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# SHARED TRAVEL NETWORK STUDY

## TECHNICAL MEMORANDUM 1
## BEST PRACTICES/CASE STUDIES

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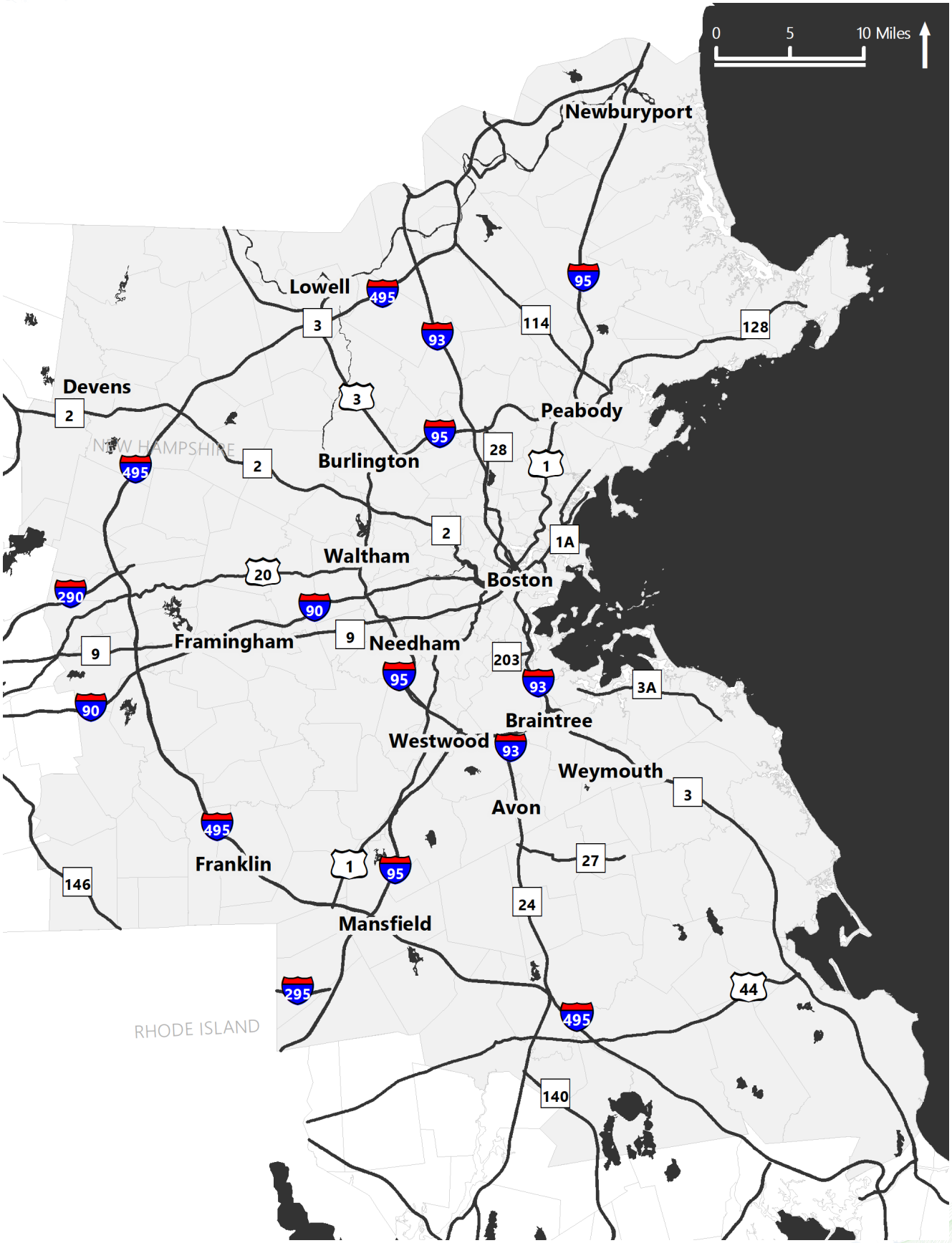
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# 1 INTRODUCTION

## Objective

The objective of this memorandum is to describe, illustrate, and evaluate strategies for park-and-ride and shared travel design, operation, enhancement, and marketing by reviewing success stories across the United States. The document also seeks to highlight answers to key questions that framed this research: what is a shared travel network and what does it look like?

FIGURE 1 | MAP OF THE SHARED TRAVEL NETWORK STUDY AREA



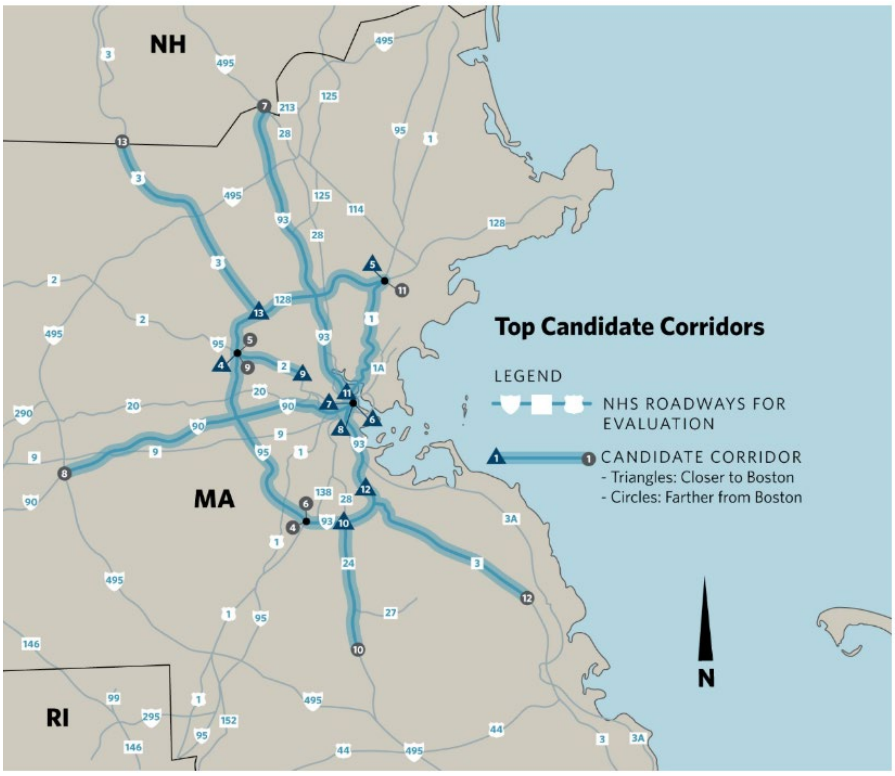
# Review of Relevant Literature

This section will scan some available research on park-and-ride and shared travel design, operation, enhancement, and marketing. Sources include precedent work by MassDOT, prior work by the consultant team, and work done by others under the Transportation Research Board (TRB) Transit Cooperative Research Program (TCRP).

## *Precedent Work by MassDOT*

MassDOT is pursuing a comprehensive approach to moving people throughout the Commonwealth. One element of this approach is to investigate the feasibility of implementing managed lanes and bus-on-shoulder treatments on particularly congested corridors. Managed lanes are lanes on highways governed by explicit operational strategies in response to changing conditions. Examples include high-occupancy vehicle (HOV) lanes, high-occupancy toll (HOT) lanes, express lanes (through-traffic lanes with fewer exits), or restricted lanes (e.g., trucks or buses only). MassDOT has completed screening studies on both managed lanes and bus-on-shoulder treatments that lay the foundation for further analysis and possible pilot implementation on selected corridors.

**FIGURE 2 | MANAGED LANES CANDIDATE CORRIDORS**




*Source: MassDOT*

- **Managed Lanes Screening Study (2020)[1] |** This screening study aimed to identify corridors meeting baseline requirements for managed lane implementation in Greater Boston. MassDOT developed a list of "success factors" for managed lanes projects; performed an initial screening of roadways within the I-495 beltway to select corridors warranting further evaluation for managed lane treatments; and evaluated the select corridors to determine which managed lanes treatment could be the most appropriate and outline potential future analysis.

  The first tier screening of potential corridors evaluated corridors on the basis of access control and baseline congestion. Tier 2 screening utilized six evaluation criteria: network connectivity, level of congestion, travel time variability, person throughput, traffic growth, and current bus service. Based on this evaluation, MassDOT identified 10 candidate corridors, illustrated in Figure 2.

[1] "Managed Lanes Screening Study". Massachusetts Department of Transportation, 2020.

MassDOT then evaluated the candidate corridors for the likely success or failure of the four managed lane treatment types: conversion of existing HOV lanes into HOT lanes; repurposing existing roadway shoulders into managed lanes; conversion of existing travel lanes into managed lanes; and construction of new managed lanes along existing roadways. Overall, this study represents an initial screening step; further evaluation and due diligence is necessary to fully understand a corridor's feasibility, managed lane treatment type, operating characteristics, environmental and socioeconomic impacts, stakeholder support and implementation strategies.

- **Regional Bus Network Assessment for Massachusetts Department of Transportation Rail and Transit Division (2016)** [2] **|** The goal of this study was to develop a list of potential improvements to the regional bus system, branded "BusPlus," that serves Massachusetts and assess the feasibility for implementation. In addition to service recommendations, the study identifies issues and implications for MassDOT's regional bus program.

  The study finds that although recent changes in funding availability have meant that expansion of state funding for BusPlus operating assistance is unlikely in the near future, the overall BusPlus program framework and brand continues to make sense and merits continued support as an element of MassDOT's statewide mission. Recommended strategies for the program include use of alternative funding sources to support a limited amount of new service; continuation of the bus capital program with oversight and monitoring of the state's capital investment; continuation of the development of the ticketing application; and expanded marketing and information to maximize the BusPlus program's benefits to the Massachusetts public. Policy recommendations also address potential funding sources for the program and the need to improve monitoring of the state's investment in the regional bus system.

- **Bus On Shoulder Screening Study (2020)**[3] **|** MassDOT initiated this study in order to determine the effective locations for the start of a cost-effective bus-on-shoulder program aimed at improving reliability and decreasing travel times. The first tier of possible roadways was selected on the basis of 1) the number of MBTA buses on each route, 2) qualities of the right-side shoulder, and 3) existing congestion levels. A second screening tier considered these factors in greater detail, plus "minimal conflict." This criterion addressed the fact that an effective bus-on-shoulder corridor will have minimal conflict points (such as merges or access points) to maximize efficiency.

  The screening found that the segment of I-93 between Somerville and Woburn demonstrates the greatest feasibility as a bus-on-shoulder pilot corridor for several reasons, including sufficient shoulder width; significant use by buses of the Massachusetts Bay Transportation Authority (MBTA); and significant congestion. The study recommended several immediate actions to advance the pilot: development of concept plans in computer-aided drafting and design (CADD); development of signing and marking for bus-on-shoulder; pavement condition and roadside objects review; engagement with MBTA and Merrimack Valley Regional Transit Authority in field tests; development of a bus driver training program; and police engagement.

[2] "Regional Bus Network Assessment for Massachusetts Department of Transportation Rail and Transit Division". KFH Group, Inc., 2016.
[3] "Bus on Shoulder Screening Study". Massachusetts Department of Transportation, 2020.

## *National Research*

- **Best Practices in Rural Regional Mobility (2017)[4] |** This report evaluates practices used by DOTs, rural regional planning agencies, and transit providers to plan and provide for rural regional mobility, focusing on policies and programs that support services that meet the Federal Transit Administration (FTA) definition of "public transportation" or the FTA definition of "intercity bus transportation. Though the report focuses on rural areas, the key takeaways are relevant to implementation of regional bus service across a range of geographies. The research highlighted several key lessons:

  - State-level policies matter; supportive state-level policies include the provision of demonstration or incentive funding or allowing the collection of local revenues.

  - A common thread among various successful organizational approaches was the inclusion of regional stakeholders in the development and oversight of the project.

  - Several states enacted legislation to ease the creation and implementation of multijurisdictional regional transit services.

  In general, the study identified a consistent need for local champions; focus on multiple markets; and provision of clear service information to riders.

- **North American Double Deck Bus Market Study (2018)[5] |** This research investigates the scope of double deck bus acceptance in North America, and the potential market for these vehicles. It finds that double-decker buses have best met market and passenger acceptance on services operating longer distances over limited access highways, often destined to dense downtowns (it terms this service "interurban/regional"). The study looks to identify potential markets for new use of these buses, using data from the National Transportation Database (NTD) to identify "commuter bus" services with more than 45 over-the-road coaches in their commuter bus fleet. Among the case studies in this memorandum, it identifies Seattle and Minneapolis/Saint Paul as growth opportunities.

  The study also provides guidance on implementation, including a survey of complementary infrastructure – bus lanes, stations, facilities – and guidance on ancillary improvements that can enhance the effectiveness of bus operation. Interviews with the six agencies that currently operate double deck buses in North America indicated that facility retrofitting for double deck buses may include installing new lifts, increasing the height of doors, and making modifications to fuel islands and bus wash and engine wash bays. These surveys also yielded insights around the operational experience, performance, safety, and maintenance of double deck buses.

- **Massachusetts Regional Bus Study (2013) [6] |** This study analyzes the changes since 1980 in the regional bus services (both intrastate and interstate) that operate within Massachusetts, identifies the reasons for the changes, and examines how these regional services relate to local rail and bus services. Based on this examination, the study identifies issues that have historically prevented the retention or expansion of important services and suggested measures that could be implemented in the future to better meet the

[4] "NCHRP Research Report 861: Best Practices in Rural Regional Mobility". National Cooperative Highway Research Program, 2017. https://www.nap.edu/catalog/24944/best-practices-in-rural-regional-mobility.
[5] "North American Double Deck Bus Market Study". Arup, 2018.
[6] "Massachusetts Regional Bus Study." Central Transportation Planning Staff, 2013. https://www.ctps.org/2013_mass_bus_study

needs of un- and-underserved markets, foster desirable system growth, and promote improved mobility options in the state. The study found that despite a contraction of the service network over the last 30 years, overall fixed-route coverage in Massachusetts remains good.

