One innovative solution in Saratoga Springs involved construction of loading docks inside a neighborhood supermarket, thereby reducing roadway congestion (S. Misiewicz, personal communication, July 21, 2015). Other strategies to address parking issues are being explored as part of the Regional Freight and Goods Movement Study.

Figure 28. A double-parked FedEx truck in downtown Albany

Balancing freight and livability needs in downtown Albany is also a challenge. The Warehouse District, a traditionally industrial area in downtown Albany, has recently experienced increased residential redevelopment, creating concerns over future land use conflicts and preservation of industrial uses (C. Bauer and M. Franchini, personal communication, July 22, 2015). There is also an increasing desire to use the waterfront for recreational uses in an area historically dominated by industrial activity at the Port. The community is currently working to connect two segments of a multiuse trail along the Hudson River, which are currently bisected by the Port of Albany and I-787, while still meeting freight needs (S. Misiewicz, personal communication, July 21, 2015).

Though the Capital Region faces some freight challenges, it is also taking proactive steps to address them and minimize or prevent future conflicts. The CDTC is developing a regional freight plan to encourage local communities to think proactively about freight. The plan emphasizes context-sensitivity and may include model strategies such as designated delivery areas, off-peak delivery programs, industrial zoning overlays and designated truck routes (P. Plumeau, personal communication, July 22, 2015).

Additionally, the CDTC is developing a TIP project prioritization process that evaluates projects according to their fulfillment of several categorical objectives, including multimodalism, environment and health, economic development and freight (M. Franchini, personal communication, July 22, 2015). The CDTC has also encouraged integration of freight considerations into local land use and transportation planning by providing technical and financial assistance through its Transportation and Community Linkage Program.

2.4.3 Lessons Learned

The Albany case study revealed several important lessons. One is the importance of forethought in siting of public housing. In the Albany example, low-income housing was constructed next to a rail terminal. At the time the housing was built, the primary cargo being transported consisted of non-hazardous goods such as bananas, cocoa beans, automobiles and wood pulp. However, due to the recent oil boom, the demand to move crude oil has increased, thereby creating both real and perceived safety and nuisance concerns among nearby residents. The key takeaway is that agencies responsible for siting public housing near ports or other freight hubs should consider potential future conditions to minimize land use conflicts.

Another lesson relates to the importance of encouraging local governments to link land use and transportation in the local planning process. The CDTC's Linkage Program has encouraged local governments to plan more proactively, and likewise, has helped CDTC understand local issues and needs. The CDTC is also working on organizing plans into an online mapping database, which will allow the DOT and other agencies to identify specific community needs and goals prior to completing maintenance projects. For example, when a community identifies multimodal needs on a given corridor, DOT can coordinate Complete Streets treatments with roadway resurfacing. By performing proactive planning, communities can ensure that transportation investments are informed by the local context and vision.

The final takeaway relates to the importance of stakeholder engagement. The CDTC's Freight Advisory Committee (FAC) has provided valuable input to agency planners and local planning officials throughout the development of the Regional Freight & Goods Movement Study. The committee lends industry perspective on various freight and livability issues and raises important questions and concerns that may not be addressed otherwise. Local government commissioners participating in the FAC meetings also note the value of the meetings to increasing their understanding of how to integrate freight into local planning, regulatory and capital improvement decisions. Finally, freight stakeholder input has afforded planners the opportunity to vet policies and strategies prior to implementation, and avoid unintended consequences.

2.4.4 Contacts

- Chris Bauer, Freight Program Manager, Capital District Transportation Committee
- Michael Franchini, Executive Director, Capital District Transportation Committee
- Kate Lawrence, Sustainability Planner, City of Albany
- Sandy Misiewicz, Senior Transportation Planner II, Capital District Transportation Committee
- Tony Vasil, Business Development and Marketing Manager, Port of Albany

2.5 PORTLAND, OREGON

2.5.1 Introduction & Background

Portland is a prime location to study the relationship between freight and livability. The city is well-known for its progressive approach to urban planning and has long been a leader in livability and sustainability planning. A series of livability-based initiatives are currently underway in Portland, including the first complete update of the city's comprehensive plan since 1980.

Portland is also heavily invested in goods movement. Connections to the interstate highway system, marine and rail terminals, and an international airport make Portland an important gateway for domestic and international commerce (City of Portland, 2006). Indeed, the Portland/Vancouver region is the fourth-largest freight hub on the West Coast (City of Portland, 2006). Approximately 11 percent of the region's workforce belongs to the distribution and logistics sector, and increases in industrial employment have far outpaced the national average (City of Portland, 2006). To support the continued success of its freight industry, Portland has adopted several plans that aim to enhance mobility and accessibility.

As a compact, livable city with a major industrial sector, Portland faces important challenges in reconciling freight and livability objectives. The lessons learned in this case study will provide valuable perspectives for communities seeking to integrate freight into the planning process while promoting livability goals.

2.5.2 Context

Livability Plans & Initiatives

The Portland Plan

The Portland Plan is a collaboration of over 20 municipal, regional and community agencies and organizations, and was adopted by the city in 2012. It is described as "a different kind of plan" that focuses on people, not land use, and establishes a core set of priorities that directly impact community livability: prosperity, education, health and equity (City of Portland, 2012a). The plan also identifies 12 measurable objectives to track progress (City of Portland, 2012a):

1. Equity and inclusion
2. Resident satisfaction
3. Educated youth
4. Prosperous households
5. Growing businesses
6. Job growth
7. Transit and active transportation
8. Reduced carbon emissions
9. Complete neighborhoods
10. Healthier people
11. Safer city

12. Healthy watersheds

City of Portland Comprehensive Plan

The City of Portland is in the process of completely updating its comprehensive plan for the first time since 1980. The plan will continue to promote community livability by linking transportation and land use planning; encouraging compact development; supporting active transportation; expanding housing options; and providing access to parks and open space (City of Portland, 2015). It is also intended to foster improved equity, health, education and prosperity by implementing The Portland Plan (City of Portland, 2015).

Freight Plans & Initiatives

City of Portland Central City Sustainable Freight Strategy

The Central City Sustainable Freight Strategy was developed in 2012 to proactively plan for the projected increase in freight demand and urban density in Portland. The dense and mixed-use nature of the central city not only creates demand for goods and services, but also makes deliveries more challenging due to competition over space. Meanwhile, freight externalities such as noise and pollution are nuisances that the community seeks to minimize. The plan's vision is to achieve a balance between freight and livability needs; it aims to increase the efficient movement of goods while promoting sustainability and maintaining community quality of life (City of Portland, 2012c). Collaboration between City staff, the Sustainable Freight Working Group and the Portland Freight Committee produced the following recommendations (City of Portland, 2012c):

- Prepare a comprehensive truck parking and loading plan;
- Develop street design guidelines that incorporate freight needs;
- Identify incentives to encourage last-mile delivery solutions;
- Implement zoning provisions to increase industrial-based employment density;
- Implement an off-hours delivery pilot program;
- Explore partnership opportunities to incentivize the use of environmentally friendly freight vehicles;
- Coordinate with other departments and agencies to develop strategies to increase the use of multimodal freight options.

Some of these actions have already been completed or are in progress. The City adopted freight roadway design guidelines in 2008, and in 2014 it was awarded a state grant to develop a Truck Parking and Loading Plan.

Freight Master Plan

The Freight Master Plan was adopted by the City of Portland in 2006. Its overall aim is to plan ahead for forecasted increases in freight movement, particularly by trucks, and to recommend strategies that enhance the efficiency of goods movement while

maintaining Portland's livability (City of Portland, 2006). The plan has a three-pronged approach of policy guidance, programmatic actions and infrastructure improvements to achieve its goals. These recommended actions are categorized according to the plan's three themes: mobility, livability and economy. Some potential strategies include:

- Implementing ITS projects to manage congestion on key truck routes;
- Developing a local street plan for the Northwest Industrial District to address access and circulation issues;
- Developing and implementing a signage program to direct trucks to appropriate routes:
- Using the Transportation Safety and Livability Hotline as a tool to monitor neighborhood conflicts with freight;
- Working with businesses to address truck access and loading issues.

Designing for Trucks and Other Large Vehicles in Portland

Designing for Trucks and Other Large Vehicles is a set of design guidelines to support the efficient movement of freight in Portland. The guidelines were developed by the City in 2008 as an important element of the Freight Master Plan. The document is intended to provide specific design guidance for improving truck access and mobility on the various types of roadways within the city (Figure 29). The guidelines utilize a context-sensitive approach, and establish design objectives that are based upon the functional classification and the users of the roadway (City of Portland, 2008). Design considerations include lane width, curb radii, on-street parking, vertical/horizontal clearances and turn lanes (City of Portland, 2008).

Classification*	Function	Application	Design Objectives**
Regional Truckway	Routes for interregional and interstate movement of freight. Provide for safe and efficient continuous-flow operation for trucks.	Applied to roadways with inter-state or inter-regional truck movement: I-5, I-84, I-205, I-405, US 26, and US 30, 99E.	Design Regional Truckways to be limited access facilities and to standards that facilitate the movement of all types of trucks.
Priority Truck Street	Serve as primary routes for access and circulation in Freight Districts, and between Freight Districts and Regional Truckways. Accommodate high truck volumes and provide high-quality mobility and access.	Applied to major city traffic streets in industrial districts and that connect industrial districts to the regional system: N. Marine Dr., NE Columbia Blvd., NW St. Helens Rd.	Priority Truck Streets should be designed to facilitate the movement of all truck classes and over-dimensional loads, as practicable.
Major Truck Street	Serve as principal routes for trucks in a Transportation District. Provide truck mobility and access to commercial and employment uses along the corridor.	Applied to commercial areas of major city traffic streets, arterial connections to central city, regional, and town centers: NE MLK Blvd., NE Sandy Blvd., SE Powell Blvd.	Major Truck Streets should accommodate all truck types, as practicable.
Freight District Street	Freight Districts are determined by presence of industrial sanctuary zoning (IG1, IG2 & IH). Freight District Streets are intended to provide safe and convenient truck mobility and access in industrial and employment areas serving high levels of truck traffic and to accommodate the needs of intermodal freight movement.	Applied to all streets in freight districts, unless classified with a higher designation.	Freight District streets should be designed to facilitate the movement of all truck types and over-dimensional loads, as practicable.
Truck Access Street	Serve as access and circulation routes for delivery of goods and services to neighborhood-serving commercial and employment uses. Provide access and circulation to land uses within a Transportation District. Non-local truck trips are discouraged from using Truck Access Streets	Applied to commercial corridors along collector streets that serve neighborhoods: NE Fremont St., NE. Halsey St., SE Division St., SE Woodstock Blvd.	Design Truck Access Streets to accommodate truck needs in balance with other modal needs of the street.
Local Truck Street	Provides local truck access and circulation for goods and service delivery to individual locations in neighborhoods.	Applied to local streets outside freight districts to provide access/circulation for goods and service delivery.	Should give preference to accessing individual properties and the specific needs of property owners and residents along the street. Use of restrictive signage and operational accommodations are appropriate.

Figure 29. Portland freight street classification system

Source: City of Portland, 2008

Regional Freight Plan

Portland Metro's Regional Freight Plan was developed in 2010 as an element of the updated long-range transportation plan. It aims to maintain Portland's competitive economy by increasing the efficiency of goods movement. Identified in the plan are a series of primary challenges the region is currently facing or will face in the future (Portland Metro, 2010). These include:

- Congestion and hotspots
- Unpredictable travel time
- Capacity constraints
- Network barriers
- Loss of industrial land uses
- Environmental and social impacts

The plan also establishes a series of broad goals as summarized below:

- Use a systems approach to plan and manage multimodal freight infrastructure and promote interagency coordination;
- Promote increased awareness among citizens and decision makers of the importance of freight on their daily lives and the community's economic well-being;
- Ensure that freight supports economic and environmental health;
- Integrate transportation and land use planning;
- Make strategic transportation investments to create a transportation system that reduces delay, increases reliability, improves safety and provides choices.

Finally, the plan delivers a comprehensive list of potential strategies to address the region's top freight issues. Potential solutions include policy measures, programmatic actions, infrastructure investments, and additional research into freight needs and trends (Portland Metro, 2010).

Metropolitan Export Initiative

In 2011, the Portland region was identified by the Brookings Institution as the metro area in the nation that doubled exports in the past decade. The region was selected as one of four to collaborate with the Brookings Institution to develop a regional plan to implement the federal National Export Strategy, which is intended to double national exports by 2015. Working with Brookings scholars and staff, the region partners (City of Portland, Port of Portland, U.S. Department of Commerce, Greater Portland Inc. and Business Oregon) developed metropolitan export plans for expanding exports to growing global markets with the goal of diversifying regional economies. This process relied on a mix of customized data, firm interviews and other market intelligence to develop strategies and programs to boost the region's global access and engagement. The result of the effort was a business strategy that included a focus on the importance of an

interconnected system to facilitate efficient freight movement into, out of and through the metropolitan area (Brookings Institution, 2015).

Stakeholder Involvement

The Portland Freight Committee serves as the primary freight stakeholder group in the Portland region. The committee is involved in freight transportation planning issues and is an advocate for freight needs. It was formed in 2004 to advise the Mayor, City Council and all city departments on matters relating to the multimodal freight network. The group meets monthly and is currently composed of about 30 members representing a variety of freight interests, including shippers, haulers, railroads, the Port and business organizations.

Considering the large role freight plays in Portland's local and regional economy, it is essential to recognize and address freight needs. The Portland Freight Committee has been critical to achieving a better understanding of freight concerns, and advancing freight and economic development objectives within the community.

Issues & Strategies

The Portland region is a well-known leader in livability planning and public engagement, and it has made a strong commitment to promoting freight interests while balancing community objectives. The City has had an active freight advisory committee since 2003 which has provided valuable guidance on many freight issues. The City Bureau of Transportation also maintains a full-time freight planning coordinator to incorporate freight into the broader planning process. Additionally, many planners and other public agency representatives came together for a freight "deep dive" with industry experts in 2015 to discuss freight and livability challenges and explore potential solutions.

One key freight and livability challenge relates to the St. Johns neighborhood. St. Johns is situated between the Rivergate Industrial District and several major freight routes. Trucks often use residential streets as a shortcut and thus create noise, congestion and safety concerns within the neighborhood (Figure 30). To address this, the City and Metro implemented the St. Johns Truck Strategy, which included geometric improvements on freight routes and traffic calming treatments on residential streets to discourage trucks from traveling through the neighborhood. Increased police enforcement has also helped keep trucks on designated freight routes.

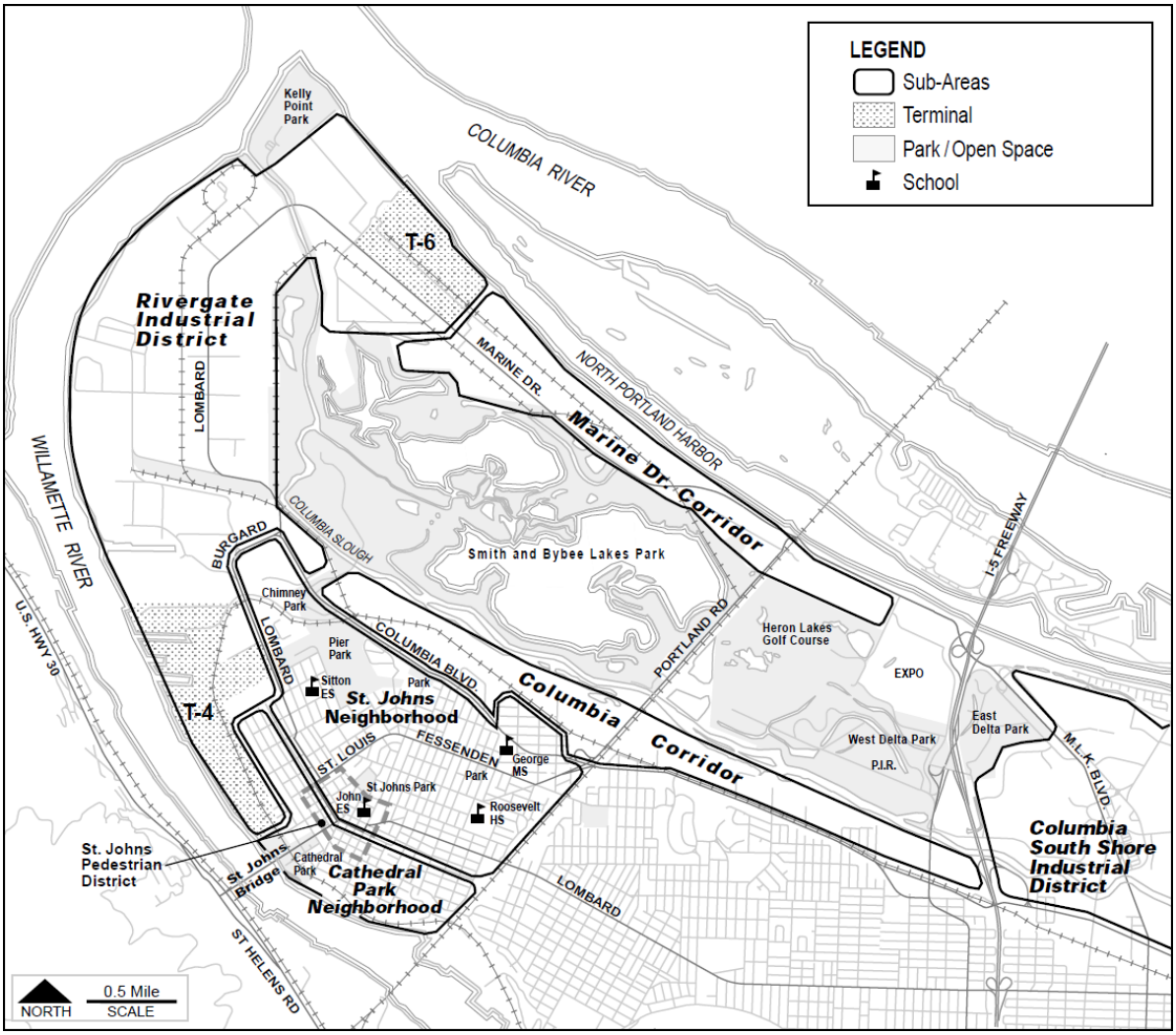

Figure 30. St. Johns neighborhood and nearby industrial districts

Source: City of Portland, 2001

Roadway congestion is another challenge which has regional economic and quality of life impacts. To avoid downtown gridlock, many trucks use local roads in rural communities west of the city as de facto bypass routes. Cornelius Pass Road is one such roadway that experiences more truck traffic than it was designed to accommodate. Not only does the increase in both truck and commuter traffic create roadway maintenance issues, but it also creates safety concerns due to the winding topography of these rural roads (Figure 31) (Redden, 2013). A new western bypass route was proposed about 20 years ago, but was not approved in light of area opposition (Redden, 2013). Meanwhile, travel demand continues to grow along the western edge of the region.

Figure 31. Large truck traveling on Cornelius Pass Road

Source: Chris Onstott, Portland Tribune, http://portlandtribune.com/pt/9-news/152542-cornelius-pass-roads-future-potholed-by-congestion%20

Traffic congestion in Portland is exacerbated by the loss of container business at the Port of Portland, which has triggered an increase in the use of trucks and trains to haul freight. The growing volume of truck and rail traffic has worsened roadway congestion in industrial areas, at railroad crossings and on the interstate highway system.

The community is applying a number of strategies to address this issue. A chief approach is the use of a street classification system and context-sensitive roadway design guidelines to enhance truck mobility on key freight corridors (B. Hillier, personal communication, September 14, 2015). Grade-separated railroad crossings and increasing rail capacity are other strategies being considered to minimize delays (T. Collins, personal communication, September 14, 2015). Planners hoped to alleviate highway congestion by replacing the aging I-5 bridge that connects Portland and Vancouver, WA, but political disagreements, funding shortfalls and interstate coordination challenges delayed the project indefinitely (Manning, 2014).

Promoting equity is another challenge. Transit access to family-wage jobs is concentrated primarily in central Portland, yet most middle-income families and communities of color cannot afford to live there. At the same time, the lack of land available and ready for industrial development or redevelopment is contributing to the loss of living-wage industrial jobs for middle-income families. In 2013, the Port of Portland proposed to develop a new marine terminal on part of West Hayden Island and expand industrial employment opportunities (Figure 32). However, costly mitigation

requirements and some public backlash compelled the Port to withdraw its application. Other approaches being explored include brownfield redevelopment, industrial land preservation, and conversion of strategic land parcels to industrial uses (Dechenne, 2012). The Columbia Corridor Association is also conducting an equity study to assess where industrial sector employees live and work. An initial takeaway of the study is the opportunity to better align land use, transportation and educational opportunities with middle-wage job growth potential in the next comprehensive plan update.

