EAST WEST BRT

a feasibility study

MILWAUKEE COUNTY EAST-WEST BUS RAPID TRANSIT

Purpose and Need Statement

REVISION #1

DATE April 6, 2016

Prepared for:
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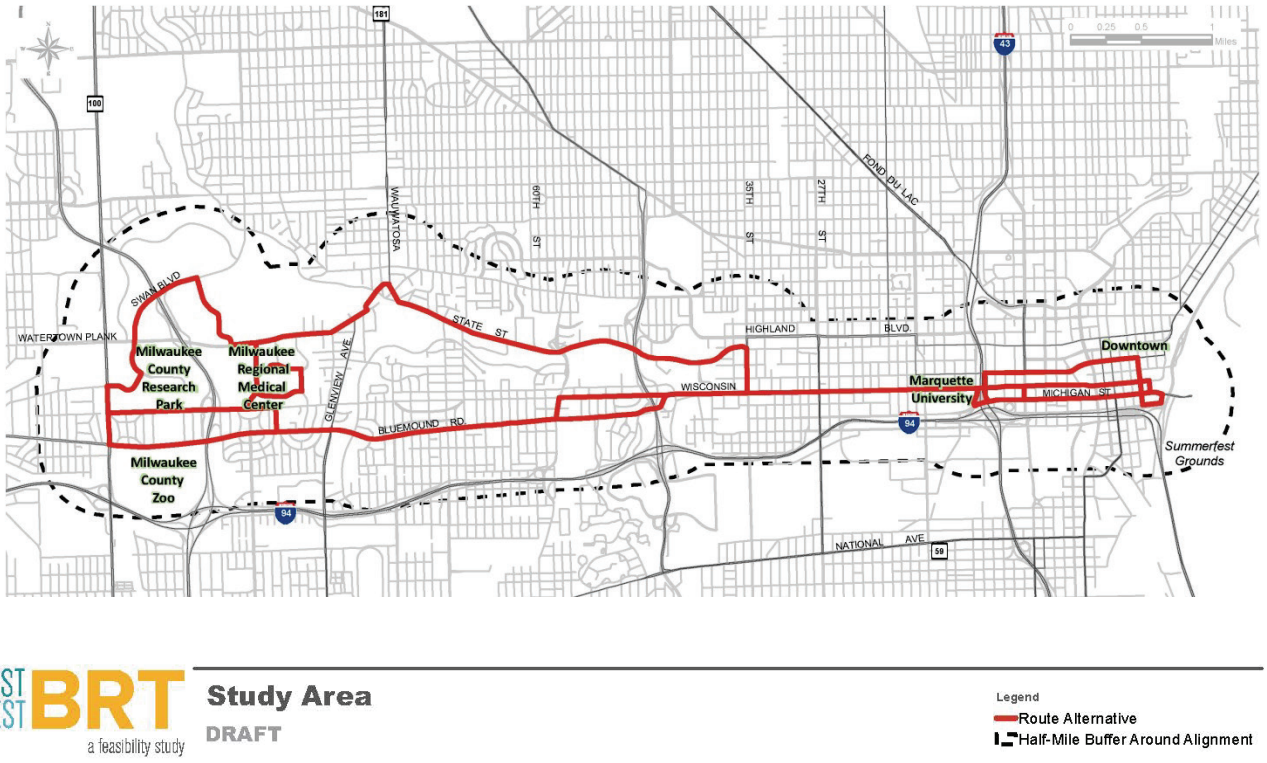
1. OVERVIEW

1.1 Corridor Context and Description

Milwaukee County and its partners have initiated a feasibility study to evaluate transit investment in the seven-mile East-West Corridor connecting major employment and activity centers between downtown Milwaukee, the Milwaukee Regional Medical Center (MRMC), and Milwaukee County Research Park (MCRP). Completing the feasibility study is a first step towards applying for funding through the Federal Transit Administration's (FTA) Small Starts program.

Figure 1-1: East-West Study Corridor



1.2 Summary of Project Purpose and Need

The **purpose of the East-West Corridor Study** is to identify and implement the transit investment strategy that will accommodate anticipated growth in travel demand and mitigate congestion within the corridor, support mobility options that match emerging demographic trends and preferences within the corridor, leverage the existing transportation infrastructure to expand network capacity and personal mobility within the corridor, and encourage sustainable development patterns that reduce reliance on single-occupant vehicles.

This Purpose and Need Statement identifies several needs in the corridor, which are summarized below and in further detail in Section 2.

- To reduce vehicle traffic volume, alleviate traffic congestion, and provide a reliable travel option unaffected by congestion in the Milwaukee area's most heavily travelled and congested travel corridor.
- To reduce transportation energy consumption and air pollutant emissions.
- To mitigate and operate as a viable alternative to the extreme traffic congestion which may be expected for multiple years during the reconstruction of the East-West Freeway (IH 94) between S. 70th and S. 16th Streets.
- To provide those without an automobile real access to jobs, healthcare, education, and other elements of daily life.
- To provide a transit alternative that will be an attractive choice for those who own an automobile and currently choose to travel by automobile in the East-West corridor.
- To efficiently service the substantial travel demand of the Milwaukee Regional Medical Center, and to accommodate and encourage its planned aggressive growth.
- To efficiently serve the substantial travel demand of the Milwaukee central business district, and to accommodate and encourage its planned aggressive growth.
- To encourage new, denser, mixed-use development and redevelopment—which results in more efficient public infrastructure and services and lower energy use per household.
- To provide the transit element of the identified multi-modal improvements needed to address the existing and forecast long-range future travel demand in the East-West Corridor as recommended in the current and previous regional transportation plans.

2. PROJECT NEEDS

2.1 To reduce vehicle traffic volume, alleviate traffic congestion, and provide a reliable travel option unaffected by congestion in the Milwaukee area's most heavily travelled and congested travel corridor

The East-West Corridor has long been recognized as the most heavily-travelled and congested corridor in the Milwaukee area. The only planned expansion of street and highway capacity in this corridor would occur with the reconstruction of the East-West freeway (IH 94), and it is acknowledged that even with this expansion, the corridor will remain congested. In addition, there is substantial development and redevelopment planned for this corridor, which is expected to significantly increase travel demand and congestion, particularly in downtown Milwaukee and the Milwaukee Regional Medical Center. For example, new developments are underway or planned in Milwaukee, including the Northwestern Mutual Life Insurance tower, the 833 East office building, and the new arena and surrounding development; the Medical College of Wisconsin is currently building a new professional office building at MRMC. Providing transit service in this corridor would increase the carrying capacity of the roadways in this corridor and provide a reliable travel option unaffected by congestion.

2.1.1 Competitive transit options within the corridor are limited.

There is a no east-west transit route that travels the length of the study corridor. While several local and express routes currently operate within the corridor, these routes only serve select east-west portions of the corridor. For example, the 30 and 30X only serve downtown Milwaukee and the 85 only serves the southwestern portion of the corridor. Moreover, all transit routes within the corridor must share general purposes lanes and therefore cannot achieve higher speeds when comingled with general traffic.[1] An important characteristic of transit travel in the corridor is the span of service, summarized in Table 2-1. Coupled with

[1] Existing local bus transit service averages 12 miles per hour per the I-94 Final Environmental Impact Statement, FHWA-WI-EIS-2014-02-F.

frequent stops, limited contiguous transit options, and no transit signal priority system in place, transit in the corridor does not offer a competitive travel option to the automobile.

