Improving Pathways to Transit for Persons with Disabilities

MTI Report 12-59

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REPORT 12-59

IMPROVING PATHWAYS TO TRANSIT FOR PERSONS WITH DISABILITIES

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Persons with disabilities can achieve a greater degree of freedom when they have full access to a variety of transit modes, but this can only be achieved when the pathways to transit – the infrastructure and conditions in the built environment – allow full access to transit stops, stations, and vehicles. Since passage of the Americans with Disabilities Act (ADA) in 1990, many transit agencies and governmental jurisdictions have made significant progress in this area. Policy initiatives, incremental enhancements, modifications, and other measures undertaken by transit agencies and their partners have significantly improved access to transit for persons with disabilities, others who rely on public transportation, and individuals who chose to utilize these services.

This research study explores, through case study work, efforts that have been effective in improving pathways to transit. Interviews and site visits were conducted with five transit agencies, along with their partners, that are actively engaged in improving pathways to connect transit consumers – particularly people with disabilities – with transit stations and stops. These agencies are: Broward County Transit (Broward County, FL), Memphis Area Transit Authority (Memphis, TN), NJ TRANSIT (Newark and New Brunswick, NJ), Tri-County Metropolitan Transportation District of Oregon (Portland, OR), and Link Transit (Wenatchee, WA). Promising practices and/or lessons were identified through the case study analysis; these should be considered by any transit agency seeking to create improved access to its services for persons with disabilities.

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EXECUTIVE SUMMARY

Persons with disabilities can achieve greater freedom when they have full access to a variety of transit modes. Expanded access allows mobility and independence in their daily lives. But this can only be achieved when the pathways to transit – the infrastructure and conditions in the built environment – allow full access to transit stops, stations, and vehicles. Since passage of the Americans with Disabilities Act (ADA) in 1990, many transit agencies and governmental jurisdictions have made significant progress in this area. The path to change can take many forms. Policy initiatives, incremental enhancements, modifications, and other measures undertaken by transit agencies and their partners have significantly improved access to transit for persons with disabilities and others who rely on public transportation. Transit agencies have an incentive to maximize the use of fixed-route services by persons with disabilities: these services are generally less costly to operate than ADA paratransit services, and they can be more cost-effective still when supported by increased ridership.

This research study explores, through case studies, efforts that have improved pathways to transit. Following a brief national survey to identify prospective case study locations, interviews and site visits were conducted with five transit agencies and their partners. The agencies chosen are actively improving the pathways that connect transit consumers – particularly people with disabilities – to transit stations and stops. The agencies are:

- Broward County, Florida – Broward County Transit (BCT);
- Memphis, Tennessee – Memphis Area Transit Authority (MATA);
- Newark and New Brunswick, New Jersey – NJ TRANSIT (NJT);
- Portland, Oregon – Tri-County Metropolitan Transportation District of Oregon (TriMet);
- Wenatchee, Washington – Link Transit.

The projects and experiences of these five agencies are diverse, yet commonalities exist. All have been engaged in station or stop improvements, and all have worked to make improvements that extend far beyond the immediate area of a station or stop. All approach this work expansively, and with an understanding that 1) to best serve their consumers with disabilities, they need to think about many aspects of the trip – not just what happens once a passenger boards a vehicle; 2) improvements that are made have the power to enable consumers with disabilities to live their lives independently, and as fully engaged as possible; and 3) improvements in pathways to transit help all consumers.

Certain themes emerged across the five agencies. The efforts undertaken can be viewed via their area of impact, which includes Corridor Improvements, Complete Streets, Evaluation and Planning, Station or Stop Improvements, and Travel Training. See the table below for detail.

Pathway Improvement Projects and Programs

Project / Program	Area of Impact
Broward County Self-Evaluation Process	Evaluation and planning
Broward County Transit Stops Retrofit	Station or stop improvements
Broward County Shelters and Amenities Program	Station or stop improvements
Broward County Community Design & Complete Streets	Complete streets
Memphis Complete Streets Initiative	Complete streets
Memphis Area Transit Authority Accessibility Training Program	Travel training
Memphis Area Transit Authority Trolley Station ADA Improvement Program	Station or stop improvements
Memphis Area Transit Authority Bus Shelter Program	Station or stop improvements
Newark Penn Plaza Pedestrian Improvements	Station or stop improvements
New Brunswick Station Area Improvements	Station or stop improvements
NJ TRANSIT Mobility Management Program	Travel training
NJ TRANSIT Arts in Transit Program	Station or stop improvements
TriMet Pedestrian Network Analysis	Evaluation and planning
TriMet Bus Stop Improvement Program	Station or stop improvements
TriMet Line 57-Tualatin Valley Highway/Forest Grove Pedestrian Improvement Project	Corridor improvements

Efforts to improve the pathway to transit can be components in larger efforts to increase mobility, such as what can occur through Complete Streets initiatives, or when an agency and its partners undertake large-scale evaluation processes. Creation and enhancement of accessible pathways to transit was one tangible result of Complete Street initiatives in both Broward County and Memphis.

Alternatively, opportunities to improve pathways can arise out of agency policy. One example of this is a policy that encourages staff to explore partnerships with other stakeholders, and to look for opportunities to undertake projects that may be both large-scale and immensely fine-grained in their attention to detail – as is the case in the improvements to Newark Penn Station and to New Brunswick Station. The agency involved, NJT, explored ways to work collaboratively with project partners, and to extend the impact of projects in both locations to dramatically improve accessibility to high-use facilities. Looking for opportunities and exploring new ways of achieving goals was also paramount when MATA located bus stops and shelters near residences for the elderly and persons with disabilities, or when Link Transit made creative use of a new paving material.

Case Studies

Responding to a legal challenge, BCT, Broward County Commission, and their partners undertook a program to retrofit transit stops throughout the county. The five-year project entailed an evaluation of existing facilities, made possible through a data collection effort and the establishment of a database for tracking infrastructure conditions. Determination of priority locations for improvement was based on customer feedback, ridership demand, and proximity to high-volume transit trip generators. By March 2014, nearly 85 percent of stops in need of improvement had been upgraded. Elements that led to their success included a willingness to continually evaluate their own processes, as well as to collect

and utilize data to determine where improvements were needed, and to track process. Other lessons learned entailed improved cooperation among project partners that allowed for intergovernmental coordination and better use of funds.

MATA joined with the Memphis Area Metropolitan Planning Organization (MPO) and the City of Memphis Engineering Department to pursue a suite of programs that when taken together provided comprehensive improvements in pathways to transit: Complete Streets policy 2013, accessibility training, Main-to-Main Multi-Modal connector project, Trolley Station ADA Improvements, and a Bus Shelter Improvement Program. A high degree of interagency coordination and community involvement, as well as the leveraging of funding opportunities, allowed MATA and its partners to achieve greater accessibility conditions to transit throughout Memphis.

In Newark & New Brunswick, NJ, NJT worked with local partners to achieve innovative solutions to improve accessibility to a major transit hub and to a commuter rail station. Through interagency cooperation and a collaborative approach to problem solving, NJT and its partners were able to extend improvements beyond the immediate environs of each station. The agency promotes using an expansive definition of a project's scope, and paying acute attention to detail in its design and building phases, to achieve its results. One additional lesson learned through the NJT experience is the role that the agency can play in educating project partners about physical improvements, and how these can be used to improve quality in the path-of-travel for people of all abilities.

Trimet utilized its Coordinated Transportation Plan to plan for and provide a basis for action in its Pedestrian Network Analysis Project and subsequent Bus Stop Improvement Program. Through its Pedestrian Network Analysis Project (which utilizes advanced data analysis methods to develop an objective, quantifiable model to identify places with the greatest need for infrastructure improvements, and the greatest potential effect based on existing usage), the agency prioritized locations for the Bus Stop Improvement Program. Implementation of the Bus Stop Improvement Program resulted in the re-design and upgrade of on-street transit facilities, bus shelter expansion, security lighting at bus shelters and stops, and bus stop sign and pole replacement with customer information displays. Collaboration during the planning process laid a foundation for future actions. Data analysis allowed the agency to optimize the potential effect of the improvements.

Link Transit sought to reduce costs, and to address a perceived overuse of paratransit by promoting the use of fixed-route services through a variety of means – including accessibility improvements to stops. The agency adopted a comprehensive approach to achieving these goals: it focused on fixed-route and paratransit services as parts of a unified system of service, and it understood that consumer preference for paratransit services arose partly because of defective pathways to stops. The agency adopted the use of new materials, and has worked collaboratively with private partners to achieve improvements that serve consumers.

Observations and Recommendations

Making transit vehicles, stations, and stops ADA-accessible are not the only necessary steps to achieving full access and the mobility afforded by that access. To best serve persons with disabilities, the infrastructure that surrounds stations and stops, and the pathways that lead to these transit facilities, must also be sufficient to create unobstructed, full access to transit services. Since passage of the ADA, many communities and transit agencies have made significant progress in this area through policy initiatives, incremental enhancements, modifications, and other measures as discussed in this report. Collectively, these measures have significantly improved access to various modes of transit for persons with disabilities, and for all persons seeking to utilize these systems.

One of the most fascinating components of this study was the similarities in lessons learned and promising practices identified among the five case studies. While details such as geographic service area size, population and demographic profiles, and density patterns vary among each of the case study agencies, all offer a mix of transit services that may include bus, rail, light rail, trolley, street cars, and paratransit services. Each agency is also striving to determine the best strategies to serve its respective transportation-disadvantaged populations, and is committed to enhancing access to its public transportation services.

In advancing this goal, similar promising practices and/or lessons were identified through the case study analysis that should be considered by any transit agency that seeks to improve access to its services for persons with disabilities.

Understanding Needs

Agencies must undertake ongoing and continual efforts to better understand the diverse travel needs and issues of their customers with disabilities. For example, as the Link Transit interviewees explained, they conducted research and fieldwork that included customer interviews and an evaluation of existing service route patterns to aid their efforts in determining the most appropriate infrastructure improvements to pursue in enhancing access to their transit facilities. On a related note, BCT interviewees suggested that a continual agency self-evaluation process should be established: this can incorporate data collection and a means to identify, monitor, and document needed accessibility improvements and the progress of ongoing improvement projects.

Pursue Partnerships

Agencies benefit from relationships with community partners from the public and private sectors to collaborate and coordinate with in planning and implementing improvements. Such action can generate many positive results in terms of project finances, and in fostering a sense of community “ownership” for any given project. For example, MATA noted the value of involving advocacy groups that had been formed by members of its own transportation-disadvantaged community. MATA also discussed the benefits of collaborating with its Metropolitan Planning Organization (MPO) and the City of Memphis to improve the infrastructure conditions near transit facilities.

BCT explained how a variety of partnerships have contributed and continue to contribute to the successful implementation of its efforts to retrofit over 2,000 area transit stops for ADA compliance, and to complete its transit facilities shelters and amenities program. TriMet discussed how instrumental community partners were in identifying needs, planning and implementing their Line 57 Highway/Forest Grove pedestrian improvement project, and noted that partnering with local entities enabled it to surmount financial constraints on many projects; it also generatedcommunity buy-in for those projects. NJT highlighted that the scope of both the Newark and the New Brunswick projects could only have been possible through a coming together of partners.

Communication

Once project stakeholders and partners have been identified, it is pivotal to communicate early and often with all of the – before, during, and after the implementation of improvements. Developing and maintaining this open line of communication was discussed by several case study interviewees as invaluable to their success. As the Link Transit interviewee noted, instituting an active communication plan with community stakeholders is vital at all stages of a project, including the post-completion period.

Approaching Cost and Funding Issues Creatively

Cost factors are and will always be significant considerations in pursuing infrastructure improvements that improve access to transit for persons with disabilities. Funding strategies to achieve the improvements varied, with most agencies relying on a mix of funding from several sources: federal grants, state grants, local funds, passenger revenue (e.g. fares), and local taxes (e.g. sales tax, payroll taxes) all came into play.

Determining cost-effective plans and measures is key to overcoming financial barriers when pursuing accessibility improvements. The use of cost-effective materials allowed Link Transit to create durable bus stop landing pads that were much less expensive than those made of concrete. Pursing partnerships and intergovernmental agreements can also yield cost savings that can be extremely helpful in implementing improvements with limited or restricted funding. NJT emphasized that when the goal is to create the longest accessible pathway possible to facilities, agencies should push their budgets to the limits to achieve the greatest impact for their investment.

Thinking Holistically

Many agencies emphasized the value in pursuing a holistic approach by utilizing mobility management concepts such as travel instruction. While such efforts as adding curb cuts and addressing poor sidewalk conditions are critical, considering strategies beyond infrastructure is vital for long term success. Link Transit actively pursued a holistic approach through its comprehensive multi-pronged plan that offered free individual and group travel training for all Link passengers; implemented a variety of fixed-route system improvements including the purchase of low-floor buses and creation of service routes designed to better serve transportation-disadvantaged residents; and developed an aggressive marketing campaign to inform persons with disabilities about the benefits of using accessible fixed-

route transit (and inform the general public about the social equity importance of accessible transit services).

Appreciating the Breadth of Benefits

One benefit that was somewhat unanticipated from these infrastructure improvements was the positive social change when more persons with disabilities utilized public transit.

As one interviewee explained, “It is not about separation, but inclusion.” Case study interviewees shared that the genesis of improvement projects was often a desire for more persons who use expensive paratransit services to instead use more cost-efficient fixed-route services. However, these same interviewees have found a general social benefit from all members of a community travelling together and having the opportunity to learn from one another and support each other in their daily journeys.

Preparing for Opposition

Transit agencies should be prepared for, but not necessarily expect to receive, opposition to infrastructure improvements. Only a few interviewees discussed this problem, often referred to as the “Not in My Backyard Syndrome” or NIMBYISM. TriMet explained that this can be a common obstacle to new transit stops, or routes near homes or businesses. Interviewees suggested that agencies focus on maintaining lines of communication with stakeholders who oppose improvements, and that they provide timely, accurate information on prospective projects. The communications should emphasize that the agency is seeking to serve and benefit all members of the community with the planned improvements.

Incorporating New Technology

Transit agencies and their patrons benefit when time is taken to investigate and pursue technological and physical design innovations, such as green materials, when infrastructure improvements are made. Some innovative processes and materials can increase efficiencies and yield long-term savings, as well as better serving customers in certain cases. Some of the innovations mentioned included utilizing plastic guards at curbs to protect bus tires and sidewalks from damage; redesigning bus signage to increase visibility from any angle; utilizing signs that encompass a blinking light that can be activated by a customer, indicating to the driver that someone is waiting at the stop; and sandblasting vandalized shelter glass to create a design, rather than paying for costly glass replacement.

Remembering that ADA Improvements Benefit All

Pursuing and implementing infrastructure improvements – such as upgraded curb cuts and pathway connections – ultimately benefits all system users, including the general public. As one interviewee put it, “universal design equals universal benefits.” Interviewees recognized that making infrastructure improvements that connect people to transit attracts new system riders . . . with and without disabilities.

I. INTRODUCTION

Full access to different modes of transit provides persons with disabilities a greater degree of freedom, mobility, and independence in their daily lives. Infrastructure and conditions in the built environment can facilitate unobstructed access to transit services and facilities and are critical to achieving this objective. Since passage of the Americans with Disabilities Act (ADA) in 1990, many transit agencies and governmental jurisdictions have made significant progress in this area through policy initiatives, incremental enhancements, modifications, and other measures. Collectively, these measures have significantly improved access to various modes of transit for persons with disabilities, others who rely on public transportation, and individuals who utilize these services.

Transit agencies have a vested interest in optimizing the use of their fixed-route services by persons with disabilities. Fixed-route services are generally less costly to operate than ADA paratransit services, and can be more cost-effective when supported by increased ridership. Additionally, improving the access to fixed-route facilities can reduce liability costs for agencies.

This research study sought to identify and explore through a case study approach those efforts that have worked to improve these pathways to transit. Our work is expansive, as it is unhelpful to ignore other conditions that persons with disabilities face when using fixed-route transportation. Like all riders, persons with disabilities must contend with the impacts of weather and maintenance of routes to transit facilities. They may also be rightly justified in having a fear of injury by passing vehicles as well as trepidation when using transit either due to a fear of the unknown or unfamiliarity with a particular location. Some of the techniques used to overcome these barriers include travel training – instruction in the use of public transportation and mobility management – activities that support the use of all transportation resources in a community.

Utilizing fixed-route services can also have a positive influence on the lives of persons with disabilities, and allow them to more actively engage in their communities and access opportunities related to employment, education, and other facets of life. Concomitantly, all persons benefit when persons with disabilities are truly able to integrate into their community, and access needed and desired services.

To identify transit agencies actively working toward the goal of improving pathways to transit, we conducted a brief national survey. From this pool of responses, we identified potential locations for further investigation and selected five agencies operating in diverse locations for case study. In-person interviews and site visits were conducted in the following locations and with each of the named agencies:

- Broward County, Florida – Broward County Transit (BCT)
- Memphis, Tennessee – Memphis Area Transit Authority (MATA)
- Newark and New Brunswick, New Jersey – NJ TRANSIT (NJT)

- Portland, Oregon – Tri-County Metropolitan Transportation District of Oregon (TriMet)
- Wenatchee, Washington – Link Transit

Research team members examined the strategies used by the agencies and their partners to make improvements to the built environment that allow persons with disabilities to access and use public transportation. We sought to understand the challenges faced by agencies that seek to make changes to infrastructure that lies beyond their own property – but the conditions of which affect whether patrons, with disabilities and without, can safely and comfortably access public transportation. Each of these agencies has employed a number of strategies to improve accessibility and to extend access into the communities in which they operate. As part of implementing these strategies, each agency has undertaken a number of projects and programs designed to improve pathways to transit. A quick guide to the many initiatives undertaken can be seen in Table 1.

Table 1. Pathway Improvement Projects and Programs Quick Guide

Project / Program	Area of Impact	Page Number
Broward County Community Design & Complete Streets	Complete streets	24
Broward County Self-Evaluation Process	Evaluation and planning	18
Broward County Shelters and Amenities Program	Station or stop improvements	20
Broward County Transit Stops Retrofit	Station or stop improvements	18
Link Transit Rural Bus Stop Improvement Program	Station or stop improvements	80
Memphis Area Transit Authority Accessibility Training Program	Travel training	41
Memphis Area Transit Authority Bus Shelter Program	Station or stop improvements	43
Memphis Area Transit Authority Trolley Station ADA Improvement Program	Station or stop improvements	42
Memphis Complete Streets Initiative	Complete streets	40
New Brunswick Station Area Improvements	Station or stop improvements	52
Newark Penn Plaza Pedestrian Improvements	Station or stop improvements	46
NJ TRANSIT Arts in Transit Program	Station or stop improvements	48
NJ TRANSIT Mobility Management Program	Travel training	53
TriMet Bus Stop Improvement Program	Station or stop improvements	64
TriMet Line 57-Tualatin Valley Highway/Forest Grove Pedestrian Improvement Project	Corridor improvements	65
TriMet Pedestrian Network Analysis	Evaluation and planning	63
TriMet / RideConnection Travel Training	Travel training	61

II. BACKGROUND

Two areas of investigation provide guidance for this research: 1) transportation and planning literature that addresses barriers preventing persons with disabilities from accessing transit and 2) research that explores ways that bolster or limit the ability of agencies, local governments, and non-governmental/advocacy groups to bring such infrastructure improvements to fruition – particularly, research that examined effective collaboration strategies.

It is valuable to note that in recent years interest among planners, transit agencies, and other community stakeholders, both public and private, in addressing transit access issues has been renewed due to a variety of initiatives that discuss the merit of accessible community design and its value in enhancing transit access for all system users, including persons with and without disabilities. One such initiative is the Complete Streets movement, a nationwide initiative launched by the National Complete Streets Coalition in 2004 that focuses on:

> "…integrating people and place in the planning, design, construction, operation, and maintenance of our transportation networks." (Smart Growth America 2015).

Addressing Barriers

Lavery et al. (1996) identified three broad components that govern the ability to travel: the person, the vehicle, and the built environment. To address infrastructure barriers in the built environment requires examining four major issues:

1. the scale of the problem in mobility terms;

2. the complexity of the personal effects of disability;

3. the scale of the problem in design and retro-fitting terms; and

4. the interdisciplinary nature of the problem.

The authors suggest a design approach to this complex issue that focuses on sidewalk surface pavement to create "friendly streets" for all, while working effectively in an interdisciplinary context (Lavery et al. 1996).

Koppa et al. found that many studies address physical barriers only within the context of the transit stop or the transit vehicle, focusing on on-board audible information and wheelchair securement techniques. Often overlooked are the needs of persons with disabilities in travelling to the stop itself (Koppa, Davies, and Rodriguez 1998).

Examining the travel patterns of people with disabilities Rosenbloom (2007) highlights the need to investigate best practices that address the irregularities of sidewalk maintenance and curb ramp installation, as well as effectively addressing the enforcement issue in order to create safe, secure, and accessible transit environments for all users (Rosenbloom 2007).

Significant improvements in the pedestrian network are also required because pedestrian barriers are the most frequently barriers cited by travelers with disabilities. All evidence suggests that ADA compliance with pedestrian (public right-of way) systems may be low because we lack enforceable regulations in this area; as a result many people with disabilities lack an accessible route to an accessible bus stop. Research suggests the need to develop and maintain accessible and fully lit pedestrian paths while promoting greater enforcement of parking, safety, and security strategies (Rosenbloom 2007).

More recent research has shown that infrastructure deficits pose a barrier to persons with disabilities. A 2010 survey conducted by researchers at the Alan M. Voorhees Transportation Center of New Jersey found that a concern of many respondents with disabilities actively seeking employment were the infrastructure issues between one's home and the nearest public transit stations/stops. Those dissatisfied with infrastructure conditions exceeded those reporting satisfaction by 10 to 15 percentage points for each of the environmental conditions reviewed: sidewalks, street crossings and intersections, and street lighting (Lubin and Deka 2012).

For persons with disabilities and the elderly, accessible routes to transit or other selected pathways are primarily comprised of connected segments of a larger system. Complete accessible routes are inclusive of all physical conditions encountered from an individual's point of trip origin to a rail station, bus stop or trolley station – and final boarding conditions. This last component often includes assistive devices such as ramps and lifts that allow for convenient boarding onto a bus, train or trolley car.

Figure 1 shows general pedestrian accessibility guidelines proposed by the U.S. Access Board, an independent federal agency devoted to accessibility for people with disabilities. Currently, the U.S. Access Board's Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way states that the physical components of accessible pathways include "… walking surfaces (with running slopes no steeper than 1:20), doorways, ramps, curb ramps, elevators, and platform lifts" (U.S. Access Board 2011). In addition to these, other features are being added to the pedestrian realm to improve pedestrian access, mobility and wayfinding. These include striped crosswalks, pedestrian lighting and audible/visual pedestrian-activated crossing signals. Along with ADA-compliant sidewalk infrastructure, these features enhance the overall accessibility of transit facilities.

R204 Pedestrian Access Routes

A pedestrian access route is a continuous and unobstructed path of travel provided for pedestrians with disabilities within or coinciding with a pedestrian circulation path in the public right-of-way (see R105.5). Pedestrian access routes in the public right-of-way ensure that the transportation network used by pedestrians is accessible to pedestrians with disabilities. Pedestrian access routes in the public right-of-way are analogous to accessible routes on sites in that they connect to accessible elements, spaces, and facilities in the public right-of-way, including accessible pedestrian signals and pedestrian pushbuttons, accessible street furniture, accessible transit stops and transit shelters, accessible on-street parking spaces and parking meters and parking pay stations serving those parking spaces, and accessible passenger loading zones. Pedestrian access routes in the public right-of-way also connect to accessible routes at building and facility site arrival points.

Pedestrian access routes must be provided within:

- Sidewalks and other pedestrian circulation paths located in the public right-of-way;
- Pedestrian street crossings and at-grade rail crossings, including medians and pedestrian refuge islands; and
- Overpasses, underpasses, bridges, and similar structures that contain pedestrian circulation paths.

Figure 1. Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way

Source: U.S. Access Board, 2011.

Infrastructure that supports general accessibility can be separated into distinct categories – each with a number of integrated physical conditions and features:

- **Contiguous, unobstructed pathways:** sidewalk systems, designated/alternative paths, ramps, pedestrian bridges;
- **Secondary public realm features:** curb ramps, marked crosswalks, detectable edge features, audible and visual features, signage and “wayfinding” elements;
- **Site arrival points:** transit stops and shelters, transit station entry areas;
- **Assistive boarding devices:** lifts; ramps, other transit vehicle features; and
- **Assistive Technology (AT):** expanding communications and information technologies that provide greater independence and improve mobility for patrons with disabilities (U.S. Access Board 2011).

Understanding the nature of sidewalks, and conditions adjacent to sidewalks, is essential when creating successful pathways to transit. Figure 2 illustrates the various zones of a typical sidewalk. The planter/furniture zone provides a buffer between pedestrians and wheelchair users on the sidewalk, and the vehicular traffic – and adds a perception of safety.

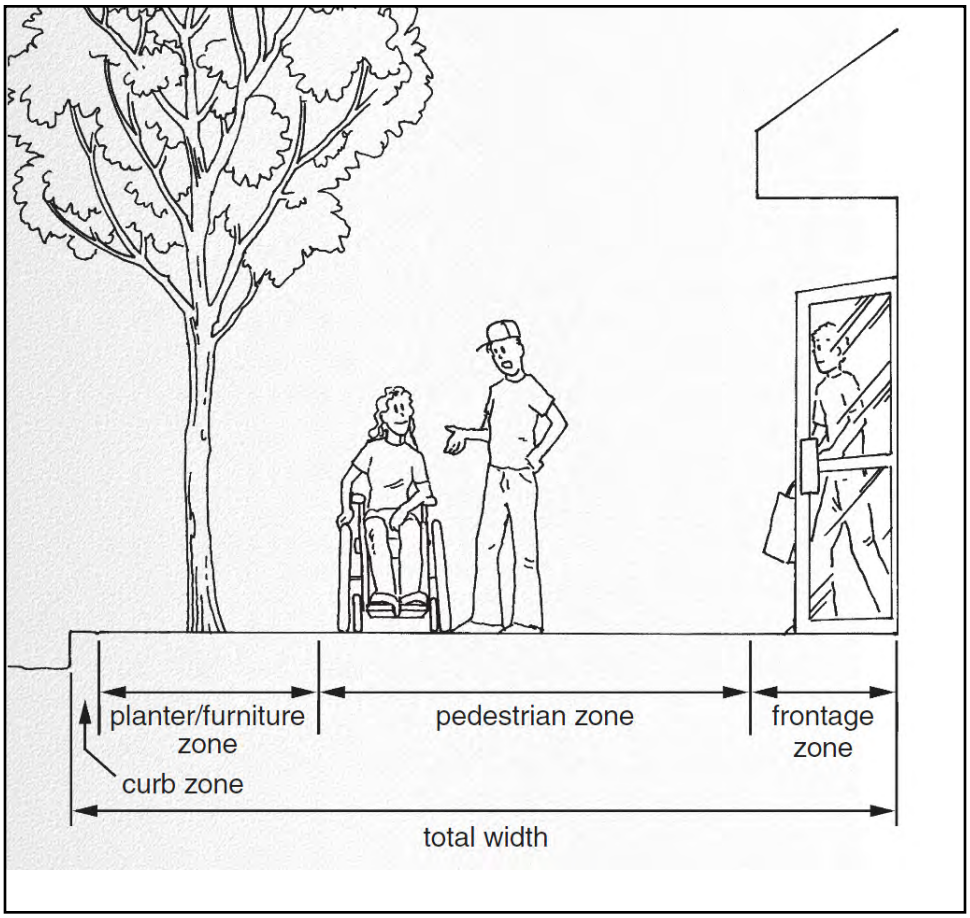


Figure 2. Sidewalk Zone Designations

Source: Kirschbaum 2001.

