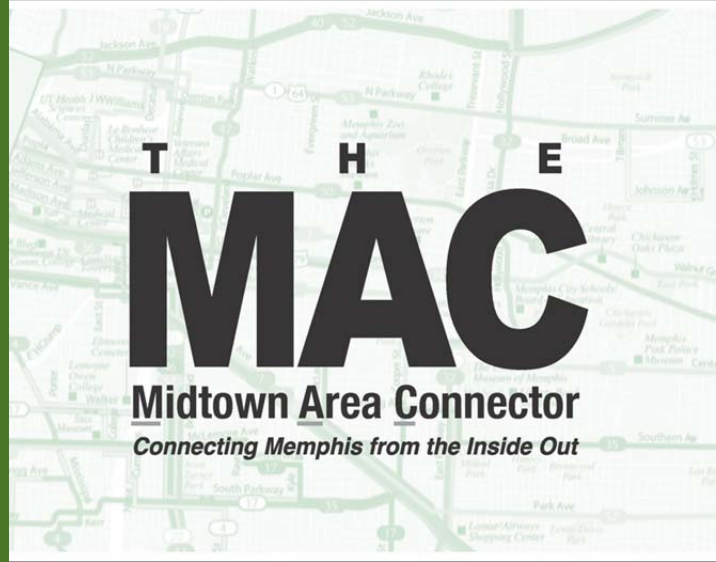


MEMPHIS AREA TRANSIT AUTHORITY

Midtown

Alternatives Analysis

ALTERNATIVES ANALYSIS/LOCALLY
PREFERRED ALTERNATIVE REPORT



May 2016

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Executive Summary

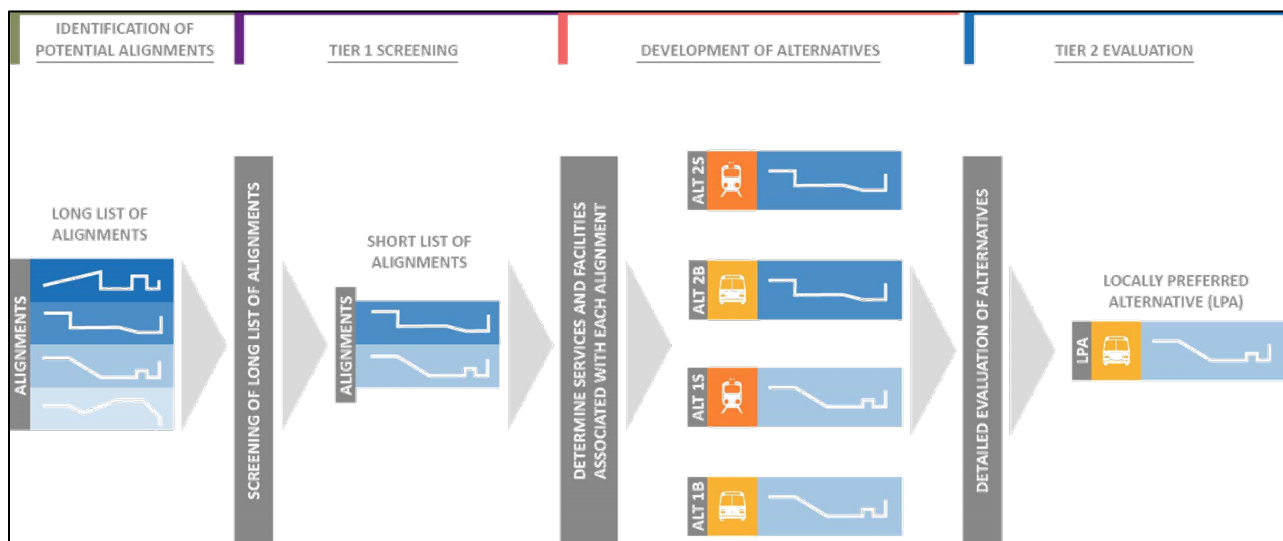
In April 2014, the Memphis Area Transit Authority (MATA) initiated the Midtown Alternatives Analysis (AA) study. The grant for the study was provided by the Federal Transit Administration (FTA) under federal legislation which stresses the importance of the linkage between metropolitan planning and environmental processes. The legislation also places a strong emphasis on the local planning process influencing the ultimate selection of a mode of transit along a preferred corridor.

Conducting an AA provides essential information to make the case to local decision-makers addressing the needs, benefits, issues, and costs of a given corridor of a local high capacity or fixed guideway transit project. The Study's primary purpose is **to examine transit needs and the potential for providing a higher quality transit service within Midtown Memphis and surrounding neighborhoods**. The following study goals and objectives were developed:

- ENHANCE:** Make transit service more compelling
- CONNECT:** Connect neighborhoods/improve local circulation
- DEVELOP:** Support local and regional economic development goals
- THRIVE:** Strengthen neighborhoods and business areas
- SUSTAIN:** Create a long-term sustainable environment

The Federal Transit Administration (FTA) AA process requires that a locally preferred alternative (LPA) is identified at the end of the Study. **Figure 1** illustrates the AA process for this Study.

FIGURE 1 | ALTERNATIVES ANALYSIS PROCESS



The Memphis Midtown AA is a multi-phase process designed to select an LPA for improved High Capacity Transit (HCT) service such as light rail, streetcar, and/or bus rapid transit (BRT) in Memphis' Midtown corridor.

At the onset of the study, a universe of potential alignments were identified and evaluated. The evaluation process consists of a three-step process: Pre-screening of a long list of alignments, Tier 1 Screening followed by development of alternatives and Tier 2 evaluation of the alternatives that would result in the identification of a locally preferred alternative.

Initially, based on specific considerations, a range of route options (twenty six) were evaluated for their ability to meet the Study's goals. These considerations include:

- Input from the public and an established Technical Advisory Committee.
- Ridership on existing routes
- Population and employment densities along corridors.
- Service to major activity centers/planned developments
- Streets that would be suitable for High Capacity Transit (HCT) service

During the Pre-screening process, these initial options were evaluated against the following criteria:

- Does the corridor have adequate terminal anchors?
- Does it meet MATA's service design guidelines?
- Does it have adequate population?
- Does it have employment density to generate demand for high capacity transit service?

This process reduced the initial options from twenty six to sixteen alignments which were then advanced into Tier 1 screening. These sixteen alignments were then screened using the criteria as shown in **Table 1**.

Through this Tier 1 screening, seven viable candidate alignments which were seen as a reasonable set of high capacity transit corridors were advanced into Tier 2, where they were further evaluated in detail. For each of these seven alternatives, analysis performed included:

- Environmental Scan
- Analysis of Development Potentials
- Ridership Projections
- Fatal Flaw Analysis
- Funding Strategy
- Branding Strategy
- Cost Estimation (Capital Cost/Operating & Maintenance Cost)

TABLE 1 | TIER 1 SCREENING CRITERIA

Objective	Screening Criteria
ENHANCE <i>Make Midtown Corridor transit service more compelling</i>	
Provide better transit service for existing riders and attract new riders	<ul style="list-style-type: none"> ↻ Ridership on existing transit services ↻ Population and employment density within ½-mile of alignment
Provide fast, frequent, and reliable service	<ul style="list-style-type: none"> ↻ Directness and average auto speeds
Improve transit options for Memphis’ most vulnerable residents	<ul style="list-style-type: none"> ↻ Transit-sensitive residents and social service centers within ½-mile of alignment
CONNECT <i>Connect neighborhoods and improve local circulation</i>	
Improve access for residents	<ul style="list-style-type: none"> ↻ Residents within ½-mile of alignment (current and projected)
Improve access to jobs	<ul style="list-style-type: none"> ↻ Jobs within ½-mile of alignment (current and projected)
Improve connections with major attractions and destinations	<ul style="list-style-type: none"> ↻ Anchors and major activity centers within ½-mile of alignment
Improve access to civic and cultural assets	<ul style="list-style-type: none"> ↻ Special use generators within ½-mile of alignment
Improve access to visitor destinations and accommodations	<ul style="list-style-type: none"> ↻ Visitor destinations and visitor accommodations within ½-mile of service
Complement other transit investments and transit plans	<ul style="list-style-type: none"> ↻ Consistency with other transit investments and plans
DEVELOP <i>Support local and regional economic development goals</i>	
Support small businesses and retail districts	<ul style="list-style-type: none"> ↻ Small businesses within ½-mile of alignment
Foster compact, mixed-use development	<ul style="list-style-type: none"> ↻ Transit-supportive land uses within ½-mile of alignment
Attract residential and commercial growth	<ul style="list-style-type: none"> ↻ Amount of undeveloped and underdeveloped land along alignment
THRIVE <i>Strengthen Memphis neighborhoods and downtown</i>	
Support community desires	<ul style="list-style-type: none"> ↻ Community and stakeholder support
SUSTAIN <i>Create an environment that will be sustainable over the long term</i>	
Develop implementable transit services	<ul style="list-style-type: none"> ↻ Design Challenges

The analysis performed during Tier 2 screening resulted in the identification of the top performing corridor, Alternative 11, as shown in **Table 2**. This alternative, identified as a Bus Rapid Transit technology, will connect Downtown Memphis with the University of Memphis via Union and Poplar Avenues. The improved service level will accommodate increasing demand from existing riders, businesses along the corridor, college students and also encourage local residents to consider transit as an attractive daily alternative to driving. This alternative, identified as the LPA was approved by the MATA Board of Commissioners in April 2016 and reflects the outcomes of technical analyses and input heard from community participants and is responsive to the five goals and criteria defined in **Table 2**.

TABLE 2 | EVALUATION OF ALTERNATIVES

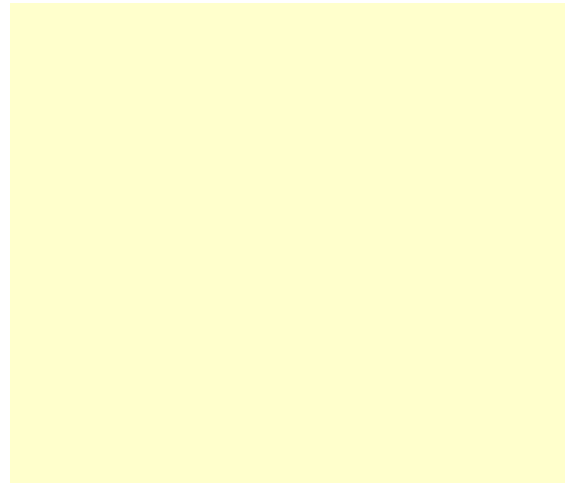
Alternative	Corridor Description	Mode of Travel	Daily Ridership (2035)	Capital Cost (2016)	Annual Operations & Maintenance Costs (2016)	Corridor Length (Miles)	One Way Travel Time (Minutes)	Number of Stops/Stations	Number of Vehicles	Development Potential (% of underutilized parcels)	Passengers per Mile
6	Airport via Poplar & Airways	BRT	1726	\$43.70	\$5.37	11.75	51.00	39	13	22%	147
7	Germantown via Poplar	BRT	2138	\$37.00	\$3.95	7.81	38.00	27	11	17%	274
8	U of M via Poplar, Cooper & Union	BRT	1205	\$35.20	\$4.40	8.49	42.00	30	12	18%	142
9*	Extension of Madison Ave Streetcar to Fairground	Streetcar	1301	\$65.00	\$3.33	2.82	28.00	4	8	13%	461
11	U of M via Union & Poplar	BRT	3061	\$25.70	\$3.61	8.63	36.00	23	9	19%	355
23	Elvis Presley, Cleveland, Watkins Crosstown	BRT	3512	\$43.80	\$5.16	11.04	47.00	39	13	22%	318
26	U of M via Union & Central	BRT	2430	\$38.40	\$4.53	9.1	45.00	32	12	20%	267
*NOTE: Alternative 9 is the Streetcar Extension. Total length of Streetcar is 7.20 miles (extension line is 2.82 miles)											

The capital cost for implementing the LPA is estimated to be \$25.7 million while the operations and maintenance costs are estimated to be \$3.6 million. All costs are in 2016 dollars.

MATA staff held the first public meeting on the project in July 2014. A Technical Advisory Committee made up of various community stakeholders was established. A total of 4 public meetings, 4 technical advisory committee meetings and additional meetings with key stakeholders and agencies were held during the 24-month study process. At various phases of the Study, through workshops and presentations, the study findings were presented to the public, the Technical Advisory Committee (TAC), MATA Board of Commissioners and staff. In addition, we met with City of Memphis staff for their input and also presented the results to the Metropolitan Planning Organization (MPO) as information.

The study process involved a branding strategy which received input from the community via focus groups and stakeholders. The service was branded as the *Midtown Area Connector* so that the community would recognize the higher quality of transit service connecting Midtown Memphis to key destinations in and around the area.

