MOVING MILWAUKEE:
Regional Rapid Transit for a 21st Century City
A SPECIAL THANKS TO THE FOLLOWING PEOPLE WHO HAVE KINDLY SHARED THEIR PROFESSIONAL EXPERIENCE AND EXPERTISE WITH OUR CLASS.

**Guest Speakers**

- Ashley Booth, HNTB
- Stacie Callies, Westown Association Business Improvement District
- Matt Dorner, Milwaukee Downtown Business Improvement District
- Brian Dranzik, Milwaukee County
- Rob Henken, Public Policy Forum
- Kevin Muhs, Southeastern Wisconsin Regional Planning Commission
- Joe Peterangelo, Public Policy Forum
- Kerry Thomas, MetroGO!

**Near West Side Public Meeting Participants and Organizers**

- Keith Stanley and Darrian Davis, Near West Side Partners
- Pastor Patrick Keen, Our Savior Lutheran Church

**November 21st Practitioner Workshop Participants**

**December 12th Final Workshop Attendees**

**Supervisor**

Dr. Robert Schneider

**Authors**

Benjamin Block, Nicholas De Marsh, Christopher Hillard, Joshua Leeder, Cassandra Leopold, Jessica Lindner, Emma Price, Emma Siegworth, Indhu Venkatachalam, Joseph Widing, Peter Wyhkuis
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This report presents an expansive vision for how bus rapid transit (BRT) can help transform Milwaukee into a 21st century city. It represents the culmination of research conducted during the Fall 2016 Bus Rapid Transit Workshop at the University of Wisconsin-Milwaukee. With a focus on providing insight into both the logistical questions of BRT implementation as well as the political feasibility of building support, the report is intended to support the existing proposal for bus rapid transit in the East-West Corridor.

With respect to logistical implementation, this report covers the basic elements of BRT to the fine details of alignment configuration along the proposed East-West Corridor. Recommendations for route alignments are presented at the end of the report. Beyond the current route, the report explores the potential for future routes based on estimations of economic development potential, time savings, and equitable benefits.

With respect to political feasibility, this report explores the benefits and challenges of implementing BRT, as they relate locally and from examples of existing systems across the globe. Key messages for promoting the benefits of BRT in the East-West Corridor are distilled into infographics that are included at the end of the report.

To further support the implementation of BRT in Milwaukee, students crafted detailed renderings and animations to illustrate key alignment configurations and showcase the potential attractiveness of the system. Links to animations can be found at the end of the report.

The time for pursuing rapid public transit in the greater Milwaukee region is long overdue. The proposed bus rapid transit route in the East-West Corridor represents a great opportunity for the city to take a step into the 21st century of transportation solutions. There are almost as many bus riders as there are cars using Wisconsin Avenue between the Milwaukee River and Marquette University on a typical day. Implementing BRT in this transit-dense corridor would go a long way in expanding people’s conceptions of what is possible in Milwaukee.

Furthermore, this route connects growing employment centers that will inevitably strain the existing transportation system. Preempting these challenges with bus rapid transit will not only help alleviate this future congestion, but will open new opportunities for transit-oriented development, improve air quality and road safety, and improve accessibility for transit-dependent residents along the corridor and in the city at large.

Realizing the full potential of the benefits of bus rapid transit requires designing a high-quality system with all of the necessary elements, and implementing that system requires building broad public support to overcome the potential resistance that comes from altering the right-of-way. With that in mind, this report hopes to serve as a map for how to navigate the challenges that exist on the road to developing a high-quality bus rapid transit system in the Milwaukee region.

1 Schneider, Robert. Class 12 Slides, “East-West Travel Along Wisconsin Avenue” Bus Rapid Transit in the Milwaukee Region, Fall 2016.
Chapter Summary

Wisconsin Avenue and Bluemound Road will soon be host to the first bus rapid transit line in the Milwaukee region in the form of the East-West Corridor bus rapid transit (BRT) route. Today, despite Wisconsin Avenue being a major transit corridor, these streets remain firmly the domain of the automobile, designed to maximize parking and the right-of-way while squeezing transit riders, pedestrians and bicyclists off to the side. It is expected that this new line will increase ridership and improve travel times for transit riders, connecting low-income residents, many of whom lack access to cars, with areas of employment while also providing opportunities for development.

Milwaukee's peer cities have all either had legacy rapid transit throughout their region or have in the recent past begun construction on rapid service networks. Of the 40 largest metropolitan areas, Milwaukee is one of only 11 that do not have any rapid transit service.¹ As millennials begin to make up a majority of the United States’ workforce, their preference is geared more towards using transit and living in walkable communities in the core of America’s cities.² If Milwaukee does not begin to develop a rapid transit system then it may continue to fall behind its peer cities and lose the population of its best and brightest to cities that have invested in mass transit, walkable communities and transportation for the future.

¹ Schneider, Robert. “40 Largest Metropolitan Areas and Rapid Transit.” July 2016.
This corridor, to be the most successful, will need to feature all the factors that make BRT truly rapid.

- Exclusive and dedicated lanes for buses throughout the length of the corridor.
- Maximize a busway alignment through the corridor, which is to allow for center running exclusive lanes for as much of the corridor as is possible.
- Fewer and more extensive and permanent stations that will allow the bus to board level with the station and allow passengers to pay for their ticket before they board.
- Intersection treatments and improvements that will support rapid transit with signal priority and support improved pedestrian conditions.

Exclusive lanes for buses throughout the corridor are particularly significant, and will provide for nearly two times greater relative travel speeds for buses as cited in other cities around the nation and the world and in the previous East West Corridor study. This is extremely important for making the East-West Corridor a success as Cleveland stated in their Before and After Study to Congress of their BRT Health Line that, “ridership gains in the Euclid Corridor are a response to faster travel times and the “fixed guideway” effects of the BRT facility”. This report will outline just how dedicated lanes will run the course of the entire route allowing for frequent, consistent and rapid service for transit riders. Each new station will be a dedicated and vastly improved station over any current bus stop that exists in the city and will allow for more comfort for transit riders during their short wait for a BRT bus to arrive. This will also feature much improved intersections with signal priority for buses throughout the route that will improve the experience for pedestrians, bicyclists and transit riders. BRT will also transform Wisconsin Avenue in downtown into a truly main street that Milwaukee can be proud of while creating spaces that will not only connect to the future streetcar, but also create space that all Milwaukeeans can enjoy.

The new line will have the potential to be a catalyst for development throughout the corridor, but could have particularly meaningful impacts for the Near West Side. This area currently has many underutilized and unused lots that dot the landscape and the increased investment that is likely to come with the new BRT line, may attract opportunities for private development. Increased private investment has been seen following the installation of LRT and BRT lines across the country and the centrality of the East-West Corridor will create a situation ripe for transit-oriented development along the route.

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While the East-West Corridor represents a significant step forward, it is important for the city and the region to begin conceptualizing this new route not as a one-off improvement, but, rather, the starting point for a larger, more integrated system. Converting express lines like the City’s Blue or Purple lines, or investigating the possibility of new BRT routes altogether should move forward parallel to the development of the new East West Corridor.

This report will cover two sides that are necessary for any large-scale infrastructure project, a vision for the final product and the message that needs to be conveyed to convince a skeptical audience of the not only the necessity of the project, but also the utility of it. These two different sides of the report are woven together to make a cohesive argument for how the East West corridor will look and how it will impact the city and ultimately expand, in which those impacts and visions are to be articulated to a wider audience to gather as many voices on the side of transit to help usher Milwaukee and the region into another successful century.
Chapter Summary
What makes Bus Rapid Transit work? The Institute for Transportation & Development Policy (ITDP) has created a classification system to determine what makes BRT different and more effective than the traditional bus transportation system. This includes what are considered to be their BRT Basics, which are the minimum elements needed to be considered BRT.\(^1\) In addition to basic classification, ITDP has created a scoring system to protect the brand of BRT and to recognize high quality implementations of BRTs throughout the world.\(^2\)

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2 ITDP
**BRT Basics**

The technical committee at the ITDP has determine these five elements essential to a BRT system. They are critical to a system because they help to reduce delay by alleviating sources of congestion, conflicts with other vehicles, and the difficulties of passenger boarding and alighting.³

- **Dedicated right-of-way**
  This allows buses to travel independently from the normal flow of traffic. In order to be considered a BRT corridor, a system must provide at least 1.9 miles of dedicated bus lane.⁴

- **Busway alignment**
  The location of bus lanes within the street can vary but the most preferred location is the median-aligned busway. On ITDP’s score card, a system with median-aligned busways receive the highest score while split alignments or curb-aligned ways receive lower scores.⁵

- **Off-board fare collection**
  Off-board fare collection expedites the boarding process. The bus can quickly move on its way from a station when it does not need to wait for passengers to find their fare while blocking other passengers waiting to board.

- **Intersection treatments**
  These treatments can include: reducing the amount of intersections with signals, forbidding turns across a busway and when needed giving the buses signal priority. These assist the system by giving the buses the most amount of green-light time as possible.⁶

- **Platform-level boarding**
  This element makes the bus system more easily and quickly accessible. Without platform-level boarding, significant delays are cause when people with strollers, suitcases or disabilities require more time to board the bus.⁷

(Source: jsonline.com)
### BRT Standard Scorecard

The image below was taken out of ITDP’s *The Bus Rapid Transit Standard* and lists the categories under which they evaluate BRT systems. This set of criteria allows BRT systems across the globe to achieve a standard recognition of what a true BRT system is and in addition to creating a framework from which designers, government officials and the public are able to implement a new system within their communities.

#### The BRT Standard Scorecard

This scorecard shows the criteria and point values that make up the *BRT Standard*, followed by a detailed description of each.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>MAX SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BRT Basics (pp. 26–37)</strong></td>
<td>38 TOTAL</td>
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<tr>
<td>Dedicated Right-of-Way</td>
<td>8</td>
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<tr>
<td>Busway Alignment</td>
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<tr>
<td>Off-Board Fare Collection</td>
<td>8</td>
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<tr>
<td>Intersection Treatments</td>
<td>7</td>
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<tr>
<td>Platform-level Boarding</td>
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<tr>
<td><strong>Service Planning (pp. 38–44)</strong></td>
<td>19</td>
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<tr>
<td>Multiple Routes</td>
<td>4</td>
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<tr>
<td>Express, Limited-Stop, and Local Service</td>
<td>3</td>
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<tr>
<td>Control Center</td>
<td>3</td>
</tr>
<tr>
<td>Located in Top Ten Corridors</td>
<td>2</td>
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<tr>
<td>Demand Profile</td>
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<tr>
<td>Hours of Operations</td>
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<tr>
<td>Multi-Corridor Network</td>
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<tr>
<td><strong>Infrastructure (pp. 45–52)</strong></td>
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</tr>
<tr>
<td>Passing Lanes at Stations</td>
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</tr>
<tr>
<td>Minimizing Bus Emissions</td>
<td>3</td>
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<tr>
<td>Stations Set Back from Intersections</td>
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<td>Center Stations</td>
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<tr>
<td>Pavement Quality</td>
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<td><strong>Stations (pp. 53–57)</strong></td>
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<td>Distances Between Stations</td>
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<td>Safe and Comfortable Stations</td>
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<tr>
<td>Number of Doors on Bus</td>
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<td>Docking Bays and Sub-stops</td>
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<tr>
<td>Sliding Doors in BRT Stations</td>
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<tr>
<td><strong>Communications (pp. 58–59)</strong></td>
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<tr>
<td>Branding</td>
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<tr>
<td>Passenger Information</td>
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<td><strong>Access and Integration (pp. 60–65)</strong></td>
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<td>Universal Access</td>
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<td>Integration with Other Public Transport</td>
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<td>Pedestrian Access and Safety</td>
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<td><strong>Operations Deductions (pp. 66–72)</strong></td>
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<td>Commercial Speeds</td>
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<td>Below 1,000</td>
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<td>Lack of Enforcement of Right-of-Way</td>
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<td>Significant Gap Between Bus Floor and Station Platform</td>
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<td>Overcrowding</td>
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<td>Poorly Maintained Infrastructure</td>
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<td>Low Peak Frequency</td>
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<tr>
<td>Low Off-Peak Frequency</td>
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<tr>
<td>Permitting Unsafe Bicycle Use</td>
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<tr>
<td>Lack of Traffic Safety Data</td>
<td>-2</td>
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<tr>
<td>Buses Running Parallel to BRT Corridor</td>
<td>-6</td>
</tr>
<tr>
<td>Bus Bunching</td>
<td>-4</td>
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</tbody>
</table>

(Source: ITDP)
Chapter Summary

A Bus Rapid Transit system has a variety of benefits that can improve the Milwaukee area economically, environmentally, and equitably. Using research based on how BRT has impacted other cities, this section addresses many benefits of BRT and how a well-designed system can provide value to the East-West Corridor, area residents, and the entire Milwaukee region. Each benefit is categorized into one of the three Es of sustainability - Economics, Environment, and Ethics'. These categories are all important in building a balanced, sustainable community that benefits all residents. As will be seen, BRT can bring numerous benefits that cover all of these categories and can help transform Milwaukee into a more sustainable metropolitan area. The themes and benefits covered below are displayed graphically in a series of infographics in the Appendix.