Table 2-1: Transit Headways in the East-West Corridor

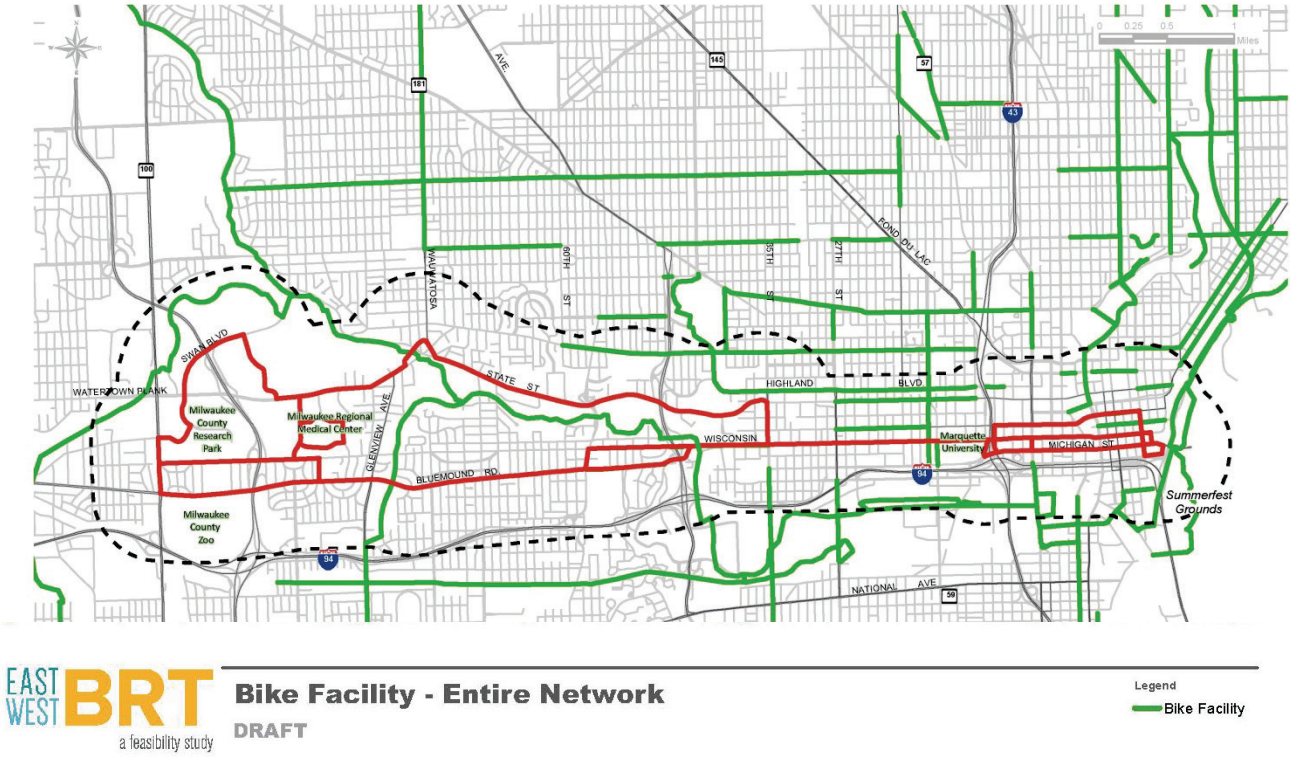
	Average Frequency in Minutes					
Route	**Early**	**AM Peak**	**Midday**	**PM Peak**	**Evening**	**Night**
14	22	18	21	23	33	32
23	40	24	23	24	30	40
27	40	19	20	23	33	30
28	--	28	38	40	51	80
30	25	21	20	21	24	19
30X	--	26	20	23	40	--
31	45	23	23	23	26	21
35	34	18	22	20	30	30
64	40	40	40	40	60	
67a*	34	13	18	17	33	33
76a**	26	16	19	18	30	32
85	--	180	210	180	--	--
Blue Line	40	19	23	23	33	44
Gold Line	30	16	16	14	26	34
Purple Line	60	17	20	18	36	48

**via 92nd Street; ** via 68th Street*

Bicycling options for travelers moving within the corridor are also limited. As noted in the Southeastern Wisconsin Regional Planning Commission's (SEWRPC) Review and Update of

the Year 2035 Regional Transportation Plan[2], it was envisioned that bicycle accommodations (e.g., bicycle lanes, widened outside travel lanes, widened shoulders, or separate bicycle paths) would be considered and implemented—if feasible—as each segment of the arterial street network within the region, totaling about 3,300 miles, was constructed, resurfaced, and reconstructed. According to the 2014 Review and Update, there was only about a 30 percent increase[3] in miles of arterial streets and highways that provided bicycle accommodations through paved shoulders, bicycle lanes, or separate paths. As shown Figure 2-1, the corridor's bicycle network is incomplete and reflects a patchwork of bicycle facilities that make some connections within neighborhoods, but do not feed into the corridor for longer trips. Furthermore, there are no city connections that would provide a greater level of connectivity between destinations in the Cities of Wauwatosa and Milwaukee.

Figure 2-1: Bicycle Facilities in the Corridor



[2] SEWRPC Memorandum Report No. 215, Review and Update of the Year 2035 Regional Transportation Plan, June 2014.

[3] (633 miles in 2004 to about 824 miles in 2013)

2.1.2 The desired future land uses aim to maximize the capacity of existing roadways to help meet growing travel demand in the corridor.

According to the current land use plan for the region[4], future land uses should seek to stabilize and revitalize urban centers, particularly central cities like Milwaukee, and to encourage new development as infill in existing urban centers with defined growth emanating outward from the existing urban centers.

Existing development in the corridor supports the desired future land use, which is likely to continue, as these institutions (e.g., Marquette University, Milwaukee Regional Medical Center, Wisconsin Lutheran College, Milwaukee County Zoo, Miller Brewery) are anchors in the corridor and help to spur complementary services and industry clustering.

Moreover, employment and population density will increase in the corridor as existing employers mature and new ones emerge, which is consistent with the desired land use direction. As such, travel options that support these land use objectives by optimizing the existing roadway network (rather than expanding the roads themselves) are a more attractive option for improving mobility and accessibility for travelers in the corridor.

Current traffic volumes in the potential corridor range from 6,000 to 22,000 vehicles per day, as shown in Table 2-2. Given that these volumes typically represent single-occupant vehicles, one way to improve the efficiency of existing roadways and accommodate future travel demand is to introduce ways to achieve higher person-carrying capacity through the corridor, for example, with fixed guideway, larger transit vehicles, multiple sets of transit vehicles, more frequent transit service, and other means.

Table 2-2: Representative Traffic Volumes

Street	Location	Average Annual Daily Traffic
Bluemound Road	Mayfair Road – Glenview Avenue	18,000 – 22,000
	Glenview Avenue – Hawley Road	10,000 – 20,000

[4] SEWRPC Planning Report No. 48, 2035 Regional Land Use Plan for Southeastern Wisconsin, June 2006.

Street	Location	Average Annual Daily Traffic
	Hawley Road – Wisconsin Avenue	7,000 – 11,000
Wisconsin Avenue	Mayfair Road – IH 41	7,000 – 11,000
	IH 41 – Glenview Avenue	11,000 – 27,000
	Glenview Avenue – Hawley Road	7,000 – 8,500
	Hawley Road – 8th Street	13,000 – 16,000
	8th Street – Cass Street	8,000 – 11,000
Michigan Street	11th Street - Broadway	5,000 – 11,000
	Broadway – Lincoln Memorial Drive	12,000 – 14,000
Harwood Avenue/ Harmonee Avenue	87th Street – Wauwatosa Avenue	11,000 – 12,000
State Street	Wauwatosa Avenue – Hawley Road	11,000 – 12,000
	Hawley Road – 35th Street	6,000 – 16,000

2.2 To reduce transportation energy consumption and air pollutant emissions

The potential reduction by BRT of vehicle traffic volume and congestion may be expected to result in reductions in transportation energy consumption, and air pollutant emissions. These reductions are particularly important as the Milwaukee area has been a nonattainment area for national ozone and particulate air quality standards.

The introduction of BRT service to the East-West Corridor has the potential to reduce vehicle traffic volume and congestion, which could result in reductions in transportation energy consumption and air pollutant emissions. These reductions are particularly important as Milwaukee County is currently in maintenance for PM 2.5 (2006). As such, the East-West BRT project is required to meet Transportation Conformity Rule requirements of 40 CFR Part 93.