Based on a review of existing conditions, trends in travel markets and service strategies, and practices in other states, this study identifies potential action items for the Commonwealth to consider for maintaining, improving, and possibly expanding the services constituting the regional bus system. For example, the study finds that the MBTA efforts to adapt smartphone fare collection techniques to the needs of the commuter rail system may offer an opportunity to develop a standard device-based media that could also be used by regional bus carriers. It also notes the potential to introduce a rural feeder service that interlines with Greyhound or other intercity carriers.

- **Designing Transit-Friendly Freeways (2019)[7] |** The research charts the key components in the design of a transit-friendly freeway, discusses policy and funding considerations, and outlines the key design features that may be incorporated during routine maintenance or reconstruction. Two of the report's case studies – bus-on-shoulder in Minneapolis/Saint Paul and Flatiron Flyer in Denver/Boulder – are carried forward into this memorandum.

- **Microtransit or General Public Demand–Response Transit Services: State of the Practice (2019)[8] |** The research helps contextualize the landscape of shuttle services in the United States. "Microtransit" generally refers to a technology-enabled transit service that is generally defined by flexible routes, on-demand service, and smaller vehicles. Microtransit services may be privately- or publicly-operated and may operate as feeders to fixed-route transit or as circulators within a community. Microtransit occupies somewhat of a "middle ground" in the transit world; it is generally less expensive per trip than traditional paratransit services but considerably more expensive per trip than fixed-route service. It is also less efficient than fixed-route service in dense areas but more efficient than fixed-route service in areas of lower density or demand.

  The research found that considerable effort is required to properly market microtransit services, and that the customers require more guidance in learning to use microtransit than fixed-route services. Successful microtransit services typically make their services more attractive to consumers by conducting extensive community outreach, offering customers traditional ways to request trips in addition to higher-tech ones, and utilizing a similar fare structure and payment method to existing fixed-route service.

  Agencies have taken different approaches towards equipment and personnel for microtransit services. While one agency cited uses its own equipment and personnel for its dial-a-ride service, the majority of agencies surveyed indicated that they provide general public demand-responsive transit using private contractors secured through the competitive procurement process. At least one agency made the decision to contract due to limited space available at its operating base. In some cases, outsourcing paratransit and demand-response services has generated substantial savings for agencies. Agencies may or may not be responsible for administrative and physical infrastructure. The Transit District of Utah staff, for example, schedules all paratransit and route deviations; builds route structures; and develops, delivers, or approves driver training. The transit agency administers all the administrative functions, including customer care. Contractors provide the driver, radio dispatcher, and the supervisor/training staff.

[7] "Designing Transit-Friendly Freeways". Arup, 2019.
[8] "TCRP Synthesis 141: Microtransit or General Public Demand–Response Transit Services: State of the Practice". Transit Cooperative Research Program, 2019. http://www.trb.org/Main/Blurbs/178931.aspx.

The research finds that flexible microtransit services are capable of connecting riders directly, thus reducing investment in fixed-route transportation infrastructure, and that a growing number of transit agencies find demand-responsive transit helpful in addressing issues of jurisdictional and socioeconomic equity. In these cases, the service enables transit agencies to fulfill their responsibilities to provide mobility and access to amenities to as many people as possible. In virtually all cases in which demand-responsive transit has been instituted, the vast majority of passengers who use the service have liked it.

- **Decision-Making Toolbox to Plan and Manage Park-and-Ride Facilities for Public Transportation: Guidebook on Planning and Managing Park-and-Ride (2017)[9] |** This guidance concerns planning and managing park-and-ride facilities—from concept to day-today management and covering key themes such as design, implementation, operation, and maintenance.

  The guidance describes how differing transit service characteristics directly affect the opportunities and requirements for park-and-rides. It also provides an overview of the relationship between park-and-rides on transit level of service and methods for estimating demand for parking. Managing demand for parking requires measurement of demand (typically calculated as a utilization rate) as well as strategic efforts to accomplish transit agency goals to increase, shift, or reduce parking demand. The guidance examines several options available to transit agencies to manage demand, noting that the effectiveness of efforts should be assessed using performance measurement techniques. The guidance also highlights best practices in marketing park-and-ride facilities and engaging the surrounding community in decision-making.

- **Use of Small Buses in Transit Service (2002)[10] |** This synthesis evaluates the use of buses 30-feet-or-less in length both as replacements for large buses in fixed-route, scheduled service and for innovative, more flexible operations (e.g., route deviation or demand-response service). It includes a survey of 94 public transit agencies in North America regarding how they use small buses. Most respondents (58%) use small buses, with a quarter using them as circulators, for demand-response service, or route deviation service. Approximately 12% used small buses as flexible feeder service.

  Case studies on the Kansas City Area Transportation Authority (KCATA), Port Authority of Allegheny County, Pennsylvania, the Suburban Mobility Authority for Regional Transportation (SMART) in suburban Detroit, and Cleveland's Lake County Regional Transit Authority (LAKETRAN) illustrate how small buses can be used in a wide range of service design concepts with very different objectives. They can be particularly useful in serving low-density suburbs where land use patterns and accessibility make traditional transit difficult.

  Overall, agencies reported four primary reasons for purchasing small buses: (1) the ability to match capacity with demand; (2) their maneuverability on small streets; (3) the positive marketing image; and (4) their value in addressing community complaints. Key factors in the successful implementation of these buses were implementation in the context of a comprehensive, coherent, and articulated strategy; dedicated data collection and monitoring as well as market research efforts; and intentionally marketing this service as "different" from a customer's perspective. The synthesis emphasizes the importance of branding these services at all levels to maximize the potential promotional benefit these services offer.

[9] "TCRP Research Report 192: Decision-Making Toolbox to Plan and Manage Park-and-Ride Facilities for Public Transportation: Guidebook on Planning and Managing Park-and-Ride". Transit Cooperative Research Program, 2017. https://www.nap.edu/catalog/24770/decision-making-toolbox-to-plan-and-manage-park-and-ride-facilities-for-public-transportation-guidebook-on-planning-and-managing-park-and-ride.
[10] "TCRP Synthesis 41: The Use of Small Buses in Transit Service". Transit Cooperative Research Program, 2002. https://trid.trb.org/view/717429.

- **Maintaining Transit Effectiveness under Major Financial Constraints (2014)**[11] | The synthesis reports on hundreds of actions implemented by transit agencies to increase their cost-effectiveness, and describes how the agencies have engaged their communities during challenging fiscal circumstances. It identifies 18 primary methods of reducing or containing expenses, including data-driven performance management systems; performance benchmarking; right-sizing vehicle fleets and using more fuel-efficient vehicles; and the use of social media for marketing and advertising and to provide more real-time information to passengers. The synthesis also advocates partnerships to help pay for service.

- **Common Sense Approaches for Improving Transit Bus Speeds (2014)**[12] | The report documents approaches to increasing average bus speeds and the impacts of those approaches on operating cost and ridership. It finds that success for many agencies lies in the ability to mitigate decreases in bus speeds resulting from increased congestion or increased ridership (i.e., dwell times). Approaches included signal priority, queue jump lanes, changes to signal timing, bus-only lanes on arterial streets, and yield-to-bus laws.

  Case studies in Columbus, Ohio; Gainesville, Florida; Nashville, Tennessee, New York, New York, San Francisco, California, and Spokane Washington yield several insights. Ensuring support from upper management when undertaking initiatives is crucial, as is establishing clear policy standards at the onset of any service or operations interventions. The case studies highlight the import of involving stakeholders, especially those who might oppose the project, early and often, and communicating via a variety of outlets and methods.

- **Uses of Higher Capacity Buses in Transit Service (2008)**[13] | The synthesis explores the use of higher capacity (45-foot, double-deck, and articulated) public transit buses in trunk, express, long-distance commuter, Bus Rapid Transit, and special (e.g., sports and special events) services in North America. The synthesis surveys selected transit agencies operating distinct higher-capacity bus fleets.

  Agencies chose to utilize higher-capacity vehicles for a variety of reasons, including the marketing impacts and passenger comfort for the 45-foot intercity coaches and double-deck buses for long-distance commuter and express services. Buses were also often deployed to address overload situations, increase operator productivity, to reduce downtown street congestion caused by large numbers of buses, to build ridership along a future rail corridor. Respondents were overwhelmingly satisfied with the higher-capacity buses.

  Some facilities and infrastructure modifications were required to accommodate higher-capacity buses, but respondents did not identify the cost of these modifications as a significant source of concern. The major reported challenges or concerns included the capital cost of the vehicle, the need to reduce dwell time to maximize vehicle efficacy, and the need to accommodate wheelchairs.

# Case Study Selection

Best practice case studies were selected with the input of the consultant team's subject matter experts and with suggestions from MassDOT (Office of Transportation Planning and Office of the Secretary of Transportation).

[11] "TCRP Synthesis 112: Maintaining Transit Effectiveness under Major Financial Constraints". Transit Cooperative Research Program, 2014. http://www.trb.org/Publications/Blurbs/171077.aspx.
[12] "TCRP Synthesis 110: Commonsense Approaches for Improving Transit Bus Speeds". Transit Cooperative Research Program, 2014. http://www.trb.org/Publications/Blurbs/170433.aspx.
[13] "TCRP) Synthesis 75: Uses of Higher Capacity Buses in Transit Service". Transit Cooperative Research Program, 2008. http://www.trb.org/Main/Blurbs/157100.aspx.

The case studies focus on one service or provider but may touch on regional approaches to shared travel. They include:

- **Community Transit**, which provides services in Snohomish County, Washington.
- **Flatiron Flyer**, which connects Denver and Boulder, Colorado.
- **Logan Express**, which carries passengers to Logan Airport in Boston, Massachusetts.
- **METRO Bus Shuttles** serving the Houston, Texas metropolitan area.
- **Team Transit**, which brings together multiple transit and transportation agencies in the Minneapolis/Saint Paul metropolitan area in Minnesota.

# Key Findings

- **What makes these agencies successful?** The case studies highlighted several success factors common across agencies. Partnership was key; agencies that coordinated with partner agencies and organizations were able to offer better service and cut costs. Team Transit provided an example of how to institutionalize a partnership, while Community Transit's work via interlocal agreement offered another example of this approach. The Flatiron Flyer and the Logan Express demonstrated the immense value of dedicated marketing and branding efforts. Houston METRO's technology-enabled shuttle services and iterative service design highlighted the importance of flexibility and accessibility. Team Transit demonstrated the impact of strategically-deployed pilots, publicizing success, and the buy-in of executive-level champions.

- **What challenges did/do these agencies face?** Whether 2008's Great Recession or 2020's COVID-19 pandemic, all agencies felt the impacts of economic downturns. COVID-19 hollowed out transit ridership almost overnight and significantly decreased sales tax revenue, generating new revenue challenges for agencies. Many agencies are looking for ways to maintain or improve service under increasingly difficult budget constraints. Another challenge is reliability, which agencies recognize as crucial to driving ridership. At the same time, rising congestion in many American cities makes reliability difficult to achieve if transit vehicles are mixed with general traffic. Several approaches towards shared travel also present new safety concerns, both real and perceived. Involving riders and drivers in decision-making can help make service safer and allay fears.

- **What can these agencies teach MassDOT?** Taken together, the case studies in this memorandum offer several lessons for MassDOT as it pursues a shared travel network. In terms of operations, Team Transit and Flatiron Flyer offer guidance in clearing snow from managed or dedicated lanes as well as maintaining communication with bus operators to ensure a clear understanding of operating challenges. Houston's METRO shuttles demonstrate the flexibility of the coach bus-based shared travel concept and the many types of unique markets it can serve. The performance of each case study service provides insight into potential data to collect; in these cases, success is measured with operational data on at least an annual basis, with common metrics including boardings, revenues, and costs. Relatedly, a focus on reliability is crucial. And finally, ensuring seamless integration of the shared travel network will require consistent coordination and partnership with regional transit agencies (RTAs), the MBTA, and other operators and stakeholders.

  These and other findings are expanded in more detail in Section 7.