ECONOMICS

Oftentimes, the biggest hurdle municipalities face pursuing a new project is justifying how much it costs. This category covers how BRT can positively impact the economic stability of the area by attracting talent, encouraging transit-oriented-development, increasing business activity, and saving residents time and money.

Summary of Economic Benefits for BRT in the East-West Corridor:

- Based on ridership projections and an average value of time of $12/hour, BRT in the East-West corridor will provide an estimated $4.2 million/year in time savings.\(^2\)
- Based on a study of properties in the East-West Corridor, BRT will generate an estimated $3 million/year in additional tax revenue from transit-oriented development.\(^3\)
- Based on comparable case studies, it is estimated that BRT will save $4 million/year in expenses related to traffic accidents.\(^4\)\(^5\)
- Based on ridership projections, BRT will bring an estimated 19,500-23,500 potential shoppers to the East-West Corridor every day.\(^6\)

Attracting Talent

Of the forty largest metro areas in the United States, only eleven lack a rapid public transit system, and ten of those are currently in the process of developing one.\(^7\) In an age of rapid-technological advancements, maintaining the status quo is not a recipe for success, and providing effective public transportation is key for cities to stay competitive on the national level.\(^8\) Milwaukee needs to pursue innovative and future-oriented investments in infrastructure to ensure that the city attracts both a talented workforce and economic investments.

Wisconsin has suffered from a fairly sizable “brain drain” of college graduates since the 1990s. From 2008 to 2012, an estimated 14,000 college graduates left the state each year.\(^9\) These educated workers are largely representative of what Richard Florida has called the creative class, which contributes to a rapidly growing portion of the economy. Members of the creative class, Florida argues, are relocating to superstar cities that are attracting them, boosting the economies within. These city-living employees are often less reliant on car-ownership, and cities that wish to attract them must provide effective rapid public transit.\(^10\) The implementation of a rapid transit system such as BRT can help Milwaukee compete with other cities for these educated workers, which in turn increases the tax base and facilitates economic growth.

\(^2\) See Appendix: p. 33, Value of Time Savings.
\(^3\) See Appendix D
\(^4\) AECOM.
\(^6\) AECOM.
\(^7\) Schneider
**Encouraging Development**

Effective rapid public transit systems such as BRT can also serve as an attractor to developers and investors, spurring development of all kinds, filling storefront vacancies, and developing vacant land. Corridors with BRT turn into opportunities for transit-oriented development that can help revitalize the community. As many cities with BRT illustrate, investments in transit-oriented development that follow rapid public transit can inject hundreds of millions to billions of dollars in a city’s economy. Cleveland’s HealthLine, one the most successful American examples of BRT, saw a total of $5.8 billion in development invested as a result of the $200 million dollar transit project that included BRT and street and infrastructure enhancements.\(^1\)

This transit-oriented development along BRT corridors can help create jobs, neighborhood-serving businesses, and tourist attractions to help grow the tax base. Residential and mixed-use development encourage city living and can help recover lagging populations. Commercial development offers employment and businesses to accommodate resident needs, and helps keep money that is made in the city from being spent elsewhere. Other development that cities with BRT have encountered (such as hotels and entertainment) help support a tourism and hospitality industry. In Milwaukee, there are many areas along the proposed BRT route that are underutilized and not fully developed. As will be demonstrated later in the report, this makes it a prime corridor for a significant amount of transit-oriented development that BRT encourages.

**Positively Impacting Local Business**

Along with encouraging new business and development, BRT can also benefit existing businesses along the corridor. Employees that work along the corridor benefit from a more reliable and faster commute that can remove the stress that correlates with finding a place to park a car. BRT also brings thousands of riders past corridor businesses every day, increasing exposure and possible customers of these businesses. Business owners along BRT routes have seen significant economic benefits. In the first six years following the implementation of Cleveland HealthLine’s BRT system, property values along the corridor doubled overall, with some values increasing even more sharply.\(^2\)

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2. Hook, Walter, Stephanie Lotshaw, and Annie Weinstock,. p139.
Additionally, BRT can help transition a once automobile-dominated thoroughfare into a more pedestrian-friendly environment that can help to encourage more pedestrian activity along the corridor. A study on consumer behaviors as it correlates to travel modes concluded that pedestrians and bicyclists spend comparable, if not more, money over the course of a month than automobile drivers. Thus, increasing pedestrian activity along a business corridor via BRT represents a potential boom to sales revenue. This fact will be important to highlight as businesses reliably express concern (particularly in Milwaukee) over the loss of street parking that dedicated lanes oftentimes require.

**Saving Time + Money for Residents**

One of the most tangible benefits of an effective rapid transit system is the time savings that riders experience. As the old adage goes, time is money, and the value of time should not be understated. For BRT in the East-West Corridor, the total trip length is expected to be reduced by approximately 15 minutes. Based on projected ridership levels and an average value of time of $12/hour, this translates to roughly $4.2 million/year in travel time savings. These savings alone are enough to offset the anticipated operating costs of BRT ($3.7/year).  

Aside from simply saving time, travel time savings have tangential economic benefits by reducing the stress from commuting and increasing productivity. These benefits enter the realm of public health issues, as longer commutes are associated with higher levels of blood pressure, stress, and heart disease.

BRT in the East-West Corridor may be the first step towards a more robust regional transit system, which could really contribute to time savings. Once developed, public transit may be competitive enough with auto-transit that residents who live in the city (and perhaps the greater metro area) may be able to forgo car ownership. Utilizing public transportation instead of owning a car can save households an estimated $10,000/year.

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14 AECOM.


(Source: Jeramey Jannene)
ENVIRONMENT

Cities everywhere should be concerned with the impacts they have on the natural environment. This category covers how BRT can positively benefit the environment by reducing carbon footprints, improving air quality, and creating a more pedestrian-friendly environment and safer streets.

Summary of Environmental Benefits for BRT in the East-West Corridor:

• Based on ridership projections, it is estimated that BRT will remove an estimated 6,700 cars from the roads in Milwaukee.\(^{18}\)

• Based on ridership projects, it is estimated that BRT will reduce vehicle miles traveled by over 50,000 every day.\(^ {19}\)

• Based on ridership projects, it is estimated that BRT will reduce carbon dioxide emissions by over 7,000 tons per year.\(^ {20}\)

• Based on comparable case studies, it is estimated that BRT will save $4 million/year in expenses related to traffic accidents.\(^ {21,22}\)

Reduced Carbon Footprint

In the age of climate change and environmental uncertainty, investments in sustainable methods of transportation become increasingly urgent. BRT offers a more environmentally-friendly form of transportation that can reduce harm to the natural environment. According to the Delaware Authority for Regional Transit, “a bus with as few as seven passengers is more fuel-efficient than the average single-occupant auto used for commuting.”\(^ {23}\) Buses are also more efficient in terms of reducing the number of vehicle miles traveled for passengers, which helps to reduce greenhouse gas emissions that contribute to global climate change. Carbon emission from automobiles currently contribute to 1/5 of all carbon emissions in the United States.\(^ {24}\) According to the American Public Transportation Association, using public transportation instead of a personal car can lead to a personal reduction of one’s contributions to greenhouse gases by 30% (APTA).\(^ {25}\)

For Milwaukee’s BRT system to accomplish its daily ridership projection of 19,500-23,500,\(^ {26}\) it will need to convert some automobile commuters into transit riders. A transition of this scale can make significant reductions to the city’s carbon footprint. In fact, it is estimated that BRT in the East-West Corridor will remove 6,700 cars off the road,\(^ {27}\) a reduction of over 30,000 tons of carbon dioxide per year.\(^ {28}\) To increase this impact, the BRT system on the East-West Corridor could use newer technology buses that are cleaner and higher capacity than the current vehicles.

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\(^{18}\) AECOM.  
\(^{19}\) AECOM.  
\(^{20}\) AECOM.  
\(^{21}\) AECOM.  
\(^{22}\) NHTSA  
\(^{23}\) “The Environmental Benefits of Riding Public Transit” Delaware Department of National Resources and Environmental Control (DNREC) http://www.dnrec.delaware.gov/dwhs/info/Pages/OzonePublicTrans.aspx  
\(^{26}\) AECOM.  
\(^{27}\) AECOM.  
Benefits of BRT

Outside of the lens of climate change, developing sustainable systems of transportation is a way of increasing local autonomy, reducing regional reliance on the dwindling supply and changing prices of oil. According to a study conducted in 2007, public transportation systems contributed to a reduction in gasoline consumption by 4.2 billion gallons each year, which represents about 3% of the national annual consumption. Petroleum is a nonrenewable fossil fuel that will eventually diminish, and public transportation systems like BRT help to reduce the region’s reliance and consumption.

**Improved Air Quality**

BRT also can lead to benefits to Milwaukee’s air quality. Vehicle emissions are not only contributing to global warming, but they are responsible for much of the local air pollutants that causes air pollution and smog. Compared to private vehicles, public transportation produces significantly less air pollutants (95% less CO, 90% less volatile organic compounds, 50% less carbon dioxide and nitrogen oxide.) Additionally, BRT in the East-West Corridor presents an opportunity to replace some of the current outdated buses with electric or low-emission buses to be used along the route. Using cleaner vehicle technology has been shown to reduce air pollutants that leads to other benefits to corridor residents and users. Bogota, Columbia, reported a “43% decline in SO2 emissions, 18% decline in NOx, and a 12% decline in particulate matter” after the implementation of its BRT system, the TransMilenio. A reduction in air pollutants also leads to health benefits and cost savings. After introducing the Metrobus Line 1 in Mexico City, local air pollutants were reduced to eliminate more than 6,000 days of lost work, 12 new cases of chronic bronchitis, and three deaths per year for an estimated savings of $3 million per year.

**Creating Safer & More Pedestrian-Friendly Streets**

In addition to reducing harm to the environment, BRT is shown to benefit all residents by creating a safer, more pedestrian-friendly street environment. Many of the design characteristics of BRT assist in making streets safer for those that travel on it. If Milwaukee chooses to have dedicated bus lanes on portions of the route, it can benefit from separated lanes for different travel modes. When buses and vehicles are limited to traveling in their own lanes, buses do not need to merge into traffic after pulling over to pick up or drop off customers. This reduces interaction between buses and vehicles, reducing the risk of collisions. Dedicated lanes also helps to slow traffic down, making it safer for both drivers and pedestrians. Dedicated lanes also lead to increased traffic congestion, which helps to slow traffic down, making it safer for both drivers and pedestrians. Stations for a median-running BRT system add a mid-crossing refuges for pedestrians, shortening the overall distance needed to cross the street during a cross signal, and giving more opportunity to those who have difficulty crossing.

Often times, BRT routes are along heavily traveled, automobile-dominated corridors that could benefit from a transformation in character. Many systems have been successful in including other street infrastructure improvements that help to create a safer pedestrian environment. Pedestrian infrastructure, such as crosswalks and curb bump-outs, increases the visibility of pedestrians and reduces the crossing distance through unpredictable

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30 EIA.
32 Embarq.
33 Embarq.
traffic. 

