Bus Stop Balancing

Port Authority's Values:
Growth, Accessibility, Efficiency

Overview

While placing bus stops close together reduces the distance that travelers need to walk to get to a bus stop, it also increases the amount of time the bus takes to travel the route, therefore reducing how reliably a bus reaches each stop on time. It also increases the need for amenities and maintenance of amenities at stops and decreases ridership as choice riders who do not have to use transit choose other modes such as carpooling or biking.

Transit systems across the United States have been exploring ways to rebalance or optimize the distance between bus stops over the last two decades, as many systems, including those in the Pittsburgh region, have existed since the time of streetcars.

Analysis

Before a transit agency plans a new or updated bus service, it should create guidelines for the following elements based on the goals of the bus route, including optimal stop spacing. frequency, daily span, stop spacing, levels of population density, and ridership. Port Authority first established its own minimum stop spacing guidelines in 2009 in their Transportation Development Plan but did not begin a system-wide stop optimization project until 2017. In 2019, Port Authority published its own "Bus Stop and Street Design Guidelines" to create a document to help guide future local plans and ordinances. A data-driven plan was developed to accomplish this program on two routes with high ridership and closely spaced stops. According to the plan, areas that have a higher population density (over 5,000 residents and

jobs per square mile) should generally have more frequent stops. Areas with a lower population density (fewer than 5,000 persons and jobs per square mile) should have fewer stops. By setting these guidelines upfront, transit agencies can better design their service to appropriately meet customer needs as well as have a ready explanation for decisions on bus stop placements based on metrics.

There are times when a slightly longer walk to the bus stop may result in a significantly shorter total travel time. According to a 2016 article in the Journal of Traffic and Transportation Engineering, overall bus reliability is generally affected by dwell time at stops due to the bus stop location, the number of passengers boarding on or off, and the fare payment method. Many riders and potential riders have said that the total travel time (including their walk to the bus) is a major factor in their decision to ride. During a series of public workshops held by New York City Transit in 2018, 63% of Bronx bus riders said they would prefer fewer stops because they had the opinion that close bus stop spacing slows them down.

In many American cities, transit systems are working to rebalance bus stops to find a moderate balance of access, reliability, maintenance, and ridership growth. Transit riders, including those in the Pittsburgh region, have been surveyed to determine that a walk distance of 5 minutes is manageable in most instances, and distances of up to 8 minutes were found to be manageable in areas with more pedestrian amenities. The average adult can walk up to a ¼ mile in 5 minutes. Finding the right balance of stop spacing that allows for a 5-minute walk differs based on the presence and quality of pedestrian infrastructure, the

pedestrian environment, local terrain, typical weather, average population age, etc. Reducing the number of stops also increases travel time reliability by reducing the number of times that a bus might be delayed while navigating to another stop or bus dwell time at the stop. The preference for the trade-off between walking distance and total travel time may change from area to area. While younger Americans tend to favor shorter travel times, older citizens and persons with disabilities tend to prefer negotiating shorter distances to bus stops. Further, Allegheny County has many geographical challenges and physical barriers which impact stop spacing. River crossings, steep elevation changes, and man-made obstacles such as railroad tracks limit pedestrian access from certain directions and necessitate stops being closer together. First- and last-mile connections (sidewalks, bike lanes, and rideshare vehicles) vary throughout the County which means stop spacing may also need to vary. In late 2019, the Authority undertook its first Bus Stop Balancing projects on Bus Routes 16, 48, 51, and 88. The stop spacing on these routes was adjusted, through elimination of less frequently used stops, from 667 average feet to 859 average feet, an increase in spacing of 29% and a reduction of 21% of stops. This increase in distance between stops resulted in an increase in on-time performance of 7% and a ridership increase of 4% for the two routes implemented in November 2019. The other two routes were implemented in March 2020, just as the pandemic hit, and could not be fully assessed.

Transit agencies in cities such as Baltimore and San Francisco improved bus travel times by 6% by slightly increasing stop spacing to 2.5 stops per mile, thereby reducing the total number of stops the bus makes along a route.

Peer Examples
Maryland's MTA
The Maryland Transit Administration (MTA) created a Bus Stop Design Guide that provides guidance on bus stop placement and bus stop design and amenities, incorporating best practices from across the United States and around the world. A table was created addressing appropriate bus stop spacing dependent on the number of residents and job density within walking distance.

San Francisco's MUNI
MUNI released a bus stop consolidation plan in 2010 and since then has slowly been consolidating stops along routes. Metro has improved bus travel times by 6% by slightly increasing stop spacing to 2.5 stops per mile, thereby reducing the total number of stops the bus makes along a route. The decrease occurred because of a ridership survey where 61% of respondents said they would be willing to walk longer distances if it meant a shorter travel time.

Level of Effort for Implementation: Low
- o PAAC has already started implementation, though the program was put on hold during the pandemic.
- o The program will recommence in 2022 with an additional 4 routes every 12 months as staff capacity ramps up and more intensive routes are completed first.
- o The program will continue to adjust its public engagement tactics to be more responsive to the community so that riders feel their voices are heard, and to be more transparent about the effects of the program.

Resources
Journal of Traffic and Transportation Engineering
Maryland Transit Administration
San Francisco Municipal Transportation Agency (MUNI)

NEXTransit