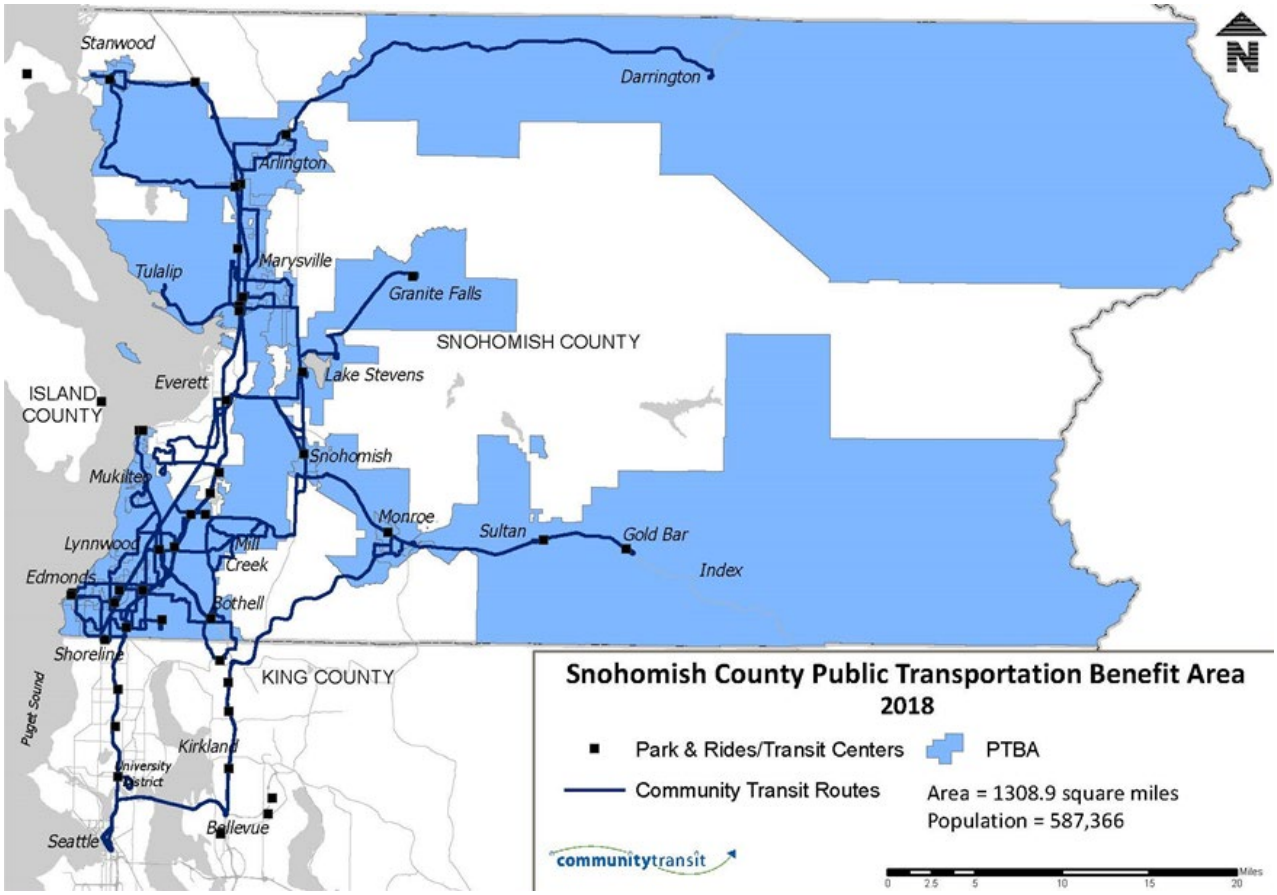
# 2 CASE STUDY | COMMUNITY TRANSIT

*(Snohomish County, Washington)*

## What is Community Transit?

The Snohomish County Public Transportation Benefit Area Corporation, or Community Transit, is a special-purpose governmental entity providing public transportation services in Snohomish County, Washington, north of Seattle. A Public Transportation Benefit Area (PTBA) is a special taxing district established for the purpose of providing public transportation. The agency's PBTA (Figure 4) has a population of more than 500,000 people, approximately half of Snohomish County's overall population. The remainder of the county's population resides in Everett, which is served by Everett Transit, and in less populated areas of north and east Snohomish County.14

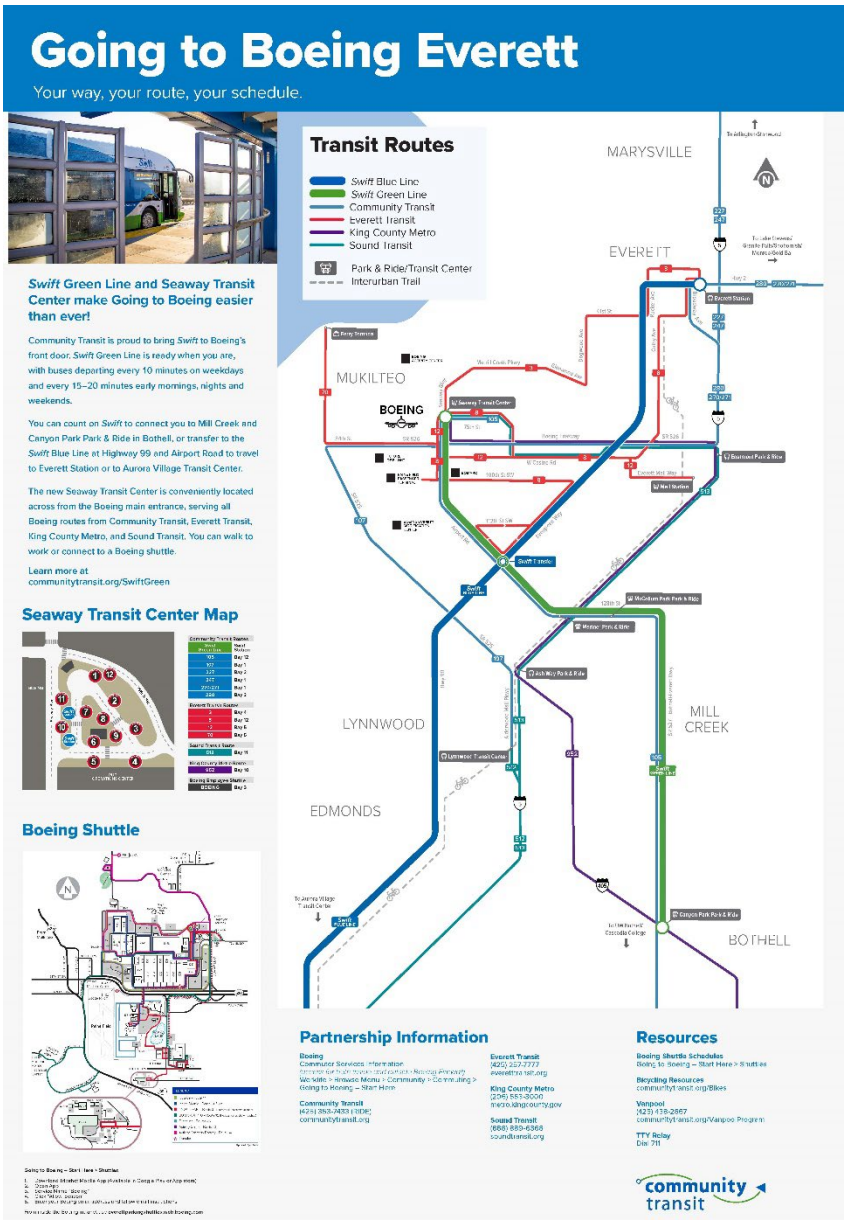
**FIGURE 3 | COMMUNITY TRANSIT PUBLIC BENEFIT AREA**




*Source: Community Transit*

[14] "Community Transit 2020-2025 Transit Development Plan". Community Transit, 2020. https://www.communitytransit.org/docs/default-source/projects/2020-transit-development-plan_adopted_11-5-20-docx.pdf?sfvrsn=75a4929e_0

**FIGURE 4 | COMMUNITY TRANSIT BOEING BROCHURE**




*Source: Community Transit*

Community Transit operates three transportation modes: bus, vanpool, and paratransit. In addition to regular bus stops, Community Transit's system includes 66 BRT stations with raised platforms, passenger shelters, benches, and off-board fare payment. It also offers tailored services for employees of the Boeing Company, the largest employer in Everett, including six dedicated routes, 14 bus stops on or adjacent to the Boeing campus, and the neighboring Seaway Transit Center (also served by Everett Transit, King County Metro, and Sound Transit).

Recognizing the need for targeted transit to this major commuter destination, Community Transit coordinates with nearby Everett Transit to serve the campus and publishes marketing materials designed to help Boeing employees navigate their transit options (Figure 4).

Community Transit connects potential vanpool riders with others through RideshareOnline.com. Once a vanpool forms, members pay one monthly fare that covers all expenses needed to keep the van on the road, including gas, maintenance and insurance. These fares are based on daily round trip miles and the size of the van. To qualify for a Community Transit Vanpool, a commute must start or end at a location within Snohomish County. Vans pick up riders at their homes and drop them at their place of work. Many local employers, such as the University of Washington and Boeing, offer Vanpool subsidies. Boeing is one major destination for such vanpools; a 2010 report found 88 vanpools routed there.[15]

## What makes Community Transit successful?

Community Transit is notable in its commitment to collaboration with agencies and communities, including:

[15]"Boeing Riders Love the Bus". Community Transit Blog, 2011. http://communitytransit.blogspot.com/2011/02/boeing-riders-love-bus.html

- **Responsiveness to Community Needs |** Community Transit's Community Programs approach incorporates communities into the planning process early on. The typical process for implementing alternative services is as follows: (1) evaluation of transportation needs and barriers; (2) formation of a community partnership; and (3) development and testing of a suite of service options uniquely tailored to the area, service, and demand.[16]

- **Inter-Agency Partnerships |** One of the eight priority areas identified in Community Transit's Long Range Transit Plan (LRTP), adopted 2011, is to coordinate with network changes being made by agencies such as Sound Transit, King County Metro, Everett Transit, Amtrak, Washington State Ferry System, and Skagit Transit. The Boeing Shuttle and bus services provide evidence of ongoing cooperation. Community Transit typically pursues these types of partnerships through an interlocal agreement (ILA).

  Community Transit's Swift BRT line, for example, is based on an ILA calling for Everett Transit to contribute 0.05 percent of its sales and use tax toward the cost of operations by Community Transit. The agreement also calls for Everett Transit to construct the northern terminus for Swift at Everett Station and to provide up to $4 million for construction of Swift stations within the city limits of Everett, as well as installation of transit signal priority technology at intersections along the Swift route.[17]

- **Coordination with Community Long-Range Planning Processes |** Community Transit's LRTP identifies a need to coordinate planned transit improvements with jurisdictions' comprehensive planning processes. The long-term goal is to ensure that, as communities foster and regulate growth, it will occur along corridors that Community Transit is able to serve, and that growth taking place in these corridors supports transit ridership to the maximum extent possible. To this end, Community Transit is represented on several local, regional and statewide organizations and committees: Snohomish County Tomorrow, an inter-jurisdictional forum of Snohomish County, Snohomish County cities and the Tulalip Tribes; the Snohomish County Transportation Coalition, an advocacy coalition that for safe, equitable and accessible transportation services; Everett Station District Alliance, a non-profit organization of stakeholders around Everett Station; Puget Sound Regional Council, a Metropolitan Planning Organization (MPO); and WSDOT's Transportation Demand Management Executive Board.

## How does Community Transit measure success?

Community Transit's TDP identifies the agency's two top priorities.

1. Provide easy access and connectivity to Sound Transit's Link light rail.

2. Innovate to improve products and services that make travel easy and safe for all.

These priorities indicate a focus on buses as rapid transit feeders and on making the system legible to users.

The LRTP establishes a set of service guidelines to assess system performance, summarized in Figure 5. Metrics are broadly divided into two categories: customer satisfaction and ridership and stewardship of public funds, which largely represents the service's cost effectiveness.

[16] "Community Transit 2020-2025 Transit Development Plan". Community Transit, 2020.
[17] "Swift Bus Rapid Transit (Community Transit and Everett Transit)". Texas A&M Transportation Institute, 2012. https://transit-mobility.tti.tamu.edu/files/2012/10/Seattle_Swift-10-26-12.pdf

**FIGURE 5 | COMMUNITY TRANSIT SYSTEM PERFORMANCE GOALS AND MEASURES**

| Measure | Baseline (2006) | Definition of Success |
|---|---|---|
| Goal: Customer Satisfaction and Ridership | | |
| Boardings per capita | 21.1 | Increase over baseline |
| Boardings per revenue hour | 15.2 | Increase over baseline |
| Customer commendations per 100,000 boardings | 2.6 | Increase over baseline |
| Customer complaints per 100,000 boardings | 31.0 | Decrease over baseline |
| Voluntary employee turnover | 0.06 | Decrease over baseline |
| Boardings per capita | 21.1 | Increase over baseline |
| Boardings per revenue hour | 15.2 | Increase over baseline |
| Goal: Good Stewards of Public Funds | | |
| Cost per passenger mile | $0.75 | Decrease over baseline |
| Cost per revenue hour (inflation adjusted) | $142 | Decrease over baseline |
| Farebox recovery | 17% | Movement towards 20% goal |
| Revenue hour per employee | 1,069 | Increase over baseline |

*Source: Community Transit*

Performance guidelines for individual routes, including those designed to serve Boeing, center on three key questions. These three areas of focus – productivity, on-time performance, and load factor – are standard measures of performance. Somewhat less standard is the emphasis on bus interval rather than bus arrival time and the explicit focus on headway-based service.

- **Is the service productive?** The most common performance measure for service productivity is the number of passengers boarding in an hour of service. Guidelines for each route classification are based upon realistic performance expectations for this type of service. For example, Swift services should ultimately carry more than 35 passengers per revenue hour.

- **Do buses run on time?** As Community Transit moves towards headway-based service on its Swift routes, the agency is emphasizing the proper interval between buses over their actual arrival time. With frequent service, customers can arrive at a bus stop knowing that a bus will arrive within a few minutes. Bus bunching should be avoided.

- **Does everyone have a seat?** When the load factor exceeds 1.0, people riding the bus are standing. Standing loads are acceptable for short distances, so long as individuals are not crushed together. Thus, both Swift and Corridor Based Routes will accept some standing passengers. This is less desirable if the standing load lasts for prolonged periods of time.

## What can Community Transit teach MassDOT?

Community Transit was selected as a case study in large part because of its comprehensive service to a major regional employer located outside of the Seattle downtown core. Furthermore, Community Transit demonstrates

a commitment to productive interagency partnerships that MassDOT could emulate in its shared travel approach. Specifically, it presents the following best practices for MassDOT:

- **Create Alternative Commute Options |** It is an observed best practice to serve major employment centers with a mix of service options to sufficiently capture the range of commuting preferences, and Community Transit illustrates this by offering some bus, vanpool, and BRT services designed to serve Boeing employees. Community Transit's Boeing shuttle is part of the agency's Community Programs process which establishes alternatives to fixed-route services in areas where geographical coverage service gaps exist or where demand for other transportation options is high. These services could range from ridesharing partnerships, real-time rideshare, community vans, or other innovative ways to provide mobility responsive options to community needs.