This infrastructure as well as increased traffic congestion helps to slow drivers down, making it safer for everyone traveling in the corridor. In Latin America, BRT systems have contributed to a 40% average reduction of street fatalities and injuries. 

Saving lives is a worthy cause in itself, but it also has an economic component. Based on existing case studies, it is estimated that BRT in the East-West Corridor will lead to a reduction of $4 million per year in traffic crashes.

When BRT systems are implemented, cities have the opportunity to make additional changes to street infrastructure during construction to help improve the corridor. Adding landscaping in medians and along sidewalks helps to create a greener environment that has the added benefit of reduced air pollution and increased stormwater management. A well-designed BRT corridor also makes for an attractive environment that people enjoy walking along. Installing street furniture like benches invites visitors to spend time in corridor, rather than pass through it. Well-designed, attractive stations add interest and a decorative quality to the street. Some cities even customize their rapid transit stations to fit the station area, giving the corridor personality and character. These infrastructure improvements, along with a high-quality transit system, help to increase pedestrian activity, especially around stations. More pedestrians walking means more “eyes on the street” creating a greater feeling of personal safety and lower risk of crime. Station designs can assist in this with 24-hour lighting, surveillance cameras, and emergency phones. Cities with BRT such as Cleveland, Ohio, have seen increases in ridership up to 60% over the bus line it replaced. This means an increase in pedestrians around station area. More pedestrians means more “eyes on the street” and a greater feeling of personal safety for corridor users. Station designs can assist in this with 24-hour lighting, surveillance cameras, and emergency phones.

35 Embarq.
36 AECOM.
37 NHTSA.
EQUITY

Many residents living in the neighborhoods along the proposed East-West Corridor in Milwaukee have certain challenges that the BRT can help overcome. This category covers how BRT can equitably improve the social landscape of cities by increasing accessibility and providing a transportation for everybody.

Summary of Equity Benefits for BRT in the East-West Corridor:

- BRT will provide faster, more frequent service at the same price; during peak hours, buses will arrive every 10 minutes.\(^{39}\)

- BRT is an equitable investment - for portions of the corridor, there are almost as many bus riders as cars.\(^{40}\)

- BRT will utilize level-boarding, increasing ease of access for those in need.

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\(^{39}\) AECOM.
\(^{40}\) Wisconsin DOT. http://wisconsindot.gov/Pages/home.aspx (2015)
Increased Accessibility

BRT systems can benefit all residents by providing a fast, and efficient way to travel in a city. For the Milwaukee region, which is lagging behind other metro areas in rapid and regional transportation efforts, BRT in the East-West Corridor could be the first step of a regional transportation network to build additional connections and further improve regional accessibility. Even by itself, the proposed route has the potential to make a significant difference. Traveling between Milwaukee and Wauwatosa, the East-West Corridor BRT would connect two of the largest regional job centers: Downtown Milwaukee, which employs 81,000 and the Milwaukee Regional Medical Center, which employs 30,000.41 With BRT in the East-West Corridor, the 47,00042 people who live in station areas would be connected to these employment centers, as well as many other employment opportunities, with a high-frequency, convenient form of transportation.

BRT in Milwaukee can also help connect residents to the many other bus routes that go through Downtown, expanding accessibility to other parts of the region. Not only does this increase accessibility to additional employment opportunities, but it helps connect residents to daily activities, by bringing people to shopping, dining, healthcare, and other services along the corridor. The proposed BRT route also runs along Marquette University, which can help bring the thousands of students and staff to class and work faster and without the hassle of parking. The eastern end of the proposed route is the Downtown Transit Center (or future Couture building), where BRT can provide easy access to all the activities and attractions along the lakefront. This is especially key in the summertime to provide a transportation option to Summerfest and other festivals, where parking is expensive and difficult.

42 AECOM.
Providing a Transportation Option For All

While BRT can increase accessibility around the Milwaukee area for everyone, it can specifically benefit those with barriers to transportation. Many people rely on public transportation as their mode of travel because they do not have access to a private vehicle or are physically disabled. Specifically, in the areas within ½ mile of proposed stations along the East-West Corridor, 23% of residents live in a household without a vehicle. BRT would assist these transit-dependent residents with an improved form of transportation along a major corridor.

When thinking of further route expansions, it will be important to focus on serving those populations that would most benefit from BRT. According to the Brookings Institution, the decline in accessibility to jobs has affected poor and minority residents more than non-poor and white residents. In the East-West Corridor station areas, 26% live below the poverty line, and 40% are people of color. Improving conditions for these residents is important for equitable growth in Milwaukee, and providing effective access to employment opportunities is a critical ingredient for this. These considerations played an important role in determining potential future routes, as will be outlined later in this paper.

Another way to look at the equity issue is in terms of equitable investments. Significant amounts of money gets spent on highway construction each year ($3 billion requested for 2017, 46% of all DOT funds) and many residents, especially transit-dependent ones, do not receive any benefit from this. Investment in effective public transportation systems like BRT can help equalize these expenditures to benefit all residents and increase equity in the region.

Apart from increasing access and connectivity, BRT helps to make public transportation easier to use for people of all abilities. A high-quality BRT system includes characteristics like platform-level boarding that allows everyone to step right onto the bus, making it easier and faster for people with wheelchairs and trouble walking. Stations also accommodate rider needs with more seating and shelter than the average bus stop. Stations can even have heated elements to make it more comfortable for riders during colder months. Fare payment is made simpler with off-board ticket purchasing, allowing those without a bus pass or cash to board the bus. All of these design elements help to make for a more convenient and easier to use system, and help contribute to a public transportation system that can benefit everybody.

Infographics

Many of the benefits discussed above are represented graphically in the form of infographics, shown in the appendix. The infographics fall into the categories of the three E’s of sustainability (economics, equity, environment) and are intended to demonstrate benefits to a specific audience. These infographics could be used as a part of the East-West Corridor marketing campaign and could be displayed on the website, on buses or at stations, and could be given out to the community. Certain infographics could be used to educate public officials on how the BRT can benefit their communities.

43 AECOM.
45 AECOM.
Economics Infographics: “BRT - The Costs and Benefits” and “BRT and Businesses”

- “BRT - The Costs and Benefits” is meant for the general public to consider economic components of the many auxiliary benefits that BRT brings (time, safety, clean air).

- “BRT and Businesses” is meant to be shared with businesses along the East-West Corridor. It is intended to counter the fear that their business will suffer as a result of BRT coming to Milwaukee.

Environment Infographics: “BRT and Safer Streets” and “BRT and Environmental Benefits”

- “BRT and Safer Streets” is designed for residents who live on or use the corridor and are concerned about how BRT will impact the corridor’s safety.

- “BRT and Environmental Benefits” is meant for those residents who live along the corridor and would directly benefit from an improved urban environment, as well as residents who are simply concerned with the impact Milwaukee has on the environment.

Equity Infographics: “BRT and Accessibility” and “BRT and Current MCTS Riders”

- “BRT and Accessibility” is meant to address how BRT can be more user-friendly than the current bus system. It also addresses how BRT makes it easier for passengers with disabilities to use public transit.

- “BRT and Current MCTS Riders” is intended to display the benefits for those users of the current MCTS system that travel this corridor. It is intended to counter the fears that BRT service will come at the expense of local service.

Comparison Infographics: “Before and After” and “Today vs The Future”

In addition, two infographics were made to compare the East-West Corridor before BRT to what it could become after BRT. Both of these infographics are intended for key stakeholders along the corridor as well as a general audience.

- “Before and After” could be used during public meetings to discuss how BRT is implemented and the benefits of this kind of public transportation. It’s a good way to show what BRT can do for a neighborhood.

- “Today vs The Future” addresses the issue about the existing MCTS system and how BRT would help remedy that, while also addressing parking concerns. This would also be great for public marketing.
Chapter Summary
This following section takes a critical look at the research that the Bus Rapid Transit Workshop studied to form the argument for BRT in the East West Corridor. The class participated in precedent studies, guest speakers and community involvement meetings to gain enough knowledge to back BRT in Milwaukee. The course took a critical look at the issues that communities face while implementing BRT and created solutions to these problems. Overall, the class's research helped form a cohesive and articulate argument for BRT in the East-West Corridor of Milwaukee.
Throughout the semester, the Bus Rapid Transit Workshop course has focused on creating a comprehensive study on the validity of Bus Rapid Transit throughout the East-West Corridor in Milwaukee. The class started its study of this corridor by looking at the existing Milwaukee County East-West Corridor Study. The East-West Corridor Study outlined prior planning efforts in the corridor, the current existing transportation in Milwaukee, the population of the surrounding area, employment opportunities around the corridor, and current and future land use. By using the suggestions outlined in this study, the class was able to outline many of its arguments for the validity of a rapid transit development happening in this corridor.

One of the goals of the class is to inform the public about BRT in its community. With the research that was gathered throughout the semester, the class was able to create many marketing infographics and animations to inform the public about the benefits of BRT. The class spent the first few weeks of the semester studying what BRT is and its implementation in other cities. The course then studied more in-depth the use of BRT in Milwaukee's East-West corridor.

There have been many studies emphasizing the need for rapid transit through this corridor. Some of the studies that the class considered include: SEWRPC's 2050 Regional Land Use and transportation plan; The Public Policy Forum's Picking up the Pace full report, and Milwaukee County's transit Crisis; and AECOM's East-West Feasibility Study. All of these studies suggest that BRT is not just suggested, but necessary for Milwaukee to remain competitive in today's marketplace.

After this initial introduction to BRT, the class had many guest speakers come in to inform the class about BRT and its real life planning efforts in Milwaukee. These speakers included Brian Dranzik the director of transportation in Milwaukee, Rob Henken from public policy forum, and numerous other guest speakers. The guest speakers helped the class formulate a cohesive argument for BRT and its use in the East-West Corridor.

The class took the information that they had gathered throughout the initial studies and the guest speakers and led a meeting of the Near-Westside partners. This meeting was used as an opportunity to hear concerns the residents living in and around the corridor. Many of the residents had the same concerns that were addressed in the prior studies.

Throughout the investigation of BRT, the class discovered that it has proven itself to be an effective form of transportation, yet the success of BRT relies heavily on the public's impression of the system. The prior studies, guest speakers, and the neighborhood meeting all informed the class on the opportunities and challenges of implementing BRT in Milwaukee's East-West Corridor.

Bus Rapid Transit offers a lot of benefits to a corridor and its surround areas. According to the prior research the class found that areas around a BRT corridor saw a major jump in development, which would help Milwaukee's lacking downtown. BRT also allows for a more pedestrian friendly road, making local businesses more desirable to the consumer. BRT is also designed with ADA guidelines in mind, making BRT more accessible to everyone. The use of a bus lane and pedestrian friendly crossings in the corridor also makes BRT a safer way to implement transit. In Latin America, streets with BRT saw an average reeducation of fatalities and injuries by 40%. From the research throughout the course, the argument

1 AECOM.
2 Carrigan, A., R. King, J.M. Velasquez, M. Raifman, and N. Duduta. Social, Environmental, and Economic Impacts of BRT Systems: Bus Rapid Transit Case Studies from Around the World, EMBARQ: A Program of the World Resources Institute,
for BRT in Milwaukee is very strong.

Although from the research one can see that BRT can improve Milwaukee’s East-West Corridor, there are many valid concerns that keep being brought up through the class’s investigation. The main concerns that the class discovered time and time again include; parking, congestion, travel times, what will happen to existing bus service, and safety concerning the speed of the buses and pedestrian safety. In every case study that the class looked at, parking was a major concern. Businesses were mostly concerned with the loss of some of the on-street parking in front of their businesses. According to the proposed design, not all parking on the street needs to be taken away. Also the introduction of BRT can lead to promoting business activity because it spurs development and creates an easier way for customers to come to the businesses. BRT creates a more pedestrian friendly environment, which could also increase the amount of foot-traffic to the businesses.

Existing bus service throughout the corridor is being discussed, however, it has not been determined how the introduction of BRT will specifically affect these lines. From discussions with the guest speakers, it was determined that local service would still operate along the corridor, or running along a parallel street. The concerns about local bus service will be addressed, but is not available at this time.