Section 1 | Introduction



About This Document

Federally-funded projects, such as a proposed high capacity transit project, are subject to review under a number of environmental statutes, regulations, and executive orders. This document provides detailed information on the project and the selection of the Locally Preferred Alternative (LPA) as required by the Federal Transit Administration's (FTA) Alternatives Analysis (AA) process. The AA requires a comprehensive assessment of various mobility options for any potential major transit investment. Additionally, this document summarizes information from an environmental screening process that will be included in a future environmental analysis in compliance with National Environmental Policy Act (NEPA) regulations.

The FTA is the lead agency for the proposed Memphis Midtown Area Connector. As the grant recipient, the Memphis Area Transit Authority (MATA) is the primary sponsor of this project. MATA has partnered with the City of Memphis and the Memphis Urban Area Metropolitan Organization (MPO) to conduct this Study.

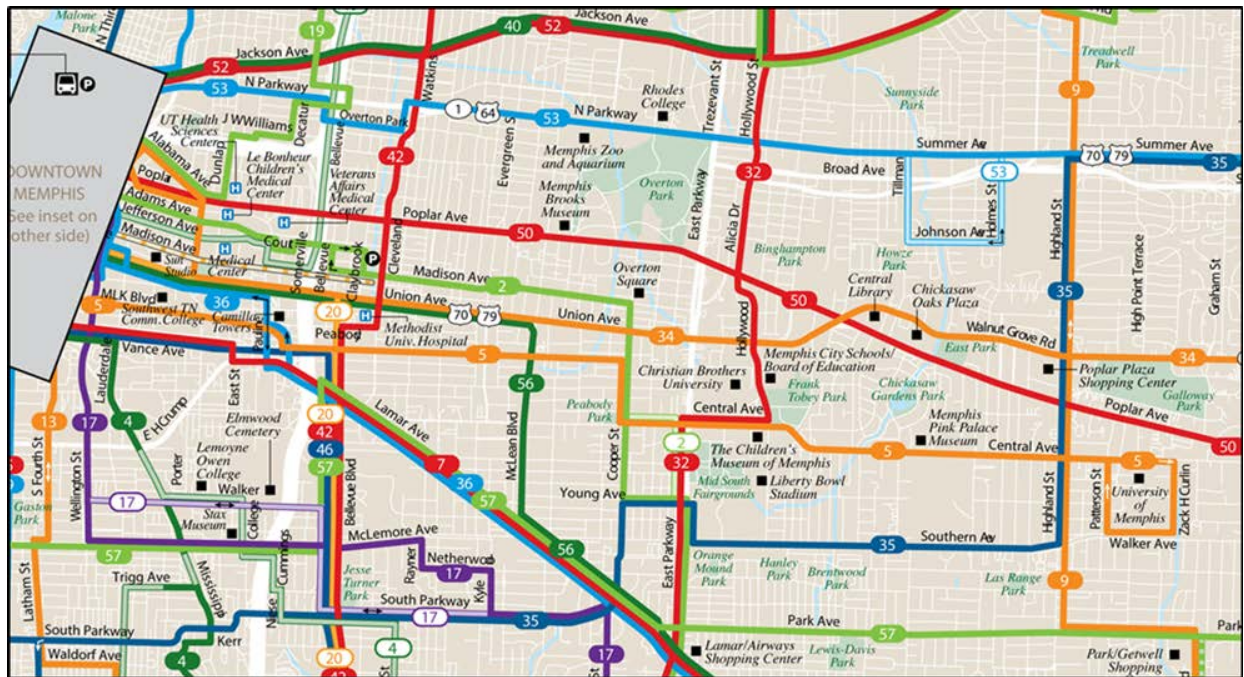
An environmental screening was done as part of this project. However, future work will involve the preparation of NEPA documents that will be submitted to the FTA in compliance with NEPA regulations.

While conceptual costs were developed for the proposed high capacity transit service based on certain design assumptions, detailed design decisions will be made as part of the future preliminary engineering and final design processes. Coordination with the public and stakeholders will continue throughout the design process. A general funding strategy for implementing the project is proposed as part of this study, but a more detailed funding plan will be established through continuing discussions with potential project partners. Additionally, in recognition of limited funding resources, the proposed project may be implemented in phases. Details regarding the potential phased implementation will be determined based on continuing technical analysis and stakeholder input.

Study Area

The study area, **Figure 2** is bounded on the west by the Downtown Central Business District (CBD)/US 51 (Danny Thomas Boulevard), on the east by Perkins Road, to the north by Jackson Avenue and to the south by Park Avenue.

FIGURE 2 | STUDY AREA



Public Involvement

As described later in this document, public and stakeholder input was sought throughout the study and, it informed all project decisions leading to the identification of the Locally Preferred Alternative (LPA). As part of the NEPA documentation to be submitted at a future date, the public will have additional opportunities to comment on the proposed Midtown Area Connector project prior to the completion of environmental review.

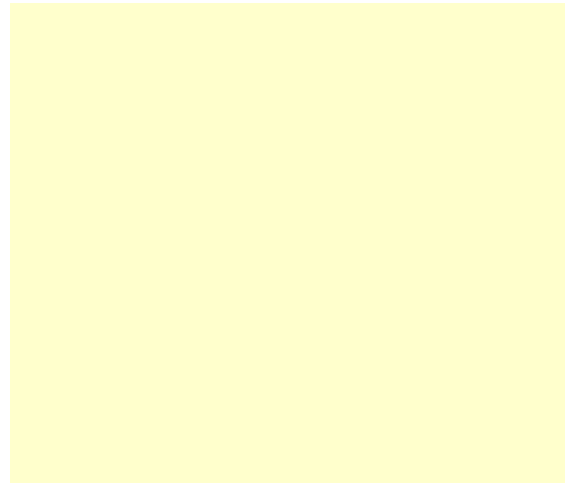
Technical Memorandums

A series of technical memorandums were completed that provides more detailed information about the elements summarized in this document. All memorandums are available on the study website at www.macmemphis.com or MATA's website at www.matatransit.com. This report is a summary of several technical memorandums completed for the study.

The following is a list of these Technical Memorandums:

- Technical Memo #1 | Summary of Previous Studies
- Technical Memo #2 | Tier 1 Screening Summary
- Technical Memo #3 | Tier 2 Screening Summary
- Technical Memo #4 | Potential Alignments
- Technical Memo #5 | Public Engagement
- Technical Memo #6 | Funding Analysis
- Technical Memo #7 | Cost Estimation Methodology & Results
- Technical Memo #8 | Operating Plans
- Technical Memo #9 | Environmental Considerations
- Technical Memo #10 | Branding Strategy
- Technical Memo #11 | Evaluation Framework
- Technical Memo #12 | Underutilized Parcels by Alignment
- Technical Memo #13 | Ridership Forecasting

Section 2| Purpose and Need



Why Is This Project Needed?

The Midtown Area Connector is needed to help Memphis achieve its vision as described in the 2012 Short Range Transit Plan to “the Key Corridor Routes to create a framework for future development of Bus Rapid Transit (BRT) on highest ridership corridors.” The Midtown Area Connector can support this vision by enhancing economic competitiveness and providing more mobility options in the urban core.

The area encompasses the greater downtown area and key regional activity centers such as the Medical District, University of Memphis, Rhodes College, Christian Brothers University, Museums, Liberty Bowl Stadium, AutoZone Park, Overton Square/Park, Cooper-Young and a host of shopping centers, restaurants and retails. Beyond economic growth, transit can help the downtown and the surrounding neighborhoods flourish by giving citizens an alternative to being dependent on automobiles. Neighborhoods with transit preserve mobility, encouraging walking, support higher property values, and promote overall public health.

A high capacity transit service connecting Midtown Memphis to surrounding regions could be a viable transit service connecting:

Uptown. Redevelopment of public housing into mixed-use, mixed income neighborhood through Hope VI program. \$150 million has been spent to generate 1,000+ new units. Strong links to downtown with pedestrian, bicycle, streetcar, and bus connections.

Bass Pro/Pyramid. \$191 million redevelopment of a former NBA arena into a hotel, retail, entertainment, space leased and operated by Bass Pro.

Downtown Memphis. Home to Beale Street, the FedEx Forum, Autozone Park, University of Memphis School of Law, courts, and major financial institutions. Significant investments in tourism, residential, and office markets. \$177 million in current investment generating 320 new hotel rooms, 467 residential units, and recent renovation to Autozone Park.

Memphis Medical District. Cluster of 8 major research, education, and healthcare institutions. Undergoing significant expansion with more than \$3 billion in capital investments and 7,000 anticipated new hires over the next 5 years. Currently 24,000 employees and students. Expansion expected to trigger significant private sector real estate investment.

Rhodes College. A private, liberal arts college that enrolls approximately 2,000 students. Has strong connection to the surrounding community with heavy focus on community service.

Crosstown Concourse. \$200 million redevelopment of the long abandoned 1.5 million sq. ft. Sears distribution center into a mixed-use development with a focus on arts, healthcare, food, education, residential and retail uses. Building will be complete in the fall of 2017.

Overton Park. A 342-acre park in Midtown. Contains Memphis Brooks Museum of Art, Memphis Zoo, a golf course, Memphis College of Art, Rainbow Lake, Veterans Plaza, Historic Greensward, Levitt Shell concert venue and the Old Forest Arboretum.

Broad Avenue Arts District. Mixed-use district with major investment in retail, arts, bicycle infrastructure, and artisan manufacturing. Nationally known for grassroots approach to redevelopment and use of incremental real-estate investments. Occupancy is at 100%. This area will connect to the MAC at Tillman. The route includes a number of public art installations and artistic transit shelters. This also provides a direct connection to the Shelby Farms Greenline. The Binghamton community is an environmental justice area.

Highland Row. Urban infill development bordering UofM and designed within context of UofM's Master Plan. A four-story, mixed-use building with apartments, restaurants and boutique shops define a thriving streetscape. Townhouses, outdoor plaza, grocery store, and coffee house further enhance a pedestrian-oriented activity.

South City. Neighborhoods Initiative includes demolition of blighted public housing to create 712 mixed-income apartments, pocket parks, community spaces, and a retail center. Received nearly \$30 million in federal funding, leveraged with over \$30 million in local funding and another \$200+ million in nearby development. Additional plans include a \$6.2 million renovation of the historic Universal Life Insurance Building and Patterson Flats, a \$14 million 177-unit housing development.

South Main. Nearly \$218 million in development projects recently completed, under construction, or planned, including 830 housing units and 250+ hotel rooms. Large-scale redevelopments featuring residential, hotel, movie theatre, and commercial space.

South End. Experiencing resurgence. Approximately \$94 million is being invested, creating 614 new housing units. Highlighted by the South Junction Apartments, a \$26.1 million project, and the Artesian, a \$47 million project.

Cooper-Young. An eclectic neighborhood and historic district in the Midtown section of Memphis, Tennessee, named for the intersection of Cooper Street and Young Avenue. The entrance to the neighborhood is marked by the Cooper-Young Trestle, a 150-foot (46 m) long steel sculpture which depicts homes and businesses found in the neighborhood. In 2012, Cooper-Young was listed on the American Planning Association's 10 Great Neighborhoods in the U.S list.

Overton Square. Overton Square is home to several restaurants and shops, employing hundreds of people from across the metro Memphis area. The Square is home to thriving businesses anchored by four live-performance theaters and a multi-screen movie theater. The Square is transforming into an arts and entertainment district that is becoming a hot destination for locals and visitors alike.

Study Goals and Objectives

The overall goal of the Alternatives Analysis is: *to develop and evaluate high-capacity transit options such as bus rapid transit (BRT) and streetcar that would increase capacity and overall transit usage and reinforce improved economic development opportunities in the Midtown area.*

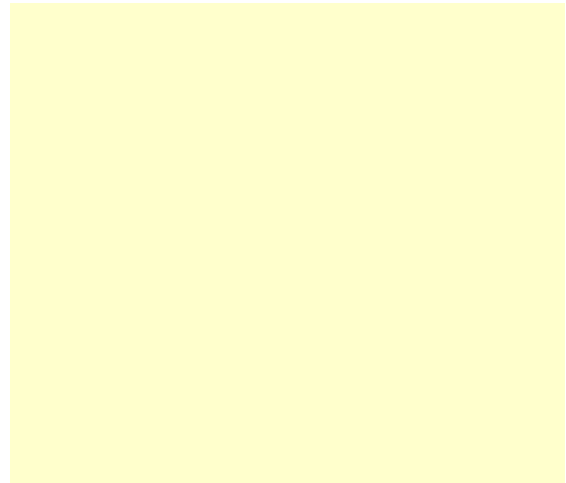
The following goals and objectives shown in **Table 3** reflect MATA’s existing and future vision and have been developed to reflect the intent of the Alternatives Analysis:

TABLE 3 | MIDTOWN STUDY GOALS AND OBJECTIVES

GOAL 1	<p>ENHANCE <i>Make Midtown Corridor transit service more compelling</i></p> <p><i>Objectives:</i></p> <ul style="list-style-type: none"> • Provide better service for existing transit users and attract new riders • Provide fast, frequent, comfortable, and reliable service • Improve transit options for Memphis’ most vulnerable residents
GOAL 2	<p>CONNECT <i>Connect neighborhoods and improve local circulation</i></p> <p><i>Objectives:</i></p> <ul style="list-style-type: none"> • Improve access to transit for Midtown Corridor residents • Improve access to jobs • Improve connections to major attractions and destinations • Enhance access to civic and cultural assets • Enhance access to visitor destinations • Complement other transit investments and transit plans
GOAL 3	<p>DEVELOP <i>Support local and regional economic development goals</i></p> <p><i>Objectives:</i></p> <ul style="list-style-type: none"> • Support small businesses and retail districts • Foster compact, mixed-use development • Attract residential and commercial growth
GOAL 4	<p>THRIVE <i>Strengthen Midtown Corridor neighborhoods and business areas</i></p> <p><i>Objectives:</i></p> <ul style="list-style-type: none"> • Support community desires • Support and enhance the character of neighborhoods • Support walkable neighborhoods and multimodal transportation choices
GOAL 5	<p>SUSTAIN <i>Create an environment that will be sustainable over the long term</i></p> <p><i>Objectives:</i></p> <ul style="list-style-type: none"> • Develop implementable transit services • Develop cost-effective transit solutions • Reduce greenhouse gases • Minimize impacts on natural, historical, and cultural resources

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Section 3 | Screening of Alignments



Development of Alignments

This chapter describes the process to identify the potential alignments for further consideration. The evaluation process consists of a three-step process: *Pre-screening*, *Tier 1 Screening* and *Tier 2 Evaluation*.