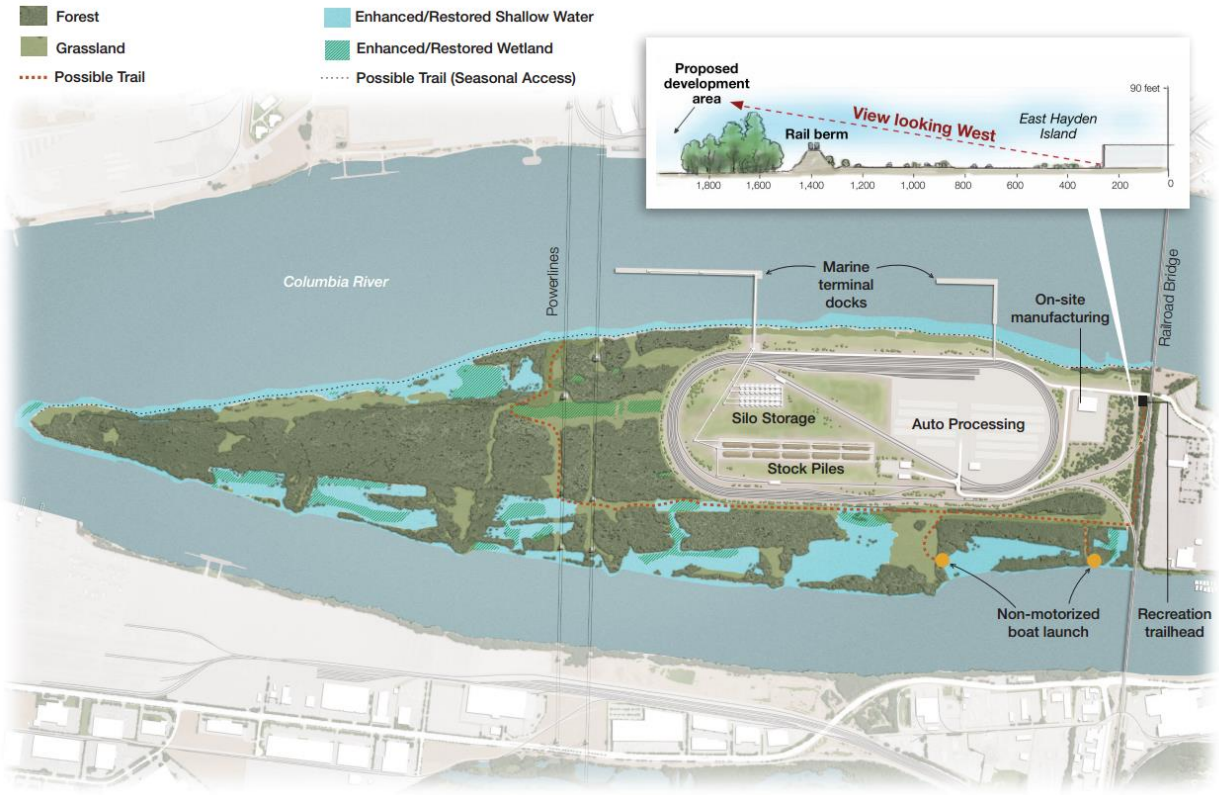

Figure 32. Proposed site development of West Hayden Island

Source: http://cdn.portofportland.com/pdfs/WHI_One_Pager.pdf

Heavy truck drayage through mixed-use areas in central Portland has also been a challenge. The Central Eastside neighborhood is one case where old industrial uses and mixed-use redevelopment conflict. The City of Portland has been very supportive of B-line, a local transportation company that uses human-powered, electric-assisted trikes for local deliveries (Figure 33). Since 2009, B-line has replaced approximately 80,000 truck deliveries and prevented 18 tons of CO_2 emissions from polluting the atmosphere (City of Portland, n.d.).

Though sustainable delivery modes do serve a niche market and are favored by locals, trucks are still necessary for many deliveries in Portland. Local planners have

explored several strategies to minimize truck impacts on the community through the Sustainable Freight Strategy. Urban consolidation centers, context-sensitive roadway design, designated freight routes, comprehensive parking and loading management, and off-peak delivery programs are among the strategies underway or being explored for future implementation. The City also adopted the Central Eastside Plan in 2010 to reconcile freight and community needs in that area. The plan uses a layered network approach to identify modal needs on various streets and implement context-sensitive design treatments (City of Portland, 2010). Finally, public education on the importance of freight has been a continuous process.

Figure 33. B-Line PDX

Source: Maus, 2015

The City of Portland is also working to increase intermodal safety. The City is planning to install left-turn pockets on Lombard Street outside Northwest Container Services, which is located within a major industrial district and attracts more than 1,000 trucks daily (Figure 34). By law the City is also required to install a multiuse path to support bicycle and pedestrian travel. However, the Portland Freight Committee has raised safety concerns over potential interactions between heavy trucks and vulnerable road users. One potential solution being discussed is rerouting the multiuse path to an alternative roadway to reduce conflict points between trucks and bicycles.

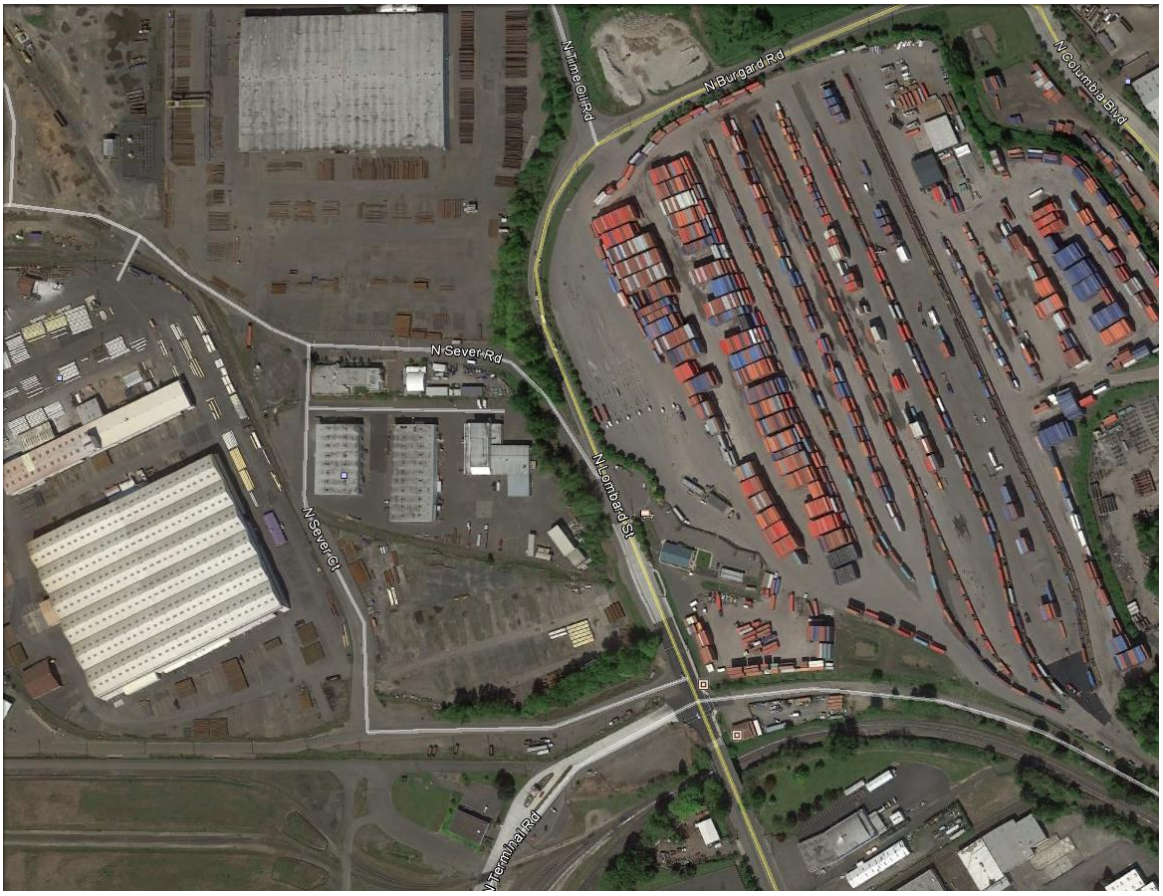

Figure 34. Lombard Street

Source: Google Earth, 2015

2.5.3 Lessons Learned

The Portland case study revealed several important lessons related to freight and livability. One major takeaway is that continuous engagement of freight stakeholders has significantly aided the planning process. Stakeholder input is critical in understanding and addressing freight-related issues. In Portland, the Freight Committee has been instrumental in the development of freight policies and programs in the region, including the Freight Master Plan, Street Design Guidelines and the Central Eastside Street Plan.

Another important lesson is the varying perceptions of Complete Streets. A common understanding of Complete Streets is the need to design for all modes on every roadway. However, given limited right-of-way and varying land use contexts, accommodating all modes is not always appropriate. Instead, communities may need to prioritize certain modes depending on the context of the corridor. This is of particular import in areas like the Central Eastside, where diverse activity requires planners to identify priority modes on various streets and design accordingly.

The final lesson is the need for continuous public education on the importance of freight. In Portland, livability is a primary planning objective, and there is substantial public support for sustainable transportation options. While legitimate, this perspective can potentially eclipse freight concerns within the broader planning process. Educating local leaders and the general public on freight's contributions to economic development and livability can promote a greater appreciation for freight needs.

2.5.4 Contacts

- Susie Lahsene, Director, Planning and Policy, Port of Portland
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- Dan Kaempff, Principal Transportation Planner, Metro
- Charles Tso, Regional Planning Intern, Metro
- Steve Szigethy, Principal Transportation Planner, Washington County

3.0 MENU OF FREIGHT AND LIVABILITY OPTIONS

3.1 INFRASTRUCTURE PLANNING AND DESIGN

3.1.1 Designated Truck Routes

Description

A truck route may be defined as "the set or network of roads or streets that a local government has formally designated for certain trucks to use when traveling through or within that jurisdiction" (Ontario Trucking Association, 2011). Primary truck routes are designated on arterial roadways or other major routes that are designed and maintained for efficient long-distance freight movement. "Last-mile" truck routes accommodate local circulation within dense urban and mixed-use environments, often on busy commercial streets where deliveries are made. The "last-mile" route, as its name suggests, includes those streets that the truck takes when it is close to its final destination (City of Tampa, 2011a; Rhodes, et al., 2012).

Trucks are not necessarily banned from using other routes (although this may be the situation on some neighborhood streets). Rather, they are required to use the designated routes until they are as close as possible to their destination. At that point, they may diverge only to complete a pickup or delivery. This helps direct truck traffic away from neighborhood streets that may be sensitive to noise, vibration and/or designed to accommodate non-auto modes of transportation (FHWA, 2009b; City of Tampa, 2011a; Rhodes, et al., 2012).

Application

Planning has a direct role in establishing truck routes and ordinances by determining which streets can best suit freight traffic safely and efficiently, and how those areas should be regulated (Rhodes, et al., 2012). Route selection is achieved through detailed analysis of issues such as intersection location and design, pavement condition, crossings, lane width, turning radii, future development needs, congestion impacts, thoroughfare plan impacts, land use, noise impacts, air quality impacts, and pedestrian and cyclist activity (Ontario Trucking Association, 2011). Results of the truck route analysis will set the guidelines for ordinances regulating truck traffic to and from major streets and "last-mile" connection streets (CRTS, 2011).

Issues to address on streets being considered for "last-mile" truck routes are curbside space, parking ordinances and parking enforcement (Rhodes, et al., 2012). The analysis will also determine what, if any, modifications are necessary for those routes to adequately handle freight traffic and if any restrictions should be established, such as time windows, vehicle weight or vehicle length (Giuliano et al., 2013). Other

considerations include whether or how these restrictions can or should be enforced by local law enforcement or Intelligent Transport System technology, such as plate-reading cameras and/or congestion pricing (Best Urban Freight Solutions, 2004b; Giuliano et al., 2013).

The cost of conducting truck route studies and implementing truck route plans is often a subject of concern to local planning agencies. These costs can vary widely depending on the size of the study area and the scope of work. Although identification of truck routes and development of implementing criteria requires careful planning and resources, the potential economic benefit of implementing these new policies can make the investment worthwhile (FHWA, 2009b).

Special Considerations

It is important for the planning department to communicate with freight carriers, other public agencies, impacted businesses and the general public when attempting to designate and regulate truck routes (Giuliano et al., 2013; Ontario Trucking Association, 2011). Truck drivers can provide valuable insight regarding the most appropriate streets for truck routes and recommendations on changes needed for effective implementation.

Planners should perform stakeholder outreach and education to establish a common understanding of truck route rules and regulations (Ontario Trucking Association, 2011). Easily accessible maps and signage will be necessary to communicate truck route locations (Ontario Trucking Association, 2011; CRTS, 2011). Ordinances should also include a complete list of designated truck route segments. Freight carriers should be aware that if drivers leave the designated truck route system, they could be required to provide evidence of a nearby destination, such as a delivery ticket, weight slip or log book.

The types of trucks that will be regulated should be clearly defined. Definitions are best based on criteria that can be readily observed and enforced, such as the number of tires (e.g., six or more), as opposed to issues such as carrying capacity, which cannot be easily determined without stopping the vehicle. For safety reasons, trucks carrying hazardous materials should not be allowed to pass through urban core areas and other locations with high concentrations of people. Violations of the truck route ordinance should be treated similarly to parking violations, which are punishable by fines, rather than traffic violations, which can result in suspension of the driver's license and loss of employment.

Examples

Orlando, Florida

The Orlando metropolitan area was selected as a study region by the FHWA's office of Freight Management and Operations for the Urban Freight Cases Studies program. As a result, the City of Orlando, in conjunction with the Florida Department of Transportation and Metroplan Orlando (Orlando's MPO), published the Freight, Goods, and Services Mobility Strategy Plan (FHWA, 2009b).

A Freight Village plan was prepared to cluster warehousing and distribution into centers within the region (see Section 3.3.2, Urban Freight Villages) together with the Downtown Orlando Truck Route Designation System (FHWA, 2009b). Using the Downtown Orlando Master Plan, the City of Orlando established a few north-south routes connecting to State Road 50, State Road 408, US 441, Orange Blossom Trail and Rosalind/Magnolia Avenue (Figure 35). Trucks are restricted to using these routes until they get as close to their destination as possible. Only then may they turn onto other east-west streets. This minimized the amount of truck traffic travelling on these smaller east-west streets, while allowing trucks to continue to access major roads and highways (FHWA, 2009b).

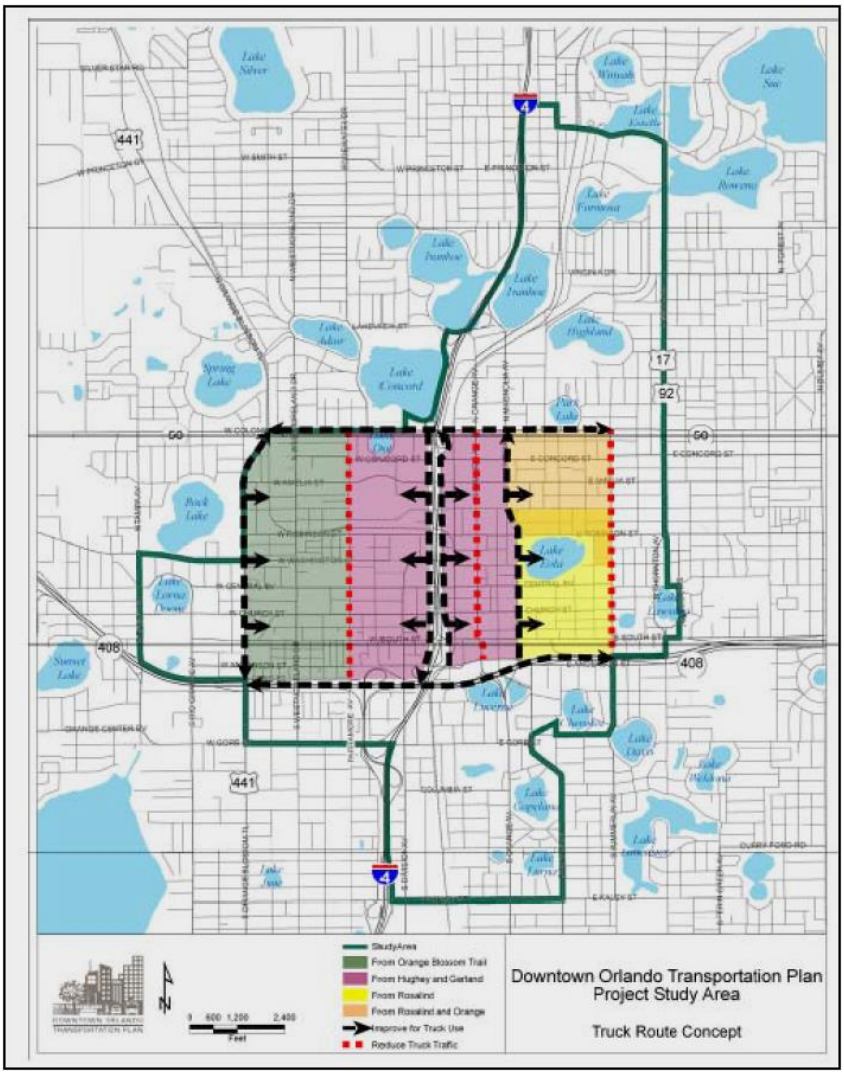

Figure 35. Downtown Orlando truck route system

Source: FHWA, 2009b

Each north-south truck route was selected due to its capability to handle larger vehicles. Criteria included wider lane widths, greater turning radii and signal timing. Diversion of truck traffic onto these primary arterials allowed other streets to better meet the non-auto transportation needs of the area (FHWA, 2009b).

Under the former development impact review process, truck traffic was treated as passenger vehicle traffic. Businesses were developed without regard to the increase in truck traffic, resulting in congestion and truck traffic on roads not designed to handle large trucks. A key component of the Mobility Strategy Plan was the separate treatment of trucks from passenger vehicles, and requiring businesses to identify major routes that would likely be impacted by the movement of freight to and from their place of business (FHWA, 2009b).

Metroplan asked truck drivers for help in locating problem areas on potential truck routes through a program known as Quick Fix. Drivers were provided a camera to photograph areas of concern in the transportation network. The result was a list of 20 improvement projects, most of which have since been completed by Metroplan (FHWA, 2009b). The program was successful enough to warrant a second Quick Fix program for the Orlando region.

Tampa, Florida

In 2011, the City of Tampa updated its truck route system based on the Citywide Truck Route Study (City of Tampa, 2011a; City of Tampa, 2011b). The study's recommendations are based on changes in land use and transportation since the system was originally enacted in 1989, as well as various enforcement and signage needs (City of Tampa, 2011a). Some of the recommended changes include:

- Expanding restrictions on transportation of hazardous materials through the central business district (CBD);
- Including a list and reference map of designated truck routes to allow for greater understanding of the truck route system;
- Establishing a violation of the truck route system as a municipal civil violation, which is enforced through fines, rather than a moving violation, which can cause the driver to lose their license, and therefore, their job;
- Requiring a truck operator to provide evidence of the need to travel off of the designated truck route system;
- Addition or deletion of designated truck routes as appropriate, including:
    - Deletion of many streets in the CBD in recognition of emerging residential, tourism and arts land uses;
    - Addition of the I-4/Selmon Connector, which will enable the deletion of 21st and 22nd Street from Adamo Drive to I-4 from the designated truck route system;
    - Deletion of Channelside Drive from Meridian Avenue to Cumberland Avenue in recognition of the character and land uses (mostly tourism and nightlife) in the heart of the Channel District (Figure 36);

- Addition of appropriate signage to improve wayfinding for trucks.

Figure 36. Channelside Drive

Source: Smatlak, 2004

Portland, Oregon

Portland is well-known for its multimodal streets, bike-friendliness and dense mixed-use development. However, it is these qualities that make truck route planning in Portland a challenge. As part of the Freight Master Plan, the City of Portland not only established a truck route system, but also established a Freight Street Classification System (City of Portland, 2008). This classification system set up the design guidelines for different kinds of truck traffic, and who or what is to be prioritized on each street (Figure 37). Each of these classified streets, as well as the Portland Freight District, are marked clearly on the Portland Freight Network Map (Figure 38).

In the Portland Freight Plan, there are two types of street strategies for truck traffic; the "Accommodate For" strategy and the "Design For" strategy. The Accommodate For strategy is a series of concepts or operational strategies for tight street environments, while the Design For strategy physically alters the intersection or street to meet the needs of trucks (City of Portland, 2008). For example, the streets in the Freight District are designed to prioritize heavy large truck traffic; the district centers and main streets are designed to accommodate some large truck traffic but not interfere with

cyclists and pedestrians; and residential streets are narrower and designed to handle smaller delivery trucks or vans (City of Portland, 2008).