Safety is one of the most discussed issues that the class discovered. People were concerned that rapid transit meant that they would have buses speeding past their streets disrupting the street and endangering their children. The bus will abide to all local street laws, the rapid part only references the increased speed of boarding and dedicated lane traffic. BRT allows for a safer street. Bus rapid transit is safer to use than the standard bus because it allows for a more pedestrian safe city.

The background research on BRT created a very strong case for the implementation of BRT throughout the corridor. Through researching precedents, hearing guest speakers, and asking residents about BRT, the class was able to create a cohesive argument on the validity of BRT throughout Milwaukee’s East-West Corridor.
Chapter Summary

This section looks at the existing Milwaukee County Transit System and makes the argument for investing in BRT to address the key challenges MCTS faces. Some key issues that will be reviewed are: the existing routes and services on the East West Corridor, current ridership, potential land use development opportunities throughout sections of the corridor, congestion and population concerns and an overview of the broader system. An understanding of the prevailing system and its problems will help developers and supporters of BRT avoid the same “speed bumps”. In turn, creating a more effective and competitive means of transportation for the city.
Existing Bus Lines on the East-West Corridor:

The East-West Corridor is prime candidate for Milwaukee’s new BRT line as it currently serves many MCTS local bus routes and already connects key sections/destinations of the city on the corridor already such as: Downtown Milwaukee, Marquette University, the business corridor and residential areas of Wauwatosa and the growing Milwaukee Regional Medical Center.

According to a review of the existing transportation network within the Milwaukee County East-West BRT Feasibility Study, the only route goes through the full length of the existing corridor today is the Gold Line. Although other routes (both local and express) do traverse the corridor, they only serve portions of it. The proposed BRT line has the potential to connect all of these stops in a more efficient and expedient manner, which consequently will reduce travel times and eliminate congestion.

Some challenges to the MCTS service mentioned in the East-West BRT Feasibility Study that the proposed BRT can overcome include:

- The East-West corridor is overrun with a variety of bus routes or duplicate routes, but these busses stop too frequently to be effective.
- Existing riders struggle to transfer to busses or are forced to wait for connections.
- Late arrivals and slowed schedules affects the overall opinion and long term use of the system.
- There is no existing transit signal priority (currently busses are waiting at red lights) on the corridor for MCTS, again contributing to increased travel time, delays due to traffic and a negative opinion of the existing system.
- Milwaukee has no competitive transit option to improve times and attract new commuters or encouragement for residents to opt for public transit versus using their cars.

Existing Corridor Ridership:

There are four primary transit routes, as reviewed within Ridership portion of the East West Feasibility study, that operate within the east-west corridor: Route 30, Route 30X, Route 31 and the Gold Line. In 2015, the study notes, 8,584 people boarded one of these routes traveling eastbound and 9,330 people boarded one these routes traveling westbound.

(Credit: Chris Phan)
Existing & Potential Land Use Development on the Corridor mentioned in AECOM’s East-West BRT Feasibility Study:

- Medical Center/Research Park District. The argument could be made that implementing BRT in this varied mixed density section of the corridor could improve travel routes from goods/services to home and reduce time in traffic for Wauwatosa residents.

- West Residential District. These areas currently have lower population density than the medical complex area and would be an ideal location for BRT to bring consumers directly to struggling businesses, and the more residential areas would benefit from improved pedestrian walkability for children coming to and from schools.

- Marquette/Near West Side District. BRT development in this section could provide relief of congestion for families and workers commuting while encouraging tourists to visit other parts of the city besides the Downtown area.

- Downtown District. The addition of BRT to this area could eliminate overlap of multiple existing bus routes on Wisconsin Avenue, reducing congestion and replace those with a faster, more efficient system that would connect riders with the new Milwaukee streetcar or other means of public transport (i.e.: Bublr bike share stations).

Existing Congestion & Population

According to the East-West Feasibility Study’s Traffic Volumes section, current traffic volumes on the potential east-west bus routes range from 5,000 to 22,000, making congestion a serious issue throughout the corridor. The study concludes that the non-motorized network (i.e.: bike paths, pedestrian walkways and refuge) is not established enough to effectively connect east-west traffic throughout the corridor. Speaking directly to the benefits of BRT, the study also takes special note that the east-west corridor currently houses 21 percent of homes with no access to a car.

The highest density and concentration of population is in the near west side of Milwaukee and north of the Downtown area (by the Marquette University campus). As noted in the study, the age group with significant growth was 18-34 year olds. Both the 18 and over 65 years old categories decreased and 35-64 years olds remained the same. Additionally, the study indicates, the population is growing more in Wauwatosa, and less so in Milwaukee.

The Broader Milwaukee County Transit System:

MCTS is one of the last transit systems in the country to not have a dedicated source of funds to keep services from being cut and fares increasing. There are investments in new technology for the existing fleet such as: web-based real-time schedule information, new clean diesel or hybrid busses, low-floor vehicles for easy access and near zero emissions. Additionally, the fleet has new electronic fareboxes, which allows for easier boarding and transferring. MCTS is attempting new programs to enhance the existing system like the “Freedom Pass” (unlimited bus pass for Transit Plus riders), “Google Transit Trip Planner” and the “Bikes on Buses” program. The transportation provided by MCTS to the city of Milwaukee community helps create jobs, provides accessibility for the disabled, and allows for city wide connectivity.

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**Chapter Summary**

The East West corridor is currently slated to be upgraded in the near future with dedicated rapid transit for the first time in its history. The corridor currently is dedicated mainly to the automobile with all the curb to curb width of the roadway throughout left solely for moving, turning and parked automobiles. For Bus Rapid Transit (BRT) to be successful in the corridor it needs to be built out to its full potential and its implementation not be limited by political constraints. The Institute for Transportation and Development Policy (ITDP) has a score card that it gives out to BRT routes throughout the world which ranges from a below base standards to gold. We recommend that the East West corridor be built up to at least the silver standard set forth by the ITDP. This will require the route to maximize dedicated lanes, and a busway alignment (center running dedicated lanes), have off board fare collection and level boarding at improved stations and have intersections treated to allow for better transit, pedestrian and bicycle access and movement. There are going to be challenges to achieve this in the corridor, but the following recommendations will achieve a silver level BRT route in the East West corridor and improve the character of the corridor while making compromises for existing users and residents of the corridor to make a Wisconsin Avenue and Bluemound Road for every user in the region and not a corridor that is solely for automobiles.

In our recommendation the corridor will be separated by sections which exhibit similar road width characteristics or similar surrounding context. These sections are; downtown East of the Milwaukee River, Wisconsin Avenue bridge East to Van Buren Street, downtown West of the River, Wisconsin Avenue bridge to 8th Street, Marquette University area, 8th Street to 16th Street, the Near West Side, 16th Street to Hawley Road and finally Bluemound Road Corridor, Hawley Road to 95th Street. These have been looked at independently and each recommendation will help to implement the best BRT possible in the East West Corridor while still mitigating any negative effects on parking or congestion.
Downtown East: Cass Street to the Milwaukee River

Current Characteristics:
The section of the line that will run east of the Milwaukee River on Wisconsin Avenue is in the neighborhood of East Town and is home to much of the corporate presence in Milwaukee. This section of the corridor is going to have ample opportunities to make meaningful connections to the now under construction streetcar and be a critical section for transforming the character of downtown. The challenges that are present here are ones that are unique, two critical connection points to the streetcar and creating or joining into an Eastern terminus for the line and one that will be present throughout, parking.

The width of Wisconsin in this section is 58 feet curb to curb. The average automobile daily traffic (AADT) through the section is between 7,500 and 8,300 per day. There are 33 on street parking stalls with each limited during peak travel times in both the Westerly and Easterly directions and overnight. These spaces are not heavily used for this reason and the lack of business that utilize them. These corridor figures show that this section of the line could accommodate dedicated curb running lanes for buses, dedicated cycling infrastructure and still accommodate a through
A single lane of traffic in both directions. Losing one lane for general traffic will not have any meaningful impact on congestion through this section of Wisconsin as many transportation departments around the country’s positions are that roads with AADT below anywhere between 18,000 to 22,000 will not have negative traffic flow impacts by the reduction of through lanes on a 4 lane roadway.  

**Recommended Alignment:**

This section of the line would be very similar in design to the Cleveland Healthline as outlined in case study. The line runs through downtown Cleveland on Euclid Avenue, which provides travel lanes for buses and general traffic while still providing limited parking on the street. The BRT line will run on the outside lane of the street and in doing so will eliminate the limited on street parking that is provided on Wisconsin Avenue. By eliminating the parking this will allow for the inclusion of dedicated cycling infrastructure. These lanes will run next to the curb and will run between stations and the sidewalk where BRT stations are installed creating a “floating” station. This station design will eliminate all bus stop movement conflicts with cyclists and has been proven to be successful in many other cities across the country.

The two on-street stations in this section would need to provide ample room for bus riders and make the street much safer and more inviting to cross. As seen in figure 4 these stations will make crossing Wisconsin much easier for pedestrians in downtown while still providing access for automobiles and limiting conflict with cyclists.

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1 Staff. “Road Diets.” City of Fresno Traffic Engineering. 2016.
The major development happening in this section of the line is the Couture project that will be replacing the downtown transit center. This project will be a $100-million-dollar apartment tower that will contain a built in transit stop for the streetcar project. It is vital for this transit center to accommodate BRT. Specifically, a BRT station should be included as a part of the Couture development to make transfers between the streetcar and BRT as seamless as possible. Currently the alignment of the preferred alternative indicates a stop outside the new transit center, which would not only cost the county more money for an unnecessary stop it would lose the line the opportunity for a grand eastern terminus for the line.

**Downtown West: Milwaukee River to 8th Street**

*Current Characteristics:*

The section of the line on Wisconsin Avenue is bounded in the east by the Milwaukee River and 8th street in the West, the curb-to-curb width of the roadway expands greatly moving West. This section is likely to have several challenges with incorporating dedicated bus lanes, given its limited curb-to-curb width. Yet in those challenges some of the greatest opportunities exist, but will require a different way of looking at transportation for the future than Milwaukee has in the past.
Wisconsin Avenue is at its most narrow in this section of the line, 48 to 50 feet from curb to curb. Average AADT through this section of Wisconsin Avenue is roughly 10,000. There are roughly 90 on-street parking spaces in the section of the corridor and for many businesses these are perceived as vital. There are also mid-block alleys present in this section as well which could be utilized for deliveries to business and residents. This will be the most challenging section for dedicated lanes, but dedicated lanes are necessary for the improvement of service in this corridor to increase ridership and fully realize other benefits of BRT, such as travel time savings and development potential. Cleveland has found that it was this increase of speed, reliability and satisfaction with the Health line that drove the increases in ridership that is present on their BRT route.\(^5\) Similar gains have been seen in other BRT lines across the country based on the increase of reliability that increased investment in a new transit line provides and the decrease of travel times that dedicated lanes would maximize for the BRT.\(^6\) If Cleveland would have built out the Healthline in mixed traffic in downtown those gains in speed, reliability would have been reduced. This would have reduced ridership gains and other benefits.

**Recommended Alignment:**

This section of Wisconsin Avenue requires some nonstandard thinking. Many businesses see parking and the ability to receive deliveries on the street as vital to their business, yet travel time savings for the route will be the greatest with dedicated lanes in areas which experience congestion and limited space, as this section does. Therefore the recommended alignment would eliminate Eastbound general traffic and parking while maintaining the Westbound direction’s parking and through travel. This alignment would also add one Eastbound lane of bicycle travel in the corridor. This would preserve about 40 of the current 90 on-street parking spaces on the north side of the street and leave room for loading and unloading for local businesses. This would also add a cycling component to Wisconsin Avenue through this side of downtown. Eastbound auto traffic would be eliminated and instead be diverted to Wells Street at Plankinton Avenue and 8th Street. Wells’ current alignment has 3 through auto lanes and has an AADT of about 8,000 and so would be more than able to handle the potential 5,000 more automobiles traveling through every day. Wells would then have 2 dedicated through lanes for the extra east bound traffic that would be diverted to Wells Street. Wells Street would also receive

\(^5\) Office of Planning and Environment.

a Westbound buffered bike lane to add a companion to the Eastbound bike lane added to Wisconsin. The lane on Wells Street would connect to the already existing infrastructure that exists on the east side of the river and would make Wells a major east west bike route for downtown in addition to the recommended improvements on Wisconsin Avenue.