One of the initial steps in the project was the identification of potential alignments for High Capacity Transit service. To begin, potential services identified as part of previous efforts such as the Short Range Transit Plan were included. Additional potential alignments were identified which were focused around other major arterials.

For each alignment, logical terminal points were identified, which were within and outside of the defined corridor. For example, the western end of many alignments was downtown Memphis, and the eastern end of some was the University of Memphis.

Finally, the alignments were defined in consideration of how different HCT modes could operate. For example, one alignment could run from the end of the existing Madison Avenue streetcar line as streetcar service, while a second could extend into downtown as BRT service.

Initially, based on specific considerations, a range of route options were evaluated for their ability to meet the Study's goals. These considerations include:

- Input from the public and an established Technical Advisory Committee
- Ridership on existing routes
- Population and employment densities along corridors
- Service to major activity centers/planned developments
- Streets that would be suitable for High Capacity Transit (HCT) service

Pre-Screening of Alignments

The study team began by soliciting input from stakeholders and the public to identify a long list of alignments that might be suitable for HCT. There were a total of 26 candidate alignments which included most of

Midtown's major arterials and are shown in **Figure 3**. These initial candidates were then pre-screened to eliminate any alignments that had significant drawbacks that would compromise their feasibility, ensuring that all the alignments to be analyzed would meet the most basic requirements for HCT service. These basic requirements were threefold (the process is described in more detail in **Technical Memo #4 | Potential Alignments Memorandum**):

Alignments must serve sufficient population and employment density to generate sufficient demand for HCT service.

Alignments must have adequate terminal anchors.

Alignments must meet MATA's service design guidelines for good transit service design.

The process identified 16 potential alignments that met the minimum requirements for HCT and were carried forward into the Tier 1 Screening (see **Figure 4**).

Figure 5 shows the result of Tier 1 Screening.

Development of Service Alternatives

Following the selection of the most promising alignments, each was paired with HCT service, as appropriate. In some cases, both modes were evaluated, but in others (for example, an extension of the existing Madison Avenue streetcar line), only a single mode was examined. Decisions on which modes will be examined for each alignment was made through a collaborative process involving MATA and the project team, and based on input from the project's advisory committees, key stakeholders, and the public.

For each mode and alignment combination, operating plans were developed that defined how service would operate in each corridor in terms of span of service, service frequencies, station and stop locations, running times, vehicle types, and other relevant information. The operating plans also considered how new services would integrate with existing services, and appropriate changes to existing services. Conceptual designs were produced at a level of detail sufficient to produce capital cost estimates.

FIGURE 3 | UNIVERSE OF 26 ALIGNMENTS

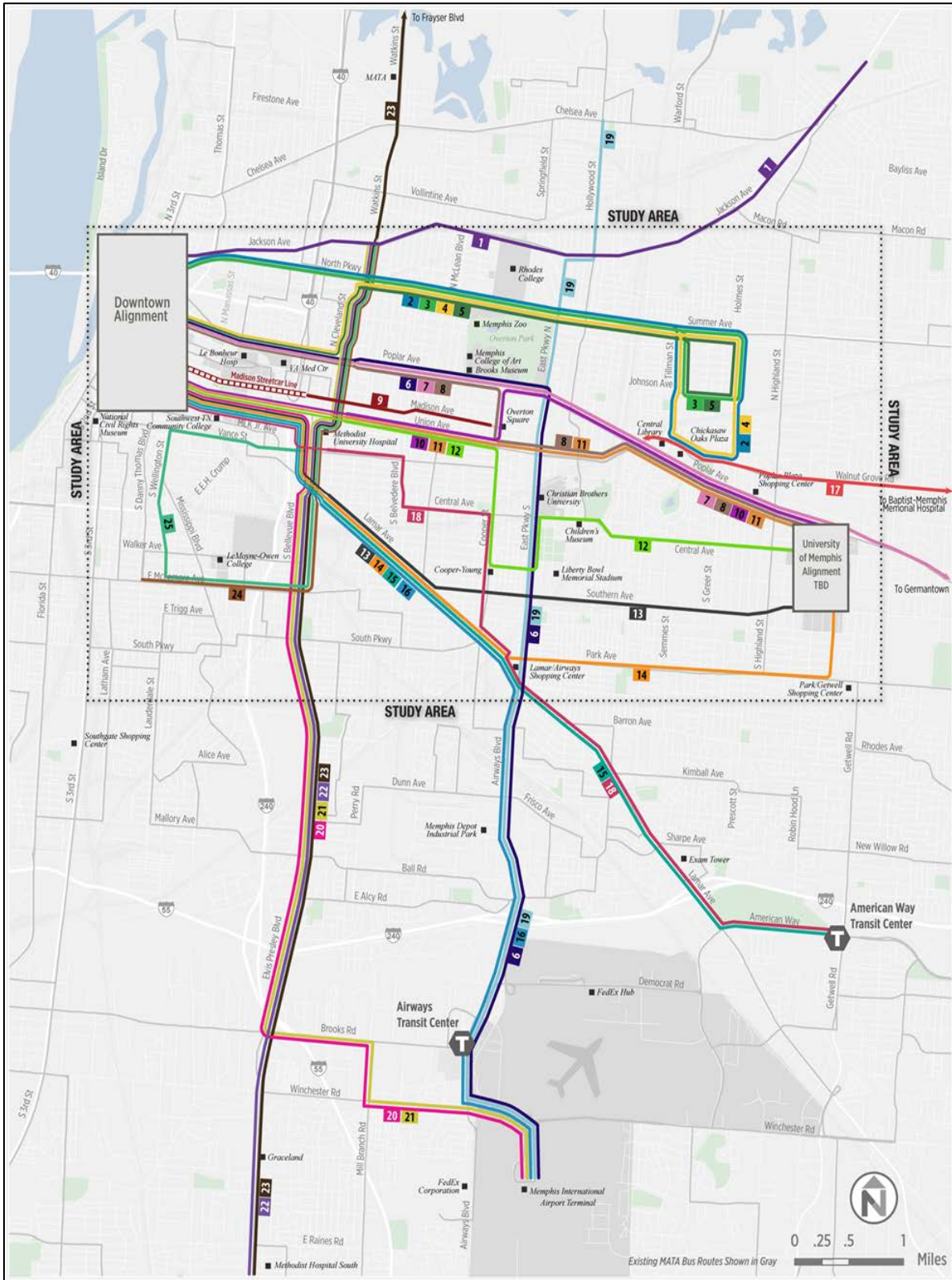


FIGURE 4 | TIER 1 SCREENING

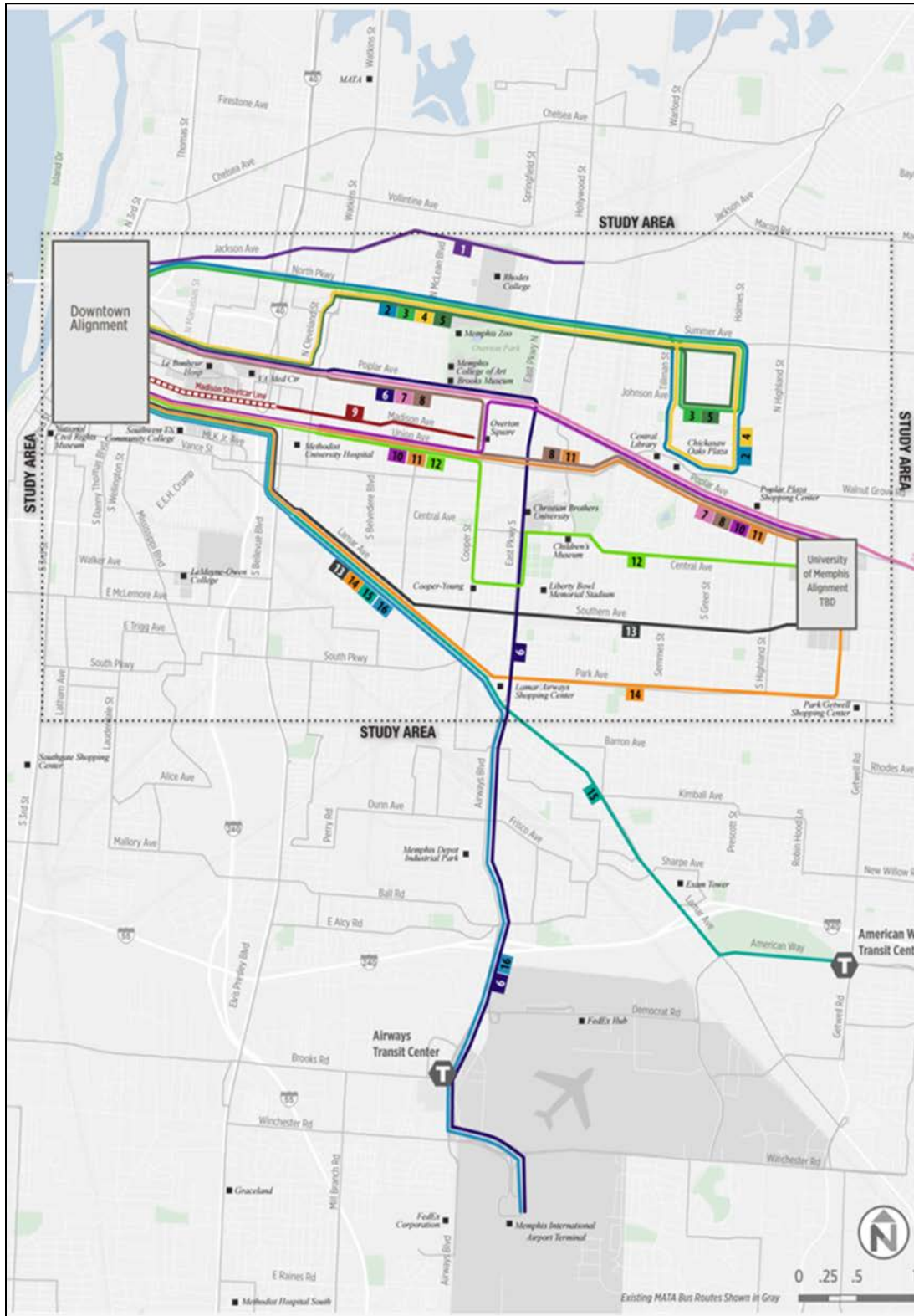
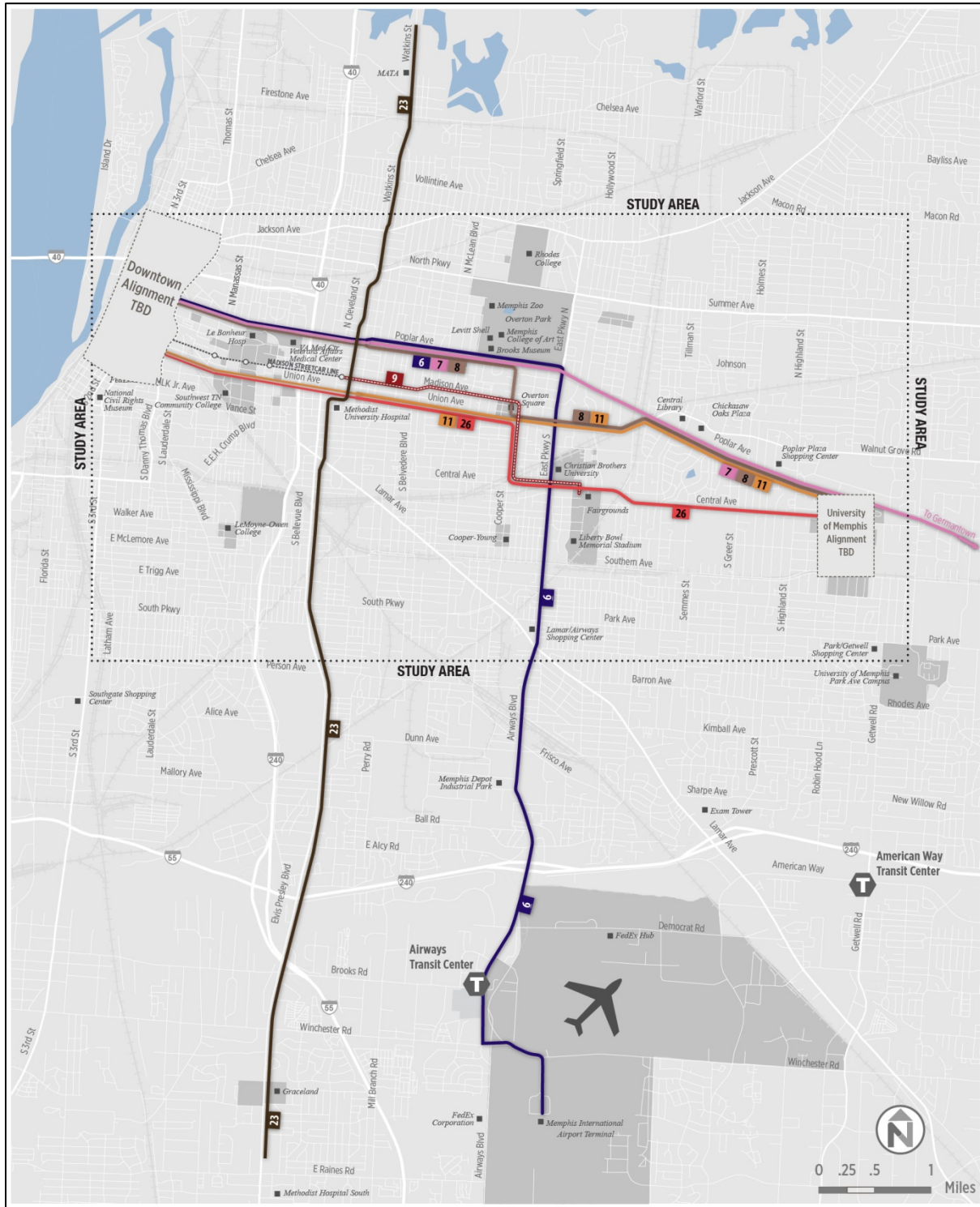