Classification*	Function	Application	Design Objectives**
Regional Truckway	Routes for interregional and interstate movement of freight. Provide for safe and efficient continuous-flow operation for trucks.	Applied to roadways with inter-state or inter-regional truck movement: I-5, I-84, I-205, I-405, US 26, and US 30, 99E.	Design Regional Truckways to be limited access facilities and to standards that facilitate the movement of all types of trucks.
Priority Truck Street	Serve as primary routes for access and circulation in Freight Districts, and between Freight Districts and Regional Truckways. Accommodate high truck volumes and provide high-quality mobility and access.	Applied to major city traffic streets in industrial districts and that connect industrial districts to the regional system: N. Marine Dr., NE Columbia Blvd., NW St. Helens Rd.	Priority Truck Streets should be designed to facilitate the movement of all truck classes and over-dimensional loads, as practicable.
Major Truck Street	Serve as principal routes for trucks in a Transportation District. Provide truck mobility and access to commercial and employment uses along the corridor.	Applied to commercial areas of major city traffic streets, arterial connections to central city, regional, and town centers: NE MLK Blvd., NE Sandy Blvd., SE Powell Blvd.	Major Truck Streets should accommodate all truck types, as practicable.
Freight District Street	Freight Districts are determined by presence of industrial sanctuary zoning (IG1, IG2 & IH). Freight District Streets are intended to provide safe and convenient truck mobility and access in industrial and employment areas serving high levels of truck traffic and to accommodate the needs of intermodal freight movement.	Applied to all streets in freight districts, unless classified with a higher designation.	Freight District streets should be designed to facilitate the movement of all truck types and over-dimensional loads, as practicable.
Truck Access Street	Serve as access and circulation routes for delivery of goods and services to neighborhood-serving commercial and employment uses. Provide access and circulation to land uses within a Transportation District. Non-local truck trips are discouraged from using Truck Access Streets	Applied to commercial corridors along collector streets that serve neighborhoods: NE Fremont St., NE. Halsey St., SE Division St., SE Woodstock Blvd.	Design Truck Access Streets to accommodate truck needs in balance with other modal needs of the street.
Local Truck Street	Provides local truck access and circulation for goods and service delivery to individual locations in neighborhoods.	Applied to local streets outside freight districts to provide access/circulation for goods and service delivery.	Should give preference to accessing individual properties and the specific needs of property owners and residents along the street. Use of restrictive signage and operational accommodations are appropriate.

Figure 37. Portland's freight street classification system

Source: City of Portland, 2008

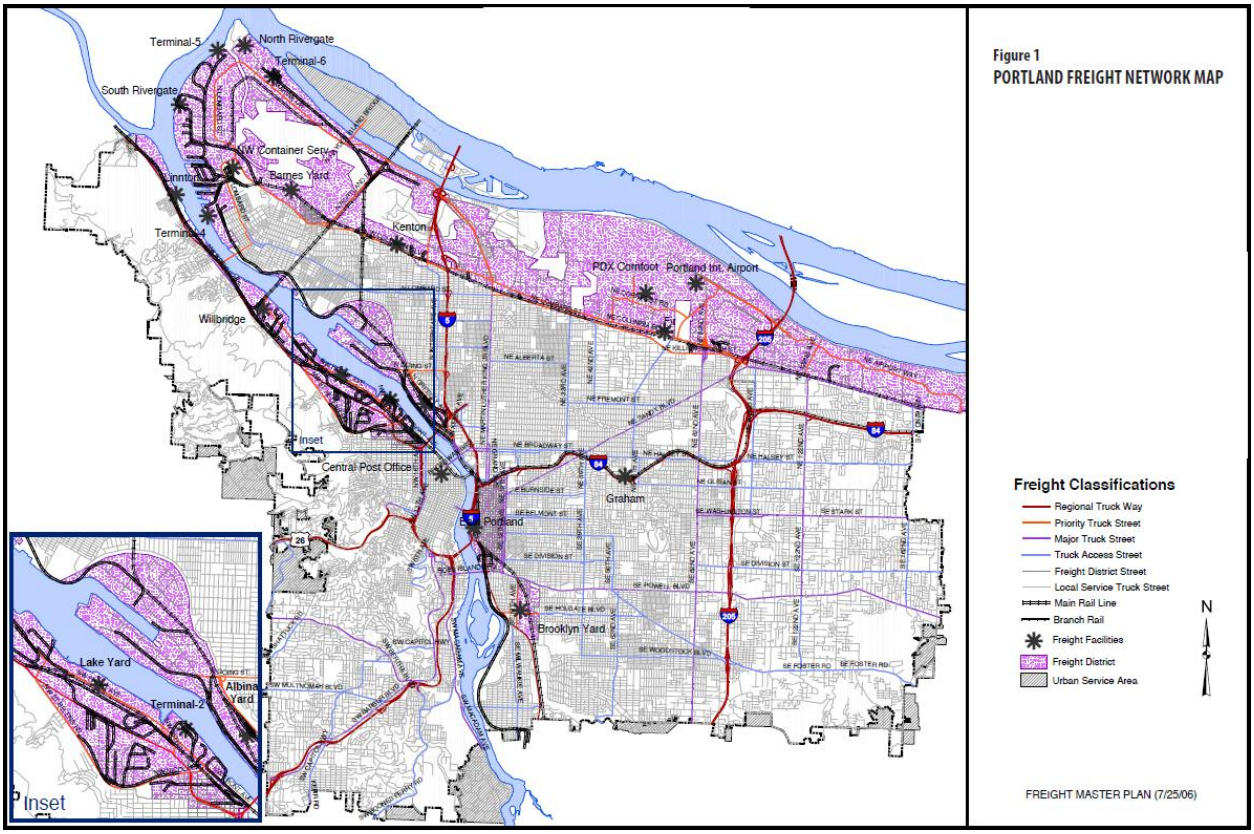

Figure 38. Portland freight network map

Source: City of Portland, 2008

3.1.2 Intermodal Freight Connectors

Description

Intermodal freight connectors, also known as connectors, are highway projects designed to support the efficient movement of freight in areas with high levels of freight traffic. Intermodal connectors are routes that connect the National Highway System (NHS) with high freight-activity areas, including ports, rail/truck terminals and passenger transit terminals (FHWA, 1999). According to federal guidelines, "NHS connectors must be public roads leading to major intermodal terminals and … must have a critical bearing on the efficient operation of that facility" (FHWA, 1999). These connectors facilitate the movement of high volumes of freight, but comprise less than one percent of the National Highway System (FHWA, 2013b).

Application

Connectors require significant build time and resources (Georgia Department of Transportation, 2014; PortMiami Tunnel, 2014c). Public-private partnerships can help

cover the costs of construction. Companies that move goods in the area benefit from reduced congestion and more timely deliveries. Expansion and reconstruction may become necessary during the lifetime of the project as traffic increases.

For projects of this scale, it is crucial to consider local and regional needs and involve various local groups, including freight stakeholders, local business owners and residents. Connectors may impact a region in a variety of ways, such as influencing the rate of growth of the local economy, the potential for new development along connector routes, and quality of life (Thompson et al., 2001).

Special Considerations

Intermodal freight connectors may encounter limitations related to space and impacts to the community, given that they serve heavy truck volumes in metropolitan areas (FHWA, 2000). Community impacts may include truck traffic, air quality and noise. Therefore, it is critical that these issues be addressed when developing and operating an intermodal freight connector (FHWA, 2000).

In 2000, the FHWA conducted a study of the condition of connectors. They found that connectors to ports and rail terminals had a larger amount of mileage with pavement deficiencies than non-interstate NHS routes, as well as geometric and physical deficiencies, including "problems with shoulders, inadequate turning radii, and inadequate travel way width" (FHWA, 2000). These issues may "slow freight movement, damage goods in transit, and decrease efficiency and safety" (American Association of Port Authorities, 2013). Recommendations included creating incentives for states and MPOs to address freight planning, increasing use of information technology, increasing opportunities for funding, and identifying host community issues (FHWA, 2000).

Examples

PortMiami Tunnel, Miami, Florida

The PortMiami Tunnel is a connector designed to accommodate increasing traffic in and out of PortMiami and reduce traffic congestion in downtown streets. The tunnel runs between Watson Island and Dodge Island, where PortMiami is located (Figure 39). Approximately 16,000 vehicles travel to areas around the port on a daily basis, with freight making up 28 percent of this traffic (PortMiami Tunnel, 2014d). The tunnel was constructed through a public-private partnership (PortMiami Tunnel, 2014d).

Figure 39. Port Miami tunnel entrance from Watson Island

Source: Port of Miami Tunnel, 2014

Prior to the tunnel's construction, trucks were using downtown streets to access I-395 and I-95 (PortMiami Tunnel, 2014d). Passenger vehicles and trucks shared the limited space on the Port Bridge, the only bridge connecting the port and the mainland (PortMiami Tunnel, 2014a). The tunnel has two lanes each way: a designated freight lane and a passenger lane, thereby reducing the number of vehicles traveling through downtown Miami.

The tunnel opened on Aug. 3, 2014 (PortMiami, 2014c). Movement of containers in PortMiami has increased 12 percent in the first six months of FY 2015 (Miami-Dade County News Release, 2015). Increased trade and commerce are projected following the Deep Dredge project designed to deepen the main harbor channel so it can accommodate larger ships (Miami Dade County, n.d.).

I-4/ Selmon Connector, Tampa, Florida

The I-4/Selmon Connector is an intermodal freight connector that links Interstate 4 with the Selmon Expressway (Figure 40). It is designed to facilitate truck travel between Port Tampa Bay and nearby interstates, and reduce truck traffic though Ybor City, a historic district of Tampa popular among residents and tourists. The project was completed through a public-private partnership (FHWA, 2013a). This route is the first example in the U.S. of a connector with a dedicated truck lane (Willman, 2012). Prior to the connector's construction, trucks would use 21st and 22nd streets in Ybor City to access the Port (Figure 41). Following construction of the I-4/Selmon Connector, truck traffic was removed from the surface streets, and an estimated 10,000 trucks used the connector on a daily basis (Florida Department of Transportation, 2015c).

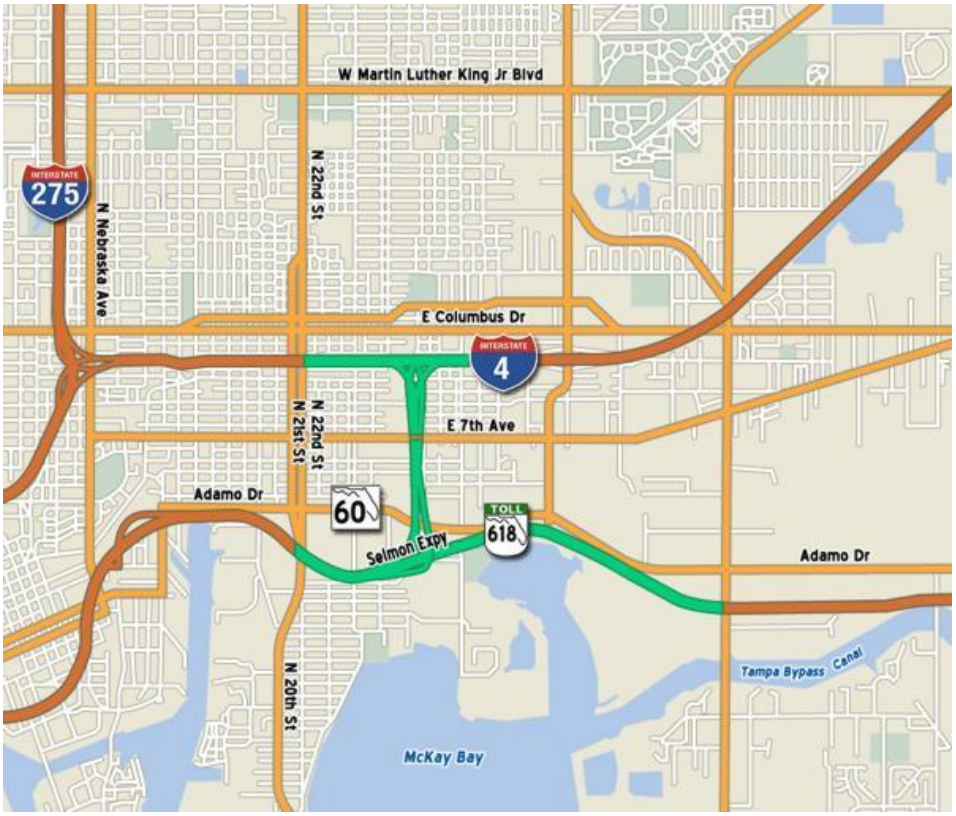

Figure 40. I-4/Selmon Expressway Connector

Source: http://tbinterstates.com/projects/map.asp?mapID=511&roadid=3

Figure 41. Truck traffic in Ybor City prior to construction of the I-4/Selmon Connector

Source: Glasser, 2015.

As of 2015, the original truck route in Ybor City is being redesigned to increase livability, including "narrowing the roads from three lanes to two, adding bike lanes, bricking the crosswalks, and adding benches, decorative lighting and trees" (Henson, 2015). The $8.3-million project will also add hardscapes such as granite curbing, brick crosswalks and trees with tree gates (M. L. Godfrey, personal communication, June 6, 2015).

3.1.3 Highway Bypasses

Description

Bypasses redirect traffic around populated areas or downtowns, allowing for quicker travel times, reduced traffic congestion and a reduction in traffic hazards on the bypassed route (Kansas Department of Transportation, 1996; Mills & Fricker, 2009). In smaller communities, there may only be one road to, from and through an area. Therefore, providing an alternate route around small towns and congested urban areas can greatly enhance the efficient movement of freight. Removing truck traffic from the bypassed route can, in turn, have a positive effect on livability in the bypassed area.

Application

Many factors are assessed before developing a bypass, including the function of the route; future and current travel delays; whether freight traffic is destination or through traffic; impacts on the local community; and the availability of services to travelers (California Department of Transportation, 2006). A bypass would ideally be included in regional transportation plans, be supported by local government officials, and be considered for funding (California Department of Transportation, 2006). Bypass alternatives that recognize the current built environment, topography and environmentally sensitive areas are important to consider (California Department of Transportation, 2006).

A variety of environmental impacts may arise with the development of a bypass, including relocations, economic impacts and cultural resource impacts. Public involvement can help identify and address community issues, determine potential adverse effects, and even identify conceptual design solutions (Florida Department of Transportation, 2014). Costs for this technique vary depending on the size and location of the project.

Special Considerations

A bypass is intended to reduce traffic congestion; minimize effects from heavy traffic (e.g., fumes, noise and vibrations); optimize emergency response time; and improve travel time (Florida Department of Transportation, 2014). While bypasses are typically built to reroute through truck traffic, they are rarely restricted to truck-only uses. Thus, there is sometimes the unintended consequence of diverting both truck and passenger traffic away from downtown commercial centers, which can stimulate changes

in development patterns and undermine local economic vitality and community livability (Florida Department of Transportation, 2014).

Without local roadway network planning in areas with poor road networks, many local trips are likely to rely on the new bypass (Seggerman & Williams, 2014). If this issue is not addressed, local congestion may eventually increase travel time for trucks and passenger vehicles. Access management is critical both for the bypass, which should be fully access controlled, along major roadways leading to the bypass, and around their interchanges. Effective access management increases safety and roadway capacity, while reducing travel time and delay (Williams et al., 2014).

In addition, the bypassed roadway may be oversized in relation to local mobility needs following bypass construction (Seggerman & Williams, 2014). With trucks and other through traffic bypassing central business districts, the original roadways can be redesigned to increase livability and expand modal options. Projects that would improve the downtown business environment include road diets, wider sidewalks, street furniture, bike paths and landscaping.

Proactive attention is needed to address potential indirect land use and mobility impacts of bypasses through development of appropriate land use and transportation plans, strategies and mitigation measures. Seggerman and Williams (2014) recommend that bypass alternatives include the development and testing of future land use and network planning scenarios.

Examples

I-285, Atlanta, Georgia

Highway 285 is a bypass that surrounds downtown Atlanta. Many state roads and highways link to the bypass. The bypass was meant to provide trucks and other vehicles the option to circumvent urban Atlanta; however, local users are creating high levels of traffic by using the route to commute to work (Georgia Department of Transportation, 2014). Some of the areas near I-285 are transitioning from suburban to urban areas due to the increased accessibility provided by the bypass, causing sections of the bypass to operate over capacity (Revive285, 2008). Surface relief routes are limited, seeing that the region's surface routes are arranged radially from the city center and lack traverse surface arterials (ARC, 2008). Trucks have no alternative other than to use I-285, even if there is already congestion on this route (ARC, 2008).

Use of the bypass by freight vehicles is enforced by state law HB 753, which prohibits trucks with more than six wheels from traveling on I-20, I-75, I-85 or SR 400 inside of I-285 (House Bill 753, 2014). There are some exceptions to this truck regulation, including allowing trucks that have pickups or deliveries inside of I-285 to use those routes.

The I-285 and SR 400 interchange experiences major traffic congestion and safety concerns (Figure 42) (Georgia Department of Transportation, 2014). The Atlanta Transportation Improvement Plan has been implemented to reduce these issues for "hundreds of thousands of motorists" (Office of the Governor, 2014). An estimated $1.06 billion are required for expansions of the interchange, including new flyover lanes, express lanes and other means to facilitate traffic (Georgia Department of Transportation,

2014; Office of the Governor, 2014). GDOT is using a public-private partnership to accomplish the project goals (Georgia Department of Transportation, 2014; Office of the Governor, 2014). Construction is expected to begin in 2016 (Georgia Department of Transportation, 2014).

Figure 42. Traffic on the SR400 and I-285 connector

Source: Getz, 2012

Route 33 Bypass, Nelsonville, Ohio

The Nelsonville bypass on Route 33 circumvents the town of Nelsonville, Ohio and traverses Wayne National Forest (Figure 43). Opened in 2013, the project addressed congestion and safety concerns within Nelsonville. Originally, the two-lane Route 33, now Business Route 33, went through the center of Nelsonville, with stop-and-go traffic that was limited to 35 mph (Lane, 2013). Traffic volumes along the new bypass route exceed 73,000 vehicles daily, with 1,700 trucks along some portions (Ohio Department of Transportation, 2013). Various Appalachian industries are located along Route 33, including coal, lumber, utilities, transportation, construction, healthcare, tourism and manufacturing (Fairfield County Economic Development, 2013). Route 33 connects Ohio River Ports to Columbus International Airport and Rickenbacker International Cargo Airport (Fairfield County Economic Development, 2013).

Figure 43. Route 33 bypass map

Source: Backer, 2013

The bypass cost $160 million and was part of a larger project to connect southeastern Ohio through Route 33, promoting economic development in that area (Lane, 2013; Ohio Department of Transportation, 2013). Following completion of the 8.5-mile bypass, the Ohio Department of Transportation reported that collisions on Business Route 33 had decreased by 82 percent within the first year and crashes within the city decreased by 78 percent (Lane, 2013; Ohio Department of Transportation, 2014b). Travel times between Athens and Columbus were projected to decrease by 20 minutes (Lane, 2013).

The Route 33 Nelsonville Bypass used environmentally sensitive solutions to mitigate its impact on the surrounding forest. ODOT used wildlife crossings and fencing, erected special high-mast lighting and constructed a 7.5-acre wetland. These efforts were recognized through the 2014 President's Transportation Award in environment and the Best Use of Innovation award by the Mid America Association of State Transportation Officials (Ohio Department of Transportation, 2014a).

3.1.4 Geometric Modifications

Description

Communities can employ design strategies to make appropriate roadways and intersections more accommodating to freight vehicles. This technique can reduce challenges associated with small curb radii, small travel lanes and other physical barriers (Bassok, et al., 2013). By removing geometric constraints on appropriate roadways,

communities can reduce adverse impacts such as roadway congestion, infrastructure damage and intermodal conflicts (Rhodes et al., 2015).

Application

Communities can implement this strategy by creating street design guidelines that incorporate freight needs. Design elements to consider include (Florida Department of Transportation, 2015b):

- Long, exclusive turn lanes
- Wide lane widths
- Shoulder edge treatment
- Wide medians
- No median nose
- Large, curb return radius
- Paved bulb-outs for U-turns
- Large intersection areas
- Direct front access with wide aprons
- No on-street parking
- Fewer amenities for other modes

The appropriateness of these elements depends on roadway functional classification and adjacent land uses. Practitioners should use a Complete Streets approach and design for the primary users of the roadway. In areas with high levels of freight activity, large tractor trailers may be the appropriate design vehicle and the design aspects listed above would be applicable. On highly livable corridors, modal emphasis may be placed on pedestrians, bicyclists and transit. Therefore, wide lanes, large turning radii and other design treatments that support large trucks would not be appropriate. In areas with diverse activity, practitioners must take a more nuanced approach to balance freight needs with broader community needs. Design elements that may be appropriate for livable corridors with high levels of freight activity include (Florida Department of Transportation, 2015b):

- Moderately wide travel lanes
- Narrower bicycle lanes
- Narrower sidewalks with a small, grassy buffer
- Exclusive left-turn lanes, but shared right-turn/through lanes
- Middle-range curb return radius
- Curb median nose to provide pedestrian refuge; nose is shaped to accommodate the largest design vehicle
- Periodic intersections with pavement bulb-outs
- Indirect rear access with minimal driveways

While the creation of design guidelines is relatively inexpensive, the costs to modify existing infrastructure can be much higher. However, geometric modifications are an ongoing strategy that can produce short-term results on key corridors and ensure consideration of freight needs over the long term.

