

NETWORK MODELING: RIDERSHIP ON THE TWIN CITIES TRANSIT NETWORK BEFORE AND AFTER GREEN LINE IMPLEMENTATION

Jacqueline Nowak | University of Minnesota |

Department of Civil, Environmental, and Geo-Engineering | nowak123@umn.edu

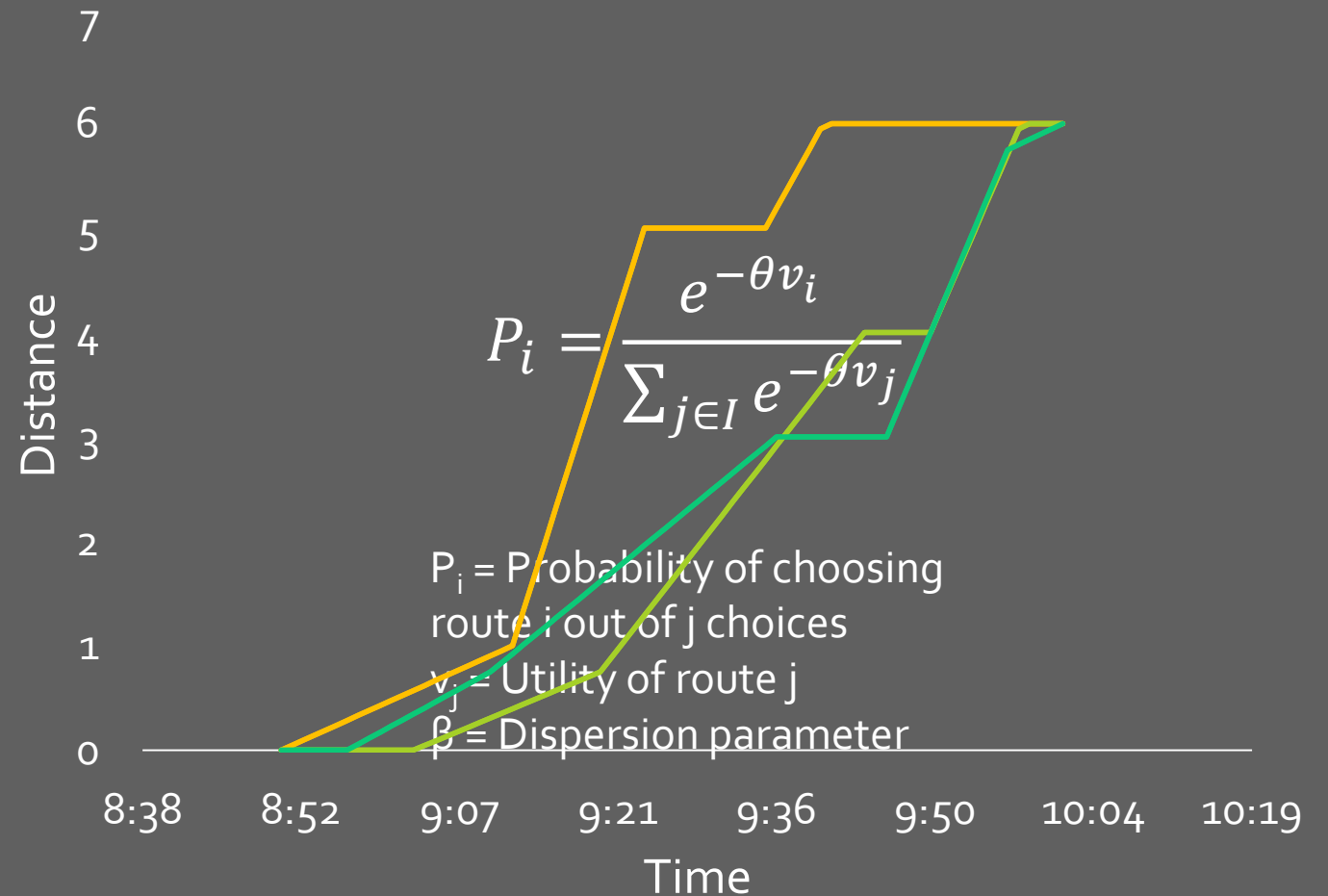
OVERVIEW

- Introduction to Network Modeling and FAST-TrIPs Model
- Data Sources
- Model Calibration
- Results
- Moving Forward
- Questions

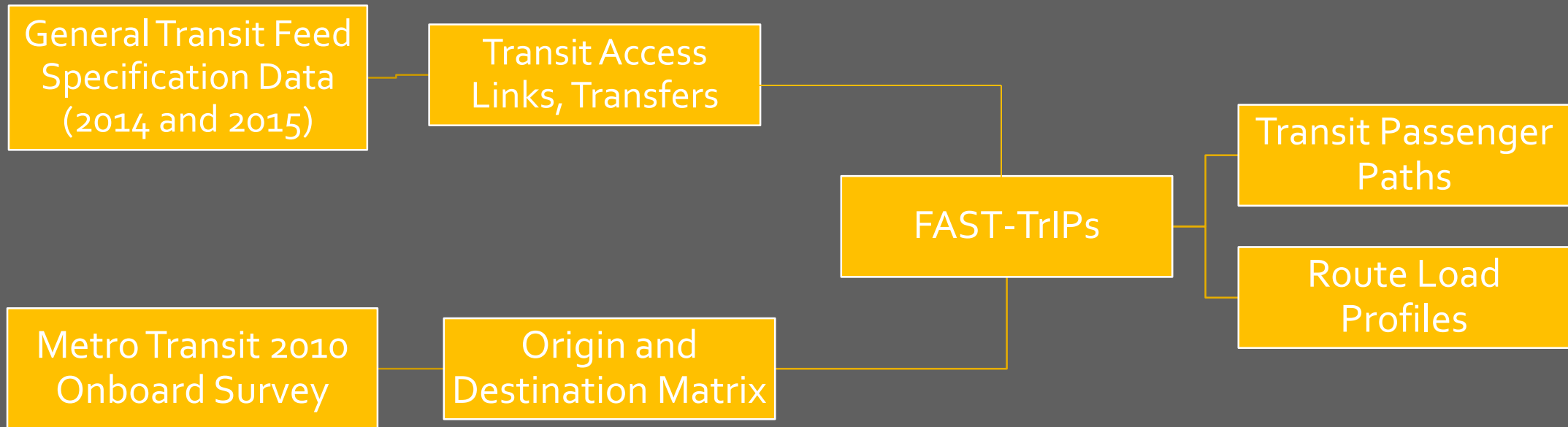


WHAT IS FAST-TRIPS MODEL?

