MILWAUKEE NORTH SOUTH Transit Enhancement

VOLUME 4

TIER 1 EVALUATION

Milwaukee County **North-South**
Transit Enhancement Study

Southeastern Wisconsin **Regional Planning Commission**

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MILWAUKEE NORTH SOUTH Transit Enhancement

MILWAUKEE COUNTY NORTH-SOUTH TRANSIT ENHANCEMENT STUDY

VOLUME 4: TIER 1 EVALUATION

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1 INTRODUCTION

The Southeastern Wisconsin Regional Planning Commission has undertaken a feasibility study at the request of Milwaukee County to consider transit alternatives along and near 27th Street to enhance transit service, increase frequency, add amenities, and potentially expand the existing Milwaukee County Transit Service (MCTS) PurpleLine service area. Both rail and bus services are being evaluated. These transit improvements are expected to increase transit ridership along the corridor and will serve residents and businesses along the chosen preferred alternative. Map 1.1 shows the enhanced transit route segment options under consideration and Map 1.2 shows the no-build alternative, which is the existing MCTS PurpleLine route.

An incremental evaluation process, described in the following three steps, will progress to the final phase of the analysis of a locally preferred alternative.

- The first step (Tier 1 Evaluation) defines the alternatives to be evaluated and recommended, including the transit technology and the identification of route options. The alternatives considered are in addition to a no-build or existing transit service option. MCTS' PurpleLine serves as the no-build base from which the build route options will be compared. This Tier 1 Evaluation will result in the elimination of some of the alternatives considered and is the subject of this report.

- The second step (Tier 2 Evaluation) will further assess the route options defined in step one and identify potential station locations along the route options. This evaluation step may also result in the elimination of some of the alternatives considered. Additional or refined routes may be added in this phase if the analyses warrant the change.

- The third step (Tier 3 Evaluation) builds upon any alternative still under consideration after the second step. Any remaining alternative will be evaluated against federal criteria for transit projects to determine if refinements should be made.

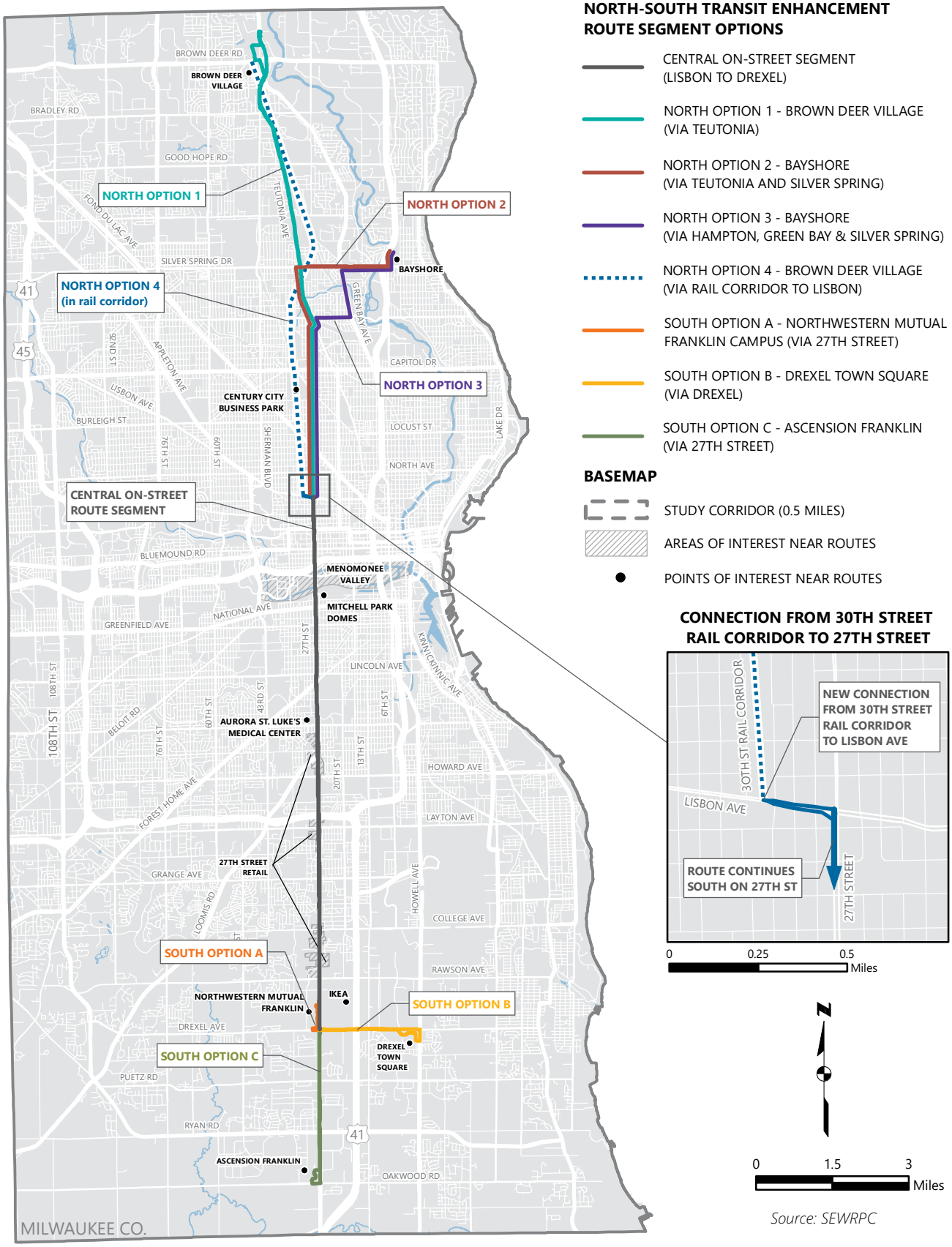
At the conclusion of the third step of the evaluation process, a locally preferred alternative (LPA) will be recommended to the Milwaukee County board, city councils, and village boards for adoption. The LPA will be the transit investment alternative that best meets the purpose of and need for the project and is competitive for funding through the Federal Transit Administration (FTA) Capital Investment Grant program. This feasibility study is scheduled to be completed in spring 2022, and a letter to FTA requesting to enter project development will follow.

This document will provide sequential, high-level analyses of the range of alternatives that include the transit mode technologies—bus rapid transit (BRT), light rail and rapid streetcar—followed by the route options associated for the mode(s) that remain under consideration. In the case where insufficient information is available at this level of evaluation, the alternatives will be carried forward into further, more detailed analyses in the Tier 2 Evaluation.

For the alternatives to advance to the Tier 2 Evaluation, they would first have to meet the defined purpose for, and needs of, the transit enhancement in the corridor. The purpose and needs of the project are provided in Chapter 2.

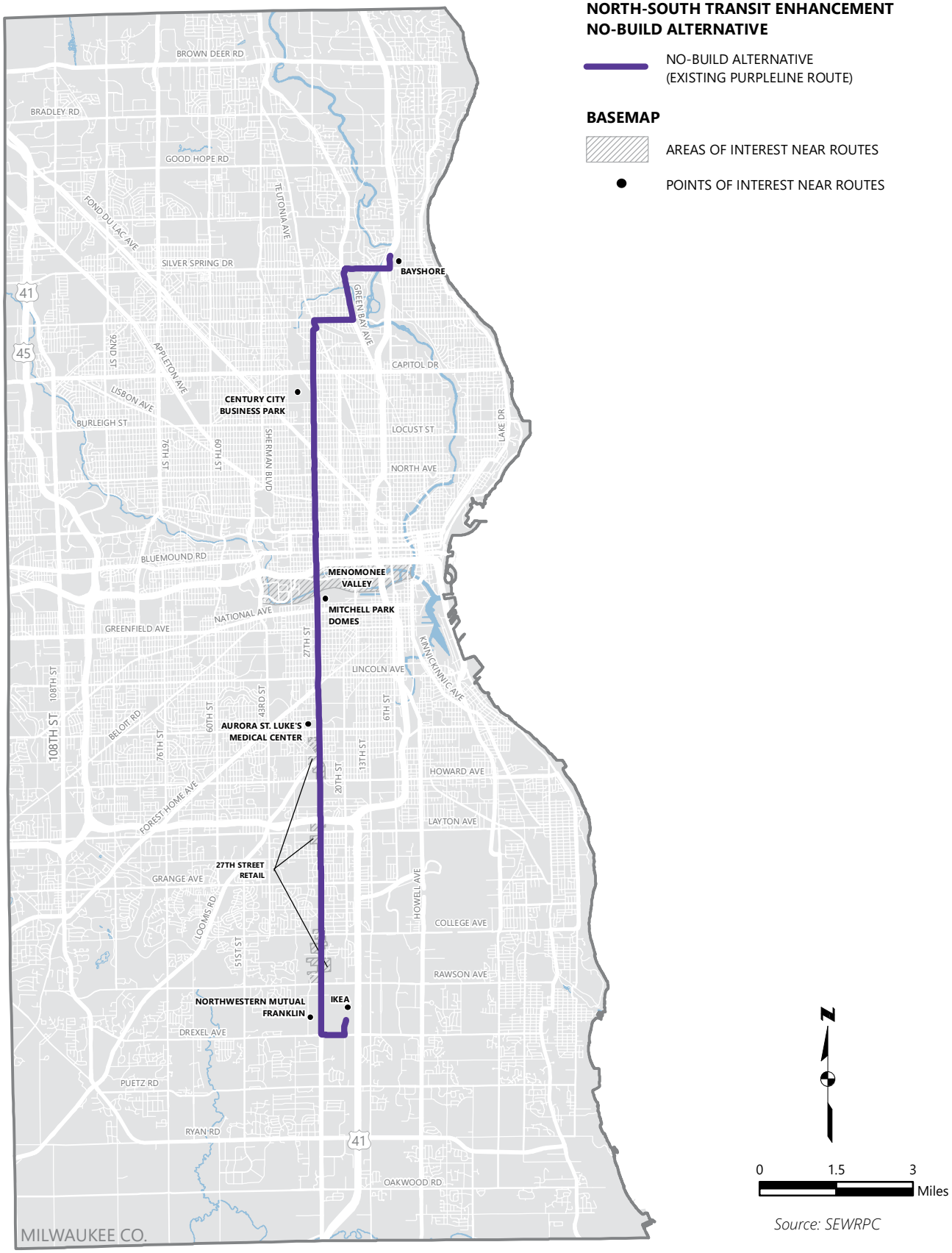
This Tier 1 Evaluation includes categories (rated most to least compatible with green, yellow, and red circles) to inform the decisions regarding which modes and route options are most appropriate for this transit corridor.

Map 1.1
Route Segment Options



Source: SEWRPC

Map 1.2
No Build Alternative



Source: SEWRPC

BACKGROUND 2

2.1 PURPOSE AND NEED

The purpose statement defines why the study is being conducted and the need statements outline the deficiencies that the transit enhancement would address. The project purpose and need statements are provided below. More details are included in Volume 3 of this report.

Purpose

The purpose of the Milwaukee North-South Transit Enhancement Study is to build upon Milwaukee's existing transit infrastructure and investment to enhance mobility along or near 27th Street and throughout Milwaukee County, focusing on underserved residents in the corridor and supporting the local commitment to racial equity and social justice investments. Racial equity is a top priority of Milwaukee County government. This study is one step toward supporting Milwaukee County's goal to identify and address policies, practices, and power structures that, whether intentionally or unintentionally, favor white people and create barriers for black, brown, and indigenous people.[1]

Needs

The needs summarized below describe why an investment in enhanced transit is necessary in this corridor. More detail, including data that supports these statements, is provided in the following sections.

1. **Provide a viable transit enhancement in the corridor along or near 27th Street.** An increase in service frequency, reduced transit travel times, and improved stops with amenities will better serve current riders and attract new riders in the corridor.

2. **Help remedy existing racial inequities and the longstanding systemic racism within the transportation network.** People of color are more likely to rely on transit than white people. As a result of this disparity, most transportation network investments—which favor car travel or that primarily serve predominantly white areas—disproportionately benefit the white, non-Hispanic population. The resulting inequities in access to jobs and education have played a role in many of the other racial disparities that exist in the Milwaukee metro area's population, including disparities in educational attainment levels, per capita income levels, and poverty rates.[2] Investing in enhanced transit in an area with a population that is 73 percent people of color would significantly improve access and amenities for that population—part of a much larger commitment by Milwaukee County to invest in projects that support racial equity and social justice.

3. **Improve access for underserved populations.** In addition to people of color, low-income families and people with disabilities are also more likely to rely on transit and are underserved by most investments in the transportation network, which favor car travel. The cost of owning a car can be prohibitive for low-income populations, while having the option to not own a car, or more than one car, can reduce transportation costs for families and provide more financial flexibility. Investing in enhanced transit in an area where a higher proportion of the population is more likely to depend on transit will significantly improve access to jobs, healthcare, education, recreation, entertainment, social activities, and other destinations for these currently underserved populations.

[1] *Milwaukee County Ordinance No. 20-4 commits Milwaukee County to advancing racial equity and eliminating health disparities.*

[2] *These disparities are documented in SEWRPC Memorandum No. 221 (Second Edition), A Comparison of the Milwaukee Metropolitan Area to Its Peers, March 2020.*

4. **Provide a transit solution that supports dense, equitable, and pedestrian-oriented mixed-use development and redevelopment.** Local and regional plans recommend relatively dense, mixed-use development and redevelopment along much of the corridor that accommodates bicyclists and pedestrians and that both supports and is supported by high-capacity transit. This kind of development also results in more efficient public infrastructure and services, lower energy use per household, and encourages active transportation that can improve public health.

5. **Improve the balance of multimodal transportation options to enhance safety for all users.** Reckless driving in Milwaukee County is a significant risk to the health and safety of the community and requires multi-faceted solutions in engineering and design, public education, and accountability. Among several recommendations included in its 2020 Activities, Findings, and Recommendations Report, the City-County Carjacking and Reckless Driving Task Force recommends increasing the availability of public transit, investing in road diets, and separating vulnerable users by providing a separate and protected space for people walking, biking, and taking transit.[3] An enhanced transit investment in this corridor could improve safety by incorporating pedestrian-oriented design around stations, providing traffic calming measures through the addition of a transit-only travel lanes (reducing the width or number of travel lanes), and reducing negative perceptions related to using public transit.

6. **Invest in environmentally sustainable options that are consistent with local and regional plans.** Enhanced public transit has the potential to reduce single occupancy vehicle travel and support more compact development—which could reduce greenhouse gas (GHG) emissions and dependence on fossil fuels. An investment in enhanced transit in the corridor would also provide an opportunity to select vehicles, station amenities, and other operations equipment that further reduces the environmental impact of transit and takes advantage of the latest in transportation technology.

2.2 GOALS AND OBJECTIVES

Figure 2.1 lists the goals and objectives that have been identified for this study with reference to the associated needs. Figure 2.2 depicts the evaluation factors and the associated study goals for this Tier 1 Evaluation.

[3] *Activities, Findings, and Recommendations Report, City-County Carjacking and Reckless Driving Task Force, June 2020. city.milwaukee.gov/ImageLibrary/Groups/ccCouncil/District-10-Murphy/PDFs/FINALReport6-7-2020-1.pdf.*

Figure 2.1
Project Goals and Objectives

Goals	Objectives
Provide improved access to underserved residents in the corridor with an enhanced, efficient, and convenient transportation option. *(Refer to needs 1, 2, 3, 4)*	1. Provide transit service with routes and stations that prioritize access to jobs, essential services, and activity centers 2. Provide enhanced transit service to maximize the number of underserved residents who live within 0.5 miles of stations 3. Provide a transportation option that is more affordable than car travel with relatively competitive travel times 4. Provide more frequent service to reduce wait time at stations 5. Provide safe pedestrian connectivity to stations, especially in areas with high pedestrian crash rates
Provide transit that is a viable, attractive alternative to driving. *(Refer to needs 1, 4, 5, 6)*	Decrease transit travel times and improved reliability in the following ways: 1. Implement transit signal priority (TSP) and reduce the number of stops to decrease transit travel time 2. Provide dedicated transit travel lanes where possible 3. Provide off-board ticketing 4. Build stations that provide level boarding for faster on-boarding of mobility devices, strollers, carts, and bicycles Increase attractiveness and ridership in the following ways: 1. Improve transit service amenities to retain current riders and attract new riders 2. Accommodate first and last mile connections via other modes, such as roll-on bike storage infrastructure, at-station bike share services, and transfers to employment shuttles 3. Improve stations with amenities such as weather protection, seating, and safety provisions
Develop a preferred alternative that will be supported by the community and that is financially sustainable within the expected transit funding. *(Refer to needs 1, 6)*	1. Select an alternative with public and stakeholder support 2. Ensure capital costs can be funded with existing or reasonably expected local, state and federal resources 3. Ensure operating costs fit within the anticipated transit budget and do not negatively impact the ability to operate existing transit service
Deliver an environmentally sustainable transportation option that will increase ridership and reduce single occupancy vehicle trips. *(Refer to needs 4, 6)*	1. Consider alternative fuels and efficient vehicles/locomotives that will reduce greenhouse gas emissions in the corridor 2. Implement operational improvements—such as TSP, dedicated transit travel lanes, off-board ticketing, and level boarding—that will reduce energy use through more consistent vehicle speed and reduced transit vehicle dwell time

Source: SEWRPC

Figure 2.2
Phased Evaluation Criteria

Project Goals	Tier 1 Evaluation *(qualitative)*	Tier 2 Evaluation *(qualitative and quantitative)*	Tier 3 Evaluation *(qualitative and quantitative)*
Provide underserved residents in the corridor with an improved, efficient, and convenient transportation option. *(Refer to needs 1, 2, 3, 4)*	• Typical Ridership Capacity • Service Reliability	• Ridership • Transit Travel Times	• Mobility Improvements[a]
Improve access for underserved neighborhoods. *(Refer to needs 2, 3, 4)*	• Demographics of Areas Served • Employment	• Demographics • Employment • Ridership	• Mobility Improvements
Provide transit that is a viable, attractive alternative to driving. *(Refer to need 1)*	• Commute Times • Service Reliability • Per Mile Capital Cost	• Ridership • Transit Travel Times • Capital, Operating and Maintenance Costs • Cost Effectiveness	• Cost Effectiveness • Mobility Improvements
Manage travel demand in the corridor. *(Refer to needs 4, 5, 6)*	• Connectivity Between Population and Employment Centers	• Parking Impacts • Potential Right-Of-Way Impacts • Bicycle and Pedestrian Impacts	• Mobility Improvements
Develop a preferred alternative that will be supported by the community and that is financially sustainable within the expected transit funding. *(Refer to needs 1, 6)*	• Per-Mile Capital Cost • Supported by Community Public Comments	• Capital, Operating and Maintenance Costs • Cost Effectiveness • Community Support	• Financial Capacity Analysis • Cost Effectiveness
Deliver an environmentally sustainable transportation option. *(Refer to needs 4, 6)*	• Environmental Impacts and Benefits	• Land Use • Environmental Impacts and Benefits • Bicycle and Pedestrian Impacts	• Land Use • Environmental Impacts and Benefits

[a] *Mobility Improvements defined as estimated annual trips (trips by non-transit dependent persons plus trips by transit dependent persons multiplied by 2) per the* Final Interim Policy Guidance, Federal Transit Administration Capital Investment Grant Program, *June 2016. www.transit.dot.gov/sites/fta.dot.gov/files/docs/FAST_Updated_Interim_Policy_Guidance_June%20_2016.pdf.*

Source: SEWRPC

TRANSIT TECHNOLOGY EVALUATION 3

The transit technology evaluation for this study reviews how compatible bus rapid transit, light rail, and rapid streetcar would be for an enhanced transit service within the study corridor, shown in Map 1.1. These technology options were presented during the second round of public involvement, which took place in June and July 2021 and included three virtual public meetings and a series of online surveys.