Many businesses currently claim that the elimination of on street parking would have a negative effect on their business, yet other corridors in the country that have added dedicated transit lanes at the expense of parking have not seen those overly negative effects. Cleveland has seen an increase of over 22,000 square feet of retail space along Euclid Avenue since the Healthline opened in 2008 after parking spaces were converted to sidewalks and turn lanes. In St. Paul only 30% of businesses along University Avenue responded that the elimination of nearly 1,000 on street parking spaces impacted their business negatively after the Green Line LRT opened in 2014.\(^7\)\(^8\) In addition, there is also at least 16 off-street parking lots or garages within 2 blocks of Wisconsin Avenue in this section of downtown as shown in figure 10. The loss of 40 on-street spaces would amount to less than 1% of off-street spaces available in the area.

Station Alignment:
Stations would be located in-between 4th and 5th street and at Plankinton Avenue. The station in front of the convention center is an important node for the corridor as it will serve as an important connection with an expanded streetcar station in the near future and provides tremendous economic development opportunity as the recent responses to request for proposals from the city of Milwaukee indicate the potential of the site.

The optimal alignment for the 5th street stop is a mid-block station that also closes Wisconsin from 4th to 5th to auto traffic. As shown in figure 11, a mid-block station will better connect the station to the future 5th street streetcar station. The mid-block station will also allow for the station to provide more public space and more room for buses to operate next to a platform. By closing the block to auto traffic it could also create a public square that will connect the station to the convention center, the future streetcar station and the future development in the parking lot to the south. Transit malls have been utilized all over the country to mixed results throughout the 20th century, but there have been great successes in many instances. In Minneapolis,


Nicollet Mall is a transit, pedestrian and bicycle only transit mall that has spurred investment of many billions of dollars since its initial construction in the 1960s. The mall is currently undergoing a $50 million reconstruction which has sparked renewed development on an underutilized section of downtown to the tune of a combined $275 million in private investment under and $260 million more planned. Other transit malls have been successful as well, in Denver the 16th Street Mall has been in place for over 30 years and is still a success to this day spurring investment and increased street activity. In San Francisco Market Street, the city’s main street, is closed in front of the famous Ferry Building and is host to daily street fairs and pedestrian traffic and has not resulted in diverted economic activity from the area. The potential for this block is sky high and closing Wisconsin to auto traffic here would maximize that potential. Yet the full closure of a street to traffic could provide increased resistance from political leaders and the public, therefore we are recommending to leave Eastbound traffic through the block with improved pedestrian features at intersections and keeping the possibility of a full closure in the future open.

Marquette Campus Area: 8th Street to 16th Street

Current Characteristics:

This section of the line runs from the point where Wisconsin Avenue widens with a median at 8th Street to the end of the Marquette campus at 16th Street. This section of the corridor has more political challenges than capacity or right of way challenges that are present in the downtown section of the corridor. The major challenge will be allowing center running stations be compatible

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Figure 12. The transit and pedestrian only Nicollet Mall has been a catalyst for development. The under construction 365 Nicollet is emphasizing Nicollet Mall as an amenity for the development. Photo courtesy of the Opus Group.

Figure 13. Current pedestrian crossing on Marquette campus across Wisconsin Ave.

Figure 14. Current cross section on Wisconsin Avenue. (Source: Streetmix.org)
with the possible right door loading buses. There is also a unique opportunity in this section to help better connect the Marquette campus, which is currently divided by Wisconsin into a more cohesive single campus utilizing the BRT and station improvements. Wisconsin through the Marquette campus is wide at 76 feet curb-to-curb width, including the planted median. With parking prohibited on both sides of Wisconsin, the street encourages high speeds from motorists by maximizing right of way for moving traffic. Average AADT for this section is roughly 14,000 per day. This is higher than Wisconsin east of the Interstate 43, but still under the 20,000 per day threshold that many DOT’s recommend for 4 lanes as intimated earlier.

**Recommended Alignment:**

There is a lot of right of way through the campus that is dedicated to automobiles that can be used in much more pedestrian friendly ways. With parking already prohibited on Wisconsin though campus no parking will be removed for dedicated bus lanes and in fact buffered bike lanes in both directions can be added and continued from downtown, all added cycle lanes on Wisconsin Avenue and Wells Street will add over a mile and a half of buffered cycling infrastructure to Milwaukee. The roadway will go from 4 plus lanes of general traffic, to two bus lanes, two automobile lanes and two bike lanes; a much more inclusive design for every possible user of the street. Currently the street has a well maintained and implemented median in the center that Marquette University has invested heavily in and our design keeps this median and enhances the roadway around it. There is opportunity for the potential BRT stations to be incorporated into the center running medians and even enhance them with greater pedestrian amenities at key connection points, which would help tie the campus together on either side of Wisconsin Avenue. This would require center bus stations although and unless the county purchases specialty vehicles with doors on both sides this causes a challenge with loading and offloading of passengers. If right door buses are utilized, they will have to switch directions to be able to stop at center running stations. The buses would switch sides before entering the Marquette area at 11th Street and after leaving the area at 16th Street to make the stations possible. This could potentially be reverted in the future when buses with doors on both sides are purchased, but this alignment would open up local routes to utilizing the Marquette stations and increase the station and alignment utility.

This movement will allow stations to be incorporated into Marquette’s median and make it not necessary to remove them, thus giving Marquette more incentive to support center-dedicated lanes. The two stations would be placed at 15th Street and 12th Street. This allows for one station to be truly a focal point of campus that connects both sides of campus together, but also aligns it to connect
with other bus routes that move north south on 16th Street, the 14 and the 23 routes. This station would take cues from the surrounding architecture of campus and be built with truly Marquette branding that when combined with increased levels of pedestrian focused street treatments will transform Wisconsin Avenue from a barrier on campus to an important and attractive piece of campus. A close comparison to this would be the METRO Green Line LRT that runs through the University of Minnesota campus in Minneapolis. Washington Avenue used to be a car-focused thoroughfare that acted as a barrier to cross for many students, similar to Wisconsin Avenue today. The LRT line allowed the UofM to pedestrianize Washington Avenue and turn the street into a bicycle and pedestrian oriented transit mall. The LRT stations were also built to connect to the history of campus and truly create a university feel that extends campus into the right of way. Washington Avenue is no longer a barrier for students on campus and the campus and neighborhood has subsequently thrived.
Near West Side: 16th Street to Hawley Road

Current Characteristics:
This section of the line will run from 17th Street and the end of the Marquette campus to 52nd and Wisconsin, the final station along Wisconsin Ave. The curb-to-curb width of the street is 76 feet with a 12-foot median for the majority of the section, the road is narrower on the bridge over the viaduct. The current alignment of this section of Wisconsin is 2 ways of through traffic both East and West and The AADT in this section of Wisconsin ranges from 13,000 to 16,000. The main challenges in this corridor will be left turning access in parts of the section and typical parking issues, the main opportunities are development potential and connections with other lines, mainly the future 27th street BRT line, but also along 35th which will transfer to multiple local bus routes. There are currently roughly 400 on-street parking spaces in this section of the corridor. Currently three local routes continue on Wisconsin Avenue after Marquette University, the 30, 30X and Gold.

Recommended Alignment:
Dedicated lanes would continue down the middle of the street straddling the median while at stops the center lanes would move together where the median is so that the stations could be aligned on the right side of buses. The daily traffic counts here support the ability of the corridor to be reduced to one general travel lane going in both directions. Local routes mentioned earlier will be diverted at 16th Street north one block to parallel Wells Street. This would allow for the parking situation to remain as is on this section of the corridor. Since left turns would be limited to signalized movements through this section, there would be some loss of parking near newly signalized intersections to accommodate left turns at 29th Street, 53rd Street and possibly 32nd Street for Marquette Highschool. There will be net zero loss in parking through this section although as parking lost currently at the many local bus stations will be restored, matching any loss from the new signalized intersections and left turn lanes.

The City of Chicago in 2013 completed its environmental assessment for Ashland Avenue and is recommending that dedicated center running bus lanes be implemented throughout the corridor. Ashland Avenue is very similar to this stretch of Wisconsin Avenue, they both are of similar curb-to-curb width, this stretch of Wisconsin has 76 feet curb to curb, and Ashland varies from 70 to 80 feet. Ashland carries far more traffic than this portion of Wisconsin, with an AADT that rises as high as 25,000 and has much denser development immediately surrounding it. Yet still the city of Chicago feels confident that the avenue can
successfully handle the new alignment and traffic congestion without the level of service falling to unacceptable levels for automobile traffic. This translates well to this section of Wisconsin Avenue and will allow for dedicated lanes to be implemented throughout the corridor. Other cities than Chicago are recommending similar treatments for planned BRT routes as well. San Francisco is currently constructing a new BRT line on Van Ness Avenue, which will eliminate one lane for general traffic for dedicated bus lanes and other BRT improvements. Van Ness Avenue handles over 40,000 automobiles a day and the City of San Francisco sees the benefits of increased transit over the potential negatives of decreasing travel lanes for general traffic. Like the previous two cited BRT lines under consideration in San Francisco and Chicago and as stated previously, left turning movements will be limited in this section of the corridor. To reiterate, this would be offset by the installation of new traffic signals on 29th Street, 53rd Street and possibly 32nd Street for Marquette high school.

Currently Wells Street has bicycle infrastructure that runs from 17th street West, while Michigan Street is a sleepy residential street that could be transformed into a bicycle boulevard, this will allow for Wisconsin Avenue West of Marquette to maximize utility for transit. This adjacent infrastructure will be clearly displayed at each station to inform riders of bike infrastructure in addition to proposing that Bublr bike share stations be installed at BRT stations where the new bike share stations will expand Bublr’s area. Charlotte’s B-Cycle Stations have been integrated to the CATS LRT line that runs through downtown, this would be similar. The Wells Street bike lanes will connect to Wisconsin Avenue lanes that will run through Marquette on 16th Street and be extended to downtown to connect to bike lanes to downtown.

The major opportunity for the section of the corridor will be at the intersection of 27th Street. This is where the next BRT line is planned for the future and the station area will need to be enhanced for future BRT service connections. Making the connections at this major transfer point clear will be of the utmost importance. Scheduling the routes to offer the quickest transferring possible will also be important and can be attained at best with more predictable service of the BRT, which would come from dedicating center running lanes for both routes. Significant improvements will need to be made at this intersection for pedestrians making transfers between the two BRT routes.

Figure 26. Aerial rendering of future new 27th Street station area.

Figure 27. Street level rendering of new 27th Street station area.
**Bluemound Road Corridor: Hawley Road to 95th Street**

**Current Characteristics:**
The east-west corridor route next turns onto Bluemound Road from Wisconsin Avenue via a short jog on Hawley Road. This section of the route would extend from Hawley Road to 95th Street before heading north to the Milwaukee Regional Medical Center. Bluemound Road has two distinct sections in this stretch, separated at Glenview Avenue: the eastern half is more locally oriented and has less traffic, while the western half is more commuter oriented and is wider with much more traffic. The eastern side of Bluemound Road of Glenview Avenue has AADT of 10,100 and a curb-to-curb width of 60 feet. There are currently approximately 425 on-street parking space on this section of Bluemound Road. This section of Bluemound has more bars and restaurants, which are more in need of the parking in front of their businesses. West of Glenview, Bluemound gets much wider, 94 feet curb to curb with a 24-foot median. There is also much more traffic and much less business, AADT is more than twice that of east of Glenview at 22,300 as many commuters head towards the freeway. There is also somewhat less on-street parking available at roughly 125 spaces.