Special Considerations

Practitioners should implement this technique with careful consideration of both community and freight needs. Distinction should be made between which modes to "design for" and which to "accommodate." For example, though modal emphasis may be placed on heavy trucks in freight activity areas, there should still be appropriate infrastructure to accommodate bicyclists and pedestrians. The same concept applies to highly livable areas. Communities should not exclude any particular mode, but rather prioritize the primary users' needs given the roadway function and land use context (Figure 44). Planners should invite stakeholder participation to establish the design vehicle, identify conflict points and determine the most useful design treatments.

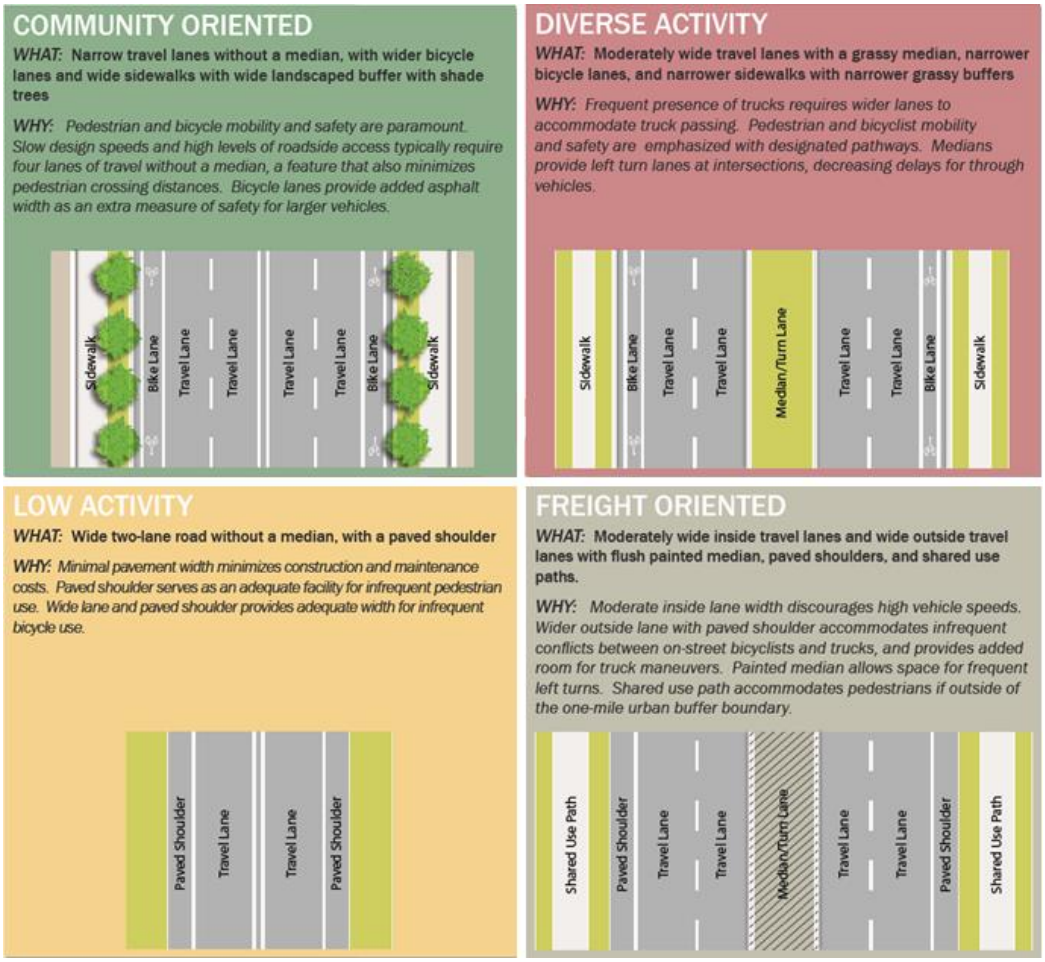

Figure 44. Context-sensitive cross-section configurations

Source: Florida Department of Transportation, 2015b

Geometric modifications can be combined with other strategies to reduce costs and minimize intermodal conflicts. Truck route programs direct freight vehicles towards designated roadways that are equipped to handle heavy truck traffic. Urban freight villages centralize various freight-related activities within a defined area. By employing strategies that concentrate industrial uses and truck traffic within distinct areas, planners can consolidate infrastructure improvements, maximize their value to the freight industry, and minimize conflicts on livable corridors. Planners may also consider coordinating geometric modifications with repaving projects to further reduce costs.

Examples

Complete Streets Checklist, Seattle, Washington

The City of Seattle adopted a Complete Streets ordinance in 2007 which not only requires transportation projects to address bicycle, pedestrian and transit needs, but also to accommodate freight vehicles where appropriate (Seattle Department of Transportation, n.d.). The City also developed a project checklist to ensure consistency with the ordinance and relevant local plans. Local plans to be considered include the Freight Mobility Action Plan and the Right-of-Way Improvements Manual, both of which state the need for appropriate roadway geometry on major truck streets. Some recommended treatments on corridors with heavy truck traffic include curb bulbs, on-street loading zones and high branching trees in planting strips (City of Seattle, 2015b).

Complete Streets Handbook, Philadelphia, Pennsylvania

The City of Philadelphia developed a Complete Streets Handbook in 2012 to guide roadway design within the city. While bicyclists and pedestrians are a major focus, the handbook also outlines express considerations for freight. Design priorities for trucks and emergency vehicles include adequate lane width, sufficient turning radii, continuous routes and loading zones.

The handbook provides a roadway classification system that is used to determine the appropriateness of specific design treatments within various land use contexts (Figure 45). Curb radii, for example, "are contingent on the context and traffic characteristics of an intersection (e.g. land use, traffic volume, vehicle sizes)" (City of Philadelphia, 2012). Lane width, bike lanes, medians, chicanes and curb extensions are just some of the other design elements explored in the handbook.

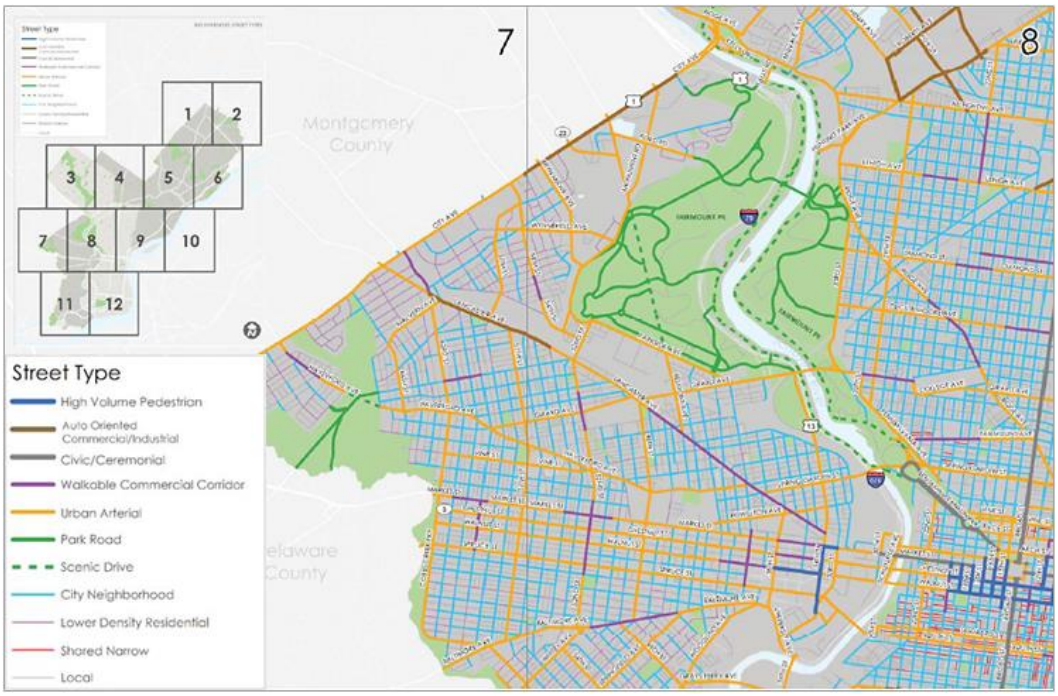

Figure 45. City of Philadelphia's context-sensitive street classification system

Source: City of Philadelphia, 2012

3.1.5 Multiuse Lanes

Description

Multiuse lanes, also referred to as combined-use lanes, refer to a variety of approaches that control the types of vehicles that may use a roadway travel lane based upon specified conditions. Some multiuse lanes allow all users to share a lane simultaneously, while others allow specific vehicles to use the lane only during designated times (Holguín-Veras et al., 2015). Examples include bus-only lanes that allow trucks at specific times for loading/unloading (Álvarez & De la Calle, 2011; FHWA, 2012). Variable message signs inform drivers of when they may use the multiuse space, while lane markings help drivers identify the types of vehicles that may be in that space (Agrawal et al., 2012; Barrera, 2010).

Application

Establishing multiuse lanes requires an assessment of the needs of local users, the types of vehicles using the roadway and stakeholder engagement (Holguín-Veras et al., 2015). Costs associated with this technique include infrastructure, electronic messaging or other signage to convey the lane use restrictions to potential users, as well as police enforcement (Barrera, 2010; Holguín-Veras et al., 2015; SUGAR, 2011). Enforcing proper use of multiuse lanes may require transportation agencies to develop a relationship

with the police, passive enforcement techniques (e.g., physically separated bus lanes using low rise curbs and offset bus lanes), and even lane enforcement cameras (Agrawal et al., 2012).

Current infrastructure influences what type of restrictions can be applied. Allowing too many types of vehicles in a multiuse lane may increase travel time, while restricting too many vehicles may cause driver confusion (Holguín-Veras et al., 2015).

Special Considerations

Multiuse lanes can increase the efficiency of traffic flow and reduce travel time (Álvarez & De la Calle, 2011; Holguín-Veras et al., 2015). Multiuse lanes can also enhance livability and promote freight strategies, like clean freight vehicles (Holguín-Veras et al., 2015).

Multiuse lanes can potentially confuse drivers, which creates enforcement challenges (Holguín-Veras et al., 2015). An increase in users may create conflicts between the different vehicles that depend on multiuse lanes (Holguín-Veras et al., 2015). Road geometry can present a challenge to larger vehicles, which may limit the use of this technique to smaller delivery vehicles (Álvarez & De la Calle, 2011; Holguín-Veras et al., 2015).

Using multiuse lanes in conjunction with time-share approaches, a practice that allows distributors to reserve a specific time slot for loading and unloading activities, can help reduce freight traffic during peak hours (Álvarez & De la Calle, 2011). Allowing "green" vehicles to use multiuse lanes may be an incentive for the public sector to explore alternative vehicles (Holguín-Veras et al., 2015).

Examples

Barcelona, Spain

Barcelona established multiuse lanes to address freight challenges, including increased automobile traffic that caused congestion issues in the commercial center (SUGAR, 2011). The goals of this initiative included: 1) suppressing illegal and double parking to reduce travel time and time spent looking for a place to park, and 2) to optimize the available street space (SUGAR, 2011).

Drivers are informed of what vehicles may use multiuse lanes through variable message signs (Figure 46) (Guerrera, 2010). As of 2011, seven multiuse lanes were using variable message signs to indicate what vehicle types may use the lanes (SUGAR, 2011). Educational campaigns have helped inform drivers of the purpose of multiuse lanes. Lanes are reserved as follows: peak-hour use (early morning and afternoon) is available for general and bus traffic, deliveries are scheduled between peak hours, and residential parking is available from evening to early morning (SUGAR, 2011).

Figure 46. Variable message sign (VMS) displays

Source: Guerrera, 2010

Since the multiuse lanes were established, travel time has decreased 12-15 percent, there has been a reduction in illegal parking, and unloading capacity has increased (as cited in Ecorys, 2008; Metrolinx, 2011; SUGAR, 2011). This strategy can reduce fuel consumption by 10 percent due to freight vehicles operating during off-peak hours, minimizing accelerations and stops, and spending less time trying to find a parking space (Álvarez & De la Calle, 2011).

Paris, France

The City of Paris allows for delivery vehicles to use a portion of its 118-mile bus lane network to access loading zones during off-peak hours (Agrawal et al, 2012). This arrangement, referred to as shared freight-public transport lanes, increases accessibility for delivery vehicles by allowing them to load and unload on bus lanes. The bus lanes are demarcated by low curbs, a passive enforcement strategy that discourages non-authorized users from using the lane without intervention from patrol or camera enforcement (Agrawal et al, 2013).

Delivery zones are located adjacent to bus lanes (Figure 47) (Agrawal et al., 2012; Agrawal et al, 2013). Special markings along the bus lane indicate where goods vehicles may load and unload, including signs that explain when deliveries are allowed; a yellow "X" identifying where to park; and the word "deliveries" in yellow paint on the pavement (Agrawal et al., 2012). Dedicated traffic agents enforce time restrictions and the use of delivery zones along the bus lane (Agrawal, 2013).

Figure 47. Loading zone adjacent to bus route

Source: Agrawal, 2012

3.2 PARKING AND LOADING

3.2.1 Peak-Hour Clearways/Parking Restrictions

Description:

Peak-hour clearways (also referred to in the UK as red routes) are roads or sections of roads where parking or stopping is prohibited during periods of high traffic demand. This technique increases the capacity of the road during the morning and evening peak, and facilitates efficient movement of both people and freight (Holguín-Veras et al., 2015). Routes are signed in various ways to inform motorists and commercial vehicles of the restriction, as illustrated in the examples.

Application

This strategy involves careful consideration of traffic movements and land use in the target area, including users and businesses that would be negatively impacted by the restriction. Clearways can be implemented relatively quickly after a sufficient analysis is completed and appropriate signage posted. While implementation involves relatively little financial investment, it does require enforcement, which can create added costs (Holguín-Veras et al., 2015).

Clearways may be appropriate when the following conditions are present:

- A high volume of directional traffic in the target area;

- Low average travel speeds during peak periods that are well under the posted speed limit;
- Roadways that are strategic corridors for the movement of people and goods;
- Alternative parking is available to accommodate drivers and freight carriers who need to stop within the target area (Transport for NSW, 2013).

The governing authority may make reasonable exceptions as needed, such as for delivery vehicles, buses and taxi cabs (Transport for NSW, 2013), and should ensure alternative accommodations are available for those residents and businesses that may be adversely impacted by the restriction. Overall, the clearway should balance the needs of the people and businesses based within the clearway with the greater good of the community to produce a net benefit (Transport for NSW, 2013).

Special Considerations

Peak-hour clearways are an innovative tool to improve roadway capacity without the cost of adding additional travel lanes (Transport for NSW, 2013). This can result in more reliable travel times for motorists and commercial vehicles as well as reduced carbon emissions due to smoother traffic flow (Transport for NSW, 2014).

Although clearways have a number of benefits, they can also have unintended, adverse effects. Firstly, they can prevent freight carriers from servicing locations in the clearway zone. Secondly, they can interfere with residents' ability to access those same locations. Thirdly, they can potentially impact profitability of businesses when clients and customers are unable to access the premises (Holguín-Veras et al., 2015). Some of these adverse effects can be mitigated by ensuring alternative parking and loading zones are located nearby and encouraging off-peak deliveries (Transport for NSW, 2014).

Examples

New South Wales, Australia

Peak-hour clearways are one of several strategies adopted by the New South Wales Government to relieve traffic congestion. This initiative has allowed motorists to use all lanes in designated corridors to improve traffic flow. This program has been in place for several decades, and Transport for New South Wales is currently proposing to extend some clearways to weekends and create new clearways to keep up with traffic demand. However, before implementing new restrictions, the city must first ensure that there is a comparable amount of parking and loading zones nearby to minimize the potential impacts on the community and on freight carriers (Transport for NSW, 2013). Figure 48 is an example of typical clearway signs in New South Wales.

Figure 48. Clearway signage

Source: Transport for New South Wales, 2013

Devon, England

The Devon County Council has implemented urban clearways on some of its streets to facilitate the smoother flow of traffic, and uses appropriate signage to indicate the restriction, any exceptions and the times enforced. Some streets are 24-hour urban clearways, while others are only effective during specific times. Figure 49 is an example of a peak-hour clearway sign. Devon's Red Routes are major road clearways indicated by signage and by road markings. In Figure 50, double red lines indicate no stopping is permitted at any time, and single red lines indicate no stopping is permitted during the hours specified on the accompanying signage. Figure 51 depicts a Red Route where exceptions are allowed in bays marked with broken lines only during certain time windows (Devon County Council, 2014).

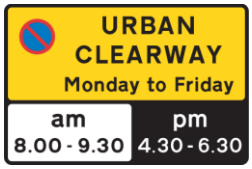

Figure 49. Urban clearway sign in Devon, England

Source: Devon County Council, 2014

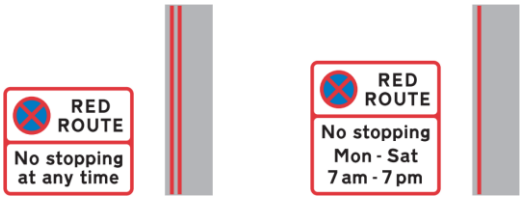

Figure 50: Red route signs and road markings in Devon, England

Source: Devon County Council, 2014

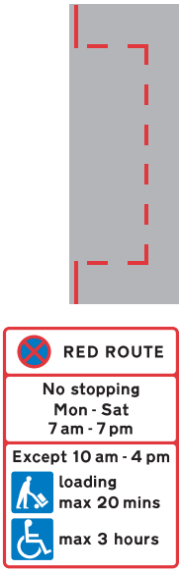

Figure 51. Red route signage with exceptions in Devon, England

Source: Devon County Council, 2014

3.2.2 On-Street Parking and Loading Zones

Description

On-street parking and loading zone-related initiatives focus on reconfiguring street design and reallocating curb space to accommodate freight vehicles. When adequate parking and loading space is provided, truck drivers spend less time searching for a curb space and can access goods receivers more easily. This strategy helps to reduce vehicle miles traveled, reduce illegal parking, improve roadway capacity, improve safety, and improve freight operational efficiency (Holguín-Veras et al., 2015).

Applications

Implementing a parking and loading zone strategy requires several steps (Holguín-Veras et al., 2015):

- Planners must engage with the private sector and identify areas where additional parking and loading space for trucks is needed.
- Land development regulations must be updated accordingly.
- Meters, if necessary, must be installed.
- Signage and road markings must be updated.
- Enforcement procedures must be in place to prevent illegal parking by both passenger and freight vehicles.

This strategy can be implemented fairly quickly and at low cost. However, costs can increase if retrofitting is needed (Holguín-Veras et al., 2015).

Planners might also consider applying this strategy in the following ways:

- Consider a regulation that limits loading zone access to delivery trucks only in high-demand areas, where eliminating metered parking to expand loading zone size would be undesirable (City of Boston, 2001).
- Add parking meters and loading zones to areas that previously did not accommodate stopped vehicles. For example, the City of Boston (2001) considers this strategy under the following conditions:
    - Downtown streets with two-hour parking limits but no parking meters
    - Corridors where peak-hour restrictions can be removed without causing congestion
    - Side streets that connect to major corridors with "No Stopping" curb regulations during peak commuting hours

Special Considerations

Inadequate parking and loading space is considered a major barrier to freight mobility in urban areas. Truck drivers must often circle a given block to find a parking/loading space, and if no spaces are available they may ultimately have to double-park to complete their delivery (Transport Research Support, 2009). Not only do freight companies bear the costs of tickets and fines for illegal parking, these conditions also increase vehicle miles traveled, increase traffic congestion and increase air pollution (Bassok et al., 2013). However, when curb space is reallocated to accommodate trucks, some of these adverse conditions can be minimized and benefit both freight operators and the community as a whole (Best Urban Freight Solutions, 2004a).

Planners should consider the following when implementing an on-street parking/loading zone policy:

- Where should the freight parking/loading zones be located? What locations have a shortage or excess of commercial loading space?
- Should the spaces specify time windows or have time limits? Parking spaces may be designated as "freight-only" during peak delivery times or outside peak traffic windows. Freight parking/loading spaces may also have time limits to encourage vehicle turnover when demand for loading space is high. However, the amount of time allocated for freight parking should be sufficient for drivers to conduct deliveries (Better Market Street, 2011)
- Pricing schedule? If parking fees are implemented, they should be high enough to encourage vehicle turnover, but low enough to avoid excessive costs to drivers.
- Should the spaces be provided on-street or off-street at the receiver location? (If the latter see Section 3.2.3, "Off-Street Parking and Loading Requirements.")
- What impact will the strategy have on automobile and bicycle traffic and how can it be minimized?