The results of the evaluations presented in the following section will rate the three transit technologies as being either highly compatible (represented by a green circle), moderately compatible (represented by a yellow circle), or not compatible (represented by a red circle) for a transit enhancement in the study corridor, based on the criteria provided. The technology or technologies that emerge as being the most compatible will remain for further evaluation. All other transit technologies will be eliminated from further study. Chapter 4 of this report will evaluate transit route options, which would utilize the remaining technology type(s).

3.1 TRANSIT TECHNOLOGY TYPES CONSIDERED

This section includes a description of the transit technology types under consideration on or near 27th Street in Milwaukee County as well as the analyses of each. Figure 3.1 summarizes technology types being considered. In addition, transit technology types that will not be evaluated as part of this study are described.

Figure 3.1
Transit Technologies Under Consideration

Bus Rapid Transit (BRT)

- Bus runs on the roadway
- Route is in at least 50% dedicated lanes
- Enhanced stations with level boarding and off-board ticketing
- Stop spacing approx. ½ mile

Rapid Streetcar

- Streetcar vehicle (or tram) runs on track in the roadway
- Route is at least 50% dedicated lanes
- Enhanced stations with level boarding and off-board ticketing
- Stop spacing approx. ¼ to ½ mile

Light Rail

- Light rail vehicle (single or multiple unit trains) runs on track in the roadway
- Route is entirely (or nearly entirely) in dedicated lanes
- Enhanced stations with level boarding and off-board ticketing
- Stop spacing approx. ½ mile+

Source: (1) HDR, Inc.; (2) International Light Rail Magazine; (3) Finance and Commerce

Existing Bus Service (No-Build)

The existing bus service in the study corridor, the MCTS PurpleLine, is included as a technology type that is under consideration as a baseline for comparison, as the no-build option. A description of the no-build option is provided below, but it is not evaluated in detail in this chapter because it does not meet the purpose and needs for the project but would be considered if an enhanced transit option does not advance.

The existing PurpleLine runs a length of approximately 15 miles—predominately on 27th Street—between Ikea in Oak Creek on the southern end and Bayshore in Glendale on the northern end. The service has approximately 70 stops and provides between 8- and 11-minute headways on weekdays and between 10- and 15-minute headways on weekends. This route serves healthcare facilities, including several hospitals where shift changes occur at various times of the day outside of the peak PurpleLine transit travel hours of 6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:00 p.m. on weekdays, and operates from 4:30 a.m. to 1:00 a.m., a total of 20.5 hours per day. Ridership on the PurpleLine was 6,700 rides per day during 2019, and during the COVID-19 pandemic in 2020—when the number of passengers on each bus was restricted as a safety measure—it had the highest ridership among MCTS bus routes with 3,700 riders per day.

Bus Rapid Transit (BRT)

Bus rapid transit (BRT) is an enhanced transit service that utilizes at least 50 percent dedicated lanes, with transit station spacing about every ½ mile. Dedicated lanes included in BRT can vary from painted exclusive transit lanes within an existing right of way to fully separated transit lanes in the roadway right-of-way or within their own right-of-way. BRT utilizes transit signal prioritization (TSP) that gives priority to transit vehicles to advance through signalized intersections. These enhancements provide travel time savings to decrease passengers' travel times. Stations include features such as level boarding and off-board ticketing, which allow for faster vehicle loading because passengers using mobility devices such as wheelchairs, or those using strollers can board more easily. Off-board ticketing stations allow fares to be purchased prior to boarding without requiring driver assistance. BRT systems also typically feature automated, real-time bus arrival information at stations, and unique branding of buses and bus shelters to signify enhanced service.

A ticket vending machine at a BRT station in Grand Rapids, MI

Credit: The Rapid

Light Rail

Light rail transit operates on tracks either in an existing rail corridor or tracks that are embedded into the existing roadway, with station spacing about every ½ mile or more. Whether it operates in an existing rail corridor or within a roadway right-of-way, light rail typically runs on tracks fully separated from automobile driving lanes. Like BRT, light rail stations include features such as level boarding and off-board ticketing, which allow for faster vehicle loading because passengers using mobility devices such as wheelchairs, or those using strollers can board more easily. Off-board ticketing stations allow fares to be purchased prior to boarding without requiring driver assistance. Light rail systems also typically feature automated, real-time train arrival information at stations, and unique branding of vehicles and shelters to signify enhanced service.

Rapid Streetcar

Rapid streetcar service is an enhanced transit service that uses a streetcar vehicle which is made up of a single car on rail tracks that are installed within the roadway with at least 50 percent of the length of the route having a dedicated lane. Rapid streetcar typically uses overhead catenary wires to power the vehicles but can also use battery power. Rapid streetcar stations are typically spaced between ¼ and ½ miles apart. Like BRT and light rail, rapid streetcar stations include features such as level boarding and off-board ticketing, which allow for faster vehicle loading because passengers using mobility devices such as wheelchairs, or those using strollers can board more easily. Off-board ticketing stations allow fares to be purchased prior to boarding without requiring driver assistance. Rapid streetcar systems also typically feature automated, real-time vehicle arrival information at stations, and unique branding of vehicles and shelters to signify enhanced service.

3.2 TRANSIT MODES NOT CONSIDERED FOR FURTHER ANALYSIS

The following section includes a description of enhanced transit technology types that are not being considered for further consideration as a part of this study.

Commuter Rail

Commuter rail typically uses electric or diesel locomotives for train cars, and it runs on existing rail corridors, which share the rail network with intercity or freight rail trains. This type of transit service usually serves longer, regional passenger rail routes, rarely running with headways better than every 15 minutes. Particularly if diesel vehicles are used, the distance between stations is usually at least two miles. In the case of the 30th Street rail corridor, the existing freight rail line does run through the Village of Brown Deer, south to the Menomonee Valley, but then travels east to downtown Milwaukee, and would not serve the southern portion of Milwaukee County on or near 27th Street. In addition, ridership along the 27th Street corridor is expected to be higher than the typical capacity of commuter rail service.

In VISION 2050, the Southeastern Wisconsin Regional Planning Commission's (SEWRPC) long-range regional land use and transportation plan, commuter rail is recommended in the 30th Street rail corridor, but as part of a longer service that connects through Downtown Milwaukee south to Racine and Kenosha.[4] For these reasons, commuter rail will not be studied as an alternative for this study, however, commuter rail on the 30th Street rail corridor could be considered as part of other studies and efforts in the future. Appendix A includes additional information regarding commuter rail recommendations and the potential for commuter rail implementation in the 30th Street rail corridor.

Bus Rapid Transit (BRT) Light

Bus rapid transit (BRT) light is like traditional BRT, except that it uses mixed traffic lanes rather than dedicated transit lanes. BRT light would not provide the needed travel time savings in this corridor; therefore, it will not be included as an alternative for this study.

[4] *The full VISION 2050 plan can be viewed at www.vision2050sewis.org.*

Local Streetcar

Local streetcar service is like a rapid streetcar service with streetcar vehicles and rail lines utilized. However, the stations for a local streetcar service are spaced closer together and typically designed to serve downtown areas. Local streetcar also typically runs on a higher proportion of mixed traffic lanes than rapid streetcar. For these reasons, the local streetcar service would not realize the needed travel time savings in this corridor, and therefore, will not be included as an alternative for this study.

3.3 EVALUATION FACTORS

This section describes the factors being used to evaluate the transit technology types under consideration, any necessary analysis, and the evaluation results for each factor. For this study, evaluations of BRT, light rail, and rapid streetcar are based on peer systems around the Midwest and in other parts of the country.

Ridership Capacity

Enhanced transit has the potential to expand ridership in the corridor by attracting new riders and encouraging more frequent travel by transit for existing riders. Case studies around the country show that ridership increases vary with the implementation of enhanced transit service.

The Tier 2 Evaluation will include a detailed ridership forecast. For this Tier 1 Evaluation, an estimated ridership increase of between 20 and 55 percent is assumed. Using the Fall 2019 average weekday ridership of 6,800 on the existing PurpleLine as a base, that would bring potential future ridership to 8,160 to 10,540 per day. Note that 2020 ridership data—the most recent data available at the time of this analysis—were not used due to unknowns surrounding travel behavior and the COVID-19 pandemic.

The ridership capacity evaluation considers both if ridership is within the capacity of the transit technologies under consideration, and if the transit technologies meet estimated ridership demand without a significant excess in capacity (which results in higher operating and maintenance costs).

While ridership capacity is scalable within a single technology type, desired headways and vehicle capacities provide a typical capacity range that structures this evaluation. Ridership capacity can generally be calculated by multiplying the number of passengers that a transit vehicle can carry by the number of vehicles expected to be in use on the service per hour, then multiplied by the number of hours per day the service is expected to run. Using this method, ranges for average weekday ridership by technology type are shown in Table 3.1.

The results of the ridership capacity analysis are shown in Table 3.2. BRT rates as highly compatible with the high-level ridership growth estimates; light rail rates as least compatible, given that typical ridership capacity is well above even a significant estimated growth in ridership; and rapid streetcar rates as moderately compatible, given that if ridership increases significantly, it will fit within the typical ridership capacity.

Table 3.1
Typical Ridership Capacity

Technology Type	Ridership/Range per Average Weekday
Bus Rapid Transit	5,000 – 20,000
Light Rail	20,000 – 40,000
Rapid Streetcar	10,000 – 17,000

Assumptions: (1) Minimum and maximum vehicle capacities of 42 passengers (40-foot bus) and 80 passengers, respectively (60-foot articulated bus, a single light rail vehicle, and a single streetcar vehicle); (2) two vehicles per train for light rail and one vehicle per train for rapid streetcar; (3) minimum headways of five minutes and maximum headways of ten minutes for all services; (4) running time of 4:30 a.m. to 1:30 a.m. (21 hours).

Source: SEWRPC

Table 3.2
Screening Results: Typical Ridership Capacity

Technology Type	Ridership/Range per Average Weekday
Bus Rapid Transit	●
Light Rail	●
Rapid Streetcar	●

Source: SEWRPC

Service Characteristics

Service characteristics, such as frequency and running times, should be matched to the appropriate transit technology type and contribute to the quality of the service. The existing PurpleLine (no-build) runs from 4:30 a.m. to 1:00 a.m. daily with frequencies between 8 and 15 minutes. Enhanced transit service on this corridor would run from early morning to late night, seven days per week with service every ten minutes during peak hours of service. As shown in Table 3.3, the transit technology types under consideration, BRT, light rail, and rapid streetcar service, typically can all offer the service frequency, timespan of service, and travel hours to accommodate transit demand in the study corridor.

Table 3.3
Typical Service Characteristics by Technology Type

Technology Type	Service Frequency	Timespan of Service	Service Timeframes
Bus Rapid Transit	High	Long	Morning Peak, Midday, Evening Peak, Weekends
Light Rail	High	Long	Morning Peak, Midday, Evening Peak, Weekends
Rapid Streetcar	High	Long	Morning Peak, Midday, Evening Peak, Weekends

Source: SEWRPC

Table 3.4 shows the evaluation results for the three transit technologies when considering the service characteristics that can accommodate an enhanced transit service in the study corridor. Since all transit technology types under consideration, BRT, light rail, and rapid streetcar service, can offer service characteristics to serve the transit needs of the corridor, all received a green rating.

Table 3.4
Typical Service Evaluation by Technology Type

Technology Type	Service Frequency	Timespan of Service	Service Timeframes
Bus Rapid Transit	●	●	●
Light Rail	●	●	●
Rapid Streetcar	●	●	●

Source: SEWRPC

Environmental Impacts

The environmental impacts considered as part of this Tier 1 Evaluation include a high-level qualitative evaluation of construction and post-construction environmental impacts. The changes and disturbance to the corridor is expected to only occur within the existing right-of-way, specifically between the curbs of the existing roadway and—for the route alternative along the 30th Street rail corridor—either on the existing tracks (for the light rail transit technology types) or adjacent to the tracks on a new transitway that would need to be constructed within the railroad right-of-way (for the BRT or rapid streetcar technology types). It can be expected that environmental impacts resulting from route or station construction would be related to noise, vibration, and visual changes to the area as compared to the existing environment. Further environmental impacts may be encountered such as hazardous materials for any transitway construction in the railroad right-of-way, which would need to be documented and potentially mitigated, if required, during the environmental documentation phase, which would take place after the conclusion of this feasibility study.

More detailed, quantitative environmental analyses such as benefits to air quality, greenhouse gas emissions, and potential impacts to the natural environment, cultural resources, and safety will be considered in the Tier 2 Evaluation. Table 3.5 provides a description of the typical noise, vibration, and visual environmental impacts related to the transit technologies under consideration for the study corridor.

Table 3.5
Typical Environmental Impacts

Technology Type	Typical Environmental Impacts
Bus Rapid Transit	BRT service would utilize dedicated travel lanes within the existing curb-to-curb roadway, in some of same locations as the existing PurpleLine bus service route. **On-street:** BRT route and station construction would create temporary noise, vibration, dust and some traffic and/or transit delays may occur during construction for the roadway alternatives. Once the BRT service would be in operation, impacts associated with noise and vibration are not expected to increase from the transit service(s) that currently exist, and may be reduced, depending on the bus vehicle type that is chosen for the service. **On a new paved transitway in the rail corridor:** In the case of the 30th Street rail corridor alternative, transitway and station construction within the railroad right-of-way may encounter existing hazardous materials and would add impervious surface, noise, dust, and vibration, but would reduce transportation delays on local streets during construction compared to on-street construction. Construction of a paved transitway in the rail corridor could preclude installation of additional railroad tracks that may be necessary to implement commuter rail, light rail, or additional freight service, and could limit the right of way available for the planned bike path in the corridor in the future.
Light Rail	Light rail (LRT) systems typically operate in dedicated trackage within the roadway right-of-way but may also use existing rail corridors. Construction activities may negatively impact the surrounding communities during the construction phase. It is also expected that the operation of an LRT system would produce noise and vibration differently than that associated with a bus or BRT system. Some of the noise receptors in the corridor, such as residential units or hospitals, would be sensitive to the added sounds associated with an LRT system. Electric power via an overhead contact system (direct suspension/single contact or catenary wire) may be required for the service, and may be visually displeasing to area residents, businesses, and transit riders. **On-street:** Safety systems for the LRT service along existing roadways may require flashing light signals, bells, horns, and crossing gates that would cause additional noise and light that is not present with the current transit system. Turning rail vehicles can also generate substantial noise when wheels grind against the steel rail. Construction is expected to be longer in duration than BRT for the rail installation and may cause traffic and/or transit delays during construction. Some of the noise receptors in the corridor, such as residential units or hospitals, would be sensitive to the added sounds associated with the LRT system. **Rail Corridor:** In the case of the route segment option that would use the existing 30th Street rail corridor, construction may be necessary for dedicated lanes, potential additional track installation, and station facilities.
Rapid Streetcar	Rapid streetcar systems are similar to LRT in that they typically operate on rails within a dedicated roadway right-of-way. Rapid streetcars have the potential to produce noise and differently than that associated with a bus or BRT system. Electric power is necessary to electrify at least substantial portions streetcar system, which typically is provided via overhead catenary wires and may be visually displeasing to area residents, businesses, and transit riders. Underground power systems, while technically feasible, are generally more expensive and require more complicated maintenance than catenary wire systems. **On Street:** Construction activities may negatively impact the surrounding communities during the construction phase of the roadway segments, which may include noise, vibration, dust, and traffic and transit delays on existing transit services. Turning rail vehicles can also generate substantial noise when wheels grind against the steel rail. Some of the noise receptors in the corridor, such as residential units or hospitals, would be sensitive to the added sounds associated with the LRT system. **On a new paved transitway in the rail corridor:** In the case of the 30th Street rail corridor alternative, transitway—including track and overhead catenary wire installation—and station construction within the railroad right-of-way may encounter existing hazardous materials and would add impervious surface, noise, dust, and vibration, but would reduce transportation delays on local streets during construction compared to on-street construction. Construction of a paved transitway in the rail corridor could preclude installation of additional railroad tracks that may be necessary to implement commuter rail, light rail, or additional freight service, and could limit the right of way available for the planned bike path in the corridor in the future.

