



DEPARTMENT OF
TRANSPORTATION

OFFICE OF RESEARCH
& INNOVATION

TECHNICAL SUMMARY

Questions?

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PROJECT COST:

\$152,458



MnPASS lanes are managed lanes that offer buses quicker access to downtown.

Bus–Highway Connections Make Transit More Competitive With Driving

What Was the Need?

Bus service in the Twin Cities relies on MnDOT-built park-and-ride (PNR) lots and managed lanes—lanes for buses on streets and highways, including high-occupancy lanes—to help transit users travel from the suburbs and urban locations to job, retail, service and entertainment sites.

One measure of how a transit system of PNR lots and bus service works for users is job accessibility—the number of jobs that can be reached by a mode of transportation within a certain travel time period.

The type of lanes a bus uses impacts travel times via bus, and the differences in these travel times in turn impact the transit user's ability to reach locations using walk-up transit service. The transit alternative to walk-up service is drive-to-transit service via PNR lots. The Twin Cities transit system intersects with over 100 PNR lots where transit users park their vehicles and take express and limited-stop services to business districts and job locations.

Understanding the impact of managed lanes and PNR lots on transit effectiveness in terms of job access requires diving into transit and travel data; developing ways to measure accessibility for walk-up, drive-to-transit and automobile-only travel modes; and adjusting methods so the cost of travel and the time of travel can be reasonably compared between modes.

What Was Our Goal?

MnDOT sought to evaluate how the bus and highway systems interact in terms of job accessibility. The research would consider how managed lanes and PNR lots affect job accessibility for walk-up and drive-to-transit users, compare these findings to automobile-only usage, and profile how well the transit system of the Twin Cities serves users in terms of cost to use and travel time.

What Did We Do?

In the first stage of work, the research team focused on the managed lane network to determine how it contributes to walk-up transit accessibility. Investigators developed a computer program to modify transit schedule data to reflect how buses operate in different managed lane configurations and calculate walk-up access to jobs systemwide.

In the second stage, the team developed a method for calculating accessibility via PNR use, and PNR accessibility in terms comparable to access via walk-up transit and automobile use.

In the third stage, researchers developed a mixed-mode accessibility profile of the system. They incorporated a monetary dimension to travel time accessibility measures, associating costs of automobile use, parking fees, transit fare and travel time with travel modes in a value of time unit to compare accessibility between automotive and transit usage.

Researchers associated travel times and travel costs with transit mobility. Results show that park-and-ride lots and managed lanes put suburban and walk-up urban transit options on equal footing and demonstrated that these bus–highway system interactions improve access to job locations.

“The researchers did more than just measure mobility; they quantified access to employment in terms of travel time and travel cost, as well. Results put park-and-rides and suburban transit on equal footing with walk-up transit in urban environments.”

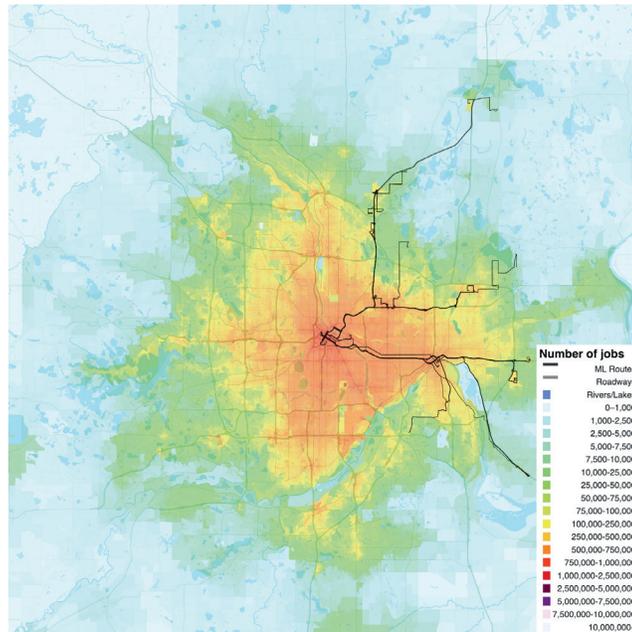
—Jim Henricksen,
Traffic Forecaster,
MnDOT Metro Traffic
Forecasting and Analysis

“We developed tools and methodologies, and applied them metrowide to bring new insights to the role of highway operations and planning on access to jobs through transit.”

—Andrew Owen,
Director, Accessibility
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of Minnesota

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This map of I-35W and north I-94 shows how job accessibility via transit intensifies as riders get closer to downtown Minneapolis.

What Did We Learn?

Study results showed that PNR lots and managed lanes offer greater access to job sites. The longer the trip to a job site, the more competitive transit becomes with driving for commuting to work. Bus-highway interactions via managed lanes and PNR lots improve transit job accessibility relative to automobile use by 3.8 percent in a 30-minute commute and by 19.1 percent in a 60-minute commute. For the 60-minute scenarios, transit accessibility from the suburbs to the central business district improves by 319,322 jobs for the average worker.

For managed lanes, the greatest benefit is for suburban regions near express routes. On the I-94 corridor, where the greatest improvement by transit to accessibility is felt, every mile of MnPASS lanes offers an increase of 98 jobs accessible to average riders.

With express bus service, travel times from PNR lots to destinations decrease by an average of 10.7 minutes for the system. Compared to walk-up transit travel, drive-to-transit from suburban areas offers accessibility values roughly three times greater than travel by walk-up transit, in part because time spent driving in suburbs gets users to more transit facilities than the same time spent walking.

Researchers found pockets in the Twin Cities where transit and PNR are more competitive with automotive travel per dollar of travel. These areas highlight urban locations where the transit network is the most robust and suburban areas where automobile travel times are long compared to express transit. When researchers applied wage value to time spent traveling, the benefit of driving rather than using PNR lots and transit dropped 89.6 percent. The relative value of transit may increase further if measures account for productivity on transit.

What's Next?

This research helps MnDOT plan future PNR and managed lane facilities to maximize benefit to transit services. Value of time models and comparisons offer a way to measure the relative value of transit to automobile use in accessing jobs.

Future analysis may include long-term fixed costs associated with vehicle ownership and show further improvement in the comparative value of transit services to automobile use. Methods from this study may also be applied to other mixed-mode transit options, like biking, scooters or ride-sharing to transit access points.

This Technical Summary pertains to Report 2019-17, “Accessibility and Behavior Impacts of Bus-Highway System Interactions,” published April 2019. The full report can be accessed at mndot.gov/research/reports/2019/201917.pdf.