**Recommended Alignment:**
We propose then that two different alignments for Bluemound Road be put into place. On the eastern side of Glenview, dedicated center lanes will be implemented in place of one lane of general traffic in both ways while preserving parking on both sides. This will be possible as traffic levels are relatively low at 10,000 AADT and much less than the 20,000 threshold recommended by DOTs across the country for four lanes of traffic. This alignment would also keep as much parking as possible for area businesses that see that as a necessary component for their patronage. Left turn movements would continue to be limited on Bluemound Road as they were on Wisconsin Avenue. Signals would then be added at 62nd Street, 66th Street and Honey Creek Parkway in addition to existing signals. This would require some parking to be lost around the intersections. Around 20 to 40 spaces would be lost, which is around 5% to 10% of existing on-street parking spaces. The Hawley Road, 66th Street and 76th Street stations and intersection improvements would be the perfect opportunity to continue to expand the Bublr Bikes bike share program further into Wauwatosa, if the Bublr stations prove to be popular in the corridor and if business support materialized, Bluemound Road could be repainted to replace the parking lanes with bike lanes in the future.
To the west of Glenview Avenue, the character of Bluemound Road changes, the street becomes much more commuter centric and handles a much higher volumes of traffic. The alignment will eliminate all on-street parking which is an estimated 150 on-street parking spaces from Bluemound Road. This will not have a drastic effect on the corridor as there is much less business presence that front the street and the few that do have ample amounts of off street parking. While the homes that front Bluemound Road through this section all have driveways and off-street parking available and can cope without on street parking facilities. This will mean that 2 lanes of general traffic can be preserved and parking will be prohibited on Bluemound Road until after the Zoo Freeway. The 95th Street station should be installed off of the road in the new space opened up from the rebuilt onramp to the freeway. This will allow for higher quality station amenities and allow for easier turning movements and less conflict for pedestrians, buses and general traffic.

This section of the corridor is similar to sections on Central Avenue of the now under construction BRT line in Albuquerque. As seen in our case study of the corridor, there are similar land uses surrounding the street corridor and the roads have similar curb-to-curb widths. There was challenges to the BRT line in Albuquerque based on the idea of the new dedicated bus lanes creating too much congestion and lawsuits were filed for an injunction to stop work on the project, but recently a federal appeals court dismissed these lawsuits and have allowed construction to proceed, agreeing with Albuquerque officials that the BRT line and dedicated lanes will not cause undue harm to area businesses and residents.12

Figure 1: Proposed BRT Expansion Routes in Milwaukee
Chapter Summary
An analysis of potential BRT expansion routes was performed to explore next steps for BRT in Milwaukee. Seven routes were chosen in total, each branching off the proposed East-West Corridor. The routes used for analysis were chosen for a number of reasons, but selection was largely based on a combination of the following:

- Connection to the East-West Corridor
- SEWRPC BRT recommendations from August 2015
- Utilization of an existing MCTS bus route or corridor
- Well-traveled arterial streets with high population densities
- Connection to a major destination

The proposed expansion routes range in length from two to six miles and would service major corridors throughout the city. The Brookfield Square Extension travels along the proposed East-West Corridor route, extending service to a major employment and activity hub. The Fond du Lac and National Extensions travel along the existing MCTS Blue line route, and would improve upon the local bus service for these riders. Similarly, the 27th Street North and South Extensions follow the existing MCTS Purple line route, servicing densely populated and relatively distressed portions of Milwaukee. Lastly, the UWM and Airport Extensions were chosen based on their high level activity and importance as key city destinations. Basic route information is summarized in the following table.

Key differences from the SEWRPC recommendations include routes for Capitol Drive, downtown Waukesha, and South Milwaukee. While these routes would be great additions to the Milwaukee BRT system, the routes proposed in this analysis focus on using the East-West Corridor as a main thoroughfare. Each of the seven routes being proposed feed off of, and into, the East-West Corridor, resulting in seven shorter, but potentially simpler and more feasible extensions to the BRT system.

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Six primary criteria were used to analyze each route. These include (1) current ridership along local bus routes, (2) estimated costs, (3) travel time savings, (4) development potential, (5) population and job density, and (6) equity. Many of these criteria align with those used by FTA in reviewing small starts grant applications, which Milwaukee hopes to receive for the proposed East-West Corridor. These include development potential along corridors and around stations, population density around stations, ridership gains from project implementation, and cost effectiveness, among others. The following sections detail our analyses and results for each criterion.

1. Current Ridership

Ridership for the corridors was estimated based on ridership for key existing routes that follow these corridors. The source for these calculations were the total weekday riders from MCTS for the Fall of 2015. Most of the proposed routes currently have both local and express service. In these cases, both local and express ridership were included in the calculations. As a result, proposed BRT routes that currently have multiple routes along the corridor tended to have higher ridership. The proposed UWM BRT extension has the highest ridership with 14,567 riders. See Appendix D for charts showing this data.

### Proposed BRT Expansion Routes - Basic Data

<table>
<thead>
<tr>
<th>Proposed Route</th>
<th>Population (Within 1/4 Mile of Route)</th>
<th>Route Length (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>East-West</td>
<td>56,705</td>
<td>8.9</td>
</tr>
<tr>
<td>27th St - North</td>
<td>40,835</td>
<td>4.5</td>
</tr>
<tr>
<td>27th St - South</td>
<td>63,701</td>
<td>7.9</td>
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<tr>
<td>Airport</td>
<td>51,107</td>
<td>6.3</td>
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<tr>
<td>Brookfield Square</td>
<td>64,549</td>
<td>11.3</td>
</tr>
<tr>
<td>Fond du Lac Ave</td>
<td>89,270</td>
<td>13.3</td>
</tr>
<tr>
<td>National Ave</td>
<td>66,284</td>
<td>6.7</td>
</tr>
<tr>
<td>UWM</td>
<td>38,870</td>
<td>5.2</td>
</tr>
</tbody>
</table>

Data Source: U.S. Census Bureau, American Community Survey 2014 5-year Estimates

Ridership and Travel Time Savings

When considering route selection, the combination of travel time savings (detailed in sub-section 3 below) and ridership can illustrate the amount of time saved for existing riders through BRT implementation. The graphs below illustrate this point.

![Figure 2. Travel Time savings calculated based on the existing ridership on the corridor for proposed routes on a per mile basis](image1)

Both of the above graphs indicate the amount of time that could be saved for existing MCTS riders with BRT implementation. Figure 2 calibrates these findings on a per mile basis. In this graph we see that Fond Du Lac, a long 12-mile route also has high ridership. However, other routes such as National and 27th street also show a high degree of travel time savings and riders. While in Figure 3, the length of the Fond Du Lac route makes the route jump far ahead of the other routes, indicating that a Fond Du Lac BRT would achieve by far the greatest travel time savings for riders traveling along the entire segment of any of the proposed routes. As explained below, the length of this route would also result in the highest cost.
2. Estimated Costs

Costs for BRT systems can vary depending on where they're located and the characteristics of the route(s) being proposed. Cleveland reported capital costs for their Healthline system around $200 million which included 36 BRT stations, 24 new hybrid busses, and upgrades along a 9.2 mile corridor.3 The Troost Ave MAX in Kansas City totaled roughly $30.7 million in capital cost for 44 BRT stations, 14 low-floor BRT vehicles, and limited upgrades to the 13 mile corridor.4 The EmX Greenline connecting downtown Eugene, OR to downtown Springfield, OR cost around $25 million which funded 10 stops along a four mile corridor.5

Capital cost estimates for the East-West Corridor proposal range from $41.9 million for a mixed-traffic system to $48.1 million for a dedicated center lane system (using the Wells St. route). Design, construction, and new vehicles are all included in these estimates.6 Annual operations and maintenance costs would be roughly $4 million with some slight variation depending on number of buses operating during peak hours, number of stations, and number of signalized intersections incorporated into the final route.7 In analyzing the proposed expansion routes, potential costs were estimated using the East-West Corridor as a baseline. Specifically, a $47.9 million capital cost and $3.7 million in annual operations and maintenance costs were used to project costs for all seven proposed routes (assuming dedicated center lanes and the Wisconsin Ave. route). These figures provide a reasonable baseline for potential costs without the need to perform an extensive construction estimate and impact analysis of each proposed route.

<table>
<thead>
<tr>
<th>Proposed BRT Route</th>
<th>Route Length (miles)</th>
<th>Estimated Capital Cost (millions)</th>
<th>Estimated O&amp;M Costs (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>East-West</td>
<td>4.4</td>
<td>$47.9</td>
<td>$3.7</td>
</tr>
<tr>
<td>27th St - North</td>
<td>2.4</td>
<td>$24.0</td>
<td>$1.9</td>
</tr>
<tr>
<td>27th St - South</td>
<td>4.2</td>
<td>$42.6</td>
<td>$3.3</td>
</tr>
<tr>
<td>Airport</td>
<td>3.5</td>
<td>$33.9</td>
<td>$2.6</td>
</tr>
<tr>
<td>Brookfield Square</td>
<td>5.8</td>
<td>$12.9</td>
<td>$1.0</td>
</tr>
<tr>
<td>Fond du Lac Ave</td>
<td>6.0</td>
<td>$71.8</td>
<td>$5.5</td>
</tr>
<tr>
<td>National Ave</td>
<td>3.2</td>
<td>$35.9</td>
<td>$2.8</td>
</tr>
<tr>
<td>UWM</td>
<td>2.0</td>
<td>$28.2</td>
<td>$2.2</td>
</tr>
</tbody>
</table>

Data Source for East-West Cost: Milwaukee County, East-West BRT Feasibility Study

Estimated costs for each route vary based on route length. Using this methodology, the Fond du Lac extension is the most expensive with $71.8 million in capital costs and $5.5 million in annual operations and maintenance costs. Conversely, the Brookfield Square route would be the least expensive with a capital cost of just $12.9 million and annual operations and maintenance costs of $1.0 million. These costs are significantly lower because the majority of this route uses the existing East-West Corridor, so that portion of the route was deducted from total cost estimates.

3. Travel Time Savings

The five major elements of BRT (dedicated right-of-way, busway alignment, off-board, intersection treatments, platform boarding) all contribute to travel time savings. An additional component of BRT, which is critical in saving travel time is the stop spacing along the route. In selecting new routes BRT routes, the ability to offer travel times savings was a key consideration for this study. According to the Transportation Research Board “travel time savings appears to be the greatest contributor to BRT ridership gains.”

![Figure 4](Source: Victoria Transport Policy Institute, 2016)

Figure 4 demonstrates how significantly ridership can increase on routes as a result of travel time savings. The potential for ridership increases indicates that travel time savings is a critical consideration in planning new routes, because a large travel time savings can lead to a greater demand for service. For Milwaukee County’s purposes this also indicates that large travel time savings can increase ridership by attracting new riders or encouraging existing riders to use this route, increasing customer base and potentially increasing efficiencies through scale.

Furthermore the BRT Practitioner’s Guide also indicates that “Faster travel times reduce operating costs for any given bus volume.” Given the current financial strain on the MCTS system, it is important to note that travel time savings can result in added revenue by attracting new riders and savings for the system in operating costs.

All other BRT features being equal, the amount of travel time savings between routes depend on the ability to implement dedicated lanes and the alignment of potential dedicated lanes. To determine the feasibility for implementing dedicated right of way for median or curb lanes or mixed traffic infrastructure and traffic counts were considered. Infrastructure elements that were determined to affect lane alignment along dedicated lanes or the need for mixed traffic were: number of travel lanes, demand for parking, presence of bike lanes, and presence/width of median.

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9 Institute for Transportation and Development Policy.
11 Kittleson & Associates, Inc.
Discussion on Route Selection for Travel Time Savings

In most cases, median, dedicated service was considered a possible option. Most routes follow existing MCTS routes. However, it is worth noting that in order to achieve dedicated lanes to the airport 4th and 5th streets south of Scott Street were selected. These streets were chosen rather than using 6th street, which is currently used by MCTS route 80 to the airport. Because 6th street has one travel lane in each direction and is heavily relied upon for parking, dedicated transit lanes were considered highly unlikely to be implemented on 6th.

Similarly, the Green Line (the other bus serving Mitchell International Airport) also presents challenges for rapid transit including road width along the corridor, traffic along corridor (especially during summer festivals), and the Water Street bridge which, when opened, can create challenges for service reliability. Because 4th and 5th may are not as pedestrian friendly as 6th street, this route is proposed as a rapid, very limited service option, with the assumption that route 80 would continue as a local service option.