Source: SEWRPC

Table 3.6 shows the ratings of the transit technologies when considering the environmental impacts associated with the three enhanced transit technologies under consideration for the study corridor. Each of the transit technology types under consideration would have potential environmental impacts and benefits for the corridor based on the various route segment options, but the impacts are expected to be minimal or mitigated in the later phases of the project. Therefore, all technology type options received a yellow rating.

Table 3.6
Results of Environmental Impacts Evaluation

Technology Type	Environmental Impacts
Bus Rapid Transit	●
Light Rail	●
Rapid Streetcar	●

Source: SEWRPC

Potential to Catalyze Development

Enhanced transit can improve mobility and expand access and as a byproduct of these primary outcomes, it can also encourage private investment in the form of transit-oriented development that both supports and is supported by the public transit investment.

The service characteristics of light rail typically result in more significant travel time savings and overall, more efficient travel when compared to BRT and, although less so, rapid streetcar. Specifically, light rail runs in almost entirely exclusive travel ways, whereas BRT and rapid streetcar are more likely to have some shared lanes with automobile traffic. In addition, the quality of transit vehicles is typically perceived to be higher for rail vehicles, which can also result in higher ridership. Higher quality transit service is likely to result in more private development as it signals to developers that more residents and businesses will want to be located closer to the service.

Table 3.7 illustrates each mode's typical development context with the existing and projected development context of the corridor.

Table 3.7
Potential to Catalyze Development

Technology Type	Demonstrated Modal Impacts on Development	Typical Development Context
Bus Rapid Transit	Medium	Suburban, medium-density urban
Light Rail	High	Medium- to high-density urban
Rapid Streetcar	High	Medium- to high-density urban

Source: SEWRPC

Table 3.8 shows the results of the evaluation, rating each technology by its potential to catalyze development in the corridor. Based on case studies reviewed, light rail and rapid streetcar have the potential to catalyze more development than BRT, although BRT also has the potential to catalyze considerable development, particularly if it includes substantial amounts of dedicated lanes and higher quality stations and vehicles.

Table 3.8
Results of Potential to Catalyze Development Evaluation

Technology Type	Potential to Catalyze Development
Bus Rapid Transit	●
Light Rail	●
Rapid Streetcar	●

Source: SEWRPC

Consistency with Corridor Character

The character of the existing corridor differs substantially along its full length. There are various neighborhoods, development patterns and densities, and types of land use, including dense residential housing, industrial zones, and commercial areas that include shopping space, office space, and major healthcare facilities. At the southern and northern ends of the study corridor, the density is more characteristic of suburban and rural land use. The existing roadways vary throughout the study corridor from 2-lane roadways to 6-lane roadways with bike lanes or paths, parking lanes, and sidewalks in most areas, except in the far northern and southern areas of the corridor.

The existing transit service along 27th Street, the MCTS PurpleLine, serves the core of the corridor from Bayshore in Glendale on the north to Ikea on W. Drexel Avenue in Oak Creek. The area north of Bayshore is served by Route 12, (Teutonia – Hampton). Currently there is no bus service south of W. Drexel Avenue on 27th Street.

As the PurpleLine serves much of the study corridor, bus service is already part of nearly all of the corridor's character, and existing and enhanced transit services have been included in local and regional planning for the study corridor. However, the enhanced rail alternatives under consideration—light rail and rapid streetcar—would introduce new infrastructure to the corridor such as rails installed in the roadway bed, and overhead catenary wires, which would most likely be used to power the light rail and rapid streetcar alternatives. In addition, light rail systems typically require crossing gates with flashing lights. These elements are not as compatible with the current visual character of the roadways, neighborhoods, and commercial areas in the corridor.

The implementation and character of BRT is most like the existing transit service in the study corridor. Therefore, when evaluating consistent character in the corridor, BRT is rated green, rapid streetcar is rated with yellow, and light rail is rated red, as shown in Table 3.9.

Table 3.9
Results of Corridor Character Consistency Evaluation

Technology Type	Character Consistency Evaluation
Bus Rapid Transit	●
Light Rail	●
Rapid Streetcar	●

Source: SEWRPC

Consistency with Local and Regional Planning

A transit improvement that is recommended in the corridor should be compatible and consistent with the existing environment and future planning for the area. Table 3.10 shows the list of planning documents that were considered for consistency with the transit enhancements under consideration, by transit technology type, for the corridor.

Table 3.10
Local and Regional Plans Reviewed for Consistency with Transit Enhancement Technology Types

Organization	Local and Regional Plans Reviewed
SEWRPC	VISION 2050 (July 2016), 2020 Review and Update of VISION 2050 (June 2020)
Village of Brown Deer	Village of Brown Deer Comprehensive Plan 2030 (November 2009)
City of Glendale	Glendale Comprehensive Master Plan (August 2020)
City of Milwaukee	Near North Area Plan (December 2009, Connecting the Corridor Strategic Action Plan (Amendment), November 2020) Fond Du Lac and North Avenue Plan (March 2004, Update Currently Underway) Century City Implementation Plan (2011) The Near West Side Plan (March 2004, Amended March 2009), includes North 27th Street Corridor Strategy (January 2018) North 27th Street Corridor Strategy: A Part of the Near West Side Area Plan (2018) The Menomonee Valley 2.0 Plan (June 2015) The Southwest Side Plan (2009) Strategic Action Plan: A part of the Southeast and Southwest Side Area Plans (March 2017)
City of Greenfield	Comprehensive Plan, (December 2020)
Oak Creek	Draft Comprehensive Plan (out for public comments, an open house was held in October 2019)
Franklin	City of Franklin 2025 Comprehensive Master Plan (October 2009)

Source: SEWRPC

The plans were reviewed to determine whether the transportation and land use goals identified in the local and regional planning documents align with the various transit technology alternatives under consideration. SEWRPC's long-range regional land use and transportation plan, VISION 2050, recommends future rapid transit, such as BRT or light rail service, and express bus service in the corridor. Rapid transit is recommended to connect Bayshore and Drexel Town Square and express bus is recommended to connect the Original Village in Brown Deer to Southridge Mall in Greendale, with the core of both routes traveling along 27th Street. VISION 2050 also recommends commuter rail in the 30th Street Corridor to downtown Milwaukee and beyond to Kenosha. In addition, the City of Milwaukee's Near North Area Plan amendment, Connecting the Corridor Strategic Action Plan, recommends commuter and high-speed passenger rail along the 30th Street rail corridor as a long-term project. Other local city and village plans reference the existing transit bus service or recommend enhanced transit service in the study corridor.

Table 3.11 rates local and regional planning consistency for each of the transit technologies under consideration for the study.

Capital Costs

Typical construction cost-per-mile for the transit technology types under consideration can vary substantially. Cost estimate ranges were developed using similar transit projects around the country that were recently awarded Capital Investment Grants from the Federal Transit Administration (FTA).

The rail alternatives, light rail and rapid streetcar, typically have higher construction estimates associated with the purchase and installation of tracks and overhead catenary wires often used to power the transit vehicles.

Table 3.12 shows the range of costs per-mile based on peer systems for each of the transit technologies under consideration. Projects funded by the FTA's Capital Investment Grant program for transit systems in the following metropolitan areas were considered to determine the cost ranges: Milwaukee, Madison, and Seattle for BRT costs; Minneapolis, Portland, and Phoenix for light rail costs; and Milwaukee, Kansas City, and Tampa for streetcar costs.

Capital costs are considered as financially viable based on reasonably expected funds available from local, state, and federal funding sources. As shown in Table 3.13, the transit technology types are rated as green, yellow, or red based on whether the technology types would be financially viable based on reasonably expected revenue available from local, state, and federal funding sources.

Table 3.11
Results of Consistency with Local and Regional Planning Evaluation

Technology Type	Consistency with Local and Regional Plans
Bus Rapid Transit	●
Light Rail	●
Rapid Streetcar	●

Source: SEWRPC

Table 3.12
Per-Mile Capital Cost for Transit Technology Types

Technology Type	Range of Cost-per-Mile
Bus Rapid Transit	$6M - $58M
Light Rail	$127M to $236M
Rapid Streetcar	$59M to $100M

Source: SEWRPC

Table 3.13
Evaluation of Per-Mile Capital Cost Comparison for Transit Technology Types

Technology Type	Range of Cost-per-Mile
Bus Rapid Transit	●
Light Rail	●
Rapid Streetcar	●

Source: SEWRPC

3.4 SUMMARY OF TRANSIT TECHNOLOGY EVALUATION

Table 3.14 provides a summary of the results of all evaluations for the transit technology types under consideration. The transit technology evaluation identified bus rapid transit (BRT) as the best option for enhanced transit in the corridor and eliminated all other options from further consideration

Table 3.14
Modes for Detailed Definition and Evaluation

Technology Type	Typical Capacity (Right Sized Mode)	Typical Service Characteristics	Environmental Characteristics	Potential to Catalyze Development	Consistency with Corridor Character	Consistency with Local and Regional Plans	Typical per Mile Capital Cost
Bus Rapid Transit	🟢	🟢	🟡	🟡	🟢	🟢	🟢
Light Rail	🔴	🟢	🟡	🟢	🔴	🟡	🔴
Rapid Streetcar	🟡	🟢	🟡	🟢	🟡	🟡	🟡

Source: SEWRPC

ROUTE ALTERNATIVE EVALUATION 4

This chapter will review the route alternatives being considered, shown by route segment option in Map 1.1. An initial map of preliminary route options was presented during the first round of public involvement for the study in February 2021. After public comments were considered, and the purpose and need statement was finalized, these same route options remained for further study and evaluation as part of this Tier 1 Evaluation. Like the transit technologies, these route alternatives were also presented for comment during the second round of public involvement for the study in June 2021.

The resulting study corridor, defined as the area within a 0.5-mile buffer around the route alternatives, spans nearly the entire length of Milwaukee County from the north to the south, with route segment options running primarily along 27th Street with various route segment options on the northern and southern ends of the corridor. In addition to these route alternatives, a no-build option, which would entail making no changes to the existing transit technology or service alignments in the corridor, is included in case no enhanced transit alternative is recommended.

The transit technology evaluation identified bus rapid transit (BRT) as the best option for enhanced transit in the corridor and eliminated all other options from further consideration. Therefore, all route alternatives are considered for BRT operations only.

4.1 DESCRIPTION OF ROUTE OPTIONS

Route alternatives being considered include several segment options that run within the existing roadway and one segment option that runs partially within a rail corridor. The on-street route alternatives share a central route segment that runs along 27th Street from W. Drexel Avenue to W. Lisbon Avenue. There are four route segment options in the northern segment of the corridor, and three route segment options in the southern end of the corridor, all branching off the Central Route Segment. These options are shown on Map 1.1 and described below:

North Route Segment Options

- North Option 1 would extend north on N. 27th Street from the northern end of the Central Segment at the intersection of W. Lisbon Avenue and N. 27th Street, continue onto N. Teutonia Avenue, and terminate near the intersection of W. Brown Deer Road (STH 100) and N. Green Bay Road (STH 57) in the Village of Brown Deer—near the Market Place of Brown Deer shopping center and the walkable, mixed-use Original Brown Deer Village neighborhood.

- North Option 2 would extend north on N. 27th Street from the northern end of the Central Segment at the intersection of W. Lisbon Avenue and N. 27th Street, continue onto N. Teutonia Avenue, then turn east onto W. Silver Spring Drive before turning north again onto N. Port Washington Road, terminating at Bayshore, the open-air, mixed-use center in the City of Glendale.

- North Option 3 would extend north on N. 27th Street from the northern end of the Central Segment at the intersection of W. Lisbon Avenue and N. 27th Street, continue onto N. Teutonia Avenue, turn east onto W. Hampton Avenue, north onto N. Green Bay Avenue (STH 57), east onto W. Silver Spring Drive, and then north again onto N. Port Washington Road, also terminating at Bayshore in the City of Glendale. This option is the same route that the existing PurpleLine bus route follows.

- North Option 4 would extend west from the northern end of the Central Segment at the intersection of W. Lisbon Avenue and N. 27th Street, by traveling west on W. Lisbon Avenue for approximately two-tenths of a mile before connecting to the existing 30th Street rail corridor via a constructed ramp structure to traverse the grade change from the elevated W. Lisbon Avenue down to the 30th Street rail corridor, below. BRT service along the rail corridor could be implemented by

constructing a new, paved transitway within the railroad right-of-way. The route would continue north in the rail corridor, terminating in Brown Deer's Original Village neighborhood, near W. Brown Deer Road (STH 100).

South Route Segment Options

- South Option A would terminate the route at the southern end of the Central Segment, at the intersection of S. 27th Street (STH 241) and W. Drexel Avenue in the City of Oak Creek on the east and the City of Franklin on the west, with a turn-around within Northwestern Mutual's Franklin Campus

- South Option B would extend east from the southern end of the Central Segment at the intersection of S. 27th Street (STH 241) and W. Drexel Avenue along W. Drexel Avenue, terminating at Drexel Town Square, a mixed-use retail, residential, and civic development on the corner of W. Drexel Avenue and S. Howell Avenue (STH 38) in the City of Oak Creek

- South Option C would extend south along S. 27th Street (STH 241) from the southern end of the Central Segment at the intersection of S. 27th Street and W. Drexel Avenue, terminating at the Ascension Medical Center at the intersection of S. 27th Street and W. Oakwood Road in the City of Franklin on the west and the City of Oak Creek on the east

A total of 12 complete route alternatives are possible given the four north route segment options and three south route segment options being considered. Since the Central Segment is included in all the possible route alternatives, and it is assumed that only one north and one south route segment option will be selected, this analysis is largely focused on evaluating the north route segment options against one another and the south route segment options against one another. Where applicable, information is included about the Central Segment.

4.2 EVALUATION FACTORS

The analysis of each evaluation factor for each route segment option is provided in the section below using examples of typical enhancements for peer transit systems.

Engineering and Operational Feasibility

For this analysis, a high-level summary of the engineering and operational feasibility is used to evaluate the route options under consideration for future BRT service. Evaluations include:

1. **Evaluation of Segment Characteristics:** A summary of the physical characteristics of each segment option that could either positively or negatively impact the implementation of BRT, including potential impacts to capital and operating costs that are directly related to the physical characteristics of the segment.

2. **Congestion Evaluation:** An evaluation of congestion on each segment to understand potential impacts to travel time, auto travel, and the feasibility of transit lanes.

3. **Accessibility Evaluation:** A summary of existing population and employment densities, which will provide a high-level understanding of which route segment options are likely to result in the highest ridership and greatest access to employment.

An overall evaluation comparing the engineering and operational feasibility of the north and south route segment options is provided at the end of this section.

Evaluation of Segment Characteristics

Tables 4.1, 4.2, and 4.3 provide a summary and subsequent rating of the physical characteristics of each route segment option that could impact future implementation of BRT. Characteristics are categorized under three topics: existing transportation network, access to important destinations, and potential impacts to capital or operating costs. Route options are grouped by northern segments (North Options 1–4), southern segments (South Options A–C), and the Central Segment. Characteristics are rated as either green, yellow,

Table 4.1
Northern Segment Characteristics Ratings

	Category	Characteristics	Rating
North Option 1 - *Brown Deer Village via Teutonia Avenue*	Existing Transportation Network	Existing cross section includes wide shoulder that could easily be converted to transit lane without reducing other travel lanes or facilities	●
		Existing cross section includes median, which could be used to assist with pedestrian crossing and/or for stations if center-running transit lanes were selected	●
		Wide cross sections and lack of pedestrian and bicycle infrastructure for much of the corridor would make safe access to stations difficult	●
		Connects to the Oak Leaf Trail	●
		Reducing travel lanes in favor of buffered transit lanes and adding stations with curb bump-outs would provide a traffic calming effects	●
	Access to Important Destinations	Access to relatively high-density, mixed-use development in the Original Brown Deer Village neighborhood and the more auto-oriented commercial destinations at the Marketplace of Brown Deer and adjacent business park; however, few other destinations along the segment	●
	Potential Impacts to Capital or Operating Costs	None, this segment would not require additional infrastructure to the roadway (outside of re-striping) and does not have any apparent complexities that would impact expected operating costs	--

	Category	Characteristics	Rating
North Option 2 - *Bayshore via Teutonia Avenue and Silver Spring Drive and Port Washington Road*	Existing Transportation Network	Existing cross sections would allow for a transit lane by removing a travel lane	●
		Segment includes sidewalks on at least one side of the street, with most sections having sidewalk on both sides, and some pedestrian safety enhancements at intersections, providing good pedestrian access to and from potential stations	●
		Access to Park and Ride located on the west side of Port Washington Road	●
		Connects to Oak Leaf Trail	●
		Reducing travel lanes in favor of buffered transit lanes and adding stations with curb bump-outs would provide a traffic calming effects	●
	Access to Important Destinations	Access to Bayshore and nearby commercial area, and relatively high-density residential areas	●
	Potential Impacts to Capital or Operating Costs	Simple segment that includes two turns, possibly saving travel time when compared to the more circuitous segment of North Option 3	●

	Category	Characteristics	Rating
North Option 3 - *Bayshore via Hampton Avenue, Green Bay Avenue, Silver Spring Drive, and Port Washington Road*	Existing Transportation Network	Existing cross sections would allow for a transit lane by removing a travel lane	●
		Segment includes sidewalks on at least one side of the street, with most sections having sidewalk on both sides, and some pedestrian safety enhancements at intersections, providing good pedestrian access to and from potential stations	●
		Park and Ride located on the west side of Port Washington Road	●
		Connects to Oak Leaf Trail	●
		Reducing travel lanes in favor of buffered transit lanes and adding stations with curb bump-outs would provide a traffic calming effects	●
	Access to Important Destinations	Access to Bayshore and nearby commercial area, and relatively high-density residential areas	●
	Potential Impacts to Capital or Operating Costs	Circuitous segment option, changing direction 4 times, possibly reducing travel time when compared to the more simplified North Option 2 route and increasing capital costs as it relates to signal prioritization	●

Table continued on next page.