FIGURE 5 | TIER 1 EVALUATION RESULTS



Tier 2 Evaluation

As with the Tier 1 screening, the Tier 2 evaluation was based on the project goals and objectives and consisted of a combination of qualitative and quantitative measures. In some cases, the Tier 2 measures were the same as the Tier 1 measures, but in many cases, additional criteria were used (for example, ridership, operating and capital costs, cost-effectiveness, and impacts on natural and historic resources and the environment). Also, in many cases, the Tier 2 evaluation was much more detailed than the Tier 1 screening. **Table 4** shows the screening criteria used for the Tier 2 evaluation.

TABLE 4: TIER 2 SCREENING CRITERIA

Objective	Evaluation Criteria
ENHANCE <i>Make Midtown Corridor transit service more compelling</i>	
Provide better transit service for existing riders and attract new riders	<ul style="list-style-type: none"> ➤ Total projected ridership ➤ Transit-dependent ridership
Provide fast, frequent, and reliable service	➤ Directness, average speeds, frequency, and alignment traffic conditions
Improve transit options for Memphis’ most vulnerable residents	➤ Transit-sensitive residents and social service centers within ½-mile of stations
CONNECT <i>Connect neighborhoods and improve local circulation</i>	
Improve access for residents	➤ Residents within ½-mile of alignment (current and projected)
Improve access to jobs	➤ Jobs within ½-mile of alignment (current and projected)
Improve connections with major attractions and destinations	➤ Anchors and major activity centers within ½-mile of alignment
Improve access to civic and cultural assets	➤ Special use generators within ½-mile of stations
Improve access to visitor destinations and accommodations	➤ Visitor destinations and visitor accommodations within ½-mile of service
Complement other transit investments and transit plans	➤ Integration with existing and other proposed MATA services
DEVELOP <i>Support local and regional economic development goals</i>	
Support small businesses and retail districts	➤ Small businesses within ½-mile of stations
Foster compact, mixed-use development	➤ Transit-supportive land uses within ½-mile of stations
Attract residential and commercial growth	➤ Economic development potential
THRIVE <i>Strengthen Memphis neighborhoods and downtown</i>	
Support community desires	➤ Community and stakeholder support
Support and enhance the character of neighborhoods	➤ Parking and neighborhood impacts
SUSTAIN <i>Create an environment that will be sustainable over the long term</i>	

Objective	Evaluation Criteria
Develop cost-effective transit solutions	➤ Operating, capital costs, and annualized operating and capital cost per passenger
Reduce greenhouse gases	➤ Changes in Automobile Passenger Miles Traveled (PMT)
Minimize impacts to natural, historical, and cultural resources	➤ Natural, historical, cultural impacts

In addition, the process was iterative. If it was determined that some alternatives perform poorly on specific criteria, they were refined so that they can better meet project goals and objectives. In some cases, the measurement methodologies were further developed in order to more accurately distinguish the advantages and disadvantages between alternatives. Ultimately, the candidate alternatives were analyzed carefully in comparison with one another and their ability to meet project goals and function as an effective part of Memphis’ local and regional transportation system.

Selection of Preferred Alternative

When all factors are considered, seven alignments rated as BEST or GOOD overall. Tier 2 Evaluation resulted in seven alternatives listed below and shown in **Table 5**:

- Alternative 6 Airport via Poplar and East Parkway
- Alternative 8 University of Memphis via Poplar, Cooper, and Union
- Alternative 9 Fairgrounds via Madison
- Alternative 7 Germantown via Poplar
- Alternative 11 University of Memphis via Union and Poplar
- Alternative 23 Elvis Presley, Cleveland, Watkins Crosstown
- Alternative 26 University of Memphis via Union, Cooper, and Central

Three of these alternative would operate between the University of Memphis and downtown Memphis, which is the core of Midtown. Alternative 7 also serves downtown Memphis and the University of Memphis, but continues traveling east after serving the University of Memphis. Three of these alternatives would not serve the University of Memphis: Alternative 6, which would operate between the airport and downtown, Alternative 9, which would operate between downtown and the Fairgrounds, and Alternative 23, which would operate along Elvis Presley Boulevard, Cleveland Street, and Watkins Street.

Tier 2 analysis was a detailed evaluation of each alternative and resulted in the selection of a Locally Preferred Alternative. Each of these alternatives was analyzed in detail. This was done through a collaborative process involving MATA staff, the project team, the project’s advisory committees, consultation with key stakeholders, and input received through the public involvement process. These analyses are documented in the respective technical memorandums. **Table 5** illustrates the results of the Tier 2 analysis.

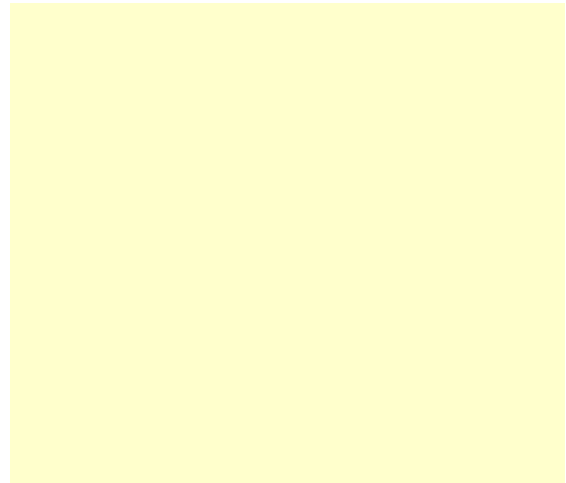
TABLE 5: TIER 2 SCREENING RESULTS

Alternative	Enhance	Connect	Develop	Thrive	Sustain	Overall Rating
6 Airport via Poplar and East Pkwy	▲ FAIR	▲ FAIR	▲ FAIR	✓✓ BEST	▲ FAIR	▲ FAIR
7 Germantown via Poplar	✓ GOOD	▲ FAIR	▲ FAIR	✓✓ BEST	✓ GOOD	✓ GOOD
8 U of M via Poplar, Cooper, and Union	▲ FAIR	✓ GOOD	✓ GOOD	✓✓ BEST	✓ GOOD	✓ GOOD
9 Fairgrounds via Madison	▲ FAIR	✓✓ BEST	▲ FAIR	▲ FAIR	▲ FAIR	▲ FAIR
11 U of M via Union and Poplar	✓✓ BEST	✓✓ BEST	✓✓ BEST	✓✓ BEST	▲ FAIR	✓✓ BEST
23 Elvis Presley, Cleveland, Watkins Crosstown	✓✓ BEST	▲ FAIR	✗ POOR	✓✓ BEST	▲ FAIR	▲ FAIR
26 U of M via Union, Cooper, and Central	✓ GOOD	▲ FAIR	✓✓ BEST	✓✓ BEST	▲ FAIR	✓ GOOD

*Note: Alternative 9 is the Streetcar Extension. Total length of Streetcar is 7.20 miles (extension line is 2.82 miles).

Alternatives received an overall rating of BEST if they had one BEST rating, three or more GOOD ratings, and no POOR ratings. Alternatives received an overall score of GOOD if they had three GOOD or BEST ratings and no POOR ratings or if they had two BEST ratings and no POOR ratings. Alternatives received a FAIR overall rating if they had three or more FAIR ratings or if they had one POOR rating. Any alternative with more than one poor rating received an overall rating of POOR.

Section 4 | Locally Preferred Alternative (LPA)



The Locally Preferred Alternative (LPA)

Although the grant for this study was provided under the 2006 SAFETEA-LU legislation, the 2013 Moving Ahead for Progress in the 21st Century (MAP-21) legislation states that the completion of an Alternatives Analysis (AA) is no longer a stand-alone requirement within the New Starts and Small Starts program, and that the selection of the locally preferred alternative (LPA) is addressed as an element of the metropolitan planning and NEPA environmental processes.

Under SAFETEA-LU, the Federal Transit Administration (FTA) emphasizes that the New Starts planning and project development process is simply an approach to problem solving, and should answer questions like:

- What is the problem in need of solving?
- What are potential solutions?
- What are their benefits?
- What do they cost? and,
- Which alternative is the best solution, given available resources, to address the problem?

MAP-21 and the 2016 Fixing America's Surface Transportation Act (FAST-Act) emphasizes that conducting an AA provides information to make the case to local decision-makers addressing the needs, benefits, issues, costs of a given corridor of a local fixed guideway transit project.

The early stages of the New Starts project development process are the Alternatives Analysis (AA) and Preliminary Engineering (PE), which are carried out within the metropolitan planning process and the environmental review processes as required by the *National Environmental Policy Act of 1969* (NEPA). As such, planning and project development activities for New Starts projects – with only a few exceptions – are intended to be consistent with the analyses and decision-making process expected for the adequate study and subsequent development of any major capital transportation project in a given corridor.

AA studies are a corridor-level analysis of a range of alternatives designed to address locally-identified mobility and other problems in a specific transportation corridor. AA is considered complete with the selection of a locally preferred alternative (LPA) to advance into PE. In PE, the LPA is further developed to the point where environmental impacts are known and mitigation is provided for; the project scope is final and its cost estimate

relatively firm; and its financial plan is set, with the majority of local funding committed. Final Design is the last phase of New/Small Starts project development during which the project sponsor prepares for construction. Final Design is also the stage during which FTA may enter into a multi-year commitment to fund a proposed New/Small Starts project.

The primary objective of this AA is to evaluate the various alternatives for the Midtown Area Connector project and determine the preferred route and mode. Various route alternatives and modal options were assessed using quantitative and qualitative measures such as ridership forecasts, capital and operating & maintenance costs, assessment of development potential, environmental analysis, as well as input from the general public, MATA Board of Commissioners, Technical Advisory Committee, focus groups, other stakeholders and the project development team. This AA Report and associated Technical Memorandums document the process and analysis to select BRT as the Locally Preferred Alternative mode along the selected 8.6-mile corridor connecting Downtown Memphis through Midtown Memphis to the University of Memphis along Poplar/Union Avenues.

This LPA was approved by MATA Board of Commissioners on April 26, 2016, and will be forwarded to the FTA and TDOT.