- **Partnerships Improve Efficiency |** Community Transit's partnership with Everett Transit allows both agency's to better serve the needs of Boeing employees. Similarly, the development and implementation of Swift BRT was in large part an exercise in relationship-building; planning and development of Swift moved forward once each agency realized that it was in its best interest to develop the service and share the costs.[18]

## What challenges did/does Community Transit face?

One of the biggest challenges facing Community Transit is rising regional congestion, which makes it more difficult to maintain the transit network's on-time performance and reliability. As the Puget Sound Region continues to grow, congestion on major highways and arterials is expected to increase. As such, Community Transit has made investments in its transit network alongside initiatives focused on managing travel demand. This includes its Curb the Congestion program, which aims to reduce vehicle trips along arterial corridors through the use of incentives and information.

Similar to most transit agencies, Community Transit is currently managing a drastic decrease in ridership due to the COVID-19 pandemic. The agency has cancelled planned service expansions in fall 2020 and anticipates a sales tax decline of 16 to 26 percent ($25 to $40 million) as a result of the pandemic-induced economic recession.[19] Community Transit's primary funding comes from a voter-approved 1.2% sales tax within the service district. Sales tax revenue typically accounts for 65 to 70 percent of Community Transit's operating budget.[20]

[18] "Swift Bus Rapid Transit (Community Transit and Everett Transit)". Texas A&M Transportation Institute, 2012. https://transit-mobility.tti.tamu.edu/files/2012/10/Seattle_Swift-10-26-12.pdf
[19] "Presentation to the Board of Directors: COVID-19 Pandemic Financial Impacts". Community Transit, 2020. https://www.communitytransit.org/docs/default-source/default-document-library/covid-19-financial-update-final-6-4-20.pdf?sfvrsn=6f65b1f5_0
[20] "Budget and Financial Information. Community Transit, 2020. https://www.communitytransit.org/budget

# 3 CASE STUDY | FLATIRON FLYER

*(Denver/Boulder, Colorado)*

## What is Flatiron Flyer?

The Flatiron Flyer is an express bus along US Route 36 that connects Denver, Aurora, and Boulder, Colorado. It is operated by the Regional Transportation District (RTD) and provides both local ("all-station") and express service on the 18 miles of express, or managed, lanes between Denver's Union Station and Downtown Boulder Station. In addition to managed lanes, Flatiron Flyer runs with additional provision for bus-on-shoulder operations. During peak hours, the bus runs on 4-to-15-minute headways, with 15-minute headways during off-peak times. Buses run 21 hours per day, and total ridership in 2019 was 3,366,476. RTD uses unified, deliberate branding and marketing for Flatiron Flyer, including the bus shown in Figure 6.

**FIGURE 6 | FLATIRON FLYER BUS**

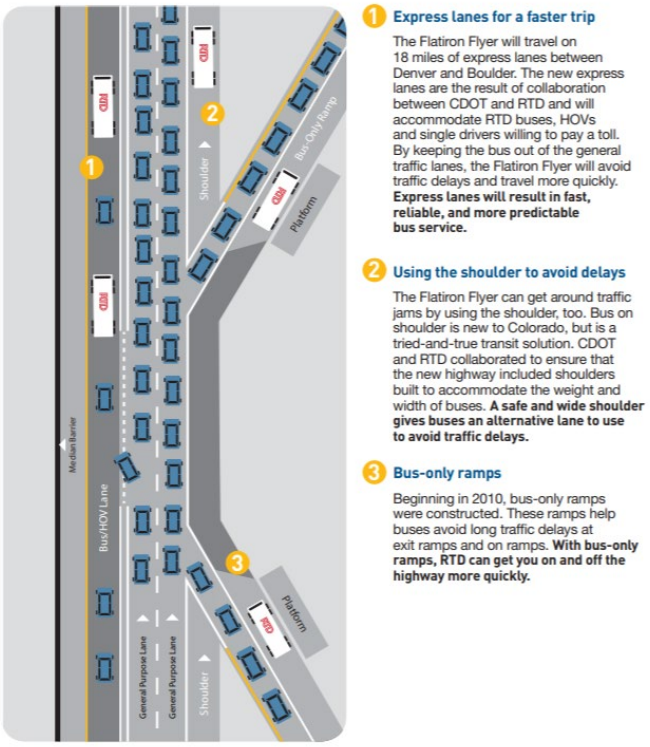



*Source: RTD*

The US-36 corridor reconstruction began in 2004 when voters passed a 0.4% sales tax for the FasTracks multimodal transportation expansion and improvement program. An environmental impact statement examining how best to serve the existing bus service's large rider base had initially called for both rail and improved bus service – a political compromise and an acknowledgment of the high-quality amenity provided by existing bus operations. The rail component was ultimately shelved.

The founding premise of the US-36 project was that service levels would drive ridership. In particular, the productivity of existing service – which was already commute-oriented – could be increased dramatically by providing bidirectional service throughout the day. Service planners at RTD consolidated about 13 to 15 routes

**FIGURE 7 | SPEED AND RELIABILITY APPROACHES**




**1 Express lanes for a faster trip**

The Flatiron Flyer will travel on 18 miles of express lanes between Denver and Boulder. The new express lanes are the result of collaboration between CDOT and RTD and will accommodate RTD buses, HOVs and single drivers willing to pay a toll. By keeping the bus out of the general traffic lanes, the Flatiron Flyer will avoid traffic delays and travel more quickly. **Express lanes will result in fast, reliable, and more predictable bus service.**

**2 Using the shoulder to avoid delays**

The Flatiron Flyer can get around traffic jams by using the shoulder, too. Bus on shoulder is new to Colorado, but is a tried-and-true transit solution. CDOT and RTD collaborated to ensure that the new highway included shoulders built to accommodate the weight and width of buses. **A safe and wide shoulder gives buses an alternative lane to use to avoid traffic delays.**

**3 Bus-only ramps**

Beginning in 2010, bus-only ramps were constructed. These ramps help buses avoid long traffic delays at exit ramps and on ramps. **With bus-only ramps, RTD can get you on and off the highway more quickly.**

*Source: RTD*

into a final total of six or seven routes, one of which is an express service. The consolidated routes share an approximate origin in Denver but serve more disparate destinations.

To guarantee effective travel times for local service, RTD designed for bus-on-shoulder operations when general traffic slows below 35mph. The managed lanes are separated by buffers (painted pavement) rather than barriers/walls to more efficiently allow for snowplowing. All stations along the corridor were effectively already in existence as park-and-rides. Formerly, buses pulled off the highway, looped through to the park-and-rides, and reentered US-36. The initial concept was to move loading areas closer to the highway – to pullouts on highway interchange ramps – to improve bus speed and reliability. The US-36 coalition considered moving stations into the center of the right-of-way but ultimately agreed that freeway ramp stations offered a better, more comfortable customer experience. These enhanced, updated stations at Park-n-Rides feature large modern shelters, digital bus arrival/departure displays, and self-service ticket vending machines. Bus-only ramps were constructed in 2010 in order to help buses avoid long traffic delays at exit ramps and on ramps (Figure 7).

Designed and named in collaboration with stakeholders to reflect the unique attributes of the service and its Rocky Mountain surroundings, the Flatiron Flyer delivered a 45% increase in ridership in active service (14,428 daily riders versus 9,932) in a four month timeframe.

## What makes Flatiron Flyer successful?

To educate existing customer about the important changes involved in merging nine routes into a new service, RTD rolled out the Flatiron Flyer alongside an extensive marketing campaign that included print, online, and out-of-home advertising. The campaign prominently featured the new bus and its attributes within known locales across its service area. RTD estimated 46 million “total impressions” from the initial campaign. Messaging was designed to position the new service as a member of the community, providing vital connections and included multiple channels, including:

- Posters and Banners | Four poster designs highlighted the comfort, usefulness, and convenience of the new service. Nontraditional outlets, such as banners at the Flatirons Mall along the service route, raised visibility.
- Direct Mail and Swag | RTD also sent direct mail to 60,000 homes along the new corridor. Packages ranged in content, but included branded lanyards, magnets, and brochures. The agency also held giveaways of t-shirts, pens, other items in branded colors at community events.

- Online Marketing | Graphic design on the agency's website that illustrated changes and conveyed timetables and trip calculations. To diversify the mix of outlets, RTD paid to reskin a variety of high-traffic consumer websites with messaging on the service, an approach that resulted in an additional 3.2 million impressions.

The culmination of the marketing campaign was free ride day, when thousands of riders participated in the opportunity to ride the new buses for free.

Figure 8 illustrates some examples of Flatiron Flyer marketing materials.

**FIGURE 8 | FLATIRON FLYER MARKETING MATERIALS**




*Source: RTD*

# How does Flatiron Flyer measure success?

Success, and thus service allocation, is driven by RTD's mission statement:

> *"To meet our constituents' present and future public transit needs by offering safe, clean, reliable, courteous, accessible cost-effective service throughout the District."*

Service standards are designed to specifically address reliability and cost-effectiveness. The measures of these qualities are passengers/hour (productivity); passengers/trip (regional class productivity); and subsidy/passenger (cost effectiveness).

Routes that perform minimally are allocated minimum service frequency, typically every 30 minutes during peak periods and 60 minutes off-peak. RTD has determined that 25 boardings per hour represents the typical minimum productivity for a route to justify 15-minute frequency, while 40 boardings per hour justifies 10-minute frequency.[21]

RTD's Transit Service Policies & Standards establish guidelines for route performance. These standards specify that routes should be evaluated for marketing, revision or elimination if they are 1) in the least productive 10% based on either subsidy per boarding, or 2) if both measures fall below 25%. Figure 9 illustrates the acceptable performance domain containing all routes meeting the 10% minimum/maximum for each class of service. The 10% and 25% standards are drawn from annual, un-weighted data and assume the data to be normally distributed. For regional routes, the average subsidy per boarding is $6.68, while the average boardings per hour is 32.2.[22]

**FIGURE 9 | RTD SYSTEM PERFORMANCE GOALS AND MEASURES**

| Service Class | Subsidy per Boarding | | | Boardings per Hour | | |
|---|---|---|---|---|---|---|
| | Average | 10% Max | 25% Max | Average | 10% Max | 20% Max |
| System Overall | $7.19 | | | 32.6 | | |
| CBD Local | $5.04 | $8.77 | $6.99 | 30.9 | 17.7 | 24.0 |
| Urban Local | $5.09 | $9.46 | $7.38 | 29.1 | 15.1 | 21.8 |
| Suburban Local | $7.67 | $12.80 | $10.36 | 19.5 | 10.1 | 14.6 |
| Regional | $6.68 | $15.16 | $10.90 | 32.3 | 10.4 | 20.8 |
| FlexRide | $22.60 | $34.09 | $28.61 | 3.5 | 1.9 | 2.7 |
| Rail | $10.52 | $17.82 | $14.34 | 126.5 | 62.0 | 92.7 |
| Mall | $1.25 | | | 181.8 | | |
| Access-a-Ride & Cab | $48.44 | | | 1.4 | | |
| Vanpool | $2.90 | | | 2.7 | | |

*Source: RTD*

[21] "Transit Service Policies & Standards". Regional Transit District, 2016. https://www.rtd-denver.com/sites/default/files/files/2017-06/service-standards-7-2016.pdf
[22] "Service Performance 2019". Regional Transit District, 2020. https://www.rtd-denver.com/sites/default/files/files/2020-07/2019-Family-of-Services-Tables-and-Charts.pdf

As shown in Figure 10, Flatiron Flyer performed above average in 2019 in both subsidy per boarding and boardings per hour for regional routes. It also easily met the performance threshold (25 boardings per hour) to justify 15-minute headways.

**FIGURE 10 | FLATIRON FLYER PERFORMANCE METRICS, 2019**

| Measure | Baseline (2006) |
|---|---|
| Fare Revenue | $6,743,627 |
| Operating Costs | $23,360,810 |
| Total Boardings | 3,366,474 |
| In-Service Hours | 9,426 |
| Net Subsidy | $16,617,183 |
| Subsidy per Boarding | $4.94 |
| Boardings per Hour | 36.03 |

*Source: RTD*

# What can Flatiron Flyer teach MassDOT?

Flatiron Flyer was selected as a case study primarily because of its effective unified branding and marketing approach. It also illustrates a case where coach bus transit was developed in concert with managed lanes in an urban area. Specifically, it presents the following best practices for MassDOT:

- **Establish Unified Branding |** Flatiron Flyer is a distinctive service in part because of its highly unified and intentional branding. The service's dual color scheme is designed to be unique and easily identifiable to commuters, while the graphic design is meant to evoke movement and speed. The "unveiling" of this new design allowed an opportunity for local news outlets to detail the additional upgraded features of the Flatiron Flyer vehicles, such as chargers, bicycle racks, and footrests. This coverage complemented the marketing messaging, which focused on comfort and speed.

- **Managed Lanes Can Support Coach Bus Transit |** The founding premise of the US-36 project was that service levels would drive ridership. RTD recognized that managed lanes were crucial to guaranteeing effective travel times for local service. Further, the managed lanes in this case have been effective without significant infrastructure investments; due to weather constraints, the managed lanes used by the Flatiron Flyer are separated by painted buffers rather than barriers or walls.

- **Approach Marketing with Creativity |** In addition to more traditional print outlets, Flatiron Flyer marketing targeted several less-traditional outlets, such as paid consumer digital advertising and direct mail with branded items. This allowed impressions on new groups of potential riders, including those who might not have already been regular transit riders.

- **Partnerships Bolster Funding |** The development of US-36 was a close partnership between the Colorado Department of Transportation (CDOT) and RTD. After an initial lack of funds, CDOT sourced partial funding through grants, but still required a local funding match. RTD contributed $120 million to the initial design-build phase, which covered the first 11 miles of the project. The following six miles of construction were

funded by a P3 concession – CDOT's first – supported by additional RTD funds. In total, RTD contributed around 40 percent of the funding for the first phase of the project.