Table 4.1 (Continued)

	Category	Characteristics	Rating
North Option 4 – *Original Brown Deer Village via 30th Street rail corridor (to Lisbon Avenue)*	Existing Transportation Network	BRT along rail corridor would require construction of a paved transitway within railroad right-of-way and a connection from the rail corridor to Lisbon Avenue Constraints in several locations would present challenges to design and construction including limited available width between Brown Deer Road and Bradley Road, near Mill Road, near Villard Avenue, near Capitol Drive, and may require new structures to overpass Silver Spring Drive, and Teutonia Avenue. A structure to connect the rail corridor to Lisbon Avenue would likely be complex and require significant coordination.	🔴
		Access to and work within the railroad right-of-way would require significant coordination with WATCO, one of the largest short-line railroad companies in the United States, which can be challenging; a lease agreement would likely be required	🟡
		Transit along the rail corridor would allow for travel that is largely unimpeded, and likely result in significant operational benefits	🟢
		Locating stations along the rail corridor is possible but could be challenging with some locations having limited pedestrian access, industrial uses, and grade separations	🟡
	Access to Important Destinations	Access to relatively high-density, mixed-use development in the Original Brown Deer Village neighborhood and jobs in the 30th Street Industrial Corridor	🟢
	Potential Impacts to Capital or Operating Costs	Construction of a paved transitway within the rail corridor, a structure to connect the rail corridor to Lisbon Avenue, and other potential structures needed to accommodate the transitway would result in significant impacts to capital costs	🔴
		The new transitway and accompanying structures would result in new maintenance and operating costs. Possible lease payments to the railroad could also increase operating costs significantly	🔴

Source: SEWRPC

Table 4.2
Southern Segment Characteristics Ratings

	Category	Characteristics	Rating
South Option A – *Northwestern Mutual Franklin Campus*	Existing Transportation Network	Route would terminate at the southern end of the central corridor segment; therefore, transportation network characteristics are reflected in central segment summary	--
	Access to Important Destinations	None (Northwestern Mutual Franklin Campus is included in the central segment summary)	--
	Potential Impacts to Capital or Operating Costs	None, this segment would not require additional infrastructure to the roadway (outside of re-striping) and does not have any apparent complexities that would impact expected operating costs.	--

	Category	Characteristics	Rating
South Option B – *Drexel Town Square (via Drexel Avenue)*	Existing Transportation Network	Existing cross sections would allow for a transit lane by removing a travel lane	🟢
		Segment includes a sidewalk or multiuse path on one side of the street	🟡
	Access to Important Destinations	Access to mixed-use Drexel Town Square development, and other commercial development in the area	🟢
	Potential Impacts to Capital or Operating Costs	None, this segment would not require additional infrastructure to the roadway (outside of re-striping) and does not have any apparent complexities that would impact expected operating costs.	--

	Category	Characteristics	Rating
South Option C – *Ascension Franklin (via S. 27th Street)*	Existing Transportation Network	Existing cross sections would allow for a transit lane by removing a travel lane	🟢
		Segment does not include sidewalks	🔴
	Access to Important Destinations	Access to Ascension Franklin hospital; however, few other destinations along the segment	🟡
	Potential Impacts to Capital or Operating Costs	Constructing sidewalks along the segment in order to connect stations with destinations would be increase capital costs.	🔴

Source: SEWRPC

Table 4.3
Central Segment Characteristics Ratings

	Category	Characteristics	Rating
Central Segment – *27th Street from Drexel Avenue to Lisbon Avenue*	Existing Transportation Network	Cross section along much of the corridor allows for a dedicated transit lane by either removing a travel lane or a parking lane.	●
		Cross section along much of the corridor includes sidewalks on both sides	●
		Bike lanes are limited along the corridor; adding a transit lane could provide an opportunity to add designated bike lanes where there are none, or provide shared bike/transit lanes	●
		Reducing travel lanes and unnecessary travel width in favor of buffered transit lanes and adding stations with curb bump-outs would provide a traffic calming effects	●
	Access to Important Destinations	Access to some of the highest-density residential areas in the City; major job centers including Century City Business Park, the Menomonee Valley, and Aurora St. Luke's Medical Center; S. 27th Street retail; and a number of community resource centers	●
	Potential Impacts to Capital or Operating Costs	None, this segment would not require additional infrastructure to the roadway (outside of re-striping) and does not have any apparent complexities that would impact expected operating costs.	--

Source: SEWRPC

or red, with green being a characteristic that would support the future implementation of BRT, yellow being a characteristic that could be a moderate challenge to the future implementation of BRT, and red being a characteristic that could be a severe challenge to the future implementation of BRT.

The overall evaluation of segment characteristics by route segment option is summarized in Table 4.4. Based on the characteristics' ratings, segments that present severe challenges to implementing BRT are shown with a red circle representing those least compatible with BRT, and those segments with characteristics that present only moderate challenges are shown with yellow or green circles representing those that could potentially support BRT.

Table 4.4
Evaluation of Segment Characteristics by Route Segment Option

Route Segment Options	Overall Segment Characteristics Evaluation
North Option 1 *Brown Deer Village via Teutonia Avenue*	●
North Option 2 *Bayshore via Teutonia Avenue and Silver Spring Drive*	●
North Option 3 *Bayshore via Hampton Avenue, Green Bay Avenue, Silver Spring Drive, and Port Washington Road*	●
North Option 4 *Original Brown Deer Village via 30th Street rail corridor (to Lisbon Avenue)*	●
Central Segment *27th Street from Drexel Avenue to Lisbon Avenue*	●
South Option A *Northwestern Mutual Franklin Campus*	●
South Option B *Drexel Town Square (via Drexel Avenue)*	●
South Option C *Ascension Franklin (via S. 27th Street)*	●

Source: SEWRPC

Congestion Evaluation

The majority of the selected route alternative would include dedicated transit lanes. Dedicated transit lanes, combined with traffic signal prioritization, significantly reduce travel time by allowing transit vehicles to move largely unimpeded by traffic congestion on the rest of the roadway. Most of the route segment options under consideration would require converting an existing shared travel lane to a transit-only lane, although some segments include a parking lane that could be converted. The congestion evaluation provides a high-level qualitative analysis to help identify where it would be most feasible to add a transit-only lane without creating significant traffic issues for non-transit vehicles. Note that North Option 4 (Original Brown Deer Village to Lisbon Avenue via the 30th Street rail corridor) is not included in the congestion analysis since the route segment option would not be impacted by traffic congestion.

Traffic operations are measured using a grading system called Level of Service (LOS), which rates how a roadway is performing in terms of traffic congestion. The grading system uses A (no congestion) through F (extreme congestion) to describe how traffic is flowing and the roadway is operating. Table 4.5 shows the characteristics of each LOS grade. Map 4.1 shows the current 24-hour LOS on arterial streets on the route segment options under consideration.

Table 4.5
Surface Arterial Traffic Level of Service Definitions

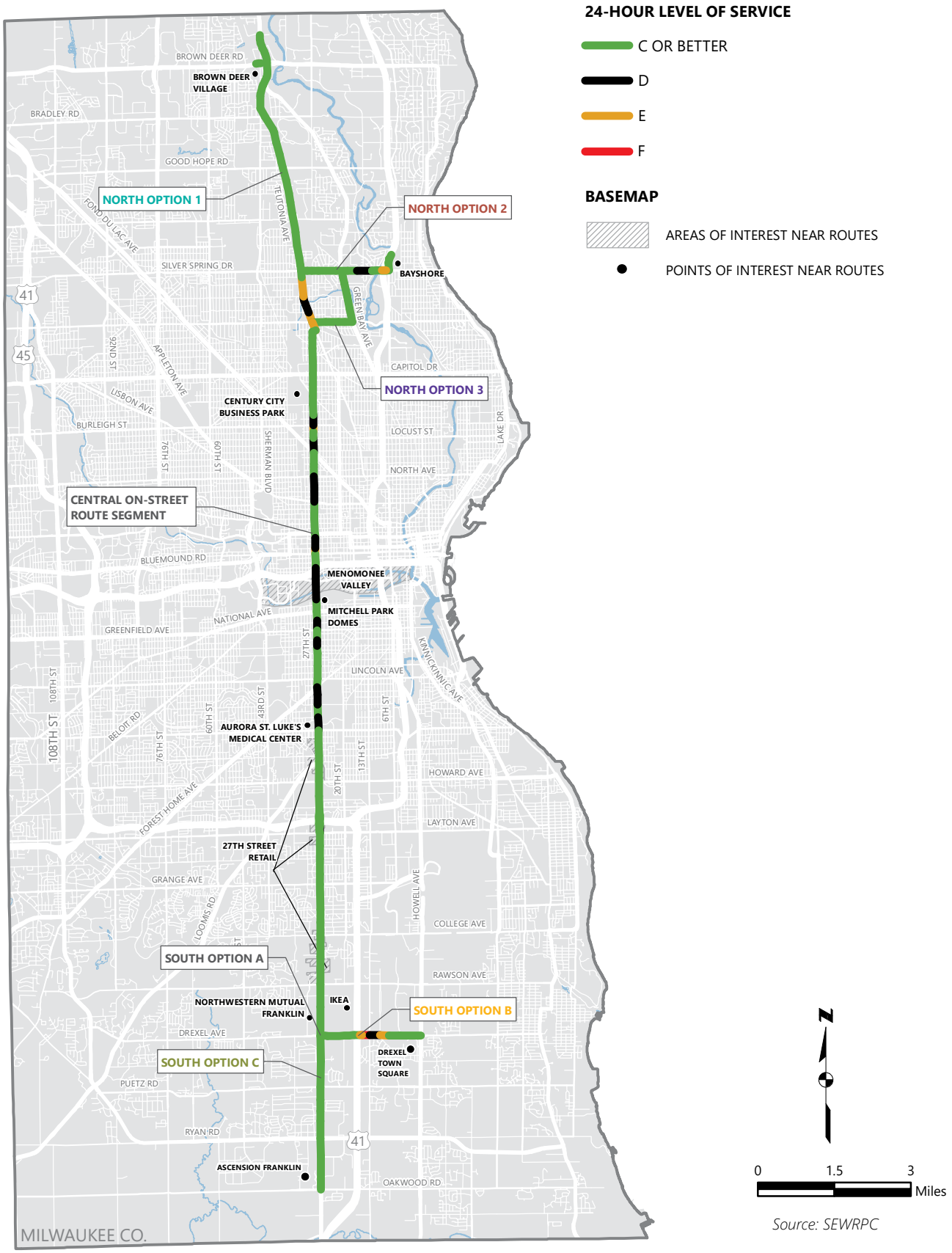
Level of Traffic Congestion	Level of Service	Average Speed	Operating Conditions
None	A and B	70 to 100 percent of free-flow speed	Ability to maneuver within traffic stream is unimpeded. Control delay at signalized intersections is minimal.
None	C	50 to 100 percent of free-flow speed	Restricted ability to maneuver and change lanes at mid-block locations.
Moderate	D	40 to 50 percent of free-flow speed	Restricted ability to maneuver and change lanes. Small increases in flow lead to substantial increases in delay and decreases in travel speed.
Severe	E	33 to 40 percent of free-flow speed	Significant restrictions on lane changes. Traffic flow approaches instability.
Extreme	F	25 to 33 percent of free-flow speed	Flow at extremely low speeds. Intersection congestion with high delays, high volumes, and extensive queuing.

Source: SEWRPC

The results of the congestion evaluation for both arterial streets and intersections are shown in Table 4.6. Congestion on route alternatives is rated as either green, yellow, or red, with green being a segment option with little to no congestion issues, yellow being a segment option with moderate congestion issues, and red being a segment option with extreme congestion issues. Most arterial street segments along the route alternatives have little to moderate congestion issues, with only very short segments rated as having severe (LOS E) congestion. Arterial street segments with severe congestion are located along Teutonia Avenue between Hampton Avenue and Silver Spring Drive (North Options 1 and 2); on Silver Spring Drive near the I-43 ramps (North Options 2 and 3); and along Drexel Avenue near S. 13th Street and the I-94 ramps (South Option B).

A review for critical intersections—intersections where there is consistently higher congestion and/or delays for drivers—along the route segment options was also completed. Operation of BRT, which could include geometric changes to intersections and changes to lane assignment or traffic signal operations, could be more challenging in these locations. At least one critical intersection was identified along each route segment option with fewer critical intersections on the far north and south ends of the corridor. The Tier 2 Evaluation will further evaluate intersection operations to better understand impacts based on proposed changes and, where possible, recommend options to mitigate issues.

Map 4.1
Level of Service on Arterial Streets on Route Segment Options



Source: SEWRPC

Table 4.6
Congestion Evaluation by Route Segment Option

Route Segment Option	Arterial Streets Congestion Evaluation
North Option 1 *Brown Deer Village via Teutonia Avenue*	🟡
North Option 2 *Bayshore via Teutonia Avenue, Silver Spring Drive and Port Washington Road*	🟡
North Option 3 *Bayshore via Hampton Avenue, Green Bay Avenue, Silver Spring Drive, and Port Washington Road*	🟡
North Option 4 *Original Brown Deer Village via 30th Street rail corridor (to Lisbon Avenue)*	🟢
Central Segment *27th Street from Drexel Avenue to Lisbon Avenue*	🟢
South Option A *Northwestern Mutual Franklin Campus*	🟢
South Option B *Drexel Town Square (via Drexel Avenue)*	🟡
South Option C *Ascension Franklin (via S. 27th Street)*	🟢

Source: SEWRPC

Accessibility Evaluation

While a detailed ridership forecast will be completed in the Tier 2 Evaluation of this study, a high-level accessibility evaluation can help to understand which route segment options under consideration would serve the most people and provide access to the most jobs—likely resulting in higher ridership and a greater public benefit. Since the length of the route alternative also impacts accessibility, population and employment are reported as a total amount and per route-mile for each route segment option. Table 4.7 shows population and employment accessibility for each of the route segment options.

Table 4.7
Population and Employment Accessibility Within 0.5 Miles of Route Segment Options

Route Segment Options	Length (miles)	Total Population	Population per Route-Mile	Total Employment	Employment per Route-Mile
North Option 1 *Brown Deer Village via Teutonia Avenue*	8.9	50,952	5,725	24,680	2,773
North Option 2 *Bayshore via Teutonia Avenue, Silver Spring Drive and Port Washington Road*	6.5	44,277	6,812	19,739	3,037
North Option 3 *Bayshore via Hampton Avenue, Green Bay Avenue, Silver Spring Drive, and Port Washington Road*	6.4	41,921	6,550	18,581	2,903
North Option 4 *Original Brown Deer Village via 30th Street rail corridor (to Lisbon Avenue)*	9.0	51,116	5,680	27,241	3,027
Central Segment *27th Street from Drexel Avenue to Lisbon Avenue*	10.5	80,073	7,626	33,206	3,162
South Option A *Northwestern Mutual Franklin Campus*	--	--	--	--	--
South Option B *Drexel Town Square (via Drexel Avenue)*	2.2	4,008	1,822	4,121	1,873
South Option C *Ascension Franklin (via S. 27th Street)*	2.8	4,173	1,490	4,263	1,523

Source: SEWRPC

In addition to total population and employment, this evaluation also includes a review of the population demographics near each route option, to help understand which route segment option would best address the project need to improve access for underserved populations—specifically people without access to a car, families in poverty, people of color, and people with disabilities. Table 4.8 shows the underserved populations that would be served by each route segment option. Data is not provided for South Option A because the people and jobs served by this route segment option will also be served by the Central Segment option; therefore, the data is included in those totals.

Table 4.8
Underserved Populations Within 0.5 Miles of Route Alternatives as a Percentage of Total Population

	Households Without Access to a Car		Families in Poverty		Non-White or of Hispanic Origin Population		People with a Disability	
Route Segment Options	Number per Route-Mile	Percent of Total	Number per Route-Mile	Percent of Total	Number per Route-Mile	Percent of Total	Number per Route-Mile	Percent of Total
North Option 1 *Brown Deer Village via Teutonia Avenue*	500	24.2	722	34.9	5,067	88.5	870	15.2
North Option 2 *Bayshore via Teutonia Avenue, Silver Spring Drive and Port Washington Road*	638	26.4	877	36.3	6,081	87.9	1,063	15.6
North Option 3 *Bayshore via Hampton Avenue, Green Bay Avenue, Silver Spring Drive, and Port Washington Road*	596	25.6	836	35.9	5,790	88.4	1,035	15.8
North Option 4 *Original Brown Deer Village via 30th Street rail corridor (to Lisbon Avenue)*	530	24.7	691	32.2	4,930	86.8	818	14.4
Central Segment *27th Street from Drexel Avenue to Lisbon Avenue*	567	21.2	771	28.8	5,262	69.0	1,098	14.4
South Option A *Northwestern Mutual Franklin Campus*	--	--	--	--	--	--	--	--
South Option B *Drexel Town Square (via Drexel Avenue)*	45	5.5	45	5.5	408	22.4	179	9.3
South Option C *Ascension Franklin (via S. 27th Street)*	43	5.5	20	2.5	408	27.4	159	10.7

Source: SEWRPC

The factors reviewed for the accessibility evaluation reveal some limited differentiation among the north options, with North Option 2 providing somewhat more access by people per route-mile than North Option 3, and substantially more than North Options 1 or 4. However, all northern options provide somewhat similar access to jobs per route-mile, with North Option 2 providing the most access by a slight margin. South Option B and C both provide relatively low access by people or jobs per route-mile compared to the north options and the central segments, but South Option B does perform slightly better on both measures than South Option C. Across all options, the longest options in the north and south provide the most access to people and jobs.

Results for the evaluation of underserved populations are mixed, with similar results among the four northern options and among the four southern options. However, significantly higher percentages of underserved populations live near the northern route segment options when compared to southern route segment options. Among the north segment options North Option 2 would provide access to the greatest number of underserved populations per route-mile. Among the southern segment options, South Option B would provide access to the greatest number of underserved populations per route-mile. The accessibility of the north and south options is ranked in Table 4.9 with 1 representing the segments that would provide the greatest access per route mile on each end of the corridor.