Alternatives Considered

As discussed in Section 3, the results of the Tier 2 Evaluation were used to select a Locally Preferred Alternative through a collaborative process involving MATA staff, the project team, the project's advisory committees, consultation with key stakeholders, and input received through the public involvement process. In Tier 2, seven alternatives were evaluated:

- Alternative 6 Airport via Poplar and East Parkway
- Alternative 8 University of Memphis via Poplar, Cooper, and Union
- Alternative 9 Fairgrounds via Madison
- Alternative 7 Germantown via Poplar
- Alternative 11 University of Memphis via Union and Poplar
- Alternative 23 Elvis Presley, Cleveland, Watkins Crosstown
- Alternative 26 University of Memphis via Union, Cooper, and Central

For each of these alternatives, various analyses were conducted:

- Environmental Scan
- Analysis of Development Potentials
- Ridership Projections
- Fatal Flaw Analysis
- Funding Strategy
- Branding Strategy
- Cost Estimation (Capital Cost/Operating & Maintenance Cost)

The analysis performed during Tier 2 screening resulted in the identification of the top performing corridor, as shown and highlighted in **Table 6**.

TABLE 6 | TIER 2 SCREENING RESULTS

Alternative	Corridor Description	Mode of Travel	Daily Ridership (2035)	Capital Cost (2016)	Annual Operations & Maintenance Costs (2016)	Corridor Length (Miles)	One Way Travel Time (Minutes)	Number of Stops/Stations	Number of Vehicles	Development Potential (% of underutilized parcels)	Passengers per Mile
6	Airport via Poplar & Airways	BRT	1726	\$43.70	\$5.37	11.75	51.00	39	13	22%	147
7	Germantown via Poplar	BRT	2138	\$37.00	\$3.95	7.81	38.00	27	11	17%	274
8	U of M via Poplar, Cooper & Union	BRT	1205	\$35.20	\$4.40	8.49	42.00	30	12	18%	142
9*	Extension of Madison Ave Streetcar to Fairground	Streetcar	1301	\$65.00	\$3.33	2.82	28.00	4	8	13%	461
11	U of M via Union & Poplar	BRT	3061	\$25.70	\$3.61	8.63	36.00	23	9	19%	355
23	Elvis Presley, Cleveland, Watkins Crosstown	BRT	3512	\$43.80	\$5.16	11.04	47.00	39	13	22%	318
26	U of M via Union & Central	BRT	2430	\$38.40	\$4.53	9.1	45.00	32	12	20%	267
*NOTE: Alternative 9 is the Streetcar Extension. Total length of Streetcar is 7.20 miles (extension line is 2.82 miles)											

Alignment (Route)

The proposed route, as shown in **Figure 6**, is approximately 8.6 miles in length and will provide a ten-minute peak service frequency along Poplar Avenue and Union Avenue between downtown Memphis and the University of Memphis. This alignment would serve numerous activity centers such as AutoZone Park in downtown Memphis, Southwest Tennessee Community College, Methodist University Hospital, Overton Square, Benjamin Hooks Central Library, and the University of Memphis. The alignment would serve an important location of transfer activity at Cleveland Street and Bellevue Boulevard. The vehicle will operate within the existing street right-of-way along with mixed traffic.

FIGURE 6 | LOCALLY PREFERRED ALTERNATIVE

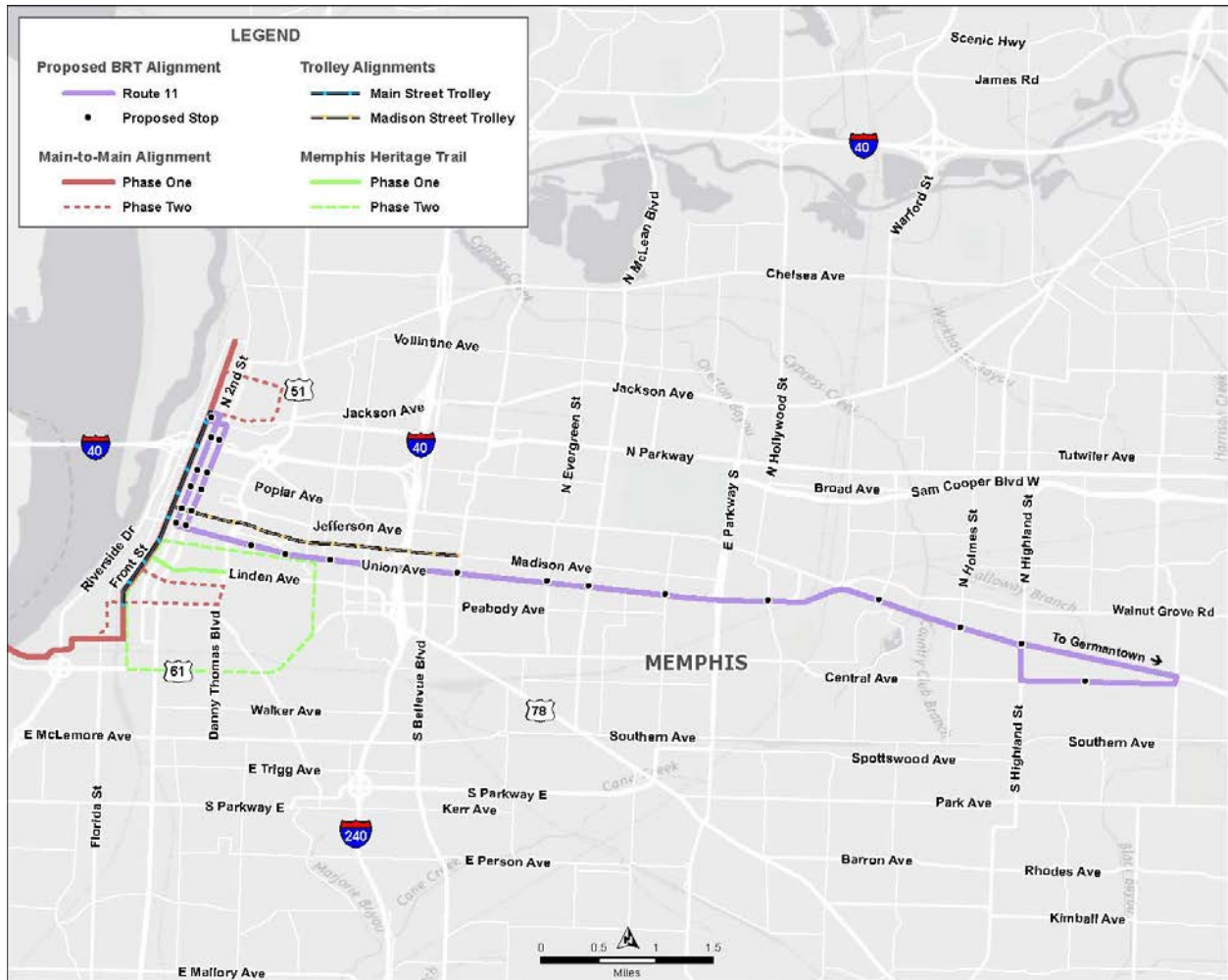


Table 7 shows the key characteristics of Union/Poplar Avenue Bus Rapid Transit service. Major features of the service include frequent connection between Downtown Memphis and the University of Memphis via Union and Poplar Avenues, operates every 10 minutes between 5am and 12am daily using double-door, low-floor, branded vehicles. The service will employ Intelligent Transit Systems at its stations as well as the use of Transit Signal Priority (TSP) at key intersections along the corridor.

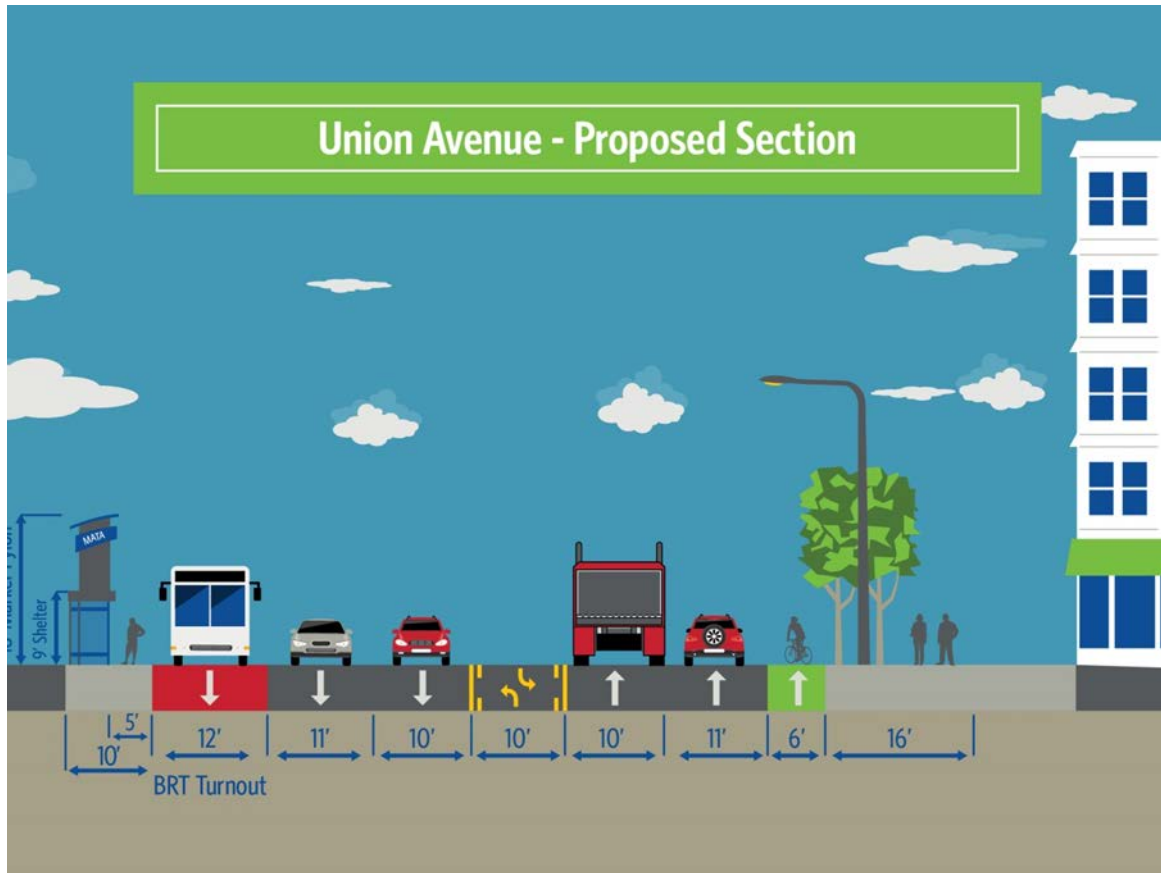
TABLE 7 | KEY CHARACTERISTICS OF BUS RAPID TRANSIT ON UNION & POPLAR AVENUES

Length	8.6 miles
Stations	23 stations
Peak Service Frequency	10 minutes
Capital Cost	\$25.70
Span of Service	5am – 12am
Annual Operating Cost	\$3.6 million
Projected Ridership	3,100
Existing Ridership	1,600
Passengers per Mile	356
One-Way Travel	28-31 minutes
Development Opportunities	19%
Percent of MATA FY16 Operating Budget	6.2%

Technology (Mode)

Service would be provided by a form of Bus Rapid Transit operating within existing streets in lanes shared with general traffic, as shown in **Figure 7**. The anticipated service will be offered via the use of low floor, 40-foot BRT vehicles which can aid mobility-impaired passengers and bicycle-riding passengers, seat more than 40 passengers, and can accommodate a total of 60 passengers seated and standing. The vehicle is equipped with double doors that will facilitate ease of access and exit.

FIGURE 7 | BUS RAPID TRANSIT ON UNION/POPLAR AVENUES



Stations/Stops Characteristics

Station amenities would include shelters, benches, lighting, trash receptacles, and real-time information to let waiting passengers know when the next vehicle will arrive. Ticket vending machines would be available at each stop, so that passengers pay their fares at the station prior to boarding the vehicle. The height of station platforms is planned to be such that it enables near-level boarding for passengers. **Figure 8** illustrates what the proposed BRT shelter and amenities could look like.

FIGURE 8 | BRT STATION ALONG UNION/POPLAR AVENUES



Vehicle Maintenance Facility

To maintain and store new BRT vehicles, a vehicle maintenance facility (VMF) is proposed and the cost is included in the estimates provided. Maintenance and storage facilities might need to be modified or expanded to accommodate these BRT vehicles depending on the scope of BRT implementation along Union and Poplar. Typical modifications could include extension of inspection pits, installation of three post axle-engaging hoists, modification or relocation of bus maintenance equipment, conversion to drive-through maintenance bays, and reconfiguration of parking and circulation layout of yards. If significant numbers of new vehicles are needed, a new facility location must be identified during the Preliminary Design to accommodate the BRT fleet. Fueling facilities may also need to be modified to accommodate these new vehicles and possibly longer vehicles. During the PE phase, the suitability of this VMF will be further evaluated.