- Stands for Flexible Assignment and Simulation Tool for Transit and Intermodal Passengers
- Dynamic transit assignment model with stochastic route choice
- Current route choice based on a multinomial logit model
- Schedule based



DATA REQUIREMENTS



CALIBRATING FAST-TRIPS FOR TWIN CITIES REGION

- Route choice parameters originally from Austin, Texas
- New route choice parameters taken from Metropolitan Council's Four Step Model (estimated for year 2000)
- Estimated rail in-vehicle time parameter based on FAST-TRIPs output

Route Choice Parameter	Austin, Texas	Met. Council Four Step Model
In-Vehicle Time	1.0	1.0
Waiting Time	1.79	2.76
Walking Time (access, egress, transfer)	2.02	0.82
Transfer Penalty	18.48	7.50
Value of Time	\$12/hour	\$12/hour
Rail In-Vehicle Time Coefficient	0.7	1.0

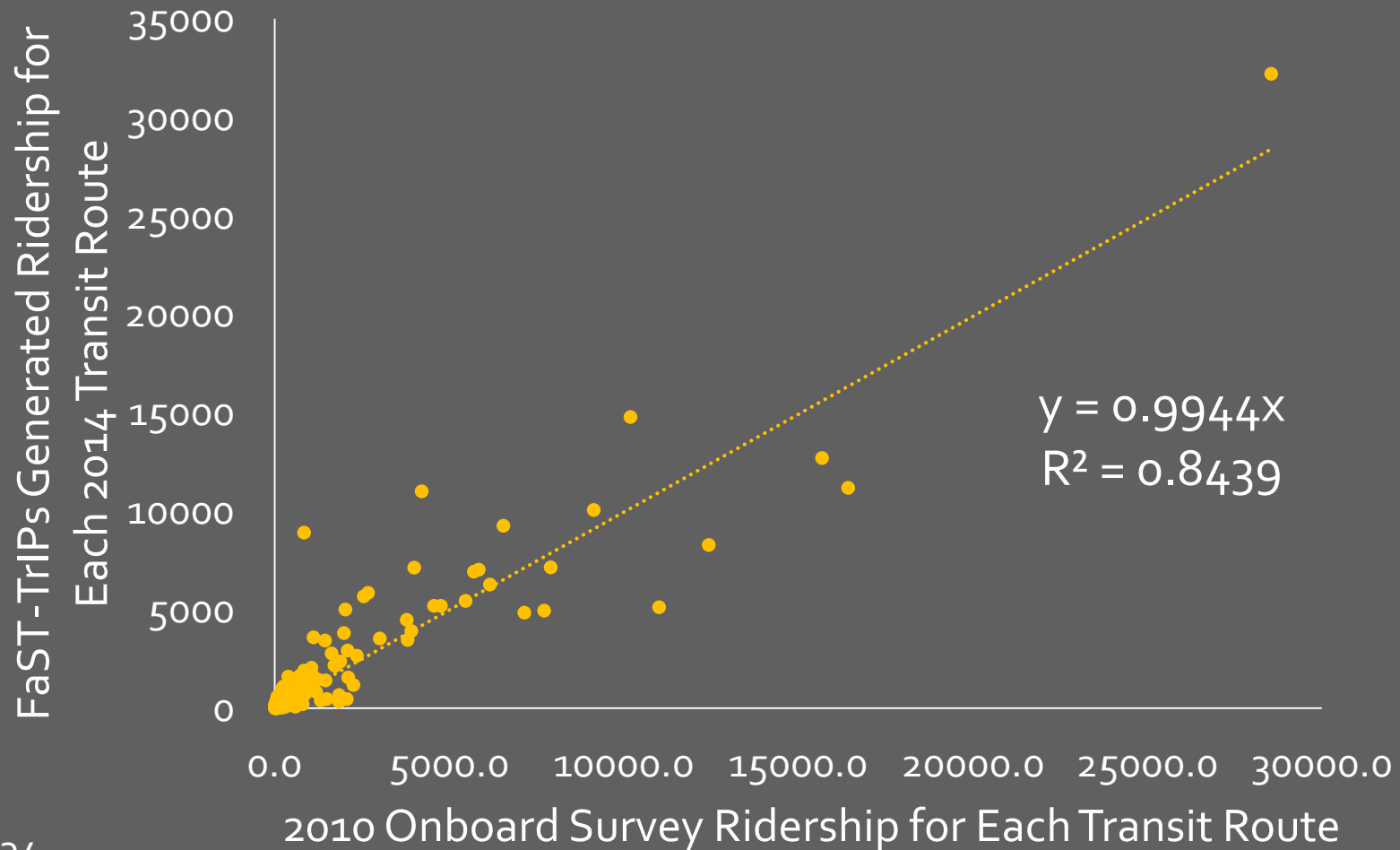
$$v_j = \text{In Vehicle Time} + 2.76 * \text{Wait Time} + 0.82 * \text{Walking Time} + 7.50 * \text{Number of Transfers}$$