Table 4.9
Accessibility Evaluation: Ranking and Evaluation of the North and South Segment Options

Route Segment Options	Population and Jobs per Route-Mile	Total Underserved Population per Route-Mile	Accessibility Evaluation
North Option 1 *Brown Deer Village via Teutonia Avenue*	4	3	🟡
North Option 2 *Bayshore via Teutonia Avenue, Silver Spring Drive and Port Washington Road*	1	1	🟢
North Option 3 *Bayshore via Hampton Avenue, Green Bay Avenue, Silver Spring Drive, and Port Washington Road*	2	2	🟡
North Option 4 *Original Brown Deer Village via 30th Street rail corridor (to Lisbon Avenue)*	3	4	🟡
Central Segment *27th Street from Drexel Avenue to Lisbon Avenue*	--	--	🟢
South Option A *Northwestern Mutual Franklin Campus*	--	--	🟢
South Option B *Drexel Town Square (via Drexel Avenue)*	1	1	🟢
South Option C *Ascension Franklin (via S. 27th Street)*	2	2	🟡

Source: SEWRPC

Environmental Impacts

For each of the route segment options described above, the presence of natural resources, adjacent to each route segment option, are listed in Table 4.10. These natural resources include natural areas, such as primary and secondary environmental corridors, parkland, and waterways.

However, since the BRT route segment options under consideration are confined to construction within the curb-to-curb roadway or rail right-of-way, the impacts to these resources would be minimal, if any. The route segment options under consideration for BRT would not impact the environmental resources, described above. Therefore, all BRT route segment options are rated as green, as shown in Table 4.11.

Approximate station locations will be determined in the Tier 2 Evaluation; however, detailed station siting will occur during the design and engineering phase of this project. At that time, potential impacts to the natural environment and cultural resources will be evaluated. If it is determined in later phases of the project that the route options would be built out beyond the curb-to-curb street or rail right-of-way, or if more investigation is required for the street or rail route segment options, any impacts to these resources would be studied in more detail as part of the federal, National Environmental Policy Act (NEPA) documentation process which would take place after completion of this feasibility study.

Table 4.10
Environmental Resources near Route Segment Options

Route Segment Options	Environmental Resources Present	Type of Environmental Resource
North Option 1 *Brown Deer Village via Teutonia Avenue*	Lincoln Creek Parkway Lincoln Creek Smith Park Brown Deer Park Brown Deer Golf Course Oak Leaf Trail Meaux Park	Parkland Water (Secondary Environmental Corridor) Parkland Parkland Parkland Parkland Parkland
North Option 2 *Bayshore via Teutonia Avenue, Silver Spring Drive and Port Washington Road*	Lincoln Creek Parkway Lincoln Creek Smith Park Milwaukee River Parkway Oak Leaf Trail Milwaukee River	Parkland Water (Secondary Environmental Corridor) Parkland Parkland Parkland Water (Secondary Environmental Corridor)
North Option 3 *Bayshore via Hampton Avenue, Green Bay Ave, Silver Spring Drive, and Port Washington Road*	Lincoln Creek Parkway Lincoln Creek Lincoln Park Lincoln Park Golf Course Oak Leaf Trail Meaux Park Milwaukee River Milwaukee River Parkway	Water (Secondary Environmental Corridor) Parkland Parkland Parkland Parkland Parkland Water (Secondary Environmental Corridor) Parkland
North Option 4 *Original Brown Deer Village via 30th Street rail corridor (to Lisbon Avenue)*	Green Tech Station Lincoln Creek Oak Leaf Trail Brown Deer Park Brown Deer Golf Course	Parkland Water (Secondary Environmental Corridor) Parkland Parkland Parkland
Central Segment *27th Street from Drexel Avenue to Hampton Avenue*	Tiefenthaler Park Menomonee River (below 27th Street viaduct) Menomonee River Parkway Hank Aaron State Trail Mitchell Park Horticultural Conservatory (Domes) Kinnickinnic River Kinnickinnic River Parkway Wilson Creek	Parkland Water (Primary Environmental Corridor) Parkland Parkland Parkland Water (Secondary Environmental Corridor) Parkland Water
South Option A *Northwestern Mutual Franklin Campus*	None	
South Option B *Drexel Town Square (via Drexel Avenue)*	Drexel Connector Trail Oak Creek	Trail Water (Secondary Environmental Corridor)
South Option C *Ascension Franklin (via S. 27th Street)*	Forested Area South of Drexel	Secondary Environmental Corridor

Source: SEWRPC

Table 4.11
Results of Environmental Resources by Route Segment Option

Route Segment Options	Potential Impacts to Environmental Resources
North Option 1 *Brown Deer Village via Teutonia Avenue*	●
North Option 2 *Bayshore via Teutonia Avenue, Silver Spring Drive and Port Washington Road*	●
North Option 3 *Bayshore via Hampton Avenue, Green Bay Avenue, Silver Spring Drive, and Port Washington Road*	●
North Option 4 *Original Brown Deer Village via 30th Street rail corridor (to Lisbon Avenue)*	●
Central Segment *27th Street from Drexel Avenue to Lisbon Avenue*	●
South Option A *Northwestern Mutual Franklin Campus*	●
South Option B *Drexel Town Square (via Drexel Avenue)*	●
South Option C *Ascension Franklin (via S. 27th Street)*	●

Source: SEWRPC

Corridor Character

Most of the study area and the BRT route segment options under consideration are served by the existing PurpleLine bus service except north of W. Silver Spring Drive, south of W. Drexel Avenue, and the 30th Street rail corridor. The character of the study area would not be affected with the change from regular bus service vehicles to bus rapid transit vehicles. However, a change in traffic patterns by reduction in vehicle travel lanes and/or fewer parking lanes would result from the dedicated transit lane and the addition of enhanced stations. These changes would not affect the character of the PurpleLine corridor. Adding bus or BRT service to the portions of the study area that do not currently have bus service or bus stops would result in a change in character to these areas that typically, with larger lots sizes and agricultural and open lands, would not support transit service.

The regional long-range land use and transportation plan, VISION 2050, recommends future rapid transit, such as BRT or light rail service with the usage of transit signal prioritization, and express bus service in parts of the study area where the land use, demographics, and employment are supportive of transit development. Rapid transit is recommended on 27th Street, south of W. Silver Spring Drive and north of W. Drexel Avenue, and express bus is recommended on 27th Street north of W. Forest Home Avenue, including north of W. Silver Spring Drive, in the study area. In Table 4.12, the route segment options that are currently served by the PurpleLine and are recommended for rapid transit in 2050 have been designated as green, the route segment options that are recommended for express bus routes in VISION 2050 are designated as yellow, and the route segment options that do not currently have bus service and are not recommended for either rapid transit or express bus service in VISION 2050 have been designated as red.

Table 4.12
Results of Corridor Character by Route Segment Option

Route Segment Options	Consistency with Existing and Planned Corridor Character
North Option 1 *Brown Deer Village via Teutonia Avenue*	🟡
North Option 2 *Bayshore via Teutonia Avenue, Silver Spring Drive and Port Washington Road*	🟢
North Option 3 *Bayshore via Hampton Avenue, Green Bay Avenue, Silver Spring Drive, and Port Washington Road*	🟡
North Option 4 *Original Brown Deer Village via 30th Street rail corridor (to Lisbon Avenue)*	🔴
Central Segment *27th Street from Drexel Avenue to Lisbon Avenue*	🟢
South Option A *Northwestern Mutual Franklin Campus*	🟢
South Option B *Drexel Town Square (via Drexel Avenue)*	🟢
South Option C *Ascension Franklin (via S. 27th Street)*	🔴

Source: SEWRPC

4.3 SUMMARY OF ROUTE ALTERNATIVE EVALUATION

Table 4.13 provides a summary of the results of all evaluations for the route segment options under consideration.

As a result of the evaluation, the following route segment options are recommended to advance to the Tier 2 Evaluation:

- North Option 1 (Original Brown Deer Village via Teutonia Avenue)[5]
- North Option 2 (Bayshore via Teutonia Avenue and Silver Spring Drive)
- Central Segment (27th Street from Drexel Avenue to Lisbon Avenue)
- South Option A (Northwestern Mutual Franklin Campus)
- South Option B (Drexel Town Square via Drexel Avenue)
- South Option C (Ascension Franklin via S. 27th Street)[6]

[5] *North Option 1 may be further evaluated as part of an open BRT model that would be paired with North Option 2. More details about an open BRT model are included in Chapter 6.*

[6] *South Option C may be further evaluated as part of an open BRT model that would be paired with South Option B. More details about an open BRT model are included in Chapter 6.*

Table 4.13
Summary of Route Segment Option Evaluation

Route Segment Options	Segment Characteristics	Congestion	Accessibility	Environmental Impacts	Consistency with Corridor Character
North Option 1 *Brown Deer Village via Teutonia Avenue*	🔴	🟡	🟡	🟢	🟡
North Option 2 *Bayshore via Teutonia Avenue, Silver Spring Drive and Port Washington Road*	🟢	🟡	🟢	🟢	🟢
North Option 3 *Bayshore via Hampton Avenue, Green Bay Avenue, Silver Spring Drive, and Port Washington Road*	🟡	🟡	🟡	🟢	🟡
North Option 4 *Original Brown Deer Village via 30th Street rail corridor (to Lisbon Avenue)*	🔴	🟢	🟡	🟢	🔴
Central Segment *27th Street from Drexel Avenue to Lisbon Avenue*	🟢	🟢	🟢	🟢	🟢
South Option A *Northwestern Mutual Franklin Campus*	🟢	🟢	🟢	🟢	🟢
South Option B *Drexel Town Square (via Drexel Avenue)*	🟢	🟡	🟢	🟢	🟢
South Option C *Ascension Franklin (via S. 27th Street)*	🔴	🟢	🟡	🟢	🟡

Source: SEWRPC

5 PUBLIC AND STAKEHOLDER INPUT

The study team used a series of strategies to share information and gather feedback for this segment of the study, including:

- **Technical and Community Advisory Groups:** The Community Advisory Committee (CAC) and the Technical Advisory Committee (TAC) provided oversight and advised project staff by reviewing documents and materials and provided input throughout the different phases of the study. An American Sign Language (ASL) interpreter was provided for the CAC meetings.

- **Community Partners:** In May 2021, SEWRPC initiated a partnership with community- and neighborhood-based organizations who have a longstanding presence in underserved neighborhoods in the corridor. Through an agreement that included payment for services, the community partners assisted with the study team in providing outreach along and near 27th Street. Fact sheets, surveys, and information sheets that Community Partners helped to distribute were provided in both English and Spanish.

- **Stakeholder Outreach:** In addition to members of the TAC and CAC, the study team held several individual and group meetings with key stakeholders to focus on issues of specific concern.

- **Project Website:** Throughout the duration of the study, a project website (mkenorthsouth.com) was maintained and frequently updated. The website was used as an information hub for the study and was utilized heavily during each round of public involvement to both share and gather information. The project website was also available in Spanish.

- **Rounds 1 and 2 of Public Involvement:** Research and analysis for the study was grouped into three phases, each of which included a round of public involvement, giving stakeholders and the public an opportunity to review progress and provide input that then informed the subsequent phases of the study. Materials that impacted the Tier 1 Evaluation were reviewed with the public and received substantial public comment during the first round of public involvement, and the Tier 1 Evaluation was the focus of the second round of public involvement. Each round of public involvement included public meetings and web-based public involvement opportunities. Where applicable, Community Partners, the CAC, and the TAC provided outreach assistance. Spanish and American Sign Language (ASL) interpretation services were available for all public involvement meetings, and a Spanish-only meeting was provided for the second round of public involvement. A third round of public involvement took place after this Tier 1 Evaluation was complete.

5.1 SUMMARY OF PUBLIC AND STAKEHOLDER INVOLVEMENT AND FEEDBACK

Feedback collected through all the public involvement strategies described above was taken into consideration for this Tier 1 Evaluation. A detailed review and summary of public and stakeholder involvement is provided in the Public Involvement Summary for this study. A high-level summary is provided below.

Technical and Community Advisory Groups

The TAC and the CAC met first in January 2021 and then a second time in June 2021 to review preliminary materials to be shared with the public regarding transit technologies and route alternatives during the second round of public involvement. The TAC and CAC are scheduled to meet at least one more time to discuss recommendations from this Tier 1 Evaluation.

Community Partners

Community partners conducted a bus stop survey in June 2021, which asked questions about how people are using the existing PurpleLine bus service and what improvements they would like to see. Of the nearly

1,500 surveys that were distributed, 479 responses were received. Key findings from the survey are listed below:

- The most common trip purposes for using transit in this corridor by respondents were to get to work (69%) and to go shopping (53%)

- 91% of survey respondents use the bus as their main form of transportation

- The top three features that respondents would like to see in an enhanced transit service are faster travel times (56%), better frequency (40%), and on-board Wi-Fi service (35%)

- The top three features that respondents would like to see in enhanced transit stations are all-weather stops/stations (heated, rain cover) (54%), safety call boxes at the stations (35%), and lighting at stations (32%)

- When asked what the top three most important places were in the corridor, the most common responses were to transfer to a connecting route (on Capitol Drive, National Avenue, Wisconsin Avenue, and Oklahoma Avenue); retail, including Walmart, Family Dollar, Kilbourn Supermarket, Walgreens, etc.; and local businesses including Daddy's Soul Food, banks, and daycares

- 52% of respondents accessed transit on 27th Street by transferring from another route, and 22% walked less than one block

In addition to conducting the bus stop survey, Community Partners also helped share information about the public meetings through email, social media, and via mail drops in the corridor.

Stakeholder Outreach

Prior to the Tier 1 Evaluation, the study team had completed 44 stakeholder meetings—some with individuals, such as local elected officials, and some with stakeholder groups, such as neighborhood organizations.

Project Website

The project website has provided the main conduit for connecting stakeholders and the public with information about the study, public meetings, and providing a 24/7 opportunity to review materials and provide feedback. After the second round of public meetings, the website also included a series of short surveys geared toward sharing information and providing feedback about transit technologies and route alternatives. Feedback received is included in the summary of public involvement below.

Round 2 of Public Involvement

The second of three rounds of public involvement for this study specifically focused on sharing information and gathering feedback about transit technologies and route alternatives under consideration, to serve as input to the Tier 1 Evaluation. This round consisted of three virtual meetings (including one entirely in Spanish) in late June 2021, an interactive web map where participants could provide comments on route alternatives and potential station locations, and a series of short web surveys, which were available after the meetings along with all meeting materials and recordings of the meetings. Themes from public comments on the three main meeting topics (transit technologies, route alternatives, and station locations) are provided below. Although station locations are not part of the Tier 1 Evaluation, feedback will help inform the Tier 2 and Tier 3 Evaluations.

Approximately 62 people responded to the online surveys and 67 people registered for the virtual meetings.

Transit Technologies

Responses from online forms:

- Vehicle or service characteristics participants most wanted to see were transit-only lanes (44%), faster travel times (39%), the ability to bring bikes on-board (38%), and better frequency (38%)

- When asked to rate based on a scale from 1-5 stars how well each of the transit technologies being considered fit in the corridor, responses were similar with BRT averaging 3.8 stars, rapid streetcar averaging 3.6 stars, and light rail averaging 3.5 stars.

Themes from open-ended comments from the meetings and other formats:

- More support for light rail or rapid streetcar

Route Alternatives

Responses from online forms:

- Participants were asked which north and south route segment option they would most like to see for the enhanced transit route. Responses are provided below:
  - North Options:
    - North Option 4 (Original Brown Deer Village via 30th Street rail corridor (to Lisbon Ave) [16]
    - North Option 1 (Brown Deer Village via Teutonia Avenue) [11]
    - North Option 2 (Bayshore via Teutonia Avenue and Silver Spring Drive) [6]
    - North Option 3 (Bayshore via Hampton Avenue, Green Bay Ave, Silver Spring Drive, and Port Washington Road) [3]
  - South Options:
    - South Option B (Drexel Town Square via Drexel Avenue) [23]
    - South Option C (Ascension Franklin via S. 27th Street) [10]
    - South Option A (Northwestern Mutual Franklin Campus) [4]

Themes from open-ended comments from the meetings and other formats:

- Support for route that utilizes 30th Street rail corridor

- Support for an option that would serve Drexel Town Square

Station Locations

Responses from online forms:

- Participants were asked which features they would like to see at stations. Responses are provided below:
  - Off-board payment [30]
  - Lighting [28]
  - Level boarding [28]
  - Safety call box [23]

- Participants were asked how far they would be willing to walk to or from a transit station. Responses are provided below:
  - 3-6 blocks [58%]
  - 6-9 blocks [29%]
  - 1-3 blocks [13%]

Themes from open-ended comments from the meetings and other formats:

- Support for suggested station spacing at 1/4 to 1/2 miles [6]

- Concern about access for people with disabilities if stations are spaced too far apart [3]

- Suggestion that stations should be connected to sidewalks and on pedestrian-friendly routes and close to building entrances, when possible [3]

RECOMMENDATIONS 6

The evaluations that were performed in previous chapters were based on a two-phased approach to identify transit enhancement recommendations for the study corridor. First, transit technology types were evaluated, followed by the recommended route segment options for the recommended transit technology type. The following sections describe the recommendations.

6.1 TRANSIT TECHNOLOGIES RECOMMENDED FOR FURTHER STUDY

Table 6.1 shows the results of the transit technology evaluation in Chapter 3, where BRT is rated as the recommended transit technology that is most compatible with the study corridor.

As noted in Chapter 5, light rail and rapid streetcar had some public support for their implementation in the study corridor, but the analysis showed that BRT is the best option at this time. If transit funding in the region would increase and light rail or rapid streetcar became financially viable, this study corridor would be considered along with other corridors to determine the most appropriate and cost-effective route to implement light rail in the region.

6.2 ROUTE SEGMENT OPTIONS RECOMMENDED FOR FURTHER STUDY

Table 6.2 shows the results of the route option evaluation in Chapter 4, indicating which BRT route options are rated as most compatible for the study corridor and recommended to be further evaluated in the Tier 2 Evaluation.