## What challenges did/does Flatiron Flyer face?

The Flatiron Flyer is a component of FasTracks, RTD's larger transit-expansion program. FasTracks was approved in 2004, creating a 0.4% sales tax to fund the $6.5 billion regional transportation expansion and improvement program. The FasTracks plan included nine new rapid transit corridors as well as an array of other multimodal projects, including light rail, Park-n-Rides, and bus network enhancements. Soon after, though, the economic downturn dramatically shrunk the sales tax revenue on which the program depended. Coupled with rising construction costs associated with the price of concrete, steel, and copper, RTD struggled with a significant funding gap and frustration from the public surrounding delayed or unfinished construction of FasTracks projects.[23] Four corridors and extensions (shown in Figure 11) remained incomplete as of 2019, with funds for their completion neither identified nor committed:

**FIGURE 11 | FASTRACKS PROJECTS, 2011**




1. The Northwest Corridor from Westminster to Longmont.

2. The North Metro Corridor from 124th Avenue to State Highway 7.

3. The Central Corridor Extension from 30th and Downing to 38th and Blake.

4. The Southwest Corridor Extension from Mineral to C-470 and Lucent.

Though the Flatiron Flyer project is largely complete, as of 2019 there were $40 million in unfunded project cost estimates associated with the project, with three additional capital scope items remaining unfunded but committed: Broomfield Park-n-Ride structure; Broomfield pedestrian bridge extension; and Church Ranch Station boarding platforms relocation.

RTD has expressed a commitment to exploring options for fulfilling all capital and operations and maintenance funding for the remaining FasTracks projects, including: reduction of debt; federal grants; private sector involvement; and project scope review.[24]

[23] " A Candid Conversation with Dave Genova". Regional Transportation District, 2020. https://www.rtd-denver.com/news-stop/news/candid-conversation-dave-genova

[24] "Initial Unfinished Corridors Report". Regional Transportation District, 2019. Initial Unfinished Corridors Report. https://drcog.org/sites/default/files/event-materials/2019-FasTracks-Unfinished-Corridors-Report-draft-6-14-002.pdf

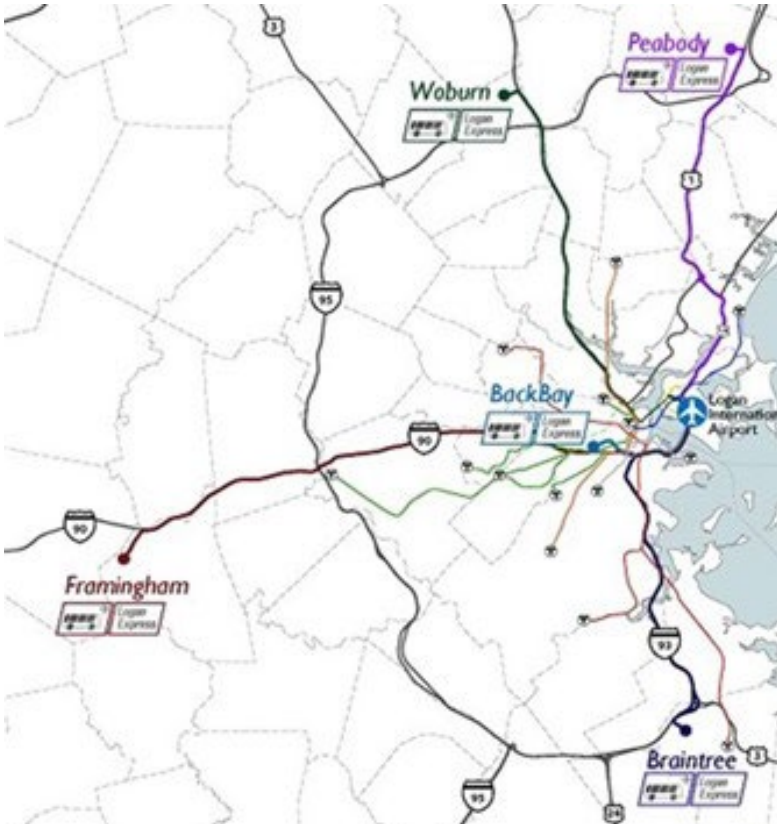
# 4 CASE STUDY | LOGAN EXPRESS

*(Boston, Massachusetts)*

## What is Logan Express?

Logan Express, operated by the Massachusetts Port Authority (Massport), carries passengers from an urban streetside location in the Back Bay and four park-and-ride facilities in the Boston Area (shown in Figure 1) to Logan International Airport (Back Bay and the Peabody and Woburn suburban services are currently suspended due to COVID-19). It served approximately 2.2 million riders in 2019, a 14% increase from the year prior and a 67% increase from 2009.[25]

**FIGURE 12 | LOGAN EXPRESS LOCATIONS**




In 2019, Massport set a goal to double ridership to 4 million trips by the time it reached 50 million annual air passengers. To help accomplish this growth, Massport planned to initiate an additional streetside pickup service at North Station in spring 2020 (before COVID-19 impacted air passenger demand and put the plans on hold) and had commenced exploring expansion to an additional suburban park-and-ride site (at a location to be determined). Massport still plans to significantly expand one of the park-and-ride facilities in Framingham, MA; however, expansion plans have been deferred due to COVID-19.

Logan Express buses are operated by contract service providers (a different contracted bus operator serves each park-and-ride location).[26] The contracted operators provide dedicated coach buses with Logan Express branding. The coaches feature reclining seats, power outlets with USB charging, and lavatories.

Park-and-ride facilities are planned to be updated to feature live-updated flight schedule boards and branding and signage consistent with the rest of the air passenger experience at the Airport. Currently this feature is available at the Framingham site.

[25] Visual Materials for Massachusetts Port Authority Board Meeting, January 16, 2020.
[26] Request for Proposals for Boston-Logan International Airport Framingham Logan Express Bus Service, Massachusetts Port Authority, September 7, 2017.

# What makes Logan Express successful?

Several factors have contributed to the success of Logan Express:

- **Congestion |** Logan Airport is located in close proximity to Downtown Boston, on the far side of the Sumner, Callahan, and Ted Williams Tunnels from much of the regional population. Consequently, the significant peak hour congestion studied in *Congestion in the Commonwealth 2019* has an impact on access to the Airport. Logan Express is critical component of Massport's ground access strategy to move more people in fewer vehicles and to promote high-occupancy vehicle (HOV) use.

- **Parking and TNC Policies |** Parking capacity at Logan Airport is regulated under Massachusetts Law (301 Mass Reg. 7.30, aka Logan Parking Freeze). While the maximum parking capacity has been increased over time – most recently in 2017. Limited commercial and employee parking capacity at the Airport property combined with the limits on private, off-site parking imposed by the East Boston Parking Freeze and the surrounding urban environs create significant parking capacity crunches during peak travel periods. Logan Express was initially introduced as a pilot program offering remote parking and shuttle services during periods of time where parking demand typically exceeded Logan parking capacity. The service became permanent and has expanded over time.

  Of the approximately 26,000 parking spaces allocated as part of the Logan Parking Freeze, less than 2,500 are allocated to approximately 24,000 Airport employees. As such, nearly 40 percent of Logan Express ridership are employees commuting to work.

  FIGURE 13 | LOGAN EXPRESS PICK-UP

  Over the past five years, partially driven by the limited availability of parking at the Airport and mostly by the general societal growth in the use of such services, Transportation Network Companies (TNCs) such as Uber and Lyft have gained a significant presence at Logan. The trips produced by these services – both when they are picking up or dropping off travelers and when they are deadheading to and from the Airport – significantly increased congestion both on the Airport roadways and in the tunnels and highways used to access it. Consequently, Massport consolidated TNC activity to the central garage to facilitate the matching of TNC drivers dropping off at Logan to airport users requesting a pickup, thereby significantly reducing deadhead trips. Massport also increased TNC fees to help fund the centralization program, while leveraging recently expanded Logan Express capacity and lower Back Bay Logan Express pricing to offer travelers additional ground access alternatives.[27]

- **Incentives |** Massport has been aggressive in marketing Logan Express as a convenient and viable option for its air passengers. In addition to consistent branding on Airport properties, Logan Express Back Bay riders also receive a "ticket-to-skip", access to a Transportation Security Administration priority line to shorten

[27] "Ride App Operations at Logan Begin Move to Central Location", Massachusetts Port Authority, Press Release, October 18, 2019. https://www.massport.com/massport/media/newsroom/ride-app-operations-at-logan-begin-move-to-central-location/

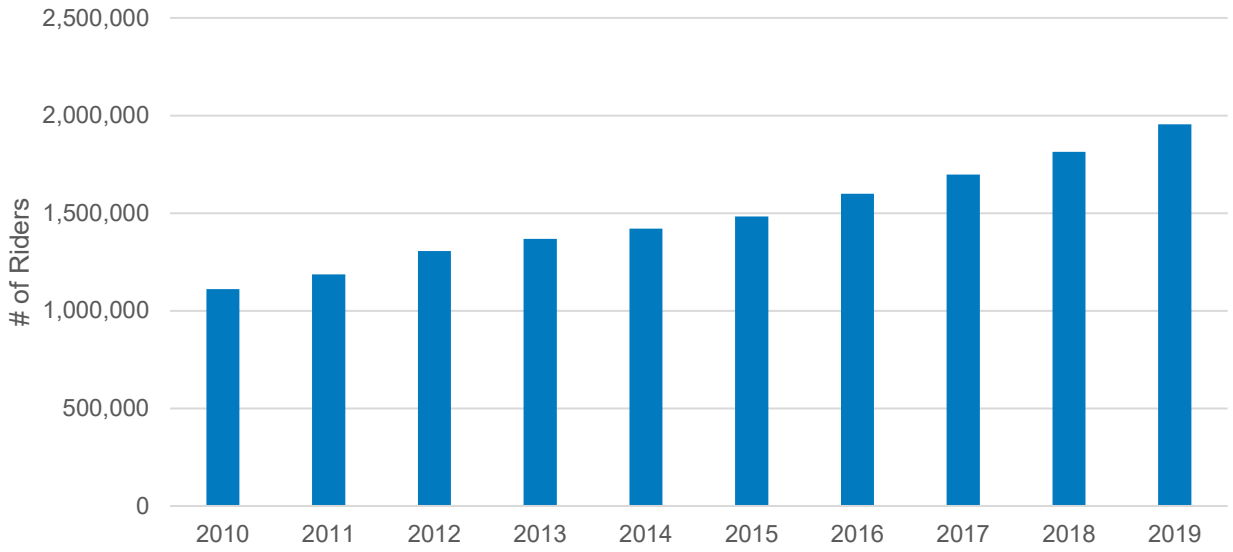
the wait for airport security (since May 2019). [28] Massport has also keeps its Logan Express pricing (tickets and parking) competitive with other ground access modes. For example, the outbound trip on the Back Bay service have been free since May 2019 and Massport provides free rides for children during school vacation weeks.

## How does Logan Express measure success?

Massport's commitment to Logan Express is grounded in a measurable commitment to moving people, not vehicles, the same mandate that has been identified as a driving principle at MassDOT. The primary metric used by Massport to measure the success of its Logan Express service is annual ridership growth and comparing that growth to air passenger growth.

As shown in Figure 14, Logan Express ridership has increased consistently over the past ten years. From 2010 to 2019, Logan Express ridership growth outpaced air passenger growth, growing over 75 percent while air passenger volumes increased 55 percent during the same period.

**FIGURE 14 | LOGAN EXPRESS RIDERSHIP, 2010-2019**




## What can Logan Express teach MassDOT?

The first and most important takeaway from Logan Express for MassDOT is that coach bus-based shared travel can and does work in the Boston Area. This is reinforced by existing regional bus service for which MassDOT owns and supplies buses to seven operators through the BusPlus program (BusPlus primarily provides support for intercity or interregional routes connecting Massachusetts metropolitan areas to each other and to neighboring states, rather than for commuter services within the Boston Area). Massport may be a partner for MassDOT in developing future park-and-ride facilities, as it has suggested it may consider pursuing satellite parking facilities and Logan Express terminals at MassDOT properties in the future.

[28] Adam Vaccaro, "If you take this bus to Logan Airport, Massport will let you cut the security line". *The Boston Globe*, May 1, 2019. https://www.bostonglobe.com/metro/2019/05/01/massport-has-deal-take-bus-cut-security-line/MdzqNrHuIkruuQcQaodwiK/story.html

At an operational level, Logan Express has had several successes that MassDOT could look to emulate, including:

- **Effective Incentives |** While the specific incentives used for Logan Express, such as the priority TSA line, do not perfectly apply to potential MassDOT services, the approach does. MassDOT can study the people who use or could use their services, understand what they value, and use it to induce new ridership. In the case of shared travel for congestion reduction, the use of queue skipping in different contexts – at signals and in freeway traffic jams, may be as effective as queue skipping in the Airport.

- **Unified Branding |** Massport's unified branding scheme is effective enough that users are likely unaware that the agency does not own or operate Logan Express vehicles. BusPlus-funded regional services retain their operators' branding, limiting their ability to be perceived as a unified regional network.

- **Mode Choice Modeling |** Massport employs a mode choice model to help quantify the impacts of potential Logan Express locations and various policy and program alternatives. This mode choice model was developed with the assistance of a consultant team and is based on an air passenger survey which included stated preference questions and respective responses. The model, for example, aided in the decision to move forward with Logan Express Back Bay service changes in May 2019 (no charge from the airport, reduced price to the airport, and priority TSA line access) was based in part on modeling that accurately estimated a near tripling of ridership.

## What challenges did/does Logan Express face?

COVID-19 has significantly impacted the airline industry and, as a result, Logan Express ridership. This drop in ridership demand resulted in the suspension of service for three services (Peabody, Woburn, and Back Bay) and service reductions to the other two. Furthermore, COVID-19 has significantly reduced the revenue of airport operators such as Massport, with lost revenue from landing fees, gate rentals, concessions, parking, and nearly every other source. Facing a $400 million budget gap over the next several years and air passenger activity projections trailing its most pessimistic forecasts, Massport has begun to reduce its workforce and defer or cancel capital projects. The airline industry has shown a history of resiliency and Massport hopes to restore Logan Express service, commensurate with air passenger demand.

Prior to COVID-19, congestion on regional roadways impacted Logan Express travel time and reliability. It is unclear how traffic (and congestion) will rebound on regional roadways as the workforce returns to the office, given the potential mode shifts from shared-ride modes resulting from perceived risk of contracting COVID-19, unemployment levels, and potential permanent shifts to work from home. Budget and service is difficult given this uncertainty.

Should travel begin to recover over the next few years, it is unclear whether demand for Logan Express will recover immediately as parking demand remains below capacity and security lanes move quickly. Additionally, demand on shared-ride and HOV modes, such as Logan Express, may lag due to the perceived risk of potential exposure to COVID-19 due to inability to properly social distance in an enclosed area. Furthermore, Massport may not have the ability to draw service back up quickly with its smaller staff and budget limitations.

# 5 CASE STUDY | METRO BUS SHUTTLES

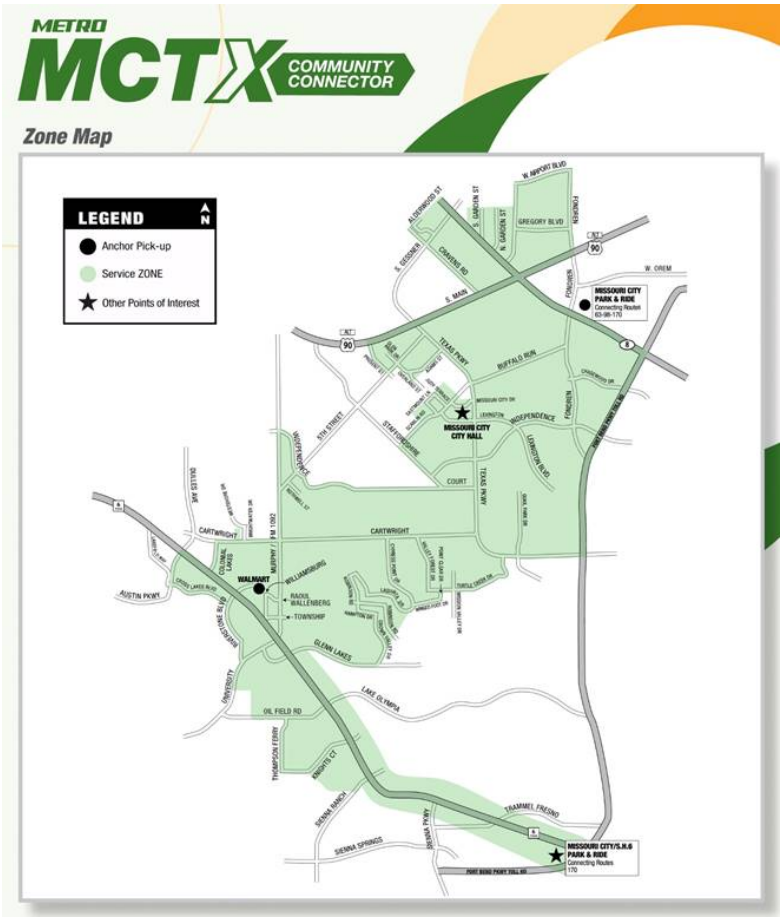
*(Houston, Texas)*

## What is METRO's shuttle system?

The Metropolitan Transit Authority of Harris County (METRO) is the Houston-based agency that provides public transportation in Harris County, Texas. METRO's bus service includes 114 fixed-routes and 21 Transit Centers. METRO's network serves 1,303 square miles — including the City of Houston, much of unincorporated Harris County, and fourteen smaller cities — through bus, rail, paratransit, vanpool, and shuttles.

METRO is widely known for having reconfigured its fixed-route bus network in 2015 through its System Reimagining Plan. This effort was spurred by recognition of wider shifts in Harris County's population, job centers, and other conditions and an understanding that the city's hub-and-spoke network no longer adequately served residents. The redesign increased the number of routes offering frequent service, provided weekend service on all local routes, connected bus routes with new rail lines, and adopted a more efficient grid-based system. These more efficient, linear routes were designed to better span the full range of Houston's disperse metropolitan area.[29]

**FIGURE 15 | METRO COMMUNITY CONNECTOR ZONE MAP**




METRO uses smaller vehicles and customized service tailored to specific communities or route needs. Included in this group are the following offerings:

- **Community Connector |** Community Connector provides curb-to-curb service in zones (as illustrated in Figure 15) where it is difficult for residents to access regular bus service. Residents can call for a ride up to an hour ahead or schedule a ride. The cost is the same as regular bus service. METRO's Community Connector has its own dedicated dispatch team and drivers. The connectors were created after METRO redesigned its bus network, aimed at filling in gaps in the service area. The primary goals of establishing demand-response transit were (a) to continue to offer service in

[29] "METRO Highlights". Metropolitan Transit Authority of Harris County, 2018. METRO Highlights. https://www.ridemetro.org/MetroPDFs/AboutMETRO/METRO-Highlights-2019.pdf

an area where fixed-route bus service was ineffective, (b) to continue to offer service in an area where fixed-route bus service was costly, and (c) to test the potential viability of an alternative service concept for other areas where fixed-route bus service was costly and ineffective.[30] Daily boardings for the Community Connector service averaged 537 on weekdays and 229 on weekends in 2019.

METRO encourages riders to use these services as a first- and last-mile connector; METRO's website explains that the connectors are designed to "connect you with METRO's larger transportation network at anchor points within the zone. For instance, your 'first mile' of traveling may be on a Community Connector between your residence and an anchor point, where you transfer to another METRO service."

- **Harris County Jury Shuttle |** METRO's 418 Harris County Jury Shuttle offers weekday service every 20 minutes to and from the District Attorney's office (and other stops along the way). The shuttle is free for jurors, while non-jurors pay the standard METRO fare.

- **311 Bayou Event Shuttle |** This shuttle serves the Harris County Public Delinquent Tax Auction, which is the monthly public auction of real estate for past due property taxes. The shuttle itself is free; riders pay $5 to park at the Fannin South Transit Center or can transfer from the METRORail Red Line at Fannin South Parking. In some forums, the shuttle is marketed with distinctive branding, illustrated in Figure 16.

**FIGURE 16 | METRO SOCIAL MEDIA MARKETING FOR BAYOU EVENT SHUTTLE**




*Source: METRO*

## What makes METRO's shuttle system successful?

Among others, METRO's shuttle system has been successful due to two key factors:

[30] "Microtransit or General Public Demand–Response Transit Services: State of the Practice." Transportation Research Board, 2019. https://www.nap.edu/download/25414

- **Technology-Forward Service |** METRO has looked to integrate new technologies into the customer service process. To illustrate: in Fall 2020, METRO debuted an application called "curb2curb" that allows riders to book trips with the agency's on-demand shuttles. The app brings interaction akin to ride hailing to shuttle users in Metro's three established Community Connector zones, including the ability to rate the service and the driver. These initial zones were selected for the application due to high need but sporadic transit use in the area; the application is thought to be a way to increase access and encourage consistent transit use.

- **Iterative Service Design |** METRO continuously retools routes as needed to best serve riders; the Houston Chronicle characterizes the Community Connectors as routes that "took years to tweak into their current forms.[31] The 364 Missouri City Flexi Route is an example of this iterative process; the line was discontinued in early 2020 and the 363 Missouri City Community Connector will be expanded to include portions of the discontinued area instead.[32]

## How does METRO measure success?

The State of Texas mandates that METRO report performance indicators and outcomes via quadrennial performance audits. [33] These audits assess compliance with legal code, collection of basic statistics, and performance. Performance must be assessed in one of three areas: administration and management, transit operations, or system maintenance. Each functional area must be addressed once every three audit cycles.

METRO's most recent audit covered Fiscal Years 2012-2015 and focused on transit operations.[34] Specifically, the audit reported operating cost per passenger, revenue hour, and revenue mile; sales and use tax receipts per passenger; fare recovery ratio; average vehicle occupancy; on-time performance; accidents her 100,000 total miles; and miles between mechanical road calls. Selected indicators are summarized in Figure 17 for the system as a whole and for METRO's bus service.

**FIGURE 17 | METRO OPERATIONS PERFORMANCE GOALS AND MEASURES, FY2015**

| Measure | METRO Overall | | Metro Bus Only | |
|---|---|---|---|---|
| | FY 2015 | Increase FY15/FY12 | FY 2015 | Increase FY15/FY12 |
| Operating cost per passenger | $5.66 | 10.7% | $5.52 | 9.3% |
| Operating cost per revenue hour | $121.06 | 11.7% | $131.68 | 3.4% |
| Operating cost per revenue mile | $8.13 | 11.4% | $8.39 | 7.7% |
| Fare Recovery Ratio | 13.7% | | 15.85% | |
| Average vehicle occupancy | 956 | 1.4% | 10.77 | 1.7% |
| On-time performance | | | 71.3% | |
| Accidents per 100,000 total miles | | | 0.75 | |

[31] Doug Begley, "Metro has lost half its riders, but still has a $7.5B plan for new projects". *Houston Chronicle*, November 2, 2020. https://www.houstonchronicle.com/news/houston-texas/transportation/article/Metro-has-lost-half-its-riders-but-still-has-a-15689817.php

[32] Krisi Nix, "METRO rolls out changes to Missouri City Bus Services". *Houston Chronicle*, January 31, 2020. https://www.chron.com/neighborhood/sugarland/news/article/METRO-rolls-out-changes-to-Missouri-City-bus-15021079.php

[33] Texas Transportation Code § 451.454

[34] "Fiscal Years 2012-2015 Performance Audit". Metropolitan Transit Authority of Harris County, 2017. https://www.ridemetro.org/MetroPDFs/FinancialAuditInformation/Audit/FY12-FY15-State-Performance-Audit-Task-2.pdf

*Source: METRO, 2017*

As part of Houston METRO's System Reimagining Plan, METRO's board of directors approved a "coverage" service category (representing the need to fill in between high-ridership routes) that is not subject to the same performance metrics as METRO's ridership–based service categories.[35] This set of additional metrics indicates a recognition that services designed primarily to fulfill coverage goals would ordinarily appear poor-performing if evaluated based on more traditional metrics. Figure 18 includes selected performance metrics for one Community Connector route (Acres Homes).

**FIGURE 18 | METRO COMMUNITY CONNECTOR ROUTES PERFORMANCE DATA, FY2017**

| Service | Weekday | Saturday | Sunday |
|---|---|---|---|
| Annualized passenger boardings | 43,998 | 4,817 | 3,776 |
| Subsidy per boarding | $29.29 | $22.77 | $20.48 |
| Operating ratio | 2.7% | 3.0% | 3.0% |
| Boardings per revenue mile | 0.34 | 0.30 | 0.32 |
| Boardings per revenue hour | 2.50 | 2.19 | 2.35 |

*Source: METRO, 2019*

## What can METRO's shuttle system teach MassDOT?

METRO's shuttle system was selected as a case study because of its unique attention to trip purpose. Specifically, its best practices include:

- **Community Connector Model to Fill Gaps |** METRO created Community Connectors after its bus network redesign in order to fill in specific gaps where regular bus service was not feasible. This allowed the agency to adopt a more efficient grid-based system while still serving outlying areas. As will be noted below, METRO is also considering its shuttle service as a stopgap for expansions of other modes that have been delayed due to COVID-19.

- **Shuttles for Highly Specific, Irregular Trips |** The shuttles serving those reporting for jury duty and attending the delinquent tax auction provide good examples of how shuttles can serve highly specific but irregular trips where demand is not high or consistent enough to justify fixed-route regular service.

- **Use Pilots to Win Over Skeptics |** In interviews for TRB's report on microtransit, this was the most important cited lesson from METRO's Community Connector implementation. Staff found that it was difficult for customers and potential customers to translate the description of the concept into an understandable and potentially positive experience without first seeing the concept in action.[36]

[35] "Microtransit or General Public Demand–Response Transit Services: State of the Practice." Transportation Research Board, 2019. https://www.nap.edu/download/25414
[36] "Microtransit or General Public Demand–Response Transit Services: State of the Practice." Transportation Research Board, 2019. https://www.nap.edu/download/25414

## What challenges did/does METRO's shuttle system face?

The METRONext plan was approved by voters in 2019, with over two-thirds approving the agency's $7.5 billion long-range plan and enabling METRO to borrow up to $3.5 billion projects, including light rail and BRT expansion as well as improved park-and-ride service. At the same time, the COVID-19 pandemic created new challenges for METRO and has complicated the agency's efforts to continue its efforts to aggressively continue transit improvements to serve anticipated future demand. The pandemic cut more than half of METRO's ridership, with fare revenues down 43.4% from expectations in 2020, and sales tax revenue down 5% below estimates.[37] This has necessitated a reevaluation of the plan. Among projects to be shelved for 2021 was a light rail extension to Houston's municipal courthouse. In the future, this and other deferred projects may mean continued reliance on shuttles to serve destinations.

[37] Doug Begley, "Metro has lost half its riders, but still has a $7.5B plan for new projects". *Houston Chronicle*, November 2, 2020. https://www.houstonchronicle.com/news/houston-texas/transportation/article/Metro-has-lost-half-its-riders-but-still-has-a-15689817.php

# 6 CASE STUDY | TEAM TRANSIT

*(Minneapolis/Saint Paul, Minnesota)*

## What is Team Transit?

In the early 1990s, the Minnesota Department of Transportation (MnDOT) implemented a bus-on-shoulder (see Figure 19) policy for transit in order to address reliability issues surrounding steadily worsening congestion in the Twin Cities (Minneapolis and Saint Paul). The body responsible for guiding this policy is "Team Transit," a collaboration between MnDOT, Metro Transit, suburban opt-out transit providers, the Metropolitan Council, cities, and counties. The Team Transit group officially formed in 1991 following a brainstorming workshop to develop innovative solutions to congestion in the Twin Cities.

**FIGURE 19 | BUS-ON-SHOULDER IN THE TWIN CITIES**



*Source: Metro Transit*

In addition to MnDOT itself, The Team Transit partners are:

- **Metro Transit |** Metro Transit is the primary public transportation operator for the Twin Cities and is a part of the Met Council, the region's metropolitan planning organization. Metro Transit offers a network of buses,

light rail, and commuter trains as well as resources for those who carpool, vanpool, walk or bike. The Metro Transitway System is also part of the group.

- **"Opt-Out" Providers |** Under Minnesota Law, suburban communities in the Met Council area can "opt-out" of Metro Transit in favor of alternative transit providers.[38] [39] Twelve of them have done so and have formed six providers, of which four have joined Team Transit:

  - Maple Grove Transit serves the City of Maple Grove. The service currently operates 5 express routes from Maple Grove to Downtown Minneapolis in the morning and return from Minneapolis to Maple Grove in the afternoon.

  - The Minnesota Valley Transit Authority serves seven suburbs approximately 15 miles south of Minneapolis and Saint Paul (Apple Valley, Burnsville, Eagan, and Rosemount in Dakota County as well as Savage, Prior Lake, and Shakopee in Scott County). It operates the METRO Red BRT line and will operate the Orange BRT Line when complete, in addition to other scheduled and demand-responsive services and four park-and-ride lots.

  - Plymouth Metrolink (First Transit under contract) provides express commuter routes to and from downtown Minneapolis and the University of Minnesota. It also offers on-demand shuttle service for trips within the City of Plymouth.

  - SouthWest Transit serves the suburbs of Chaska, Chanhassen, and Eden Prairie. It operates scheduled bus services, express services from park-and-ride lots, and on-demand services.

- **Anoka Traveler |** Provides transportation services to Anoka County to the north of Minneapolis. It operates several fixed-routes, as well as dial-a-ride services and a shuttle connecting suburban businesses to the local Northstar Commuter Rail station.

Team Transit's role is to initiate deployment of transit related enhancements such as park-and-ride lots, ramp meter bypasses, and bus-only shoulders within the Metro area. Team Transit's aim in guiding these interventions is to encourage current single-occupant drivers to choose transit and to retain current transit riders. This work is guided by Team Transit's Executive Committee, which is comprised of managers and senior-level representatives of partner organizations.

The Executive Committee formed in order to fill three primary roles:

- To provide a general grant of authority to establish the scope of work to be undertaken by Team Transit, rather than details of specific projects;

- To facilitate direct cooperation among the agencies, and remove bureaucratic obstacles; and

[38] "Governance of Transit in the Twin Cities Region". Office of the Legislative Auditor, State of Minnesota, January, 2011. https://www.auditor.leg.state.mn.us/ped/pedrep/transit.pdf

[39] There is some controversy surrounding the suburban opt-outs. These providers emerged in the 1970s following major regional service cuts, and were supported by property tax levies. In 2001, legislature shifted funding to the Motor Vehicle Sales Tax (MVST). Opt-out providers did not dissolve and today operate at per-passenger subsidies that are substantially higher than that of Metro Transit. Berg, Steve. "A Bus Gap: Are Fancy Suburban Lines Taking Taxpayers for a Ride?" https://www.minnpost.com/cityscape/2010/09/bus-gap-are-fancy-suburban-bus-lines-taking-taxpayers-ride/

- To work collectively at the highest levels of the budgeting process to locate funding sources.[40]

Upon formation, the Executive Committee's overarching role was to ensure a consistent level of awareness among the constituent agencies regarding transportation issues and to promote consensus of macrolevel objectives. Team Transit projects were primarily initiated by group's Director, the first of whom was appointed from MnDOT. The role of the Director, while supervisory in nature, was to focus on the specific details of identifying, designing, and implementing each improvement project while working directly with key staff people at the other constituent agencies. [41]

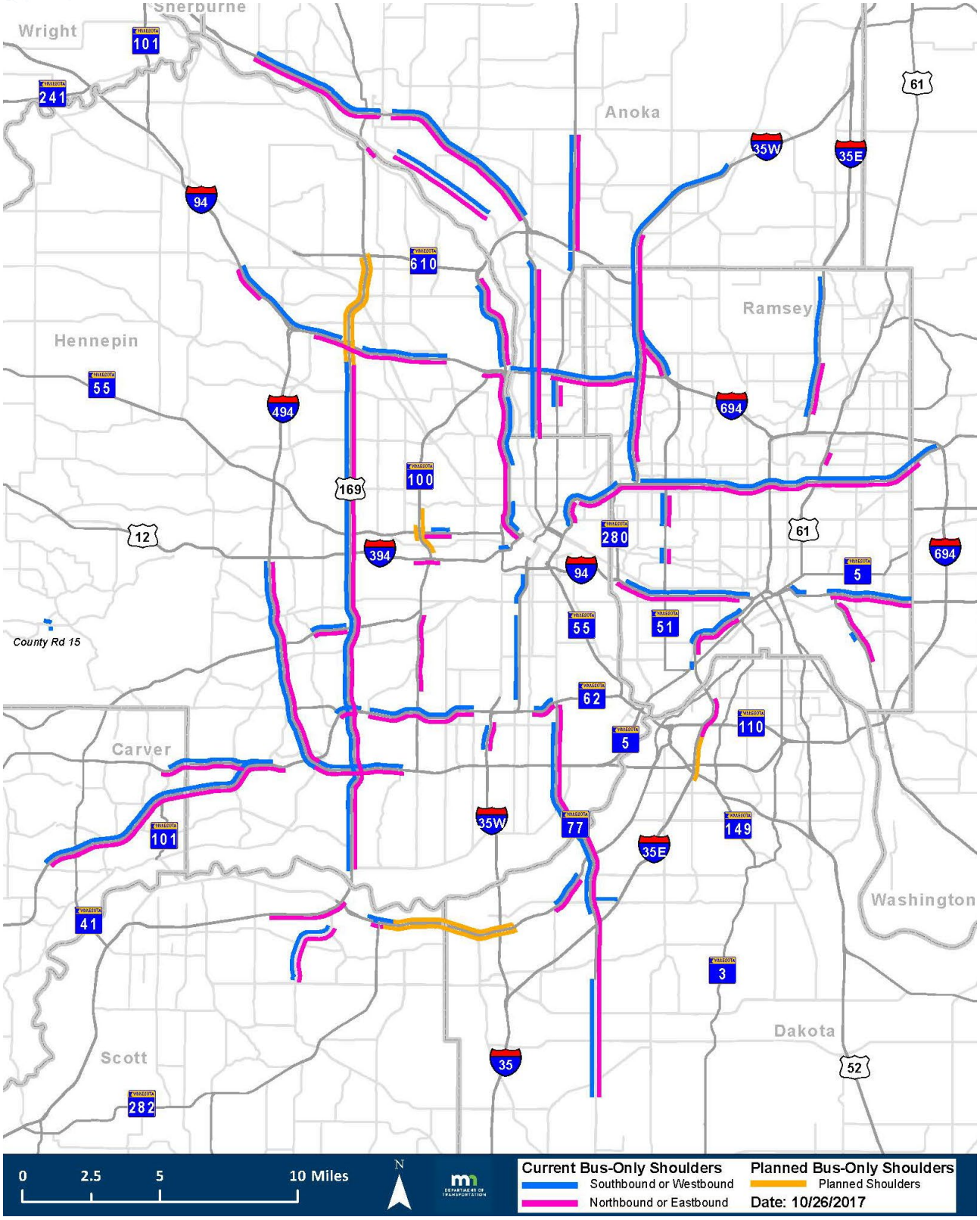
Today, Metro District typically allocates approximately $500,000/year annually to the Team Transit. This funds a range of transit-related enhancements, including HOV bypass lanes, park and pool lots, and ADA accessibility. The majority of the group's projects concern bus-on-shoulder, prioritized based on roadway congestion and anticipated bus use. At times, these projects are relatively simple, and may include tasks such as installing roadway signs authorizing bus shoulder use. More often, the shoulders require strengthening and/or widening to appropriately and safely accommodate bus use. Design criteria for shoulders have evolved over time. Initially, buses were permitted to drive on shoulders "as is" without any modification. With heavier use, it became necessary to modify shoulders constructed before a 1980s-era change to a standard 7- inch minimum thickness. After BOS implementation, MnDOT also recognized the need to develop new design standards for catch basin specifically for bus-only shoulders. These standards now include placing a concrete pad around each catch basin and bringing the structure level with the shoulder. [42]

As a result of this work, the Metro area's bus-on-shoulder network now comprises over 300 miles of shoulders in the Twin Cities metro, supporting routes run by Metro Transit, MVTA, and SouthWest Transit. About half of Metro Transit routes are on the shoulder for at least part of their trip. The bus-only shoulders are operational at any time when traffic in the adjacent main lanes is moving at less than 35 mph, and buses may not travel more than 15 mph faster than the mainline. Metro Transit, MVTA, and SouthWest Transit provide commuter services to downtown Minneapolis, the neighboring state capital of St. Paul, the University of Minnesota and other employment nodes. While these agencies do not list their service as commuter bus service in the National Transit Database (NTD), their fleet of over-the-road coaches fulfill this function.

Figure 20 (next page) illustrates current and planned bus-on-shoulder facilities in the Twin Cities region.

[40] "TCRP Report 27: Building Transit Ridership: An Exploration of Transit's Market Share and the Public Policies that Influence It." Transportation Research Board. 1997. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_27.pdf
[41] "TCRP Report 27: Building Transit Ridership: An Exploration of Transit's Market Share and the Public Policies that Influence It." Transportation Research Board. 1997. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_27.pdf
[42] "Bus-Only Shoulders in the Twin Cities". Federal Transit Administration, 2007. https://www.dot.state.mn.us/metro/teamtransit/pdf/Bus-Only-Shoulders-Report.pdf

**FIGURE 20 | BUS-ON-SHOULDER FACILITIES IN THE TWIN CITIES REGION**




*Source: Metro Transit*

Team Transit's work on bus-on-shoulder shifted MnDOT's relationship to transit overall. Whereas the agency had been more concerned with highway construction and funding prior to Team Transit, FTA's report on the history of bus-on-shoulder in the region found that "the creation of Team Transit required [MnDOT] to increase its relationship to transit, which eventually affected its outlook on highway projects." MnDOT's role, as it turned out, extended beyond its ability to consider transit when working on highway projects; it also had a coordination role when it came to maintenance. Snow plowing in the winter, for example, is necessary for safe operation of buses on shoulders.[43]

The vast expansion of the Twin Cities' bus-on-shoulder network was accomplished with minimal safety and/or operational issues and with positive passenger perceptions. Initial surveys by Metro Transit, indicated that 95% of riders surveyed believed they were saving time (generally higher than actual), and 65% reporting that they had recommended the service to others. Though there were several early instances of "copycat" cars following buses into the shoulders, it is rare to see violations of operating procedures. There have been no safety issues; the rare accident has so far been limited to sideswipes and/or damaged mirrors. [44]

## What makes Team Transit successful?

Several factors led to both Team Transit's success as a governance structure and to the proliferation of bus-on-shoulder in the Twin Cities area:[45,46]

- **Executive-Level Champions |** Team Transit benefited from the vocal support from the current, former, and Deputy Commissioners of Transportation. These individuals helped send the message that "discussion around BOS use should focus on the question of how bus-only shoulders can become a reality and rather than ask if buses can be driven on shoulders." The group sought to build participation across the highest-possible levels of the participating agencies.
- **Recognition of Mutual Advantages |** Metro Transit and MnDOT saw their partnership around bus-on-shoulder as a clear win-win; Metro Transit needed to serve ever-growing transit demands on a limited budget while MnDOT recognized that building highways would not solve the Twin Cities' congestion challenges. These underlying motivations strengthened a support system that helped Team Transit overcome legal, institutional, operational, and technical obstacles.
- **Strategic Deployment of Pilots |** Team Transit recognized the importance of running successful bus-on-shoulder pilots in order to build support both for future bus-on-shoulder efforts and for Team Transit as an entity. Early pilots were focused on areas with clear and immediate congestion relief and to arterial roads with stoplights (which hypothetically would help facilitate safe operation of the new lanes). These projects were non-controversial and relatively easy to permit. Team Transit also closely monitored the corridors to ensure that bus-on-shoulder did not adversely affect general lane travel.