Conceptual Design

BRT systems generally operate in the street. The benefit of an in-street placement is limited right-of-way acquisition, challenging designers to “fit” the system into the existing roadway. The conceptual design focused on the operation of the service considering future improvements proposed for the corridor by the City of Memphis. Future design phases will consider the vertical profile, which generally follows the existing roadway profile.

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Section 5 | Public Involvement



Overview

As a key element of the AA process, the public involvement program was an effective tool in documenting the outcomes and implementation. The program utilized a variety of consensus-building tools to engage the public in a variety of opportunities to participate. The first public meeting was held in July 2014. During the 24-month study process, a total of 4 public meetings, 4 technical advisory committee meetings and additional meetings with focus groups, key stakeholders and partner agencies were held.

The overall emphasis of the project's public engagement was to:

- Educate interested stakeholders and the public on all aspects of the project.
- Encourage public participation by providing multiple opportunities and a variety of techniques for input.
- Build consensus around a Locally Preferred Alternative that best meets the needs of a diverse public

The community outreach for the project, branded the Midtown Area Connector (The MAC), was broad-based and engaged a wide variety of stakeholders, from bus riders and interested citizens, neighborhood groups, and community development corporations, to some of Memphis' largest institutions serving as anchors within the study area. Stakeholder input was collected at each stage of the project and used to inform the direction of the study and to establish criteria for evaluating each potential route and type of service considered.

Public involvement activities were compliant with Title VI of the Civil Rights Act of 1964 and related regulations which ensured that no person shall, on the grounds of race, color, sex, national origin (including limited English proficiency), religion, age, income, family status, or physical handicap, be excluded from participation in, be denied benefits of, or be otherwise subjected to discrimination under any program receiving federal assistance from the United States Department of Transportation (USDOT).

Key Stakeholders and Committees

Early in the engagement process, a number of stakeholder groups were identified, including existing MATA customers, institutional/organizational stakeholders, neighborhood representatives, the business community, and the general public. The MAC AA study process was guided by a Technical Advisory Committee, the makeup of which deliberately represents the stakeholder groups identified by MATA and its

consultants and partners. The TAC membership, at the invitation of the Memphis Mayor and MATA chief executive, included public transit stakeholders, business representatives, community groups, and citizens representing various sectors of the community. Additional stakeholders were identified and engaged through public meetings and a series of stakeholder interviews and focus groups, which are described in detail later in this report.

The project team also engaged the Memphis Urban Area Metropolitan Planning Organization (Memphis MPO), which is the regional agency responsible for long range planning and administering federal funding programs in the region, to coordinate with development of their plans and programs. The Memphis MPO’s Active Transportation Advisory Committee (ATAC), comprised of citizens, public officials, and organizations involved in active transportation, bicycling, pedestrian, and transit concerns in the region, was engaged on a regular basis at their quarterly meetings.

Public Engagement Schedule

Shown in **Table 8** is a calendar of community engagement events and project milestones (the latter shown in bold italics):

TABLE 8 | PUBLIC ENGAGEMENT SCHEDULE

Community Engagement Schedule of Events and Milestones		
2014	April	<ul style="list-style-type: none"> Project Kickoff with Staff & Consultants
	May	<ul style="list-style-type: none"> Technical Advisory Committee Meeting #1 <i>Completion of Draft Goals & Objectives</i> <i>Completion of Public Engagement Strategy</i>
	July	<ul style="list-style-type: none"> Public Meeting #1 (35 attendees)
	December	<ul style="list-style-type: none"> MATA Leadership Meeting
2015	February	<ul style="list-style-type: none"> Technical Advisory Committee Meeting #2 MATA Board Update Stakeholder Interviews & Focus Groups
	March	<ul style="list-style-type: none"> Public Meeting #2 (23 attendees) Memphis MPO ATAC Presentation #1 Stakeholder Interviews & Focus Groups
	May	<ul style="list-style-type: none"> Stakeholder Interviews & Focus Groups
	June	<ul style="list-style-type: none"> <i>Completion of Tier 1 Screening</i> Technical Advisory Committee Meeting #3
	July	<ul style="list-style-type: none"> Workshops with MATA & City Staff Public Meeting #3 (61 attendees)

Community Engagement Schedule of Events and Milestones		
		<ul style="list-style-type: none"> • Memphis MPO ATAC Presentation #2
2016	January	<ul style="list-style-type: none"> • Completion of Tier 2 Screening & Financial Analysis
	February	<ul style="list-style-type: none"> • MATA Board Update
	March	<ul style="list-style-type: none"> • Public Meeting #4 (16 attendees) • Technical Advisory Committee Meeting #4 • MATA Board Update
	April	<ul style="list-style-type: none"> • Memphis MPO ATAC Presentation #3 • Selection of Locally Preferred Alternative (LPA) • MATA Board Adoption of LPA
	May	<ul style="list-style-type: none"> • Completion and Presentation of Final Report

Technical Advisory Committee

The MAC’s Technical Advisory Committee (TAC) guided the overall planning process (Table 9), adding broader community insight on policy and technical issues. The TAC, which began meeting at the earliest stage of the project in May 2014, included public transit stakeholders, business representatives, community groups, and citizens representing various sectors of the community.

The TAC membership was comprised of representatives of the following groups:

TABLE 9 | TECHNICAL ADVISORY COMMITTEE

Organizations Represented on the TAC	
Binghampton Development Corporation	Memphis Area Transit Authority
Broad Avenue Business Association	Memphis Bioworks Foundation
CD Council of Greater Memphis	Memphis Bus Riders Union
Christian Brothers University	Memphis Center for Independent Living
Community LIFT	Memphis College of Art
Cooper Young Business Association	Memphis Engineering
Crosstown Concourse/Crosstown Arts	Memphis Housing & Community Development

Organizations Represented on the TAC	
Downtown Memphis Commission	Memphis MPO
EDGE	Midtown Development Corporation
Greater Memphis Chamber	Office of the Mayor of City of Memphis
Loeb Properties	Office of the Mayor of Shelby County
Innovate Memphis	Overton Park Conservancy
M/SC Division of Planning & Development	Pigeon Roost Development Corporation
M/SC Office of Planning & Development	Rhodes College
M/SC Office of Sustainability	University of Memphis
Madison Avenue Business Association	Uptown Alliance
Medical District	Victorian Village CDC
Memphis Aerotropolis	Workforce Investment Network

Stakeholder Workshops, Interviews, and Focus Groups

In order to directly engage stakeholders in the study process, workshops, focus groups, and interviews were conducted to gather input on current travel patterns, typical destinations, service hours and other time-of-day needs, route and mode alternatives for high capacity transit, and general transit needs/desires within the study area. These sessions helped the planning team gauge the similarities and differences between different constituencies interested in public transit and transportation generally within the study area. A list of the activities is shown in **Table 10**.

TABLE 10 | STAKEHOLDER ENGAGEMENT TIMELINE

Stakeholder Outreach Activities, Audiences, and Dates	
Workshop - MATA Leadership	12/15/14
Workshop - City of Memphis – Engineering	2/13/15
Focus Group - Arts & Educational Institutions	2/24/15
Focus Group - Study Area Business Association	2/24/15
Interview - Development Industry Representative	3/9/15

Stakeholder Outreach Activities, Audiences, and Dates	
Interview - Arts & Education Institution Representative	3/31/15
Focus Group - Memphis Bus Riders Union	5/8/15
Focus Group - University of Memphis Faculty & Staff	5/15/15
Workshop - City of Memphis - Engineering & Public Works	7/16/15
Workshop - MATA Staff and Board of Commissioners	7/15/16

The project team conducted four focus groups with a variety of stakeholder groups drawing from: MATA ridership, business and development interests, community and neighborhood organizations, and institutional stakeholders. Focus group participants were invited using an extensive list of potential stakeholders in the study area developed by MATA and the consultants, shown in **Table 11**. A questionnaire was developed to capture comprehensive input and candid responses on the current state and future potential of public transit in the study area. The sessions included private citizens, particularly those with greater mobility needs, business interests, and institutions and organizations with a presence in the study area.

TABLE 11 | POTENTIAL STAKEHOLDERS FOR FOCUS GROUPS OR INTERVIEWS

Organizations Invited by Focus Area	
Transit Ridership	
Memphis Bus Riders Union	Memphis Center for Independent Living
Memphis Interfaith Association (MIFA)	Mid-South Peace and Justice Center
Business Interests	
Cooper-Young Business Association	Madison Avenue Business Association
Grocery Stores	Overtown Square Businesses
Historic Broad Business Association	Workforce Investment Network
Community or Neighborhood Organizations	
Annesdale Snowden Neighborhood Association	Midtown Central Neighborhood Association
Belleair Woods Neighborhood Association	Midtown Memphis Development Corporation
Binghampton Development Corporation	Neighborhood Associations
Central Gardens Neighborhood Association	Old Binghampton Neighborhood Association
Community LIFT	Orange Mound CDC

Organizations Invited by Focus Area	
Cooper Young Neighborhood Association	Pigeon Roost Development Corporation
Cooper-Young Community Association	Rhodes View Neighborhood Association
Crosstown Arts & Crosstown development team	Rozelle-Annesdale Neighborhood Association
Evergreen Historic District Association	Soulsville
Glenview Edgewood Manor Area Association	Tucker-Jefferson Neighborhood Association
Green Meadows Poplar Glen Neighborhood Association	Uptown Alliance
Hein Park Civic Association	Victorian Village CDC
Lemoine-Owen CDC	Vollintine-Evergreen Community Association
Institutional Stakeholders	
Brooks Museum of Art	Methodist University & LeBonheur Hospitals
Christian Brothers University	Overton Park Conservancy & Memphis Zoo
Church Health Center	Regional Medical Center (The Med)
Downtown Memphis Commission	Rhodes College
Memphis Bioworks	Shelby County Schools
Memphis College of Art	St Jude Children’s Research Hospital
Memphis Medical District	University of Memphis
Memphis Public Library	University of Tennessee at Memphis

Fact Sheets

Fact sheets and publication documents were developed at key study milestones for distribution to the public and at project activities. Copies of these fact sheets are included as Appendix A. These fact sheets were distributed by email to project contacts and were made available at all public and stakeholder meetings. The fact sheets are summarized in **Table 12**.

TABLE 12 | THE MAC FACT SHEETS

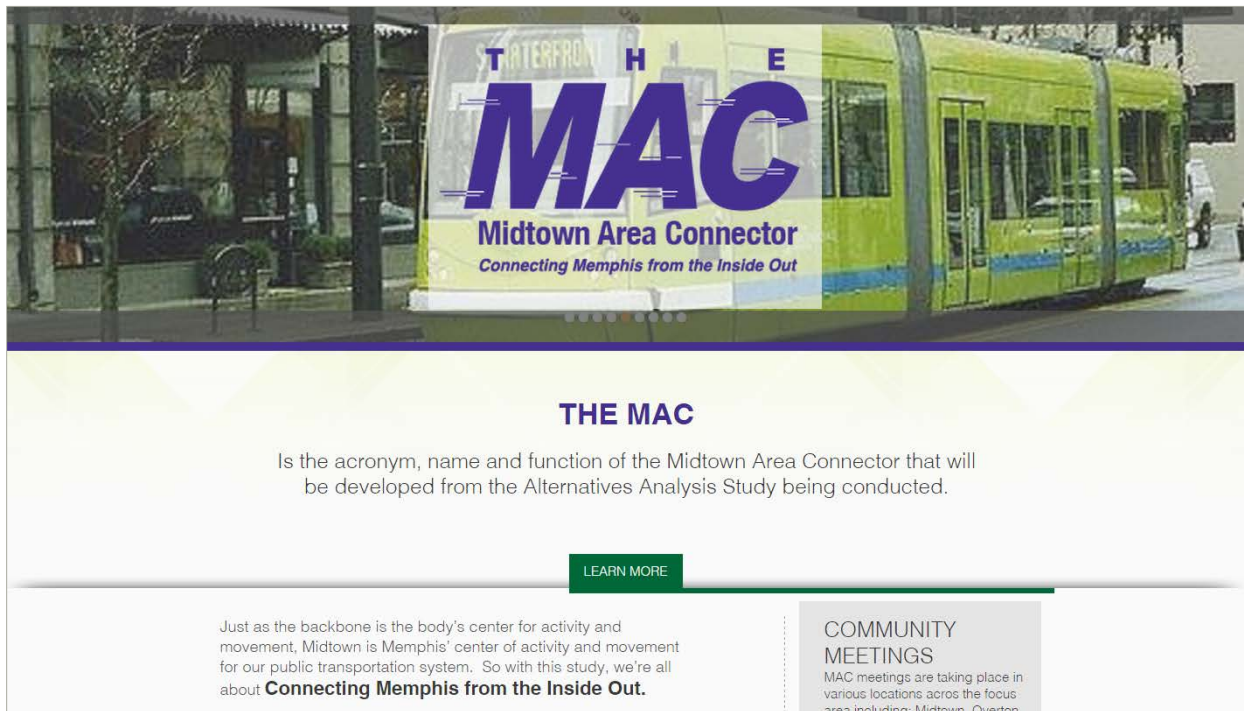
The MAC Fact Sheets, Timeframes, Details, and Content		
Fact Sheet #1	February 2015 Tier 1 Screening	Distributed to TAC, Focus Groups, and at Public Meeting #2. Included general information on the AA process, public engagement, potential routes, and types of service & vehicles

The MAC Fact Sheets, Timeframes, Details, and Content		
		being considered.
Fact Sheet #2	July 2015 Tier 2 Screening	Distributed at Public Meeting #3. Included updates on the project process, Goals & Objectives for the study, a summary of public input, the pre-screening and Tier 1 screening results, and next steps.
Fact Sheet #3	March 2016 Selection of LPA	Distributed at Public Meeting #4. Included project background, results of screening process, public involvement summary and next steps.