‘Maintenance areas’ for a criteria pollutant must demonstrate compliance with the National Ambient Air Quality Standards (NAAQS). Federal law also requires that states prepare

implementation plans for air quality to identify how the NAAQS in maintenance areas will be met.

Public transit options, such as BRT, can help reduce the overall amount of vehicle miles traveled (VMT) and shift commuters to high-capacity transit vehicles (BRT vehicles can carry up to 80 – 120 passengers). Reducing the number of vehicles to transport the same amount of passengers with modern, high-capacity vehicles can reduce traffic congestion and emissions. Currently this corridor is one of the most heavily-travelled and congested in the state, and future projections indicate increases in commuters and congestion. BRT could assist in reducing future energy consumption and air pollutant emissions.

2.3 To mitigate and operate as a viable alternative to the extreme traffic congestion which may be expected for multiple years during the reconstruction of the East-West Freeway (IH 94) between S. 70th and S. 16th Streets

The reconstruction of the East-West Freeway (IH 94) may be initiated as soon as 2019 and extend for at least a few years, during which traffic congestion may be expected to increase significantly on the freeway and arterial streets in the corridor, as the freeway is narrowed during construction from three to two lanes in each direction and on- and off-ramps are closed. During reconstruction, vehicle travel times will increase substantially, and travel time reliability will be severely affected. Transit investment in the corridor will provide a reliable means of travel unaffected by congestion during the reconstruction.

2.3.1 I-94 is a critical link in Milwaukee County's freeway system.

As documented in the Final Environmental Impact Statement (EIS),[5] reconstruction of I-94 between 70th Street and16th Street in Milwaukee is intended to address the deteriorated condition of I-94, obsolete roadway and bridge design, existing and future traffic demand, and high crash rates. A range of alternatives were evaluated to determine whether the purpose and need for the project could be met without capacity expansion. This included doubling

[5] FHWA-WI-EIS-2014-02-F.

region-wide public transit service as recommended in the 2035 Regional Transportation Plan and transportation demand management (TDM) elements, which included ways to reduce travel or to shift such travel to alternative times and routes. As documented in the Final EIS, transit projects included in the 2035 Regional Transportation Plan were evaluated to assess whether implementing them could satisfy the need to add capacity on I-94. Even with these measures, the Final EIS found that there is a need for additional lanes on I-94.

2.3.2 WisDOT encourages the implementation of transit in the Milwaukee area to mitigate traffic congestion caused by freeway lane closures during construction on I-94.

Overall, the Wisconsin DOT (WisDOT) promotes greater mobility and transportation choice throughout the state, as outlined in the statewide long-range transportation plan known as Connections 2030. There are many transit-supportive policies contained in the Connections 2030 Plan, including WisDOT support of the development of fixed guideway transit services like Bus Rapid Transit.

Consistent with Connections 2030 policies, additional transit would help to mitigate traffic congestion caused by freeway lane closures during construction on I-94. As noted in the Final EIS, none of the alternatives evaluated in the Final EIS, nor the preferred alternative for I-94 reconstruction, preclude transit. In fact, the Final EIS notes that WisDOT will likely fund additional transit service in the I-94 corridor during construction of the project, and that WisDOT is willing to partner with local agencies (similar to successful partnerships used in other states, including the Carmageddon campaign for I-405 in Los Angeles, Salt Lake City's I-15 CORE, and the T-REX project in Colorado) to implement transit projects.

2.4 To provide those without an automobile real access to jobs, healthcare, education, and other elements of daily life

Current excessively transit travel times effectively result in a lack of access to jobs, healthcare, education, and other activities for those without an automobile. Within the Cities of Milwaukee and Wauwatosa -- the communities through which the BRT facility would extend--an estimated 18 percent of households do not have access to an automobile. The current excessive transit travel times are a result of nearly all transit being local service with

frequent stops, with no traffic signal preferential treatment, and operation in mixed traffic subject to congestion. Infrequent transit service and the grid nature of transit service in Milwaukee County also contribute to long transit travel times. BRT operating at higher frequencies will significantly reduce travel time and increase access to jobs, healthcare, and education in the East-West Corridor for those without access to an automobile.

2.4.1 The demographic profile within the corridor reflects pockets of transit-dependent populations.

There are three key factors that help to define populations that typically rely on transit service: (1) households that do not own a car, known as zero-car households; (2) communities of color (Black, Asian, American Indian, Native Hawaiian and Pacific Islander, Other Race, Two or more races, and Hispanic); and (3) people living below the poverty line. Tables 2-3 through 2-5 detail the number and percentage of people that fall into these groups and Figures 2-2 through 2-4 illustrate the location of these groups by census tract.

As shown in Figure 2-2, most of the zero-car households in the corridor are located near Marquette University and its surrounding environs, reflecting the tendency for students not to own personal vehicles. Other concentrations of transit-dependent populations are found near Miller Park, the Potawatomi Hotel and Casino, and in the eastern portion of the City of Wauwatosa in communities following the Menomonee River. Households without access to a primary vehicle are typically dependent on transit to meet their day-to-day mobility needs. As such, access to reliable and efficient transit is essential for traveling to work, school, and to other destinations.

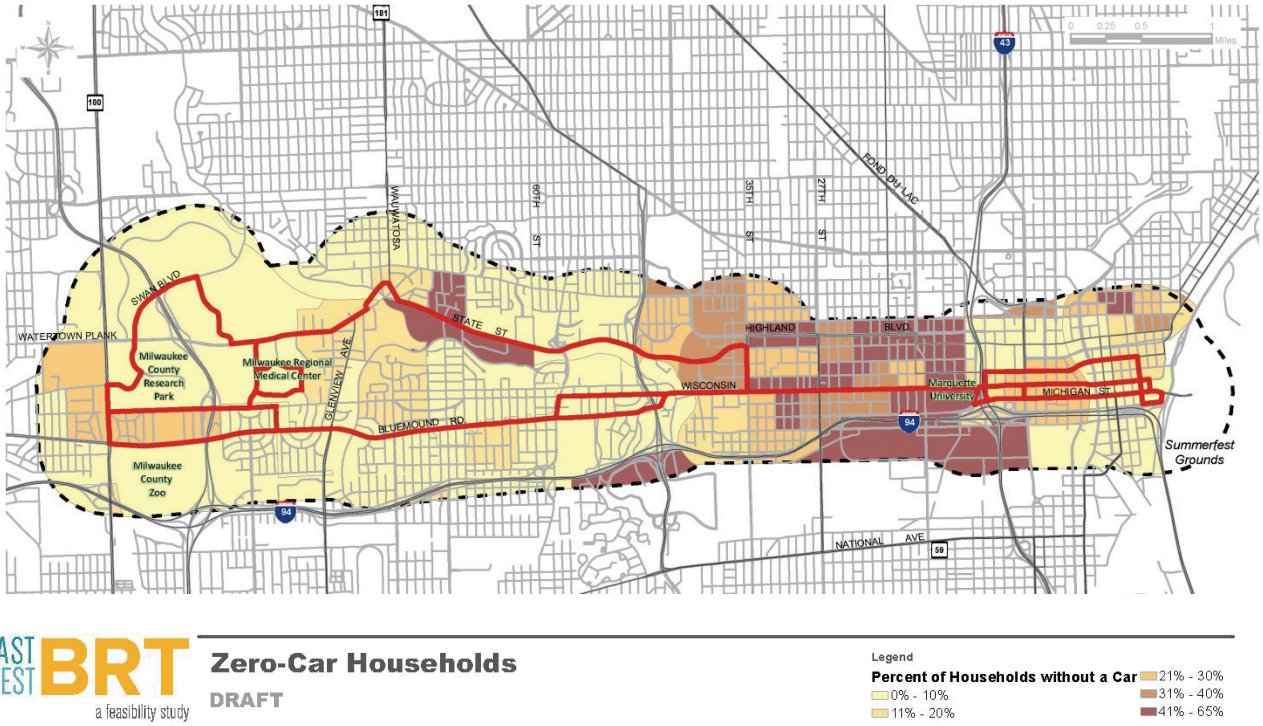
Table 2-3: East-West Corridor Zero-Car Households

Place	Total Households	Zero-Car Households	% of Population that are Zero-Car Households
East-West Corridor	30,851	6,427	21%
City of Wauwatosa	20,515	1,591	8%
City of Milwaukee	230,181	42,428	18%
Milwaukee County	381,446	54,667	14%
State of Wisconsin	2,293,250	163,459	7%

Place	Total Households	Zero-Car Households	% of Population that are Zero-Car Households
U.S.	116,211,092	10,594,153	9%

Census, ACS 2010-2014

Figure 2-2: East-West Corridor Zero-Car Households



Communities of color within the corridor are represented largely in the area roughly bounded by the junction of Bluemound Road and Wisconsin Avenue and the Milwaukee River to the East (see Figure 2-3). The high percentage of communities of color detailed in Table 2-4 is reflective of the County as a whole, but is far above that of the State. In compliance with federal guidelines and regulations, it will be important to ensure that communities of color are not adversely impacted by any high-capacity transit investments within the corridor, and to ensure that communities that have been historically excluded from public processes are targeted for inclusion in all public outreach components of the study effort.

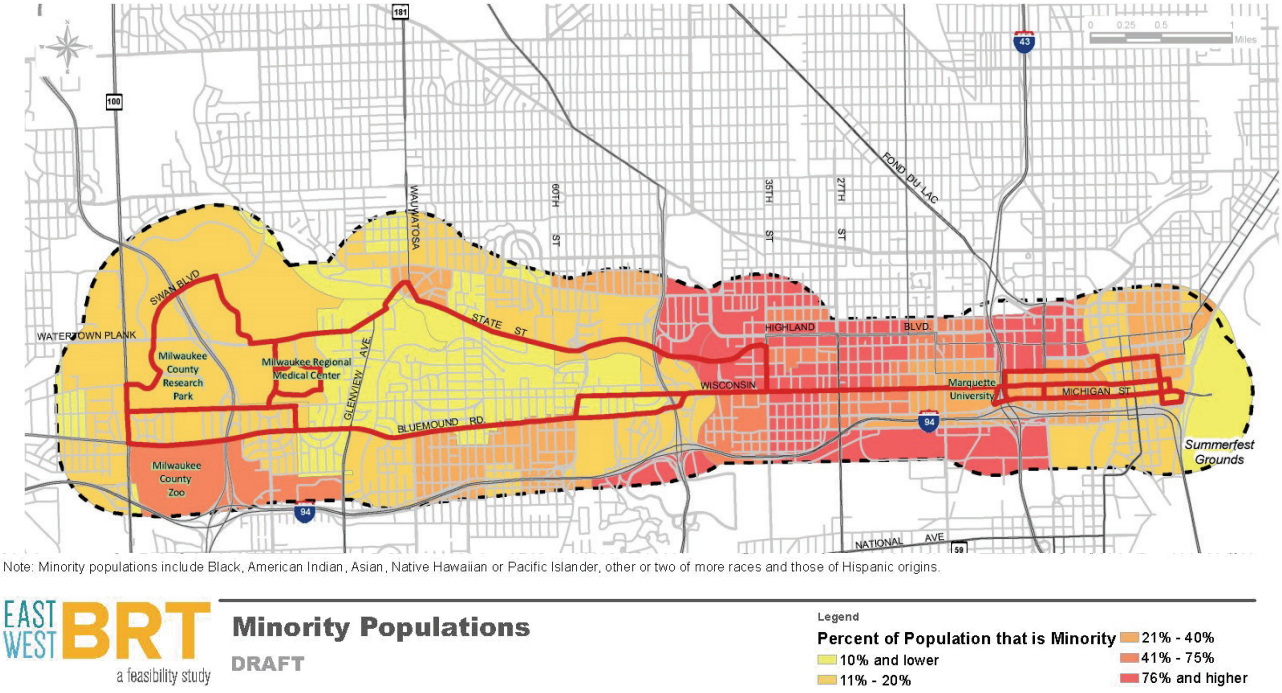
Table 2-4: East-West Corridor Communities of Color Population

Place	Total Population	Population of Communities of Color	% of Population that are Communities of Color
East-West Corridor	69,821	25,878	37%
City of Wauwatosa	46,838	5,627	12%
City of Milwaukee	598,078	379,467	63%
Milwaukee County	953,401	442,797	46%
State of Wisconsin	5,724,692	990,981	17%
U.S.	314,107,084	116,947,592	37%

Census, ACS 2010-2014

**Communities of color includes: Black, Asian, American Indian, Native Hawaiian and Pacific Islander, Other Race, Two or more races, and Hispanic.*

Figure 2-3: East-West Corridor Communities of Color Population



Note: Minority populations include Black, American Indian, Asian, Native Hawaiian or Pacific Islander, other or two of more races and those of Hispanic origins.

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Minority Populations

DRAFT

Legend

Percent of Population that is Minority

- 10% and lower
- 11% - 20%
- 21% - 40%
- 41% - 75%
- 76% and higher

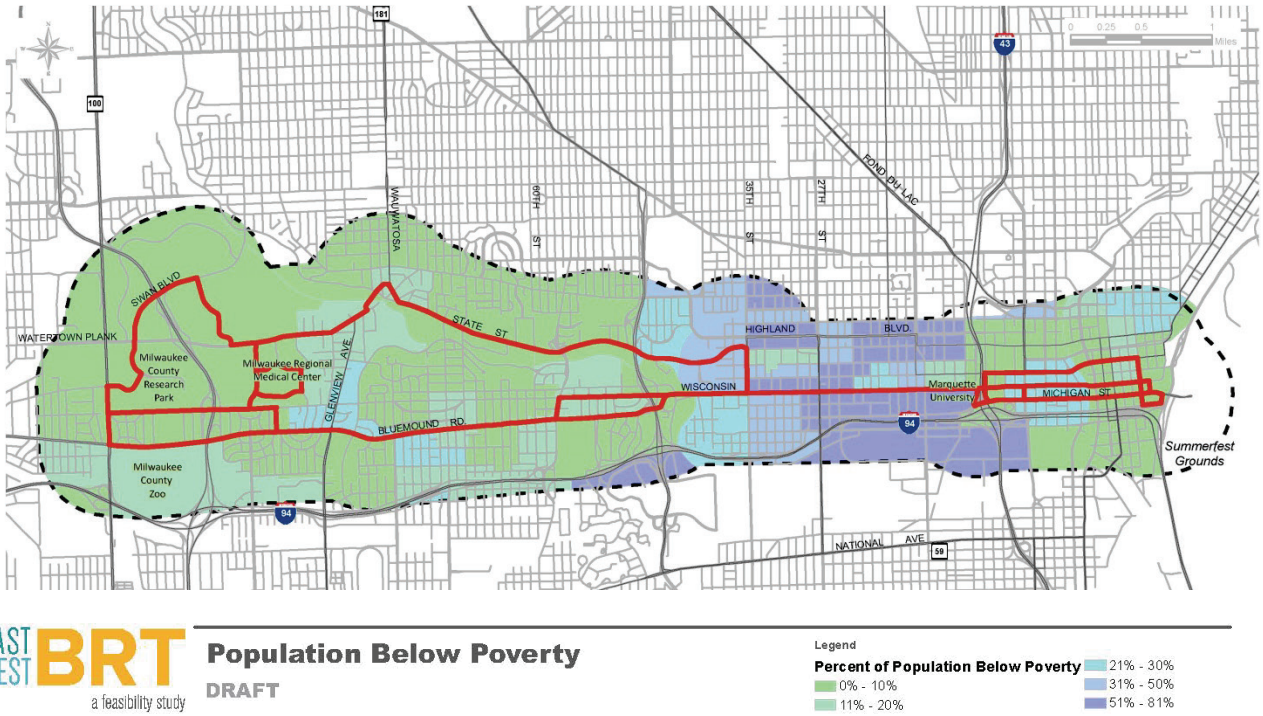
Populations living below the federal poverty line are concentrated near the junction of Bluemound Road and Wisconsin Avenue and the Milwaukee River to the east (see Figure 2-4). The corridor percentages of the population living below poverty are in line with the County as a whole, but above the City of Wauwatosa, the State, and Nation (see Table 2-5). It should be noted that this area is also home to Marquette University, and the percentages likely reflects much of the student population. Students have lower median incomes reported than the general population as they often work only part-time, rely on loans, grants and/or parental financial support.

Table 2-5: East-West Corridor Population below Poverty

Place	Total Population	Population below Poverty	% Population below Poverty
East-West Corridor	69,821	16,141	23%
City of Wauwatosa	46,264	2,758	6%
City of Milwaukee	581,847	170,943	29%
Milwaukee County	931,401	203,926	22%
State of Wisconsin	5,571,083	738,557	13%
U.S.	306,226,394	47,755,606	16%

Census, ACS 2010-2014

Figure 2-4: East-West Corridor Population below Poverty



2.5 To provide a transit alternative that will be an attractive choice for those who own an automobile and currently choose to travel by automobile in the East-West Corridor

The existing travel times and speeds of transit service in the East-West corridor are not competitive with the automobile. All transit service is in mixed traffic subject to traffic congestion, and there is no traffic signal preferential treatment. Nearly all of the existing East-West Corridor transit service is local service with frequently spaced stops, and the limited existing express service has, for much of its route, closely spaced stops of one-quarter mile. Providing a fast transit alternative that is competitive with the automobile will give travelers in the East-West Corridor an alternative cost-effective choice for travel.

Calculating the transit and driving travel times from Wisconsin Avenue and Van Buren Street in downtown Milwaukee to the Milwaukee Regional Medical Center in Wauwatosa through

Google Maps quickly illustrates that transit travel times are not competitive with automobile travel times. Typically, transit trips take more than twice as long as driving. Table 2-6 below outlines the travel time options for both driving and taking transit based on Google Maps.

Table 2-6: Corridor Travel Times

		Driving Time (minutes)			Transit Time (minutes)	
Start	**End**	**via I-94**	**via Bluemound Rd and I-94**	**via Wisconsin Ave. and I-94**	**via Gold Line**	**via Route 31**
Wisconsin and Van Buren, Milwaukee	Milwaukee Regional Medical Center, Wauwatosa	18	19	18	41	48

Source: Google Maps

As might be expected, the majority of people who live in Wauwatosa and work in Milwaukee, and those who live in Milwaukee and work in Wauwatosa, drive to work. Out of those who commute from Milwaukee to Wauwatosa, 88% either drove alone or carpooled and approximately 12% used public transportation or another mode such as bicycling or walking. Out of the commuters traveling from Wauwatosa to Milwaukee, 94% either drove alone or carpooled and about 6% chose to use public transportation or walking and biking. Table 2-7 outlines the transportation mode choice for commuters between Milwaukee and Wauwatosa.

Table 2-7: Transportation Mode Choices for Commuters between Milwaukee and Wauwatosa

		All Workers			
Home Location	**Work Location**	**Total**	**Drove Alone**	**Carpool**	**Public Transportation, bicycle, walked, taxi, motorcycle, other, or worked at home**
Milwaukee	Wauwatosa	16,170	12,440	1,730	2,000
Wauwatosa	Milwaukee	8,275	7,200	610	460

Source: U.S. Census Bureau, American Community Survey 2006-2010 Five-year estimates. Special Tabulation: Census Transportation Planning

The prevalence of automobile commuting between these two cities may be partially attributed to the lack of fast and efficient transit options for commuters to major regional employment destinations. Tables 2-8, 2-9, and 2-10 outline the transportation mode choice by commute time between Milwaukee and Wauwatosa and Wauwatosa and Milwaukee

Most of the trips between Wauwatosa and Milwaukee and vice versa are under 30 minutes, but over 5,000 trips are over 30 minutes, with approximately 4,000 trips taking between 30-60 minutes and over 1,000 trips taking more than an hour.

Table 2-8: Transportation Mode by Time, Less than 30 Minutes between Milwaukee and Wauwatosa

		Less than 30 Minutes			
Home Location	Work Location	Total	Drove Alone	Carpool	Public Transportation, bicycle, walked, taxi, motorcycle, other, or worked at home
Milwaukee	Wauwatosa	12,350	10,450	1,390	525
Wauwatosa	Milwaukee	7,075	6380	510	190

Source: U.S. Census Bureau, American Community Survey 2006-2010 Five-year estimates. Special Tabulation: Census Transportation Planning

Table 2-9: Transportation Mode by Time, 30 – 60 Minutes between Milwaukee and Wauwatosa

		30-60 Minutes			
Home Location	Work Location	Total	Drove Alone	Carpool	Public Transportation, bicycle, walked, taxi, motorcycle, other, or worked at home
Milwaukee	Wauwatosa	3,005	1,870	295	835
Wauwatosa	Milwaukee	1,010	760	80	160

Source: U.S. Census Bureau, American Community Survey 2006-2010 Five-year estimates. Special Tabulation: Census Transportation Planning

Table 2-10: Transportation Mode by Time, more than 60 Minutes between Milwaukee and Wauwatosa

		60+ Minutes			
Home Location	Work Location	Total	Drove Alone	Carpool	Public Transportation, bicycle, walked, taxi, motorcycle, other, or worked at home
Milwaukee	Wauwatosa	815	125	40	645
Wauwatosa	Milwaukee	190	60	20	105

Source: U.S. Census Bureau, American Community Survey 2006-2010 Five-year estimates. Special Tabulation: Census Transportation Planning

Within the half-mile buffer around the corridor, there are 31,346 workers who commute to a job. Most of these workers spend less than 30 minutes commuting to their job. The majority (74%) drive and 9% use public transportation to commute. Of the commuting trips that take more than 60 minutes, 49% of those are taken with public transportation. Tables 2-11, 2-12 and 2-13 outline the total commuter by time and mode choice. Offering a fast and efficient public transportation option may encourage some workers who currently drive to choose public transportation.

Table 2-11: Total Commuters by Time

		Total Commuters by Time		
	Total Commuters	Less than 30 minutes	30-60 minutes	60+ minutes
Commuters Living in the Corridor	31,346	24,331	5,895	1,120

Source: U.S. Census Bureau, American Community Survey 2010-2014

Table 2-12: Total Commuters by Car by Time

		Total Commuters by Time		
	Total Commuters	Less than 30 minutes	30-60 minutes	60+ minutes
Commuters Living in the Corridor	23,293	18,138	4,670	485

Source: U.S. Census Bureau, American Community Survey 2010-2014

Table 2-13: Total Commuters by Public Transit by Time

		Total Commuters by Time		
	Total Commuters	Less than 30 minutes	30-60 minutes	60+ minutes
Commuters Living in the Corridor	2,822	1,305	972	545

Source: U.S. Census Bureau, American Community Survey 2010-2014

In addition to time savings, cost savings is another important factor that may encourage and influence commuters to choose public transportation. According to the Center for Neighborhood Technology's Housing and Transportation Index, the monthly costs of automobile ownership in Milwaukee are $755. In Wauwatosa, the monthly costs of automobile ownership are approximately $826. The current price for the MCTS 31-day pass is $64. The monthly cost of a transit pass cost is significantly lower than the monthly cost of automobile ownership.