CALIBRATING FAST-TRIPS FOR TWIN CITIES REGION

- FAST-TRIPs output compared to survey data from 2010 Onboard Survey
- Route choice parameters will be re-estimated following the release of data from 2016 Onboard Survey

$$\% \text{ difference} = \frac{\text{Survey Value} - \text{FASTTrIPs Value}}{\text{Survey Value}}$$

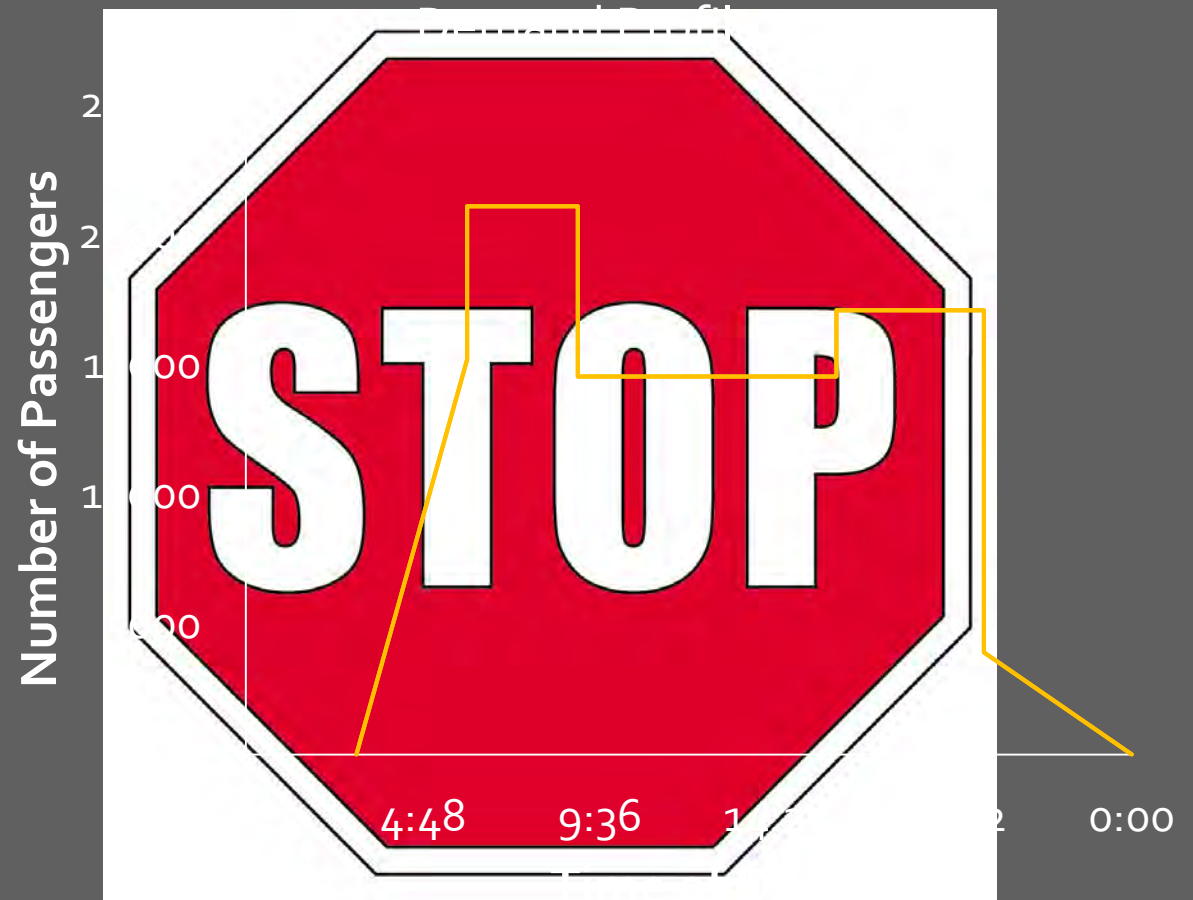
MSP Root Mean Square Error = 19,034



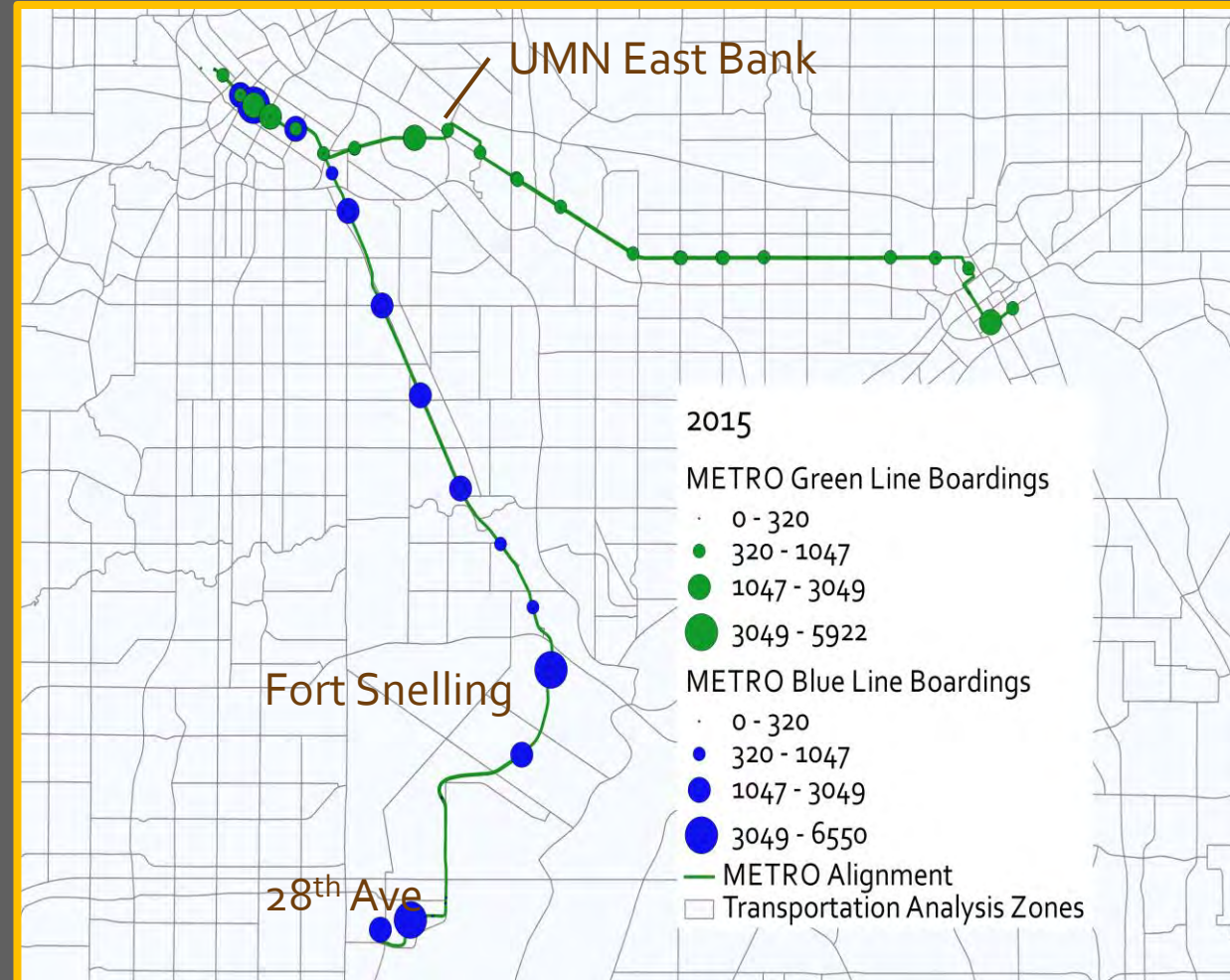
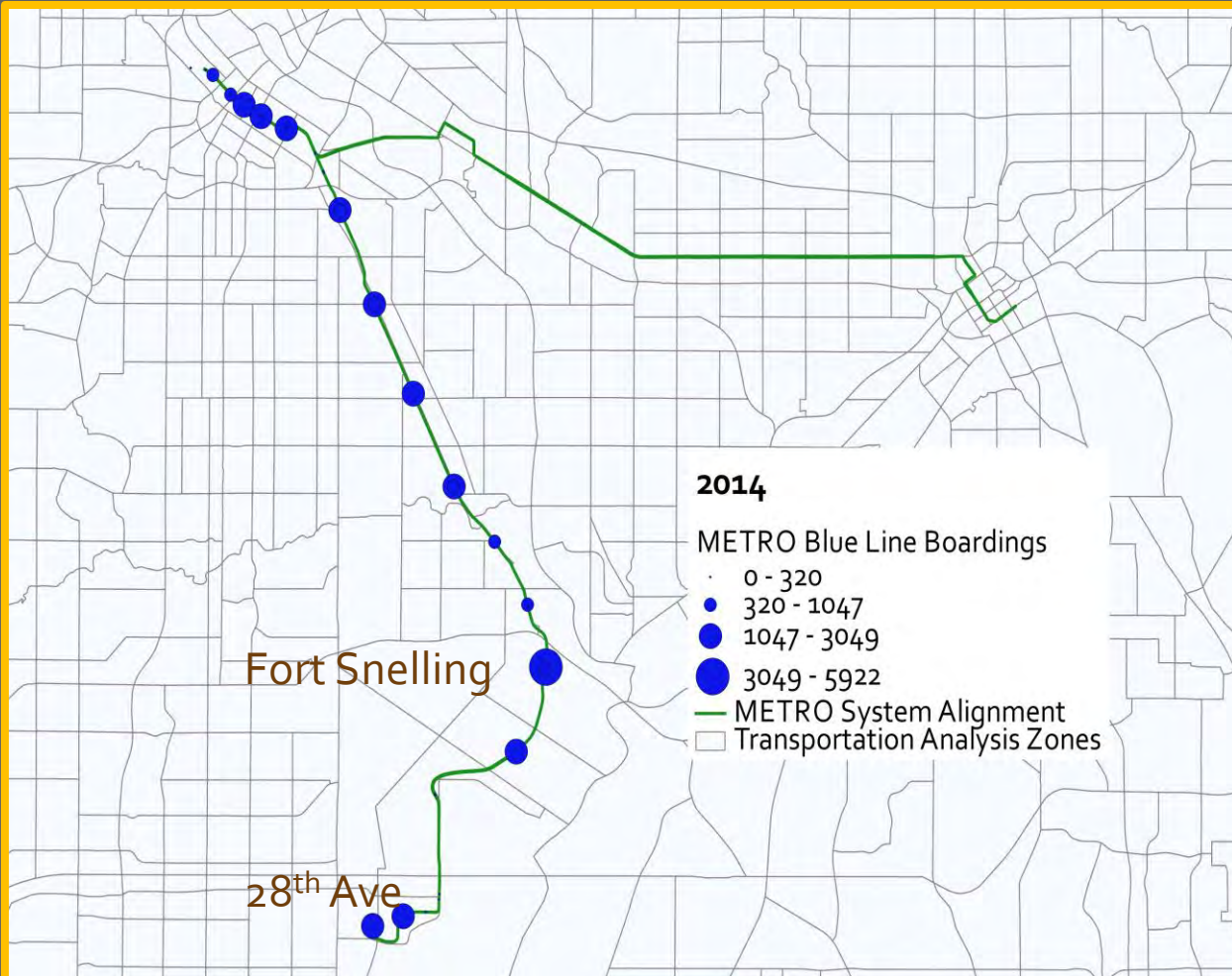
RESULTS