The use of a zone system, employed by many cities around the country, allows for a sidewalk to be divided into specific areas of usage (i.e. curb zone; planter/furniture zone; pedestrian zone; and frontage zone). For new sidewalks, this system is used to allocate appropriate widths to a sidewalk corridor to ensure adequate pedestrian access. For existing sidewalks, this system can also provide criteria for determining accessibility deficiencies and other potential barriers to accessibility. Table 2 provides the design criteria for accessible sidewalk conditions as established by the U.S. Department of Transportation (Kirschbaum et al. 2001).

Table 2. Design Criteria for Sidewalk Corridor Widths

Zone	Minimum Width
Curb Zone	152 mm (6 in)
Planter/Furniture Zone	610 mm (24 in) [1.22 m (48 in) if planting trees]
Pedestrian Zone	1.525 m (60 in)
Frontage Zone	760 mm (30 in)*
Total Sidewalk Corridor	3.10 m (10 ft.)*

Source: Kirschbaum 2001.

** If at least 760 mm (2.5 ft) of open space is available between the sidewalk corridor and the property line, no frontage zone is needed and the minimum recommended width for the sidewalk corridor is 2.285m (7.5 ft).*

The 2012 American Public Transportation Association (APTA) recommended practice report, “Design of On-Street Transit Stops and Access from Surrounding Areas” highlights the increased codification of design guidelines that would benefit all transit users, especially persons with disabilities. APTA offers that removing barriers to access is an important issue for transit agencies to address and that it would lead to “improved user safety, increased opportunity for pedestrian travel for any trip, and reduced costs for providing paratransit service.” APTA identifies these barriers as “lack of sidewalks, inadequate curb ramps or poorly timed traffic signals.” The report recommends that all projects within the transit stop’s walkshed should be reviewed for opportunities to construct sidewalks, provide new direct pedestrian links, or improve the safety and environment of the pedestrian experience (American Public Transportation Association 2012).

Collaboration

A variety of techniques and collaboration strategies are used by transit agencies, governmental bodies, and other stakeholders to bring accessible infrastructure projects to fruition. Those actively engaged in improving accessible pathways to transit stations and stops have at their disposal transit stop accessibility studies, pedestrian master plans/sidewalk inventories, and ADA Transition Plans, to name just a few of the available means to reach consensus and to begin the improvement process. Additionally, agencies must work closely with a variety of partners in order to identify and secure funding and to establish policy that governs the nature of any design, the extent of improvements, and the ongoing maintenance and/or operations of facilities.

Easter Seals Project ACTION’s “Accessible Pathways to Bus Stops and Transit Facilities: A Process Guide” is instructive and provides guidance to transit, transportation, and public works agency staff in their efforts to implement accessible pathway projects (The Institute of Transportation Engineers 2009). The report recommends a four step process for implementation: 1) identify goals, 2) assess community assets, 3) develop implementation plan, and 4) ensure follow through. Creating and maintaining relationships between local governments, transit agencies and advocacy groups are essential to the success of these efforts and are examined through several case studies (The Institute of Transportation Engineers 2009). Building upon the lessons learned from this report, we can further enhance our understanding of effective methods to implement accessible infrastructure projects.

Our investigation identified several cities that have undertaken bus stop accessibility studies. Tucson, Arizona prepared an “ADA Bus Stop Accessibility Study” which is a model report. This is a comprehensive overview of all features that impact bus stop accessibility. In terms of pathways to bus stops, the team evaluated sidewalks “in the vicinity of the bus stop to determine if they were continuous from the stop to the intersections in both directions” (Mueller 2009).

Charlottesville, Virginia’s ADA Transition Plan provides an example of how the city worked to develop an understanding of the travel patterns of persons with disabilities and then proposed targeted improvements throughout the public right of way to remove infrastructure barriers. The city conducts an annual sidewalk inventory through its public works department and is in the process of inventorying curb ramps throughout the city.

Also, the plan indicates that there is coordination with Charlottesville Area Transit (CAT) to “maintain an accessible transit system” and that “CAT will make every effort to place all requested bus stops in an accessible location” (City of Charlottesville 2013).

Securing funding for accessible infrastructure improvements is vital to their overall success. NCHRP Synthesis 436 identified funding as a major barrier to implementation of pedestrian safety improvements, noting that although municipalities are the primary group involved in project implementation, “they are dependent on funding and review from agencies at various administrative levels.” Case study practices that were successful often relied upon “creative implementation of available [funding] mechanisms.” The report also offered that when adopted as mandatory requirements, architectural and urban design guidelines provided an effective means to incorporate desired features, including accessibility, into designs or contracting language. Such guidelines are often subject to scrutiny and discretion at all levels of government. Collaboration and negotiation among these and with other stakeholders provide a necessary level of accord that can result in policies and guidelines that can help improve the pedestrian realm and accessible pathways (Walsh 2012).

III. CASE STUDIES

BROWARD COUNTY, FLORIDA

Introduction

Located in southeast Florida, Broward County experienced explosive growth in the 1980s, particularly in the suburban neighborhoods to the west. Much of the growth occurred during a period when new development was designed primarily to accommodate private automobile travel. Today Broward County is home to over 1.8 million people residing in 31 municipalities. The largest of these municipalities is the City of Fort Lauderdale, and little undeveloped land remains outside of the Everglades to the west.

The largely suburban, auto-oriented development patterns of the County pose a number of accessibility challenges for pedestrians and transit riders. Wide highways, spread out land uses, sprawling parking lots, and incomplete sidewalk networks constrain the ability of residents to meet daily needs without an automobile. In some areas, gated communities with thousands of homes funnel automobile traffic from one or two access points onto a state highway, while interrupting local network connectivity for pedestrians and vehicles.

To counter this, a concerted effort is underway to plan for a countywide transit system that is accessible to users of all abilities. The collection of initiatives aimed to create a more transit-, pedestrian-, and bicycle-friendly environment, which includes a Broward County Transit (BCT) self-evaluation process, Broward County Transit Development Plan, a countywide Complete Streets Initiative and Community Design Guidebook, and a number of supportive policies and practices of the Florida Department of Transportation (FDOT), Broward County Metropolitan Planning Organization (MPO), and local governments. Regarding MPOs, they are federally mandated and funded policy-making organizations. One of the core functions of an MPO is to develop a transportation improvement program for its operational area, which may include efforts to improve infrastructure that allows access to transit. Together, these combined efforts are gradually making transit more accessible through coordinated infrastructure improvements and integrated transportation and land-use planning.

Broward County Transit Service Area Characteristics

Figure 3 summarizes key transit service characteristics of the County. About 14 percent of the population is 65 or older, and over 10 percent are classified as having a disability (U.S. Census 2012a). Between 2008 and 2013, the population of transportation-disadvantaged persons served by paratransit grew by 10 percent (Broward County Transit 2013b). With the cost of paratransit service nearly eight times greater than fixed-route and with an aging population, the need to increase accessibility of fixed-route and local circulator transit services in the region is apparent (Petrowski 2014). A goal of the area paratransit agency and municipalities in the region is to encourage as many riders as possible to shift to fixed-route service, which utilizes wheelchair accessible buses on all routes.

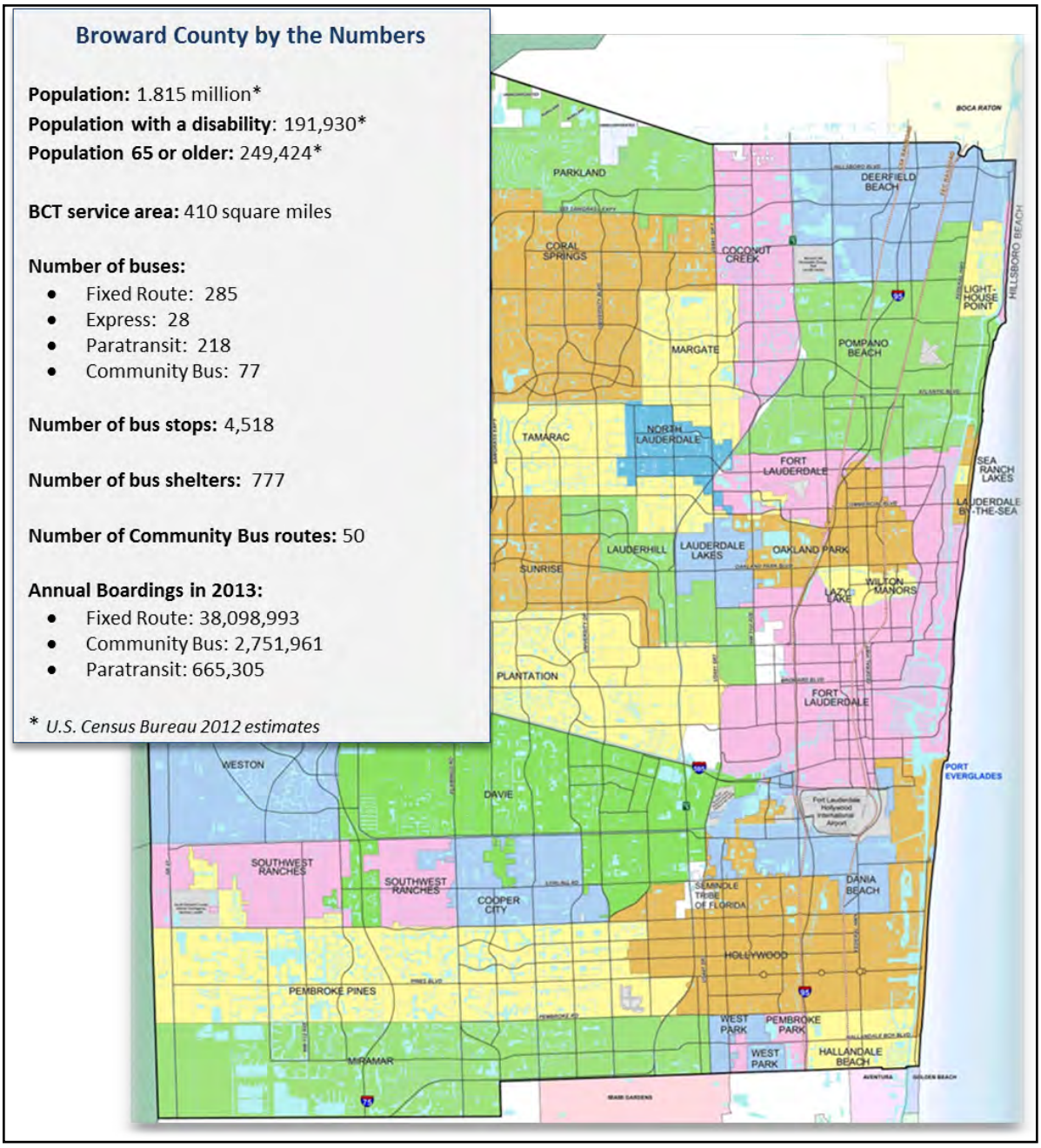


Figure 3. Broward County Transit Service Characteristics and Municipal Boundaries

BCT buses connect to the transit systems of Palm Beach and Miami-Dade Counties. BCT will also own and operate the WAVE, a 2.7-mile streetcar service in Fort Lauderdale. When complete the streetcar service will offer 10 stations and 7.5-minute headways during weekdays and 15-minute headways in the evenings and on weekends (Downtown Development Authority of Fort Lauderdale 2009). BCT services also connect to Tri-Rail, the north-south commuter rail system connecting Palm Beach, Broward, and Miami-Dade Counties. BCT does not operate Tri-Rail.

Community Bus

In addition to its traditional service, BCT partners with 18 municipalities to provide a local circulator system known as Community Bus (Figure 4). Community Bus service is a unique aspect of the county's effort to make transit accessible to everyone, including senior citizens and passengers that might otherwise have relied on door-to-door paratransit (Chavarria and Volinski 2004). The system connects to BCT fixed-route service, as well as to destinations not well serviced by BCT buses – including grocery stores, medical facilities, and social services. Annual boardings have fluctuated since 2007 with recent BCT data showing an increase of 15.1 percent between 2011 and 2013, to 2.8 million total annual boardings.

Figure 4. Community Bus Service in the City of Deerfield Beach

The Community Bus program is funded by the local option gas tax, the County's general revenue fund, and federal funds. Cities can supplement revenue with advertising at bus stops, bus benches, and on buses (Broward County Transit 2013a). Five cities charge a fare: Plantation, Margate, Fort Lauderdale, Coral Springs, and Tamarac (Ramos 2014).

Project Initiatives

BCT staff notes that the agency has always placed a priority on making transit stops accessible to users of all abilities. That process was accelerated in 2006 when the Broward County Commission committed $10 million over five years to retrofit transit stops for compliance with the Americans with Disabilities Act (ADA) of 1990. The decision was part of a settlement agreement stemming from a three-year lawsuit originally initiated against the region's water taxi service (Wyman 2006).

At the beginning of this period, BCT officials met with each city manager in the County to form a partnership and outline a plan for retrofitting transit stops that had not yet been reconstructed to ADA accessibility standards. Some cities that already had sidewalk improvement programs in place paid for half of the costs, with Broward County funding the other half. Cities unable to match BCT funding contributed by hastening the permitting process, which allowed BCT to make changes in the municipality's right-of-way (Ramos 2014).

Self-Evaluation Process

To facilitate compliance with the settlement agreement, as well as to better monitor overall agency progress toward improving accessibility of bus stops, BCT began a process of self-evaluation. BCT implemented data collection and established a database to: a) identify bus stop locations not compliant with accessibility requirements of the ADA; b) document needed improvements; and c) monitor the progress of improvement projects.

The database documents infrastructure associated with each bus stop, including the presence or absence of a bus shelter, bench, landing pad, and sidewalk connection to the stop. Data on boardings and ridership, the County Commission District where the bus stop is located, and its bus stop geocoordinates are also recorded. Each entry contains a photograph of the transit stop before any improvements, and – where improvements have been made – images of the construction process and the improved bus stop (Figure 5).

Of BCT's nearly 5,000 transit stops, approximately 2,600 needed to be upgraded to meet ADA accessibility standards. The bus stop locations were prioritized for improvement based on customer feedback, ridership demand, and location in proximity to higher-volume transit trip generators, such as schools, shopping centers, and government centers (Ramos 2014).

Figure 5. (Left) Bus Stop Before Reconstruction for ADA Accessibility (Right) Bus Stop Following Reconstruction

As of March 2014, nearly 85 percent of all bus stops had been upgraded at a cost of $6,000 to $8,000 per stop, depending on the improvements needed (Ramos 2014). Examples of specific infrastructure improvements included:

- Installation of landing pads, curb cuts and bus shelters;
- Fixing cracked slopes;
- Ensuring that curb ramp slopes leading to the landing pads are 2 percent grade; and
- Building sidewalks to fill gaps between transit stops and sidewalks not linked to the stops.

In addition, BCT installed yellow octagonal poles at transit stops to help vision-impaired and other riders readily identify the location as a BCT transit stop (Ramos 2014). The poles, as well as shelters and other improvements, are shown in Figure 6 and Figure 7.

Figure 6. New Bus Shelters and Yellow Poles along Sistrunk Boulevard in Ft. Lauderdale

Figure 7. BCT Transit Stop on Hillsboro Boulevard in the City of Deerfield Beach

These efforts have come at considerable cost to the agency's capital program. Between FY2012 and FY2016, programmed funding increased from $100,000 to $750,000 for ADA bus stop and facility improvements. The BCT FY2012 priority capital improvement program reflected upgrades/improvements to 160 bus stops to meet ADA standards (Broward County Transit 2012). A total of 265 bus stops were upgraded/improved to comply with ADA standards the prior fiscal year, and 105 bus stops were upgraded/improved to meet ADA requirements in 2013 (Broward County Transit 2013c).

Shelters and Amenities Program

The BCT Shelters and Amenities Program, updated in 2010, has been another avenue for improving accessibility of transit infrastructure. The purpose of the program is to "increase the number of shelters, seating areas, and transit amenities at BCT bus stops at a minimum of 679 bus stop locations with identified funding" (Broward County Transit 2013c). Bus stop improvements were prioritized in part based upon ADA and pedestrian accessibility needs. The program is funded by a combined $23.5 million from the Federal Urban Attributable (XU) fund and the American Recovery and Reinvestment Act (ARRA) funds: $10.0 million of the Federal XU funds administered by the MPO; $11.1 million ARRA/Stimulus funds administered by BCT; and $2.4 million ARRA/Stimulus funds administered by FDOT (Broward County Transportation Department 2010).

As of 2016, more than 1,000 bus shelters are expected to be completed, representing about 20 percent of all BCT bus stops. In FY2012 alone, 125 bus shelters had been designed and constructed, and BCT had 18 active contracts with municipalities to design and install shelters in their jurisdictions (Broward County Transit 2013c).

Planning Processes and Policies

A number of interrelated planning processes, documents, and policies support BCT's efforts to make transit stops accessible to users of all abilities. Examples include the Broward County MPO Long Range Transportation Plan, Broward County County-wide Community Design Guidebook, Broward County Complete Streets Guidelines, the Broward County Transit Disadvantaged Plan and supportive policies in the County and municipal comprehensive plans. Together these efforts promote improved infrastructure accessibility to transit for all persons through a variety of intergovernmental coordination and partnering activities, as discussed below.

Intergovernmental Coordination

Intergovernmental coordination and cooperation between Broward County's numerous independent municipalities is essential for successful implementation of transit infrastructure accessibility improvements. The county's transit agency, BCT, collaborates regularly with local governments, Broward County MPO, and FDOT to address the region's growing transit needs, including accessibility of transit stops for all users. This is consistent with an MPO role in the transportation process. These activities include coordination in development review, as well as partnering in the planning, design, permitting, funding and construction of improvements to transit stops, pedestrian ways, and related infrastructure. Two objectives of the BCT's strategic 10-year transit development plan illustrate the importance of transit accessibility and coordination (Broward County Transit 2013a):

- Objective 1.2 – Coordinate to link multimodal transportation with land-use decisions.
- Objective 1.3 – Integrate BCT's service planning efforts with other local and regional plans.

The FDOT District 4 also works with the Broward County MPO and BCT on roadway improvement and maintenance plans to ensure that transit facilities are provided or upgraded as necessary. Several corridors have been reconstructed and many more are planned for reconstruction through the MPO long-range planning process.

BCT also actively coordinates with local governments in addressing transit needs in land-use planning and development review. Although such coordination was largely absent in the early years of the County's growth, the need for coordination with local agencies on bus stop placement became apparent in the early 1990s. "It became critical to be at the table when land use changes are being made," said John Ramos, BCT Division of Service and Capital Planning (Ramos 2014). BCT staff now regularly coordinates with the County and its municipalities in development review to ensure connectivity between the development, pedestrian facilities, and bus stop locations (Ramos 2014).

MPO Long-Range Planning

The Broward County MPO invests heavily in transit and supports infrastructure improvements through its 2035 long-range planning and programming process. The plan provides a framework for improved accessibility to transit through interagency partnering and developer contributions. The plan prioritizes improvements in key transit corridors, as well as those providing direct service connections to major employment or activity centers, and service for transit-dependent populations. The MPO also prioritizes investment in premium and local bus transit (including Community Bus) and pedestrian facilities that offer greater opportunities for transit accessibility in the future. Figure 8 illustrates planned pedestrian infrastructure improvement projects in the 2035 cost-feasible plan.

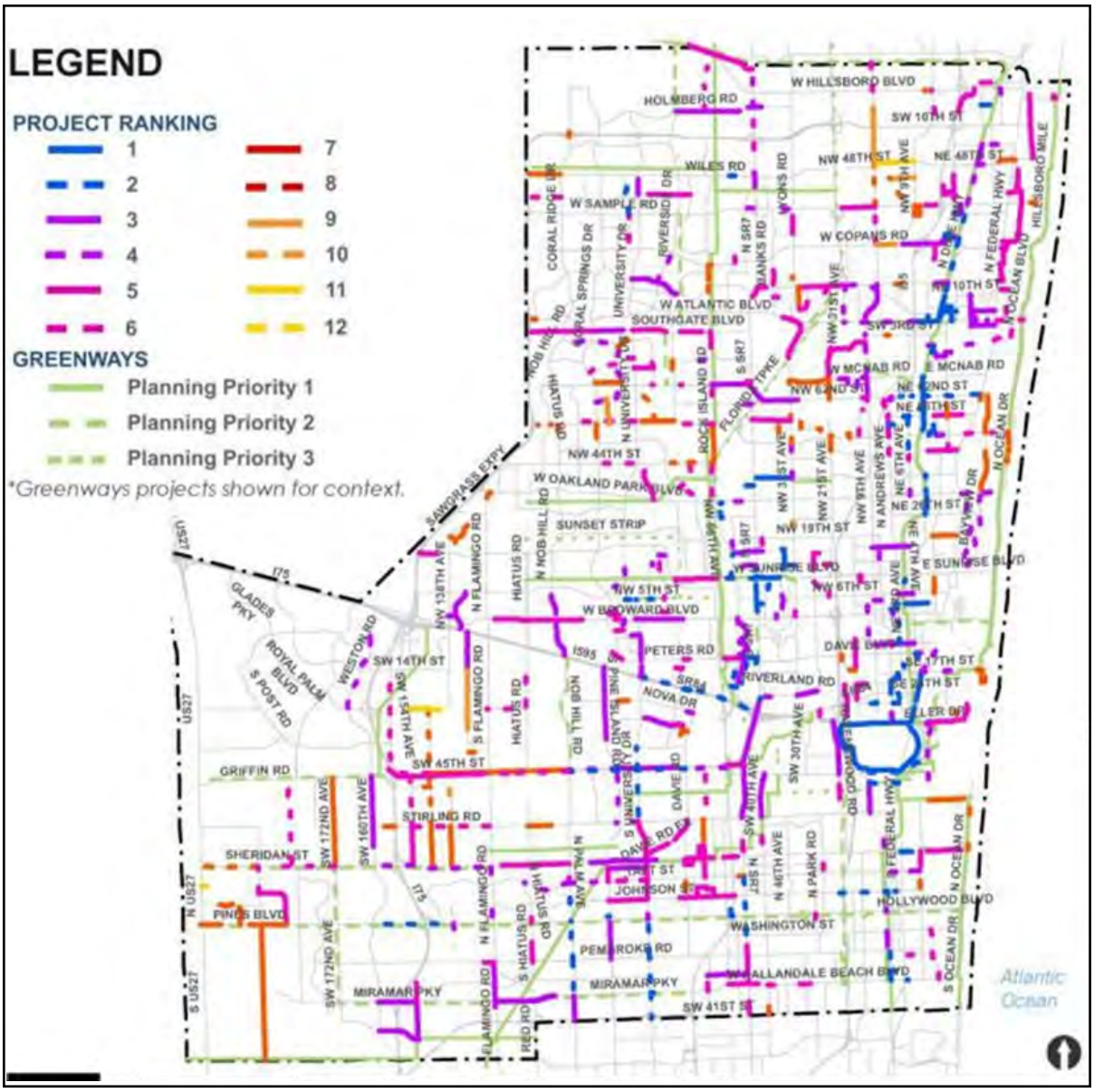


Figure 8. Broward MPO 2035 Cost-Feasible Pedestrian Projects

Figure 9 shows the total funding distribution by cost category in the cost-feasible plan. The cost-feasible plan allocates approximately 79 percent of available funds to projects and services related to non-auto modes of transportation, and 17 percent of roadway funding is allocated for projects that directly or indirectly support transit. Approximately $185 million is programmed for sidewalk improvements alone, with another $426 million for greenways over the 21-year planning period (Broward Metropolitan Planning Organization 2009).