Project Website

Websites provide a valuable means of providing real-time project information and soliciting input throughout the study process. The study team established a dedicated project website at www.macmemphis.com. The site included elements such as the following: project history; project goals and schedule; meeting notices; documents, presentations and reports; information contacts; and relevant links. A screen shot of the home page is shown in **Figure 9**.

FIGURE 9 | THE MAC PROJECT WEBSITE



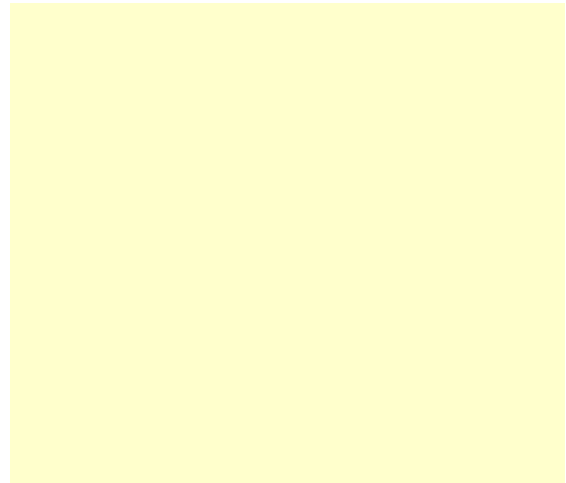
Social Media

Based on previous experience of the community engagement team, the use of existing social media accounts was used for public outreach purposes, rather than creating new accounts for the purpose of a planning study. MATA and Livable Memphis Facebook and Twitter accounts were used extensively throughout the study to share information, promote public engagement activities, and solicit feedback. Between the two organizations' accounts and email lists, the project team accessed a combined network of nearly 5,000 online followers and contacts, with an average weekly reach of over 13,000 impressions. Figure 10 shows screen shots of some of the social media posts from the project.

FIGURE 10 | SOCIAL MEDIA



Section 6 | Ridership Projections



Introduction

A data-driven ridership forecasting approach was developed using FTA's STOPS model runs to evaluate ridership for the seven alternatives identified through the Tier 2 evaluation.

STOPS is Simplified Trips on Project Software, which helps project sponsors predict the trips-on-project measures and the automobile-VMT change needed for the environmental measure. STOPS is a stand-alone software package that applies a set of travel models to predict detailed transit travel patterns for the No-build and Build scenarios, quantify the trips-on-project measure for all travelers and for transit dependents, and compute the change in automobile VMT based on the change in overall transit ridership between the two scenarios.

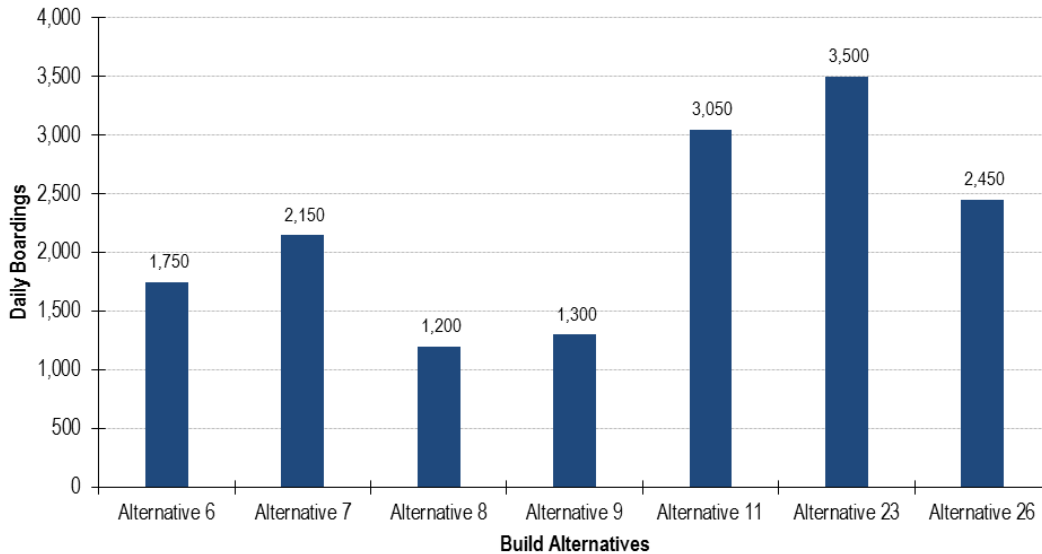
Parameters were incorporated in the STOPS model based on guidance received from FTA staff on other projects of similar nature. In addition to running the seven alternatives through STOPS to develop ridership projections, sensitivity tests were also performed to better understand the sensitivity of the model, and explain ridership results that the model generated.

Ridership Results

2035 Trips on Project

STOPS produces ridership estimates for the Build project analyzed. **Figure 11** illustrates the projected 2035 daily ridership for each alternative. The model estimates the highest ridership on Alternatives 11 and 23 (approximately 3,000 to 3,500), and the lowest on Alternatives 8 and 9 (approximately 1,200 to 1,300). These projections do not include trips generated by special generators. During our review of the results, several questions were raised regarding the validity of the results. For example, in Alternative 7 which has more robust service compared to Route 50 that it replaces, why does ridership decrease compared to the No Build Route 50 ridership. In this particular case, as further explained below, it had to do with how STOPS addresses the consolidation of stops. In the case of Alternative 23, the travel times modeled could be higher than the scheduled time due to the way it was coded in the model.

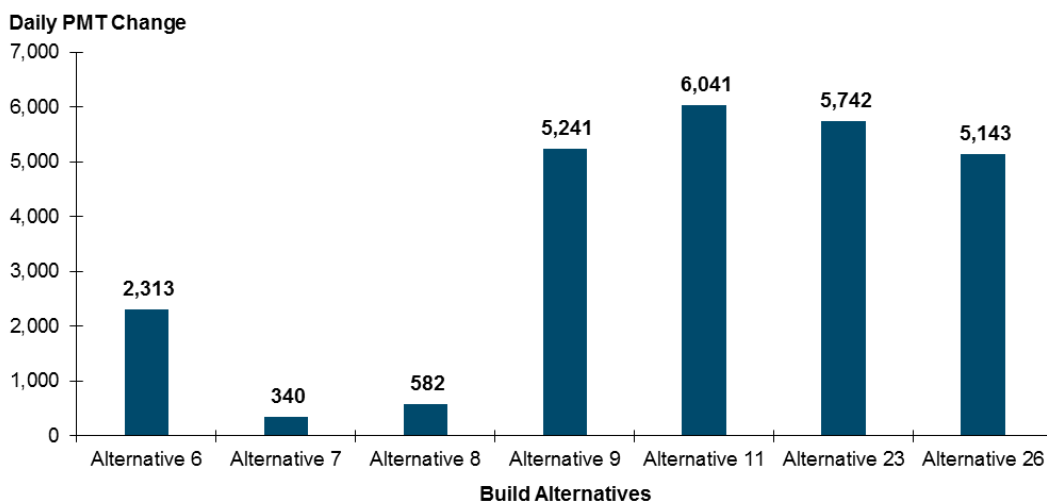
FIGURE 11 | 2035 DAILY TRIPS ON PROJECT (BUILD SCENARIO)



Automobile Passenger Miles Traveled (PMT)

All alternatives experience an increase in automobile person miles traveled (Figure 12). The increase could be attributed to the reduction in service, i.e., truncation/alteration of existing bus routes as well. As discussed earlier, Alternatives 7 and 8 undergo the least change in service, reflected in smaller increases in PMT compared to other alternatives.

FIGURE 12: 2035 AUTOMOBILE PMT CHANGE (BUILD VERSUS NO-BUILD)



2035 Ridership by Stop

The 2035 ridership estimates were developed using the STOPS model. Figures 5 through 11 illustrate the range of projected riders by stop across alternatives. Despite the variation in overall project ridership and the alignment of alternatives, there are some clear trends that emerge from the stop-level ridership.

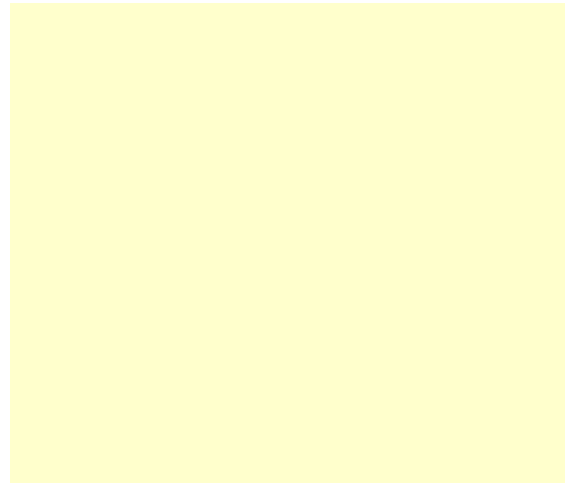
- Alternatives 11 and 26 attract the highest number of riders at Union Avenue compared to any other stop across alternatives.
- The intersection of the east-west alignments and Cleveland Street attracts a high number of riders.
- Alternatives 9, 11, and 26 attract a significant percentage of riders at Pauline Street.
- Other stops that are projected to attract a significant number of riders are S. Alicia Drive, Deloach Street, and McLean Boulevard.
- Hudson Transit Center appears to attract a sizeable number of riders under Alternatives 11 and 26.

Key Findings

- Alternatives 11 and 23 are projected to generate the highest daily boardings (approximately 3,000 to 3,500), and Alternatives 8 and 9 are projected to generate the lowest daily boardings (approximately 1,200 to 1,300).
- All alternatives are projected to experience an increase in PMT.
- Based on the service plans developed, several stop locations were identified as high ridership locations.
- Based on the ridership results, the team recommends revising service plans to reflect less aggressive service cuts to existing bus routes compared with the original Tier 2 service plans.

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Section 7 | Cost & Funding Strategy



Introduction

The proposed Bus Rapid Transit project extending from Downtown Memphis through Midtown Memphis to the University of Memphis has an estimated capital cost of \$25.7 million (in 2016 dollars). The cost estimate is based assumptions made for the capital and operating costs. As the project moves to advanced stages of engineering, the cost estimates will be refined. Annual operating costs are estimated as \$3.6 million, based on the proposed hours and frequency of service and unit cost assumptions.

The capital cost estimate is presented in **Table 13** using FTA’s Standard Cost Categories, which is used by all major transit investment projects seeking FTA funding. Contingencies varying from 10-50 percent of each item are included in each line item; the additional unallocated contingency shown as a separate item represents additional elements that are not yet defined at this conceptual stage. Please see **Technical Memorandum #7 | Cost Estimation Methodology and Results** for detailed costs estimation.

Conceptual and Operating Cost Estimates

To support the Midtown AA evaluation process, conceptual capital and operating cost estimates have been developed for the six remaining BRT corridors and one remaining streetcar corridor. As shown in Table 1, conceptual capital costs for the BRT alternatives range from \$25.7 million (Alternative 11: University of Memphis via Union & Poplar) to \$43.8 million (Alternative 23: Elvis Presley, Cleveland and Watkins Crosstown) and the remaining streetcar alternative (Alternative 9: Extension of Madison Avenue Streetcar to Overton) has a capital cost estimate of \$65.0 million.

Additionally, annual operating cost estimates for the BRT alternatives range from \$3.6 million (Alternative 11: University of Memphis via Union & Poplar) to \$5.4 million (Alternative 6: Airport via Poplar & Airway) and the remaining streetcar alternative would cost approximately \$3.3 million per year. Compared to MATA’s fiscal year (FY) 2016 operating budget, implementation of any of the alternatives represent a between a 5.7 percent and 9.2 percent increase in the Authority’s annual operating budget.