LIMITATIONS

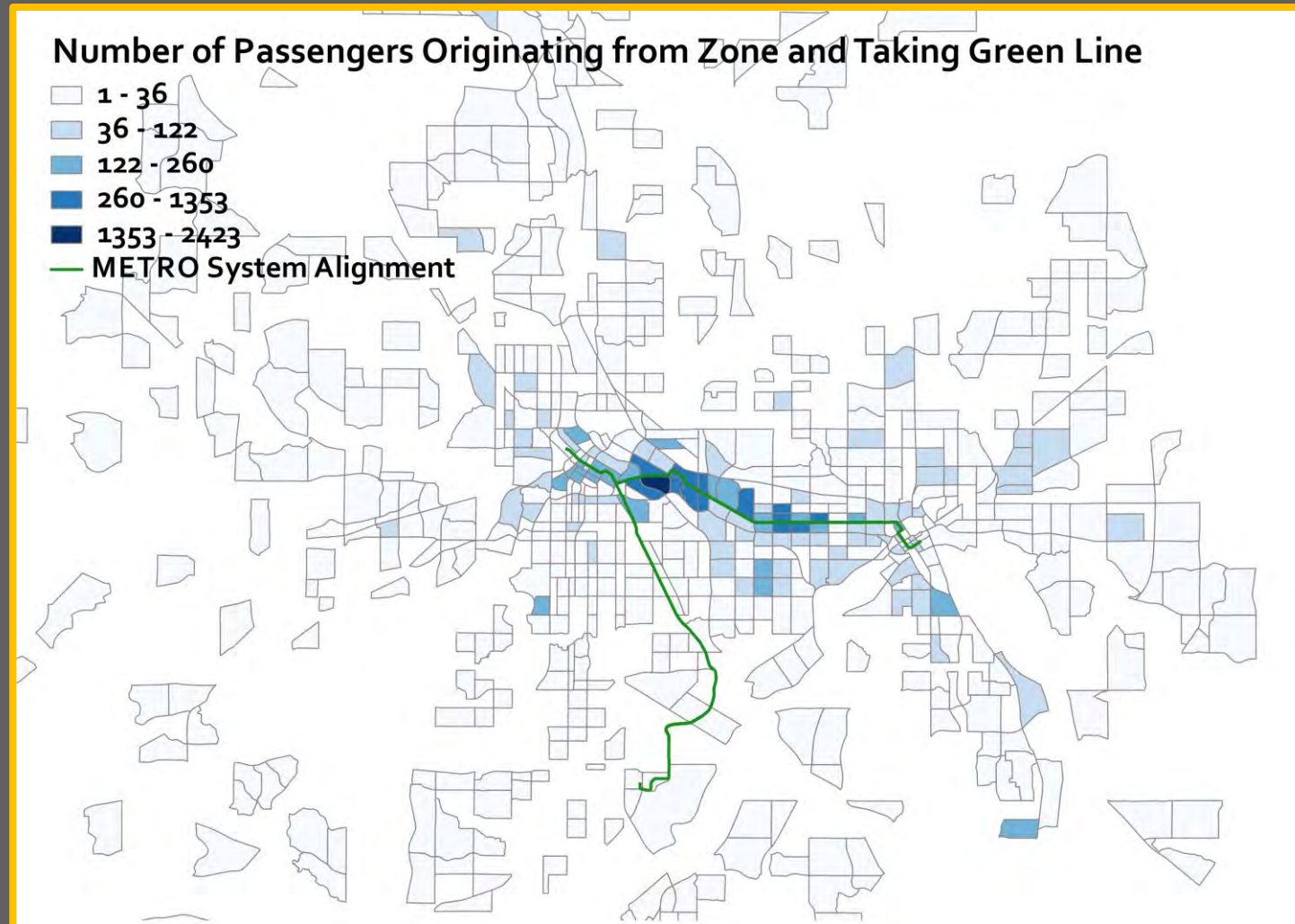
- Model is not fully calibrated
- Demand is not necessarily accurate for current conditions
- Model is dynamic, demand is static within each time period
- Walking links to transit stops are simplified and do not follow actual network routes (for now)



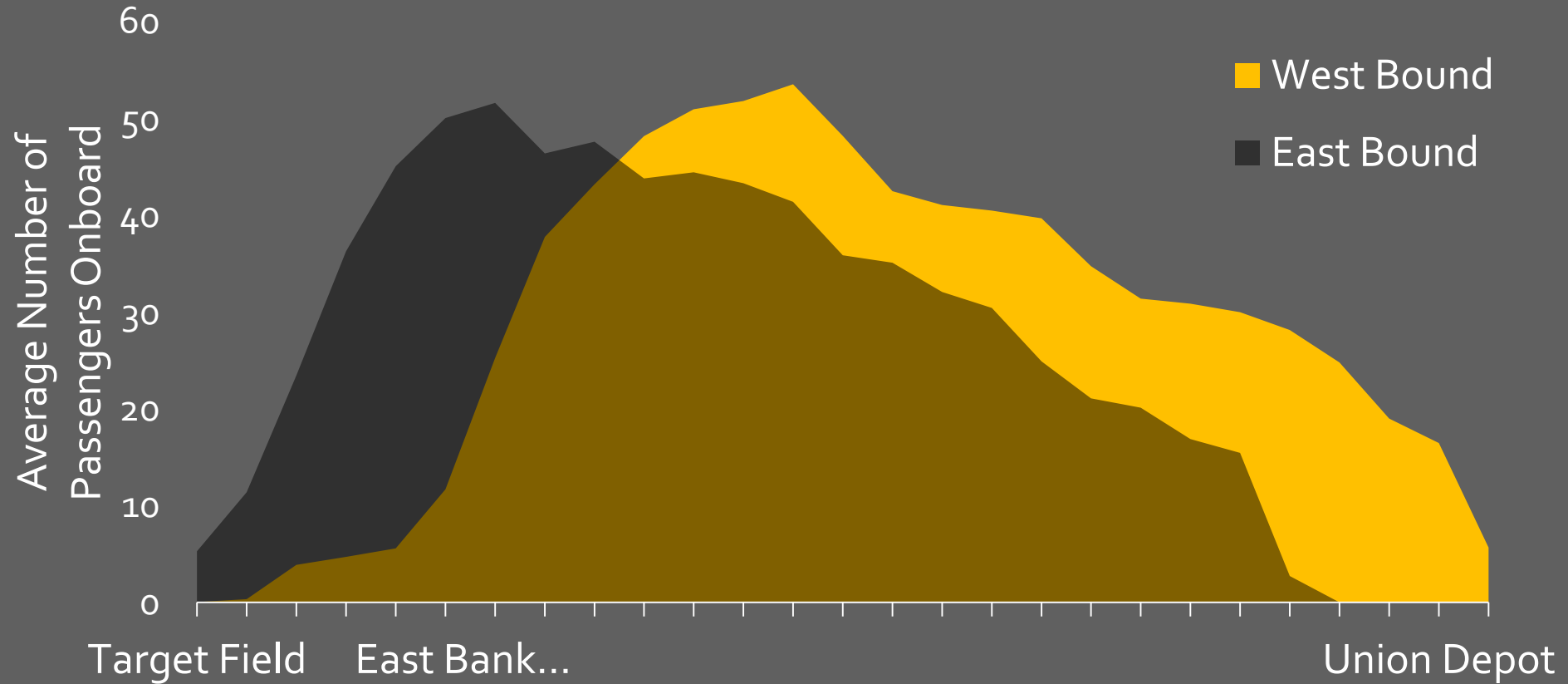
METRO SYSTEM DAILY BOARDINGS



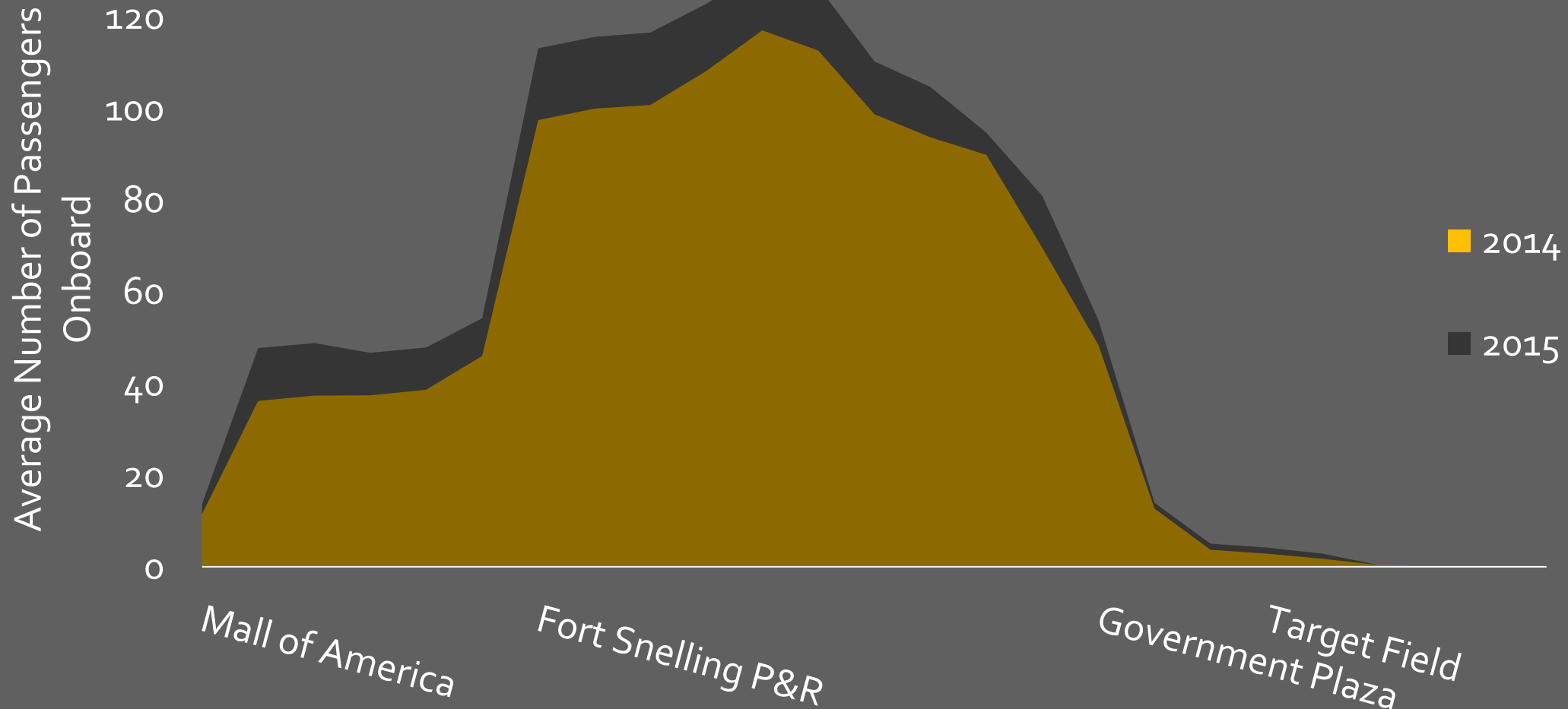
GREEN LINE PASSENGER ORIGINS



METRO GREEN LINE LOAD PROFILES



NORTHBOUND METRO BLUE LINE SPATIAL LOAD PROFILE

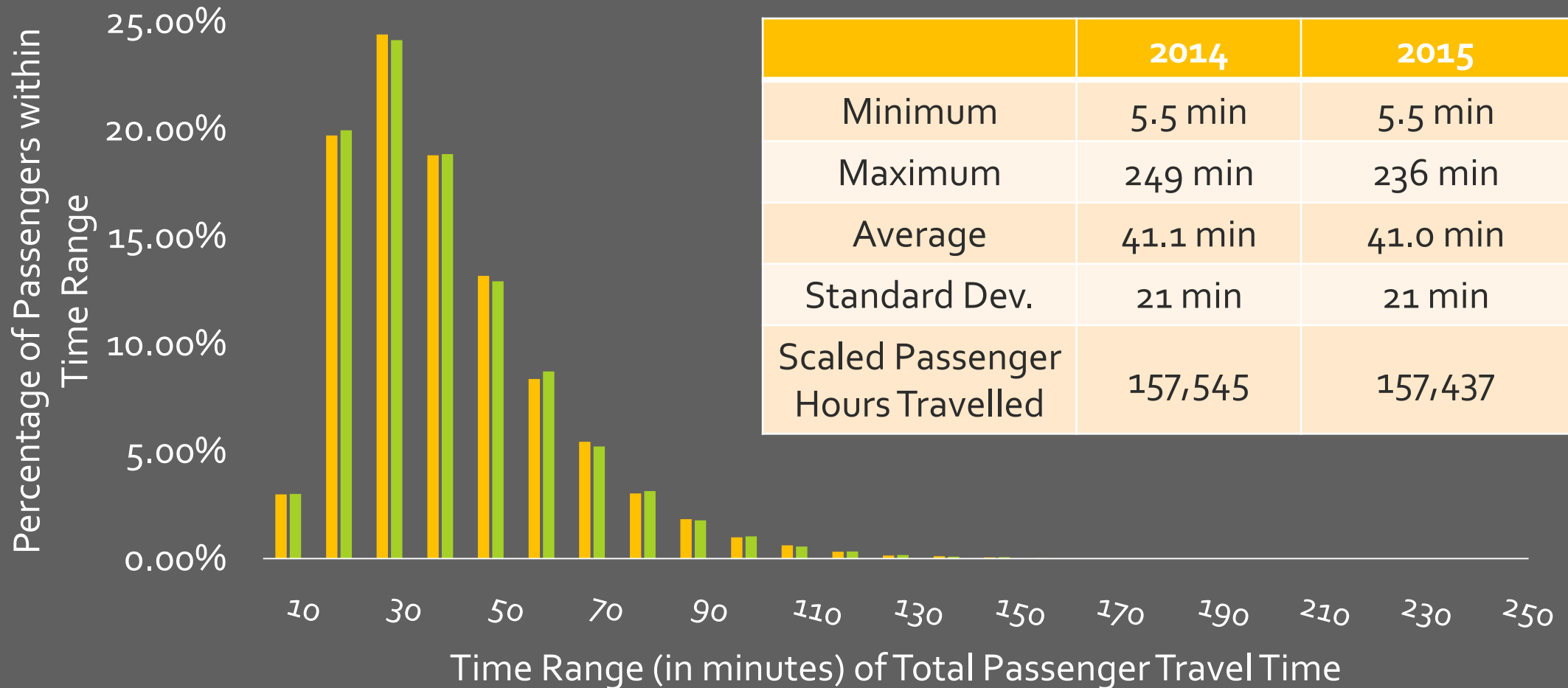


METRO SYSTEM DAILY RIDERSHIP SUMMARY