This corridor exemplifies how ‘underutilized’ streets present opportunities to find other BRT routes that could provide significant travel time savings. Examples of such underutilized streets include Teutonia Avenue which features daily traffic counts of 13,800,\(^{1,3}\) (a very low traffic count for a four lane road). Although Teutonia Avenue is not featured in the BRT routes proposed, it is a possible eventual north extension of the 27th Street BRT proposal and demonstrates that there are multiple opportunities beyond the scope of this study across Milwaukee where roads with excess capacity can easily accommodate dedicated travel lanes and provide significant travel time savings.

Travel Time Savings Analysis

![Figure 5. Data source appendix travel time savings](image)

Based on the analysis of proposed BRT routes above, both of the 27th extensions resulted in the highest travel time savings, closely followed by the route from Brookfield Square to the downtown. It is worth noting the portion of this corridor in Brookfield currently features the only dedicated bus lanes in the region.

\(^{1,3}\) Wisconsin Department of Transportation. Bureau of State Highway Program. [https://trust.dot.state.wi.us/roadrunner/](https://trust.dot.state.wi.us/roadrunner/)
Fond Du Lac offers a lower travel time savings largely because traffic counts along Fond Du Lac, limited road width, a lack of contiguous boulevards, limit the ability to provide dedicated median service along Fond Du Lac. Refer to Appendix D travel time savings for map of proposed route alignments. Similarly, narrow road width of the business district on Downer Avenue and the use of parking would likely require mixed service along this section, limiting the travel time savings of this route.

4. Development Potential
When analyzing the development potential for the eight proposed lines our group chose to take into consideration zoning, vacant lots and parking lots. Our initial analysis focused on aggregating the total land in each category within a quarter mile buffer of each proposed station to get a feel for which routes might have the most potential for new, transit oriented development (TOD). These totals were then divided by the total number of proposed stations to give an accurate comparison from one line to the next.
Using this analysis the UWM extension, East West Corridor, National Avenue and Brookfield East West lines all had the most TOD amenable zoning (well over one million square feet, with UWM in particular having nearly eight million). 

In terms of vacant space the North 27th Street line had by far the most (nearly four hundred thousand square feet) while the National Line and proposed East West Corridor had by far the most available surface parking area (over two-hundred thousand and one-hundred and seventy thousand square feet respectively).

### Development Value and Tax Revenue

While this analysis provided some insight into which lines may be the most favorable, it came with some obvious limitations. Aggregate totals of vacant land and TOD-friendly zoning are not sufficient for identifying where actual TOD development is possible. To expand on this analysis, therefore, our group took the same data set, but isolated vacant lots and parking lots that were over a half-acre to use as the basis for this more in-depth analysis.

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**Figure 7. Parking Lot Analysis: Quarter Mile Buffer**

**Figure 8. Table of Vacant and TOD-eligible areas.**

*Zoning considered “good” for TOD: C9H, C9G, C9F (C), C9F (B), C9E, C9D (B), C9D (A), C9C, C9B (B), C9B (A), LB3, RO2, RM7, RM6, RM4, C9A (B), C9A (A)

**Zoning considered “fair” for TOD: NS2, LB2, RM3**

**Note: 6 of the stations are doubles (i.e. One on Prospect, One on Farwell)**

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14 Zoning considered “good” for TOD: C9H, C9G, C9F (C), C9F (B), C9E, C9D (B), C9D (A), C9C, C9B (B), C9B (A), LB3, RO2, RM7, RM6, RM4, C9A (B), C9A (A)

15 Zoning considered “fair” for TOD: NS2, LB2, RM3

16 Analysis based on aggregate of both “good” and “fair” totals.

17 See Appendix D for totals
A half-acre was selected based on the characteristics of two TOD-style developments that have been built relatively recently within some proximity to the proposed Fond du Lac line: Lisbon Terrace (2730 W Lisbon Ave.) and Fond du Lac Center (2708 W Center St.). These were selected because of their presence near one of the lines with the highest poverty rates, therefore making them a plausible development scenario for the entire analysis. Based on these precedents we used 24 residential units per half acre, and 5000 square feet of commercial space per whole acre as our standard. This was intended to keep the analysis conservative.

Once we determined how many units and how much commercial space we would be using per-acre we next established criteria for how much these units and commercial space would be worth. Based on the recommendations of Milwaukee’s DCD we established a three tiered structure: within one mile of Downtown, less than 35% poverty: $100 thousand per unit, $100 per square foot of commercial. 18 Outside one mile of Downtown but still less than 35% poverty rate: $70 thousand per unit and $70 per square foot of commercial. Finally, if the quarter mile around the station had greater than a 35% poverty rate: $40 Thousand per unit and $40 per square foot of commercial. The last range was intended to capture the value of developments built using the benefit of low-income housing tax credits.

After we established these values we next created scenarios that would reflect the total value of development that happened at 100%, 75%, 50%, 25% and 10% for each property tier. In doing so we allowed for the creation of multiple scenarios, ranging from the optimistic, to very conservative. Finally, once these values were created, we multiplied the total value being created under each scenario by the current, combined tax rate for properties in Milwaukee County ($31.58 per $1000 in 2016) to get a feel for the kind of tax revenue that could be expected under each scenario. 19

18 Samuel Leichtling, Milwaukee Department of City Development
Using this analysis we discovered that National Avenue had by far the most development potential, based at least partly on the abundance of available surface parking and the proximity of much of the line to Downtown. Also fairing well were the East West Corridor, South 27th Street and the two Brookfield lines. This also translated into the most potential tax revenue.\(^\text{20}\)

**Conclusion**

Based on our analysis there appears to be a great deal of potential for TOD development throughout the eight proposed lines. Even under some of the most conservative development projections we did the lines along National and the East West Corridor either pay for themselves or come very close to doing so, and with slightly more robust growth the additional tax revenue generated by the National, East West Corridor, South 27th Street and Both Brookfield lines either completely or mostly cover their projected annual operating expenses.

There are some limitations to this analysis. One factor that was not taken into consideration were adjacent vacant lots, which may total a half acre when combined together. This would most likely benefit the Fond du Lac and North 27th Street lines the most. The values given to the three tiers of development could also be more closely tied to local property values. Going forward, an even more robust analysis of these lines should take these limitations into consideration.

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5. Population and Employment Density

Population and employment density are critical in selecting appropriate BRT corridors. Connecting people to jobs will be a primary function of the BRT system, so identifying dense population and job clusters is a key focus for analysis. The FTA Small Starts grant program uses population density around station areas as a criterion when reviewing applications. Population densities over 15,000 persons/square mile receive the highest rating, and population densities between 9,600 and 15,000 persons/square mile receive their second highest rating.\(^\text{21}\) Four of the routes analyzed would receive the highest rating: UWM, National Ave, 27th St – North, and 27th St – South. The remaining three routes would all receive the second highest rating. The table below shows population density analysis results. Please refer to Appendix D for charts showing these data.

<table>
<thead>
<tr>
<th>Potential BRT Route</th>
<th>Population (within 1/4 mile of route)</th>
<th>Population / Square Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>East-West</td>
<td>56,705</td>
<td>12,858</td>
</tr>
<tr>
<td>27th St - North</td>
<td>40,835</td>
<td>16,805</td>
</tr>
<tr>
<td>27th St - South</td>
<td>63,701</td>
<td>15,350</td>
</tr>
<tr>
<td>Airport</td>
<td>51,107</td>
<td>14,771</td>
</tr>
<tr>
<td>Brookfield Square</td>
<td>64,549</td>
<td>11,110</td>
</tr>
<tr>
<td>Fond du Lac Ave</td>
<td>89,270</td>
<td>14,854</td>
</tr>
<tr>
<td>National Ave</td>
<td>66,284</td>
<td>20,714</td>
</tr>
<tr>
<td>UWM</td>
<td>38,870</td>
<td>19,435</td>
</tr>
</tbody>
</table>

Data Source: U.S. Census Bureau, American Community Survey 2014 5-year Estimates

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\(^{20}\) See Appendix D  
Job density is also an FTA Small Starts criterion, which looks at total employment served by the system. A system with access to over 220,000 jobs receives the highest rating, while access to fewer than 40,000 jobs receives their lowest rating. Judging specific routes based on these criteria is difficult, because none would achieve the highest rating alone. However, the 220,000 job benchmark can be met when routes are combined. The following table presents job density analysis results.

<table>
<thead>
<tr>
<th>Potential BRT Route</th>
<th>Total Jobs (within 1/4 mile of route)</th>
<th>Jobs / Square Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>East-West</td>
<td>122,637</td>
<td>27,809</td>
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<tr>
<td>27th St - North</td>
<td>18,217</td>
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</tr>
<tr>
<td>27th St - South</td>
<td>32,398</td>
<td>7,807</td>
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<tr>
<td>Airport</td>
<td>71,213</td>
<td>20,582</td>
</tr>
<tr>
<td>Brookfield Square</td>
<td>139,824</td>
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<td>Fond du Lac Ave</td>
<td>48,891</td>
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<tr>
<td>National Ave</td>
<td>96,846</td>
<td>30,264</td>
</tr>
<tr>
<td>UWM</td>
<td>53,477</td>
<td>26,739</td>
</tr>
</tbody>
</table>

*Data Source: SEWRPC 2010 Employer Survey*

The Brookfield Square and National Ave routes have the highest job totals, as well as the highest job densities with the addition of the Airport route. In comparing job density to population density, connecting the 27th Street corridor to other portions of the region, such as Brookfield Square or the Airport, would connect a highly populated, but underemployed, part of the city to key job clusters. In addition, converting 27th Street to a BRT corridor could generate new development and, thus, new jobs around BRT stations.

### 6. Equity

Equity continues to be a key issue for the city of Milwaukee as many residents find themselves stuck in distressed neighborhoods with limited access to employment. Some of these distressed neighborhoods were once strong, active employment centers, offering good-paying jobs that were highly accessible for city residents. However, many of these jobs are now gone as companies have shifted operations to the suburbs, out of the region, or shut down completely. Manufacturing, for example, remains a key industry in the area, but has seen a significant decline since its peak in the mid-1900s. In fact, Milwaukee's manufacturing sector employed 41% of inner-city workers in 1970, but that number shrunk to 19% by 2000. More recently, manufacturing accounted for 95% of job loss in Milwaukee since 2000.
Segregation is a major component of Milwaukee’s larger equity issue. The city consistently ranks at or near the top of nationwide studies on the most segregated cities in America. Specifically, the African American community continues to struggle the most, as this population was once largely supported by the city’s manufacturing industry. Figure 12 provides a glimpse of how starkly segregated the city’s population remains. Limited accessibility to employment is a substantial, underlying constraint for the African American and Hispanic populations depicted in Figure 16. BRT is a potential and realistic solution for distressed Milwaukee residents.

BRT projects across the country have generated positive social, economic, and environmental benefits. Job creation and providing more efficient access to employment centers are certainly typical. Public transit also tends to promote diversity by providing a place where people from various backgrounds, race, or economic status to congregate. It also has the ability to connect successful neighborhoods with good-paying jobs to more distressed neighborhoods ripe with job seekers. In addition, BRT has a positive environmental impact by reducing automobile dependence, promoting active transportation modes such as walking and biking, and generally moves people around more efficiently.