Based on the results of the BRT route option evaluation, the following route segment options are recommended to advance to the Tier 2 Evaluation (shown in Map 6.1):

- North Option 1 (Original Brown Deer Village via Teutonia Avenue)
- North Option 2 (Bayshore via Teutonia Avenue and Silver Spring Drive)
- Central Segment (27th Street from Drexel Avenue to Lisbon Avenue)
- South Option A (Northwestern Mutual Franklin Campus)
- South Option B (Drexel Town Square via Drexel Avenue)
- South Option C (Ascension Franklin via S. 27th Street)

As previously noted, the no-build (the existing MCTS PurpleLine), will be carried forward into the subsequent phases of this study as a basis for comparison.

Regarding the northern route alternatives, North Option 2 resulted in the most favorable evaluation among the factors considered in this analysis, offering a direct route to Bayshore, serving the greatest number of people and jobs per route-mile, among other factors, and will be carried forward for further evaluation. North Option 1 will also be evaluated further, potentially as part of an open BRT model that would be paired with North Option 2. An open BRT system would provide periodic service to the multiple destinations in the corridor by allowing buses to continue off the end of the primary BRT route. This system could be advantageous to allow the transit enhancement to serve both Bayshore and the Original Brown Deer Village neighborhood and nearby commercial area during different periods of the day. Like North Option 2, North Option 1 also serves a significant number of people and jobs, however existing land use and roadway characteristics are less conducive to transit. More detailed ridership forecasts will be developed as part of the Tier 2 Evaluation, which will help to better understand the effect of extending the route to Brown Deer.

Table 6.1
Transit Technology Evaluation Results

Technology Type	Typical Capacity (Right Sized Mode)	Typical Service Characteristics	Environmental Characteristics	Potential to Catalyze Development	Consistency with Corridor Character	Consistency with Local and Regional Plans	Typical per Mile Capital Cost	Advance to Tier 2 Evaluation?
Bus Rapid Transit	🟢	🟢	🟡	🟡	🟢	🟢	🟢	**YES**
Light Rail	🔴	🟢	🟡	🟢	🔴	🟡	🔴	**NO**
Rapid Streetcar	🟡	🟢	🟡	🟢	🟡	🟡	🟡	**NO**

Source: SEWRPC

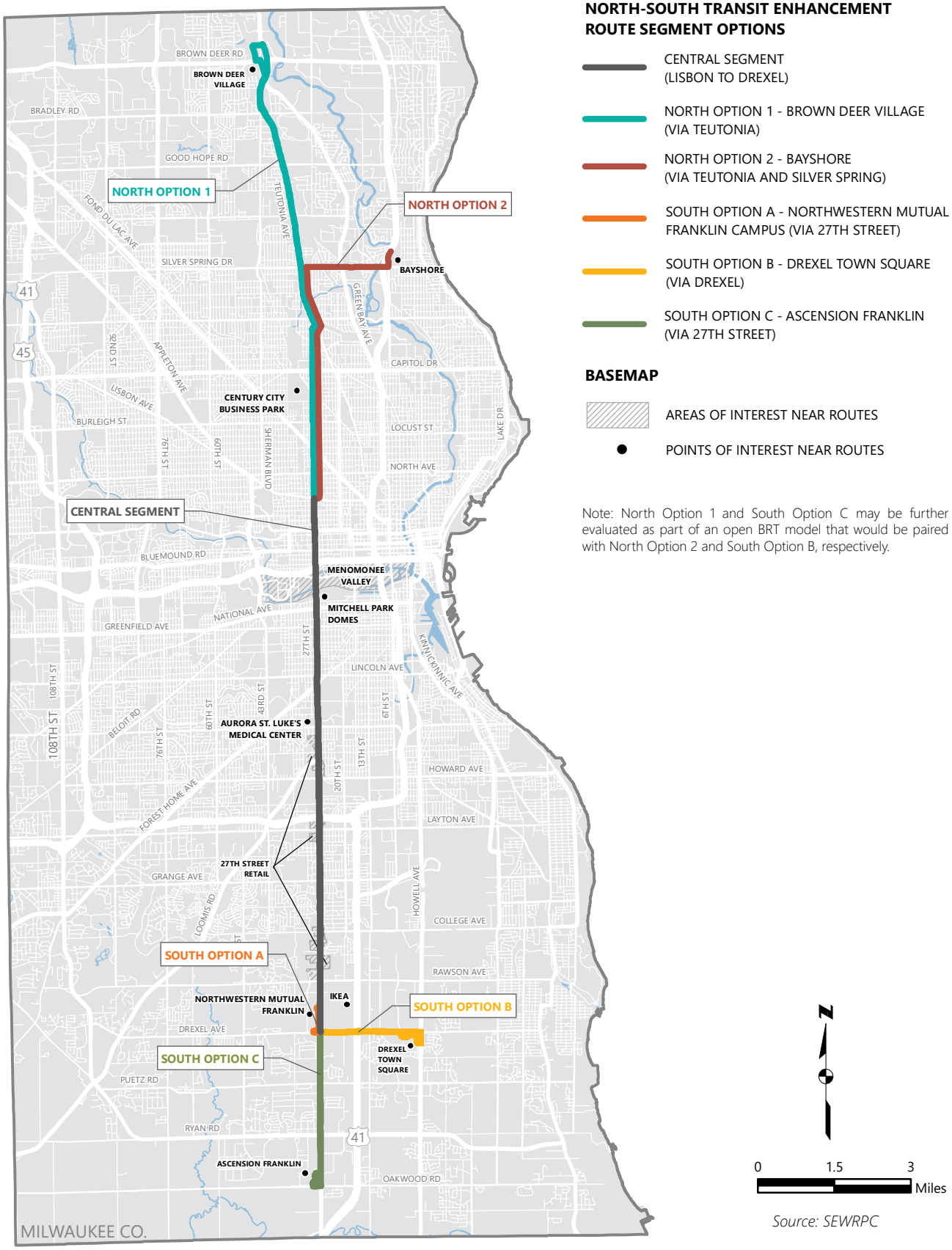
Table 6.2
Summary of Route Segment Option Evaluation

Route Segment Options	Segment Characteristics	Congestion	Accessibility	Environmental Impacts	Consistency with Corridor Character	Advance to Tier 2 Evaluation?
North Option 1 *Brown Deer Village via Teutonia Avenue*	🔴	🟡	🟡	🟢	🟡	**YES[a]**
North Option 2 *Bayshore via Teutonia Avenue, Silver Spring Drive and Port Washington Road*	🟢	🟡	🟢	🟢	🟢	**YES**
North Option 3 *Bayshore via Hampton Avenue, Green Bay Avenue, Silver Spring Drive, and Port Washington Road*	🟡	🟡	🟡	🟢	🟡	**NO**
North Option 4 *Original Brown Deer Village via 30th Street rail corridor (to Lisbon Avenue)*	🔴	🟢	🟡	🟢	🔴	**NO**
Central Segment *27th Street from Drexel Avenue to Lisbon Avenue*	🟢	🟢	🟢	🟢	🟢	**YES**
South Option A *Northwestern Mutual Franklin Campus*	🟢	🟢	🟢	🟢	🟢	**YES**
South Option B *Drexel Town Square (via Drexel Avenue)*	🟢	🟡	🟢	🟢	🟢	**YES**
South Option C *Ascension Franklin (via S. 27th Street)*	🔴	🟢	🟡	🟢	🟡	**YES[a]**

[a] *North Option 1 and South Option C may be further evaluated as part of an open BRT model that would be paired with North Option 2 and South Option B, respectively.*

Source: SEWRPC

Map 6.1
Updated Route Segment Options



NORTH-SOUTH TRANSIT ENHANCEMENT ROUTE SEGMENT OPTIONS

- CENTRAL SEGMENT (LISBON TO DREXEL)
- NORTH OPTION 1 - BROWN DEER VILLAGE (VIA TEUTONIA)
- NORTH OPTION 2 - BAYSHORE (VIA TEUTONIA AND SILVER SPRING)
- SOUTH OPTION A - NORTHWESTERN MUTUAL FRANKLIN CAMPUS (VIA 27TH STREET)
- SOUTH OPTION B - DREXEL TOWN SQUARE (VIA DREXEL)
- SOUTH OPTION C - ASCENSION FRANKLIN (VIA 27TH STREET)

BASEMAP

- AREAS OF INTEREST NEAR ROUTES
- POINTS OF INTEREST NEAR ROUTES

Note: North Option 1 and South Option C may be further evaluated as part of an open BRT model that would be paired with North Option 2 and South Option B, respectively.

N

0 1.5 3 Miles

Source: SEWRPC

North Option 3 and North Option 4 were eliminated with this evaluation. North Option 3 will not be considered for further evaluation because North Option 2 offers a more direct route to Bayshore while also providing transit access to more people and jobs. Implementing BRT on North Option 4—in a transitway along the 30th Street rail corridor—would pose significant challenges, most notably the increased cost and complexity associated with constructing a new transitway with a ramp to connect the transitway to Lisbon Avenue, and the engineering and construction costs associated with additional structures, including more complex stations, that may be necessary. In addition, pursuing North Option 4 as part of this project may limit the ability of the 30th Street rail corridor to host a planned bike trail and future commuter/regional rail service, as right-of-way needed for those transportation investments would be consumed by a paved transitway. Appendix A provides a preliminary analysis of the types and level of investment required to utilize that corridor for more cost-effective passenger rail services than those considered as part of this Tier 1 Evaluation. Separate planning efforts are underway to advance the implementation of a multi-use path in that corridor.

Regarding the southern route segment options, all three options are being carried forward to the Tier 2 analysis, with a recommendation that South Option C (Ascension Franklin via S. 27th Street) potentially be considered as a leg of an open BRT system if such a model is recommended in the more detailed Tier 2 Evaluation. This system could be advantageous to allow the transit enhancement to serve both Drexel Town Square and Ascension Hospital during different periods of the day, without significant cost increases as stations would be limited, and dedicated lanes may not be necessary in these locations.

The recommended BRT route segment options for the study corridor will be further evaluated for future ridership, transit service plan development, and cost estimates as part of the Tier 2 Evaluation, which may include further elimination of routes. Those alternatives that remain after the Tier 2 Evaluation will be refined in the Tier 3 Evaluation of this feasibility study. In later phases of the project, environmental review, preliminary engineering and design, more detailed information, mapping, and surveys will be conducted and considered for the preferred alternative and station locations prior to finalizing design and construction.

APPENDICES

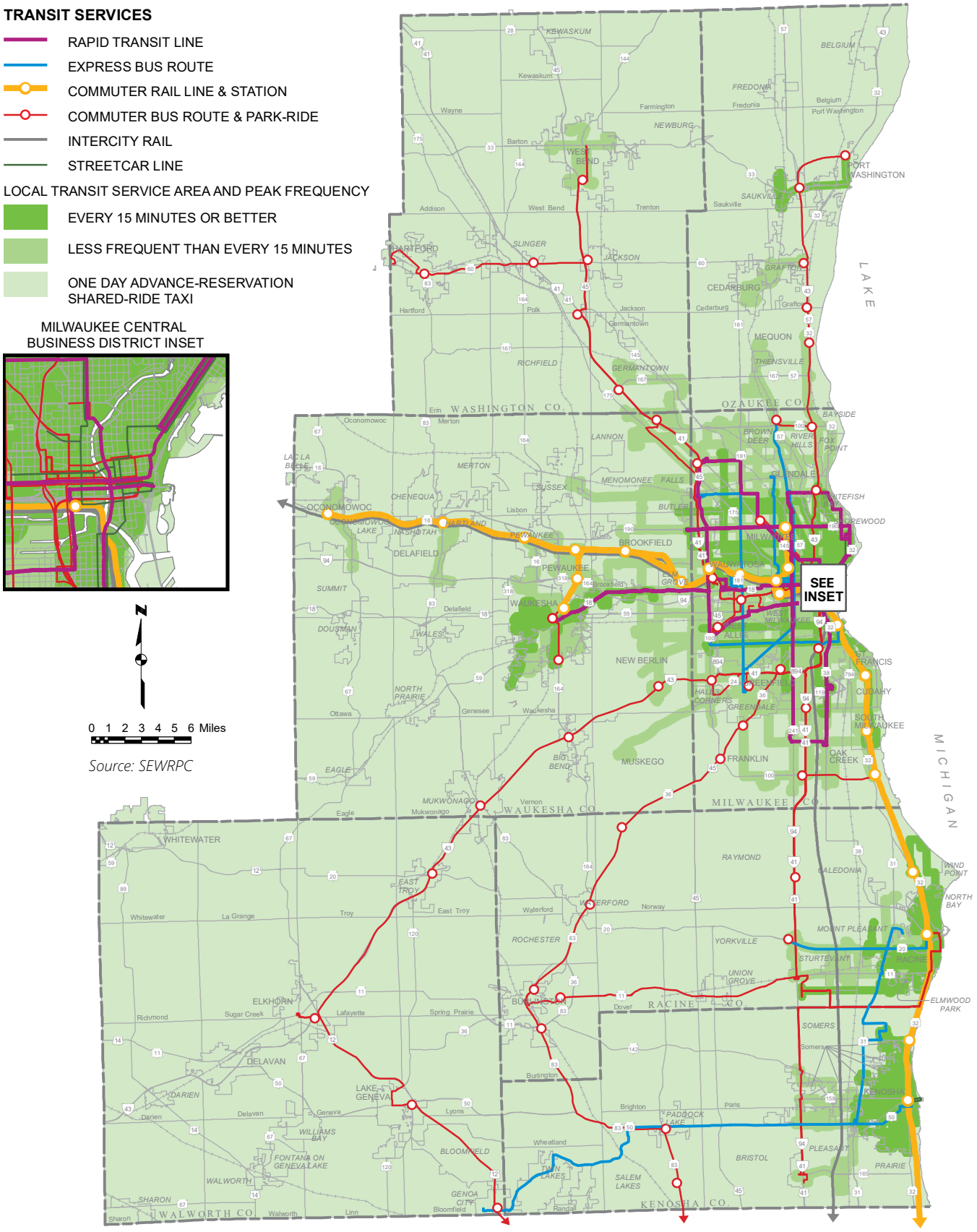
APPENDIX A

A PRIMER ON POTENTIAL COMMUTER RAIL SERVICE IN NORTHERN MILWAUKEE COUNTY

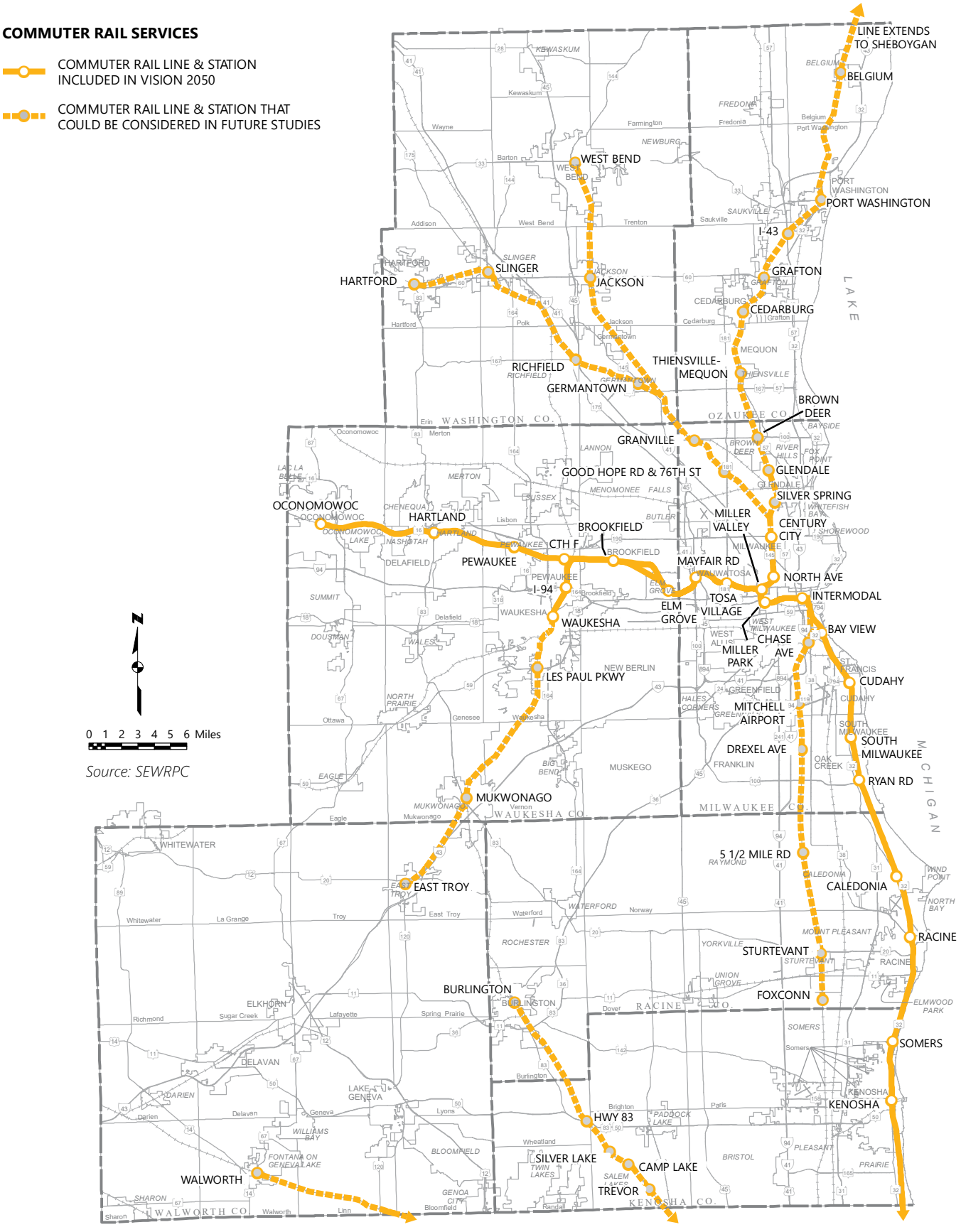
This appendix provides a high-level overview of what would be needed to implement commuter or regional rail service in northern Milwaukee County along and north of the 30th Street rail corridor. As shown in Map A.1, VISION 2050, Southeastern Wisconsin's long-range regional land use and transportation plan, recommends implementing commuter or regional rail service along the 30th Street rail corridor in the City of Milwaukee as part of a longer service that connects through the Milwaukee Intermodal Station (MIS) in downtown Milwaukee to the City of Racine and the City of Kenosha. As shown in Map A.2, VISION 2050 also identifies potential extensions of the recommended commuter rail line—serving northern Milwaukee County, Ozaukee County, and Washington County—that could be considered in future studies.