Route	Metro Transit Reported Ridership, 2014	FAST-TRiPs 2014	Metro Transit Reported Ridership, 2015	FAST-TRiPs 2015
METRO Blue Line	27,644	32,212	31,471	35,154
METRO Green Line	N/A	N/A	37,402	22,522
Total	30,300	32,212	68,873	57,676

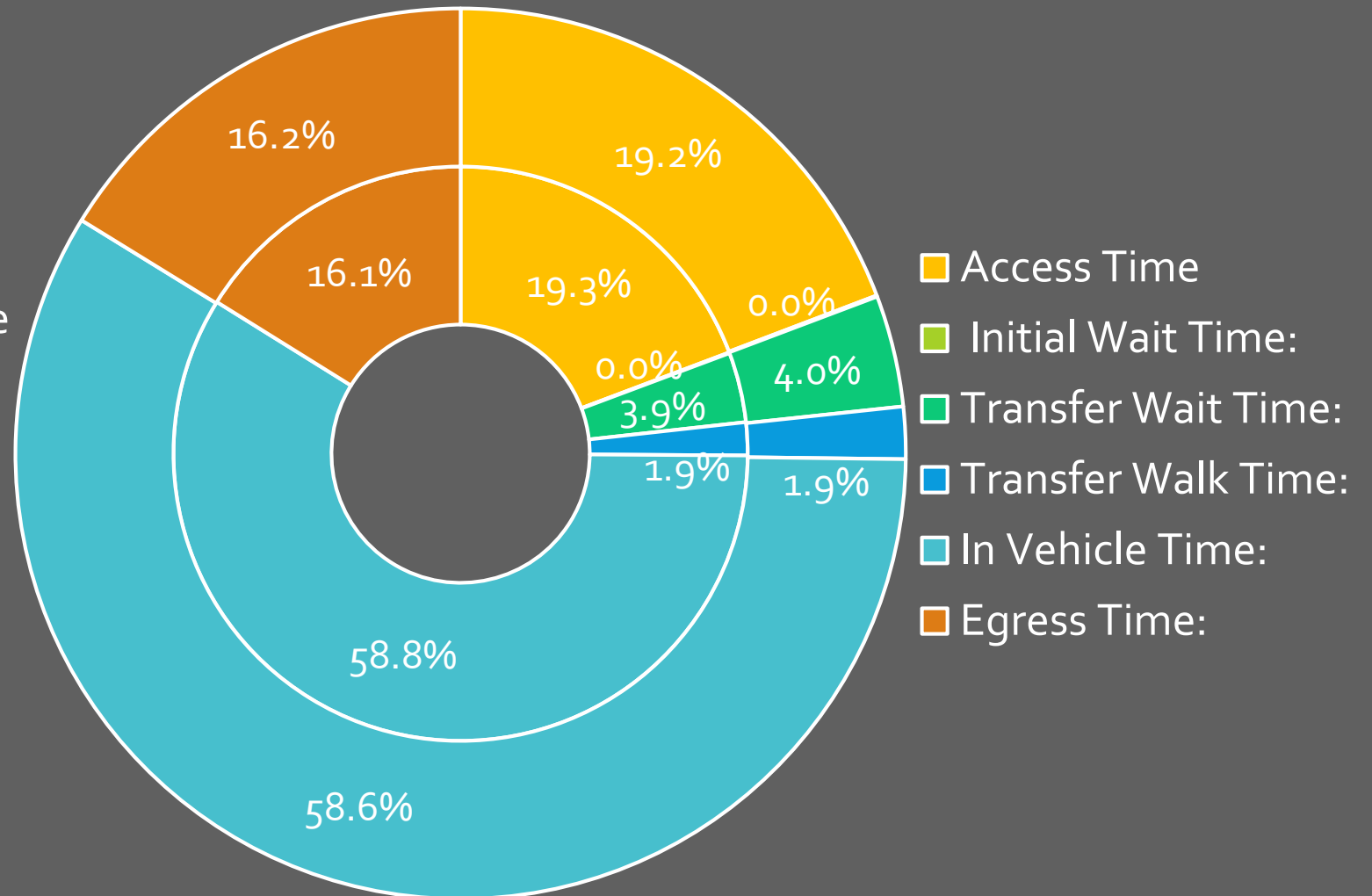
Ridership data source: Metro Transit press releases Jan. 28, 2015 and Jan. 22, 2016