Employment and job creation are top priorities in nearly all cities. Implementing BRT has the ability to create jobs and improve employment rates in a variety of ways. The initial construction of BRT infrastructure or road upgrades creates jobs in construction, which can often be filled with lower-skilled workers. Residents from more distressed neighborhoods would have a great opportunity to fill these positions because BRT routes are often located within the central city. The operations side of a new BRT project can also support a number of new jobs, despite the concern

that improving transit efficiency or consolidating routes would actually take jobs away. The majority of local bus routes would remain the same, so few drivers would be affected by a BRT addition, and BRT vehicles often require multiple driver shifts throughout the day. BRT also creates new positions in fare collection, security, information services, and management, which are where most operations-related jobs are added.\(^{26}\)

Not only is BRT effective in connecting people to job opportunities, but it is doing so efficiently with widespread travel time savings on most systems throughout the country.\(^{27}\) Unemployment and, thus, poverty are often clustered or concentrated in pockets throughout most metro areas. Some of Milwaukee’s west, northwest, and south neighborhoods are examples of this trend and BRT routes could help to alleviate some of this distress. The proposed East-West corridor has the potential to attract development around stations throughout some west-side neighborhoods. In addition, lack of employees is an increasing problem for Brookfield and other western suburbs of Milwaukee. Specifically, Brookfield Square and the adjacent Bluemound Road corridor are projected to have a significant demand for jobs in the coming years.\(^{28}\) Many of these jobs are in the service industry and fantastic opportunities for inner-city residents who may lack employment or are currently underemployed.

Neighborhoods with BRT access have shown to be more economically stable as well. The National Institute for Transportation and Communities (NITC) conducted an economic study, which analyzed census block groups with BRT access before, during, and after the Great Recession. Data was collected for all 12 U.S. BRT systems that were in operation in 2011. The key finding from the study was that block groups with BRT access gained more jobs during the recovery from the recession than block groups without BRT access. In addition, almost all census blocks with BRT access fared better than the overall counties during the recovery. Another finding, which could be of great benefit to Milwaukee, was that the manufacturing sector experienced more growth in BRT-accessible neighborhoods.\(^{29}\)

When properly planned and implemented, BRT projects have the ability to make major employment centers more accessible for residents who can’t afford to own a vehicle or are simply stuck in a stagnant, distressed portion of the city. The City of Milwaukee has an opportunity to reverse some recent trends involving job loss and hyper segregation between whites and African Americans. By strategically planning new BRT routes, connections to jobs can be established and development can be promoted in areas that need it most.

**Equity Analysis**

An analysis of potential routes geared towards equity may help the City of Milwaukee prioritize the next steps in BRT implementation. The proposed East-West corridor will certainly benefit some of the more distressed west side neighborhoods in terms of development and employment potential. In addition, the route will improve access to the many jobs located in Milwaukee’s west-side suburbs and the Milwaukee Regional Medical Center. This study analyzed 2010-2014 American Community Survey 5-year data along potential BRT routes in the Milwaukee Region. In addition to the proposed East-West corridor, the analysis includes each of the seven proposed expansion routes.


\(^{28}\) Thomas, Kerry. Presentation to BRT class on UWM campus. Fall 2016.


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Key demographics including racial breakdown, means of transportation, commute time, educational attainment, poverty status, employment, and housing data were used in the analysis. A table, which compiles all data collected, as well as supporting charts, can be found in Appendix B of this report.

A summary table of the analysis is shown below

An important note — all data was collected at the block group level within a distance of one-quarter mile of each potential route. GIS software was used to extract relevant data using this methodology.

Key Findings

• **Non-white Population:** The 27th Street – North Extension includes the largest proportion of non-white residents with 91.4%. The Fond du Lac Extension, Fond du Lac – National, and 27th Street – Full routes had the next highest proportions with 78.9%, 72.0%, and 72.0%, respectively. The route with the lowest proportion included the UWM Extension with 16.5%, which traverses through mainly white neighborhoods on the East Side of Milwaukee. The student population at UWM is also 68% white.

• **Means of Transportation to Work:** Single-occupant, personal automobile use is the primary mode of transportation for residents along all routes analyzed. The proportion of residents driving themselves to work is between 56% and 70% for all routes, with only the 27th Street – North Extension falling under 64%. 21.8% of residents along the 27th Street – North Extension rely on public transit, which is by far the largest proportion among the BRT routes considered. The 27th Street – Full route is the next highest in terms of public transit use at 11.0%. Walking was a major commute mode along the UWM Extension and East-West routes, with proportions of 13.6% and 16.2%. These routes have high student populations attending UWM and Marquette Universities.

• **Earnings and Employment:** The 27th Street – North Extension route stands out as the most distressed route among these categories. 43.6% of residents along this route earned an income below the poverty line in the past 12 months, and the median household income was $21,740. In addition, the unemployment rate along this route was a substantial 23.5%. The Fond du Lac Extension and 27th Street – Full routes followed 27th Street – North as the most distressed. The main takeaway from these data is that the African American population located in the west and northwest neighborhoods of Milwaukee are extremely distressed. They earn less than half the income, are twice as impoverished, and have twice the unemployment as many predominantly white Milwaukee neighborhoods. By comparison, the UWM Extension, which fared best in all categories, had 20.8% poverty, a median household income of $50,760, and just 4.8% unemployment.

• **Housing Vacancy:** Abnormally high rates of housing vacancy are often indicators of blighted, distressed, and high-crime areas. The vacancy rate of 23.2% along the 27th Street – North route follows this theory. The 27th Street – Full route had the second highest vacancy rate at 14.6%. The remaining routes were in the 9% to 12% range.

Equity Evaluation Summary

The 27th Street - North corridor should be a primary focus for the City of Milwaukee going forward. The residents along this route are substantially more distressed than residents along the other routes analyzed. In addition, the 27th Street - South and Fond du Lac corridors rank highest in terms of equity for the majority of analytics considered. A potential solution could involve adding both 27th Street routes and the Fond du Lac extension as new BRT routes once the initial East-West route is established. Not only would this action spur new development in distressed neighborhoods, the connections to the East-West corridor would create access to

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jobs located in the western suburbs. In this same vein, the Brookfield Square and Airport routes shouldn’t be overlooked based on results from this equity analysis. The airport and Brookfield Square are significant employment hubs within the Milwaukee region, and implementing BRT along this corridor would connect many inner-city residents to jobs they may be desperate for. UWM is another key employment hub and has a current enrollment of 26,000 students – many of which are potential transit users.  

Evaluation and Recommendation

The following table presents overall results from the BRT expansion analysis. To summarize, selecting the best routes based on the analyses performed is difficult. The criteria used cover a broad range of topics, and all routes performed better in some categories while lagging in others. It is important to note how some criteria are best used when compared directly to other criteria. For example, the population located along the 27th Street routes are clearly in need of better job access, as seen in the unemployment and income results from the equity analysis. However, these routes scored poorly on the employment density analysis. Conversely, residents along the Brookfield Square route, on average, have much higher income and lower unemployment statistics – and the Brookfield Square route scored very well on employment density. Linking the 27th Street residents to Brookfield Square would be an effective BRT system connection.

<table>
<thead>
<tr>
<th>Proposed BRT Route Equity Comparison</th>
<th>Non-white Population</th>
<th>Public Transit Use</th>
<th>Poverty Status</th>
<th>Unemployment</th>
<th>Median Household Income</th>
<th>Housing Vacancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>East-West</td>
<td>36.4%</td>
<td>6.1%</td>
<td>23.7%</td>
<td>7.7%</td>
<td>$43,870</td>
<td>12.3%</td>
</tr>
<tr>
<td>27th St - North</td>
<td>91.4%</td>
<td>21.8%</td>
<td>43.6%</td>
<td>23.5%</td>
<td>$21,740</td>
<td>23.2%</td>
</tr>
<tr>
<td>27th St - South</td>
<td>60.8%</td>
<td>7.2%</td>
<td>28.4%</td>
<td>12.7%</td>
<td>$35,346</td>
<td>11.0%</td>
</tr>
<tr>
<td>Airport</td>
<td>50.3%</td>
<td>7.0%</td>
<td>25.1%</td>
<td>10.0%</td>
<td>$44,039</td>
<td>10.7%</td>
</tr>
<tr>
<td>Brookfield Square</td>
<td>32.5%</td>
<td>5.5%</td>
<td>21.8%</td>
<td>7.5%</td>
<td>$49,911</td>
<td>11.6%</td>
</tr>
<tr>
<td>Fond du Lac Ave</td>
<td>78.9%</td>
<td>10.5%</td>
<td>29.8%</td>
<td>15.6%</td>
<td>$34,088</td>
<td>12.4%</td>
</tr>
<tr>
<td>National Ave</td>
<td>46.5%</td>
<td>5.3%</td>
<td>22.1%</td>
<td>9.9%</td>
<td>$40,628</td>
<td>9.2%</td>
</tr>
<tr>
<td>UWM</td>
<td>16.5%</td>
<td>7.6%</td>
<td>20.8%</td>
<td>4.8%</td>
<td>$50,760</td>
<td>10.1%</td>
</tr>
</tbody>
</table>

Note: All data measured within 1/4 mile of routes

Data Source: U.S. Census Bureau, American Community Survey 2014 5-year Data

<table>
<thead>
<tr>
<th>Evaluation Matrix for Potential BRT Routes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential BRT Route</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>27th St - North</td>
</tr>
<tr>
<td>27th St - South</td>
</tr>
<tr>
<td>Airport</td>
</tr>
<tr>
<td>Brookfield Square</td>
</tr>
<tr>
<td>Fond du Lac</td>
</tr>
<tr>
<td>National</td>
</tr>
<tr>
<td>UWM</td>
</tr>
</tbody>
</table>

Figure 13.

Route Recommendations
Based on these results, the 27th St - North, 27th St - South, and National Avenue routes are the final recommendations. Ideally, all the routes will be transformed into BRT corridors, but these routes could be seen as priorities. The 27th Street routes would provide a major north-south BRT corridor through the city, complementing the East-West corridor nicely. 27th Street is densely populated and full of residents who would benefit from the job connections made possible with BRT. In addition, both 27th Street routes score highest in potential travel time savings and have solid existing ridership. National Avenue scored well in many categories. It is another densely populated corridor, and also boasts many employment opportunities and has great development potential. It’s already one of the most traveled public transit routes in the city, and converting this corridor to BRT would result in significant collective time savings for Milwaukee residents.
As findings in this report indicate, Milwaukee has the potential to implement a highly effective BRT system. If the E-W proposal were to incorporate all elements of the proposed route alignment, Milwaukee could have the highest rated BRT system in the nation based on ITDP standards. ITDP provides additional scoring for systems with multiple BRT routes along corridors and for systems that have multiple, intersecting BRT corridors. The future routes proposed by this proposal would help Milwaukee to achieve an even higher rating, because the Brookfield – Downtown route is proposed as a second East – West route. This overall vision is one that would provide higher quality service, saving time for existing riders and creating a robust system with travel times competitive with cars.

Though rapid transit has faced obstacles in Milwaukee, planners, politicians, and the broader public should seize this opportunity to move forward with a rational discussion based on facts here in Milwaukee and the findings of communities that have effectively implemented BRT across the country and internationally. In Milwaukee, transit can easily become an afterthought, which fails consider the thousands of Milwaukeeans who use transit in this city everyday. Findings indicate that nearly as many transit riders travel Wisconsin Avenue as cars. It is important to note that high ridership persists along Wisconsin Avenue despite a lack of rapid service.

Furthermore, public discourse around public transit in Milwaukee should consider the density of Milwaukee. Milwaukee is the 15th most dense city and when weighted for population size Milwaukee stands out even further in regards to population density. These findings indicate that Milwaukee is, in fact, well suited for rapid transit. While change can bring challenges, the positive opportunities from change should be given equal weight when considering major transformative projects such as BRT.

2 Institute for Transportation and Development Policy.
For example, many have expressed interest in seeing sidewalk cafes at the Grand Avenue to increase accessibility from the street. Increasing walkability along Wisconsin Avenue by increasing transit accessibility could help to achieve this goal.

Though some may be uneasy with implementing rapid transit, others may lament the absence of rail in a BRT system. Hoffman cautions against viewing BRT as a “consolation prize,” but instead cites international examples where BRT provides high quality rapid service that provides flexibility, and notes that “all three cities routinely move as many or more people than any light rail in the U.S.”

Though Milwaukee has up until this point been unable to move forward with rapid transit, this may be the right time to move forward. The question that remains is whether or not the region decides to shape the future by incorporating elements of a robust, multimodal transportation system that will attract talent to the city and provide better options for those already here.

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10_References


"EmX_vehicle" by Chris Phan is licensed by CC by Share-Alike 3.0 https://commons.wikimedia.org/wiki/File:EmX_vehicle.jpg

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