2.6 To efficiently serve the substantial travel demand of the Milwaukee Regional Medical Center, and to accommodate and encourage its planned aggressive growth

The Milwaukee Regional Medical Center (MRMC), located in Wauwatosa at the west end of the study corridor, is comprised of six separate medical institutions: Froedtert Hospital, the

Medical College of Wisconsin, the Blood Center of Wisconsin, Children's Hospital and Health System, Curative Care Network, and the Milwaukee County Behavioral Health Division. The MRMC campus is a destination for approximately 14,000 daily visitors and 16,000 employees on its 240-acre campus. Currently, the campus provides 12,900 parking spaces, occupying 58 acres of the campus, all free to employees, patients and visitors.

Growth Trends. The campus has experienced substantial growth in the past decade, and more is expected in the coming years. Froedtert Hospital recently opened an eight-story, 610,000 square foot Center for Advanced Care building, the first step in a multi-year $240 million plan to modernize existing facilities. Froedtert's annual patient visits have both grown over the past several years, increasing to 763,000 outpatient visits in 2015.[6]

The Medical College of Wisconsin has now announced the construction of a six-story office building, set to house up to 1,200 faculty and staff members. The building is slated to be completed in 2017.

Getting around. Currently, employees and visitors experience substantial congestion and delays in parking facilities, on campus streets, and on streets and highways leading to and from the MRMC. According to the Wisconsin Department of Transportation, average annual daily traffic on 92nd Street through the campus increased by 20% between 2004 and 2010, with increases also seen on other segments bordering the campus. Traffic counts on the surrounding major arterial highways have also substantially increased in recent years, including US-Hwy 18, Interstate 41 and their respective on-ramps.[7]

Congestion and delays due to the nearby multi-year Zoo interchange construction project regularly affect MRMC commuters, to the extent that the campus now offers a "Travel MRMC" app and features the project on its homepage. The app allows travelers to receive frequent updates about route closures, delays, and select the best route based on their starting point. Providing a rapid transit option for those traveling to the campus from the east would allow travelers to bypass this confusion, and reduce the overall numbers of vehicles navigating the congested construction zone throughout the project.

MRMC currently operates a park-and-ride service for employees in an attempt to eliminate parking congestion. In the absence of a viable alternative transportation option, future

[6] Jsonline.com "Froedtert Completes Initial Phase of $240 Million Expansion and Renovation." Oct

[7] Wisconsin DOT Road Runner site: https://trust.dot.state.wi.us/roadrunner/

increases in demand for parking may ultimately inhibit MRMC growth, either due to the space demands of surface parking or the cost of structured and underground parking.

According to the American Community Survey (2006-2010), the primary mode of transportation for the approximately 20,000 workers employed in the Census tract including the MRMC and Milwaukee County Research Park was by car, truck, or van (87.1%) (see Table 2-14). Additionally, 2.6% workers commuted via bus and 8.2% by carpool. A BRT facility in the East-West corridor would encourage the regular use of public transit, relieving traffic congestion and reducing the demand for parking. At least 900 employees of the MRMC live within the study BRT corridor, while approximately another 300 live within travel distance of the proposed line, making the system an attractive commuting option for at least 1,200 employees.[8]

Table 2-14: Means of Transportation to Work for Workers 16 and Over*

Means of Transportation	Number of Workers	%
Car, truck, or van -- Drove alone	16,800	87.1
Carpool	1585	8.2
Bus	495	2.6
Bicycle	95	0.5
Walked	150	0.8
Taxicab	30	0.2
Motorcycle	25	0.1
Other means	60	0.3
Total	**19,295**	**100.0**

**Workers Employed in and around the MRMC (Census Tract 1853)*

Source: U.S. Census Bureau, American Community Survey 2006-2010 Five-year estimates. Special Tabulation: Census Transportation Planning

Transit investment that provides high-quality transit service could also assist in attracting employees to the MRMC. Of the 28,000 workers living in the study corridor, 16% already

[8] US Census, LEHD. www.onthemap.ces.census.gov

work in health care careers, while 21% have a bachelor's degree or higher, fitting the profile of a typical MRMC worker.[9] Transit investment would likely help MRMC to recruit additional workers from this local population as the facility continues to grow.

Similarly, tens of thousands of visitors each day represent substantial transportation demand to, from, and within the MRMC. Improved transit in the corridor will be likely to help some proportion of these travelers access the medical facility more efficiently, as well as divert some trips currently made by private automobile. Finally, a high-quality, modern transit option would make travel to and from the medical facility more accessible for those employees and visitors who cannot travel by automobile. With 14,000 visitors traveling to the campus every day, many for medical treatments and ongoing care, it is reasonable to assume that some proportion of those visitors experience mobility limitations. Bus rapid transit's level boarding platform provides better service to these individuals than traditional transit or paratransit or even private automobiles, by allowing persons using mobility aids and devices to easily and quickly board and alight from vehicles.

2.7 To efficiently serve the substantial travel demand of the Milwaukee central business district, and to accommodate and encourage its planned aggressive growth

The Milwaukee central business district, or downtown, encompasses about 640 acres and is home to 81,000 employees and 25,000 residents. Substantial development is underway--the Northwestern Mutual Life Insurance office tower, the 833 East office building, the new arena with attendant development; planned--the Couture apartment tower; and, being discussed--a Johnson Controls headquarters office tower. It is the location of the greatest traffic congestion in the Milwaukee area, and has the greatest potential for increased transit use due to its density of employment and higher costs for parking. A BRT facility has the potential to substantially increase transit use to the Milwaukee central business district, by providing a reliable travel option unaffected by congestion with travel times competitive with the automobile. It is the location of the greatest traffic congestion in the Milwaukee area, and has the greatest potential for increased transit use due to its density of employment and higher costs for parking. Other cities that have implemented Bus Rapid Transit – such as Portland,

[9] US Census, LEHD. www.onthemap.ces.census.gov

Grand Rapids and Cleveland -- have seen corridor ridership expand by 45%-60% over existing levels. These levels of increase represent substantial changes to travel patterns; among downtown commuters, a similar increase would add more than 3,300 daily roundtrips by transit.

Residential households. Downtown Milwaukee features a vibrant residential presence, and has seen substantial growth in resident population over the last decades, even as the city's overall population has slightly declined. Between 2000 and 2010, the resident population grew by more than 25%, to 21,000 individuals in 11,600 households.[10] Since 2000, more than 51 individual housing development projects have been constructed downtown, with an additional dozen in the planning phases. Downtown households tend to be slightly smaller, younger and higher-earning than city households overall.

In 2014, approximately 12,500 workers lived in downtown Milwaukee.[11] Predominant employment sectors included Health Care and Social Assistance, Education, Accommodation and Food Service, Manufacturing, Finance and Insurance and Professional Services. Approximately one-quarter of these workers were employed downtown; an additional 5% were employed in the area around the Milwaukee Regional Medical Center.

Of the 28,000 workers who lived within the study area corridor, over 7,000 of them (26%) also travelled to jobs within the corridor, making a dedicated east-west BRT line a very appealing commute option. Downtown and the MRMC were the two most frequent job locations for workers who live within the corridor in 2014.

As a residential area, downtown Milwaukee is poised to continue its strong recent growth. Numerous office buildings are actively being converted to housing, and new developments are planned in areas along the Milwaukee River and in the Park East corridor, in Westtown, in the Third Ward and close to the lakefront.

Employment. For the last decade, employment in downtown Milwaukee has averaged about 85,000 jobs – by far the densest employment concentration in the region. In 2014, the US Census estimates that the CBD includes 89,700 jobs with concentrations in the following sectors: Finance and Insurance, Public Administration, and Professional Services. There is relatively little retail employment downtown; less than 2% of downtown employees work in

[10] Downtown Milwaukee Market Profile, 2012. www.milwaukeedowntown.com

[11] US Census, LEHD. www.onthemap.ces.census.gov

this sector. Worker origins are concentrated in Milwaukee County, particularly on the north shore, south shore and workers who also live downtown. 55,000 of those workers – about 61% -- commute less than 10 miles to the CBD.

