RESEARCH SUMMARY

DEPARTMENT OF TRANSPORTATION

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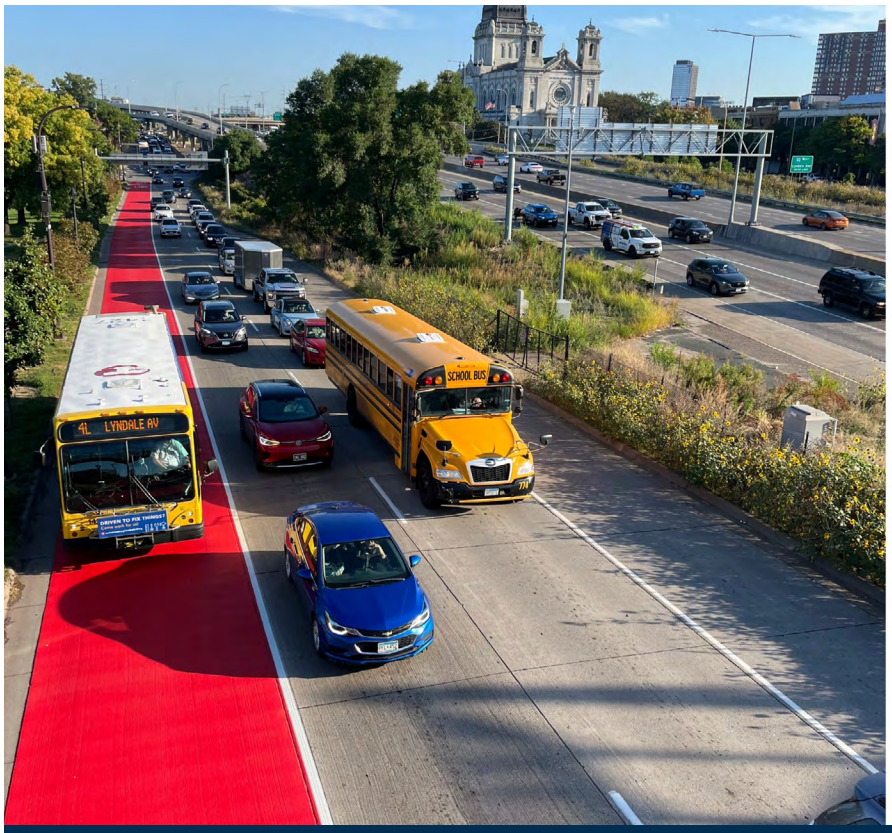

Photo courtesy of Metro Transit

Increasing Service Reliability by Adding a Dedicated Right of Way for Buses

In dense urban areas, public transit is a primary mode of transportation for people to commute to work, complete errands and connect with their community. If transit is not reliable, riders may choose other forms of transportation that could negatively affect riders, transportation agencies and communities. To improve service reliability, MnDOT investigated the use of dedicated rights of way (ROWs) for transit service across route segments within the system.

What Was the Need?

Reliability is one of the most requested service improvements expected from a transit system. A transit ROW enhances reliability by allowing buses to bypass traffic congestion and stay on schedule. But an ROW can be expensive to implement, and agencies want to be sure that it will result in improved reliability.

Previous research has examined reliability measures, but few projects have focused on the impacts of a dedicated ROW. This study investigated variations in service reliability across route segments in the Twin Cities metropolitan area transit system to determine the variables that contributed to high or low reliability. Identifying low reliability route segments and the characteristics associated with those segments allows the model developed in this project to suggest route segments that would benefit most from a dedicated ROW.

What Did We Do?

To determine the benefits of a transit ROW, route segment reliability metrics were calculated using

"This project validated work that is planned and can serve as a valuable tool for determining what transit service would benefit from dedicated rights of way."

—AMRISH PATEL, SENIOR ENGINEER, MnDOT METRO DISTRICT

high-resolution automatic vehicle location (AVL) and automatic passenger count (APC) data. A spatial analysis integrated data from various sources to specify service characteristics, operating environments, traffic conditions and land use features along route segments.

Then a gradient boosting model (GBM) was applied to uncover the relationships between these factors and reliability. The information obtained from the GBM was used to estimate potential improvements in reliability for each route segment with a dedicated ROW. More specifically, the model used the relationships between reliability and other contributing factors to identify route segments in which a specific type of ROW such as bus lanes would improve reliability and benefit riders the most.

What Was the Result?

The results of the analysis of bus travel times using AVL and APC data demonstrated suburban route segments were most reliable, likely due to light traffic in these areas.

Least reliable were commuter express route segments, which may be the result of operating during morning and afternoon peak travel times with heavy traffic. Bus rapid transit (BRT) routes compared to local urban routes were slightly faster and more reliable even with more frequent stops and higher ridership, possibly attributed to traveling on a more bus-friendly BRT route.

Modeling indicated that three types of transit ROWs had different relationships with reliability. First, an increased ratio of bus lanes and busways led to higher reliability, but only when the ratio exceeded 20%. Second, the presence of high-occupancy vehicle (HOV) and high-occupancy toll (HOT) lanes was associated with higher reliability, but a higher ratio of HOV and HOT lanes did not result in greater improvements. Finally, the presence of shoulder lanes did not improve reliability significantly.

In addition to using transit ROWs, three factors are associated with more reliable transit service: higher free-flow speeds, fewer traffic signals and longer route segments. Because many variables influence travel time reliability, the implementation benefits of an ROW may be constrained and will be most effective when these variables are complementary to ROWs.

The statistical modeling results identified specific route segments along several service corridors that would benefit from a transit ROW, such as the bus lane along 7th Street in downtown Minneapolis. Some of these segments had been previously identified as segments needing improvements.

What's Next?

This project addressed important public transportation questions by evaluating service reliability at the route segment level, identifying key factors contributing to reliability and estimating reliability improvements from adding a dedicated ROW.

Further, the model was able to estimate which specific routes would experience the greatest benefit from a dedicated ROW. These results can inform budgetary and prioritization decisions about ROW projects on service corridors with high potential benefits.

Future research will analyze additional routes to identify route segments in need and will also create an interactive map with a more user-friendly interface for stakeholders to examine the data and results.

About This Project

REPORT 2025-01
"Value of Dedicated Right-of-Way: Transit Service Reliability and User Impacts."
Find it at mdl.mndot.gov.

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