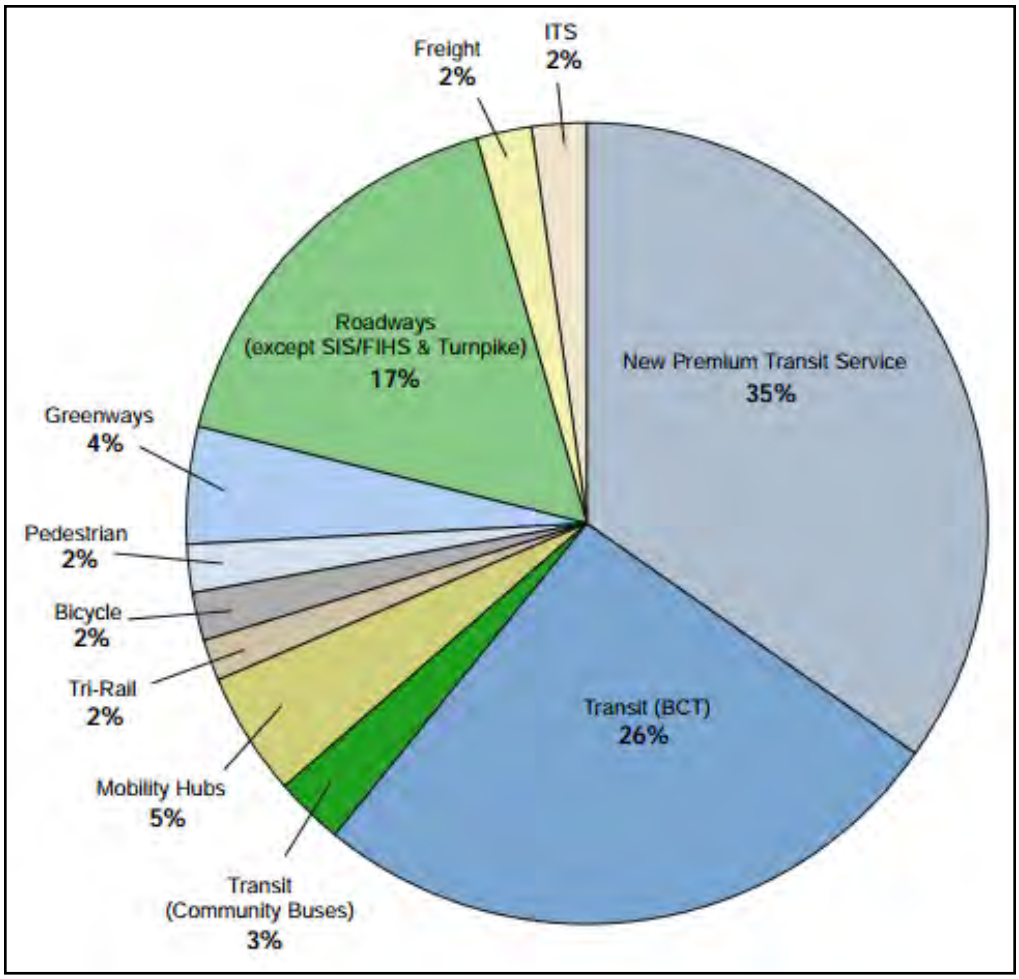


Figure 9. Funding Distribution of the Broward MPO 2035 Cost-Feasible Plan

State Highway Maintenance

FDOT leverages its Resurfacing, Restoration and Rehabilitation (RRR) program to identify and carry out needed accessibility improvements for transit stops. This program is an asset maintenance and preservation function to extend the service life of existing highways and/or enhance highway safety. The majority of RRR projects are identified and programmed as a result of deficient pavement conditions and may focus on improving capacity or reducing the likelihood of crashes (Florida Department of Transportation 2014).

The RRR process involves an extensive analysis that considers accessibility, among other issues. FDOT's analysis examines transit stops, bicycle and pedestrian facilities, and connectivity needs. Specified improvements may include drainage, tree removal, additional bicycle and pedestrian facilities, or the construction of a pad for a transit facility. Potential costs of identified needs are analyzed in light of the connectivity benefits and whether space exists within the ROW for the project. FDOT interviews stakeholders such as the County, the MPO, and school boards to identify accessibility and connectivity improvements projects that might be addressed in the process of an RRR project.

This analysis is done early in the RRR process, so funding needs can be addressed. RRR projects are funded under the Department's Pavement Resurfacing program, but also provide opportunities for cost-sharing with the County and the transit agency. The RRR process and projects have improved overall coordination and planning of resources between the County, BCT, and FDOT, especially through integration with FDOT's geographic information system (GIS), which allows for information sharing.

Community Design and Complete Streets Initiatives

Broward County also aims to create a strong "sense of place" and community identity through improved aesthetic and functional design. A goal of the process is to create places that are more livable, walkable and transit-friendly – objectives that implicitly support infrastructure accessibility goals. The *County-Wide Community Design Guidebook* establishes a conceptual framework through a detailed policy describing the location and form of future development, and recommends a number of updates to the Broward County Comprehensive Plan, Broward County Land Development Code, traffic engineering standards, and other codes and standards to further the desired designs and development patterns (Broward County Board of County Commissioners 2007).

Instrumental to BCT's accessibility efforts is the newly-adopted *Broward County Complete Streets Guidelines* (Kimley-Horn and Associates 2013). In March 2013, the Broward County Commission adopted the design guidelines to help municipalities accommodate all modes of travel for all users on new streets, reconstruction of existing streets and in development review. The initiative established an interdepartmental Complete Streets team, which coordinates with FDOT as well as other departments and area municipalities, to implement the effort and conduct community outreach.

A diverse collaboration effort between the Broward MPO, Smart Growth Partnership, Transforming Our Community's Health Initiative, and the Broward Regional Health Planning Council produced the guidelines. The vision statement and policies establish a framework for the guidelines to be incorporated into each local government's plans and policies in Broward County. Examples of accessibility policies within the guidelines include:

- "Local governments will enhance the safety, access, convenience, and comfort of users of all ages and abilities. Local governments understand that children, elderly adults, and persons with disabilities will require special accommodations," and

- "Local governments will design, operate, and maintain a transportation system that provides a highly connected network of streets that accommodate all modes of travel" (Kimley-Horn and Associates 2013).

Since adoption of the guidelines and with additional support from FDOT, several municipalities in the County – including the Cities of Deerfield Beach, Fort Lauderdale, Oakland Park, and Pompano Beach – have begun adopting their own complete streets policies and designing, retrofitting, and building streets within their jurisdictions to conform to the guidelines (Streeter 2012). Figure 10 illustrates the Deerfield Beach complete streets functional classification system for roadways within the municipality (City of Deerfield Beach 2013).

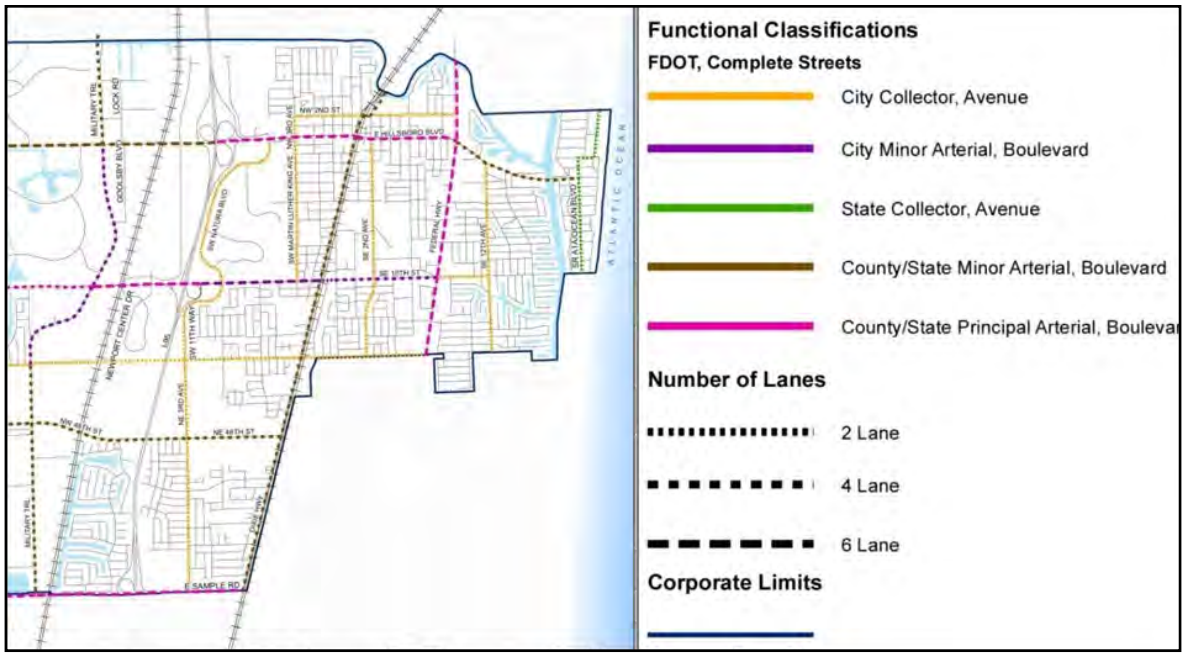


Figure 10. City of Deerfield Beach Complete Streets Classification System

Local Comprehensive Planning

The Broward County Comprehensive Plan, prepared by the Countywide Planning Council, also prioritizes accessibility for persons with disabilities and the elderly. Policy 3.2.2 of the Broward County Transportation Element makes ADA accessibility a priority, including several parts focusing on infrastructure needs:

> 7: "Continue to maintain a public transit fleet that is accessible to people with physical disabilities."
>
> 8: "Continue to coordinate the provision of bus shelters, benches, and stops with proper lighting and signage at those locations which generate 25 passengers or more per day and develop transit facility design standards and guidelines in compliance with the ADA of 1990 and Section 504 of the Rehabilitation Act of 1972 rules and regulations, including 42 U.S.C. §12146, 49 C.F.R. § 37.9 (Standards for Accessible Transportation Facilities:, and 49 C.F.R. § 37.43 (alteration of Transportation Facilities by Public Entities"), and the standards for Accessible Transportation Facilities, 49 C.F.R., Part 37, Appendix A."
>
> 9: "Continue to reduce the number of ADA inaccessible public transit facilities through construction and alteration of public transit facilities, including bus stop Section 504 of the Rehabilitation Act of 1972 rules and regulations, including 42 U.S.C. §12146, 49 C.F.R. §37.9 (Standards for Accessible Transportation Facilities) and 49 C.F.R. §37.43 (Alteration of Transportation Facilities by Public Entities) and the Standards for Accessible Transportation Facilities, 49 C.F.R., Part 37, Appendix A, within sixty (60) months of February 28, 2006, as follows: 16% within year one, 32% within year two, 48% within year three, 64% within year four, and 100% within five years, with initial focus on priority locations" (Broward County 2006).

Some municipalities have also adopted supportive polices for improving accessibility to public transportation. The City of Pompano Beach's comprehensive plan has a number of policies that address funding, connectivity, and intergovernmental cooperation and coordination with BCT, the Broward County MPO, FDOT, and adjacent municipalities (Broward County 2006; City of Pompano Beach 2012).

Evaluation, Key Challenges, and Lessons Learned

BCT staff note that continual self-evaluation is critical for meeting their goal of retrofitting all transit stops, yet limited staff make it difficult to maintain the database on a regular basis. At a minimum, staff would like to update the database once a year for each transit stop, and ideally, once every six months to track progress and monitor changes that occur in the surrounding area that may limit accessibility to the transit stop. Intergovernmental communication is occurring; however, local agencies are not required to report new development projects that do not directly impact BCT's transit stops. A development that occurs after BCT's transit stop site visit could adversely impact sidewalk connectivity to the transit stop if the local agency fails to address the issue (Ramos 2014).

BCT also notes the challenges of fulfilling requests for bus shelters in areas where they do not have an easement. Acquiring an easement can be arduous, involving significant staff time and cost, including leasing costs in some cases. Typical issues include verifying legal property boundaries, identifying and negotiating with property owner(s), liability concerns of impacted agencies and jurisdictions, and citizen concerns regarding congestion at the site. BCT is exploring ADA-compliant shelter designs that can be incorporated into tight or limited right-of-way conditions. Local governments can also take the lead by acquiring the necessary easements and addressing citizen concerns where improvements are desired.

Additionally, citizen concerns have occasionally impeded FDOT District 4 in its efforts to upgrade transit infrastructure on all new or reconstructed segments of the state highway system. Property owner opposition to sidewalks and transit stops has been an issue in some areas, such as along Florida State Road A1A. Reasons include a perception of increased crime, transient populations, waste of money, and disruption of residential landscaping, which frequently encroaches upon state highway right-of-way. BCT has experienced similar pushback, particularly in the higher-income planned communities to the west that lack connected streets and sidewalks. Although some areas do not presently value transit service, this may change as agencies continue to upgrade the systems, and as the populations in these areas continue to age.

Finally, BCT has made great strides in installing bus shelters in feasible bus stop locations close to the existing transit stop locations that cannot be made ADA-accessible due to factors beyond BCT's control. For example, efforts have been made to improve drainage, but flooding will continually be a problem at some locations (Ramos 2014). In addition, continuity and connectivity of pedestrian infrastructure requires active local government attention in development review, regardless of whether a transit stop is located at the site.

In sum, surmounting the barriers to accessibility posed by an auto-oriented suburban environment is a continuing challenge. It is critical, however, in light of the growing costs

of paratransit service and the mobility needs of the region's aging population and people with disabilities. Lessons learned include the benefits of intergovernmental partnering on infrastructure funding, regular coordination and communication between the transit agency and municipalities in land-use planning and development review, attention to infrastructure accessibility needs in state highway maintenance and reconstruction projects, and continuing agency self-evaluation on accessibility needs and issues.

MEMPHIS, TENNESSEE

Introduction

National statistics indicate some of the highest transit ridership levels in five decades. This has also brought about an increase in ridership among person with disabilities, the elderly and other transit-dependent patrons. Since 2004, transit ridership has grown at a rate higher than the nation's population and highway travel (American Public Transportation Association 2014). In Memphis, this trend has resulted in an ongoing, multi-faceted strategy to assess, plan and implement a number of measures aimed at eliminating barriers to the region's public transportation system. However, with aging rights-of-way, sprawling development patterns, older transit facilities and budget limitations, cities like Memphis face ongoing challenges in improving infrastructure and other conditions that facilitate unobstructed access to transit.

Achieving improved accessibility to transit is the shared objective of the Memphis Area Transit Authority (MATA), the Memphis Area Metropolitan Planning Organization (MPO) and the City of Memphis Engineering Department. This case study examines the nexus between infrastructure and access to transit in the city of Memphis and how MATA and its partners are attempting to eliminate physical barriers to transit accessibility in the Memphis area.

Context: Memphis, Shelby County Profile

Memphis is located in southwestern Tennessee, on the Mississippi River; it encompasses over 315 square miles. Memphis is the largest city in Shelby County, and the county seat. The city is part of the Memphis Metropolitan Statistical Area (TN-MS-AR), which includes ten counties in southwestern Tennessee, northern Mississippi and eastern Arkansas. According to the U.S. Census, this area is ranked 41st in the country in population, with over 1.3 million residents. The current population in Memphis is approximately 653,450 residents. In 2011, the city had an estimated 25 percent poverty rate. Sixty percent of MATA's transit patrons do not have access to an automobile, and rely exclusively on public transportation to access jobs and for general mobility purposes (U.S. Census 2011).

Memphis has a long and storied transportation history. At the turn of the 20th century, the city had already become a multimodal transportation hub. In addition to functioning as a major inland shipping center on the lower Mississippi River, Memphis was quickly becoming a major overland connection point for passenger and freight rail routes to other parts of the country. Memphis developed an extensive streetcar network prior to World War II, but like other U.S. cities with this type of transit system, the city began to abandon its streetcar lines as personal automobile usage proliferated after the war. This trend ushered in a new

era of urban growth expansion for Memphis. With the introduction of Interstates 40 and 55 and a number of radial arterial roadways during the 1960s, the city experienced a surge in suburban expansion. Figure 11 shows the Memphis metropolitan area.

Figure 11. Map of the Memphis Metropolitan Area

Constructed primarily for vehicular travel, most of the city's primary arterial and collector streets carved up the urban core. These same roadways defined the city's transportation patterns, and became the framework for its bus system. Many of these roadways were originally constructed with right-of-way conditions that were unsafe for pedestrians. Since then, a number of the city's major roadways have further evolved, with conditions that discourage walking as a form of mobility. These conditions have earned Memphis the distinction of having some of the most dangerous streets in the country relative to pedestrian fatalities (Smart Growth America, National Complete Streets Coalition 2014).

Outside the urban core, the spatial form of Memphis is primarily defined by low-density development patterns. While much of the sidewalk infrastructure in certain neighborhoods provides good access to bus stops for people with physical limitations, other parts of this system along fixed bus routes are aging, and still in need of modifications to eliminate different types of barriers.

With six intermodal rail yards, the Port of Memphis, FedEx Corporation World Headquarters, the Chickasaw Distribution Complex, and a growing number of other logistics centers, Memphis is often referred to as "America's Distribution Center." In addition to these, other employment centers around the city such as Memphis International Airport and the Midtown Medical Area are also major destinations for the city's transit-dependent population. Aside from downtown, these employment centers are distributed throughout the city's suburbs. Jobs in these areas, therefore, are primarily accessible by either private vehicles or regular fixed-route bus service. With so many employment centers located outside the urban core, much of the City's workforce experiences a "reverse commute" to its jobs.

The Transportation Disadvantaged Community in Memphis

A large segment of the Memphis population is classified as transportation disadvantaged. This includes local residents with significant unmet transportation needs. The transportation disadvantaged population of Memphis is composed of: low-income individuals (33%), people with disabilities (88,711 or 14%, non-institutionalized), the elderly (21,872, or 9%), clients of human services agencies, recipients of Medicaid, children in Headstart programs, and others with special transportation needs. Over 60 percent of transit patrons who use MATA services live in households that do not have access to a personal vehicle. The transportation-disadvantaged account for a majority of the demand for all modes of transit provided by the Memphis Area Transportation Authority (Memphis Area Transit Authority 2011). Table 3 identifies demand for transit services of these populations, as compiled from various sources.

Table 3. Demand for Public Transit-Human Services Transportation in the Memphis Area

People with Special Transportation Needs		Total Number by Census 2000	In human Services Programs	Demand for Transit Services
Elderly and people with disabilities	Elderly individuals	151,784	30,659	30,659
	Individuals w/ disability	169,467		
People with limited income	Living below poverty line	170,813	232,989	170,813
	Living at or below 150% poverty line	367,120		
Total excluding overlapping		560,206	263,648	201,472

Source: Department of Human Services (AR, MS, TN), TN Commission on Aging and Disability, Census 2000, Various MACTP Planning Stakeholders, and The NBM Associates.

While accessible routes serving transit are important to the mobility of all Memphis residents, they are essential for riders with disabilities and elderly residents who access these services by negotiating city streets. Demand for transit services by persons with disabilities and others with special needs is evident in the documented wheelchair boardings along some of MATA's most popular bus and trolley routes. In May 2014, the top ten bus routes for wheelchair boardings accounted for 49 percent of all such boardings throughout the combined bus and trolley systems (Memphis Area Transit Authority 2014).

Trip origin points for the transportation-disadvantaged in Memphis, as in other areas, typically begin at a private residence. Destinations include job locations, medical facilities, human services agencies, career centers, workforce development centers, educational destinations, cultural and recreational locations, retail establishments, downtown and the various transportation hubs around the city. In response to the different locations where these trip origins are likely to occur, MATA has focused public realm enhancements around bus and trolley stops in close proximity to 17 affordable housing sites, 13 neighborhood corridors and 30 senior housing complexes within the city of Memphis (Memphis Area Transit Authority 2007).

Memphis Transit Service Characteristics

Buses, trolleys and paratransit services constitute the range of transit options available in the city of Memphis. All public transit services in the Memphis metropolitan area are provided solely by the MATA. This is the largest transit agency in the state of Tennessee and provides over 9.3 million passenger trips a year. MATA's three main transit systems operate throughout a service area that encompasses over 311 square miles. Its bus fleet includes over 153 vehicles operating on 35 fixed routes. Additionally MATA provides special event shuttle bus service for the annual Southern Heritage and Liberty Bowl football games, as well the Memphis Grizzlies and the University of Memphis basketball games. MATA also operates up to 19 vintage trolley cars on three routes in the downtown area. Table 4 indicates the most recent overall ridership numbers for all three modes of transit service provided by MATA for Fiscal Year 2014.

Table 4. MATA Ridership History – FY2014

	Demand Response: MATAplus Paratransit Service	Street Car: Vintage Trolley System	Motor Bus: Bus System	Total for All Modes
July	19,826	157,153	688,863	865,842
August	21,071	127,674	715,580	864,325
September	19,990	95,170	719,927	835,087
October	21,368	100,951	759,925	882,244
November	19,286	72,166	698,077	789,529
December	18,790	64,990	673,425	757,205
January	20,944	62,849	612,901	696,694
February	20,294	65,338	586,217	671,849
March	20,814	93,461	610,319	724,594
April	21,255	97,371	656,530	775,156
May	20,674	140,185	709,196	870,055
June	19,180	25,927	605,532	650,639
Annual totals	243,492	1,103,235	8,036,492	9,383,219

Source: MATA – NTD Ridership Numbers.

MATAplus is the agency's paratransit service (see Figure 12). This is an on-demand shared ride service for transit patrons with disabilities who can't board, ride, or disembark from regular city buses without assistance. Each of these vehicles has a lowered floor and is equipped with a foldup ramp that extends to a sidewalk surface or the top of a curb. When deployed, this feature facilitates direct transfer of a wheelchair user on to the transit vehicle. Figure 12 (Right) shows this feature in use on one of MATA's paratransit vehicles.

Figure 12. (Left) MATAplus Paratransit Vehicle; (Right) MATAplus Van with Fold-up Boarding Ramp

The primary mode of transit in the city is the fixed-route bus system. Of the 35 fixed routes operated by MATA, 31 are entirely within Shelby County. The remaining bus routes are contracted services for West Memphis, Arkansas, on the west side of the Mississippi River. Figure 13 illustrates how MATA's bus routes cover the greater Memphis metropolitan area. Most major routes extend either north-south or radiate eastward from the downtown core. There are over 4,500 bus stops and over 300 bus shelters throughout MATA's service area. To accommodate patrons with disabilities, MATA's entire fleet of 150 buses is wheelchair-accessible. Each is equipped with a "kneeling" feature, a wheelchair ramp, and wheelchair locking features at the front of each bus.

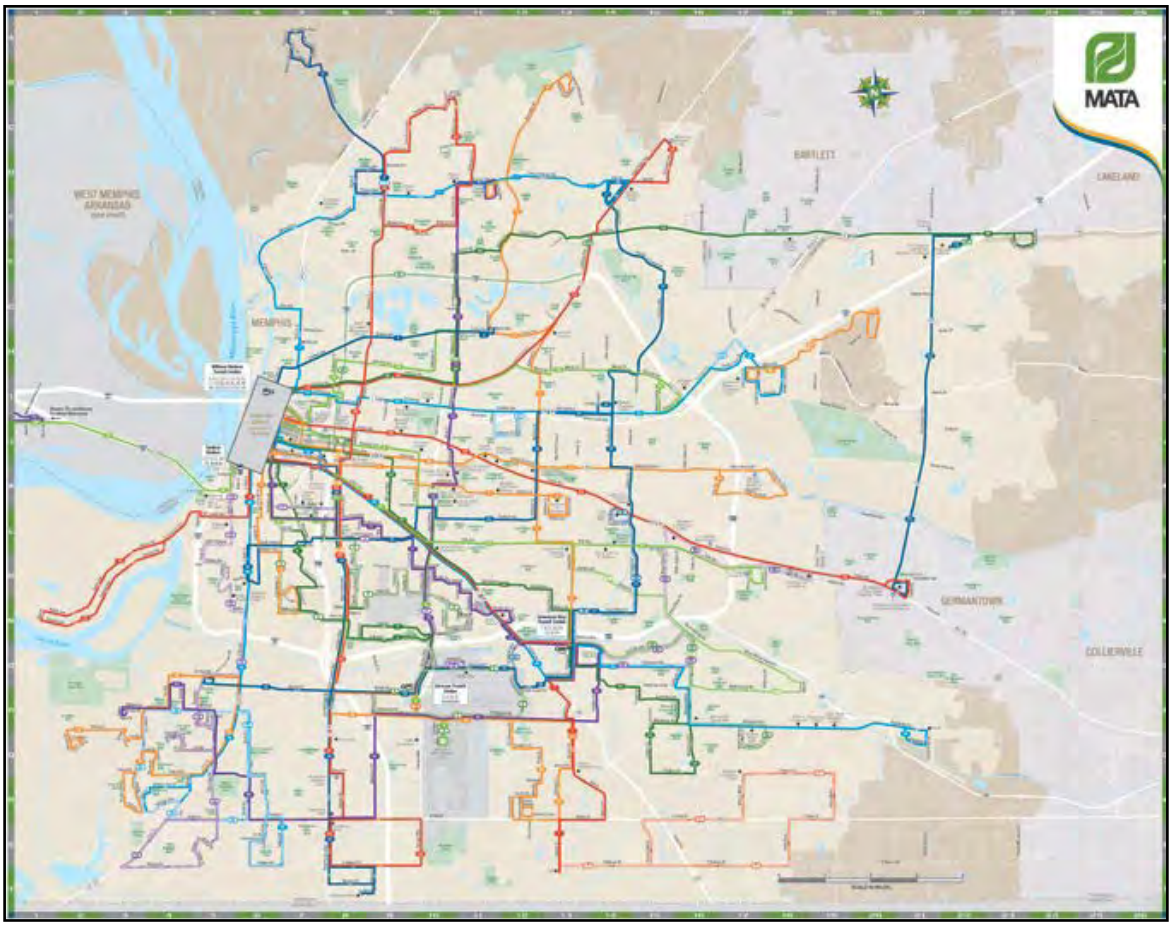
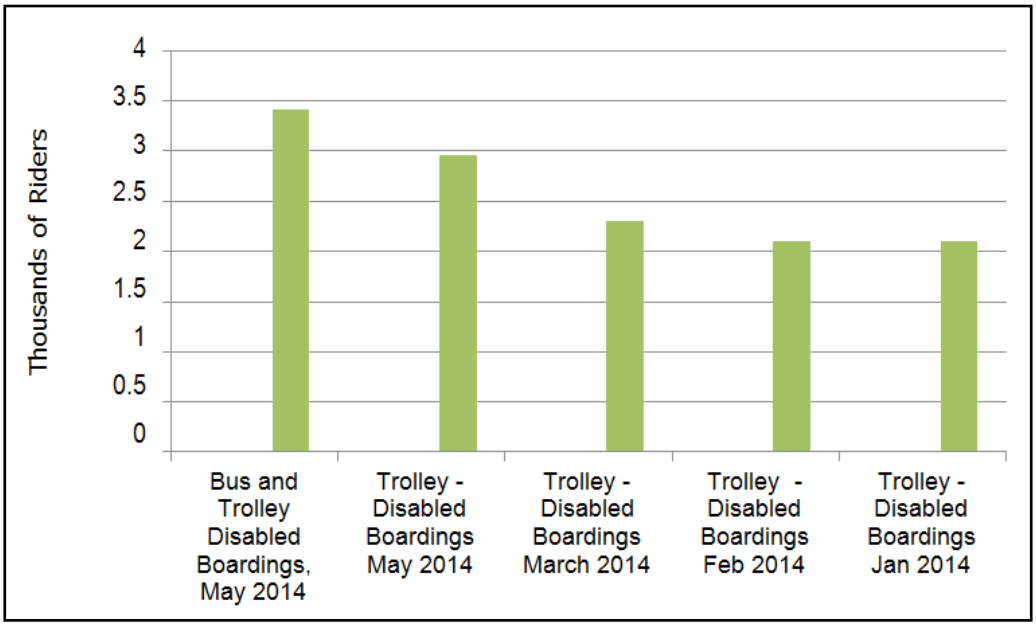


Figure 13. MATA Bus System Map

To monitor ridership levels for wheelchair users, MATA documents deployment of bus ramps on its fixed-route bus fleet and the use of wheelchair lifts at each of its trolley stations. Data from the month of May 2014 indicates that there were 6,804 boardings/departures by transit patrons who utilize wheelchairs on these modes of transit. MATA uses the following formula to determine the actual number of wheelchair boardings for one month: Total Number of Patrons Using Wheelchairs (boardings and departures ÷ 2). In May of 2014, this amounted to a total of 3,402 wheelchair boardings. Table 3 illustrates total boardings by wheelchair users for both the bus and the trolley system during this same period.