- What sizes should freight parking/loading zones be to allow the driver to access the space? How can loading areas be designed to facilitate transfers of goods? Loading areas should provide a reasonable amount of space for goods to be removed from the back of the truck, and obstacles such as poles should be minimized (Transport Research Support, 2009).

Examples

Corridor Improvement Program, Boston, Massachusetts

The City of Boston Transportation Department initiated a corridor improvement program to address problems with truck double parking in key corridors. Five corridors were evaluated for loading and unloading issues. The analysis found that most double parking or illegal curb parking by trucks occurred during the morning or midday hours. Reasons for this included difficulty accessing loading zones, high demand, illegal parking, and/or the lack of nearby loading zones. Figure 52 shows two "yellow hat" meters used in Boston to designate loading zones for specific time periods.

Figure 52. Yellow hat meters

Source: City of Boston, 2001

Based on the evaluation, the city identified several regulatory strategies to accommodate loading during the morning period when peak loading demands occurred, as well as to provide additional parking opportunities at other times of the day:

- Eliminate parking on one side of the street from 8-11 a.m. to provide "guaranteed" areas for loading during these periods;
- Provide limited loading zones after 11 a.m. and use the available space for short-term metered parking;
- Regulate all previously unregulated curb space;
- Extend meter hours of operation from 6-8 p.m.; and/or
- Prohibit loading or curbside use during peak periods.

The strategies that were applied were tailored to the unique conditions and problems identified in each of the key corridors. In addition to the analysis of traffic conditions and parking violations, the city involved residents, merchants and other key stakeholder groups, including frequent commercial carriers (e.g., UPS, FedEx, etc.) in development of the regulatory plan. The city plans to extend this approach to other corridors with strategies "fine-tuned" based on corridor specific evaluations (City of Boston, 2001).

Freight Mobility Strategic Action Plan, Seattle, Washington

The City of Seattle adopted a Freight Mobility Strategic Action Plan to address various last-mile delivery issues, including the availability of parking and loading zones. In order to balance the demand for parking between residents, businesses and government, the city proposed a series of strategies, including:

- Ensuring workable truck access and adequate loading berths in the design of new buildings;
- Retaining alleys and ensuring they work efficiently for goods delivery
- Exercising appropriate enforcement to ensure that loading zones are used for freight loading and unloading
- Allowing after-hour truck access on certain streets to reduce the demand for daytime parking and loading (City of Seattle, 2005)

The city also plans to work with businesses to install loading zones where appropriate, and consult the Freight Mobility Advisory Committee to identify additional approaches to improve freight access in the city (City of Seattle, 2005).

Commercial Loading Zone Program, Washington, D.C.

The District of Columbia's 2007 Downtown Curb-space Management Plan is a notable example of how cities can accommodate freight movement in urban environments. In partnership with two business improvement districts, the city researched two pilot locations, and, based on the data collected, tested several loading zone strategies, including:

- Reallocating curbside loading through regulatory signage;
- Expanding loading zones from 40 feet to 100 feet where necessary;
- Establishing metered loading zones; and
- Increasing enforcement of parking and loading regulations (District of Columbia, 2014b; District of Columbia, 2014c).

To communicate these changes, the city sent letters to over 300 companies that deliver goods and services in downtown D.C. Property managers in the pilot areas were also informed of the changes so they could pass the information along to their tenants and delivery companies (District of Columbia, 2014b). Data collected for the plan's final

report indicated an overall reduction in automobile and bicycle travel times in the pilot locations after these strategies were implemented (District of Columbia, 2014b).

Following the Downtown Curb-space Management Plan pilot study, the city conducted a broader study on current parking conditions and evaluated commercial parking and loading needs (Figure 53) (District of Columbia, 2014a). The District also finalized regulations to begin metering commercial loading zones city-wide to increase efficiency, vehicle turnover and curb-space availability (District of Columbia, 2014c). Additionally, the city is exploring other strategies to reduce demand for commercial parking/loading areas, including promoting off-peak deliveries, supporting vehicle consolidation strategies, and supporting off-street parking and loading (District of Columbia, 2014c).

Approach	Customer Curbside Demand	Duration of parking need	Loading Zone Size	Loading Zone Time	Representative Neighborhoods
NG&S	Lower	Shorter time periods	Larger zones needed	Wider window for reserved loading period needed	Petworth Foggy Bottom Van Ness
F&B	High	Longer time periods	Existing zones generally adequate	Wider window for reserved loading period needed	8th Street/Barracks Row 14th and U Street Adams Morgan
GAFO	Lower	Longer time periods	Existing zones generally adequate	Existing loading time periods generally adequate	Dupont Circle Metro Center Friendship Heights Georgetown

Figure 53. Retailer customer parking and loading zone needs

Source: District of Columbia, 2014a

3.2.3 Off-Street Parking and Loading Requirements

Description

Local land development codes can be enhanced to accommodate goods delivery by requiring on-site parking and loading facilities, storage space or through design guidelines for delivery bays. By supporting on-site, off-street facilities, cities can help reduce demand for on-street curb space, improve infrastructure, reduce vehicle miles traveled, reduce traffic congestion and improve air quality (Holguín-Veras, 2015).

Application

Integrating off-street parking and loading requirements into local ordinances is an effective approach to better accommodate goods delivery and minimize its impacts on the greater community. Requiring off-street loading and unloading areas within a business's premises can prevent trucks from circulating to find a loading space or double parking (Giuliano et al., 2013). The requirements would apply to commercial and industrial developments, whether new or altered.

To determine the most appropriate requirements, planners will need to evaluate the local context and work with affected stakeholders, such as freight movers and area businesses. Considerations include existing building regulations, current building designs, availability of space, amount of traffic generated at various types of establishments, and types and sizes of delivery vehicles (Holguín-Veras, 2015). In addition, access to service and delivery areas should be provided from roadways properly designed for the types, sizes and number of the delivery vehicles that serve these areas (Stover & Koepke, 2002).

Special Considerations

While enhancing local ordinances to promote on-site deliveries is a low-cost strategy for local governments, it can add to building costs and therefore may be resisted by the development community (Giuliano et al., 2013). However, the following benefits may outweigh concerns about building costs (Bassok et al., 2013):

- Increases commercial building value;
- Makes deliveries easier for businesses and for freight operators;
- Supports freight operational efficiency;
- Prevents double parking;
- Reduces conflicts between delivery vehicles and other modes;
- Reduces vehicle miles traveled as trucks need not circulate to find a parking/loading area;
- Reduces traffic congestion; and
- Improves air quality.

Examples

Orlando, Florida

Acknowledging that developers are unlikely to construct truck bays and docks unless the facility is built for a specific truck purpose, the City of Orlando has codified standards in its land development code for off-street facilities based on the square footage and use of the building (Metroplan Orlando, 2002). The off-street loading requirements, which apply to commercial and industrial development or redevelopment, are as follows (City of Orlando, 2014):

Sec. 61.352. - Number of Loading Berths.

(a) *Required Number*. All commercial, industrial, and office uses, except banks and savings institutions, shall provide loading berths in the following amounts:

0 - 2,999 sq. ft. GFA	1 delivery truck berth
3,000 sq. ft. GFA or more	Minimum of 1 loading

Multi-family uses with more than three residential units, and structured parking, shall require one loading berth. In the case of multiple uses within a single building, the required number of berths shall be based on the total gross floor area (GFA) of the uses listed above in the building. Where loading berths are provided in excess of these standards, the exact number of berths shall be at the option of the developer based upon the needs of the particular use(s). All loading facilities provided shall comply with the development standards of this Part.

(b) *Determinations by the Transportation Official.* The Transportation Official shall be authorized to require additional loading berths be provided when the number of loading berths proposed is insufficient for the needs of the particular use(s), based on the standards and guidelines of the Institute of Transportation Engineers. Appeals to such determinations shall be made through City Council.

Sec. 61.353. - Location.

(a) *Requirements.* All loading facilities shall be located on the same building site as the use they serve, and outside of existing public rights-of-way and proposed right-of-way lines established by the Major Thoroughfare Plan (Chapter 61, Part 2B); and shall be well separated and buffered from residential uses abutting the building site in accordance with the bufferyard requirements of Chapter 60, Part 2.

(b) *Separation From Parking Facilities.* All loading berths and maneuvering areas shall be separated from required off-street parking facilities, except in industrial and office/warehouse uses. Directional information to assist traffic flow shall be provided by either pavement marking or signage. Delivery truck berths may be combined with parking facilities, but shall be reserved and marked exclusively for loading purposes. In all cases, access aisles may serve both parking and loading facilities.

(c) *Maneuvering Area.* All loading facilities and vehicular use areas shall be designed so as to eliminate the need for backing and maneuvering from, on, or onto streets, sidewalks, pedestrian walkways or bikeways. Loading berths shall be provided with a maneuvering area of no less than 100 feet.

Sec. 61.354. - Design. (Figure 54)

(a) *Loading Berth Dimensions:* 12 feet × 55 feet.

(1) Aisle Width (1-way): 16 feet.

(2) Aisle Width (2-way): 28 feet.

(3) Turning Radius: 47 feet.

(b) *Delivery Truck Berth Dimensions:* 12 feet × 25 feet.

(1) Aisle Width (2-way): 24 feet.

(2) Turning Radius: 42 feet.

(c) *Minimum Height Clearance:* 14 feet.

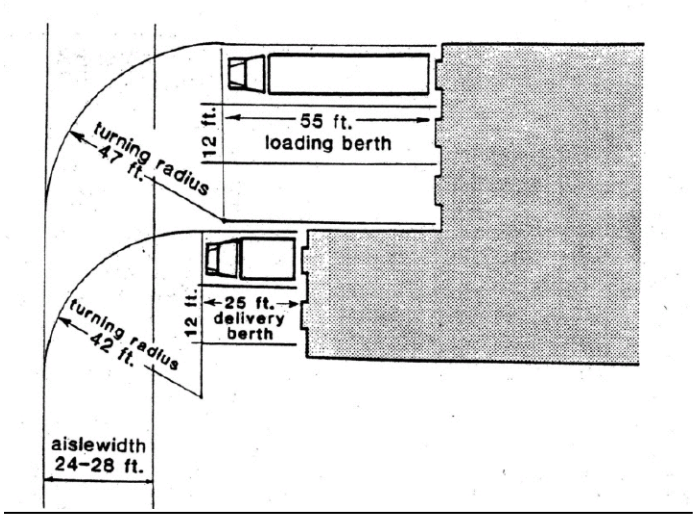

Figure 54. Off-Street loading requirements

Source: City of Orlando, 2014

Tucson, Arizona

The City of Tucson has implemented land use regulations and design standards for off-street loading for the purposes of safety, enhanced mobility and greater accessibility for all users (City of Tucson, 2014). The regulations apply to new development, new land uses locating in existing development, and any expansion of an existing land use (City of Tucson, 2014).

The minimum quantities and dimensions of off-street loading spaces specified in Tucson's land use code were calculated based on the specific use and square footage of the building. Design criteria were also implemented to ensure the loading spaces met sufficient standards of quality. The design criteria for off-street loading zones address:

- Locational requirements of the loading zone in relation to the building
- Access requirements, such as which streets may be used for maneuvering into or out of a loading space
- Screening and landscaping
- Lighting of loading areas
- Surfacing of loading areas
- Striping of loading spaces

3.2.4 Vehicle Parking Reservation Systems

Description

Vehicle parking reservation systems (also called delivery space booking systems) allow parking and loading spaces to be reserved in advance by freight carriers through the use of wireless communication technology (Holguín-Veras et al., 2015). This technique is intended to guarantee loading and unloading space and thereby reduce congestion caused by truck double parking, cut greenhouse gas emissions from truck circulation, and minimize costs to carriers from parking fines and wasted time.

Application

Delivery and pickup space reservation systems can be applied to on-street parking near large traffic generators or at private terminals. The costs to implement this technique are moderate (Holguín-Veras et al., 2015). The process generally involves the implementation of an ITS system to monitor and manage the delivery spaces as well as strict enforcement to ensure maximum efficiency. Appropriate signage is also necessary to notify drivers where they can and cannot park. Planners should engage the freight community to identify areas where a reservation system is needed and to decide the most appropriate length of each reservation (e.g., 15 minutes, 30 minutes, etc.). This technique is most applicable to areas where traffic volumes are high and parking is scarce (Giuliano et al., 2013).

Special Considerations

Planners should consider common situations that may arise when implementing a parking reservation system. One major consideration is the dynamic nature of logistics. Trucks may arrive early or late due to a variety of reasons (e.g., delayed deliveries, traffic delays, vehicle malfunctions, et cetera) (Fraser & Cherrett, 2010). If trucks arrive too early, they may wait until their reservation, utilize the space if it is not already reserved for another vehicle, or cancel their reservation and park elsewhere. If they arrive late, they may utilize the remainder of their reservation, extend their reservation if one is available, or find alternative parking. The system's ability to respond to and manage constant change is a crucial factor in its success (Giuliano et al., 2010).

Another consideration is the extent to which the freight community will utilize this tool. Planners should engage freight stakeholders and determine how valuable a reservation system would be and identify ways to maximize its utility (Holguín-Veras et al., 2015). For example, some drivers may resist having an additional task on an already busy schedule, while some may be inclined to utilize the system in areas where parking is especially difficult to find. Therefore, the benefits of a reservation system should outweigh its costs and improve upon existing conditions (Fraser & Cherrett, 2010). Additionally, planners should identify a pricing schedule that encourages drivers to use the system. The costs should be offset by the savings earned from not having to waste time searching for a parking space. While deposits, late fees and "no refund" policies may promote punctuality, they could also discourage drivers from using the system

altogether. Planners should work with their local stakeholders to determine the best approach for their community.

Examples

Toyota City, Japan

Toyota City implemented a parking-reservation pilot program for off-street parking in 2007. The aim was to reduce intermodal conflicts and roadway congestion by eliminating on-street truck parking and designating off-street areas for loading and unloading. A preliminary survey was conducted to provide context and a point of reference when measuring the program's success (PIARC, 2012).

The scope of the pilot program included space for three delivery vehicles, which were monitored and remotely controlled via webcam. Drivers could reserve space via mobile device and were required to show a special ID card to access the space. The cost to reserve a space was 10 yen (approximately 10 cents) per minute (PIARC, 2012).

At the end of the pilot, researchers found that the number of delivery vehicles parked on-street reduced by 56 percent in the vicinity of the lot. However, additional loading space (approximately six spaces total) would be necessary to meet carrier demand for parking. Researchers determined that five lots would cover about 80 percent of the on-street parking, given a walking distance of about 650 feet (PIARC, 2012).

Bilbao, Spain

The City of Bilbao tested a delivery space-booking pilot program in 2010, for which it earned the 2011 ITS España award for the best freight project. The system allowed a variety of options, including advance single booking and fixed regular bookings for up to three months. Each reservation allotted 30 minutes to load and unload the truck. Trucks could book as many slots as necessary, but to increase vehicle turnover they could not book two consecutive slots for the same parking space (Gonzalez-Feliu et al., 2013).

The electronic system was equipped with detection loops that could identify unauthorized or improperly parked vehicles, and drivers were required to present proper identification to utilize the space. Drivers also had the option to book in real time during their delivery route using parking meters. Meters allowed trucks to use the space if it was free of reservation and discouraged passenger vehicles from parking there illegally (Gonzalez-Feliu et al., 2013).

3.3 LAND USE MANAGEMENT

3.3.1 Preferential Zoning and Tax Relief

Description

Offering preferential zoning and tax relief are among the ways communities can preserve industrial uses within the central city, and prevent logistics sprawl and its associated impacts. Benefits in the form of land preservation and tax benefits can offset conditions that drive industrial uses out, such as development pressure, land use conflicts and rising land values. Incentivizing freight-related uses to locate and remain near the urban core can reduce vehicle miles traveled, cut greenhouse gas emissions, improve operational efficiency and minimize traffic congestion. It can also allow communities to concentrate infrastructure investments that benefit heavy vehicles.

Application

Planners can utilize a number of zoning strategies to preserve industrial uses and prevent freight sprawl. Preferential zoning regulations encourage specific types of development, and offer rewards to developers who meet the desired qualifications. For example, where industrial development is the goal, developers can be given floor area ratio or height limit bonuses when freight-friendly designs are incorporated into the site plans (FHWA, 2012).

Communities can also establish industrial zoning overlay districts to encourage freight-related development in designated areas. Industrial overlays may prohibit incompatible uses to minimize conflicts and prevent encroachment on industrial areas. Overlay districts may be useful for areas such as airports or seaports, where industrial activity may negatively impact surrounding areas and development pressure is high. Costs to implement this strategy are attributed to ordinance development and long-term administrative costs, though they may vary depending on the amount of research required to establish overlay requirements. When creating an industrial overlay district, communities should take the following steps (Georgia Department of Community Affairs, n.d.):

- Perform stakeholder outreach to decide if an overlay is appropriate;
- Decide specific overlay boundaries. Boundaries should be established with stakeholder input and be well-founded;
- Establish overlay requirements, such as uses, site design, noise standards, etc.; and
- Adopt an overlay district ordinance and revise the comprehensive plan. The ordinance should include a purpose statement, definitions, application procedures, standards for approval, a review board, appeals process, and resolution of conflicting provisions.

Financial incentives can also be offered at the state, regional and local level to promote industrial preservation. Property tax credits, sales tax exemptions on building materials and reduced duty fees can encourage industrial uses to locate within specified

areas (Florida Department of Transportation, 2013; New York City Economic Development Corporation, n.d.b). Though incentives can be costly to provide, the outcome can save money by reducing the need for new freight-friendly infrastructure. It can also create local jobs and foster economic development.

Special Considerations

Industrial uses can adversely impact quality of life due to excessive lighting, noise, vibrations, odors and unsightliness. It may be necessary to create buffers to minimize these impacts on nearby properties. This may involve constructing physical barriers such as sound walls, installing berms or landscape barriers, or including buffer zones around industrial uses (FHWA, 2012). Buffer zones serve to separate incompatible uses and may take the form of open space, light industrial uses or commercial development (Florida Department of Transportation, 2013). Light and noise standards may also be necessary to minimize impacts on nearby sensitive areas such as residential neighborhoods and schools.

Planners may consider combining industrial preservation techniques with other techniques discussed in this report, namely freight villages, geometric design and truck routes. By designating areas and routes specifically for freight-related uses and travel, communities can promote targeted economic development, consolidate infrastructure improvements for large trucks, and minimize adverse impacts overall.

Examples

Maritime Industrial Zoning Overlay District, Baltimore, Maryland

The Maritime Industrial Zoning Overlay District (MIZOD) was established in 2004 in response to unsustainable redevelopment of industrial properties at the Port of Baltimore (Figure 55). The district protects industrial operations and their access to deep water. It is zoned heavy industrial and prohibits non-industrial uses such as hotels, planned unit developments, and non-accessory retail and commercial uses (Maryland Department of Planning, n.d.).

Figure 55. Maritime Industrial Zoning Overlay District boundaries

Source:
http://archive.baltimorecity.gov/Portals/0/agencies/planning/public%20downloads/2010/Maritime%20Industrial%20Zoning%20Overlay%20District.pdf.

Decision makers faced some challenges during the MIZOD's development. The changing dynamics of international trade created uncertainty about the Port's future, which called into question the appropriateness of protecting industrial uses that might be dying out anyway. Planners also faced some backlash from landowners who planned to develop non-industrial uses within the proposed overlay (Envision Freight, n.d.). A public education campaign was necessary to explain the importance of deep water access to maritime industrial uses.

The MIZOD has had many positive impacts on both industrial uses at the Port and the community as a whole. The stability and reassurance provided by the MIZOD enabled businesses like Domino Sugar to continue its operations and even encouraged new business (Envision Freight, n.d.). This also helped sustain over 50,000 Port-related jobs, many of which provide middle-wage employment for uneducated, unskilled workers (Envision Freight, n.d.).

There has also been some criticism of the MIZOD. Key issues include:

- The lack of protection for transportation networks that provide access to Port operations;
- The lack of buffers and conflict resolution measures between the MIZOD area and incompatible uses neighboring the overlay zone; and

- The future land speculation that could occur at the end of the MIZOD.

Some of these issues are being addressed through the City of Baltimore's comprehensive rezoning effort. Under the new zoning code, the previous MIZOD designation will become a base zoning district with no expiration date (Baltimore Industrial Group, n.d.). The zoning code may also include buffer regulations to minimize land use conflicts (City of Baltimore, 2009).

Industrial Business Zones and Financial Incentives, New York City, NY

The 2006, the City of New York established 16 Industrial Business Zones (IBZs) to protect existing industrial districts in the Bronx, Brooklyn, Queens and Staten Island (New York City Economic Development Corporation, n.d.c). The designation prevents non-industrial use encroachment and provides real estate certainty for companies located within the IBZs. The City provides a one-time tax credit of $1,000 per employee to industrial and manufacturing companies that relocate to an IBZ (City of New York, n.d.).

The City offers other financial incentives as well. The Industrial Incentives Program provides manufacturers, distributors, warehouses and other industrial businesses with real estate tax deductions, mortgage recording tax waivers, and sales tax exemptions on building materials and equipment (New York City Economic Development Commission, 2011).

Incentives are also available for developers who construct or renovate industrial space that will be used for manufacturing, distribution, warehousing or other industrial activity (New York City Economic Development Corporation, n.d.a). Sites must be located within designated Empire Zones or Empowerment Zones. Benefits include a mortgage recording tax waiver and sales tax exemptions on building materials and equipment.

3.3.2 Urban Freight Villages

Description

"A freight village is a defined area, often master-planned, within which all activities relating to the transport, logistics, and distribution of goods are carried out by various operators" (FHWA, 2012). Also referred to as an "Integrated Logistics Center," it is an intermodal or freight staging facility which enhances connectivity across and between modes, aims to consolidate logistics activities and improves operational efficiency (Florida Department of Transportation, 2009a; MetroPlan Orlando, 2010; NYMTC, 2009). Primary features in a freight village include access to multiple modes of transportation, intermodal terminals, warehousing, distribution centers, customs and freight forwarders. Freight villages may also have supplementary commercial facilities such as restaurants, hotels, banks, post offices and truck washing stations (Florida Department of Transportation, 2009a; Mann, 2010; Weisbrook, 2005; NYMTC, 2009). Freight villages provide a means of separating freight land uses and activities from urban residential and mixed-use areas, thereby helping to curb exposure to adverse impacts

such as emissions, noise and vibrations (Florida Department of Transportation, 2009a; Mann, 2010; Weisbrook, 2005).

Application

Both the public and private sector play important roles in the formation and success of freight villages. In many cases, public support is needed via subsidies, infrastructure development and/or rezoning to initiate the formation of the village, while private-sector investment and cooperation is essential to freight village success (NYMTC, 2009).

Freight villages can be developed from scratch or through additions to existing freight hubs or industrial parks (Florida Department of Transportation, 2009a). Planners should conduct a feasibility study or develop a master plan for freight villages, and should develop public-private partnerships to garner crucial private-sector support (Smart Growth America, 2014). Planners may also consider creating a specific zoning category for freight hubs to preserve surrounding land for future industrial development (Smart Growth America, 2014; FHWA, 2009b).

Freight villages can have a number of characteristics which help it integrate with the surrounding community. Services such as restaurants, banks, day cares and hotels can serve both the freight village and the community, and provide a buffer between industrial and non-industrial uses (Florida Department of Transportation, 2009a; NYMTC, 2009). Well-placed landscaping can improve the overall appearance of the center and reduce the aesthetic impact on the community (Florida Department of Transportation, 2009a). Freight villages can also promote economic growth by creating jobs and increasing property values (Florida Department of Transportation, 2009a; NYMTC, 2009 Weisbrook, 2005).

Special Considerations

Freight villages offer several benefits to businesses, including consolidated infrastructure improvements, market proximity, access to multimodal transport, increased efficiency, perimeter security, supportive services, and synergistic business opportunities (Weisbrook, 2005; FHWA, 2009b). Freight villages offer benefits to the public sector as well, including reduced congestion and vehicle miles traveled; reduced conflict with other uses; potential brownfields redevelopment; economic growth; and increased land values (Weisbrook, 2005).

However, freight villages do face some challenges. One study found that businesses often locate within a freight village but do not cooperate, which precludes increased efficiency (NYMTC, 2009). This is especially common with multinational firms that do not base their operations on local initiatives (NYMTC, 2009). Additionally, freight villages, which are constructed over time, could face development pressures from other uses and create zoning conflicts (FHWA, 2012).

Examples

Orange County, Florida

As part of its 2030 Long Range Transportation Plan, MetroPlan Orlando proposed 15 locations for freight villages based on current land use and proximity to regional transportation infrastructure facilities (MetroPlan Orlando, 2010). The plan also recommended creating and implementing a warehousing and logistics zoning category to support existing freight clusters and preserve space for future freight-related development (Holloway & Spahr, 2013).

One goal of the Sustainable Orange County Plan is to make freight movement safe and efficient. Related benchmarks include an increase in designated truck routes and a designated freight village/intermodal logistics center. Current projects to implement this goal are (A. Barber-Torres, personal communication, August 19, 2015):

- Map of Orange County intermodal logistics center/freight village sites to include existing, proposed and potential sites updated from MetroPlan Orlando's 2013 Regional Freight Study
- Comprehensive Plan Amendments to Orange County's Transportation Element and Future Land Use Element
- Freight Logistics Zone Feasibility Analysis for Orange County

Promotion of the planned freight villages will involve efforts from several entities. The Florida Department of Transportation would be responsible for preserving the roles of arterial corridors, monitoring roadway conditions and identifying transportation impacts of developments (MetroPlan Orlando, 2010). Cities and counties would be responsible for directing warehouse development in designated freight cluster areas and maintaining buffer zones to prevent land use conflicts (MetroPlan Orlando, 2010). Finally, some shared roles include reviewing the existing roadway network, planning in an integrated manner, and implementing appropriate design standards in and around freight villages (MetroPlan Orlando, 2010).

Raritan Center, New Jersey

Raritan Center is part of a former Army arsenal that was purchased in 1964 after it was deemed unusable for the modern U.S. military. The buyers, who also owned federal storage warehouses based out of Newark, sought to develop the site into a warehousing and office complex. Cooperation with a local rail shortline led to infrastructure and service improvements, which attracted more businesses to the park and eventually transformed it into a freight village (Florida Department of Transportation, 2009a; NYMTC, 2009).

In 2009, 15,000 people worked in over 13 million square feet of space in Raritan Center, compared to 8,000 people in 9 million square feet of space in 1984 (Florida Department of Transportation, 2009a; NYMTC, 2009). In addition to its various warehousing and logistics facilities, the complex has a variety of commercial facilities such as restaurants, hotels and banks which serve both the freight village employees as well as the surrounding community. These commercial facilities also serve as a buffer

between the industrial activities inside Raritan Center and the neighboring land uses (Figure 56) (NYMTC, 2009).

Figure 56. Landscaping and non-industrial buffers at Raritan Center, New Jersey
Source: federalbusinesscenters.com

3.4 TRAFFIC AND DELIVERY MANAGEMENT

3.4.1 Voluntary Off-Peak Deliveries

Description

Voluntary off-peak delivery programs are designed to encourage carriers and receivers to conduct deliveries during off-peak travel periods, generally at night or early in the morning (e.g., between 7 p.m. and 6 a.m.). Shifting some deliveries to off-peak periods can serve freight, business and broader community goals by:

- Enhancing public-private collaboration;
- Reducing peak-hour roadway congestion;
- Reducing intermodal conflicts;
- Improving freight operational efficiency;
- Reducing fuel and delivery costs;
- Improving dependability of deliveries;
- Curbing greenhouse gas emissions; and

- Improving air quality.

Application

Voluntary off-peak delivery programs can be an appropriate strategy for urban areas with high levels of truck traffic and roadway congestion. A comprehensive study of existing traffic in a given area should be conducted to determine how much congestion could be reduced if an off-peak delivery program was implemented (Holguín-Veras et al., 2014). Examples of areas that may benefit from an off-peak delivery program include busy commercial districts, downtown cores and major traffic generators such as universities, convention centers and sport complexes (Holguín-Veras et al., 2005).

Planners should also perform extensive public outreach to determine if an off-hour delivery program is appropriate for a given area. Communicating with multiple stakeholders including freight carriers, business owners and neighborhood residents can provide insight into the need, feasibility and acceptability of such a program. It may also reveal which types of carriers and receivers are likely to participate when the program launches.

Communities interested in implementing an off-peak delivery program may consider a pilot test. Pilot tests can be operated on a small scale (e.g., involving only a few selected participants) for a limited period of time, such as three months. This would allow program administrators to perform cost/benefit analysis and address any challenges before implementing the program on a broader scale (Holguín-Veras et al., 2014).

Costs to implement an off-hour delivery program may vary depending on the amount of staff time devoted to administering the program as well as the amount of incentives provided to encourage participation. Programs can be implemented relatively quickly following research and stakeholder outreach.

Special Considerations

The primary challenge in encouraging off-peak deliveries is getting receivers who may not be open during the off-peak to agree to accept deliveries outside normal business hours. Freight carriers generally recognize the benefits of off-peak deliveries, but receivers may object to the increased costs of staffing someone to accept them (City of Portland, 2012b). Additional costs incurred may include supervisor labor (if a supervisor is required to be present during deliveries), insurance costs, security costs and energy costs (Holguín-Veras et al., 2005).

Planners should also consider constraints on freight carriers. Trucking companies must meet federal hours of service requirements, and may have to pay premium wages for off-peak operations. They may also incur efficiency losses from spreading deliveries over a longer period (Dablanc et al., 2013).

Local governments can take steps to address obstacles faced by both receivers and carriers when shifting to off-peak deliveries. Meaningful stakeholder outreach can help practitioners identify and resolve challenges. Educational initiatives can make businesses aware of potential benefits. Local governments can provide financial incentives such as tax credits, subsidies or grants to encourage participation and offset any increased costs

(Holguín-Veras et al., 2005). Some carriers may even be willing to offer delivery discounts. Local governments may also reduce receiver staffing costs by encouraging unassisted deliveries, where truck drivers make deliveries without a receiver present (City of Portland, 2012b). Public recognition of participating businesses' commitment to sustainable practices may also be a motivating factor (Holguín-Veras et al., 2014).

Though off-peak deliveries pose many benefits, they can increase noise pollution during the off-hours. This can be a nuisance for local residents and is a major obstacle for off-peak delivery programs. Local governments can avert excess noise by encouraging or requiring trucks that participate in off-peak deliveries to use low-noise technology (Holguín-Veras, 2014). Driver training programs can also promote behavioral changes that minimize noise during the late night or early morning hours. City codes may also need to be amended to remove any existing restrictions on nighttime deliveries (City of Portland, 2012b).

Examples

PierPass OffPeak Program, Ports of Long Beach and Los Angeles, California

PierPass is a nonprofit company created by marine terminal operators at the ports of Los Angeles and Long Beach to address multi-terminal issues such as congestion, security and air quality. In 2005, PierPass launched the OffPeak program to encourage cargo pickups and dropoffs during nights and weekends (PierPass, n.d.). PierPass charges a traffic mitigation fee on weekday, daytime cargo traffic to incentivize shifts to off-peak operations. The revenue from the congestion charge helps pay for the cost of operating during off-peak hours (PierPass, 2015).

Since its inception in 2005, the OffPeak program has diverted 34 million daytime truck trips to nights and weekends (PierPass, 2015). OffPeak now regularly diverts about half of the daily truck-borne container traffic to off-peak hours (PierPass, 2015).On an average weeknight, approximately 13,500 trucks visit the marine container terminals at the ports of Los Angeles and Long Beach (PierPass, 2015).

Off-Peak Delivery Pilot Program, New York, New York

From 2009 to 2010, the City of New York conducted an off-peak delivery pilot test to reduce traffic congestion, improve environmental conditions and enhance productivity in Manhattan. In 2008, the pilot test team attempted to recruit participants through an Industry Advisory Group, the New York State Restaurants Association and direct contact with restaurants, but received no positive responses. This is likely attributable to the recent financial crisis that severely impacted New York's economy. In 2009, once the economy was relatively stable, the pilot team was able to recruit participants by identifying industry leaders with interest in supporting off-hour deliveries. Notable participants included Whole Foods Market, Foot Locker and Sysco (Holguín-Veras et al., 2010).

The pilot paired more than 30 truckers and receivers who agreed to shift deliveries to the hours between 7 p.m. and 6 a.m., with half performing staffed off-hour deliveries and half performing unassisted off-hour deliveries. The program offered receivers an initial incentive of $2,000 and carriers an incentive of $300 per truck

(Holguín-Veras et al., 2010). Trucks were equipped with remote sensing technology to track and analyze performance.

Overall, the program benefited all parties involved. Deliveries were much more timely and efficient. Trucks reached their first destination 75 percent more quickly, and unloading time was reduced from 90 minutes to 30 minutes. Parking was also more readily available during the off-peak hours, causing truck parking fines during the off-peak to be virtually eliminated. While some businesses faced increased costs, they also saw increases in daytime productivity due to the focus on customer service instead of receiving deliveries (Cassidy, 2010). Drivers reported lower stress levels and increased feelings of safety, and many receivers reported an overall positive experience (Figure 57) (Holguín-Veras et al., 2010). Due to the pilot's success, the City of New York is looking to recruit new participants and expand the off-peak delivery program.

Figure 57. Late-night delivery

Source: Rensselaer Polytechnic Institute, 2013

3.4.2 Alternate Pickup/Delivery Locations

Description

Alternate pickup/delivery locations are a last-mile strategy which specifically targets home deliveries. The concept is similar to P.O. boxes in that the deliveries could potentially be kept in a secure facility or locker and be available for pickup at the customer's convenience. Sites typically include regularly trafficked locations, such as supermarkets, dry cleaners or the workplace. Deliveries to alternate pickup points help maximize route efficiency, lower freight operating costs and potentially reduce vehicle miles traveled. This technique also helps avoid the legal and logistical conflicts that arise

when no receiver is present for a home delivery (Holguín-Veras, 2015). Figure 58 and Figure 59 depict an example of this strategy, Amazon Locker.

Application

While alternate pickup points are organized primarily by the freight industry, it is important for planners to be aware of this approach so they may help facilitate implementation where appropriate. Planners can play an indirect role in the process by granting permission to install pickup points, determining the best locations for them and providing public space for them, if necessary (NICHES, 2007). Additionally, it is possible for planners to initiate a pickup-point program as part of an overall transportation strategy (NICHES, 2007).

Location is an important factor in the overall effectiveness of this strategy (Best Urban Freight Solutions, 2004b; NICHES, 2007). Car-oriented access points such as gas stations should be discouraged, while frequently visited locations that do not necessarily promote automobile use are the most desirable (Best Urban Freight Solutions, 2004b; NICHES, 2007). Examples include supermarkets, dry cleaners, pharmacies or train stations (Best Urban Freight Solutions, 2004b).

Figure 58. Amazon locker

Source: amazon.com

Figure 59. Amazon locker instructions

Source: amazon.com

Implementation of this technique can be completed quickly and at little to no cost to cities. Minimal costs could potentially derive from any necessary infrastructure improvements (NICHES, 2007). However, cities can potentially earn income as well from this technique by renting public space for the use of pickup points (NICHES, 2007).

Special Considerations

The emergence of e-commerce or online shopping creates new logistical challenges by increasing the demand for delivery services to end consumers. While pickup points can reduce VMT for freight carriers, they can potentially increase VMT for consumers who may have to drive to the pickup location to retrieve their deliveries.

The pickup-point location is an important factor in determining this strategy's impact on vehicle miles traveled. If the delivery is made to the workplace instead of to the home, there is a greater chance that the delivery will be successful. The consumer can then save a trip with the purchase being made online and the package being delivered to a regularly visited location. However, delivery to the workplace could impact the consumer's mode choice. For example, if the consumer typically uses public transit or bikes to work, they might choose to take their car instead if they know they will need to carry their package home. This could potentially offset any reductions in truck VMT (Best Urban Freight Solutions, 2004b).

Another option is to establish a network of pickup points at various places in town, such as supermarkets, train stations and shops. The carrier could leave the package at the designated location, and the consumer could retrieve it at their convenience. This process can have benefits for the carrier, the consumer and the business storing the package (Dawid, 2014; Stevens, 2014). Carriers can reduce operating costs, consumers can avoid missed pickups, and businesses can potentially attract more customers in the process (Dawid, 2014; Stevens, 2014).

Examples

DHL PACKSTATION, Germany

PACKSTATION is a free service offered by DHL in Germany which allows consumers to select an alternative site to which to deliver their packages (Figure 60) (NICHES, 2007). Consumers are notified when their package has been delivered and are given an access code with which to retrieve their parcel. The pickup points are available 24/7 to accommodate all users. In 2006, there were over 700 stations in Germany with over 500,000 clients (NICHES, 2007). Currently, there are over 2,650 PACKSTATIONS throughout Germany with over four million clients (DHL, 2013; DHL, 2015).

Figure 60. DHL Packstation

Source: http://www.dhl.de/en/paket/paket

Most PACKSTATIONS take approximately six months to plan and construct before they are ready for use (NICHES, 2007). Local officials have been involved in determining the most suitable locations for the stations, which include railway stations or sites near large employment centers (NICHES, 2007).

3.5 NOISE REDUCTION

3.5.1 Quiet Delivery Schemes

Description

A major impact of freight is excessive noise (Table 1). Quiet delivery schemes are strategies intended to minimize freight-generated noise pollution through changes to vehicle technology, delivery equipment or driver behavior. These strategies enable trucks to perform off-peak deliveries without creating excessive noise and disturbing community residents. When off-peak deliveries are possible, the freight industry benefits from improved operational efficiency, and the community benefits from reduced roadway

congestion, improved roadway safety and enhanced air quality (Department for Transport, 2014).

Table 1. Common Noise Levels Compared to Noises Associated with Deliveries
Source: Holguín-Veras et al., 2013.

Action	Noise Measurement dB(A)
Common Noises	
Whispering	30
Normal conversation	60
Busy highway (10m away)	80
Airplane takeoff at 200m altitude	100
Noises Associated with Deliveries (Without Low Noise Technologies)	
Carts/dollies on ground	53-77
Load hatch	65-92
Driving up/away	67-83
Refrigeration kicking on	70-78
Slamming doors	74
Containers on floor	74-85
Removing onboard forklift	77-82
Standard diesel engine	80

Application

Quiet delivery schemes include technological or operational changes to limit nighttime noise from freight deliveries (Wang et al., 2013). Potential strategies include:

- Disabling beepers when backing up;
- Using low-noise alternative fuel engines;
- Installing sound-absorbing coatings such as foam to the trailer floor, walls and tailgate to minimize noise upon contact with cargo;
- Using quiet roll cages and dollies;
- Using alternative, low-noise refrigeration technology ; and
- Changing driver behavior to reduce noise from talking, door slamming, accelerating and decelerating, and loading and unloading supplies.

Although the responsibility to employ quiet delivery strategies is generally borne by the private sector, local authorities can initiate quiet delivery programs. Local authorities may require freight companies that operate during off-peak hours to administer quiet delivery strategies and reduce adverse community impacts. They may also offer incentives to encourage quiet delivery practices. Incentives can be monetary (e.g., tax credits for noise-reduction technology) or non-monetary (e.g., permission to perform off-peak deliveries). Public agencies can also offer driver training programs to promote quiet handling behavior.

Local authorities also have a role as freight generators and providers. Authorities may consider updating and improving public delivery sites and equipment to reduce noise impacts. Small changes such as installing quieter gates and doors and managing staff behavior can help reduce excessive noise. Public-sector performance can also be improved through larger commitments such as deploying government fleets equipped with quiet vehicle technology.

Public-sector costs to implement this strategy may vary depending on the government's level of involvement and amount of incentive provided. Staff time to administer the program and perform stakeholder engagement can produce moderate costs. Costs to improve loading zones, delivery equipment and government fleets can vary depending on the types of improvements.

Special Considerations

Many communities have existing ordinances that limit noise or prohibit nighttime deliveries which may need to be relaxed or amended to allow quiet deliveries during the off-peak hours. Easing restrictions on nighttime deliveries may alarm community residents. Therefore, public education and stakeholder outreach may be necessary to reassure those who may be affected by the change.

Because all parties stand to benefit by quiet delivery technology and off-peak deliveries, it may be useful to form a partnership that can collaborate on freight-related noise issues (Department for Transport, 2014). Stakeholders can work together to establish performance measures, monitoring strategies and accountability protocols (Department for Transport, 2014).

Quiet delivery strategies can be coordinated with other last-mile techniques to enhance freight mobility while preserving community livability. Off-peak delivery programs can be coordinated in conjunction with noise-reduction strategies. Additionally, quiet delivery practices can be incorporated into a freight certification program.

Examples

Off-Hour Delivery Program, New York City, New York

In 2009, the City of New York conducted an off-peak delivery pilot test in Manhattan to reduce traffic congestion, improve freight operational efficiency and reduce air pollution. One concern identified during the pilot was the potential for increased noise during the late night and early morning hours, which can create annoyance, sleep disturbance, and increased heart rate and blood pressure among neighborhood residents (Holguín-Veras et al., 2013). Though no noise complaints were received during the pilot, researchers recorded noise levels associated with off-hour deliveries. Key sources of excess noise related to handling the roll cart inside the truck, handling the metal ramp, closing the truck's back door and closing the lift gate (Figure 61).

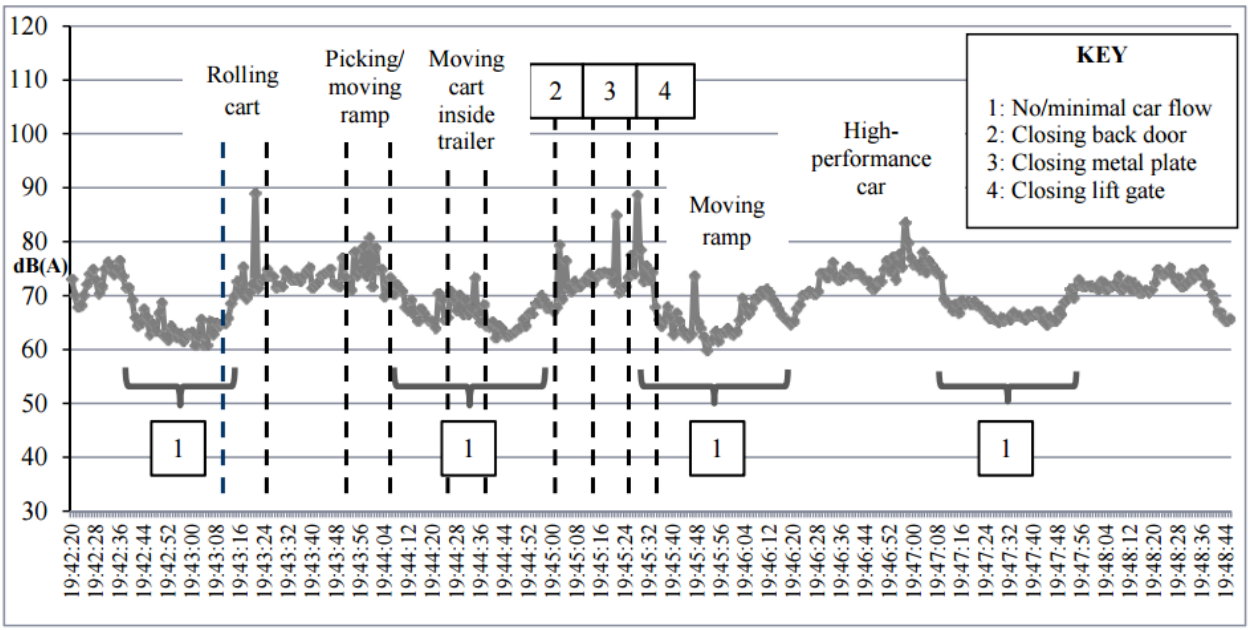

Figure 61. Example of a noise profile of an off-peak delivery

Source: Holguín-Veras et al., 2013

The researchers noted potential strategies to minimize noise impacts of future off-peak delivery programs (Holguín-Veras et al., 2013). In addition to enforcing existing noise ordinances, possible solutions include:

- Training staff to behave more quietly (e.g., managing driving speed, turning off the radio when conducting deliveries, not slamming doors, not dropping or dragging equipment, etc.);
- Encouraging the use of alternative fuel engines;
- Installing low-noise accessories (e.g., insulation, quiet tail lifts for loading and unloading, etc.);
- Applying noise-absorbing materials; and
- Improving delivery locations (e.g., paving, receiving dock, etc.).

PIEK Programme, The Netherlands

In 1998, the Dutch government established noise standards for off-peak freight deliveries to reduce adverse impacts on neighborhoods. The standard states that noise from deliveries must not exceed 65dB(A) from 7.5 meters away between 7-11 p.m., and 60dB(A) from 7.5 meters away between 11 p.m. and 7 a.m. (NICHES, 2007). In 1999, the country launched the PIEK certification scheme to encourage and assist freight companies in meeting the noise standard. The scheme consists of 10 key projects (Best Urban Freight Solutions, 2007):

- Knowledge transfer to companies that operate at night;
- Encouraging quiet behavior;

- Optimizing loading and unloading locations
- Low-noise distribution vehicles up to 7.5 tons
- Low-noise distribution vehicles over 7.5 tons
- Low-noise refrigerated transport installations
- Low-noise portable forklift trucks
- Noise reduction in roll containers, pallet trucks and hand pallet trucks
- Noise reduction in shopping carts
- Alternative fuel engines

Vehicles that meet the established noise standards are awarded a PIEK certification label (Figure 62). The government offers subsidies to support the adoption of low-noise technology, which makes the program costly (SUGAR Logistics, 2011). However, it has been successful in reducing noise-associated impacts and has compelled other European countries such as the UK, France, Germany and Belgium to adopt similar measures (PIEK International, n.d.).

Figure 62. PIEK certification label

Source: PIEK International, n.d.

3.5.2 Quiet Zones

Description

The Federal Railroad Administration requires that trains must begin sounding their horns 15-20 seconds in advance of all public grade crossings to alert roadway users of the train's approach and reduce the potential for collisions (Federal Railroad Administration, n.d.). Quiet zones are segments of railroad lines where trains are exempt from the Train Horn Rule due to the presence of added safety features. This can minimize noise impacts on neighborhood residents and improve local quality of life.

Application

Only public authorities with jurisdiction for the roadway at the crossing may establish quiet zones. If a proposed quiet zone includes more than one public authority, all agencies must agree on how to proceed and all measures must be taken jointly (TriMet, 2009).

Communities must take steps to mitigate the increased risk of collisions prior to establishing a quiet zone. Minimum requirements include the use of flashing lights, gates, constant warning time devices and power-out indicators (Federal Railroad Administration, 2013). Quiet zones must be at least one-half mile in length. Additionally, one of the following conditions must be met (Federal Railroad Administration, 2013):

- The Quiet Zone Risk Index is less than or equal to the Nationwide Significant Risk Threshold;
- The Quiet Zone Risk Index is less than or equal to the Risk Index with Horns;
- Supplementary safety measures are installed at the grade crossing.

The Federal Railroad Administration has identified supplementary safety measures (SSMs) as the best way to reduce risks in a proposed quiet zone (Federal Railroad Administration, 2013). SSMs are engineering devices that can minimize risks and include medians or channelization devices, one-way streets with gates, four quadrant gate systems, and temporary or permanent crossing closures (Figure 63).

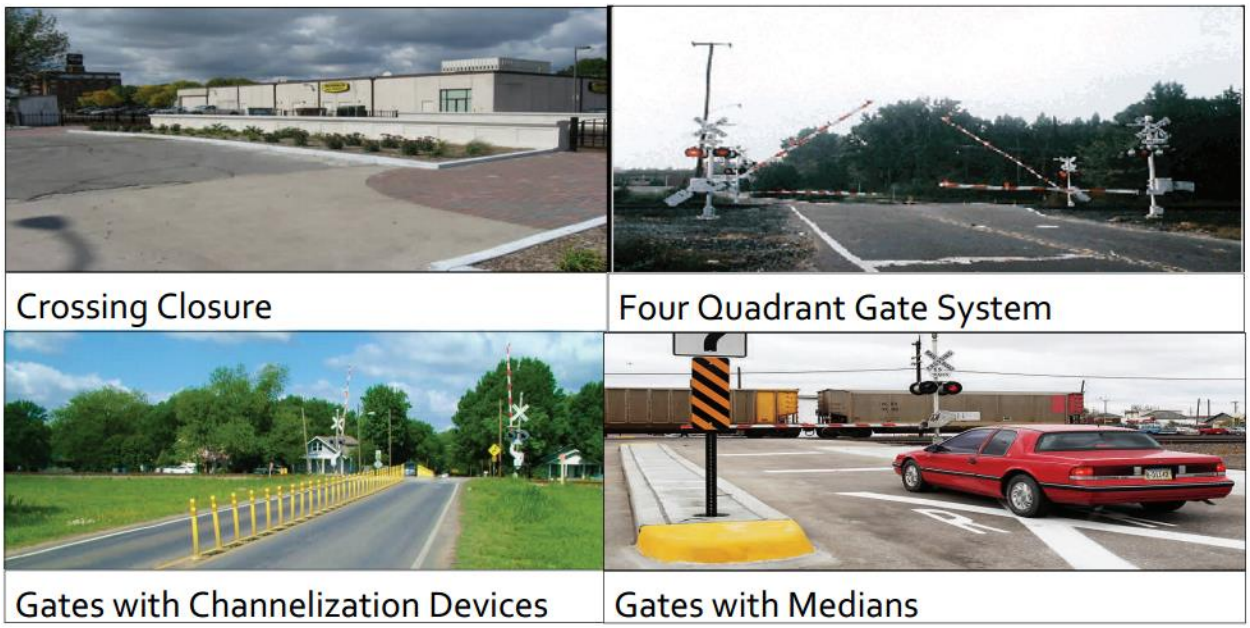

Figure 63. Examples of supplementary safety measures
Source: Federal Railroad Administration, 2013.

When determining which crossings will be included in the quiet zone, local authorities should also identify any private and pedestrian crossings. A diagnostic team

consisting of representatives from the local authority, railroad and state transportation authority should inspect the crossings to assess its adherence to federal and state safety requirements. The local authority should provide a Notice of Intent to all railroads that operate in the proposed quiet zone and the state agencies responsible for highway and crossing safety. Once the aforementioned requirements are met, the local authority should provide a Notice of Quiet Zone Establishment to all affected parties (Federal Railroad Administration, 2013).

Establishing quiet zones can be costly. Costs can vary from $30,000 per crossing to over $1 million depending on the number of crossings and types of safety improvements needed (Federal Railroad Administration, 2013). Once funding has been identified, quiet zones can be implemented in 18 months to three years (City of Boulder, n.d.).

Special Considerations

Local authorities should consider the legal implications of establishing quiet zones. In the event of a collision at a grade crossing within a quiet zone, the courts will determine who is liable on a case-by-case basis (Federal Railroad Administration, 2013).

Local authorities should also consider the impact of quiet zones on the roadway network. Communities have the option to close a grade crossing to meet quiet zone criteria. However, this will reduce street connectivity and could impact livability.

Examples

Boulder, Colorado

In 2014, the City of Boulder completed a Railroad Quiet Zone Study in response to concerns about excess noise from trains. The study was intended to evaluate the need and possibility of establishing a quiet zone at the nine Burlington Northern Santa Fe railroad crossings within and adjacent to the city. The estimated cost to establish the quiet zone ranged from $2.4 million to $4.4 million, depending on the methods used to meet federal safety requirements (City of Boulder, 2014).

The study also evaluated the impact of potential quiet zones on broader community goals. The study found that the quiet zones support economic goals by reducing the impact of noise on businesses along the rail corridor. It also found that a quiet zone would enhance environmental sustainability by reducing barriers to infill development. Finally, a quiet zone would have a positive impact on community livability.

At the time of the study, the city's Capital Improvement Program (CIP) did not include funding for quiet zones. However, quiet zones may be considered during future CIP updates (City of Boulder, 2014). The city also plans to weigh the potential liability and safety implications of establishing quiet zones.

3.6 SAFETY

3.6.1 Truck Side Guards

Description

Side guards are safety barriers that run between truck tires (Figure 64). Trucks can be retrofitted with side guards to prevent vulnerable road users (VRUs), like bicyclists and pedestrians, from falling under the rear wheels. Side guards may also reduce fatal injuries for motorcyclists and passenger vehicles by preventing side underride (NTSB, 2014; Transport Canada, 2010). They are typically used in conjunction with mirrors, cameras and blind spot Fresnel lenses to increase visibility and reduce impacts (City of Boston, 2014; City of New York, 2014).

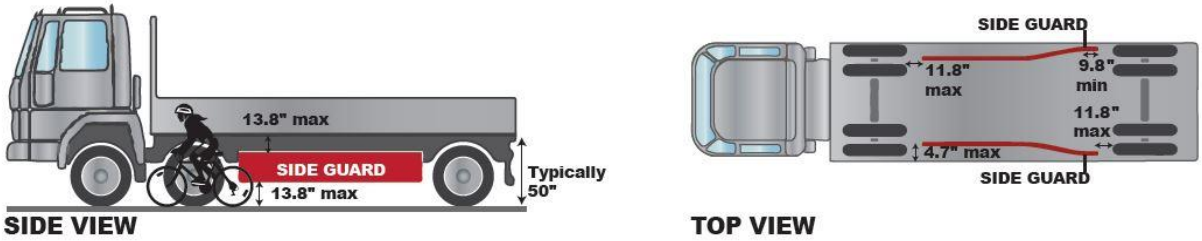

Figure 64. Truck side guards

Source: http://bostoncyclistsunion.org/wp-content/upLoads/2014/09/side-guards-infographic-1.pdf.

Currently, there are regulations for rear guards in the United States (49 C.F.R. § 571.223, 2011). These guards were developed to minimize damage and fatalities in collisions between trucks and automobiles, with standards established to address collisions at high speeds on highways. As demands for goods in livable communities increase, trucks and pedestrians/bicycles are sharing the roads more frequently in the urban environment. Side guards reduce the hazard associated with trucks being increasingly exposed to VRUs during "last-mile" deliveries.

Application

Initiatives to install side guards can come from both the public and private sector. In the U.S., local governments have passed ordinances requiring vendor vehicles that fall within certain specifications to add side guards to their trucks. Cities like New York and Boston have also started implementing side guard technology on collection trucks and other vehicles owned by the respective cities.

The cost of side guards can be between $600 to $2,500, depending on the type of side guard, quantity purchased, etc. (City of New York, 2014). It is important to inspect vehicles to identify which trucks these regulations may apply to. Some vehicles, like street sweepers and emergency vehicles, may not need side guards due to the dimensions of the vehicles (City of New York, 2014).

Private-sector traction can occur through bike-group education and company involvement in implementing side guards. Promoting incentives like fuel savings through programs like the U.S. EPA Smartways could serve as an added benefit of side guards. The U.S. EPA Smartway program currently recognizes side skirt fairings, which are attachments that increase aerodynamics, as equipment that can help save on fuel spending (U.S. Environmental Protection Agency, 2010).

Special Considerations

Side guards are a good initial step towards increasing VRU safety. This method can be used in conjunction with other technology to decrease fatal injuries to VRUs. While trucks only make up 4 percent of vehicles in the U.S., they are involved in a large amount of pedestrian and bicyclist collisions, at 7 percent and 11 percent, respectively (City of New York, 2014). In the UK, certain trucks have been required to have side guards since 1986 (The Road Vehicles (Construction and Use) Regulations, 1986). After this regulation was passed, a 61percent decrease in fatal injuries for bicyclists and a 20 percent decrease in pedestrian fatal injuries were observed when trucks were impacted on the side (Knight et al, 2005).

There are a variety of side guard styles available. The design of the side guard has an impact on how effective they can be (Transport Canada, 2010). Smooth-panel side guards have the added benefit of increasing aerodynamics for trucks (U.S. Environmental Protection Agency, 2010). Exceptions should be considered for special purpose vehicles, such as emergency vehicles and snow plows (GLA 2015 No. 11, 2015; City of New York, 2014; Transport Canada, 2010).

Vehicle operations may restrict side guard style. For example, a truck used off-road may have higher clearance than those used on-road (City of New York, 2014). Snow is a concern for side guards, including allowing space for snow chains on tires (City of New York, 2014). In Boston, there were concerns that rail side guards would cause inadequate air flow and high temperatures. However, none of these effects were observed when rail systems were installed on public works collection vehicles (City of New York, 2014). Side guards may affect how a truck turns, seeing that they may catch on snowbanks or other elevated surfaces (Transport Canada, 2010).

Examples

Boston, Massachusetts

Boston passed a Truck Side Guard Ordinance in 2014 that applied to trucks owned and contracted by the City (City of New York, 2014; City of Boston, 2014). Vehicles over 10,000 pounds are required to have side guards, convex mirrors, crossover mirrors and blind spot stickers (City of Boston, 2014). Local government officials and members of the Boston Cyclists Union were involved with the passing of the ordinance (Annear, 2014). This ordinance also requires biennial inspections, where vehicles receive a permit (Annear, 2014). A $100 fine would apply to noncompliant trucks (Annear, 2014).

Prior to passing this ordinance, the Public Works Department and the Mayor's Office of New Urban Mechanics developed a pilot program with the U.S. Department of Transportation Volpe Center (New Urban Mechanics). The pilot took place over two years (City of New York, 2014) and consisted of three types of side guards on 16 large vehicles (Figure 65) (City of Boston, 2014). Two fleet companies in Boston installed side guards on their trucks following demonstrations of the pilot program (City of New York, 2014; New Urban Mechanics).

Figure 65. Various side guard styles on Boston Public Works vehicles

Source: First Image: http://newurbanmechanics.org/project/vehicle-side-guards/, Second and Third image: City of New York, 2014

London, UK

The City of London has taken many steps to promote cyclist safety. The UK began regulating truck safety features in 1986, when certain goods vehicles were first required to have side guards (The Road Vehicles (Construction and Use) Regulations, 1986). In 2015, the city launched the Safer Lorry Scheme which requires that vehicles of more than 3.5 tons operating in London must be fitted with side guards along with Class V and Class VI mirrors (Transport for London, n.d.) Appropriate signage installed at the boundaries of the scheme alerts drivers to areas where the policy is being enforced (Figure 66). Drivers found to be in charge of a noncompliant vehicle may receive fines or have their licenses suspended (Transport for London, n.d.).

Figure 66. Safer Lorry Scheme sign

Source: http://www.tfl.gov.uk/cdn/static/cms/images/safer-hgv-zone_rdax_400x457.jpg.

Cambridge, Massachusetts

The City of Cambridge started a pilot program in 2013 with six municipal vehicles fitted with side guards (City of New York, 2014). The City partnered with Volpe, part of the Department of Transportation, to create recommendations for city vehicles (City of Cambridge, 2015). They currently do not require privately owned trucks to have side guards, but they focus on being able to "lead by example" (City of Cambridge, 2015). This initiative is not limited to side guards; Cambridge is also addressing a need for "additional blind spot mirrors, lenses or cameras to increase a driver's field of view" (City of Cambridge, 2015).

3.7 INCENTIVES

3.7.1 Certification Programs

Description

Recognition and certification programs are voluntary programs administered by the public sector that incentivize the private freight carriers to meet established community standards or goals. Public agencies provide certification, benefits or other forms of recognition to reward carriers that meet or exceed certain benchmarks. This technique promotes better public-private cooperation in the advancement of transportation, environmental, economic and social objectives.

Application

Certification programs require administration by a public agency. The agency must establish standards which private freight carriers can adhere to on a voluntary basis (Fleet Operator Recognition Scheme, 2015). Standards can relate to:

- *Management.* The company is being managed by qualified personnel; has obtained appropriate licenses; has effective communication with all employees; has a functional system to receive and address complaints; and has a process for keeping up with new industry developments and best practices.
- *Vehicles.* Vehicles are appropriately insured and undergo regular inspection and maintenance. Vehicles are fitted with appropriate safety equipment. Fuel and tire usage are monitored and managed.
- *Drivers.* All drivers are properly licensed, undergo progressive training, and drive safely and lawfully at all times. Drivers do not work excessive hours, and drivers' fitness and health are managed. Driving infractions are monitored and addressed appropriately.
- *Routing and Scheduling.* Fleet operators adhere to the most efficient, safe and appropriate routes. Specialized goods are handled in compliance with appropriate regulations. Traffic incidents are documented and addressed.

- *Performance Measurement.* Performance indicators such as fuel usage, CO2 output, incident data, and transport-related fines and charges are monitored.

When specified standards are met or exceeded, companies are provided a certification logo which promotes public recognition of the achievement. This recognition is advantageous to carriers, as many people want to do business with environmentally friendly or otherwise responsible companies (Giuliano et al., 2013). Certification can also afford companies other benefits, such as extended delivery hours or access to loading facilities (Giuliano et al., 2013). Certification programs may offer varying levels of certification, such as bronze, silver and gold rankings (Fleet Operator Recognition Scheme, 2015). Established standards can be modified to include higher benchmarks to promote continued improvement over time.

Certification programs are a long-term, relatively low-cost strategy to improving freight performance in metropolitan areas. Most costs are attributable to program management, which may include staff and other administrative expenses.

Special Considerations

Certification programs can be more advantageous to larger freight companies, which tend to wield greater influence in negotiating program conditions than small carriers (Giuliano et al., 2013). Program administrators can address this by directly engaging small carriers in program development.

The voluntary nature of these programs has certain advantages. Certification programs promote greater public-private collaboration on freight-related issues and are well-suited to the often anti-regulatory political environment in the U.S. (Giuliano et al., 2013). They can promote reform without the political and administrative challenges associated with establishing new regulations.

Examples

SmartWay, United States

SmartWay is a certification program introduced by the U.S. Environmental Protection Agency in 2004 to help the freight transportation sector improve supply chain efficiency and reduce greenhouse gas emissions. The program provides companies with a set of EPA-tested tools that are used to measure, benchmark, report and reduce carbon emissions (Figure 67). Companies are encouraged to meet voluntary equipment specifications that reduce fuel consumption and adopt operational practices that improve efficiency. As of 2015, the SmartWay program has over 3,000 partners, has prevented 61.7 million metric tons of CO_2 from being emitted, and has saved $20.6 billion in fuel costs (U.S. Environmental Protection Agency, 2015).

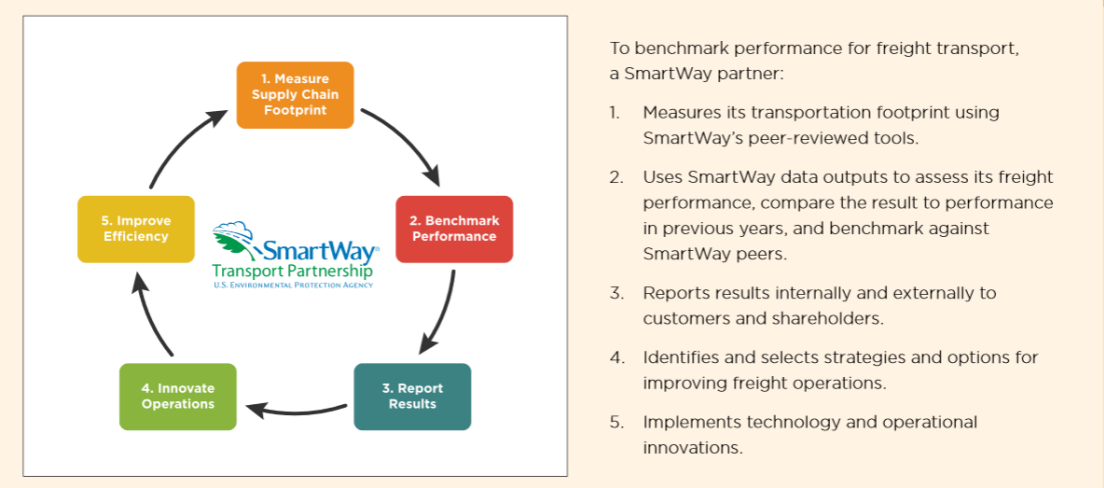

Figure 67. SmartWay emissions reduction process

Source: http://www.epa.gov/smartway/about/documents/basics/420f15001.pdf.

http://www.epa.gov/smartway/about/documents/basics/420f15001.pdf

Clean Fuels Ohio, Ohio, United States

Clean Fuels Ohio (CFO) provides free consultation services, financial assistance, driver training programs, and certification to freight companies that take steps towards reducing fossil fuel consumption and vehicle emissions (Clean Fuels Ohio, n.d.). The program establishes emissions baselines using data provided by each company. Companies are encouraged to adopt emission reduction strategies, emissions are monitored over time, and companies are scored based on their level of improvement (Figure 68). Each company's cumulative score is then used to determine what level of designation (one, three or five stars) has been earned (Figure 69).

Figure 68. Ohio Green Fleets scoring system

Source: http://www.cleanfuelsohio.org/fleet-solutions/ohio-green-fleets/certification/.

Figure 69. Ohio Green Fleets certification logos

Source: http://www.cleanfuelsohio.org/fleet-solutions/ohio-green-fleets/certification/.

CarbonNeutral® Shipment, International

Natural Capital Partners (formerly the CarbonNeutral Company) is a private-sector entity that helps other companies, including freight carriers, reduce adverse environmental impacts of their operations. Participating companies that reduce their emissions to net zero are awarded the CarbonNeutral certification to display on websites, reports, vehicles and other company materials (Figure 70). Participants can achieve net carbon neutrality by reducing emissions internally and participating in projects to offset their carbon footprint (Natural Capital Partners, 2015a). Projects include alternative energy initiatives, forest conservation activities and improved cookstoves in developing countries.

UPS is one company that has earned CarbonNeutral certification. The company has purchased carbon offsets to support environmental stewardship around the world. Offsets include landfill gas projects, forest management initiatives and biogas-to-energy projects (Natural Capital Partners, 2015b).

Figure 70. CarbonNeutral certification logo

Source: http://www.carbonneutral.com/page/ups/.

http://www.carbonneutral.com/page/ups/http://www.carbonneutral.com/page/ups/

Freight Operator Recognition Scheme, UK

The Freight Operator Recognition Scheme (FORS) is an accreditation program introduced by Transport for London aimed at improving freight performance and reducing carbon emissions. The program was developed with an advisory group consisting of industry stakeholders such as the Chartered Institute of Logistics and Transport, the Department of Transport, the Freight Transport Association, and the Health and Safety Executive (Fleet Operator Recognition Scheme, n.d.b).

Companies that wish to earn FORS certification must undergo audits and meet minimum standards related to management, vehicles, drivers and operations. Companies can earn bronze, silver and gold certification depending on which benchmark level is reached (Figure 71) (Fleet Operator Recognition Scheme, 2015). In addition to public recognition, the program offers several benefits, including (Fleet Operator Recognition Scheme, n.d.a):

- Advice, guidance and toolkits
- Performance management tools
- Online training courses
- Regular news and bulletins
- Best practice workshops

Figure 71. FORS gold certification label

Source: http://www.murphygroup.co.uk/Media/News/default.asp?id=556&page=4.

Participating companies are charged an annual subscription fee and an audit fee to cover operational costs. The program was originally launched in London in 2008, and by 2012 had over 800 registered companies representing over 85,000 freight vehicles (Freight Operator Recognition Scheme, 2012). The program was expanded nationwide in February 2015, and by April had over 3,000 registered companies (Tinham, 2015).

3.7.2 Incentives for Green Vehicles

Description

Investment in environmentally friendly vehicles has long-term benefits both for the freight industry and the community at large. Freight companies benefit by reducing fuel costs and improving their public image, while communities benefit from reduced greenhouse gas emissions and air pollution (Automotive Fleet, 2010; Climate and Clean Air Coalition, 2015; UN, 2014). Despite the clear benefits, many companies are reluctant to invest in newer, cleaner technology due to its high cost. The public sector can offer financial incentives to encourage and enable commercial vehicle owners and operators to invest in environmentally friendly vehicles (Holguín-Veras et al., 2015). Typical incentives include:

- *Grants.* Grants are the most significant funding resource for freight vehicle owners. Grant programs can cover up to 100 percent of the costs for a new vehicle and do not need to be repaid (Finch, 2013).
- *Rebates and vouchers*. Rebates allow purchasers to receive a partial reimbursement for the cost of the vehicle. Vouchers provide a discount at the point of sale (Finch, 2013).

- *Loans*. Subsidized loans offer reduced down payments and low-interest financing to smaller freight companies with less financial means to improve their fleet (Finch, 2013).
- *Tax credits*. Tax credits reduce fleet owners' tax liability when they invest in green vehicle technology.
- *Tax exemptions*. Tax exemptions allow the cost of green vehicle technology to be deducted from fleet owners' taxable income.

Application

Most financial incentive programs are implemented at the federal or state level. Some programs, such as the National Clean Fleets Partnership, offer federal funding directly to large private fleets to cut petroleum use (U.S. Department of Energy, 2015). Others, such as the EPA National Clean Diesel Campaign, allocate funding to the states to administer grant and loan programs (Environmental Protection Agency, 2015). Many programs offer a fixed, budgeted amount of financial incentives and establish specific eligibility requirements. These requirements typically relate to the year, model and miles on the vehicle, and the types of improvements made upon it. For example, many programs require clean vehicle technology to be certified by the EPA (U.S. Department of Energy, 2014).

Local agencies can also play an important role in dispensing financial assistance to freight companies. Incentives can be offered at the local level, provided sufficient funding is available. Alternatively, local governments may inform fleet managers of funding opportunities at the state and federal levels. In addition to those mentioned above, key federal financial incentive programs include the Alternative Fuel Tax Exemption and the Idle Reduction Equipment Excise Tax Exemption (U.S. Department of Energy, 2014).

Special Considerations

Public agencies might consider providing a variety of incentives to offset the disadvantages of any one program. For example, although grant programs provide the most funding, they can be time consuming and labor intensive due to the application process, progress reporting, and post-award recordkeeping (Finch, 2013). Other incentives such as rebates, vouchers and loans can offer quicker and easier access to funding opportunities (Finch, 2013). Meanwhile, tax credits and exemptions can be very useful for large-scale companies, but seldom benefit smaller companies that may be unable to afford upfront and long-term investment costs (Marks, 2015). Therefore, the public sector may need to provide additional funding opportunities to enable small-scale companies to purchase environmentally friendly vehicles. Alternatively, local government agencies can provide small freight companies with non-monetary incentives to offset financial challenges.

Because many incentive programs encourage the replacement of older commercial vehicles, agencies should consider what to do with the old trucks once they have been replaced. Some programs encourage freight companies to surrender their old

vehicles in exchange for financial incentives for green vehicles. If the old vehicles cannot be converted to operate more efficiently, they can be scrapped to ensure they are not purchased and used elsewhere (Port of Baltimore, 2015; Port Authority of New York and New Jersey, 2015).

Many freight companies may be hesitant to make large investments in green vehicle technology due to high conversion costs and the durability of "legacy" diesel engines (UN, 2014). Therefore, public agencies should effectively communicate the long-term cost-savings benefits of environmentally friendly vehicles, and increase awareness of funding opportunities (Finch, 2013; Marks, 2015).

Examples

Low-Emission Vehicle (LEV) Sales Tax Exemption, Colorado

The State of Colorado is offering a state sales tax exemption until December 31, 2015 on all vehicles, vehicle power sources, or parts used to convert a vehicle power source to reduce its emissions (U.S. Dept. of Energy, 2014). For vehicles sold on or after July 1, 2014, vehicles greater than 26,000 pounds gross vehicle weight rating that are certified by the EPA are exempt from state sales and use tax. Motor vehicles greater than 10,000 pounds gross vehicle weight rating are exempt when one of the following criterion are met:

- The vehicle is equipped to operate on compressed natural gas (CNG) or liquefied petroleum gas (LPG);
- The vehicle is equipped with a CNG or LPG conversion certified by the EPA;
- The vehicle is equipped to operate on LPG or hydrogen;
- The vehicle is equipped with a LPG or hydrogen conversion certified by the EPA;
- The vehicle is equipped as an electric truck or plug-in hybrid electric truck; and
- The vehicle is converted to an electric truck or plug-in hybrid electric truck.

Alternative Fuel, Advanced Vehicle and Idle Reduction Technology Tax Credit, Colorado

The State of Colorado offers a state tax credit for qualified vehicle purchases from January 1, 2014, through December 31, 2021 (U.S. Dept. of Energy, 2014). Any vehicle that uses or is converted to use an alternative fuel, is a diesel hybrid electric vehicle, is a plug-in hybrid electric vehicle, or has its power source replaced with one that uses alternative fuel is eligible for the credit. Aerodynamic technologies, idle reduction technologies and clean fuel trailers are also eligible (U.S. Dept. of Energy, 2014). Credit amounts vary for each category, vehicle weight and tax year, and apply to the actual cost for conversions, technologies and purchases, minus any eligible federal credits, grants or rebates (U.S. Department of Energy, 2014).

The tax credit does have several vehicle, fuel or equipment specifications that must be met in order to be eligible, and is applicable to freight vehicles (U.S. Dept. of Energy, 2014). The state credits individuals the actual cost for conversions, the technologies and purchases, minus any other credits, grants and/or rebates (U.S. Dept. of Energy, 2014).

Heavy-Duty Truck Vouchers, San Joaquin Valley, California

The San Joaquin Valley Air Pollution Control District administers the Truck Voucher Program for small businesses to retrofit or replace old, high-polluting, heavy-duty diesel trucks. Qualified businesses must be independently owned and operated, be located in California, have fewer than 100 employees, and have an annual gross income of $14 million or less during the year of their application (San Joaquin Valley Air Pollution Control District, 2014). Vouchers must achieve emissions reductions beyond those required by law. The voucher is not retroactive and only applies to future purchases. Voucher amounts vary according to engine model, and eligibility varies according to the number of miles on the truck.

Small Business Pollution Prevention Assistance Account Loan Program, Pennsylvania

The Pollution Prevention Assistance Account is a loan program administered by the Pennsylvania Department of Environmental Protection and the Pennsylvania Department of Community and Economic Development. The program provides low interest rate loans to small businesses undertaking projects in Pennsylvania that reduce waste, pollution or energy use, including the purchase of truck auxiliary power units and other energy-efficient equipment. Businesses may borrow up to $100,000 but no more than 75 percent of the total project cost. Loan terms extend up to 10 years with an annual fixed interest rate of 2 percent.

Drive Clean Chicago, Chicago, Illinois

Drive Clean Chicago is a $14-million incentive program funded through the Chicago Department of Transportation and resources from the federal Congestion Mitigation Air Quality program (Figure 72). Drive Clean Truck is a component of that program that provides vouchers to Class 2 and Class 8 trucks and buses for all-electric and hybrid vehicles. Vouchers cover 80 percent of the incremental cost up to a maximum of $150,000 per vehicle (Drive Clean Chicago, n.d.). Funds are offered for vehicles that meet state and federal standards, and operate at least 75 percent of the time in the Chicago six-county area (Drive Clean Chicago, 2015).

Figure 72. Drive Clean Truck logo

Source: Drive Clean Chicago, n.d.

3.8 STAKEHOLDER ENGAGEMENT

3.8.1 Freight Advisory Committees

Description

Freight advisory committees are used by all levels of government to obtain private-sector input on freight operations as it relates to public-sector planning (FHWA, 2009a). MPOs, transportation departments and municipal governments can form freight advisory committees to collect stakeholder input on freight issues, gather industry knowledge and data, and to collaborate with stakeholders on transportation project funding and implementation (FHWA, 2009a; Cambridge Systematics et al., 2007).

Advisory committees can improve relationships between the public and private sectors, allow plans and programs to be vetted by the freight community, and minimize unintended consequences of various planning strategies. This process can also lead to more effective plans that can better serve freight needs and the community as a whole.

Application

To create and maintain a freight advisory committee, planning agencies should (SHRP, 2013; FHWA, 2014):

- Identify key local freight stakeholders;
- Determine a style type (i.e., informal, formal) and size for the group;
- Determine practical incentives to motive private-sector involvement (e.g., outside speakers, networking opportunities, refreshments);
- Collaboratively develop agendas with private-sector representatives and meet at times convenient for them (e.g., monthly or quarterly for no more than two hours);
- Identify needs and problem areas; and
- Create a list of actions to complete at every meeting.

Private-sector representation at a minimum should consist of local shippers and carriers. Logistic companies and other freight-related associations should also be represented (FHWA, 2009a). Researching previous freight-related studies, associations and chambers of commerce can provide a list of initial contacts (SHRP, 2013). Public-sector representation may consist of government fleets, local public agencies, port authorities and economic development agencies (FHWA, 2009a; Delaware Valley Regional Planning Commission, 2014).

Areas of focus for the committee include (FHWA, 2009a):

- Providing a voice for the freight industry;
- Identifying and prioritizing freight-related needs;
- Identifying problem areas and developing solutions;
- Promoting green freight transportation;

- Educating policy makers on the interdependent relationship between passengers and freight systems;
- Promoting economic development in the region;
- Improving technology and data sharing for freight planning and analysis; and
- Implementing better management programs.

Continued engagement of the private sector involves demonstrating to freight stakeholders how their input is considered in MPO decisions on transportation planning, funding and project implementation. Implementation of this technique may require significant time commitments and funding resources from MPOs (FHWA, 2009a). According to the FHWA, MPOs will require a minimum 0.25 of a staff position to manage their committee (FHWA, 2009a). Agencies with limited funding resources could obtain periodic or ad hoc private-sector input on state and regional transportation plans and improvement programs (FHWA, 2009a).

Special Considerations

Finding private stakeholder representatives willing to serve on freight advisory committees can be challenging. Many freight stakeholders either do not have time or are not interested in the planning process due to relatively long planning horizons. For instance, short-term planning timelines range from one to five years, while logistics companies operate in terms of hours and days (IHS Global Insight, 2009). Therefore, planners need to develop meaningful, short-term solutions to make participation worthwhile (FHWA, 2009a). Greater consideration of freight in government decision-making processes can also be enhanced by adding freight planning specialists to agency staff and policy boards.

Examples

Freight Transportation Advisory Committee, Miami, Florida.

The Miami-Dade MPO recognizes that the freight industry is one of Miami's largest economic sectors, and that addressing freight needs is essential to the region's economic success and competitiveness (Miami-Dade MPO, 2015). The MPO Freight Transportation Advisory Committee (FTAC) was formed in 2005 and is comprised of 23 MPO-appointed, private-sector representatives (Miami-Date MPO, 2015). Members include representatives of Port Miami, Miami International Airport, CSX, Florida East Coast Railway, the Florida Department of Transportation and others (Miami-Dade MPO, 2014). The committee meets monthly to identify freight needs and advise the MPO on potential improvements (Miami-Dade MPO, 2015). The committee played an important role in the development of the 2014 Miami-Dade County Freight Plan update (Miami-Dade MPO, 2014).

Delaware Valley Goods Movement Task Force, Philadelphia, Pennsylvania

The Delaware Valley Regional Planning Commission has had an active freight advisory committee since 1992 that meets quarterly to "[promote] a regional goods

movement strategy and [balance] freight operations with community goals" (Delaware Valley Regional Planning Commission, 2014). The Goods Movement Task Force includes representatives from shippers and receivers, railroads, port operators and agencies, trucking firms and associations, air cargo carriers, third-party logistics companies, industrial development organizations, state transportation departments, and federal and county agencies (Delaware Valley Regional Planning Commission, 2014). The task force comprises an Executive Committee and three subcommittees, whose responsibilities are as follows:

- Executive Committee
    - Establish task force themes, priorities and agenda items, and promote collaboration between DVRPC and PennDOT and New Jersey DOT
- Data Subcommittee
    - PhillyFreightFinder online mapping tool, performance measures, Freight Analysis Framework
- Planning Subcommittee
    - Transportation Improvement Program, Long-Range Plan, federal funding programs
- Shippers Subcommittee
    - Delaware Valley Freight Centers, economic development, rail freight assistance programs and freight facility tours

The task force has been instrumental in advancing freight planning in the Delaware Valley region. Accomplishments include a variety of technical studies, capital improvements to transportation facilities, and greater consideration of freight movement in short- and long-range plans (Delaware Valley Regional Planning Commission, 2003; Delaware Valley Regional Planning Commission, 2014).

Seattle Freight Advisory Board, City of Seattle, U.S.

The City of Seattle Freight Advisory Board was formed in 2010. The board is composed of 12 regular members, six appointed by the Mayor, five by the City Council, and one by the Port of Seattle (City of Seattle, 2015a). Membership includes representatives from the Port of Seattle, BNSF Railway, Pacific Terminals Customs Freight Service, and the International Longshore and Warehouse Union. The board meets monthly to advise the city and facilitate policies and plans that enhance freight mobility. It also participates in the Freight Mobility Strategic Action Plan update, the Transportation Strategic Plan, designation of major truck streets, and various freight mobility projects (City of Seattle, 2015a).

4.0 CONCLUSIONS

Goods movement is an integral component of any local economy. Efficient freight movement ensures that stores, restaurants, businesses and manufacturers receive the goods needed to perform their daily functions. Yet freight is often considered a nuisance due to adverse impacts such as congestion, noise and pollution that diminish livability. Where livability is a goal of the planning process, freight runs the risk of being ignored, excluded or only considered as an afterthought.

This report presents a series of strategies that could be used to integrate freight into livable communities. These strategies were selected based on their applicability within the U.S. context, and their ability to manage and support freight. This list is by no means prescriptive. Rather, it represents a menu of options for decision makers. Because every community is unique, it is up to local leaders and stakeholders to determine which techniques may be appropriate given their community context.

The menu of options is supplemented with a series of case study perspectives on various freight and livability issues and strategies. Several important lessons have emerged from the case studies. Key takeaways include: 1) A need for current data on freight trends and improvement needs in a form that can be readily used in the planning process; 2) The importance of integrated land use and transportation planning as well as context-sensitive network design to reduce conflicts between incompatible uses and advance efficient freight movement; 3) Important equity issues relative to livability and freight-related uses, including access to living-wage industrial jobs; and 4) The value of education and freight stakeholder engagement in raising awareness of planning and elected officials and the broader public regarding freight benefits and needs. Because every community is unique, it is important for decision makers to communicate with stakeholders, and pursue context-sensitive strategies that reconcile freight and livability objectives.

This report adds to the growing body of literature on freight and livability planning. There is a continuing need for both education and outreach on the topic at the local and regional level. Many case study participants welcomed ideas for effective strategies to address freight challenges. State and regional planning agencies could use the information in this report and associated presentation materials for this purpose. In addition, state transportation agencies could work with data providers and private consultants to develop data sets that can be readily used for planning purposes. These steps together with additional case study applications could go far in advancing local and regional practice on this important topic.

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