DISTRIBUTION OF TOTAL PASSENGER TIME FROM FAST-TRIPS

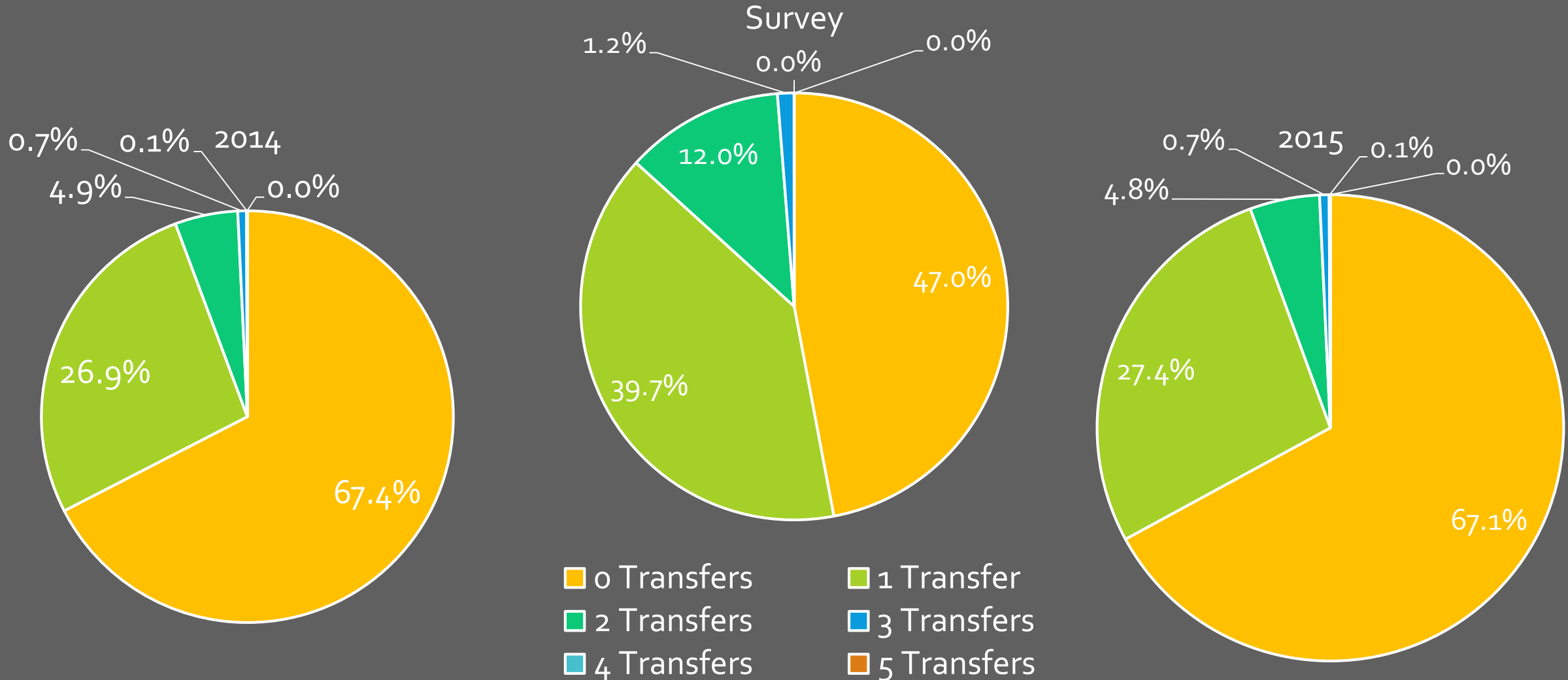


FAST-TRIPS PASSENGER TIME DISTRIBUTION

- No significant changes to passenger time distribution before and after METRO Green Line implementation
- New route choice parameters will change this



DISTRIBUTION OF TRANSFERS MADE DURING EACH TRIP



NEXT STEPS FOR FAST-TRIPS CALIBRATION

- New route choice model development
- Calibrate model with more relevant data
- More accurate access link calculation
- More realistic waiting time assumptions: understand how people coordinate their time with transit uncertainty
- Incorporate reliability measures



FUTURE APPLICATIONS FOR FAST-TRIPS

- Integration with the Metropolitan Council's Activity Based Model or other travel demand model
- LRT and BRT before and after studies
- Estimate ridership of future projects and their network impacts

