

APPENDIX C



STOPS Model Documentation





MEMORANDUM

To: John Zeanah, Director
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John Lancaster, Director of Planning and Scheduling
Memphis Area Transit Authority (MATA)

From: Kenneth Monroe, and
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Date: July 17, 2018

Subject: Ridership Forecasting Update

A ridership forecast update was conducted in support of the City of Memphis and Memphis Area Transit Authority (MATA) grant application for USDOT's Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Grant Program. Ridership for the MATA Midtown BRT project was forecasted using the Federal Transit Administration (FTA) Simplified Trips-on-Project Software (STOPS) Version 2.01 model. This memorandum summarizes the forecasting methodology and results, specifically focusing on revisions to previous forecasting efforts for the MATA Midtown BRT project. This memorandum is intended to be a supplement to the Midtown Alternatives Analysis Technical Memorandum 13 – Ridership Forecasting dated May 2016.

The forecasted weekday ridership for the BRT in the horizon year 2040 is 5,400 transit trips, with 900 weekday trips shifted from automobile to transit and 4,500 weekday trips shifted from local bus routes. This equates to approximately 650 weekday riders per mile using the BRT.

Model Inputs

Since the 2015 MATA Midtown Alternatives Analysis (AA) study was completed, several factors that affect ridership projections have changed, including the proposed BRT alignment/stations for the Locally Preferred Alternative (LPA), baseline travel flow data by modes, existing baseline and future demographics, development densities, and transit service. The LPA, based on Alignment 11 of the AA study, is shown in **Figure 1** and connects Downtown Memphis, the Memphis Medical District, and the University of Memphis along Second Street, BB King Boulevard, Union Avenue, and Poplar Avenue.

The STOPS model from the AA study was used as a starting point, and the following inputs were updated:

- Baseline travel flow from American Community Survey commuting journey to work data – 2010

- Population and employment data from the Memphis Area Planning Model – 2010, 2017, and 2040
- Zone-to-zone distance and highway travel time data from the Memphis Area Planning Model – 2017 and 2040
- MATA transit network in GTFS format – Spring 2018
- MATA weekday ridership by route – Spring 2018
- MATA systemwide weekday ridership – 2018