Table 5. MATA Recent Ridership Levels Among Persons with Disabilities



Source: MATA Wheelchair lift deployment data, 2014.

In 1993 MATA began operations of its vintage trolley rail system, with the Main Street Line. This “heritage streetcar transit system” diversifies transit options in the city while preserving the history of rail travel in Memphis. The agency added the Riverfront Line in 1997, and the Madison Avenue Line in 2004. This system provides transit service to the local downtown workforce, and has become a major tourist attraction. The system connects with numerous downtown activity areas and destinations, the riverfront, and the Midtown Medical Area. As such, the vintage trolley system has become an important transportation asset to the city, and is an integral part of the downtown culture of Memphis. Each trolley car in the fleet has provisions for accommodating wheelchair users at each trolley station on all three lines (see Figure 14 and Figure 18).

Figure 14. MATA Vintage Trolley Car

MATA's trolley system comprises 19 vintage cars operating on three different lines:

- The Main Street Line – operates along the Main Street transit/pedestrian mall from A. W. Willis Avenue in the north to G. E. Patterson Avenue in the south;
- The Riverfront Line – operates in a loop along Riverside Drive and Main Street;
- The Madison Avenue Line – operates from Court Square in Downtown, east along Madison Avenue to Cleveland Street.

Figure 15 shows the alignment of the trolley system's 10 route miles of track in the downtown area, and its 38 station stops. The system currently provides over 1.1 million passenger trips per year (Memphis Area Transit Authority 2014).

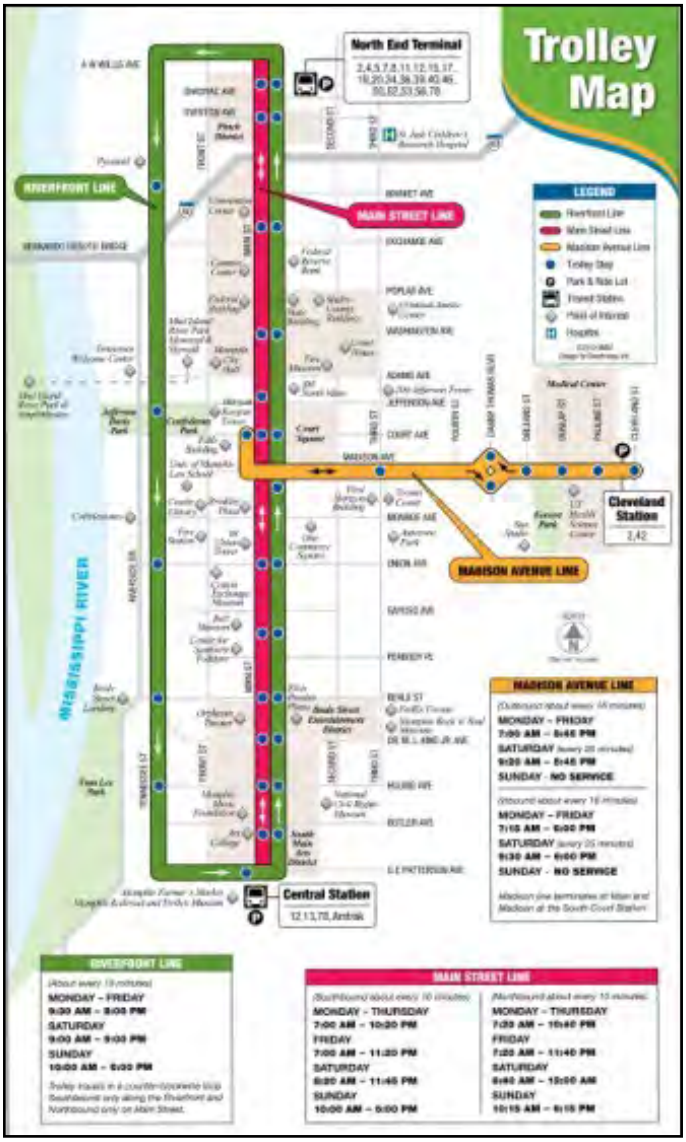


Figure 15. MATA Trolley System Map

To comply with Americans with Disabilities Act (ADA) requirements, MATAplus provides paratransit services for eligible patrons with disabilities throughout the Memphis service area. MATAplus operates up to 20 vehicles within ¾ miles of fixed routes. Figure 16 illustrates the type of vehicles used in the MATAplus fleet. Most of the vehicles in use are 29-foot heavy-duty transit vehicles with seating capacity for between 22 and 29 individuals. All of these vehicles are fully accessible to transit patrons with disabilities.

As required by law, patrons using this service must be certified with one or more disabilities that prevent them from using the regular fixed-route bus system. This paratransit service alone accommodates over 5,970 certified riders. MATAplus provided over 243,525 passenger trips during 2011 (Memphis Area Transit Authority 2014).

Figure 16. MATAplus Paratransit Van

In addition to MATAplus, the Memphis metropolitan area is served by a number of other non-profit and for-profit paratransit providers. These include the Memphis Center for Independent Living, Delta-HRA, DARTS, Premier Transportation Services, Game Over Charters and Tours, Arrow Transportation, Southaven Taxi Company and the Adult Services Program of North Delta Planning and Development District (Memphis Area Transit Authority 2007).

Infrastructure Features that Support Access to Transit

Although MATA collaborates with the Memphis Area MPO on a number of different initiatives, the provision and maintenance of transit facilities and the pathways to reaching those facilities is the shared responsibility of the City of Memphis and MATA. The City of Memphis Engineering Division oversees infrastructure features pertaining to contiguous, unobstructed pathways (sidewalk systems, designated/alternative paths, ramps, pedestrian bridges) and the secondary public realm (curb ramps, marked crosswalks, detectable edge features, audible and visual features, signage and “wayfinding” elements). Infrastructure features such as transit stops and shelters, transit station entry areas, and assistive boarding devices are the responsibility of the MATA. While each of these agencies has a different mission, it is not uncommon for them to jointly collaborate on planning, coordinating and implementing initiatives that enhance public realm conditions and foster improved mobility for persons with disabilities.

Obstacles and Challenges

Outside of the downtown area, Memphis has evolved with low-density residential development patterns and dispersed commercial development along broad arterial roadways that extend out to the city's suburbs. These land-use patterns and roadways were designed primarily for vehicular usage, often with little regard for pedestrian conditions within the right-of-way. In some locations, sidewalks, which are the primary infrastructure features necessary to facilitate pedestrian mobility, have wide-ranging physical characteristics or are altogether non-existent. Contiguous, well-maintained sidewalk corridors are essential for this purpose.

While many of the streets along transit corridors in Memphis do have connected sidewalk systems that facilitate general pedestrian mobility, others do not. Accessibility challenges are exacerbated by the absence of sidewalks along certain streets and adverse physical conditions such as broken and uneven pavement along existing sidewalks that connect to transit stops. In certain instances, simple access to bus stops can prove difficult, if not impossible, for some members of the transportation-disadvantaged community. This situation appears to be more evident on older secondary and neighborhood streets that directly connect to transit corridors.

Since the passage of the Americans with Disabilities Act over twenty-five years ago, communities around the country have wrestled with the problem of contextual conditions that limit or restrict the mobility of people with disabilities as they navigate urban areas. Since then, the city of Memphis and MATA have launched multiple initiatives to address this issue. Although efforts to eliminate or minimize the impacts of obstacles for general accessibility in Memphis have been successful, many of the city's streets still pose challenges for persons with disabilities, the elderly, and other transit-dependent individuals. A visual survey of roadway conditions along several streets leading out from downtown – with major bus routes through neighborhoods and into the suburbs – further supports this observation.

Accessible routes to bus stops and trolley stations in Memphis share many of the same characteristics as in other cities: Existing rights-of-way and other conditions that do not provide safe pedestrian rights-of-way or meet current ADA standards are evident along different types of roadways throughout the city. These conditions exist in inner-city neighborhoods, as well as in outlying suburban communities. Transit patrons with physical limitations who rely solely on public transportation are affected by these conditions on a daily basis. Independence and personal mobility can be significantly diminished when someone is confronted by even small breaks along a desired route to a bus stop or transit facility.

In downtown Memphis, the sidewalk system is contiguous, and connects directly to bus and trolley stops and other transit facilities. Most sidewalks are generally in good repair, have even surfaces, and do not pose major obstacles to mobility for people with physical limitations. While sidewalk widths tend to vary, most provide the required minimum three feet of unobstructed passage for wheelchairs. The sidewalks in downtown Memphis are also equipped with curb ramps at most intersections. Crosswalks at these intersections are often marked only with the traditional two white lines across the road; however, in some locations with modest levels of pedestrian activity, crosswalk designations are still absent.

Downtown Memphis has a fourteen-block-long transit/pedestrian mall that extends north-south along a portion of Main Street. This linear activity area has two of MATA's trolley lines operating within the Main Street right-of-way. Figure 17 shows conditions along the Downtown Transit Mall at the City Hall Trolley stop. The absence of vehicular traffic lanes and curbs along the length of the mall allows the sidewalks to blend in with the street and extend across the full width of the right of way. The entire sidewalk surface is consistent, and paved with brick.

Figure 17. Downtown Memphis Main Street Transit Mall

MATA maintains 37 trolley stations that are distributed among 24 locations along Main Street, Riverside Drive, and Madison Avenue. Planning for ADA retrofits of downtown trolley stations grew out of a feasibility study completed in 2013. The purpose of this study was to identify potential improvements that would "address the challenges related to wheelchair access (loading/unloading) and trolley schedule/timing" (Memphis Area Transit Authority 2012b). Recently, MATA has retrofitted 24 of these stations with hydraulic wheelchair lifts and ramps, making them fully accessible for wheelchair patrons (see Figure 18).

The trolley car fleet has been modified with on-board ramps that are deployed by trolley operators to fully engage the newer lift technology at the stations. As a result, wheelchair boardings are less problematic for transit riders with disabilities. Recent wheelchair boarding data seem to suggest that these modifications are a welcome enhancement and are helping to support ridership by transit patrons with disabilities.

**Figure 18. (Left) Downtown Trolley Station;
(Right) Wheelchair Lift and Variable Message Sign at Downtown Trolley Station**

Although most streets and public spaces in the downtown core of Memphis provide a high level of general accessibility, conditions are not as consistent in surrounding neighborhoods, peripheral suburban communities, or along major commercial corridors within MATA's bus service area. In some of these locations, roadway and intersection geometry along city thoroughfares have reduced pedestrian conditions to an almost irrelevant status. Accessible pathways in most of these instances are composed solely of sidewalks along neighborhood and collector streets. Narrow sidewalk widths, discontinuous sidewalk segments, older sidewalks with uneven surfaces, and inadequate maneuvering space for wheelchairs are often major obstacles to accessibility for patrons with disabilities and elderly citizens. Figure 19 and Figure 20 illustrate a number of these conditions that still pose challenges in different parts of the city.

**Figure 19. (Left) Uneven, Cracked Sidewalk Surface;
(Right) Obstacles Limiting Sidewalk Width and Broken Surface**

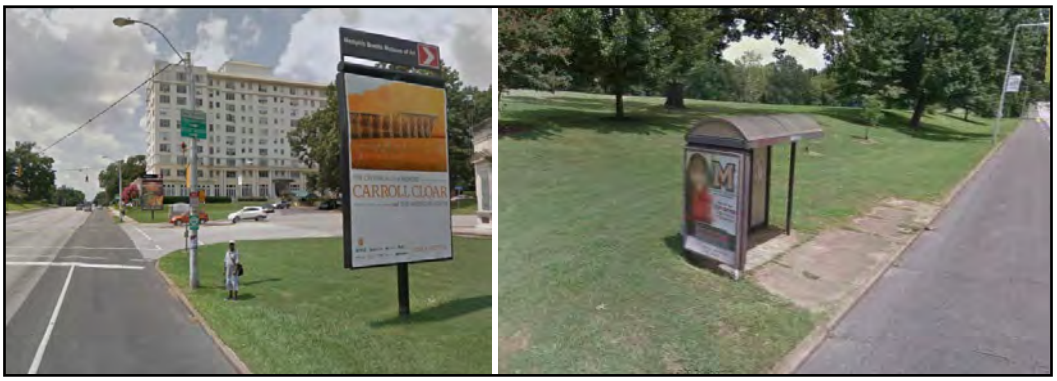


**Figure 20. (Left) Discontinuous Sidewalk;
(Right) Inaccessible Bus Stop for Wheelchair Users**

Source: Google Earth, 2014.

This situation is further exacerbated by the following conditions:

- Objects on or within the sidewalk (e.g. utility poles, traffic signal masts, fire hydrants, signage, fixed street furnishings, etc.);
- Cracked sidewalk surfaces, protruding objects, unstable cross slopes (>2%), inadequate overhead clearance (<6'8");

- The absence of curb ramps at intersections;
- Continuous vehicular curb cuts;
- Temporary obstructions; and
- Mature trees in the sidewalk.

The proximity of sidewalk corridors and pathways to high-speed traffic is also a deterrent to accessibility. For the large number of persons with disabilities and elderly residents who rely on public transportation throughout the city, this condition alone continues to influence the decision to either navigate local streets and access MATA's bus service, or rather utilize one of the many paratransit services available in the city (Cunningham, 2014).

The 2007 "Memphis Area Coordinated Transportation Plan" includes a number of unmet needs and service gaps that have been identified by persons with disabilities, low-income people, and elderly transit patrons. Among others, these include user experiences and perceived shortcomings that directly relate to transit accessibility. Some of the shortcomings indicated are as follows:

- Bus stop locations too far to walk to;
- Perception of unsafe conditions while waiting for buses in certain locations;
- High cost of regular and demand-responsive transit services;
- Transit fare cost differentials between ADA-paratransit service providers in the public, private, and non-profit sectors;
- Difficulty in making carpool connections;
- Lack of information or a transportation resource center;
- Sidewalks without curb ramps at intersections/other ramp protections;
- Obstacles associated with bus-to-bus transfers and other modes of transportation connectivity;
- Frequency of service that fails to meet transit patron needs; and
- A lack of funding for ongoing accessibility enhancements.

Responses to Accessibility Challenges in Memphis

MATA, the City of Memphis, and the Memphis MPO have been at the forefront of accessibility planning and project implementation since the passage of the Americans with Disabilities Act. They have spearheaded a number of policy, planning, and implementation initiatives

that have significantly enhanced accessibility to transit for persons with disabilities, the elderly, and others in the transportation-disadvantaged community. In addition to these efforts, members of the transit community have played a significant role in advocating for accessibility improvements to the city's transportation system and its infrastructure. The following list identifies several ongoing efforts and completed projects that have improved access to transit in various parts of the city of Memphis.

Community Involvement

The large number of residents that make up the transportation-disadvantaged community in Memphis has fostered several community advocacy groups that work to improve access to transit. Many of these groups have played an active role in promoting accessible conditions for transit patrons. In the recent past, they have collaborated with MATA on accessibility priorities related to bus transit, and trolley station enhancements.

On other transit-related issues, the disabled community has taken a more proactive role in articulating problems associated with access to transit and other perceived deficiencies. Stakeholder involvement played a significant role in developing the needs assessment component of the Coordinated Human Services Transportation Plan for Memphis, which was developed by MATA and the Memphis Area MPO in June 2007. These groups included such entities as the Memphis Center for Independent Living, the Paralyzed Veterans Association, transportation and human services providers, and other ADA advocacy groups.

Policy Initiatives

Planning policies aimed at improving access to transit have been incorporated in the City of Memphis Comprehensive Plan and MATA's Short Range Transportation Plan. These policies state that "access will be provided to all of the city's transit systems for the elderly and handicapped." They also identify a number of strategies for achieving this objective, such as expanding services, eliminating remaining barriers, locating bus stops and shelters closer to residences of the elderly and persons with disabilities, and studying the adequacy of service in low-income areas (Memphis Area Transit Authority 2012a).

Complete Streets Initiative

The City of Memphis enacted a Complete Streets policy in January 2013. This policy states that public rights-of-way throughout the city shall "accommodate all users … including pedestrians, bicyclists, users of mass transit, people with disabilities, the elderly, motorists, freight providers, emergency responders and adjacent land users." Adoption of this policy was especially timely, given that Memphis has been ranked by National Complete Streets Coalition as being one of the most dangerous places to walk. With the limited finances of the City, implementing this initiative is expected to be an incremental, long-term process that is realized through ongoing community engagement and the leveraging of other public works efforts.

Accessibility Training Program

Currently MATA does not have a mobility manager, but does provide travel training. This service instructs individuals with disabilities how to use public transportation and associated features. These include use of wheelchair lifts, ramps, securing wheelchairs on buses, reading schedules, and other features that facilitate access to the different transit systems. This is a free service provided to the public, and has resulted in greater awareness among transit patrons with disabilities on how to access buses and trolleys. Figure 21 shows MATA staff instructing a wheelchair-user on boarding a MATAplus vehicle.

Figure 21. MATA Travel Training in Action

Main to Main Program

The Main to Main Multi-Modal Connector Project is a major infrastructure initiative that includes, among others, improvements to public realm conditions along Main Street in downtown Memphis. Funded through a grant from the U.S. Department of Transportation "Transportation Investment Generating Economic Recovery" (TIGER IV) program, this initiative has already helped enhance the Main Street Transit Mall's sidewalk conditions throughout downtown. Initial phases of this effort have eliminated all accessibility obstacles along the Main Street Transit Mall (Lancaster and Foresee 2014).

Improvements to Pathways that Connect to Transit

Although most public works projects are funded through the City's Capital Improvement Program, MATA is planning to make sidewalk improvements along several of its bus routes. This is made possible through the use of up to $1 million in a previous New Freedom Funds grant from the Federal Transit Administration. These funds will be used for curb ramp improvements at intersections and the installation of new shelters at bus stops.

Direction 2040 Long Range Transportation Plan (Memphis Urban Area Metropolitan Planning Organization)

Chapter 5 of the Direction 2040 Plan, entitled Transportation Strategies, identifies guidelines for integrating enhanced pedestrian facilities (i.e., sidewalks, pathways) along area roadways. More specifically, it recommends conformance with the Americans with Disabilities Act Accessibility Guidelines (ADAAG) for sidewalk widths, curb ramps,

pedestrian crossings, and other features to encourage accessible active use of MATA's bus and trolley systems (Memphis Area Metropolitan Planning Organization 2012).

Trolley Station ADA Improvements

This program was started in 2012 as part of a feasibility study to identify design strategies for eliminating barriers to the downtown trolley system. The effort involved retrofitting each station with new assistive devices, such as mechanical lifts and ramps to allow for the 32-inch vertical transition needed for wheelchair patrons to board trolley cars (see Figure 22). Since 2012 MATA has also installed variable message signage at each trolley station. These signs stream real-time information and were installed primarily to benefit deaf patrons. In addition to these, the City of Memphis has installed audible signals at intersection crosswalks near trolley stations and textured surfaces at edge conditions to help ensure safe access and usage of the system by blind patrons. Figure 22 (Right) shows textured edge surfaces on an elevated trolley station platform.

Figure 22. (Left) Trolley Station with Mechanical Lift and Variable Message Sign; (Right) Trolley Station Wheelchair Boarding Platform and Textured Ground Surface

Identification of Funding Resources and Inter-Governmental Coordination

MATA has worked closely with municipal agencies on a number of transportation initiatives. The agency also works cooperatively with the Memphis Urban Area Metropolitan Planning Organization (MPO) on transit planning activities in the Memphis area under the terms of a 2004 Memorandum of Agreement (MOA). A new agreement between these agencies outlines funding splits for use of grants received for planning under the Federal Transit Administration Section 5303 Program.

MATA and the MPO led the Memphis Area Coordinated Transportation Plan (MACTP) planning process. One of the main purposes of this plan was to assess the transportation needs of transit-dependent populations, including the elderly, persons with disabilities, and low-income individuals. More recently, MATA has secured over $1 million in New Freedom Funds to assist the City of Memphis with the installation of curb ramps on sidewalks and to facilitate better access at crosswalks and bus stops (Lancaster and Foresee 2014).

MATA Bus Shelter Program

MATA is in the process of upgrading most of its existing bus shelters, and will be installing up to 100 new bus shelters throughout its service area over the next five years. It is working with a Community Advisory Committee and other stakeholders to determine the best location of these structures (Lancaster and Foresee 2014). Figure 23 depicts examples of the new bus shelters that are being installed throughout the city.

Figure 23. Examples of New Bus Shelters at Front & Jefferson (Left) and Poplar & Cleveland (Right)

Transit Innovations

Since 2011, MATA's Intelligent Transportation System (ITS) has been integrated into bus operations. The MATA Traveler system provides all transit patrons with real-time information to plan bus trips. With each bus stop assigned a specific locational footprint, this feature provides transit patrons with disabilities – and others – with reliable bus arrival times at all bus stops throughout the city. This information is available through text message, as well as the MATAtraveler website.

Conclusion

Since the adoption of the Americans with Disabilities Act, cities and towns across the country continue to struggle with the major challenge of retrofitting existing sidewalk corridors and other pathways to make them unobstructed, accessible routes to transit. Memphis is no different: Over the last 24 years, aging infrastructure, sprawling development patterns, increased costs and dwindling public-sector budgets have collectively played a major role in the City's ability to retrofit many of its public realm conditions. Although the existing transit bus, trolley and paratransit van fleets are all fully accessible for patrons with disabilities, a number of pathways to bus stops along some routes still require attention.

To date, efforts to retrofit this part of the City's infrastructure and eliminate barriers to transit have been successfully implemented by both the City and MATA. The expansive nature of the City and the high demand for transit services will require ongoing collaboration between the agencies, leveraging future funding opportunities, innovative implementation strategies, and continued community engagement to achieve greater accessible conditions to transit throughout Memphis.

NEWARK & NEW BRUNSWICK, NEW JERSEY

Introduction

NJ TRANSIT (NJT) is the statewide transit agency providing nearly 223 million passenger trips annually. The agency is the nation's third largest with bus, rail, and light rail transit covering an area of 5,325 square miles. As one of the nation's oldest and most extensive systems, the agency faces having to improve access to its numerous stations and stops to allow for their use by consumers of all abilities. Updates to facilities and to the areas around facilities occur frequently, during which time the agency undertakes efforts to improve the connections to those facilities. These activities fall under the purview of two offices within the agency, the Civil Rights Office (CRO) and the Capital Planning and Programming Office (CPPO). Collaboration between the CRO and the CPPO, and between these offices and community stakeholders, enables the agency to set priorities for ADA improvements and to successfully carry out those improvements.

Agency representatives observed that throughout the nation it is common practice for public transportation accessibility improvements to "end at the property line," and that this practice limits the effectiveness of said improvement. It is NJT's practice to consider conditions beyond the "property line," and how improvements can be integrated into existing infrastructure. They acknowledged that while NJT and most transit agencies cannot address deficits throughout the pedestrian environment, improvements that take into account pathways to stations and stops, and that extend a critical assessment of the path of travel as far as budgets and cooperation will allow, are critical to serving riders' needs.

This case study examines two projects undertaken by the agency as examples of how it sought to improve pathways of travel to its facilities, the results of which improved accessibility for all potential and existing users of the transit system, both with and without disabilities. The first of these projects improved accessibility to Newark Penn Station, a large urban transit center located in the state's largest city. The second project made improvements to the New Brunswick Station area as part of a larger redevelopment effort that resulted in a mixed-use transit-oriented development that added an outdoor plaza, a new bookstore, office and residential space, and area parking. For each project, NJT worked with community stakeholders, extended improvements beyond its property, and oversaw design and construction processes so as to exceed ADA requirements.

Newark

Newark's historic McKim, Mead, and White Penn station was constructed in 1935, and is a vital transportation hub for the region. The station, known as Newark Penn Station, is the meeting point for three NJT commuter rail lines (Raritan Valley, Northeast Corridor, and North Jersey Coast) as well as the Newark Light Rail and PATH system, which connects Newark with Harrison, Jersey City, and lower and midtown Manhattan. The station is also a major stopping point on the Amtrak system, and a point of convergence for many of NJT buses operating in the area. Amtrak owns the station, and NJT has a long-term lease. The station serves more than 27,000 NJT customers and nearly 23,000 PATH riders each day (NJ TRANSIT 2014b; Port Authority of New York and New Jersey 2015). Each year more than 670,000 Amtrak arrivals and departures occur at the station (Amtrak 2014).

The project focused on improving accessibility to the station, particularly to improve connections to Newark Penn Plaza West – the area that connects the station with Newark's downtown. Subsequent to implementation of the Newark Penn Plaza West improvements, other improvements have been made to Newark Penn Plaza East, and have extended into the surrounding area.

Newark Penn Plaza West grew out of the 2002 effort to improve area vehicular flow, and initially focused on traffic signaling. Both the City of Newark and former U.S. Senator Frank L. Lautenberg were key stakeholders in the project, with the latter helping to secure project funding. At that time, the City of Newark had begun a process of implementing an adaptive signaling project, whereby the traffic signals are timed based on factors including traffic flow. The city intended to include the Penn Station Plaza West area signals as part of this effort. In considering the project, NJT determined that it provided an opportunity to improve the pedestrian environment and flow around the station, not only the vehicular environment. Improving the aesthetics in the Newark Penn Plaza West station area was also a goal of the project, as the city is committed to overall community beautification.

The physical completion of the project occurred in October 2013. Construction costs for the project were $8 million, and included improvements to both Newark Penn Plaza West and Newark Penn Plaza East (NJ TRANSIT 2014a). Project funding was a mix of federal and state sources.