In recognition of VISION 2050's recommendations and those potential future extensions, early discussions regarding what would become the North-South Transit Enhancement Study (NSTES) included whether to include the rail segment to the City of Milwaukee's northwestern neighborhoods and the rail segment south of Lisbon Avenue connecting to downtown Milwaukee in the study. However, these segments were not formally included for analysis in the NSTES as they are too far from the 27th Street corridor, the County's identified focus area for the NSTES. The Tier 1 analysis for the study did include consideration of utilizing the 30th Street rail corridor between Lisbon Avenue and the Village of Brown Deer for the future north-south transit service, but due to the difficulty in cost-effectively serving both ends of the north-south corridor with one mode (either adapting the 30th Street rail corridor for bus use or adapting 27th Street south of Lisbon Avenue for rail service) resulted in the alternative that utilized the 30th Street rail corridor not proceeding to Tier 2. The Tier 1 analysis concluded that the 30th Street rail corridor should be further considered for transit use as part of a rail transit service that would utilize existing freight rail corridors to the greatest extent possible. This appendix discusses a service (to be studied in more detail as part of a separate effort) that would utilize the existing freight rail corridors in this area for rail transit service.

Map A.1
VISION 2050 Public Transit System



Map A.2
Potential Extension of the Commuter Rail Network: VISION 2050



This appendix provides a high-level overview of the operating characteristics of potential commuter or regional rail service utilizing the corridors between the Village of Brown Deer and/or the City of Milwaukee's northwestern neighborhoods and downtown Milwaukee, the existing condition of the rail corridors that would be used by the service, a description of the types of infrastructure improvements and train equipment that may be required to implement the service, and the potential government and private-sector roles, responsibilities, and funding sources required to implement and operate the service. While this appendix provides a general overview of such a concept, more-detailed feasibility, engineering, and environmental studies would need to be conducted for the full corridor under consideration should there be interest in implementing this service.

POTENTIAL COMMUTER RAIL OPERATING CHARACTERISTICS

As shown in Map A.3, commuter rail service in northern Milwaukee County could be operated with service from the Milwaukee Intermodal Station (MIS) in downtown Milwaukee, continuing west toward American Family Field and then turning north onto the 30th Street rail corridor (30th Street Rail Corridor Segment). Just north of Hampton Avenue, the route could continue north connecting to the Original Brown Deer Village neighborhood in the City of Brown Deer (Brown Deer Route Segment), or the route could continue northwest extending through the City of Milwaukee's far northwest side to Brown Deer Road and N. 107th Street in the Granville neighborhood (Northwest Milwaukee Route Segment). Either the Brown Deer Route Segment or the Northwest Milwaukee Route Segment, or a combination of both route options north of the 30th Street Rail Corridor Segment, could be considered for service in a future study. As Canadian Pacific Railway (CP) and the Wisconsin & Southern Railroad (WSOR) currently operate over these rail lines, the commuter rail service would operate in mixed rail traffic with freight trains.

Station Locations

Commuter rail stations typically are spaced two to five miles apart to facilitate faster travel times and to accommodate the acceleration and deceleration characteristics of commuter trains. However, stations spaced less than two miles apart can be considered. For example, Metra, the commuter rail operator in the Chicago metro area, has stations spaced one mile apart along portions of its network. As shown in Map A.3 and in Table A.1, route segments in this area could include stations that are spaced approximately one to three miles apart and that would be located adjacent to, or near, residential areas, employment centers—such as the 86-acre Century City Business Park (Century City)[7], proposed bus rapid transit (BRT) stops along the 27th Street corridor, and other Milwaukee County Transit System (MCTS) bus stops. Other potential station locations should be studied as part of any future efforts to advance commuter rail service in this corridor.

Table A.1
Potential Station Locations

Milepost[a]	Station Location	Brown Deer Route	Northwest Milwaukee Route
0.0	Milwaukee Intermodal Station	X	X
2.4	American Family Field	X	X
3.2	State Street	X	X
4.9	North Avenue	X	X
5.7	Fond Du Lac Avenue	X	X
6.8	Century City	X	X
9.1	Silver Spring Road (East)	X	
9.3	Silver Spring Road (West)		X
11.2	Good Hope Road	X	
11.9	76th Street		X
13.3	Original Brown Deer Village	X	
15.2	Granville/Brown Deer Road		X

[a] *Milepost indicates the distance in miles along the rail corridor from Milwaukee Intermodal Station*

Source: SEWRPC

[7] *Century City is located along the 30th Street rail corridor in the City of Milwaukee. Historically, the Century City site was home to A.O. Smith and Tower Automotive. The City of Milwaukee acquired the property in 2009 and redeveloped it for current and future business development.*

Map A.3
Potential Commuter Rail Routes in Northern Milwaukee County

POTENTIAL COMMUTER RAIL

- VISION 2050 RECOMMENDED 30TH STREET RAIL CORRIDOR ROUTE SEGMENT
- NORTHWEST MILWAUKEE ROUTE SEGMENT
- BROWN DEER ROUTE SEGMENT
- OTHER VISION 2050 RECOMMENDED ROUTE
- OTHER VISION 2050 ROUTE FOR FUTURE CONSIDERATION
- PASSENGER STATION
- LAYOVER/MAINTENANCE FACILTY

N

0 0.5 1 1.5 2 Miles

Source: SEWRPC

Commuter Rail Travel Times

Commuter rail travel times would depend on the number and spacing of stations, the acceleration and deceleration characteristics of the train technology used, and the operating speed limits along the various track segments. The operating speed limits, in turn, would depend on the class of track, geometric constraints, and other operational factors identified by the host railroads.

The most common types of commuter train technologies currently used in the United States include diesel-electric locomotive-hauled commuter trains (e.g., the trains used on many Metra commuter rail routes in the Chicago metro area) and diesel multiple unit (DMU) trains (e.g., the trains used by the commuter rail systems in the Austin and Dallas metro areas), as shown in Figures A.1 and A.2. DMU trains typically have better acceleration and deceleration characteristics than locomotive-hauled trains, and therefore would be particularly beneficial in a corridor with stations located less than two-miles apart.

Figure A.1
Metra Locomotive-Hauled Commuter Train in the Chicago Metro Area

Source: Wikimedia Commons User JeremyA

Figure A.2
MetroRail Diesel Multiple Unit Train in the Austin Metro Area

Source: Wikimedia Commons User Greg3564

In accordance with Federal regulations, rail lines generally are classified by railroads into one of six track classes that specify maximum allowable operating speeds for both freight trains and passenger trains. Railroads classify their track largely based on the physical state of the rail line. The six most common track classes and their maximum allowable train operating speed limits are listed in Table A.2.

A railroad may lower a particular track segment's operating speed limit below the maximum allowable operating speed due to track geometry, track infrastructure, or other operational considerations. For example, trains may need to operate at a slower speed through a curve, a track switch, or a rail yard.

Table A.2
Maximum Allowable Train Operating Speeds by Track Class

Track Class	Maximum Allowable Operating Speed (MPH)	
	Freight Trains	Passenger Trains
1	10	15
2	25	30
3	40	60
4	60	80
5	80	90
6	110	110

Source: SEWRPC

Assuming that the track in this area would be upgraded, where necessary, and maintained as a Class 3 track, DMU trains potentially could provide commuter rail travel times that are competitive with or faster than automobile and bus transit travel times, as shown in Table A.3.

Table A.3
Estimated Commuter Rail Travel Times Between Select Stations

From Station	To Station	Commuter Rail Distance (Miles)	Estimated Peak Weekday Travel Time (Minutes)		
			Commuter Rail[a]	Bus[b]	Auto[b]
Original Brown Deer Village	Century City	6.5	11 – 15	42	14 – 24
Original Brown Deer Village	Milwaukee Intermodal Station	13.3	25 – 32	52	18 – 30
Granville/Brown Deer Road	Century City	8.4	13 – 18	55	14 – 26
Granville/Brown Deer Road	Milwaukee Intermodal Station	15.2	27 – 35	79	24 – 40
Century City	Milwaukee Intermodal Station	6.8	14 – 17	25	10 – 18

[a] *Commuter rail travel times are estimated based on assumed diesel multiple-unit (DMU) train performance characteristics (acceleration and deceleration rates) and maximum train operating speeds of 40 – 60 mph.*

[b] *Milwaukee County Transit System (MCTS) bus and auto travel times are estimated for an 8:00 a.m. weekday arrival time using Google Maps.*

Source: SEWRPC

Commuter Train Schedules and Service Hours

Commuter rail train schedules and service hours vary substantially across the United States, and details of northern Milwaukee County commuter train schedules and service hours would be outlined in future studies. However, to provide a useful service in this corridor, it would be expected that commuter trains operate at a minimum of every 30 minutes on weekdays during peak travel periods between 5:00 a.m. and 9:00 p.m. If commuter rail service is implemented to serve both the Village of Brown Deer and northwestern Milwaukee, the schedules of the two routes could be coordinated to effectively provide service every 15 minutes between Century City and MIS. Future studies could determine a preferred balance of service frequency and operating costs.

Fare Structure

As shown in Table A.4, the fare structure for commuter rail service in northern Milwaukee County could be based on the commuter rail fare structure assumed for VISION 2050, or it could replicate the existing fare structures for MCTS buses or for Metra commuter trains in the Chicago metro area.

Table A.4
Potential Northern Milwaukee County Commuter Rail Base Fares

From Station	To Station	Commuter Rail Distance (Miles)	Example Base Fares (2020 $)		
			VISION 2050 Fare Structure[a]	MCTS Fare Structure	Metra Fare Structure
Original Brown Deer Village	Century City	6.5	$3.25	$2.25	$4.25
Original Brown Deer Village	Milwaukee Intermodal Station	13.3	$3.75	$2.25	$5.50
Granville/Brown Deer Road	Century City	8.4	$3.25	$2.25	$4.25
Granville/Brown Deer Road	Milwaukee Intermodal Station	15.2	$4.00	$2.25	$6.25
Century City	Milwaukee Intermodal Station	6.8	$3.25	$2.25	$4.25

[a] *Assumed commuter rail fare structure used during the VISION 2050 planning process.*

Source: SEWRPC

Complementary Operating Characteristics

Commuter rail service along the Brown Deer Route and the Northwest Milwaukee Route could complement existing public transit service as well as the preferred alternative that will be eventually recommended in the Milwaukee North-South Transit Enhancement Study (NSTES) in several ways:

- Provide opportunities at commuter rail stations to transfer to and from existing MCTS bus routes
- Provide opportunities to transfer between commuter rail and the proposed BRT service via a shared station or a short walk at Original Brown Deer Village, Good Hope Road, Silver Spring Road (East), Century City, and North Avenue
- Provide faster overall trip times, via a combination of commuter rail and BRT service, for some transit users along the entire North-South BRT transit corridor
- Provide express transit service to additional locations not directly served by BRT, including downtown Milwaukee, MIS (with connections to The Hop streetcar, Amtrak, and intercity bus services), American Family Field, Molson Coors, northwestern Milwaukee, and areas north of Milwaukee County and south of downtown Milwaukee if commuter rail service is extended

EXISTING RAIL INFRASTRUCTURE

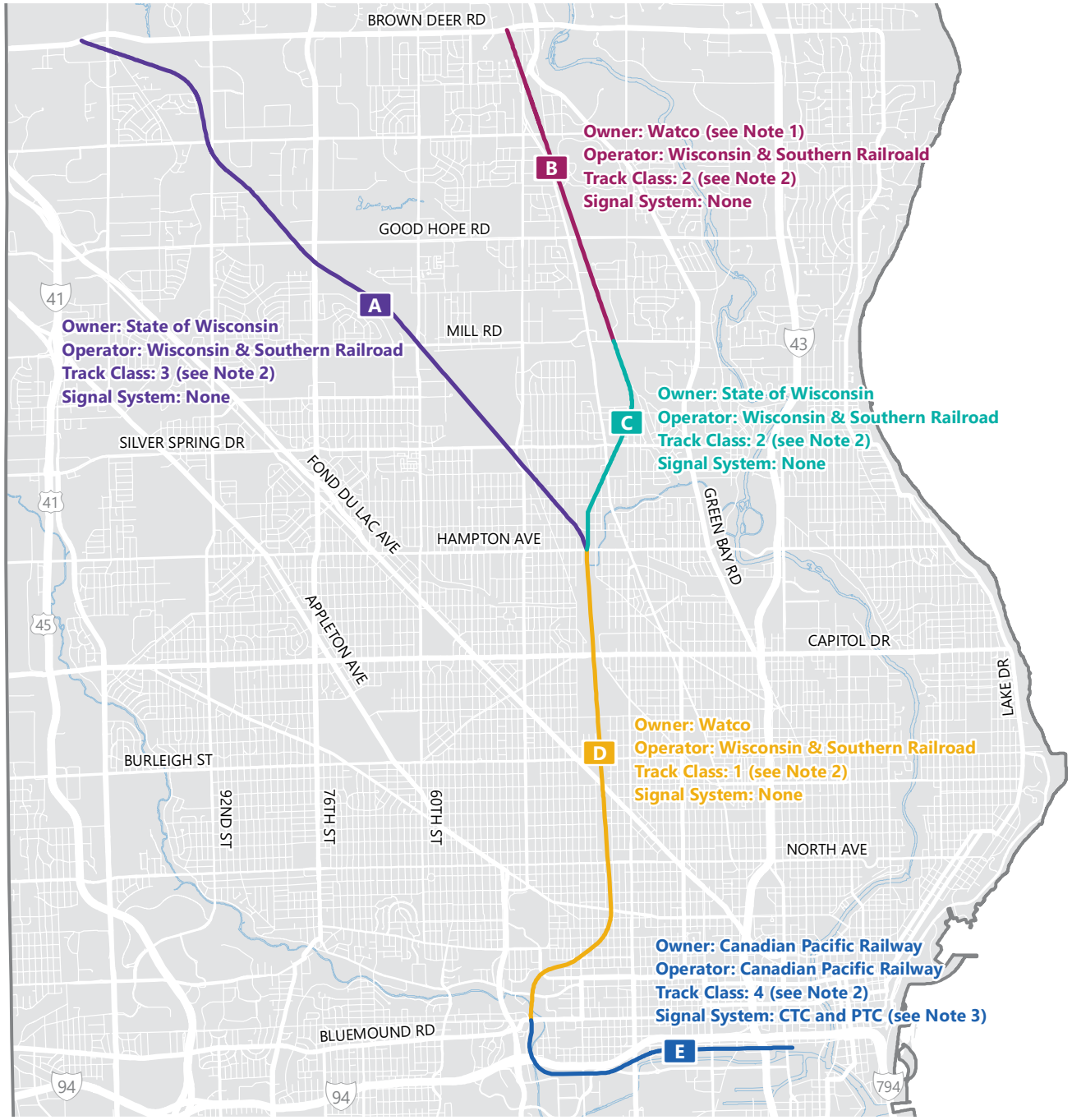
As shown on Map A.4 and in Table A.5, the 30th Street Rail Corridor Segment, Brown Deer Route Segment, and Northwest Milwaukee Route Segment are comprised of different corridor segments owned by CP, Watco, or the State of Wisconsin and operated by CP or WSOR. The State does not directly contract with WSOR to provide freight service on the State-owned segments of track in Milwaukee County. Instead, the State confers responsibility for railroad operations and management to the East Wisconsin Counties Railroad Consortium (EWCRC)[8]—one of several rail transit commissions (RTCs)[9] in Wisconsin—through a grant agreement. The EWCRC, in turn, contracts with WSOR to provide freight rail service on these corridor segments. Collectively, the rail segments consist of approximately 5.0 miles of Class 1 track, 5.3 miles of Class 2 track, 7.2 miles of Class 3 track, and 3.0 miles of Class 4 track. CP maintains both centralized traffic control (CTC) and positive train control (PTC) signal systems along the 3.0-mile segment of track it owns. The remainder of the track segments along the 30th Street Rail Corridor Segment, Brown Deer Route Segment and Northwest Milwaukee Route Segment are unsignalized.[10] The railroad right-of-way width is a minimum of 66-feet along all the corridor segments. Except for the 3.0 miles of double-track railroad CP maintains, the existing rail corridor segments are largely single-track. A total of 19 public at-grade roadway and pedestrian crossings, 19 railroad bridges, and 21 roadway bridges are located along the rail corridors, as shown in Map A.5.