Between 2006 and 2010, the predominant means of transportation for the roughly 70,000 workers employed in the CBD Census tracts was by car, truck, or van (72.8%) (see Table 2-15). Additionally, 10.8% workers commuted via public transit, 9.5% by carpool, and 4.6% walked.

Table 2-15: Means of Transportation to Work for Workers 16 and Over*

Means of Transportation	Number of Workers	%
Car, truck, or van -- Drove alone	50,055	72.8%
Carpool	6,518	9.5%
Bus	7,390	10.8%
Railroad	49	0.1%
Bicycle	579	0.8%
Walked	3,160	4.6%
Taxicab	115	0.2%
Motorcycle	244	0.4%
Other method	230	0.3%
Worked at home	380	0.6%

**Workers Employed in Downtown Milwaukee (Census Tracts 111, 113, 114, 141, 143, 144, 1863, 1864, 1874)*

Source: U.S. Census Bureau, American Community Survey 2006-2010 Five-year estimates. Special Tabulation: Census Transportation Planning

Major downtown employers include Roundy's corporation, Northwestern Mutual Insurance, WE Energies, BMO Harris Bank, AT&T, Wells Fargo Bank, US Bank, and Manpower. After a moribund period following the recession, office development activity has picked up in the central business district, with a major 32-story tower under construction for Northwestern Mutual Insurance, the recent completion of the 18-story 833 E. Michigan St. building and smaller just-approved projects across the Milwaukee River from the Manpower headquarters.

Hospitality, Culture and Tourism. In 2011, there were nearly 3,700 hotel rooms in downtown Milwaukee, located in 20 properties. They enjoyed 64.2% occupancy rates, higher than the US average of 60.1%. A number of hotel developments are recently completed, under construction or in planning phases, including a Hilton Garden Inn (adaptive reuse), Kimpton Hotel (new construction), Milwaukee Marriott (adaptive reuse), and Brewhouse Inn (adaptive reuse) in the former Pabst Brewery.

Tourism and cultural events draw large numbers of residents and visitors to downtown Milwaukee every year. Attendance in 2010 at key locations is summarized in the table below.

Table 2-16: Downtown Event Attendance 2010[12]

Location	Attendance
Bradley Center	1,200,000
Summerfest Grounds	1,500,000
Milwaukee Public Museum	700,000
Wisconsin Center District	1,600,000
Central Library	540,000
Marcus Center	520,000
Milwaukee Art Museum	370,000
Pabst, Riverside, Turner Hall	214,000

A new arena for the Milwaukee Bucks, the city's professional basketball team, is currently under design review for a location west of the Milwaukee River. It is expected to drive considerable investment in the redevelopment of the area.

Milwaukee's central business district is the locus of a large portion of regional real estate and development investment. The area continues to attract residents and jobs and travelers at very high densities. Millions of people attend cultural and sporting events in the downtown area every year. A BRT facility has the potential to substantially increase transit use to the Milwaukee central business district, by providing a reliable travel option unaffected by congestion with travel times competitive with the automobile.

[12] Downtown Milwaukee Market Profile, 2012. www.milwaukeedowntown.com

2.8 Encourage new, denser, mixed-use development and redevelopment—which results in more efficient public infrastructure and services and lower energy use per household

Research shows that high quality public transit facilities, such as BRT, can encourage higher density mixed use development and redevelopment within walking distance of its stations. Such development typically costs less per household to serve with public infrastructure and services, requires less energy use per households, and generates fewer air pollutant emissions.

Research suggests that high quality public transit facilities, such as BRT, can encourage higher density mixed use development and redevelopment within walking distance of transit stations. Dense, mixed-use developments are typically less costly to provide with public infrastructure and services, as they require less energy on a household basis, and generate fewer air pollutant emissions.

Dense, mixed use developments (also referred to as transit-oriented development) supports business and the environment. While public transit is not the sole contributor to development and redevelopment in adjacent areas, incorporation of public transit has proven to be a contributing force for sustainable growth. The following bullets identify some of the benefits and characteristics of public transit projects and transit-oriented development:

- Focused growth
- Development at higher densities
- Reduced parking demands
- Creation of walkable spaces
- Community redevelopment and revitalization
- Wider range of retail opportunities
- Increased local real estate and sales taxes
- Diversified housing choices
- Businesses are willing to invest along transit corridors

- Reduced dependency on single occupancy vehicles
- Improved transit ridership
- Measurable economic development within 1/4 mile around station

Projects such as the Cleveland Healthline (BRT) is a great example of this.

- Cleveland HealthLine (opened in 2008) – $5.8 billion in investment since 2008[13]

In addition to transit-oriented development, the introduction of long-term transit investments encourages all types of development (commercial, residential, industrial, etc.) and also helps to encourage more transit usage and additional transit investment. This cyclical relationship encourages more efficient public infrastructure.

Investment. A recent study looking at the impact of BRT on urban environments identifies the introduction of BRT as a positive investment for surrounding communities.[14] Table 2-17 provides information on transit-oriented development benefits of BRT and LRT projects. The study suggests that BRT systems reap the greatest return on investments among the transit modes included in the study.

Table 2-17: Transit-Oriented Development Investment and Development per Dollar Invested

System	Public TOD Investment ($MM)	Investment in TOD Areas ($MM)	Development per TOD $ Invested
Bus Rapid Transit			
Cleveland HealthLine	$51	$5,800	$114.54
Kansas City Main Street Metro Area Express	$51	$5,200	$101.96
Las Vegas Strip & Downtown Express (SDX)	$47	$2,000	$42.28
Boston Washington Street Silver Line	$31	$650	$20.97

[13] "HealthLine Drives Growth in Cleveland", Jason Hellendrung, *The Magazine of the Urban Land Institute*, (July 2012) http://urbanland.uli.org/economy-markets-trends/healthline-drives-growth-in-cleveland/

[14] "National Study of BRT Development Outcomes. Final Report. NITC-UU-14-650." Arthur C. Nelson and Joanna Ganning, University of Utah for the National Institute for Transportation and Communities (NITC). http://t4america.org/wp-content/uploads/2016/01/NATIONAL-STUDY-OF-BRT-DEVELOPMENT-OUTCOMES-11-30-15.pdf

System	Public TOD Investment ($MM)	Investment in TOD Areas ($MM)	Development per TOD $ Invested
Eugene Emerald Express Green Line (EmX)	$25	$100	$3.96
Pittsburgh Martin Luther King, Jr. East Busway	$252	$900	$3.59
Ottawa Transitway	$585	$1,000	$1.71
Boston Waterfront Silver Line	$719	$1,000	$1.39
BRT Summary	**$1,761**	**$16,650**	**$9.46**

Source: *Data adapted from Institute for Transportation and Development Policy (2013). Table shown in –National Study of BRT Development Outcomes. Final Report. NITC-UU-14-650. Arthur C. Nelson and Joanna Ganning, University of Utah for the National Institute for Transportation and Communities (NITC).*

Reduction in Energy Consumption, Increase in Household Savings. Public transit and subsequent transit-oriented development reduce energy consumption and and facilitate increased household savings. A 2007 study by ICF International found that "current public transportation usage reduces U.S. gasoline consumption by 1.4 billion gallons each year."[15] Public transit options results in fewer cars filling up, fewer tanker truck deliveries to service stations and an annual savings of 3.9 million gallons of gasoline per day. Savings result from public transit's ability to carry multiple passengers and the reduction in traffic congestion from a reduction in automobiles on the roads.

As mentioned in Section 2.5, the Center for Neighborhood Technology's Housing and Transportation Index, the monthly costs of automobile ownership in Milwaukee are $755. In Wauwatosa, the monthly costs of automobile ownership are approximately $826. The current price for the MCTS 31-day pass is $64. Currently, 74% of the 31,346 workers within a half-mile buffer of the corridor (as shown in Section 2.5) drive to work. BRT investment in the corridor could provide a significant savings for households that choose transit.

[15] "Public Transportation and Petroleum Savings in the U.S.: Reducing Dependence on Oil", Linda Bailey, ICF International (January 2007). http://www.apta.com/resources/reportsandpublications/Documents/apta_public_transportation_fuel_savings_final_010807.pdf

2.9 To provide the transit element of the identified multi-modal improvements needed to address the existing and forecast long-range future travel demand in the East-West corridor as recommended in the current and previous regional transportation plans

The regional transportation plan has long identified the East-West corridor as the most heavily travelled and congested corridor in the Southeastern Wisconsin Region. An important improvement long recommended in the regional transportation plan is the development of a BRT facility. A BRT facility is recommended in the year 2035 regional transportation plan which was last reviewed and updated in 2014, and was also recommended in the first regional plan completed in 1966 for the design year 1990.

As summarized below, references to the high-capacity transit investment within the corridor has been included in plans for more than 40 years.

The County of Milwaukee, Expressway and Transportation Commission, *Milwaukee Area Transit Plan: A Mass Transit Technical Planning Study*, June 1971

This plan recommends a larger rapid transit system in the Milwaukee area, with one of the corridors of this system being the “West Corridor”. The “West Corridor” would run from approximately the Zoo Freeway to downtown Milwaukee. The overall completion of the proposed system was 1990. The plan notes that the “east-west corridor from downtown Milwaukee emerged as the potential alignments having the greatest and most imminent need for a separate right-of-way transit facility”.

Southeastern Wisconsin Regional Planning Commission, *The Milwaukee Northwest Corridor Rapid Transit Study: Environmental Assessment of Alternatives*, January 1988

This study included alternatives with exclusive transit lanes on Wisconsin Avenue, east of N. 35th St, both rapid bus service and light rail alternatives were evaluated. Specifically, three bus alternatives were developed. Two of the three alternatives include a transit mall in downtown Milwaukee. Buses would operate on a combination of bus-on-freeway routes and reserved lanes on arterial streets. Six LRT alternatives were developed as well. All

alternatives would run at-grade, using existing right-of-way, including streets, street medians and railroad right-of-way.

Wisconsin Department of Transportation, *East-West Corridor Alternative Analysis / Draft Environmental Impact Statement*, April 1994

This alternatives analysis/DEIS included a number of bus rapid transit, light rail or express bus services connecting the City of Waukesha to the University of Wisconsin-Milwaukee. Alternative 2 included a proposed reserved bus lane on Wisconsin Avenue between the Stadium Freeway and Prospect Avenue.

Southeastern Wisconsin Regional Planning Commission, *Review and Update of the Year 2035 Regional Transportation Plan,* June 2014

This plan discusses express transit service on the corridor currently being studied. Express routes would replace existing major local bus routes. Stops would typically be placed about one-quarter mile apart. This system would initial consist of buses operating over arterial streets in mixed traffic and would be upgraded over time to buses operating on reserved street lanes with priority treatment at traffic signals.

Southeastern Wisconsin Regional Planning Commission, *Milwaukee County Transit System Development Plan*, October 2010

The plan recommends converting three high-ridership local bus routes into express bus routes in order to improve transit travel times. Specifically Route 10/30X would run from the Milwaukee Regional Medical Center in Wauwatosa to the University of Wisconsin-Milwaukee over portions of Route Nos. 10 and 30. The express service could be upgraded to bus rapid transit.

Southeastern Wisconsin Regional Planning Commission, *Vision 2050*

The region's upcoming long-range transportation shows the current study corridor as a proposed corridor for rapid transit (either light rail or BRT) that would extend from downtown Waukesha to downtown Milwaukee via the Milwaukee Regional Medical Center, on W. Blue Mound Rd., and Wisconsin Ave.

3. GOALS AND OBJECTIVES

The following four goals and related objectives have been established for the East-West Corridor. These will be utilized for the development of evaluation criteria used in comparing the alternative transit investment options for the corridor.

Table 3-1: East-West Corridor Goals and Objectives

Goal	Objectives
Increase the efficiency, attractiveness and utilization of transit for all users	▪ Provide reliable, frequent service that improves the experience of existing customers and attracts "choice" riders ▪ Provide capacity for future growth in transit ridership ▪ Provide enhanced passenger amenities and infrastructure
Efficiently manage the forecasted increase in corridor travel demand	▪ Provide frequent, high-capacity, one-seat transit connections between key East-West Corridor activity generators ▪ Manage increasing corridor travel demand through more efficient use of the existing transportation network ▪ Contribute to acceptable levels of traffic operations and parking supply in the corridor ▪ Improve pedestrian and bicycle connections to East-West Corridor transit ▪ Coordinate with existing and planned transit services
Contribute to a socially-, economically-, and environmentally-sustainable transportation network	▪ Promote a more efficient and sustainable transportation system that reduces energy usage, emissions, and costs of living ▪ Increase mobility and accessibility for transit-dependent populations ▪ Support regional planning efforts for a more balanced, multi-modal transportation network in the region ▪ Support local and regional goals for compact, mixed-use development along the corridor ▪ Support institutional and key stakeholder planning efforts

Goal	Objectives
Develop and select an implementable and community-supported project	▪ Define and select transit improvements with strong public, stakeholder and agency support ▪ Define and select transit improvements that are cost-effective and financially feasible, both in the short- and long-term ▪ Define and select transit improvements that are competitive for Federal Transit Administration funding

4. EVALUATION CRITERIA

In order to evaluate the initial group of transit modes and alignment options and identify the appropriate mode-alignment pairings that will comprise the detailed alternatives, the East-West Corridor Study will follow a three-step method.

- The first step ("Tier 1 Evaluation") will entail the assessment of each mode and alignment relative to overall implementation viability.
- The second step ("Tier 2 Evaluation") will assess the mode/alignment pairings that passed the Tier 1 Evaluation and compare the benefits and impacts of each.
- The alternative(s) that fare(s) best against the detailed criteria in this second step will be identified as Preferred Alternative(s) and further refined in the third step ("Tier 3"). The Locally Preferred Alternative will be identified at the conclusion of the third step.

The evaluation criteria associated with each step are a combination of quantitative and qualitative performance measures.

- The Tier 1 Evaluation will apply fewer and broader measures, including information from previous corridor/area studies. The analysis will largely rely on order-of-magnitude estimates and the outcomes of similar transit projects from around the country.
- The Tier 2 Evaluation will apply more detailed and alternative-specific evaluation results.
- The Tier 3 Evaluation will evaluate the Preferred Alternative(s) against federal criteria to identify and refine the Locally Preferred Alternative.

This three-step process will result in the identification of an LPA that not only meets locally-identified project purpose and needs, but is also competitive for federal funding.

Table 4-1 on the following page presents the evaluation criteria that are likely to be used during the three steps of alternative evaluation. Note that each successive step builds upon the criteria from the previous step, ensuring a consistent rating throughout.

Table 4-1: Draft Evaluation Criteria

	Evaluation Phases		
Project Goals	**Tier 1 (qualitative analysis)**	**Tier 2 (qualitative and quantitative)**	**Tier 3 (quantitative and qualitative)**
Increase the efficiency, attractiveness and utilization of transit for all users	Typical ridership capacity Service reliability	Ridership Transit travel times	Mobility improvements*
Efficiently manage the forecasted increase in corridor travel demand	Connectivity between population and employment centers	Traffic impacts Parking impacts Potential right-of-way impacts Bicycle and pedestrian impacts	Mobility improvements* Congestion relief*
Contribute to a socially-, economically-, and environmentally-sustainable transportation network	Environmental impacts (visual, natural) Demonstrated ability to catalyze economic development Consistency with existing corridor character Compatibility with local and regional plans	Station area population and employment densities Station area equity characteristics Station area land use and economic development opportunities Environmental impacts/benefits	Economic development* Land use* Environmental benefits*
Develop and select an implementable and community-supported project	Typical per-mile capital cost Community support	Capital and operating and maintenance costs Cost effectiveness Community support	Financial capacity analysis* Cost effectiveness*

**consistent with FTA New Starts/Small Starts criteria*