Community Characteristics

Located less than ten miles from New York City, Newark serves as a significant transportation hub for the region. In addition to passenger transportation, detailed earlier, the city is home to one of the nation's busiest airports and to the third largest port in the U.S., Port Newark-Elizabeth. The city is a regional employment center; more than 50 major companies maintain operations in the city including Prudential Financial, Panasonic Corporation of North America, Public Service Enterprise Group, Verizon, Horizon Blue Cross Blue Shield, and Audibile.com.

Institutions of higher learning also have a strong presence in the city. Newark is home to several universities and colleges, including the New Jersey Institute of Technology, Rutgers, the State University of New Jersey at Newark, Essex County College, and the Seton Hall School of Law. More than 37,000 students attend school in the city.

Redevelopment efforts in the urban center, long nascent, have taken hold over the last decade. Recent additions to Newark include the Prudential Center (2007), Panasonic headquarters (2014), Prudential headquarters (2015), and the Teachers' Village, a mixed-use educational, commercial, and residential project (to be completed in 2016).

Despite its role as an employment and educational center, and its recent redevelopment efforts, Newark is still addressing long-term urban blight and neglect. Many of Newark's 280,000 residents live in poverty – nearly 30 percent of the city's residents live below the poverty level according to the U.S. Census.

Public transportation usage is high among city residents – 27 percent of residents report traveling by public transportation for their trip to work (U.S. Census 2014). Three-quarters of these commute by bus. Eight percent of city residents walk to work.

To support its residents and to buttress its redevelopment goals, in recent year the city has renewed its efforts to improve its pedestrian and bicycle infrastructure. Newark adopted a Complete Streets policy in 2012.

Prior Conditions

The Newark Plaza West area is a main entrance for many travelers seeking to access and depart Penn Station on foot, as well as a major pick-up and drop-off point for those arriving/departing by taxis, private automobiles, and NJT and private carrier buses. The area is typically very crowded with both pedestrian and vehicular traffic.

Prior to the improvements, the pedestrian and vehicle flow through the area was often chaotic. Increasing vitality in the downtown has meant more frequent use of the plaza as city residents, members of its workforce, and increasingly visitors travel through this "crossroads" to Newark's business, shopping, and entertainment districts.

Planning Process

As with many major rehabilitation efforts, the process leading to the Newark Penn Plaza West pedestrian improvements took more than a decade. NJT led the planning effort. Interest among the stakeholders remained strong throughout the period, due in good measure to the importance of the project's location, the Plaza's proximity to Newark's downtown, and the desire to improve accessibility between the station and many of the city's key destinations, including the Prudential Center, a multi-purpose indoor arena, hosting approximately 200 events per year.

The agency received feedback on the project's goals and design through its ADA Task Force. The NJT ADA Task force comprises individuals with disabilities and representatives of organizations that support the disability community and it assists the agency in the implementation of its ADA improvements plan. Additional public outreach was not conducted for this project, primarily due to its location in a business district.

Project Scope

The scope of the improvements – on the west side of Newark Penn Station, on Alling Street and, on Raymond Plaza West – includes:

- Roadway and pedestrian improvements, including traffic signals with pedestrian crossing signals, curb ramps and crosswalks at intersections of Raymond Plaza West / Market Street / Alling Street;

- Roadway improvements on Alling Street, including signage, lighting, drainage, curbing, pavement striping and a Taxi queuing and pick-up area with textured pavement;

- Pedestrian improvements on Alling Street, including sidewalk surfaces, curb ramps and crosswalks;
- Market Street Plaza improvements, including new walking surfaces, lighting, and plantings;
- A variable message sign on Raymond Plaza West at the pick-up / drop-off area;
- Loiterer Guards (to prevent pedestrians from sitting upon, or putting luggage on, the Station Window Ledges); and
- Arts in Transit (NJ TRANSIT 2014a).

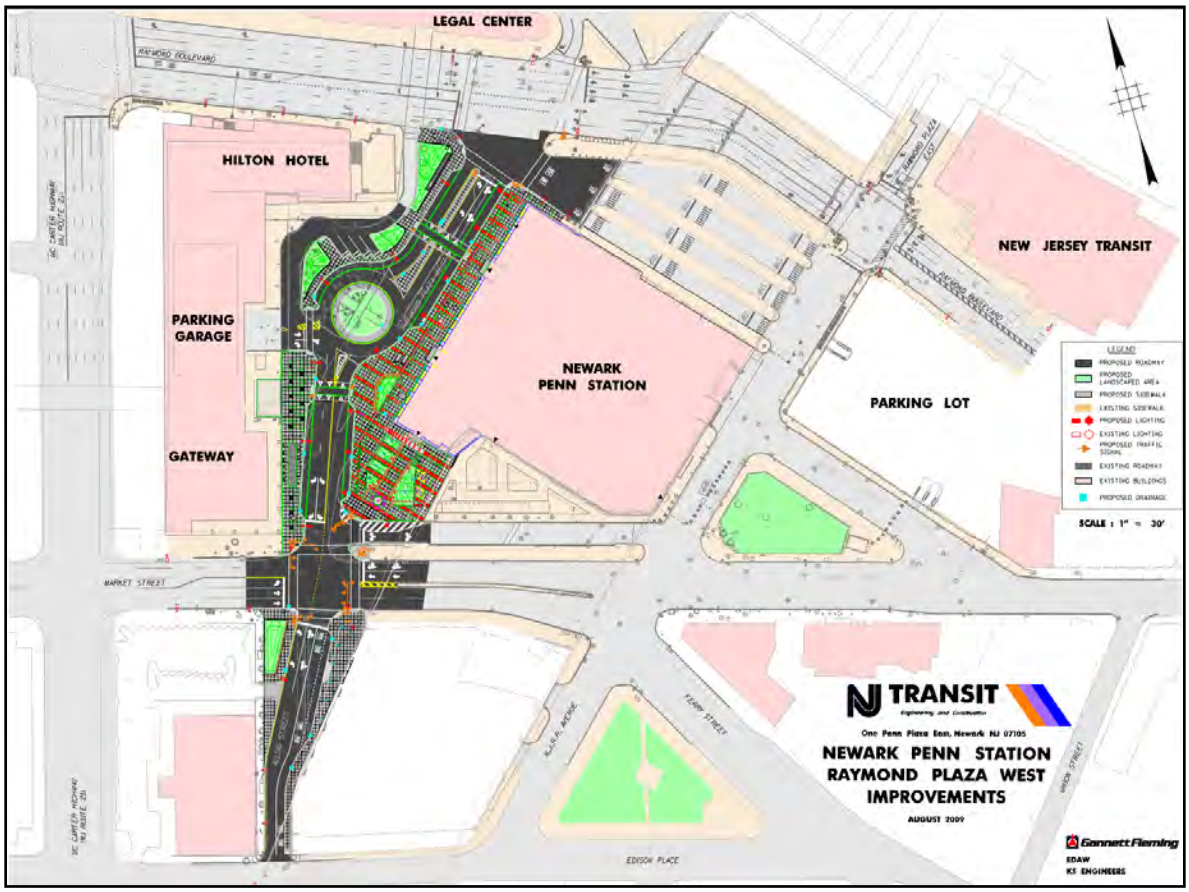


Figure 24. Newark Penn Station Plaza West Improvements

Working with Partners

Given the long planning and construction process, it was essential to maintain support for the project among stakeholders. All were uniformly positive, and remained engaged despite the challenges presented, as many had a “stake” in its ultimate success. In addition to NJT and the City of Newark, key stakeholders included private transport carriers (e.g., taxis, Greyhound Bus Company) and Amtrak, which owns the Newark Penn Station facility (NJT is the long-term leaseholder of the station). Other stakeholders included The Port

Authority of New York & New Jersey, the Federal Transit Administration (as a funder), and NJT and local police. Collaboration with the NJT and local police was critical, as their approval was needed to address security concerns regarding planned patron flow patterns in the Plaza area.

Another stakeholder was the NJT Transit Arts Program, the aim of which is to integrate art into transit facility designs, enhance the aesthetics of public space, and improve the customer experience. At Plaza West, public art enhancements take the form of 33 stainless steel globe representations on bollards, meant to symbolize time and the cycle of day into night.

Figure 25. Public Art in the Form of Bollards that Represent the Cycle of Day into Night, Newark Penn Station, Newark, NJ

Challenges

NJT and the project partners faced several challenges while planning and making improvements to Plaza West. The site location and activity level made phasing of the project particularly sensitive. The western entrance to Newark Penn Station receives heavy pedestrian and motor vehicle traffic throughout the day. Work at this location required a phased approach to limit areas made inaccessible during the construction process. Additionally, much of the work occurred overnight and during non-peak mid-afternoon hours.

At the request of the City of Newark, NJT also incorporated adaptive signal control technology into the project's design and construction. Adaptive signal control adjusts timing to accommodate traffic patterns, and was used to improve vehicular flow through the busy station area. This was the first instance in which NJT implemented the use of such technology. For this reason, the agency sought out assistance from the local power company, PSEG, and coordinated between the power company, the city, and its own contractors to integrate the technology into existing infrastructure.

New Brunswick

New Brunswick Station is located on the Northeast Corridor in Middlesex County, New Jersey. The city is home to several major employers, principally Johnson & Johnson, Robert Wood Johnson University Hospital, and Rutgers University. Located in a community with a focus on education and medicine, the station serves a large population of students, workers, and hospital patrons who use public transit as their primary means of transportation. More than 5,000 riders board trains at the New Brunswick Station each weekday. The station is also a point of convergence for multiple bus providers, taxis, and commuters using park and ride facilities, as well as pedestrians and bicyclists. Area bus providers include NJT, Middlesex County Area Transit (MCAT) and Somerset County Transit (local deviated fixed-route paratransit systems), and the Rutgers bus system, the largest university-operated transit system in the nation. A burgeoning transit-oriented development hub and one of 32 designated Transit Villages in the state, New Brunswick is in a period of transition – with new housing, office, and commercial space spurring an improved pedestrian environment in its downtown.

Conditions coalesced to bring forth a comprehensive accessibility improvement effort focused on the station. The local community development corporation, DEVCO, had started to move forward on a longstanding plan to build a large mixed-use structure adjacent to the New Brunswick Station, known as the Gateway. NJT was seeking to improve access to the station, having identified several shortcomings, including poorly situated and inadequate elevator facilities. Other partners included the City of New Brunswick, which was looking to improve pedestrian conditions throughout the downtown and also – through its Parking Authority – was working with DEVCO on the Gateway project; and Rutgers University, which was to be a major tenant in the Gateway and a significant landowner of adjacent property.

The coincidence of needs among the project partners was propelled forward once financing was identified, particularly funding for the station improvements. NJT utilized funds from the larger Liberty Corridor project, a set of transportation improvements funded by federal dollars and designed to enhance connections – including feeders – to Newark Liberty Airport. Original plans called for an extension of the platforms to allow for a platform-level connection to a proposed medical education building. Desire to enhance ADA access to the inbound-side of the station, including the area sidewalks, arose out of internal discussion. Stakeholder desire to make changes to the outbound-side of the station provided an opportunity to coordinate projects and create a more holistic approach to ADA accessibility for the station's users.

The coming together of the stakeholders allowed for an alliance of purpose and mutual need, and provided an opportunity for NJT to work with the local development corporation and other stakeholders and create a holistic solution for ADA access to the station – as well as extending the area of improvements far beyond those that could otherwise be scoped. Physical completion of the $3 million project occurred in 2012 (NJ TRANSIT).

Community Characteristics

In the 1970s and 80s, New Brunswick experienced a period of disinvestment, and became less desirable as a place to live. City officials, local business leaders, and the university leaders came together to address these concerns. One outgrowth of this effort was the formation of the New Brunswick Development Corporation or DEVCO, a private nonprofit development corporation. DEVCO has been instrumental in many redevelopment efforts throughout the New Brunswick downtown, including the Gateway Transit Village project.

Poverty rates are high in the city, with nearly 35 percent of residents living below the poverty level. The city has a large immigrant population, with 39 percent of residents foreign-born. More than 56 percent of residents identify as Hispanic or Latino (U.S. Census 2014).

Comparatively few city residents travel by car to work. Only 39 percent of New Brunswick residents drive alone to work, and 16 percent as part of a carpool. (Nationally 76 percent of commuters drive alone to work and 10 percent in a carpool.) Nearly 11 percent of residents travel by public transportation, 14 percent walk, and nearly 20 percent travel by other means including taxi and bicycle (U.S. Census 2014).

Prior Conditions

As a high-use station, New Brunswick Station was made ADA-compliant in the 1990s with the installation of two elevators to reach the elevated track: one to access inbound trains traveling to Newark Penn Station and New York Penn Station, and one for outbound trains traveling to the Trenton Transit Center. Placement and operations of the elevator connecting to the inbound trains was suboptimal, as it was inconvenient and unpleasant – located near the taxi queue and a vehicle entrance to a parking garage. The outbound elevator was placed at the opposite end of the platform from the station shelter, though close to stairs that connected the platform to the street.

Placement of these facilities made oversight and maintenance difficult, and both elevators were subject to frequent misuse, breakdowns, and vandalism.

**Figure 26. (Left) Old Inbound Elevator;
(Right) New Inbound Elevator, New Brunswick Station, New Brunswick, NJ**

**Figure 27. (Left) Outbound Elevator/Stairs;
(Right) Ramp Connecting Somerset Street to Outbound Platform (Elevators are Located to the Right), New Brunswick Station, New Brunswick, NJ**

Planning Process

Ideas about revisiting ADA improvements at the New Brunswick station arose among NJT staff in the early 2000s. At that time, the agency collaborated with the National Transit Institute on a “destinations as places” workshop that used New Brunswick as its setting.

NJT staff working on ADA issues critiqued the area and station access. An outcome of this discussion resulted in the concept for an additional inbound elevator at the front of the historic station, as this location would be more convenient to travelers, including persons with disabilities, and less prone to vandalism and malicious mischief. This idea remained in consideration among others in the NJT work plan, and was put forward when federal funding became available in 2009.

Working with Partners

Support for this project among stakeholders was positive, as many desired the ultimate success of the work on both sides of the station.

Understanding the parts of the work that would be governed by NJT versus DEVCO required considerable coordination. NJT provided oversight on the planning for and construction of improvements that lay within NJT facilities, or that would serve NJT patrons, including elevators that are fully housed within the DEVCO building and are operated by the New Brunswick Parking Authority. DEVCO came to rely upon the agency for its expertise with ADA improvements, and for facilitating the integration of offsite improvements with the public transportation facilities.

This collaboration resulted in a shared work program, with NJT responsible for:

- A new ADA-accessible elevator that connected the street-level, station first floor, and inbound station platform (no access to the first floor had existed previously);
- Extensive regrading and sidewalk improvements to the landing area and plaza that connect to elevator and ticket machines, and extends from NJT/Amtrak property to city-owned property and the street;
- An additional stair riser and tread added to inbound and outbound stairs, and extension of railings;
- The regrading and replacement of sidewalk under an adjacent rail tunnel. The sidewalk was extended to the street edge, and an ADA ramp was added on City of New Brunswick property;
- Preparation of the outbound platform for connection to DEVCO improvements; and
- Review of DEVCO design specifications, inspection of DEVCO improvements, coordination of DEVCO improvement to meet NJT standards, and inspection of onsite conditions (i.e., elevation of the ramp).

Project partner DEVCO implemented improvements that resulted in:

- Sidewalks and ADA ramps adjacent to its building site, and the block on which the site is situated (Easton Avenue, Somerset Street, and Wall Street);

- The ramp connecting Somerset Street, the Gateway project, and the outbound platform; and

- The elevators that serve the parking garage, but are open for public use and connect the street and the outbound platform.

The resulting ramp serves as a pedestrian bridge between New Brunswick Station and the new Gateway project, and provides a link to Rutgers University's College Avenue Campus. A written agreement between NJT and project partners DEVCO and the New Brunswick Parking Authority was executed prior to construction; it specifies that non-agency elevators will be in operation throughout the NJT rail-service day.

Challenges

One of the most challenging aspects of this project was coming to agreement about the aspects of the work that would be governed by NJT versus those that would be under DEVCO's control. Achieving a level of trust between the partners and a highly-integrated working arrangement allowed each to operate from a position of expertise and to satisfy respective and mutual goals.

As with the Newark Penn Plaza West project, coordination and the need to address the confounding conditions found in the field required the agency to consider design and construction details carefully. The agency employed quality assurance procedures to evaluate design specifications and to inspect construction in progress, to assure that built improvements met ADA and NJT's exacting specifications. To meet NJT's standards, the need for adjustments and corrections did occur, and sometimes required the wholesale demolition and recreation of recently completed work that failed to meet project requirements. For example, work initially resulted in ramps that did not meet NJT's slope standards, a situation that was rectified.

Agency Initiatives

Mobility Management

NJT recognizes the need and benefit in taking a holistic approach to achieve true system accessibility. They include an accessibility module in operator trainings across modes. The agency also operates an ADA-complementary paratransit service called Access Link, for individuals who are unable to use local bus service as a result of their disabilities. Access Link mirrors local bus routes (in terms of days and hours of operation) and provides curb to curb, shared-ride service to eligible riders. Access Link service is limited to origins and destinations that are in a 3/4 mile radius of the fixed route local bus service.

NJT also partners with all 21 New Jersey counties to fund local public transportation programs, and to provide other support and guidance to assist these programs to operate effectively. These programs have played an increasingly significant role in providing community-based transportation in the state since the 1980s, serving people with disabilities, the elderly, those with low income, veterans, and the general public.

A key path to increasing awareness, familiarity, and increased usage of public transit services among persons with disabilities lies through travel training/instruction. The main intent of travel instruction is to facilitate access to desired and needed sites – such as employment, education, medical providers, daily living, and recreational/social destinations – by teaching students how to safely and independently utilize public transit services. Since 2005, NJT has supported travel instruction for persons with disabilities through a partnership with the NJ Travel Independence Program (NJTIP). In 2012, NJTIP joined Rutgers, and is now known as NJTIP @ Rutgers. By the end of 2015, NJTIP had successfully trained more than 300 persons through its one-on-one travel training program.

Accessibility planning is undertaken at the onset of all capital projects. Maximizing accessibility remains a focus throughout the design – and, importantly, the build – periods of capital projects. Interviewees explained that stopping accessibility improvements at the agency's property line often limits opportunities for all persons to access the transit system.

NJT staff recognized that their efforts at improving ADA accessibility are not always successful. An example shared is illustrative, and demonstrates the challenges to making accessibility improvements that extend beyond agency property. Specifically, as part of earlier station improvements, NJT worked with a local government to improve the curb ramps that led to a station. However, a short time after the project was completed, the municipality implemented a plan to improve all curb ramps, and reconstructed the curb ramps NJT had recently erected. Unfortunately, the municipality did not make the ramps compliant to NJT's standards. This situation highlights the need for ongoing communication between the agency and each municipality about maintenance of improvements.

Evaluation, Key Challenges, and Lessons

The agency strives to implement improvements that are beyond what is required by law. It has taken a creative approach to identifying, evaluating, and adopting strategies and materials to improve accessibility to and at their stations and stops. The agency has partnered with community-based organizations to evaluate and field-test applications and materials designed to improve accessibility. Through a partnership with the Heightened Independence and Progress (HIP) Independent Living Center, the agency tested the use of guide strips positioned at an angle to assess if these strips were detectable to persons using certain mobility devices, such as canes or walkers. This low-cost test demonstrated that the strips did not consistently serve as a boundary or "shoreline" for users with canes/walkers.

Similarly, the agency tested raised rumble strips to determine if they offered detectable warnings for pedestrians at each bus lane at the Hoboken bus terminal site. The strips did not function as intended, as they were quickly destroyed due to the amount of foot and vehicle traffic in the locale.

Experience with construction has led the agency to adopt standards that exceed ADA requirements. For example, the agency has adopted a 1:14 slope ratio for its Station Standards Manual. This standard is used for all of its projects rather than the ADA requirement of 1:12 slope. Use of this more restrictive specification arose out of recognition that even with careful oversight by the agency during the design and construction process, ramps rarely were built to meet the specific warrants of the ADA.

Implementation of accessibility improvements requires long-term commitment on the part of the agency; a high level of skill among staff; a strong planning process involving multiple stakeholders including several departments within the transit agency, municipal, county, and often, state-level government representatives; and collaboration with private landowners. Good working relationships with construction contractors, built over time, contribute to the success of projects, as the necessary work is often technically exacting and requires high-level skills.

Thinking about projects in a collaborative manner from a planning and design perspective as well as from a financing perspective allowed for the projects in both Newark and New Brunswick to succeed.

In Newark, collaboration with the city and other project partners was essential to making improvements that better allow riders with and without disabilities to access the station. Improvements to the intersections and sidewalks beyond the station property greatly helped to improve access throughout the area.

In New Brunswick, opportunities to collaborate with the local development corporation and the city resulted in 1) a pathway to the station that met ADA requirements seamlessly and is integrated into the urban fabric; 2) an additional elevator connecting to parking facilities, the station, and to the station platform; and 3) ramp, sidewalk, and other safety and accessibility improvements on NJT property, on city property, and on privately-owned property. Collaboration between NJT, DEVCO, the city of New Brunswick, and other partners resulted in changes in the project's design, extension of ADA improvements beyond NJT property, and oversight by NJT during the planning, design, and construction processes that allowed for better integration and execution of the accessibility improvements.

The NJT team observed that design often provides a means to resolve long-standing accessibility issues, and working closely with the contracted design professionals was necessary to achieve these goals. This proved to be the case in both the Newark and New Brunswick projects.

For the Newark project, initial construction drawings provided three curb ramp details to satisfy conditions across the site. Close review of site demands and design plans by NJT personnel and collaboration between NJT staff and project designers ultimately resulted in a total of 30 such details. The planning of one ramp was particularly inventive: Due to restrictions in width and its placement as a meeting place for three pathways, it was not possible to specify ramps leading to a level landing in a single location. The eventual solution called for an on-grade cut-through connecting two of the pathways and the recessing of a NJT-specification-compliant ramp to the third pathway.

Figure 28. Grade Cut-Through Provides a Design Solution Where Three Pathways Meet. Newark Penn Station, Newark, NJ

In New Brunswick, design innovations abound as the project incorporated a landscape feature, a change in topography to create an accessible ramp to the station. Other design solutions of note include specification of an elevator with access from two directions. Passengers turn 90 degrees from the ground floor entrance to exit at the station's first floor or second floor platform.

Both projects and other work undertaken by NJT to improve accessible pathways to transit facilities offer the following lessons:

- Civil Rights representative(s) within transit agencies should be involved in pathway improvements and other projects from inception and initial scoping to help ensure ADA compliance.

- ADA enforcement from within the transit agency for projects and improvements is critical, as the agency must not assume project public and/or private partners are committed to ADA compliance or understand its complexities.

- Transit agencies must consider not only ADA compliance factors related to any improvement, but the actual usability of the improvement. In other words, can a customer with a disability truly get from Point A to Point B safely?

- Informing partners in the disability community about system accessibility should be and is a NJT priority. For example, the agency gave over 20 Orientation and Mobility (O&M) instructors who serve people with visual impairments on-site tours of select NJT stations to demonstrate accessible features, and to discuss how these stations can best serve customers with disabilities.

- Working closely with external partners requires a high level of commitment and benefits from ample time, sufficient patience, and a little tact. Despite the added complexity that comes with bringing in external partners, these kinds of collaborations can allow an agency to undertake much more extensive improvements, and to stretch its limited resources over a much greater area. This can result in a more profound impact on improving pathways to transit facilities.

- Agencies need to plan for conditions after the project is complete, and careful consideration must be taken to assure ongoing cooperation will exist between external partners providing facilities and the agency.

- Quality Assurance (QA) is essential to the successful implementation of any accessibility project, and is required during both the design and construction processes. NJT conducts checks at multiple milestones during the design process as well as during the construction phase. Following completion of project schematics, the QA process begins. Design documents are shared among agency personnel and with project partners at several stages – when 30 percent, 60 percent and 90 percent complete. To ensure that construction details are correctly implemented, a high degree of agency field observation is required. Adjustments and corrections often need to happen, sometimes including the demolition and recreation of recently completed work that failed to meet standards. Interviewees explained that sometimes construction managers do not have the needed knowledge to make the correct decisions in the field to improvements that impact ADA accessibility. One interviewee explained that the construction professionals need to understand that even a "one-inch differential can sometimes render an improvement unusable by a person with a disability."

- Projects benefit from a degree of skepticism throughout the process. Designers need to ask themselves if the design will actually work, especially when applying a "standard" detail to a particular location. Construction managers need to question whether the work as constructed fulfills needs of consumers of all abilities to reach their destination with ease. All team members must work to understand the needs of their consumers, and use that knowledge to inform all stages of the process.

- Transit agencies should push the scope and the budget to its limits, and try to create the longest accessible pathway they can. Agencies should also engage project partners – local jurisdictions in which agencies operate, as well as private landowners – to extend the impact of improvements at the transit facility.

- Transit agencies should take on an educational role and provide guidance to project partners on the nuances of the ADA requirements, and how to achieve these in the built environment to best serve persons with disabilities.

PORTLAND, OREGON

Introduction

Tri-County Metropolitan Transportation District of Oregon (TriMet) is the mass transit public agency that operates in the region spanning most of the Portland metropolitan area. Among the country's leading transportation agencies, TriMet ranks 7th in transit ridership, despite Portland being the 24th most populated city in the United States. TriMet's successes include its strategic efforts and programming that are designed to serve the needs of the elderly and users with disabilities. A site visit allowed researchers to document the system's characteristics and gain detailed information on TriMet's accessibility projects and initiatives.

Community Characteristics

Created in 1969 by the Oregon legislature, TriMet replaced five private bus companies that operated in the counties of Multnomah, Washington, and Clackamas. Today, the agency serves an expansive 532-square-mile area with a population of 1.5 million. Table 6 describes past and projected population growth for the three counties and statewide from 2000 to 2030. Multnomah County, which includes Portland, is the most populous. However, Clackamas County and Washington County are expected to experience higher population growth.

Table 6. Tri-County and Regional Area Total Population

Geographic Boundary	2000	2010	2030	% Change 2000-2010	% Change 2000-2030
Clackamas County	338,391	375,992	536,123	11%	58%
Multnomah County	660,486	735,334	800,565	11%	21%
Washington County	445,342	529,710	788,162	19%	77%
Tri-County Area	1,444,219	1,641,036	2,124,850	14%	47%
Oregon	3,421,399	3,831,074	4,626,015	12%	35%

Source: U.S. Census, SF1 (2000, 2010); 2012 Coordinated Transportation Plan for Elderly and Disabled, TriMet.