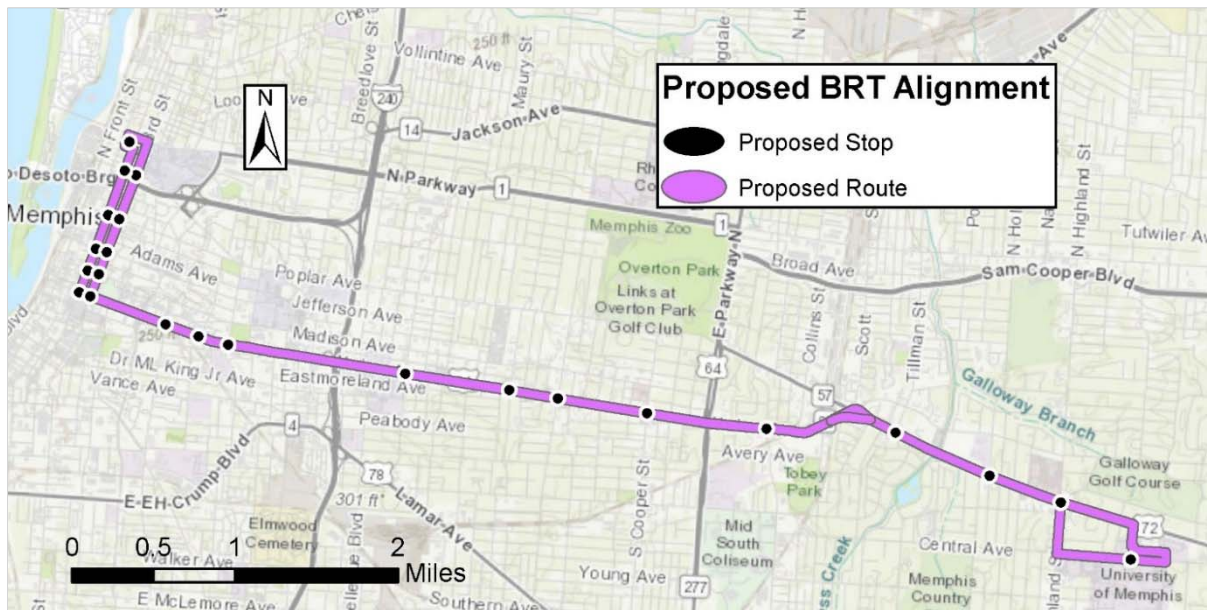


Figure 1. Proposed BRT Alignment and Stations

The transit network was updated for the existing year 2018 and horizon year 2040 to include the service changes identified in the AA study:

- Implementation of BRT with a frequency of 10 minutes during morning and afternoon peak, 15 minutes in the early morning and midday, and 30 minutes during the evening.
- Route 2 – elimination of service
- Route 32 – increase frequency to 30 minutes
- Route 34 and Route 34L – truncate at the Central Library
- Route 56 – move service off Union Avenue and onto Jefferson Avenue and Madison Avenue

Both the STOPS district system and fixed guideway transit visibility factor, which indicates the degree to which the project is more visible to the traveling public than the local bus, were maintained from the AA study. This factor reflects the operational characteristics of the proposed BRT where a dedicated transitway is not available for majority of the alignment.

Model Calibration and Validation

A limited amount of model re-calibration was done to the STOPS model from the AA study based on the updated input data in order to maintain consistency with the parameters (e.g., visibility factor) assumed in the previous forecasting efforts. STOPS model calibration was done using route and station group boardings. Station group boardings from the AA study model were inflated to 2018 ridership levels based on systemwide ridership. This calibration approach controls for geographic distribution of boardings in the service area. The resulting adjustment factors used STOPS were similar to those of the AA study.

As part of the validation process, estimated boardings from the STOPS model were compared to the existing route ridership for specific routes operating in or near the BRT project corridor. The STOPS model represented corridor ridership well as shown in **Table 1**.

Table 1. Weekday Observed versus Estimated Route-Level Boardings

Route	Observed	Post-Calibration	% Difference
Route 2	794	852	7.3%
Route 5	389	389	0.0%
Route 34	124	135	8.9%
Route 34L	40	41	2.5%
Route 50	2,542	2,609	2.6%
Route 56	1,321	1,385	4.8%
Local Route Total	5,210	5,411	3.9%

Ridership Forecasts

BRT project ridership was estimated for 2018 and 2040. **Table 2** provides a summary of the following measures:

- **Weekday trips on project:** total weekday transit trips using the BRT
- **Weekday trips on project (transit-dependent):** total weekday transit trips using the BRT by members of zero-car households
- **Weekday project boardings per mile:** total trips on project divided by the corridor length
- **Weekday new trips:** new transit trips compared to the no-build alternative that are shifted from the automobile mode
- **Weekday new trips (transit-dependent):** new transit trips by members of zero-car households compared to the no-build alternative that are shifted from the automobile mode
- **Change in weekday automobile person miles traveled:** reduction in weekday automobile person miles of travel compared to the no-build alternative