TABLE 13 | CONCEPTUAL CAPITAL AND OPERATING COSTS (2016 DOLLARS IN MILLIONS)

Alternative	Corridor Description	Mode of Travel	Capital Cost	Annual Operating Cost	% Share of FY 2016 Operating Budget
6	Airport via Poplar & Airways	BRT	\$43.7	\$5.37	9.4%
7	Germantown via Poplar	BRT	\$37.0	\$3.95	6.9%
8	University of Memphis (U of M) via Poplar, Cooper & Union	BRT	\$35.2	\$4.40	7.7%
9	Extension of Madison Ave Streetcar to Overton	Streetcar	\$65.0	\$3.33	5.8%
11	U of M via Union & Poplar	BRT	\$37.2	\$3.61	7.8%
23	Elvis Presley, Cleveland, Watkins Crosstown	BRT	\$40.0	\$5.16	9.0%
26	U of M via Union & Central	BRT	\$38.4	\$4.53	7.9%

Conceptual Financial Strategies

Table 14 summarizes the results of three conceptual capital financial strategies for the high capacity transit alternatives. These strategies reflect the review of financial approaches used to implement similar high capacity projects around the country (summarized in Section 2) and the potential capital funding sources used (described in Section 3).

- Scenario 1 - Maximize Small Starts Funds:** Under this scenario, MATA would pursue a Federal Transit Administration (FTA) Small Starts Construction Grant equivalent to 80 percent of the estimated capital costs. Reflecting current federal transportation legislation, 80 percent of total funding from federal sources is the maximum level allowed. The non-federal matching funds under this scenario reflect an assumption that MATA would continue the historic funding partnership with the State of Tennessee and City of Memphis. Historically, the State and City have equally shared the non-federal matching funds requirement, which for this scenario is 10 percent each.
- Scenario 2 - Combine Small Starts and Other Federal Funds:** Under this scenario, MATA would again pursue federal funds to cover 80 percent of the total capital costs but the federal funds would be provided through multiple programs. Specifically, MATA would pursue a FTA Small Starts Construction Grant equivalent to 50 percent of the estimated capital costs and the remaining 30 percent would be provided by one or more of the Other Federal Programs described in Section 3. Similar to Scenario 1, the State and City would each provide 10 percent of the funding to address the non-federal funding requirements.
- Scenario 3 – TIGER Grant:** Under this scenario, MATA would pursue a United States Department of Transportation (USDOT) Transportation Investment Generating Economic Recovery (TIGER) Grant

for the entire high capacity project. As shown in Table 2, this scenario assumes MATA would receive a \$10-\$20 million TIGER Grant, which reflects the “typical” largest award individual projects have received in the last several years. The remaining funds would be provided by the State and City. As shown in the table, the State and City funding share under this scenario is 2.5 to 4 times larger than the other two scenarios.

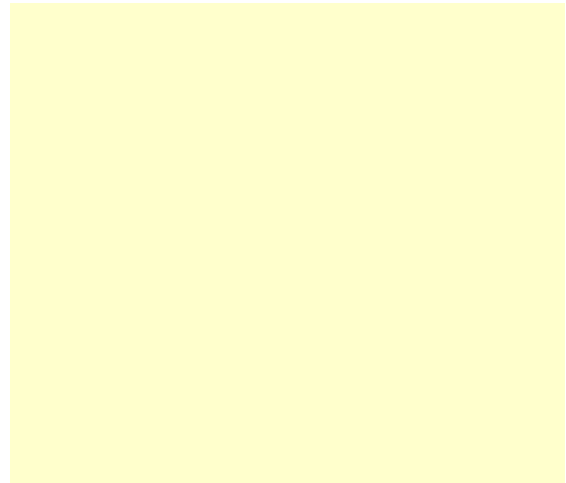
- Scenario 4 – Combine TIGER Grant and Other Federal Funds:** Under this scenario, MATA would pursue a \$10-\$20 million TIGER Grant for specific elements of the high capacity alternatives that can address independent utility requirements. Independent utility is the ability to demonstrate that these specific elements would be usable and be a reasonable expenditure even if no additional transportation improvements in the area were made. Additionally, MATA would pursue funding from Other Federal Programs to achieve a total of 80 percent federal funding. Similar to Scenarios 1 and 2, the State and City would each provide 10 percent of the funding to address the non-federal funding requirements.

TABLE 14 | CONCEPTUAL FINANCIAL STRATEGIES (2016 DOLLARS, IN MILLIONS)

Alternative	6	7	8	9	11	23	26
Corridor Description	Airport via Poplar & Airways	Germantown via Poplar	U of M via Poplar, Cooper & Union	Extension of Madison Ave Streetcar to Overton	U of M via Union & Poplar	Elvis Presley, Cleveland, Watkins Crosstown	U of M via Union & Central
Mode of Travel	BRT	BRT	BRT	Streetcar	BRT	BRT	BRT
Capital Cost	\$43.7	\$37.0	\$35.2	\$65.0	\$25.7	\$43.8	\$38.4
Scenario #1: Maximum Small Starts Funding							
Small Starts (80%)	\$35.0	\$29.6	\$28.2	\$52.0	\$20.6	\$35.0	\$30.7
State (10%)	\$4.4	\$3.7	\$3.5	\$6.5	\$2.6	\$4.4	\$3.8
City (10%)	\$4.4	\$3.7	\$3.5	\$6.5	\$2.6	\$4.4	\$3.8
Total	\$43.7	\$37.0	\$35.2	\$65.0	\$25.7	\$43.8	\$38.4
Scenario #2: Combined Small Starts and Other Federal Programs							
Small Starts (50%)	\$21.9	\$18.5	\$17.6	\$32.5	\$12.9	\$21.9	\$19.2
Other Federal Funds (30%)	\$13.1	\$11.1	\$10.6	\$19.5	\$7.7	\$13.1	\$11.5
State (10%)	\$4.4	\$3.7	\$3.5	\$6.5	\$2.6	\$4.4	\$3.8
City (10%)	\$4.4	\$3.7	\$3.5	\$6.5	\$2.6	\$4.4	\$3.8
Total	\$43.7	\$37.0	\$35.2	\$65.0	\$25.7	\$43.8	\$38.4
Scenario #3: TIGER Grant							
TIGER Grant	\$20.0	\$20.0	\$20.0	\$20.0	\$20.0	\$20.0	\$20.0
State	\$11.9	\$8.5	\$7.6	\$22.5	\$2.9	\$11.9	\$9.2
City	\$11.9	\$8.5	\$7.6	\$22.5	\$2.9	\$11.9	\$9.2
Total	\$43.7	\$37.0	\$35.2	\$65.0	\$25.7	\$43.8	\$38.4
Scenario #4: Combined TIGER Grant and Other Federal Programs							
TIGER Grant	\$20.0	\$20.0	\$20.0	\$20.0	\$20.0	\$20.0	\$20.0
Other Federal Funds	\$15.0	\$9.6	\$8.2	\$32.0	\$0.6	\$15.0	\$10.7
State (10%)	\$4.4	\$3.7	\$3.5	\$6.5	\$2.6	\$4.4	\$3.8
City (10%)	\$4.4	\$3.7	\$3.5	\$6.5	\$2.6	\$4.4	\$3.8
Total	\$43.7	\$37.0	\$35.2	\$65.0	\$25.7	\$43.8	\$38.4

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Section 8 | Assessment of Development Potentials



Introduction

The Memphis Area Transit Authority (MATA) and the community view the proposed high capacity transit project as a component of a larger development strategy - an opportunity for enhancing the City's economic competitiveness. While Bus Rapid Transit in and of itself may not generate substantial growth, given underlying market conditions for development and supportive zoning and land use policies, it helps to accelerate and shape growth to create more dense, mixed use environments. Such a growth pattern is the vision for Memphis' urban core.

Investing in premium transit can attract residential and commercial growth by spurring development of underutilized areas. The project team analyzed the potential for each of the seven corridors to spur residential and commercial growth by assessing the amount of undeveloped and underdeveloped land that would be served by and that are good potentials for development within ½ mile of each corridor. As the following analysis shows, each corridor has varying potentials. Subsequent detailed evaluation of specific corridor in the future will demonstrate their capacities for development

Development Potentials

To understand the potential redevelopment and development along each of the seven alternatives identified for high capacity transit service operations, an assessment of the availability of land was completed. This was completed by using existing parcel data from Shelby County and property assessment data from the Shelby County Assessor's Office.

Two pieces of information were critical to assess whether a parcel is underutilized or not – Total Land Value and Building Value. The Building Value is necessary to determine the value of the building compared to the land that it sits on. If the land is valued more than the building, then there could be a better use for the particular piece of property purely from a property valuation point of view. This ratio is known as Underutilized Ratio, and to determine this ratio, the Building Value is divided by the Land Value. If the ratio is less than 30 percent, then that parcel is considered to be underutilized.

BUILDING VALUE / LAND VALUE = UNDERUTILIZED RATIO

To determine the amount of underutilized land along each of these alternatives, parcels within a half mile of each corridor were selected. The total acreage of underutilized land was calculated and is summarized in **Table 15** below. **Figure 13** illustrates some of the underutilized and vacant land within these corridors.

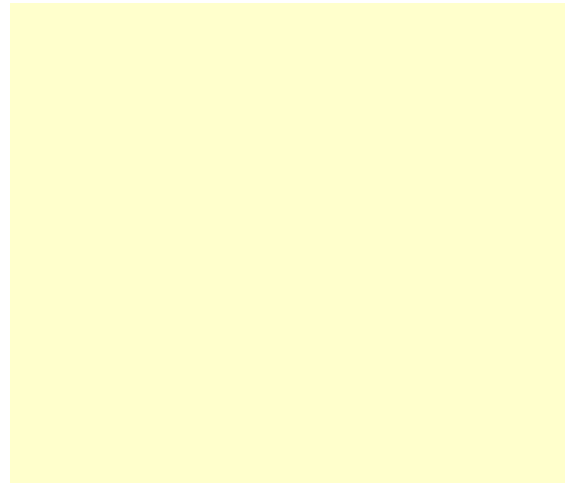
TABLE 15 | TOTAL ACRES OF UNDERUTILIZED LAND BY ALIGNMENT

Category	Tier 2 Alignments						
	6	7	8	9	11	23	26
Total acres within ½-mile of alignment	5,692	8,880	4,139	2,171	4,173	6,228	3,912
Underutilized acres within ½-mile of alignment	1,272	1,507	744	291	803	1,396	800
% Underutilized	22%	17%	18%	13%	19%	22%	20%

FIGURE 13 | TOTAL ACRES OF UNDERUTILIZED LAND BY ALIGNMENT



Section 9 | Screening of Potential Environmental Impacts



Introduction

An environmental screening was prepared for the seven corridors. The intent was to review readily-available environmental (physical, natural, socio-economic, and regulatory) data to determine potential issues associated within the study area. This environmental review considers the proposed infrastructure (in-street tracks, boarding locations, and vehicle maintenance facility) associated with the alternatives analysis. These analyses included on-site reconnaissance, but no detailed regulatory investigation. The goal is to determine overall feasibility and broad constraints.

All alignments are within urban and suburban areas of Memphis that are fully developed or provide significant potential for redevelopment, as these are typically the most transit-supportive portions of the city. This previous development will allow for less overall environmental impact to be incurred by construction of any chosen alternative. Several of the alignments already have a built-out corridor, allowing for little to no environmental impacts from a construction footprint for the project.

Methodology and Results

Historic Resources

A number of historic districts and potentially-eligible historic properties are located along the alignments being studied. Further analysis of each alternative would be provided in a full Environmental Assessment. Among the readily-apparent concerns are the Overton Park, Cooper-Young, and similar residential areas of Midtown Memphis. Both areas contain many potentially-eligible homes and buildings, as well as designated districts and landmarks. While the project's alternatives will primarily fall within existing rights-of-way and paved roadways, consideration will need to be given to historic properties to ensure impacts are minimized and mitigated appropriately.

Wetlands/Streams/Floodplains

The alignments being carried forward are within previously-developed corridors, where drainage infrastructure (ditches, pipes, culverts, bridges) are already in place. Preliminary and final designs should consider whether floodplain encroachment issues need to be addressed, but at this stage of alternative considerations floodplains do not appear to be a significant issue. Additionally, the corridors being studied have little or no wetlands abutting the alignments. Several of the alignments are along existing roads that run ridges through older parts of Memphis. Streams do occasionally cross perpendicular to the roadways, but are already flowing through culverts that provide existing drainage. These same culverts will be further studied during final design efforts to provide adequate clearance along the right-of-way.

Natural Areas/Species of Concern

The developed areas along these alignments provide for little natural habitat. Alternatives 6 and 7 have the highest potential for natural area concerns, as they both abut Overton Park and its intact Old Forest State Natural Area. This Natural Area is documented in the state’s 2014 draft “Old Forest State Natural Area Management Plan” and should be considered if those alternatives move forward toward design.

Additional Considerations

Due to the developed nature of the corridors, many environmental contamination issues may be encountered. Industrial and commercial developments along these alignments create a need for avoidance and mitigative measures to be taken. These should be closely studied during preliminary design to help minimize potential impacts.

Conclusion

No significant impacts have been identified at this point in the Alternatives Analysis process. Further investigation and evaluation will occur during the Environmental and Design phases and documented in the final environmental assessment.