The elderly constitute a significant and growing population – in the region, and the state. According to 2010 census data, 11 percent of the Tri-County Area population is 65 years of age or older. While this is slightly below the state and national average of 13 percent, tremendous growth is observed in the 2030 projection; it is expected that the elderly population will experience a 97 percent change. The most drastic growth in the elderly population is expected to occur within Washington County, where the change is projected to be around 123 percent (see Table 7).

Table 7. Tri-County and Regional Area Elderly (65+) Population

Geographic Boundary	65 or older (2010)		65 or older (2030)		% change 2010-2030
	number	percent	number	percent	
Clackamas County	51,231	14%	94,945	18%	85%
Multnomah County	77,423	11%	143,992	18%	86%
Washington County	53,109	10%	118,607	15%	123%
Tri-County Area	181,763	11%	357,544	17%	97%
Oregon	438,177	13%	950,922	19%	117%

Source: U.S. Census, SF1 (2000, 2010); 2012 Coordinated Transportation Plan for Elderly and Disabled, TriMet.

Table 8 documents the population with disabilities within TriMet's service area, as well as the entire state of Oregon. Similar to the figures describing the elderly population, it is estimated that people with disabilities also make up about 11 percent of the entire Tri-County area population. This is slightly below the state percentage of 13 percent.

Table 8. Tri-County and Regional Area Population with Disabilities

Geographic Boundary	Population with Disabilities	
	number	percent
Clackamas County	42,224	11%
Multnomah County	82,350	11%
Washington County	48,928	9%
Tri-County Area	173,502	11%
Oregon	505,869	13%

Source: 2010 ACS 3 year estimate; 2012 Coordinated Transportation Plan for Elderly and Disabled, TriMet.

Transit Service

While TriMet's transportation system began with the bus, over the years it has evolved to encompass a wide system of services – including the MAX light rail system, WES commuter rail, and LIFT paratransit. Additionally, TriMet also operates the City of Portland-owned Portland Streetcar system. Combined, these services provide a complete and convenient transit system that connects residents and visitors with the community. TriMet buses serve much of the Portland metro area, and include bus lines that connect with MAX, WES, and the Portland Streetcar. Currently, TriMet operates around 600 buses running along 79 bus lines, with a total of 6,742 bus stops. Ridership for FY2013 was reported to be nearly 60 million trips. Additionally, TriMet's MAX light rail system connects the Downtown Portland area to the surrounding communities of Beaverton, Clackamas, Gresham, Hillsboro, and to the Portland International Airport. The MAX light rail system includes 4 lines and 87 stations; FY2013 ridership was around 39 million trips. The newer WES commuter rail system (opened in 2009) travels on existing freight tracks to provide the cities of Beaverton, Tigard, Tualatin, and Wilsonville with weekday rush-hour service; it has five stations. Ridership for FY2013 was 440,000 trips. Lastly, TriMet's LIFT paratransit service provides an alternative to users with disabilities who are unable to ride regular buses or transit. There are 253 LIFT buses and 15 LIFT vans in TriMet's fleet; paratransit

ridership for the 2013 fiscal year was estimated to be around 1 million trips. Table 9 and Table 10 give a summary of TriMet's transportation system characteristics and fares (TriMet 2014b).

Table 9. Summary of TriMet's Transportation System

Service	Vehicles / lines	Stops / stations	FY13 Ridership (trips)
Buses	79 bus lines 12 frequent service bus	6,742 stops	59,600,000
MAX Light Rail	4 MAX lines 52 miles of track	87 stations	39,100,000
Wes Commuter Rail	3 diesel multiple units (DMUs) 14.7 miles of track	5 stations	440,000
LIFT Paratransit Service	253 LIFT buses 15 LIFT vans	Not applicable	1,000,000

Source: 2014 "TriMet At-a-Glance."

Table 10. TriMet Fares Breakdown

	2-Hour Ticket	1-Day Pass	
Adult	$2.50	$5.00	Fares are Valid for travel on any combination of buses, MAX Light Rail, WES Commuter Rail, & Portland Street Car.
Honored Citizen	$1.00	$2.00	
Youth	$1.65	$3.30	
LIFT	$2.45	–	

Source: 2014 "TriMet At-a-Glance."

Mobility Management Strategies for People with Disabilities

Accessibility features are fully integrated within the TriMet transportation system, cater to a wide variety of user needs, and are designed to create safety and convenience for *all* users. For those with limited mobility, all buses, trains, transit centers, and stations are fully accessible to people using mobility devices. For those who are blind or have low vision, accommodations such as texturized tiles along platform edges exist along all MAX and WES stations, along with braille/raised-letter signage on most transit stops. Both systems are also equipped with automatic audio announcements of stops. For the deaf or hard of hearing, digital displays with real-time arrival information can be found on a number of bus stops and transit stations; there are reader boards with route information in most trains and buses, and light-up displays inside nearly all modes of public transit indicate when a stop has been requested (TriMet 2014a). To further encourage seniors and people with disabilities to use transit, TriMet has an "Honored Citizen" reduced rate for seniors age 65 or older, people on Medicare, and people with a mental or physical disability (TriMet 2014b).

Figure 29. TriMet's Accessibility Feature Examples – Digital Displays and Texturized Tiles

Source: Carla Salehian.

While many of these features have now become standard practice for transit agencies, a feature more unique to TriMet is that of its Travel Training system. Created in partnership with RideConnection, a non-profit community service operation, travel training allows seniors and people with disabilities the opportunity to learn how to use public transportation to travel independently. Qualified users can participate in either group or one-on-one travel training provided by a qualified travel instructor at no charge. For those who are still unable to utilize fixed-route transit, TriMet also provides its LIFT paratransit service and neighborhood shuttles, along with medical transportation for low-income Oregon Health Plan Plus[1] members who need rides to medical appointments and have no other transportation options available (Medical Transportation Management 2013).

Projects and Initiatives

In addition to TriMet's array of accessibility features and mobility management systems designed to accommodate users while *riding* transit, the agency takes a holistic approach to accessibility, and has created a series of projects and initiatives that enhance walkability and access *to* the transit stations. Particularly relevant are the agency's Coordinated Transportation Plan for the Elderly and Disabled, Pedestrian Network Analysis project, and Bus Stop Improvement program. All three initiatives address infrastructural barriers that may pose obstacles to using transit for riders with disabilities.

Coordinated Transportation Plan for the Elderly and Disabled

TriMet's vision for improving accessibility was advanced through its Coordinated Transportation Plan for the Elderly and Disabled (CTP), which was designed to accomplish several goals including: 1) guiding transportation investments toward providing a full range of options for the elderly and people with disabilities; 2) fostering independent and productive lives; 3) strengthening community connections; and 4) striving for continual improvement of services through coordination, innovation, and community involvement. Created in 2006, the document anticipates growing demand for accessible transit. The 2012 update was a result of meetings between transportation providers and sponsors (including the Special Transportation Fund Advisory Committee, the County Aging and

Disability agencies, and TriMet) to assess additional population needs. Participants were asked to confirm whether a preliminary list of potential transportation needs was accurate, whether there were additional needs that had to be addressed, and to indicate which of the issues were the most urgent. Common infrastructural issues addressed included gaps in sidewalks, difficult crosswalks, security and lighting issues, and a lack of seats or shelters at bus stops (TriMet 2012a).

During the meetings, concerns were raised over the need for improvements in the paths of travel leading to bus stops or rail stations, especially in the lower-income suburban areas surrounding downtown Portland. In response to these infrastructural concerns, the CTP set forth the following strategic initiatives:

- Encouraging the use of fixed-route transit: Strategies included the implementation of trip screening and path-of-travel review (during the Travel Training ADA para-transit eligibility process), bus stop improvements, paratransit feeder services (for customers who were able to use fixed-route transit, but had difficulty accessing the nearest bus stops), and route deviation (only after pre-scheduled requests).

- Enhancing pedestrian access: The CTP encouraged jurisdictions within the tri-county area to make communities more pedestrian-friendly for the elderly and persons with disabilities. Additionally, it set forth actions that could be taken to address safety and security concerns at transit facilities, including improved lighting/visibility, improved communications with transit security personnel, and provision of public information on transit and security.

To further promote a wholly accessible and efficient system, the CTP also addressed other common barriers to accessing transit, by proposing to:

- Promote coordination among service providers. This included detailed measures that addressed everything from coordinating with private sector transportation services and non-profit organizations/medical facilities to making use of online reservation services, thereby establishing open and transparent networks to allow for coordination.

- Improve information and referral/program outreach. TriMet understands that advertising its accessibility options to the public is as important as developing them. Consequently, the information and program outreach measures include information distribution strategies aimed at increasing outreach both to the public and to policymakers.

Overall, the CTP demonstrates TriMet's dedication to improving accessibility for the elderly and persons with disabilities. By clearly and effectively stating this commitment, it creates the framework of programs, projects, and strategies that all contribute to accessible transit (TriMet 2012a).

Pedestrian Network Analysis

While the CTP provides an overarching framework by which TriMet approaches accessibility issues, the Pedestrian Network Analysis project serves as an example of how TriMet uses data analysis to facilitate improvement. In this undertaking, TriMet and its regional partners worked to develop an objective and quantifiable model to prioritize places with the greatest *need* for infrastructure improvements and the greatest *potential effect,* based on existing usage. The project was intended to meet a variety of TriMet's CTP goals and objectives – including enhancing safety, increasing rider independence, and reducing the need for paratransit. At the time of the project's inception in 2012, a paratransit trip cost the agency around $29 per ride (TriMet 2012b).

Pedestrian Network Analysis allowed TriMet to identify 66 clusters of stops, encompassing roughly 600, as high need/high opportunity areas. Using this data, TriMet and its partners selected 10 focus areas to receive primary consideration. Table 11 lists each of these areas. Figure 30 demonstrates that the majority of the clusters are outside the downtown core in the peripheral counties.

Table 11. Pedestrian Network Analysis Project's Ten Focus Areas

	Jurisdiction	Transit Area
1	City of Beaverton	SW Farmington Rd. & SW Murray Blvd.
2	Clackamas County	Clackamas Town Center Transit Center
3	City of Gresham	SE Division St. & SE 182nd Ave.
4	City of Hillsboro	Tanasbourne Town Center
5	City of Oregon City	Clackamas County Red Solis Campus
6	City of Portland	SE Division St. & SE 122nd Ave.
7	City of Portland	SE Powel Blvd. & SE 82nd Ave.
8	City of Portland	Hillsdale
9	City of Tigard	Tigard Transit Center
10	Washington County	SW Beaverton-Hillsdale Hwy. & SW Scholls Ferry Rd.

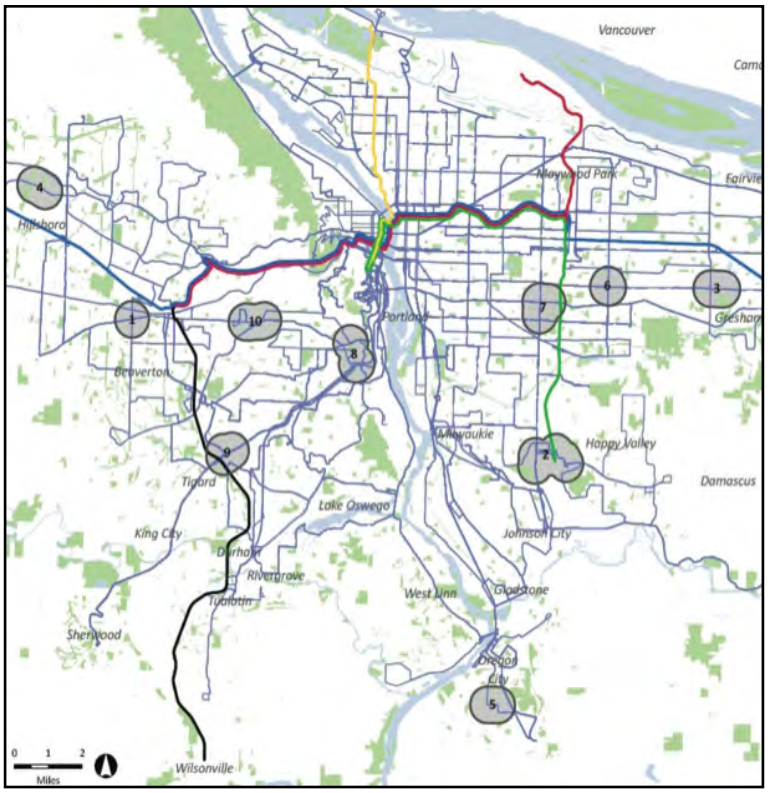


Figure 30. TriMet Pedestrian Network Analysis Project's Ten Focus Areas

Source: 2012 TriMet Pedestrian Network Analysis Project Overview.

Bus Stop Improvement Program

To advance the broad goals and objectives established in the transportation plan, TriMet adopted a Bus Stop Improvement Program, which implements infrastructural and design improvements at the ground level. TriMet begins all bus stop projects, whether a new bus stop or refurbishment of an existing stop, by consulting its Bus Stop Design Guidelines. Last updated in 2010, this document identifies the elements within TriMet bus stops, sets guidelines for the design of stops and placement of associated amenities, and describes the process for managing and developing bus stops. The document illustrates the strong emphasis the agency places on bus stop access and infrastructure.

TriMet has had success in improving the physical conditions of a large number of bus stops. Capital improvements initiated as a result of the Bus Stop Improvement Program include:

- On-street transit facilities development. Focusing on improving pedestrian safety, TriMet improved infrastructural conditions at ten sites (as of July of 2012), integrating sidewalk and bus stop ADA improvements.

- Bus shelter expansion. Initiated in 2000 with the primary goal of improving patron comfort at bus stops that lacked shelter, TriMet placed around 100 new bus shelters at its stops. It plans to continue the process until 500 new shelters have been placed.

- Security lighting at bus shelter and stops. Beginning in 2004, TriMet installed about 100 solar LED lights in bus shelters on TV Highway, Barbur Boulevard, and Powell Boulevard – and improved installations at 320 shelter sites and 30 bus stops in 2012.

- Bus stop sign and pole replacement with customer information displays. TriMet implemented this as part of a larger branding measure. The agency replaced its older bus stop signs and poles with two-sided bus stop signs and poles to distinguish bus stop identity and place, and to allow riders quick access to real-time arrivals by phone through TransitTracker.

Further accomplishments achieved by these measures are exemplified in its Line 57-Tualatin Valley (TV) Highway/Forest Grove Pedestrian Improvement Project, a project initiated in 2009 and designed to improve bus stop and pedestrian infrastructure along the transit corridor. The following section describes this project in detail.

Improvement Highlight:
Line 57-TV Highway/Forest Grove Pedestrian Improvement Project

The TV Highway feels much like any suburban commercial corridor in the U.S.: Two lanes run in either direction, lined with commercial land uses – auto dealerships, old strip shopping centers, large parking lots, and the like. The urban form is overwhelmingly automobile-oriented. Sidewalks are long, intersections are widely dispersed, and cars consistently travel at high speeds (the average posted speed limit is 40 mph). It is not an area that inspires pedestrian activity. Just beyond a block or two of the commercial land uses on either side of the highway, however, there are high-density residential areas largely populated by lower-income, transit-dependent populations, including a largely Hispanic component. This combination of pedestrian-unfriendliness and transit-dependent neighborhoods made the area a place of interest for TriMet.

Line 57 is located west of the City of Portland; it connects the suburban city of Beaverton to Forest Grove and then Hillsboro, and is consistently among the top ten busiest bus lines within the TriMet system: it averages 50,000 weekly rides. In 2008, this high ridership, paired with considerable need for infrastructural improvements (sidewalks, bus shelters, etc.), prompted TriMet to join with the Oregon Department of Transportation (ODOT) to develop the TV Highway Corridor Plan (TVCP).

TriMet secured a $700,000 grant through the ODOT to improve bus stop conditions and pedestrian access infrastructure along the TV Highway. In 2009 TriMet began the Line 57-TV Highway/Forest Grove Pedestrian Improvement Project, which led to $500,000 in infrastructural improvements at 17 bus stops and surrounding pathways. This resulted in increased pedestrian safety and comfort; the bus stops with improvements experienced increases in ADA ridership and decreases in paratransit demand.

Planning Process

This project reflects TriMet's holistic approach toward transportation issues, and fits within the agency's broad framework of programs and plans. The project fits within operating

strategies for the Bus Stop Improvement program, and is consistent with the agency's vision and strategic initiatives outlined in the Coordinated Transportation Plan for the Elderly and Disabled – including those that encourage the use of fixed-route transit and the enhancement of pedestrian access and walkability. A major contributor to the project's success was coordination with local jurisdictions, which allowed them to also take ownership of the project.

Teamwork was a defining feature. The TV Highway Pedestrian Access Work Group, a team of consultants and TriMet and ODOT representatives, began with an evaluation of infrastructure conditions and facilities along the corridor to identify and prioritize areas most in need of improvement. As described by staff (and evidenced in Figure 31) "the sidewalk connectivity here was dismal, at best. There were sidewalks that were poor in quality and were far too narrow or nonexistent" (personal communication, February 21, 2014). The team identified 43 highway crossings and 17 bus stops that ranked *poor* or *very poor* for safety or accessibility, and outlined measures that could be taken to improve physical conditions. These measures included adding amenities (shelters, seating, trash cans, lighting, digital displays, etc.), improving curb cuts and sidewalk conditions, and designing safer crosswalks.

Figure 31. SW Oak & 17th – Before (Left) and After (Right) for Line 57-TV Highway Improvement

Source: Young Park, TriMet.

Similarly, a teamwork approach was taken throughout the planning process and through the implementation phase. As the sole public transit provider in the tri-county area, the agency has established an efficient working relationship with the 26 jurisdictions that constitute its area of service. TriMet and local jurisdictions typically combine efforts to lead the planning process, with local jurisdictions planning the regional streetscape. TriMet usually takes command of site-specific project steps, such as the notification of adjacent businesses and homeowners, the determination of bus stop locations, and the form of physical improvement. TriMet attributes this role to its ability to leverage grant resources.

> "TriMet, in our case, is a little more unique than other systems that I know. In those systems, the local jurisdiction has complete ownership of the bus stop, leaving transit agencies at their mercy in terms of the permitting for everything including the bus stop sign pole, the shelter, or the design of the shelter. Here at TriMet, we are the one

> transit system in the region and our vision has always been that the bus stops are our responsibility. We are concerned for the whole process and our mission is to serve the community. Some jurisdictions might be threatened by this but for the most part all of the jurisdictions we serve are on board" (Park 2014).

Strong partnerships between TriMet and local municipalities enable timely approval of improvement projects. A well-functioning inter-governmental agreement system in place between Portland and TriMet allows the agency to accumulate proposals and designs for five to six locations before submission to the city for approval. After notifying businesses and other stakeholders of the proposed changes, the city itself provides manpower and manages the construction process. Agency staff indicated that the City of Portland has committed about 25 percent of its staff resources to TriMet-related projects. TriMet provides significant funding and serves as consultant and final inspector, which allows the agency to streamline the process and complete an improvement within three months rather than a year – the norm for many other transit agencies. This streamlined process also occurred during the TV Highway project. Because the latter was a larger project with over 16 bus stops, the initiative took TriMet a year to plan the work, commission the design, and get approval from the affected jurisdictions.

Stakeholders involved in bus stop improvement projects typically include local jurisdictions, local businesses, surrounding communities, neighborhood associations, bicycle coalitions, and TriMet's committee Citizens for Accessible Transportation (CAT). Established in 1985, CAT comprises 15 individuals who represent the elderly and people with disabilities. TriMet consults with this group regularly to discuss upcoming projects and receive feedback on issues to be addressed.

While CAT was very supportive of the TV Highway improvement project, it was not directly involved in the planning or implementation processes. Due to the project's large scope, TriMet opted to time the opening of the new improvements with other promotions and improvements on Line 57. TriMet fostered increased community support by upgrading Line 57 to a frequent service line with 15-minute headways on weekdays. In doing so, all public outreach and communication efforts (website announcement, public notices, etc.) described the project as a "complete package" upgrade.

Issues and Key Challenges

No agency is immune to challenges raised by NIMBYism. However, TriMet staff described pushback from neighbors as a common occurrence, most often occurring when the agency is establishing a brand new stop or routes in close vicinity to an individual's home or business. Despite this, the agency can find comfort in its high approval rating in the region. TriMet's 2013 "Attitude and Awareness Survey" reports that three-quarters of riders approve of the agency's work across the region, claiming – above other things – good service and good coverage (TriMet 2013).

> "I think everybody knows we are here to serve the community. It is part of our mission, if we need to place a stop in a certain place we are going to be pretty adamant that that happens. At the same time we are somewhat flexible to make sure that the stop is

not outside someone's front door, but regardless, we always try to do what's right on a bigger scale" (Park 2014).

Funding

As demonstrated in the nationwide survey conducted for this study, approximately 65 percent of survey participants indicated financial barriers as a significant obstacle to addressing infrastructural barriers to accessible transit. According to TCRP Report 163, the majority of the infrastructural improvements for the entire Line 57-TV Highway/Forest Grove Pedestrian Improvement Project were paid by using grant funds, totaling $512,167 ($417,415 in construction costs and $94,752 in shelter amenity costs). In the case of TriMet, the agency has been able to drastically reduce costs thanks to its aforementioned inter-governmental agreement with the City of Portland (Thatcher et al. 2013). With the City in control of construction, TriMet was able to reduce the man-hours required for permitting and for construction – compared to what would have been the case had the work been done by a contractor. As a result, the agency was able to cut project costs in half. For the TV Highway improvements, TriMet covered the costs of the concrete and other materials, while the City took responsibility for the labor. In another project, staff reported sidewalk construction costs totaling just under $4,000 for an improvement that would normally cost about $20,000.

As for maintenance costs, long-term sidewalk maintenance is the responsibility of the local jurisdiction, or sometimes a neighboring business owner. However, TriMet does make a pronounced effort to ensure proper construction initially, to provide a 10- to 20-year life span. TriMet is responsible for the maintenance of amenities and bus shelters and uses locally manufactured street furniture and recycling techniques to keep maintenance costs to no more than a few hundred dollars per year. For example, TriMet reuses damaged bus shelter glass panels. Each year about 750 panels are scratched and etched by vandals; the panels cost $200 apiece to replace. TriMet removes the vandalized glass, sandblasts it with an artist-designed pattern, and reinstalls it where needed (see Figure 32). Sandblasting removes the scratches and replaces them with aesthetically pleasing (and locally commissioned) artwork at less than $20 a panel, providing a financial benefit of approximately $100,000 per year.

Figure 32. TriMet's Bus Shelter Art

Source: Carla Salehian.

The agency receives funding from several sources, and may be less insecure financially than its peers. Figure 33 illustrates the breakdown of the agency's FY14 budget operating revenues and expenses, indicating payroll taxes as the major source of funding, and operation costs as the primary expense. Funding for projects to enhance services for the elderly and persons with disabilities, however, often comes from the State Special Transportation Fund (STF) program, and various grants. Regarding state funding, TriMet's Coordinated Transportation Plan for the Elderly and People with Disabilities (2012) states that the "TriMet STF area receives approximately $13.5 million in STF formula and discretionary funds a biennium" (TriMet 2012a). For the past five years, these funds have played an important role in supporting innovative services such as TriMet's Ride Connection/RideWise paratransit eligibility program.

Understanding the limitations of this flat resource, however, TriMet has actively sought out other sources of grant funding. Recently TriMet joined forces with various jurisdictions in applying for a series of grants. They were awarded three separate grants, for a total of approximately $6 million dedicated solely to physical improvements for the FY16-FY19 cycle. Agency staff attributes its success in surmounting financial challenges to its partnerships with local jurisdictions.

> "The reason why our agency is different is the time we save on our short construction. Funding is the least of my worries, especially when we can get surrounding jurisdictions involved. They already have the tools and the skills. When we are able to have them act as our contractors, then I can just put the plans together, transfer it over, and get twenty of these improvements built in the time it would normally take to build one" (Park 2014).

This, coupled with the agency's success in raising funds for their projects, has allowed it to improve project management and cut costs, enabling its success in making infrastructure improvements that improve access to transit for people with disabilities.

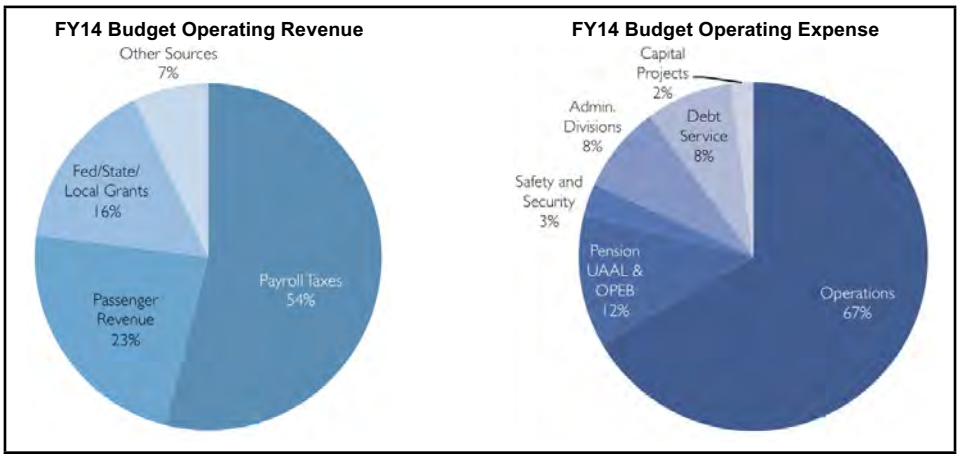


Figure 33. TriMet FY14 Budget Operating Revenue and Expense Breakdown

Source: 2014 "TriMet At-a-Glance."

Implementation

TriMet pays particular attention to technological and physical design innovations that result in unique transit stops. The agency recently adopted a practice of placing guards – two- to three-inch-thick pieces of plastic – at the curb or concrete edges of stops, to protect bus tires and sidewalks from damage. This practice results in savings on maintenance costs in the long run. TriMet redesigned its bus stop sign and poles in an octagon shape to improve brand identity and wayfinding through increased visibility, as the signs can be viewed at any angle. The agency adopted the use of Simme seats for use in locations with limited space so as to maintain ADA sidewalk width requirements. Locally produced in Eugene, OR, Simme seats provide two individual seats attached to the octagonal bus stop pole. This innovative arrangement allows bus stop designers to position the seat to fit in difficult locations. For instance, it allowed the placement of bus shelters at several well utilized Line 57 stops that were otherwise too small. Figure 34 shows seating in a perpendicular position that minimally affects the main sidewalk right-of-way and allows for uninhibited use of the pathway.

Figure 34. TriMet's Simme Seating in Action

Source: Carla Salehian.

TriMet remains in the vanguard of technological advancements for communicating information and promoting safety. In response to widespread smart phone ownership, TriMet developed fare and real-time arrival information applications for use via mobile. Additionally, the agency has equipped some stops with signaling devices: with a signalling device, a blinking light activated at the push of a button informs an approaching bus driver that a rider is at the stop. This is particularly useful during late evening hours or in poorly lit areas.

While there is little doubt of the TV Highway/Forest Grove Pedestrian Improvement Project's success in terms of incorporating many of the agency's design innovations, the project's implementation was not without its share of challenges, notably those posed by the existing geography and transportation characteristics of Line 57. The TV highway runs alongside an active freight railroad in several locations which, according to agency staff, created several complications including right-of-way and safety issues. Eventually, agreements were formed with the railroad company, and TriMet was able to construct ADA-adequate landing pads in areas that encroached upon the rail right-of-way. In response to safety concerns, proximity issues with the railroad in certain areas were ameliorated with

fencing. The high traffic speeds along the TV highway posed another significant challenge, and additional measures had to be taken to ensure that street crossings would be safe and effective. Agency staff noted that some other challenges continue to exist, particularly in instances where gaps in the pedestrian network remain, or where obstacles were too great to fit within the scope or timeline of the project. In these instances, it is hoped that the project can serve as a catalyst and encourage local jurisdictions or nearby business owners to invest in making the necessary changes.

Evaluation and Lessons Learned

Community Reaction

TriMet and its partners addressed considerable infrastructure barriers along the TV highway. Site visits confirmed bus stop improvements and their seamless integration into their surroundings. Broken and cracked sidewalks, unkempt landscaping, missing curb cuts, and dangerous pedestrian crosswalks all had been addressed. Most sidewalks were clean, and landscaping elements and bus stop amenities existed where they were once absent.

TriMet welcomes public feedback, but does not expect acknowledgement for its efforts.

> "That's not our mission. Our mission is to target improvements that we know are going to have a major impact and the ridership numbers are our reward. If we see a jump or a spike in the numbers and see happier customers waiting at the bus stop, then we know we've done our job" (Park 2014).

Evaluation

The ridership numbers at each of the 17 improved bus stops have been encouraging. Advanced data tracking technology installed in TriMet's fixed-route fleet collects passenger activity data for each stop – including boarding, exit, and lift or ramp deployment. Table 12 presents a snapshot of weekday boardings ('ons') and lift deployment figures for the 17 improved stops from the fall of 2008 (prior to the improvements) through the fall of 2011. While boardings dropped immediately following the improvements, overall boarding increased 9.5 percent from 2008 to 2011. Ridership among people with physical disabilities was affected more dramatically as lift/ramp deployments before and immediately after improvements increased by 96 percent, and continued slow but steady growth in subsequent years. Overall lift or ramp deployments in buses grew about 112 percent from 2008 to 2011, indicating that the infrastructure improvements benefitted riders with disabilities, and enabled many to begin using fixed-use transit.

Table 12. Fixed-Route Ridership 2008-2011

	Fall 2008	Fall 2009	Fall 2010	Fall 2011	% Change 2008-2009	% Change 2009-2010	% Change 2010-2011	% Change 2008-2011
Boardings	1,137	1,122	1,177	1,245	-1.3%	4.9%	5.8%	9.5%
Lift/Ramp Deployment	172	337	343	364	95.9%	1.8%	6.1%	111.6%

Source: TriMet, Personal Communication.

Annual paratransit ridership for Line 57 illustrates that while there has been an overall increase in paratransit trips taken, the rate at which paratransit demand has grown decreased significantly once the infrastructure improvements were implemented. From 2008 to 2009, prior to completion of the TV Highway Pedestrian Improvement Project, paratransit trips increased 26 percent. Upon completion, the percent increase dropped to less than one percent. From 2010 to 2011, paratransit trips *decreased* by 17 percent (Table 13 and Figure 35).

Table 13. Paratransit Ridership 2008-2011

	2008	2009	2010	2011	% Change 2008-2009	% Change 2009-2010	% Change 2010-2011	% Change 2008-2011
Paratransit Trips	12,452	15,656	15,762	13,015	25.7%	0.7%	-17.4%	4.5%

Source: TriMet, Personal Communication.

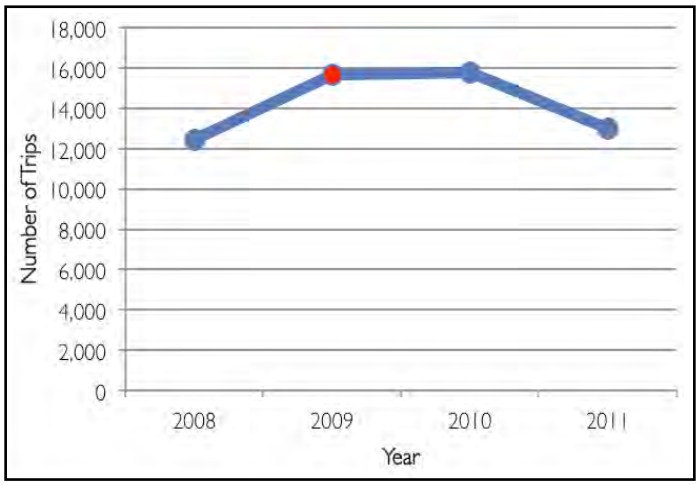


Figure 35. Paratransit Ridership

Note: Figures represent annual data for the areas near Line 57.
Infrastructural improvements were constructed during the summer of 2009 (indicated in red).

While these figures represent only a short time period, they suggest that while standard fixed-route ridership figures have remained relatively stable, the TV Highway Pedestrian Improvement Project has improved transit accessibility along Line 57, and that pedestrian infrastructure upgrades can make a significant impact on increasing transit options for users with disabilities.

In addition to users with disabilities and the elderly, this project also benefited Latino customers. The area surrounding the TV Highway is home to a large Latino community that was not particularly vocal in expressing transportation needs. Often, these individuals had learned to adapt to poor transit conditions in terms of the existing infrastructure (it was poorly lit, and lacked visibility and safety). It was not until TriMet and its partners noticed these problems that they were able to make the necessary changes and adjustments, which at one particular location included relocating the bus stop and working to get a large shelter installed. To TriMet's surprise, a large number of these community members attended the next board meeting to voice support and appreciation for the bus stop improvements.

Lessons Learned

In reflecting on the TriMet transportation system, accessibility-related projects and programs, and the success of the TV Highway/Forest Grove Pedestrian Improvement Project, three particular characteristics stand out as major takeaways or lessons to be learned:

- Advocate. Improved infrastructure and accessible public spaces do not only benefit transit users with disabilities; they also improve the health and livelihood of all citizens. TriMet's early adoption of this vision has allowed accessibility improvement elements to be seamlessly integrated into many of its projects. The sooner local jurisdictions and agencies adopt similar visions of "universal" design leading to "universal" benefits, the easier it is to garner support for developing related policy initiatives or investing money into these projects.

- Innovate. TriMet utilizes the latest data analysis tools and has determined that incorporating "green" materials is nearly always a worthwhile investment, as they can increase efficiency and save money in the long term. This was especially evident in the agency's Pedestrian Network Analysis project, in its paratransit eligibility program, and even in its thrifty design innovations that included its sandblasted bus shelter art and the installation of locally produced Simme seating.

- Communicate & Collaborate. TriMet demonstrates the importance of involving all stakeholders from the early stages of project development, and ensuring that clear and frequent lines of communication are maintained throughout the process. For projects that target improved access for people with disabilities and the elderly, standing committees such as TriMet's "Citizens for Accessible Transportation (CAT)" can make a significant difference in project quality and can facilitate the project approval process.

TriMet emphasized this third major takeaway. When asked if the agency had any advice for other transit agencies wanting to make similar infrastructure improvements around bus stops, agency staff offered that establishing solid partnerships and intergovernmental agreements with stakeholders and ensuring they share a common goal or vision is key. This is an important lesson that can be applied to agencies of any size, especially in light of the financial benefits that can result from such partnerships. Reaching out to other agencies, governmental bodies, and resources can contribute not only to "stretching their dollar," but also helps to establish a greater sense of community.

This sense of collaboration has contributed toward TriMet's success, and TriMet is continuing its efforts. In 2015 the agency and its partners completed the Tilikum Crossing, a light rail bridge across the Willamette River, or the "Bridge of the People." The $1.5 billion improvement is unique in being a dedicated "transit only" bridge designed to carry light rail trains, buses, cyclists, and streetcars. It features very wide sidewalks to allow for a safe and pleasant pedestrian experience.

WENATCHEE, WASHINGTON

Introduction

Approximately 150 miles southeast of Seattle is the small city of Wenatchee (Figure 36). Incorporated as a city in 1893, Wenatchee is also known as the "Apple Capital of the World," with orchards initiated as early as the 1870s. The Wenatchee metropolitan area covers just over 1,800 square miles, and has an urban density of approximately 210 persons per square mile. The city has a population of about 33,000, and is bordered by the Wenatchee River to the north, the Columbia River to the east, and the Wenatchee Mountains to the south and west. These high, rugged peaks form a wall around the western and southern sides of the city.

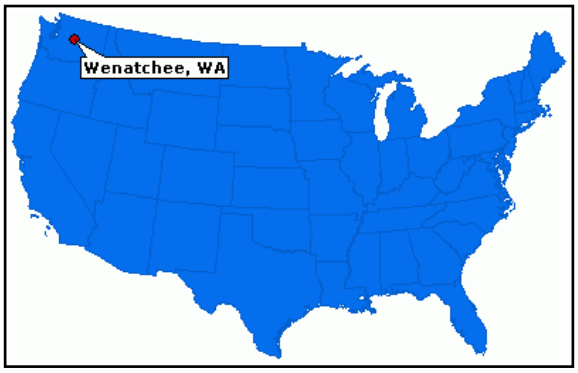


Figure 36. Wenatchee Location Map – National Context

Source: http://pix.epodunk.com

With a history deeply intertwined with that of agriculture and harvest, its rural terrain and characteristics create several unique challenges to the provision of accessible public transportation. Despite this, Link Transit, a public transit agency centered in Wenatchee and serving all of Chelan County and several population centers in Douglas County, has set forth significant efforts to ensure accessibility for all its patrons, demonstrating the positive effects achieved through strategic policy planning. It was primarily for this reason that Link Transit was selected as a case study to explore successful efforts in overcoming barriers to accessible transit (particularly with regard to those made by a smaller transit agency). The following sections give an overview of the agency's transit system characteristics, and describe its efforts to improve accessibility and encourage the use of fixed-route transit.

In October 1988 a group of Wenatchee's business and political leaders joined together, at the invitation of the Wenatchee Downtown Association, to discuss the possibility of bringing public transit back into the area, marking the first steps toward the establishment

of Link Transit. Public transit service had stopped operating in the area in 1968. The idea of reestablishing a public transportation system was met with great enthusiasm, for it would offer the opportunity to enhance tourism, link communities together, and help the elderly. As a result, the Public Transit Benefit Area (PTBA) was established on November 21, 1989. By 1990 the new public transportation system was set up with funding from a PTBA voter-approved local sales tax of 4/10 of one percent, and a 63 percent match from the Motor Vehicle Excise tax. This was a major step toward reestablishing transit in the area; by 1996, Link Transit's service area had an estimated service population of 87,000 (DeRock 2014).

Community Characteristics

Since that time, the community has experienced several changes. In 2013 the agency's estimated service area population had grown to a total of 115,000 residing in 16 communities (see Figure 37). The area has also experienced many demographic changes since Link Transit's inception. The once overwhelmingly Caucasian community is now 29 percent Hispanic, many of its Hispanic population being first-generation immigrants. About 68 percent of Wenatchee area residents are Caucasian, and the balance is composed of African-American, Asian, American Indian, and Hawaiian Islander ethnicities. The greater Wenatchee area has what is sometimes referred to as a "hollowed" demographic: its population is both very young and very old. This is partly due to the fact that as soon as residents reach college age, they move elsewhere in search of other education and career paths. The city had a recorded unemployment rate of 5.9 percent in 2013 (U.S. Census 2002; U.S. Census 2012b; TriMet 2012a).

Link Transit Communities Served	
Wenatchee	Chelan
East Wenatchee	Entiat
Leavenworth	Ardenvoir
Peshastin	Chelan Falls
Dryden	Orondo
Cashmere	Waterville
Monitor	Malaga
Manson	Rock Island

Figure 37. Link Transit Communities Served and Geographic Boundaries Map

Source: U.S. Census, SF1 (2000, 2010); 2012 Coordinated Transportation Plan for Elderly and Disabled, TriMet.

Disability data are shown in Table 14. Due to the large senior population, there is a large number of assisted-living facilities in Wenatchee. In the central area of the city of Wenatchee, alone, thirteen facilities could be found within a 1.5 mile radius (U.S. Census 2009; U.S. Census 2012b).

Table 14. Link Transit Service Area Population, Total and Persons with Disability

	Total Population		Disabled Population	
Category	Count	Percent of Total	Count	Percent of Total
Total Population	31,925	100%	6,125	19.2%
Age 0-4	2,502	7.8%	na	na
Age 5-17	5,844	18.3%	na	na
Age 18-64	18,733	58.7%	3,945	12.4%
Age 65+	4,846	15.2%	2,180	6.8%

Source: U.S. Census Bureau, 2005-2007 American Community Survey and U.S. Census Bureau, 2010.

Demographic characteristics show that the median household income for the area is lower than for the rest of Washington. According to the ACS 5-year estimates, median household income in Chelan County was $50,582 from 2008 to 2012, while median household income in Washington State was nearly $60,000. U.S. median household income was about $53,000 for that period. As a result of all these trends, Link Transit was placed in an interesting situation: the agency's development was occurring at the same time that the region's population was becoming more 'transit dependent' due to income, age, or disability. The following section provides an overview of the Link Transit system and the programs that have been developed to respond to the community's transport needs (U.S. Census 2012a).

Link Transit System Overview

In the years since the agency was first established, Link Transit has expanded its services to include bus, trolley, dial-a-ride (DART), and paratransit (LinkPlus) services in a service area that is estimated to encompass approximately 3,500 square miles and 115,000 residents from 16 separate communities constituting both rural and urban locations in the region (Figure 5) (Link Transit 2013).

Link Transit currently provides bus services along eight local fixed routes, eight commuter routes, and one dial-a-ride route for the small city of Leavenworth. Link Transit also services two trolley routes: one in Wenatchee (with nineteen stops) and the other in East Wenatchee (with eight stops). Lastly, the agency also delivers LinkPlus paratransit service for individuals whose disability prevents them from using the regular fixed-route bus service. This service is provided up to three quarters of a mile beyond where the regular fixed-route buses travel, and the ride service request can be placed at least one hour before the desired trip. Service for all these modes of transport is provided from Monday through Friday, 5:00AM to 8:00PM, and on Saturday from 7:30AM until 5:30PM. Table 15 and Table 16 provide a summary of Link Transit's fares and system features (Link Transit 2013).

The topography of the Wenatchee Valley region is characterized by deep valleys between steep mountains, which require that Link Transit network operate along the region's valley floors. As a result, many routes encompass long distances, particularly those to outlying areas and neighboring towns. Link Transit offers a "Dial-A-Ride Transportation" (DART) service to the outer regions to provide more efficient service, rather than operating full-

time regular bus service and incurring the associated costs. The service is a shared-ride, advanced reservation transportation option for all persons; it provides transit within specified service boundaries and to Link Transit's fixed routes (Link Transit 2013).

Table 15. Link Transit Fares Breakdown

	1 – ZONE	2 – ZONE	NOTES
Fixed-route – Single Ride	$1.00	$2.50	
Fixed-route – Reduced	$0.50	$2.00	Disabled, Medicare Card Holder, 65+
Fixed-route – Day Pass	$2.00	$5.00	
Trolley	Free	N/A	
LinkPlus	$1.50	$3.00	No charge for LinkPlus rider on fixed-route

Source: linktransit.com

Table 16. Summary of Link Transit's Transportation System

Service	Vehicles	Routes	FY13 Ridership (trips)
Buses	65 buses	8 local & 8 commute routes	890,632
Trolley	5 battery electric trolleys	1 Wentachee line 1 East Wenatchee line	Not available
Paratransit (LinkPlus)	7 minivans 9 propane minivans	Not applicable	56,703

Source: 2013 "Link Transit Service Area – Wenatchee and Environs."

While Link Transit paratransit services have always been widely used in the area, in more recent years the agency has performed a system-wide strategic effort to encourage elderly users and those with disabilities to make the switch from its more costly paratransit services, which costs the agency an average of $34 per person, per trip, to fixed-route services.

Mobility Management Strategies for People with Disabilities

The program with the greatest success record implemented by Link Transit is its Travel Training program. This comprehensive service is designed to assist community members in learning ways in which to ride the fixed-route services, and Link Plus (paratransit) if needed. The program and its staff help riders (or guests, in agency terminology), plan trips and understand ways to access the bus services. There are also tips on rider etiquette and personal safety. This program is available to all guests who need assistance. To ensure the best results from the program, an initial interview is conducted to determine the skill set of the guest, and to match those skills with the goals and expected use of the transit system.

The goal of this training service is to assist guests with independent travel on either the fixed-route or Link Plus services. Those guests eligible for Link Plus service may also request training to introduce them to the drivers and the schedules, and may receive tips to enhance their safety. Travel training typically involves mobility device training for fixed routes, a basic orientation to the Link Transit network, and individualized training for specific routes and destinations for both short- and long-term travel goals. Most training is conducted on a one-to-one basis, but it can be organized for groups as well. Finally,

the travel training service is provided free-of-charge to all Link Transit passengers, and is entirely voluntary.

Initiative: Switching Passengers From Paratransit To Fixed-Route Services

Prior Conditions

In 2000, Washington state voters repealed the Motor Vehicle Excise Tax (MVAT), causing a large reduction in Link Transit's budget, and a challenge to the agency. The effect of this fiscal constraint was felt most acutely by 2002; at that time Link Transit was spending 47 percent of its budget solely on paratransit, on an estimated 425 daily trips. This, together with the declining ridership on its fixed-route service, led the Link Transit board to consider becoming a paratransit-only operation.

> "There didn't appear to have any way of moving things forward, paratransit was eating us alive" (DeRock 2014).

Existing infrastructural conditions in the agency's service area were also in severe need of improvements. Approximately 80 percent of the agency's bus stops were unimproved, curb cuts throughout Wenatchee and its neighboring communities were not universal, and at a broader scale, the area's streetscapes were largely automobile- and truck-oriented; see Figure 38 for examples.

Figure 38. Rural Bus Stop Infrastructure Conditions

Source: Richard DeRock, Link Transit.

Facing these challenges, the agency's first course of action was to assess why paratransit ridership was growing at such an alarming rate, and what conditions were preventing users from making trips on fixed-route transit. In making this assessment, agency staff found that most paratransit trips were taken for the purpose of medical appointments or for shopping needs, and that the origins for these trips were largely in assisted living or rehabilitation facilities. Despite the fact that these origin and destination points were located

along existing fixed-route bus lines, elderly users and those with disabilities preferred to take paratransit because 1) fixed-route travel often required a transfer, 2) riders found stairs and lifts on high-floor buses intimidating, and 3) the average fixed-route travel time was longer. In addition, most fixed-route stops were without shelters or benches. At this time the paratransit service was free of charge, so Link Transit customers had no incentive to use fixed-route transit. They were simply making rational transportation decisions to maximize convenience.

Based on the agency's established trends and observations, it was clear that the agency would have to undergo several system updates and transformations. Agency staff described these changes as a multi-pronged approach that included: limiting the agency's paratransit services, making a series of fixed-route system and infrastructural improvements, and encouraging an overall shift in attitude in how paratransit and fixed-route transit should be utilized.

Paratransit Programming Changes

Considering the degree to which paratransit was posing a budgeting burden to the agency, making adjustments to this branch of service was a top priority. One of the ways in which Link Transit began to curb paratransit demand was by following eligibility requirements more closely, and incorporating a travel-training component to the eligibility process. Eligibility for the LinkPlus paratransit service is evaluated through an in-person "transit review" in which a Link Transit representative determines whether an individual is a good match for paratransit, and whether their eligibility meets one of the following criteria:

- **Unconditional:** In which a transit user's disability permanently prevents them from boarding or riding a fixed-route bus.

- **Conditional:** In which a transit user is able to use fixed-route for some circumstances, but is not able to board a bus in certain situations where a barrier prevents the rider from getting to or from a bus stop. Examples of these barriers include infrastructural barriers such as a lack of curb cuts, or environmental barriers posed by harsh weather conditions.

- **Temporary:** In which a transit user's disability or injury temporarily prevents them from using fixed-route buses.

Within twenty-one days of completing the transit review, an applicant is notified on the eligibility determination. With regard to the area's large elderly population, the agency's eligibility requirements are slightly more generous during the winter. Staff offered that many of their riders may not meet the typical definition of a person with a disability, but may have balance or bone density issues that make winter potentially dangerous, and thus qualify them for paratransit during ice and snow periods.

Apart from eligibility requirements, adjustments were also made with regard to fares. Prior to 2000, paratransit services were free for eligible users. The decision to start charging its riders $1.50 for a "1 Zone Single Ride" or $3.00 for a "2 Zone Single Ride" – rates that

are $0.50 more than equivalent fixed-route rides – was met with some hesitancy and trepidation. The agency was aware of a Washington State Supreme Court ruling involving Spokane Transit that found the agency could not charge higher fares for paratransit than for its fixed-route services. Staff noted that the ruling was not applicable to the Wenatchee agency in that Spokane's fixed-route buses were not accessible, and users with disabilities had no alternative to using paratransit. Despite now charging patrons for using LinkPlus, in Link Transit's new system paratransit-eligible riders were now able to ride fixed-route transit free of charge, which provided conditional users an added incentive to change their transit habits.

Eligibility requirements and implementing fares for usage were not the only changes that Link Transit made to its paratransit system. Changes were made with regard to service, as well. For one thing, the agency intentionally "slowed down" its paratransit service by incorporating additional stops and facilitating group rides. As a result of this action, Link Transit believed its riders would be further incentivized to ride the bus, where they would have more control over their trips.

Another change that was implemented in terms of paratransit service was with regard to driver training and wages. Link Transit's fixed-route and paratransit drivers are provided the same training, belong to the same union, and are paid the same wages. Upon seeing the positive effects of this, agency staff have become advocates for creating parity between the two services, and ensuring that fixed-route bus drivers also operate paratransit vans. For users with disabilities, a sense of trust and familiarity is often created with paratransit drivers, and seeing those same drivers operate fixed-route buses often facilitates the transition process for riders who might be more hesitant to switch from paratransit to fixed-route (DeRock 2014).

Fixed-Route Service Improvements

Buttressing Link Transit's paratransit programming changes, improvements were also made to its fixed-route service as a way of further incentivizing paratransit users to change their transit habits. First, the agency updated its equipment by purchasing used low-floor buses. As a result, a ramp could quickly and efficiently be deployed, and guests did not have to wait for the slow and cumbersome lifts on higher-floor buses. Additionally, changes were made to the bus routes themselves that incorporated ideas from the agency's paratransit ridership assessment. Specifically, the agency created a circular route that connected several of the largest senior housing facilities, a senior center, most of the grocery stores, the hospital, and the clinic. Most importantly, this route would be transfer-free, which would make the convenience of the route highly appealing to seniors and users with disabilities who had been highly dependent on paratransit to make a similar trip.

Upon increasing the convenience and efficiency of its fixed-route service, Link Transit embarked on aggressive outreach to the community to inform them of these service improvements, working with newspaper and radio stations to publicize the revamped service. Efforts to reach out to the community not only targeted seniors or users with disabilities; the agency produced a marketing campaign geared toward the general public in order to increase community awareness. The campaign stressed the importance of social

equity for riders with disabilities. One result the agency noticed was that the community, at large, became very receptive and would go out of its way to help riders with disabilities navigate the transit system. By embracing this larger, community-wide effort, the public was able to further encourage paratransit riders to use fixed-route services.

Planning Process

Planning for the discussed improvements was initiated in 2002, with the arrival of Link Transit's new General Manager. Link Transit has also made significant efforts on a smaller scale to improve transit accessibility in and around its bus stops. While the agency might not have the budgeting capacity of a larger agency (the agency sets aside around $50,000 per year for capital improvements such as curb cuts, sidewalk construction, etc.), it has been successful in discovering a variety of cost-effective alternatives that have facilitated their accessibility efforts. For example, the agency has made use of water soluble, vinyl acetate-acrylic copolymer soil stabilization material (commonly referred to as "Rhino Snot") at its rural bus stop locations to create many flat, stable, and durable landing pad alternatives with the same amount of money that would have created only one standard concrete landing pad. To date, the agency has used Rhino Snot to create nearly seventy of these bus pads (See Figure 39). Agency staff observed that the improvements proved to be more durable than anticipated, lasting at least seven years rather than the expected three years specified by the manufacturer.

Figure 39. Rural Bus Stops Improved Using "Rhino Snot"

Source: Richard DeRock, Link Transit.

From time to time, the agency's small community size has allowed them to respond to smaller-scale individual projects or "easy fixes" (Figure 40). When a construction of a simple curb cut or clearing a pathway issue makes the difference between a rider using fixed-route services daily or being paratransit-dependent, the agency makes a pronounced effort to fix the issue themselves, or requests help from local municipalities.

Figure 40. Wenatchee Hospital Transit Stop at Main Entrance

Photo: Stephen Gibson.

Apart from these consistent capital improvement projects, staff also described some of Link Transit's more exceptional projects, including a highway transit stop near Leavenworth and another transit center in a Wenatchee Mall. Typical infrastructural improvements for these projects included the installation of information kiosks, constructing shelters and benches, identifying and improving pathways, and constructing several critical curb cuts. In some cases, Link Transit has to coordinate with the surrounding businesses, if some improvements are located on private property. This was the case with Wenatchee Mall, where the mall owners incurred the cost of a sidewalk with railing on their property, which takes wheelchairs from the bus stop directly to the entrance of the mall. According to staff, the cost of the previously described improvements can range from $50,000 to $140,000, and are usually implemented with the help of federal grants – which can cover approximately three-quarters of the total cost of each project. Figure 41 provides a series of photographs featuring the improvements made at these transit centers.

Figure 41. Link Transit's Capital Improvements Projects

Photo: Stephen Gibson.

Community Outreach

According to staff, Link Transit has conducted a significant number of surveys and interviews with paratransit riders to understand their needs. Link Transit has also instituted guest training programs for riders with disabilities to aid them in better using the regular transit system instead of paratransit. The general manager has also sought input from senior citizens as to how to better serve their needs, through informal visits and conversations with them at the Senior Citizen Center. Lastly, Link Transit has worked with newspaper and radio reporters to communicate and market to the larger public the implemented infrastructural improvements to their transit vehicles and settings (e.g., low-floor buses, curb cuts near clinics and hospitals, etc.).

Attitudinal Shifts

Critical to the success exhibited in each of Link Transit's efforts toward improving accessibility infrastructure and transportation programming was the overall attitudinal shift the agency experienced toward its ADA services. Prior to the passage of the Americans with Disabilities Act, there was an overall corporate philosophy that the elderly and people with disabilities should solely use paratransit. Particular to this small rural community, Link Transit instead places a strong emphasis on referring to their transportation system as an all-encompassing *social service*.

This is demonstrated by the agency's practice of referring to their riders as "guests" rather than patrons. By stressing the notion of the transit rider as a guest, the agency has been able to create a welcoming environment for all transit riders. Staff explained that "there's a sense here that operators aren't going to leave someone stuck. They're going to find a way to make the trip happen and there's a real ownership of [the transit needs of] their guests." In the case of the elderly or riders with disabilities, who may have a fear of the unknown or of their physical limitations, this approach can be especially useful in promoting an increased feeling of confidence in the transit system.

Funding

The funding model for Link Transit's initiative was created with the long-term objective of conceptualizing, establishing, installing, and maintaining a transit system that would service the community, develop and grow along with the community, and provide service to all residents of the service area. The network that was in place when the current General Manager took his position was financially stretched and not providing the complete level of service that was required for the needs of the community. The project undertaken by Link Transit was not considered a single attempt at providing that level of service, but rather the creation of a developing network for a high level of service.

Infrastructural improvements are allocated funding from the general budget in each fiscal year and installed accordingly. Infrastructural projects are placed on a priority list in which the highest and best use of the available funding is considered for the benefit of the highest number of guests who are in the most need. The current model of special project funding provides 70 percent of the budget through local sales tax, approximately 18 to 19 percent

from federal funds and grants, approximately 6 percent via fares, and 5-6 percent by way of various state grants. Fares are typically a small proportion of the annual revenues. For example, paratransit fares are less than 1 percent of the overall operating cost. Link Transit managers indicated that this model of funding is relatively standard across the country. Currently, all streams of funding and financial allocations are tracked for financial management purposes.

Distribution of the budget across the operating, improvement, and maintenance of the network fluctuates fractionally each year, as required. Approximately 12 to 13 percent of the budget is allocated towards infrastructural maintenance – including vehicles, bus stops, and general repairs. Capital improvement receives a relatively small percentage of the overall budget, an annual allocation of approximately $50,000 (4%) from an overall budget of approximately $12 million. Occasionally, a large project is identified as critical for implementation, and either external funding sources are sought for this venture or a restructuring of the current funding model is undertaken – or a combination of both. The agency's funding models were put in place in 2002 by both the General Manager and the Operations Manager as a result of their extensive experience. Both had worked as transit specialists in their previous positions (in Los Angeles and San Diego, respectively) and utilized their respective experience to generate a substantial improvement of the Wenatchee Link Transit network and its operations.

The main source of the revenue is through a sales tax imposed in the region, which is relatively sustainable. This tax was endorsed by the citizens of the region, and is levied through the Public Transportation Benefit Area (PTBA). The approved range of sales tax is not supposed to exceed nine tenths of a cent; however, the Wenatchee PTBA has not gone back to the voters for any increases as the current budget is adequate for what is required. The Link Transit General Manager indicated that as the population in the region increases, there may be cause for a vote to potentially increase the levied sales tax at a future date. The remaining sources of funding for the Link Transit budget are slightly less stable, but continue to be a reliable funding source for the system. Link transit also applies for Federal and State grant funds.

At the inception of Link Transit in 1991, all transit services were operated free of charge to the public. The current model imposes a nominal fare for riders, and this contributes approximately $700,000 annually to the budget. Recently, a very small increase was approved in the fares.

Implementation

Improvements that create more accessible pathways to transit stops occur on an annual basis. They are chosen from a list of different possible improvement projects. Projects are prioritized based on ongoing internal evaluation, passenger feedback, and, in a few cases, interface and input from the Washington State Department of Transportation. Link Transit leads the process for all the transit improvements. Coordination efforts with the Washington State Department of Transportation (WSDOT) are occasionally undertaken, while for particular infrastructural projects Link Transit may coordinate with local institutions (a local hospital, a senior citizen center, etc.).

The impact of Link Transit's efforts has been significant. In 2007, it was found that paratransit trips declined by about 41 percent, while fixed-route trips rose by 106 percent, indicating that paratransit users had changed their transit patterns and moved to fixed-route trips. Figure 42 and Figure 43 show ridership trends and boarding for fixed-route and paratransit services respectively (Link Transit 2013). Paratransit ridership trends from 2005 to 2013 indicate small fluctuations, but an overall increase in annual fixed-route and flex-route boardings is seen. As demonstrated in Figure 42, ridership peaked in 2011, with just over 962,000 boardings It dropped by around 100,000 boardings in 2012, only to increase again in recent years. Agency staff indicated that present day fixed-route boardings are now estimated to be around 1 million per year. In comparison, annual paratransit boarding figures have experienced similar fluctuations (See Figure 43). In more recent years, however, paratransit ridership has seen an overall decrease from its peak of 83,044 boardings in 2008 to its lowest ridership in recent years of 56,703 boardings in 2013, a decrease of around 32 percent in five years. Staff reported that in 2002 the agency provided a daily average of 450-475 paratransit trips, and in 2014 it provided about 210 a day; the cost of paratransit service was reduced from 47 percent to 24 percent of the budget. Most impressive about these figures is the fact that the reduction in paratransit use was entirely voluntary. Once the combination of incentives and fixed-route infrastructure improvements was in place, users made the choice to switch over to fixed-route transit because the option was more efficient and convenient.

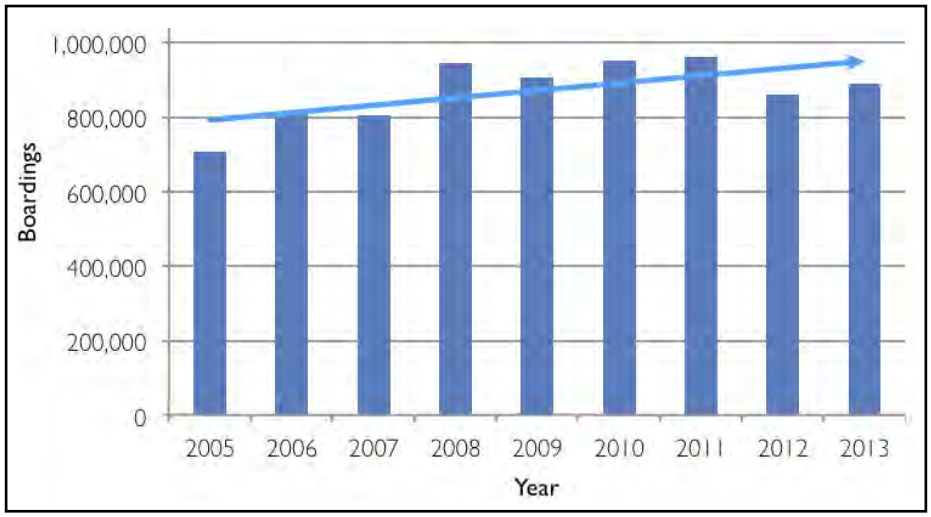


Figure 42. Annual Fixed-Route/Flex Route Boardings

Source: 2013 "Link Transit Service Area – Wenatchee and Environs."

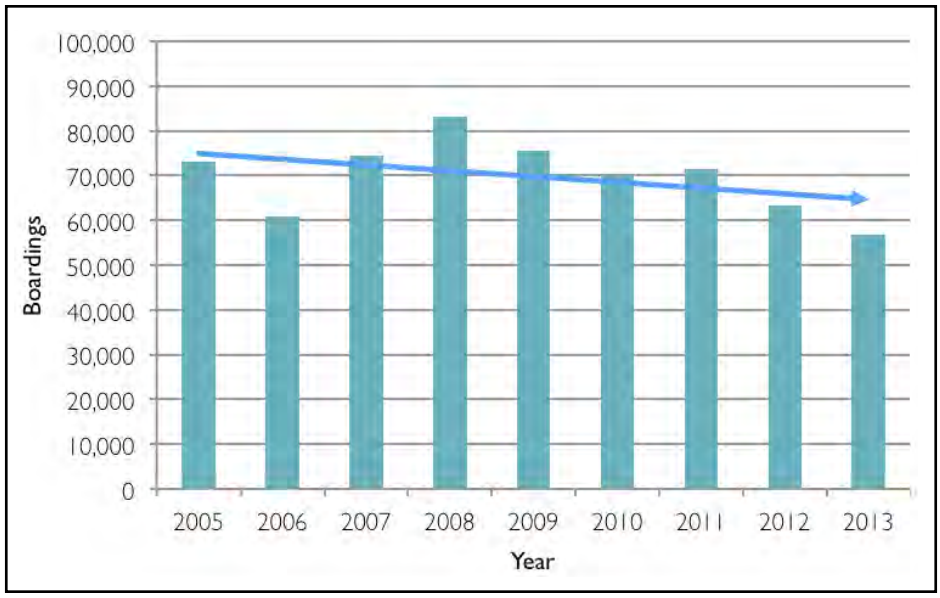


Figure 43. Paratransit Boardings

Source: 2013 "Link Transit Service Area – Wenatchee and Environs."

The agency sought feedback at all stages of project planning and implementation. It wanted to fully understand the needs of the guests before planning occurred, and also wished to formulate ways to conduct the projects successfully during implementation. There was also a need to adjust completed projects from time to time to achieve fully utilizable infrastructure and programming. For example, the agency gathered direct feedback from guests at a senior center, which resulted in changes to the bus timetable and subsequent reduction in paratransit trips among that population.

The expansion of the fixed-route services to cater to an ever-increasing ridership of guests with disabilities and elderly guests also brought a direct benefit to the general public in the form of increased frequencies of pickup times and an extended service network. The initiatives of continually upgrading curb cuts and pathway connections between origin and destination points also directly benefits the general public, particularly people pushing strollers and children on bikes. In a community of this size, it is of general benefit when all members of the community travel together and can support each other in their daily journeys. It is not about separation, but inclusion.

Evaluation and Lessons Learned

Upon reflecting on Link Transit's transportation system, accessibility-related projects and programs, and the success the agency has had in transitioning its elderly guests and those with disabilities from paratransit to fixed-route transportation, several characteristics stand out as major takeaways or lessons to be learned:

- Search for creative cost-effective solutions. Tight budgets have forced the agency to adopt innovative and collaborative approaches. Faced with the need to improve rural bus stop locations, the agency employed "Rhino Snot" at a significantly lower cost than the installation of concrete landing pads. In its work at Wenatchee Mall, the

agency used its own resources as an incentive to get cooperation and private funding that resulted in an accessible pathway between the bus stop and the mall entrance.

- Understand clients and their needs. Communication is essential to the success of any complex project. Prior to establishing any policy or undertaking physical changes to their transportation system, staff understood the importance of research and conducting fieldwork as a means of better assessing Link Transit's clients and their needs. This included conducting a series of informal interviews with paratransit patrons, evaluating existing route patterns and their flaws, spending time on buses and vans and at bus stops, and enlisting the media to publicize improvements.

- Make fixed-route service routes convenient. Efforts transit agencies take toward better understanding their clients make a big difference in ensuring that the changes an agency proposes are the most appropriate allocation of their funds. In the case of Link Transit, the agency was able to pinpoint flaws in its existing fixed-route system (inefficient routes that failed to connect major neighborhood amenities, the need for transfers, timely lift deployment in higher-floor buses, etc.) and make targeted changes causing a significant impact in the areas where their systems needed it the most, thereby reducing user dependency on costly paratransit.

- Foster a positive approach toward service: Finally, it takes the proper attitude to ensure that paratransit riders are comfortable and confident enough to voluntarily switch their transportation mode. By incorporating a "guest" philosophy toward their services, Link Transit was able to create a friendly and welcoming environment for *all* its users. Offering individual attention and catering to a guest's particular needs is typically more feasible for an agency operating within a smaller, community-type setting and often cannot be matched in an agency operating within a larger urban setting. Leading by example and publicizing the need for accessible, inclusive transportation, Link Transit has been able to promote tolerance and awareness toward the elderly and people with disabilities at a larger, community-wide level.

According to agency staff, success in increasing transit accessibility can only be achieved when an agency uses a holistic approach toward transportation planning.

> "People will ask over the years, 'What have you done that's worked?' It's not just one thing, it's everything! It's pathways, it's low-floor buses, it's training, it's the parity, it's community attitude, the idea that it should be positive to have people with disabilities on the regular buses. You have to do all of it to get the benefit" (DeRock 2014).

There is little doubt that Link Transit's approach is having a significant effect for the better on the lives of its citizens, demonstrating one final lesson to be learned: that a small agency is capable of creating a large impact.

IV. CONCLUDING OBSERVATIONS & RECOMMENDATIONS

Enabling full access to different modes of public transportation provides persons with disabilities a greater degree of freedom, mobility, and independence in their daily lives, and allows them to access life-sustaining and -enhancing services that may include trips for medical purposes, employment, education, and daily living. However, making transit vehicles, stations, and stops ADA-accessible are not the only necessary steps to achieving full access and the mobility afforded by that access. For persons with disabilities, the infrastructure that surrounds stations and stops and the pathways that lead to these transit facilities must also be sufficient to create unobstructed, full access to transit services.

Since passage of the ADA, many communities and transit agencies have made significant progress in this area through policy initiatives, incremental enhancements, modifications, and other measures as discussed in this report. Collectively, these measures have significantly improved access to various modes of transit for persons with disabilities, and in truth, for all persons seeking to utilize these systems.

One of the most fascinating components of this study was the similarities in lessons learned and promising practices identified among the five cases. This finding was somewhat unexpected by the research team, because of the diverse transit agencies selected for the case study analysis, namely: The Memphis Area Transit Authority (MATA), Memphis, Tennessee; Broward County Transit (BCT), Florida; Link Transit, Wenatchee, Washington; TriMet, Portland, Oregon; and NJ TRANSIT, Newark and New Brunswick, New Jersey.

While NJ TRANSIT is the nation's third largest provider of bus, rail, and light-rail services, providing over 223 million passenger trips per year to customers statewide in a service area that exceeds 5,000 square miles, whereas MATA covers a service area of approximately 315 square miles, serving approximately 600,000 residents living in the Memphis urban core or surrounding low-density neighborhoods. BCT is focused on providing services to a primarily suburban, auto-oriented customer base.

While details such as geographic service area size, population, demographic profiles, and density patterns vary among each of the six case study sites, all offer a mix of transit services that may include bus, rail, light rail, trolley, street cars, and paratransit services. Each is also striving to determine the best strategies to serve its respective transportation-disadvantaged populations, and is committed to pursuing initiatives to enhance access to its accessible public transportation services.

In advancing this goal, similar promising practices and/or lessons were identified through the case study analysis that should be considered by any transit agency seeking to create improved access to its services for persons with disabilities. These include the following:

Understand Needs

Agencies must undertake efforts to better understand the divergent travel needs and issues of their customers with disabilities. For example, as the Link Transit interviewees explained, they conducted research and fieldwork that included customer interviews

and an evaluation of existing service route patterns to determine the most appropriate infrastructure and other improvements for enhancing access to their transit facilities. Several interviewees remarked that this work to document customer accessibility needs and issues was an ongoing task, without an end.

On a related note, BCT interviewees stated that a continual agency self-evaluation process should be established that incorporates data collection and a means to identify, monitor, and document needed improvements and the progress of ongoing improvements.

Pursue Partnerships

Agencies benefit from relationships with diverse community partners – from the public and private sectors – to collaborate and coordinate with in planning and implementing improvements. Such action can generate many positive results in terms of project finances, and in fostering a sense of community 'ownership' for any given project. For example, MATA noted the value of involving advocacy groups that had been formed by members of their transportation-disadvantaged community. MATA also discussed the benefits of collaborating with its Metropolitan Planning Organization (MPO) and the City of Memphis to improve the infrastructure conditions near transit facilities. These partnerships are sometimes organized through MOUs, which can assist partners in assessing how to best utilize and appropriately leverage various funding opportunities.

BCT explained how a variety of partnerships have contributed and continue to contribute to the successful implementation of the efforts to retrofit over 2,000 area transit stops for ADA compliance, and to complete its shelters and amenities program. Specifically, intergovernmental cooperation between the County and its independent municipalities was critical, as was coordination between BCT, the MPO, and the Florida DOT in terms of improvement planning, design, permitting, funding, and construction. It must also be noted that BCT emphasized that the agency's coordination with local government stakeholders involved with land use planning and development review was vital to ensure connectivity between area developments, pedestrian facilities, and transit stops.

TriMet discussed how instrumental community partners were in identifying needs, as shown in the planning and implementing of their Line 57 Highway/Forest Grove improvement project. Partners included the Oregon DOT, consultants, municipalities, local businesses, neighborhood associations, bicycle coalitions, and members of an advocacy group focused on accessible transportation. TriMet offered that this commitment to fostering strong community partnerships to advance accessibility-focused infrastructure improvements, as well as the usage of intergovernmental agreements, has yielded financial benefits. For example, costs were halved for their Line 57 highway improvement project, due to an intergovernmental agreement whereby the city of Portland managed control of the construction labor costs and TriMet covered materials costs. In addition, TriMet discussed how partnering specifically with local entities contributed to success in surmounting financial constraints on many projects, and in generating community buy-in and ownership for said projects. Their partnerships with municipalities specifically resulted in development of a streamlined, efficient approval process for bus stop improvements.

NJ TRANSIT highlighted how the scope of the Newark and New Brunswick projects could only occur through a coming together of partners. In Newark, key stakeholders included the City, other transportation providers, local and agency police, consultants, and adjacent landowners. Collaboration and cooperation allowed the agency to extend improvements to the street crossings and surrounding properties, as well as to enhance vehicular access to the site. In New Brunswick, the extensive nature of the improvements could only have been achieved through collaboration with private and public partners. NJ TRANSIT worked closely with the local development corporation, DEVCO, and other partners to bring about a wide range of improvements and enhancements that include a pedestrian bridge to an adjacent street, access to 24-hour elevators, and sidewalk and ramp upgrades on both agency and private property.

Communicate

Once project stakeholders and partners have been identified, communicate early and often with all – before, during and after the implementation of any improvements. Developing and maintaining this open line of communication was discussed by several case study interviewees as invaluable to their success. For example, the Link Transit interviewee noted that instituting an active communication plan with community stakeholders is vital at all stages of a project, including the post-completion period, at which time Link often works with local media to communicate with and market to customers with disabilities – and the larger public – the benefits of the completed infrastructural improvements. The TriMet interviewee explained that consulting regularly with the agency's standing accessibility committee helps to identify issues that need to be addressed, and permits the group to function as a "checks and balances tool" for TriMet as they progress with infrastructure improvement work.

Approach Cost and Funding Issues Creatively

Cost factors are and will always be significant considerations in pursuing infrastructure improvements that improve access to transit for persons with disabilities. Funding strategies to achieve these improvements that were utilized among case study interviewees varied, with most relying upon a mix of funding from several sources that included federal grants, state grants, local funds, passenger revenue (that is, fares), and local taxes (e.g., sales tax, payroll tax). MATA used federal New Freedom program funding to make sidewalk and curb ramp improvements, and to install new bus shelters along several routes. TriMet shared that its revenue largely comes from state payroll taxes, while Link Transit offered that local sales tax provides the majority of funding for improvements. NJ TRANSIT used federal funds provided through the Liberty Corridor initiative, a set of transportation improvements designed to enhance connections to Newark Liberty Airport.

Determining cost-effective plans and measures is key to overcoming cost-related barriers when pursuing accessibility improvements. The interviewee from Link Transit explained how they successfully searched for and found a cost-effective water-soluble material to create durable bus stop landing pads that were much less costly than those made of concrete. As noted previously in discussing TriMet's experiences, pursuing partnerships and intergovernmental agreements can also yield cost savings that can be extremely helpful

for implementing improvements with limited funding. Partnerships were also crucial to NJ TRANSIT's work. Additionally, the agency emphasized that when the goal is to create the longest accessible pathway possible to facilities, agencies should seek to push budgets to their limits, and achieve the greatest impact for their investment.

Think Holistically

The value in pursuing a holistic approach and utilizing mobility management concepts such as travel instruction to help overcome barriers to accessible transit was a sentiment expressed by many. TriMet discussed how limiting accessibility initiatives to vehicle accessibility is short-sighted; considering ways to enhance walkability and access to transit facilities creates tremendous benefits for customers with disabilities. It must be noted though that while adding curb cuts or addressing poor sidewalk and other infrastructure conditions are critical to improving accessibility, strategies beyond infrastructure issues can be vital for long-term success. For example, Link Transit made the decision to pursue a holistic approach to transit accessibility by developing a comprehensive multi-pronged plan that included free individual and group travel training for all Link passengers; a variety of fixed-route system improvements including low-floor buses and service routes designed to better serve transportation-disadvantaged residents; and developing an aggressive marketing campaign to inform persons with disabilities about the benefits of using accessible fixed-route transit and advise the general public about the social equity importance of accessible transit services. Similarly, NJ TRANSIT, through its collaboration with NJTIP, has supported a program of travel training to expand travel options for persons with disabilities who use its system.

Appreciate Breadth of Benefits

One of the most significant and somewhat unanticipated benefits experienced by interviewees in pursuing infrastructure improvements to improve access to transit was the positive social changes experienced when more persons with disabilities have the option to utilize public transit.

As one interviewee explained, "It is not about separation, but inclusion." Several case study interviewees shared that the genesis of the infrastructure improvement projects in their communities often stemmed from a desire to enable more persons using costly paratransit services to instead use more cost-efficient accessible fixed-route services. Following project completion, these same interviewees acknowledged that while cost benefits have been realized in some cases, they have found a general social benefit when all members of a community travel together, have the opportunity to learn from one another, and support one another in their daily journeys. As another interviewee noted, "operating a truly inclusive transit system enables riders to learn about one another, from another, contributing to increased awareness for folks with disabilities and their needs." In addition, inclusion allows for the achievement of parity in civil rights for persons with disabilities, which is the ADA mandate.

Prepare for Opposition

Transit agencies should be prepared for – but not necessarily expect to receive – opposition to infrastructure improvements. Only a few interviewees discussed this problem. Often referred to as the "Not in My Backyard Syndrome" or NIMBYISM, TriMet explained that this can be a common occurrence when seeking to implement new transit stops or routes near homes or businesses. BCT also discussed encountering property owner opposition to sidewalks and transit stops in some neighborhoods, due to concerns that a likely increase in crime and "transient" populations would accompany such improvements. Interviewees noted that agencies should focus on maintaining open lines of communication with stakeholders who oppose a given project, providing them with timely and accurate information on the project. They should also emphasize in these communications that the transit agency is seeking to serve and benefit all members of the community with the planned improvements.

Incorporate New Technology

Transit agencies and their patrons benefit when time is taken to investigate and pursue technological and physical design innovations, such as green materials, when making infrastructure improvements – as they can increase efficiencies and yield long-term cost savings, as well as better serve customers in certain cases.

Some of these innovations and strategies mentioned included utilizing plastic guards at curbs or concrete edges of bus stops to protect bus tires and sidewalks from damage; redesigning bus signage to increase visibility from any angle; utilizing signs that encompass a blinking light function that can be activated by a customer, to indicate to the driver that the customer is waiting at the stop; and sandblasting vandalized shelter glass to create an artistic pattern, instead of paying for costly glass replacement. Using technology or technologies that are new to an agency can also pose challenges. When asked to incorporate adaptive signal technology into its Newark project, the agency found that it needed to acquire an additional partner, PSEG, to facilitate the integration of the technology into older infrastructure.

Remember that ADA Improvements Benefit All

Lastly, pursuing and implementing infrastructure improvements such as upgraded curb cuts and pathway connections that enhance access to transit facilities ultimately benefits *all* system users, including the general public. One measure of success is the degree to which improvements provide a seamless experience for persons with disabilities and others. Improvements such as the pedestrian bridge at New Brunswick Station create better connections for all who utilize the station, also allowing persons with disabilities to more easily access the station platform.

As one interviewee stated, "universal design equals universal benefits." Interviewees recognized that making infrastructure improvements that better connect to transit helps to successfully attract new system riders, both with and without disabilities.

Table 17. Recommendation Snapshot

Recommendation	Example
Understand needs	Conduct fieldwork with customers Evaluate and change current routes based on research Collect data on a continual basis to monitor progress
Pursue partnerships	Foster ownership by involving advocacy groups, MPOs, and municipalities Involve land use agencies to ensure connectivity to transit Develop intergovernmental agreements to share costs
Communicate	Develop and actively use communication plans Share information with all Utilize multiple modes to deliver the message
Approach cost and funding issues creatively	Consider less expensive ways to meet goals Pool funding sources
Think holistically	Consider route changes to provide better service Adopt evaluation criteria and prioritize projects Offer travel instruction
Appreciate breadth of benefits	Understand that infrastructure improvements can have social benefits to all Promote inclusion, not separation
Prepare for opposition	Communicate with all stakeholders early and often Provide timely information Stress the message that improvements will serve all community members
Incorporate new technology	Consider long-term costs Reuse materials and use green materials to reduce costs Work with partners to gain expertise
Remember that ADA improvements benefit all	Understand the improvements enhance travel for all system users Measure success by seamlessness

ENDNOTES

1. The Oregon Health Plan (OHP) provides health care coverage to low-income Oregonians through programs administered by the Division of Medical Assistance Programs (DMAP).

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