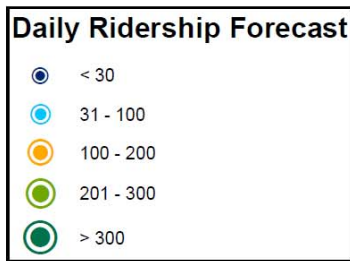
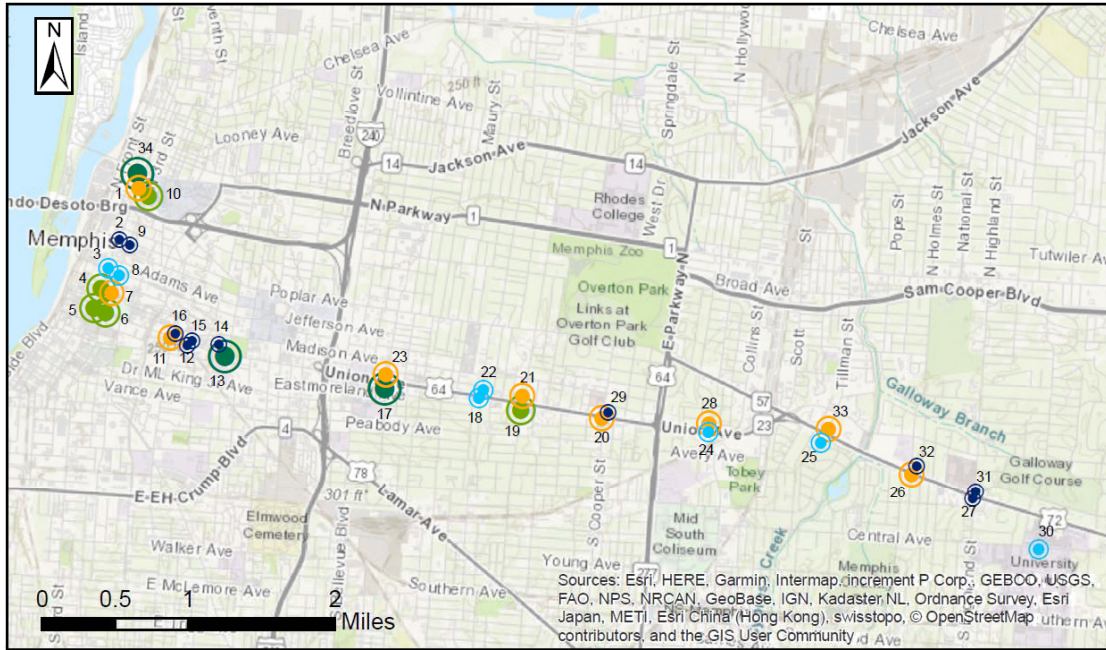
Table 2. 2018 and 2040 Weekday Ridership Forecast

Measure	2018 Forecast	2040 Forecast
Weekday trips on project	4,400	5,400
Weekday trips on project (transit-dependent)	1,600	1,800
Weekday project boardings per mile	500	650
Weekday new trips	700	900
Weekday new trips (transit-dependent)	-	50
Change in weekday automobile person miles traveled	-5,500	-7,300

The increases in the ridership forecasts as compared to the AA study are attributed to projected population and employment growth in Memphis by 2040, use of more recent baseline travel flow data, and fewer intermediate BRT stations which results in faster corridor travel time for BRT operations.

The stations forecasted to have high utilization are those in Downtown, the Medical District, and at Methodist University Hospital, as shown in **Figure 2**. Local routes that see notable decline in ridership as trips shift to BRT are:

- Route 50 - travel along Poplar Avenue
- Main Street Trolley – travel along Main Street in Downtown
- Route 34 and 34L – replaced with BRT between Downtown and Central Library
- Route 57 – travel through Downtown



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|------------------------------|------------------------------|----------------------------------|
| 1 2nd and Overton | 13 Union and Manassas (EB) | 25 Poplar and Tillman (EB) |
| 2 2nd and Poplar | 14 Union and Manassas (WB) | 26 Poplar and Holmes (EB) |
| 3 2nd and Jefferson | 15 Union and Myrtle (WB) | 27 Poplar and Highland (EB) |
| 4 2nd and Madison | 16 Union and Lauderdale (WB) | 28 Union and Alicia (WB) |
| 5 2nd and Union | 17 Union and Cleveland (EB) | 29 Union and Cooper (WB) |
| 6 3rd and Union | 18 Union and Belvedere (EB) | 30 Central and Conlee |
| 7 3rd and Madison | 19 Union and Mclean (EB) | 31 Poplar and Highland (WB) |
| 8 3rd and Jefferson | 20 Union and Cooper (EB) | 32 Poplar and Holmes (WB) |
| 9 3rd and Poplar | 21 Union and Mclean (WB) | 33 Poplar and Tillman (WB) |
| 10 3rd and Overton | 22 Union and Belvedere (WB) | 34 William Hudson Transit Center |
| 11 Union and Lauderdale (EB) | 23 Union and Cleveland (WB) | |
| 12 Union and Myrtle (EB) | 24 Union and Alicia (EB) | |

Figure 2. 2040 Weekday BRT Station Ridership Forecast