[43] "Bus-Only Shoulders in the Twin Cities." Federal Transit Administration, 2007. https://www.dot.state.mn.us/metro/teamtransit/pdf/Bus-Only-Shoulders-Report.pdf
[44] "Bus Use On Shoulders." Transportation Research Board, 2016. http://www.trb.org/Main/Public/Blurbs/157542.aspx
[45] Bus-Only Shoulders in the Twin Cities." Federal Transit Administration, 2007. https://www.dot.state.mn.us/metro/teamtransit/pdf/Bus-Only-Shoulders-Report.pdf
[46] Evaluation of Team Transit Program." Mathcraft Incorporated and JHK & Associates, 1996. https://trid.trb.org/view/466732

- **Publicizing Success |** In addition to generating easy wins through early pilots, Team Transit ensured that the success of these and other projects enjoyed media coverage.[47] This has included national coverage or local coverage in regions considering bus-on-shoulder, demonstrating that Team Transit has a well-known national best practice.[48][49]
- **Enabling Legislation |** Minnesota law was updated to permit bus-on-shoulder operation and enforcement (tickets for misuse of the shoulders) in 2002.[50] Prior to this formal amendment of statute, the State Patrol had an operating agreement with Metro Transit and MnDOT outlining the rules for bus-on-shoulder operation.
- **Supportive Infrastructure Investments |** Generating noticeable service improvements is an important component of a successful bus-on-shoulder program. Team Transit has used dedicated freeway ramps to park-and-ride lots to help maximize time savings; these ramps allow buses to bypass ramp meters.[51]
- **Learning from Bus Operators |** Team Transit addressed concerns about the safety of running 10.5-foot-wide buses on narrow shoulders by soliciting feedback on optimal speed limits and standards for shoulders from bus operators as part of the first pilot. One standard that resulted from these conversations was the establishment of an 11.5-foot minimum shoulder width when a barrier is present on one side of the lane. Additionally, bus drivers are empowered to use their own discretion in managing traffic conditions; in its study of Minnesota's bus-on-shoulder lanes, TRB identified this lack of over-regulation as one of the top three conditions of the lanes' success.[52]

## How does Team Transit measure success?

Team Transit's goal is to move people through congested highways by:

> *"Investing in highway transit improvements that will support and encourage transit use in congested highways; interacting with local agencies involved in transit for a seamless system of information sharing and project coordination; preserving more than 334 miles of bus shoulders in the Twin Cities Metro Area; and Informing other State DOTs on the cost-effective transit advantages of bus shoulder use."*[53]

In 1996, an evaluation of the newly-formed Team Transit identified innovations in that program that might be transferrable to other metropolitan areas. The review considered 12 Team Transit projects on bus-on-shoulder, ramp meter bypasses, traffic signal prioritization, and "Route-o-Matic" (a low-cost ITS device that allows express bus drivers to select the less congested of two alternate routes using a live feed of traffic speeds from pre-

[47] "Evaluation of Team Transit Program." Mathcraft Incorporated and JHK & Associates, 1996. https://trid.trb.org/view/466732
[48] Rich Longionotti, "Guest Commentary | Climate change goals vs. practice gap on Highway 1 expansion". *Santa Cruz Sentinel*, December 10, 2020. https://www.santacruzsentinel.com/2020/12/10/guest-commentary-climate-change-goals-vs-practice-gap-on-highway-1-expansion/
[49] Luz Lazo, "VDOT to launch 'bus-on-shoulder' program on Interstate 66 by mid-November". *The Washington Post*, October 5, 2014. https://www.washingtonpost.com/local/trafficandcommuting/vdot-to-launch-bus-on-shoulder-program-on-interstate-66-by-mid-november/2014/10/03/a83da53c-4990-11e4-a046-120a8a855cca_story.html
[50] Minnesota Statute 169.306, Use of Shoulders by Buses
[51] "Designing Transit-Friendly Freeways". Arup, 2019
[52] "Bus Use On Shoulders." Transportation Research Board, 2016. http://www.trb.org/Main/Public/Blurbs/157542.aspx
[53] (all points) "Metropolitan Area Transit Finance Report". Metropolitan Council, 2018. https://metrocouncil.org/Transportation/Publications-And-Resources/Finance/Metropolitan-Area-Transit-Finance-Report,-2018.aspx

positioned radar guns)[54] based on improvements in speed, reliability, and ridership, and found that shoulder use resulted in increased transit ridership, decreased operational costs, more predictable and shorter travel times, and fewer missed connections. In come cases, travel times decreased to the point where schedules were rewritten to eliminate unneeded buses.[55] Statements by MnDOT and Metro Transit leadership indicate that key measures of success for the bus-on-shoulder system are cost-per-mile, travel time reliability, speed, and safety.[56]

## What can Team Transit teach MassDOT?

The Team Transit experience speaks to the governance and stakeholder engagement pieces of the development of BOS in the Twin Cities. Specific lessons include:

- **Governance Structure Matters |** The Team Transit structure was designed to generate collaboration and an expressly regional approach to bus-on-shoulder investments. Bringing in suburban opt-out providers of all sizes ensured buy-in and support from a range of municipalities from the onset, ensuring that the bus-on-shoulder effort was pursued less at the behest of specific champions than as a broad and diverse partnership. In FTA's report on bus-on-shoulder in the Twin Cities area, some suburban providers claimed that the use of shoulders helped them attract and retain new riders, leading to long-term growth of these agencies that enabled them to play a larger role in transit planning.
- **Engage Bus Drivers |** Team Transit proactively engaged bus drivers in roles critical to the bus-on-shoulder network's success. Team Transit consulted bus drivers and supervisors for feedback on speed limits and other operating rules during the pilot. In Minnesota, bus drivers tended to operate at lower speeds and increase speeds with experience; ensuring the bus drivers' comfort is thus crucial to delivering time savings.
- **Engage Law Enforcement |** The Minnesota State Patrol is the entity charged with enforcing authorized users of the shoulders. Team Transit endeavored to create a strong working relationship with the State Patrol and to regularly keep the organization apprised of any updates to allowable shoulder use. This helped allay fears of illegal shoulder use. Law enforcement's ability to enforce traffic rules was strengthened through the formalization of bus-on-shoulder in State Statute.
- **Think Strategically About Pilots |** Minnesota's strategic deployment of pilots allowed the agency to gather feedback from drivers, allay concerns about time savings and safety, and demonstrate the value of the strategy in a high-traffic corridor. Collecting data that can be utilized both to improve operations and address key concerns about bus-on-shoulder is crucial for success. Choosing corridors where time savings will be significant and where intersections have stoplights can also aid success.

## What challenges did/does Team Transit face?

Opposition to bus-on-shoulder in Minnesota centered on safety. MnDOT's design section raised safety concerns around the operation of buses at higher speeds than vehicles in the adjacent general-purpose lanes. Team Transit's careful selection of pilot corridors and close alignment with both bus drivers and law enforcement

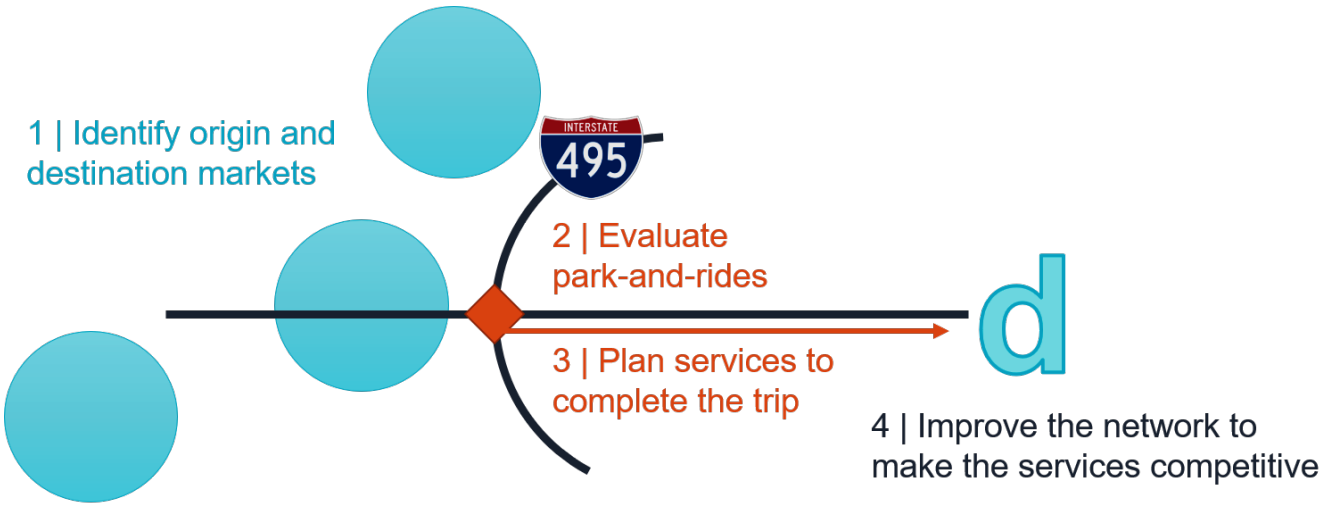
[54] "Department of Transportation and Related Agencies Appropriations for 1996". US House of Representatives, 1995, page 1532.
[55] "Evaluation of Team Transit Program". Mathcraft Incorporated and JHK & Associates, 1996. https://trid.trb.org/view/466732
[56] "13th International HOV/HOT Systems Conference: Partnerships for Innovation – Conference Proceedings". FHWA Office of Operations, 2008. https://ops.fhwa.dot.gov/publications/fhwahop10008/general.htm

helped ensure that any perceived safety issues did not ultimately materialize. MnDOT leadership also pointed to the strong commitment to bus-on-shoulder from leadership as helping to allay these concerns.

# 7 TAKEAWAYS FOR MASSDOT

The case studies in this memorandum focus on specific services offered by agencies or groups of agencies and can help guide MassDOT toward a shared travel network that is a unique, branded service offering. In making recommendations for establishing new shared travel service in Greater Boston, future phases of the Shared Travel Network Study will (as illustrated in Figure 21):

**FIGURE 21 | APPROACH OF THE SHARED TRAVEL NETWORK STUDY**




- Identify **markets** for potential shared travel services using location-based services data. These data consist of anonymized individual trips and include origin, destination, and travel time. From these, the project will derive major origin/destination pairs in Greater Boston where origins are in the suburbs beyond I-95/Route 128 and destinations are clustered either inside or outside of that beltway.

- Assess MassDOT's existing **park-and-ride lots** to identify opportunities for enhancement and identify opportunities for new facilities. Specifically, this effort will target the region between I-95/Route 128 and just outside of I-495 (see Figure 1 on p.2), including areas adjacent to axial freeways, in locations that serve origin clusters identified in the previous step.

- Recommend **shared travel services** that connect park-and-ride lots to destination clusters on both limited-access and arterial roadways. "Services" may include mode, vehicle type, service structure (e.g., scheduled or demand-responsive), management structure (e.g., who operates/manages the service), marketing, etc.

- Identify improvements to the surface transportation network to facilitate effective operation of the shared travel services designed in the previous step. These may include infrastructure improvements (e.g., managed lanes, queue jump lanes) or technical improvements (e.g., signal priority). They will enhance the vision in MassDOT's screening studies and will be coordinated with recommendations in other studies performed in response to *Congestion in the Commonwealth, 2019.*

- Prioritize **recommendations** based on a rubric of factors and present them for MassDOT's consideration.

Taken together, the case studies in this technical memorandum have some general lessons for MassDOT as it pursues a shared travel network:

- **Marketing and Branding |** In order to establish a shared travel service as a "missing piece" of the Greater Boston transportation system, MassDOT should consider a unified marketing and branding approach. The value of these is demonstrated by Flatiron Flyer and Logan Express most prominently among the case studies. The brand may include a name, a logo, a common vehicle livery (even across multiple operators/vehicle owners as demonstrated by Logan Express), signage at stops, directional signage on highways and access roads, etc. Marketing may include the service's website, a smartphone app, digital signage on the MBTA, Logan Airport, etc., billboards, online advertising, print advertising, pop-up stands on streets or at festivals and events, etc.

- **Cooperation and Coordination Among Agencies |** In order to ensure that the new shared travel network integrates seamlessly and effectively into the Greater Boston transportation system, MassDOT should ensure coordination with regional transit agencies (RTAs), the MBTA, and other operators and stakeholders. The value of doing so is demonstrated most prominently by Community Transit and Team Transit, the latter of which provides many lessons for how to implement a multi-agency approach to bus-on-shoulder, an infrastructure approach under consideration in Massachusetts. MassDOT should consider existing RTA commuter shuttle services as well as those operated by business consortia when locating park-and-ride lots and designing services. Co-location of stops with these services and with local bus services may allow for transfers and a more efficient network generally. MassDOT is already assembling a Shared Travel Advisory Group (STAG) that includes many of these partners.

- **Consideration of Unique Markets |** Houston's METRO shuttles demonstrate the flexibility of the coach bus-based shared travel concept and the many types of markets it can serve. METRO uses shuttles to ensure equitable access to its judicial functions (courthouses and auctions). MassDOT may wish to consider which events or specific demand centers might be uniquely well-served by shared travel services, drawing from location-based services and local insight.

- **Focus on Reliability |** Users of the transportation system must be confident in a particular service in order to utilize it, making reliability a crucial component of service provision. The Flatiron Flyer overcame issues of unreliability related to congestion through the use of managed lanes, which allow buses to maintain an established schedule. MassDOT may wish to consider integrating bus services into any potential future managed lane projects.

- **Operational Concerns |** The case studies and review of relevant literature identify some common operational challenges with potential infrastructure improvements and service patterns. Should MassDOT pursue bus service on freeways, for instance, the Team Transit and Flatiron Flyer provide lessons for clearing snow from managed or dedicated lanes, and also for maintaining communication with bus operators to ensure a clear ground-level picture of operating challenges. MassDOT must also ensure equitable access to any of its solutions by people of varying levels of mobility – high-floor vehicles without wheelchair access may present challenges if used in transit-like settings. Operational challenges of bus-on-shoulder and managed lanes have been discussed in MassDOT's 2020 screening studies.

- **Performance Measures |** The performance of each case study service is measured with operational data on at least an annual basis, with common metrics including boardings, revenues, and costs. MassDOT should provide for performance measurement and reporting upfront in any plan for service, building on the MBTA Performance Dashboard, the MassDOT Tracker, and other internal performance reporting systems.