[8] *The EWCRC is comprised of the Counties of Columbia, Dodge, Fond du Lac, Green Lake, Milwaukee, Ozaukee, Sheboygan, Washington, and Winnebago.*

[9] *Most of Wisconsin's RTCs were created in the 1970s and 1980s to help preserve rail service, or the potential for future rail service, on rail corridors that were at risk of being abandoned. At that time, the State of Wisconsin was prohibited by the State's constitution from directly funding rail improvements, and creation of the RTCs allowed the State to indirectly help preserve these rail corridors. Even though the State's constitution was amended in 1992 to allow the State to directly fund rail improvements, the State has maintained its grant agreements with the RTCs.*

[10] *Freight trains can operate over rail corridors that are unsignalized, typically using a system such as track warrant control. Under this system, a train dispatcher typically uses a radio to deliver instructions for moving between two points along a rail corridor to a train crew.*

Map A.4
Potential Commuter Rail Service in Northern Milwaukee County – Railroad Owners and Operators



OWNERSHIP BY RAIL SEGMENT

- A HAMPTON AVENUE-GRANVILLE/BROWN DEER ROAD
- B MILL STREET-ORIGINAL BROWN DEER VILLAGE
- C HAMPTON AVENUE-MILL STREET
- D CP/WATCO JUNCTION-HAMPTON AVENUE
- E MILWAUKEE INTERMODAL STATION-CP/WATCO JUNCTION

N

0 0.5 1 1.5 2 Miles

Source: SEWRPC

Notes:
1. In 2021, Watco reached an agreement to purchase this rail line from CN.
2. Class 1: freight = 10 mph, passenger = 15 mph; Class 2: freight = 25 mph, passenger = 30 mph
   Class 3: freight = 40 mph, passenger = 60 mph; Class 4: freight = 60 mph, passenger = 80 mph
3. CTC - Centralized Traffic Control, PTC - Positive Train Control

Table A.5
Potential Northern Milwaukee County Commuter Rail Routes – Existing Rail Infrastructure by Corridor Segment

Corridor Segment Mileposts	Corridor Segment Description	Track Owner/Operator	Track Class	Number of Tracks	Signal System	Right-of-Way Width (Feet)	Number of Public At-Grade Crossings[a]	Number of Railroad Bridges over Roadways	Number of Roadway Bridges over Railroads	Number of Railroad Bridges over Rivers
30th Street Corridor										
0.0 – 3.0	Milwaukee Intermodal Station to junction of CP and Watco rail lines	Canadian Pacific Railway/Canadian Pacific Railway	4	2	CTC and PTC[b]	Variable (≥ 66)	2	0	11	1
3.0 – 8.0	Junction of CP and Watco rail lines to Hampton Avenue	Watco/Wisconsin & Southern Railroad	1	Variable (≥ 1)[c]	None	100	0	7	9	2
Brown Deer Route										
8.0 – 10.1	Hampton Avenue to Mill Road	State of Wisconsin/Wisconsin and Southern Railroad	2	1 – 2	None	66 – 100	3	2	0	0
10.1 – 13.3	Mill Road to Original Brown Deer Village	CN[d]/Wisconsin and Southern Railroad	2	1	None	66 – 100	4	1	0	0
Northwest Milwaukee Route										
8.0 – 15.2	Hampton Avenue to Granville/Brown Deer Road	State of Wisconsin/Wisconsin and Southern Railroad	3	1	None	66 – 100	10	4	1	2

[a] *Public roadway crossings and public pedestrian crossings.*

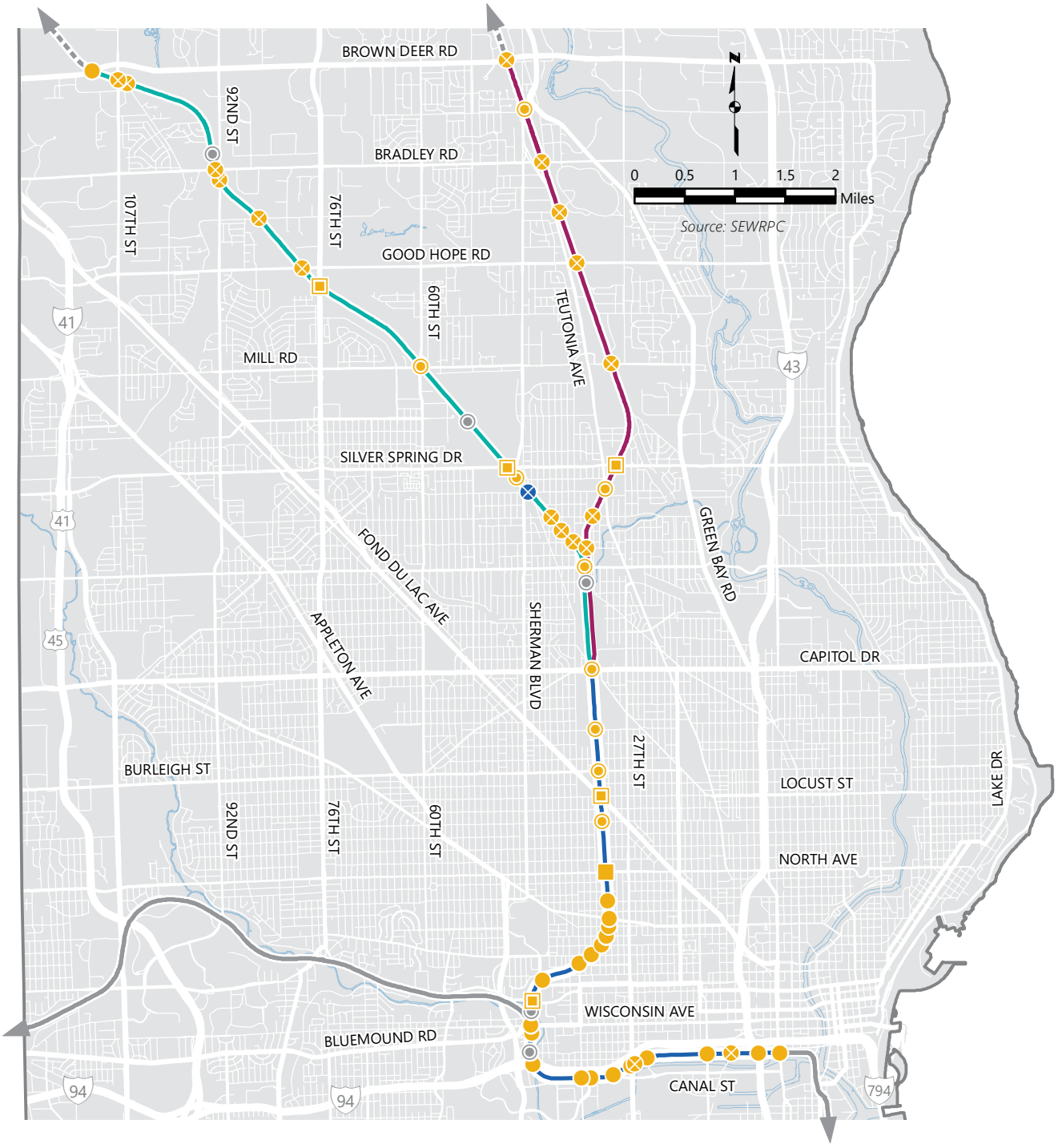
[b] *Centralized Traffic Control (CTC) and Positive Train Control (PTC).*

[c] *The Glendale Rail Yard is located along this corridor segment.*

[d] *In 2021, Watco reached an agreement with CN to purchase approximately 900 miles of rail corridors in Wisconsin, Michigan, and Ontario from CN, including the rail corridor segment between Mill Road and Brown Deer Road.*

Source: SEWRPC

Map A.5
Bridges and At-Grade Crossings Along Potential Commuter Rail Routes in Northern Milwaukee County



POTENTIAL COMMUTER RAIL FACILITIES

- VISION 2050 RECOMMENDED 30TH STREET RAIL CORRIDOR ROUTE SEGMENT
- BROWN DEER ROUTE SEGMENT
- NORTHWEST MILWAUKEE ROUTE SEGMENT
- OTHER VISION 2050 RECOMMENDED ROUTE
- OTHER VISION 2050 ROUTE FOR FUTURE CONSIDERATION
- ROADWAY BRIDGE OVER RAILROAD
- ROADWAY BRIDGE OVER RAILROAD - STATION ACCOMMODATIONS
- RAILROAD BRIDGE OVER ROADWAY
- RAILROAD BRIDGE OVER ROADWAY - STATION ACCOMMODATIONS
- RAILROAD BRIDGE OVER RIVER
- AT-GRADE PUBLIC ROADWAY CROSSING
- AT-GRADE PUBLIC PEDESTRIAN CROSSING

POTENTIAL CAPITAL IMPROVEMENTS

Implementing commuter rail service along the 30th Street Rail Corridor Segment, Brown Deer Route Segment and Northwest Milwaukee Route Segment potentially could require a range of capital improvements, including upgrading track infrastructure, installing signal systems, upgrading bridges, improving roadway-railway grade crossings, constructing new stations, purchasing new train equipment, and constructing a new train equipment layover and maintenance facility. Should there be interest in implementing this commuter rail service, more-detailed feasibility, engineering, and environmental studies would need to be conducted—in partnership with CP, Watco, and the State of Wisconsin—to identify the necessary capital improvements and costs associated with the improvements. However, the following sections provide a general description of the types of capital improvements that likely would be required to implement the service.

Track Infrastructure

To support commuter train speeds necessary for achieving travel times that are competitive with automobile and bus transit travel times, all railroad tracks along the 30th Street Rail Corridor Segment, Brown Deer Route Segment, and Northwest Milwaukee Route Segment likely would need to be upgraded, if necessary, and maintained at Class 3 standards at a minimum. Class 3 track would support maximum allowable commuter train operating speeds of 60 mph (host railroads may set lower maximum operating speeds based on track geometry, track infrastructure, or other operational considerations). Along the routes, a total of 10.3 miles of track infrastructure would need to be upgraded from Class 1 or 2 to Class 3. Upgrading track infrastructure to Class 3 potentially could involve replacing or upgrading track ballast, ties, and rail.

To accommodate the flow of commuter and freight trains, additional track capacity—in the form of additional mainline tracks or passing sidings—may be required at key locations. During a more advanced stage of planning and engineering, a computer model of train movements likely would be used to help identify the necessary track capacity needed to accommodate the flow of passenger and freight trains along the rail corridor segments. However, based on the high number of CP freight trains and commuter trains that would operate daily between MIS (0.0) and the junction of CP and Watco's rail lines (MP 3.0), it is reasonable to assume that a third mainline track may need to be constructed along this corridor segment, particularly between the western end of CP's Muskego Yard (MP 1.9) and the junction of CP and Watco's rail lines (MP 3.0). WSOR's freight trains currently operate less frequently north of the junction of CP and Watco's rail lines (MP 3.0), so a second mainline track may not be required along these corridor segments. However, passing sidings may need to be constructed at certain locations. In addition, a dedicated run-through track for commuter trains may need to be established through the Glendale Yard, located between Century City and Hampton Avenue. The existing railroad right-of-way widths along the rail corridors should be sufficient to accommodate additional track capacity.

Signal Systems

To support safe and efficient commuter rail operations, a signal system—such as the CTC system used by CP—may need to be installed on the rail corridors north of the junction of CP and Watco's rail lines. In addition, Federal regulations require that PTC systems be installed along any rail corridors that host passenger rail service (commuter rail or intercity passenger rail). A PTC system includes equipment located along rail corridors as well as equipment installed on passenger and freight trains operating in the corridors. PTC systems are designed to automatically stop a train and prevent certain types of accidents—such as train-to-train collisions and derailments caused by excessive speed—caused by human error.

Bridges and Grade Crossings

Along the commuter rail routes, some of the 19 railroad bridges over roadways and rivers may require maintenance or upgrades. In some cases, bridges may need to be modified to accommodate elevated or recessed stations and/or station platforms. In addition, the 19 public at-grade roadway and pedestrian crossings along the corridors likely would also need upgrades such as new warning lights, bells, and gates that are timed to provide a consistent amount of protection and warning time. Map A.5 shows the locations of roadway bridges over railroads, railroad bridges over roadways, and public at-grade roadway and pedestrian crossings.

Stations

The design of a commuter rail station can range from a simple station consisting of a single platform with an open-air, covered shelter to a more robust station comprised of an enclosed mixed-use building, multiple platforms with grade-separated pedestrian access, provisions for passenger pick-up and drop-off by automobile or bus transit, and parking. All stations would need to comply with relevant Federal, State, and local regulations, including the Americans with Disabilities Act (ADA).

The designs of potential stations along the 30th Street Rail Corridor Segment, Brown Deer Route Segment, and Northwest Milwaukee Route Segment would be driven to a large extent by the track conditions and the existing, adjacent land use at each location. Segments of the rail lines that would be used by the commuter rail service are located either at grade, above grade, or below grade. Therefore, stations and/or station platforms necessarily would be located at grade, above grade, or below grade, depending on their location. Table A.6 lists potential general design concepts for the 12 stations along the 30th Street Rail Corridor Segment, Brown Deer Route Segment, and Northwest Milwaukee Route Segment. Experience in other areas in North America indicates that commuter rail stations can vary widely in scale and types of amenities, from simple platforms with a shelter to substantial climate-controlled structures with large seating areas and other amenities. Simpler stations will generally keep capital and operating costs of a service lower but may be seen as less attractive to riders and neighborhoods surrounding the stations. Some of the commuter rail stations potentially could be mixed-use facilities and/or support nearby transit-oriented developed (TOD).

Train Equipment and Train Layover/Maintenance Facility

Approximately eight trains (including spare equipment) likely would be required to operate commuter rail serving both the Village of Brown Deer and northwestern Milwaukee. While diesel-electric locomotive hauled trains could be considered for the service, the two routes likely would be better served using diesel-electric multiple unit trains (DMUs) due to their better performance characteristics. In addition, alternative power sources currently under development by several manufacturers could be explored, including battery-electric and hydrogen fuel cell multiple unit trains. Given that the commuter trains would operate in mixed rail traffic with freight trains, the trains would be required to meet certain Federal safety standards. The potential commuter rail service would require construction of a facility for servicing (cleaning and refueling), maintaining, and storing the commuter trains. Such a facility could be constructed within Century City.

ROLES, RESPONSIBILITIES, AND FUNDING

Implementing commuter rail serving the Village of Brown Deer and northwestern Milwaukee would require coordination and cooperation between the private sector and Federal, State, and local governments. Table A.7 lists examples of potential responsible parties that could be involved with implementing and operating the potential commuter rail service. It is important to note that, unlike Amtrak, which has the right to operate over rail corridors owned by private railroads under Federal law, the sponsor of the potential commuter rail service would be required to reach agreements with CP, Watco, and the EWCRC (under its grant agreement with the State of Wisconsin), the owners/managers of the rail corridor segments, to implement the service. The sponsor would need to develop an ongoing working relationship with CP, Watco, the EWCRC, and the State of Wisconsin during early feasibility, engineering, and environmental study phases, as well as during construction and operation of the service.

Funding for commuter rail capital costs, including the costs of infrastructure improvements and new train equipment, likely would be come from Federal, State, and local governments, and potentially from the private sector. A large portion of the capital costs likely would be provided through competitive Federal grant programs managed by the Federal Transit Administration (FTA). Revenue from commuter rail fares would cover a portion of the service's total ongoing operating costs. Additional funding to cover the remainder of the operating costs would likely need to come from State and/or local governments, and potentially from the private sector.

Table A.6
Potential General Design Concepts for Northern Milwaukee County Commuter Rail Stations

Station	Station Structure	Number of Platforms	Location of Station Structure/Platforms	Station/Platform Access	Transit Access	Bicycle/ Pedestrian Access	Parking
30th Street Rail Corridor							
Milwaukee Intermodal Station[a]	Enclosed, mixed-use	4	At grade/At grade	Stairs, escalators, elevators, overhead walkway	Yes[b]	Yes[d]	Yes
American Family Field	Enclosed, simple	2	At grade/At grade	Stairs, elevators, overhead walkway	No	Yes[e]	Yes
State Street	Enclosed, simple	1	Above grade/Above grade	Stairs, ramps	Yes[c]	Yes[d]	No
North Avenue	Enclosed, simple	1	At grade/Below grade	Stairs, ramps	Yes[c]	Yes[d]	No
Fond Du Lac Avenue	Enclosed, simple	1	Above grade/Above grade	Stairs, ramps	Yes[c]	Yes[f]	No
Century City	Enclosed, simple	1	At grade/At grade	At grade	Yes[c]	Yes[f]	No
Brown Deer Route							
Silver Spring Road (East)	Enclosed, simple	1	Above grade/Above grade	Stairs, ramps	Yes[c]	Yes[f]	No
Good Hope Road	Enclosed, simple	1	At grade/At grade	At grade	Yes[c]	Yes[e]	No
Original Brown Deer Village	Enclosed, simple	1	At grade/At grade	At grade	Yes[c]	Yes[f]	Yes
Northwest Milwaukee Route							
Silver Spring Road (West)	Enclosed, simple	1	Above grade/Above grade	Stairs, ramps	Yes[c]	Yes[f]	No
76th Street	Enclosed, simple	1	Above grade/Above grade	Stairs, ramps	Yes[c]	Yes[f]	Yes
Granville	Enclosed, simple	1	At grade/At grade	At grade	Yes[c]	Yes[e]	Yes

[a] *Milwaukee Intermodal Station should be able to accommodate the Brown Deer Route and the Northwest Milwaukee Route without additional infrastructure improvements.*

[b] *Station served by existing MCTS bus transit, The Hop streetcar, Amtrak, and intercity bus.*

[c] *Station served by existing MCTS bus transit.*

[d] *Station served by existing sidewalks and bicycle infrastructure.*

[e] *Station would require construction of new bicycle and pedestrian connections to existing bicycle and pedestrian infrastructure.*

[f] *Station served by existing sidewalks. Station would require construction of new bicycle connections to existing bicycle infrastructure.*

Source: SEWRPC

Table A.7
Example Commuter Rail Service Development and Operation Roles and Responsibilities

Example Commuter Rail Implementation/Operation Roles	Examples of Potential Responsible Parties
Commuter Rail Implementation	
Project sponsor (feasibility, engineering, and environmental studies, contracting, funding)	State of Wisconsin Milwaukee County City of Milwaukee Consortium of local governments Regional transit authority Private company
Federal oversight	Federal Transit Administration (FTA) Federal Railroad Administration (FRA)
Railroad infrastructure construction	Host railroads (CP, State of Wisconsin, and Watco) East Wisconsin Counties Railroad Consortium Third-party contractors
Railroad-roadway crossing construction	Host railroads (CP, State of Wisconsin, and/or Watco) Third-party contractors Roadway jurisdictional responsible parties (State, county, and local governments)
Station construction	Milwaukee County Local governments Private company
Train equipment acquisition	State of Wisconsin Milwaukee County City of Milwaukee Consortium of local governments Regional transit authority Private company
Commuter Rail Operation	
Train operations	Third-party contractor Host railroad (CP or WSOR)
Train servicing and maintenance	Third-party contractor
Train dispatching	Host railroad (CP or WSOR)
Maintenance of way	Host railroads (CP and WSOR) Third-party contractor
Maintenance of stations	Milwaukee County Local governments

Source: SEWRPC

Prepared for: