



West Broadway Transit Study

Concept Development of Alternatives

5/20/2015

Prepared by the
SRF Consulting Group Team

for





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1. Introduction

The West Broadway Transit Study is a collaboration between Metro Transit, Hennepin County, and the Cities of Minneapolis, Robbinsdale, and Golden Valley to evaluate transit improvements in North Minneapolis, the North Loop neighborhood, the North Washington Jobs Park, and potential connections to the planned METRO Blue Line Extension LRT stations in Golden Valley or Robbinsdale. The project will analyze the corridor's important connections to other existing and proposed transit lines, such as the Nicollet-Central Streetcar, the C Line, and the Chicago-Fremont arterial BRT line. The project will also evaluate Transit-Oriented Development (TOD) opportunities and market potential throughout the corridor. Overall, the West Broadway Transit Study is seen as a transit improvement project, as well as a fully encompassing public investment strategy to improve and revitalize the West Broadway area into a resilient and prosperous corridor.

This study will include potential service improvements to existing transit service, as well as infrastructure improvements necessary to implement either streetcar or arterial bus rapid transit (BRT) in the project corridor. The purpose of this memo is to discuss the infrastructure improvements necessary to implement enhanced transit service in the corridor. Transit service improvements in the project area will be discussed further in a separate document. The project team has reviewed the preliminary corridor alignments for the West Broadway Transit Study, and has prepared proposed corridor alignment alternatives for the project based on the technical constraints for each transit mode. The routing descriptions for each mode are listed below.

2. Previously Dismissed Alignment Alternatives

The preliminary West Broadway study area included multiple alignment alternatives that were to be screened during this study. This preliminary project study area is shown below as **Figure 1**. During the development of "Memo #1 – Relevant Issues" for the West Broadway Transit Study, several of these alignment alternatives were dismissed from future study. A map of dismissed alternatives is shown in **Figure 2**, and descriptions of each are listed below.



Figure 1: Preliminary West Broadway Study Area

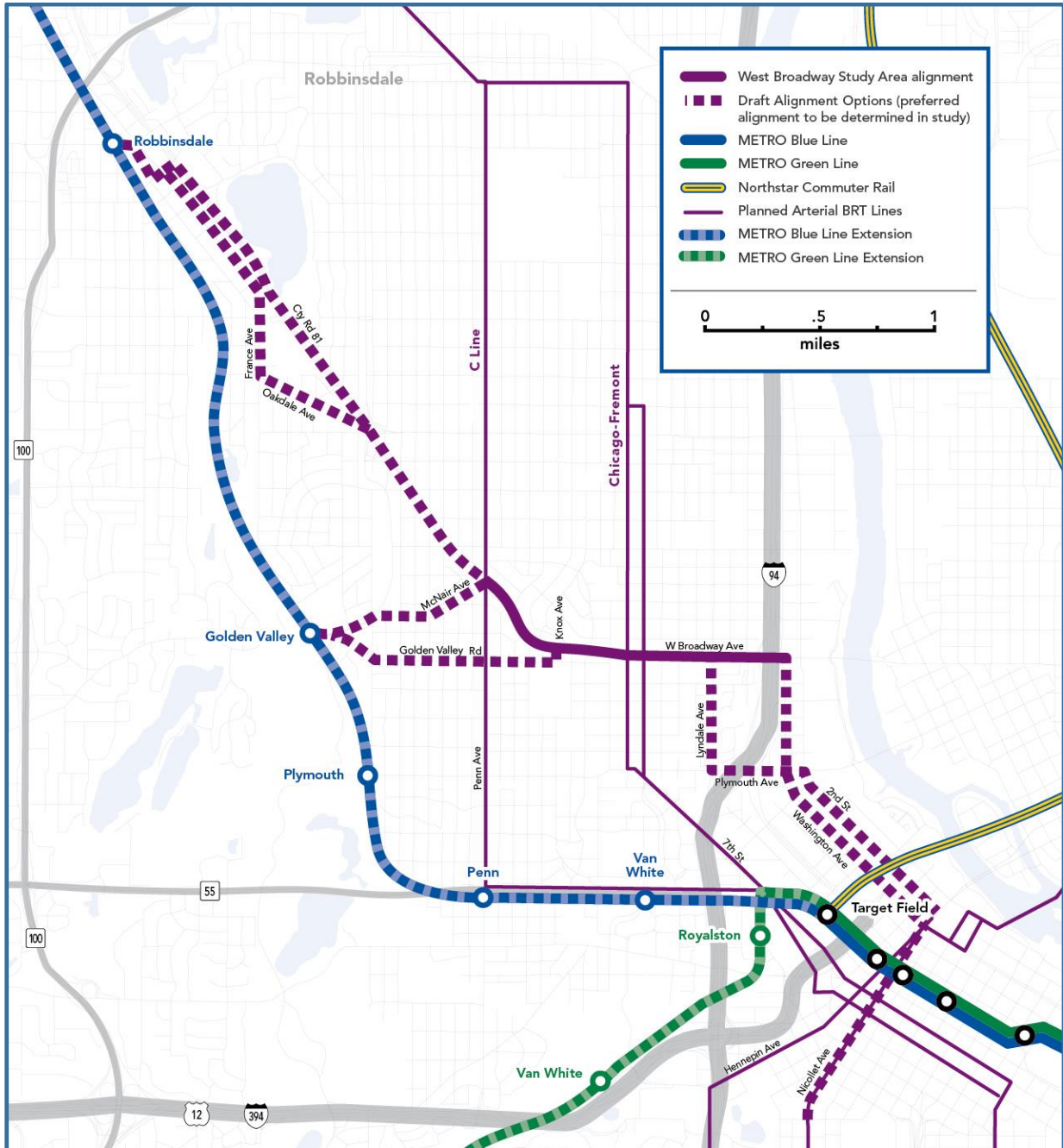
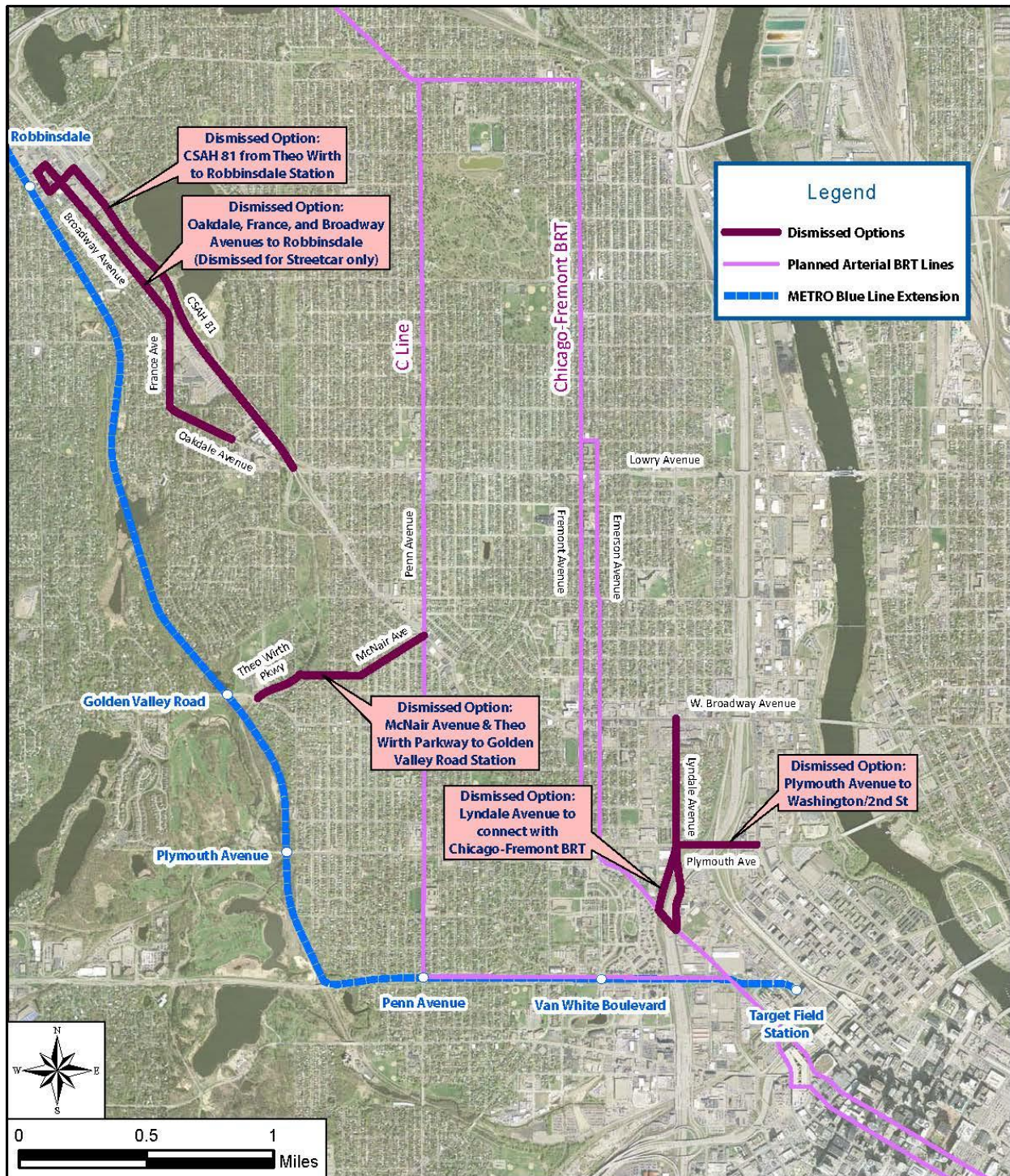




Figure 2: Dismissed Alignment Alternatives



Lyndale Avenue & Plymouth Avenue alternatives

To reach its terminus at Nicollet Mall, the transitway would turn south from West Broadway onto Lyndale Avenue. The transitway would then either continue on Lyndale to connect with the proposed Chicago-Fremont arterial BRT line, or turn onto Plymouth Avenue and connect to Washington Avenue or 2nd Street North through the North Loop neighborhood to reach downtown Minneapolis.



This option was dismissed for both streetcar and arterial BRT. Lyndale Avenue from Broadway to 18th Avenue is lined with large shopping centers on each side that have no entrances open towards the street. These shopping centers contain grocery, pharmacy, and other well-used retail stores that make them unlikely candidates for redevelopment.

Lyndale Avenue from 18th Avenue to Plymouth Avenue runs primarily through a “suburban-style” neighborhood, which contains a broken street grid and single-family houses. The current configuration of Lyndale in this section includes two travel lanes in each direction and narrow sidewalks on each side. The sidewalks also have streetlight poles that make the sidewalks non-ADA compliant. There are no cross streets on Lyndale from 14th to 18th Avenue, making transit connections difficult. Most of this area is developed and contains small single-family lots, with little potential for redevelopment. Hall Park is also located in this area, and does not present an opportunity for redevelopment. Lyndale Avenue from Plymouth to 7th Street functions as a frontage road to Interstate 94, and splits into a one-way pair on each side of the interstate. These frontage roads have poor pedestrian accommodations, which limits the accessibility to potential transit stations.

Plymouth Avenue from Lyndale Avenue to Washington Avenue consists of a long bridge overpassing I-94 and its associated ramps. The highway land use renders redevelopment opportunities unlikely. The long bridge would also pose a costly technical challenge for streetcar implementation, due to the high cost of bridge modifications required to accommodate streetcar track.

A detailed map of this dismissed alternative is shown in **Figure 3**.

McNair Avenue & Glenwood Parkway alternative

To reach the Golden Valley Road Station on the METRO Blue Line Extension, the transitway would run from the intersection of Penn and West Broadway Avenues along McNair Avenue and Glenwood Parkway.

This option was dismissed for both streetcar and arterial BRT transit. Although the transitway would be able to access the important Penn & Broadway commercial node, McNair Avenue from West Broadway Avenue to Thomas Avenue has a narrow curb-to-curb roadway, measuring between 22 and 25 feet. Available public right-of-way averages around 50 feet in this section, and any transit implementation along McNair would require expanding the road to accommodate track or wide bus vehicles. Modifying McNair would likely require many property acquisitions, which would increase project costs and would impact a sensitive community recently affected by the 2011 tornado. Land use in this section consists of various single family homes, making redevelopment potential very low.

West of Washburn Avenue, the streetcar or BRT would operate on Glenwood Parkway, which abuts Minneapolis Parks and Recreation Board property. Glenwood also contains a curb-to-curb width measuring about 22 feet, and would require a full street reconstruction to allow streetcar tracks or wider bus vehicles. Operating transit in this area could pose a significant topographical challenge due to the relatively steep street slopes approaching Golden Valley Road. Implementing transit in this section would also require coordination with the Minneapolis Parks and Recreation Board. Development



potential in this corridor is also very low due to the existing and planned future land use as single family homes.

A detailed map of this dismissed alternative is shown in **Figure 4**.

County Road 81 alternative in Robbinsdale

To reach a western terminus at the Robbinsdale Station on the METRO Blue Line Extension, the transitway would run along County Road 81 from the Theodore Wirth Parkway interchange to 41st Avenue, where it would turn west and terminate at the LRT station.

This option was dismissed for both modes. County Road 81 provides little access for the walk-up transit users that streetcar and arterial BRT intend to serve. The City of Robbinsdale and Hennepin County also recently reconstructed this corridor; streetcar implementation in particular would require major modifications to the roadway.

County Road 81 provides little access for the walk-up transit users that arterial BRT intends to serve, and currently operates like an expressway for vehicular travel. Implementing improved transit service on County Road 81 would pose a challenge to maintaining the higher speed use of the roadway. The other arterial BRT route option to downtown Robbinsdale along Oakdale, France, and West Broadway Avenues serves existing transit riders and is closer to residences, commercial uses, and North Memorial Hospital. Furthermore, use of the Oakdale-France-West Broadway route for arterial BRT allows for replacement of much of the Route 14 and simplifies the route structure so that just one branch of the Route 14 would operate from Robbinsdale Transit Center along Noble Avenue and 36th Avenue to West Broadway.

A detailed map of this dismissed alternative is shown in **Figure 5**.

Streetcar to downtown Robbinsdale alternative

To reach a western terminus at the Robbinsdale Station on the METRO Blue Line Extension, the transitway would run along Oakdale, France, and West Broadway Avenues from North Memorial Hospital to the LRT station via downtown Robbinsdale.

This option was retained for arterial BRT, but was dismissed for streetcar. The City of Robbinsdale reconstructed Oakdale and France Avenues in 2012 and 2013. Part of this project buried all overhead wire crossings and re-aligned water and sanitary sewer lines to meet separation guidelines. If streetcar were implemented in this area, these streets would need to be reopened and newly replaced utilities would need to be relocated. Similar improvements were made to West Broadway Avenue in the early 1990s through downtown Robbinsdale, and included underground wire placement, widened sidewalk construction, reductions of roadway width, and additional pedestrian nodes. Overhead wires were also buried during reconstruction of Hennepin County Road 81 to improve views of nearby lake and park. For these reasons, streetcar will not be considered for alignments serving downtown Robbinsdale.

A detailed map of this dismissed alternative is also shown in **Figure 5**.



Streetcar to North Memorial via 29th & Zenith alternative

If streetcar across the Theodore Wirth & CSAH 81 interchange proves too technically difficult or cost-restrictive, or if North Memorial Hospital infrastructure restricted rail transit being constructed on Oakdale Avenue, the alignment would turn the alignment west at 29th Avenue before the interchange, and then run on Parkview and Zenith Avenue before terminating at a station on Lowry Avenue near the back entrance of the hospital. The station would be located at Lowry Avenue and would include a one-track stub as a terminus point.

This alternative was dismissed. Although this alternative would grant access to the North Memorial Hospital area, the station would be located near the less publicized back entrance where ambulances frequently operate. Further discussions with North Memorial Hospital officials also confirmed that streetcar could be feasible along Oakdale Avenue.

A detailed map of this dismissed alternative is also shown in **Figure 5**.



Figure 3: Dismissed Lyndale & Plymouth Avenue Alternative

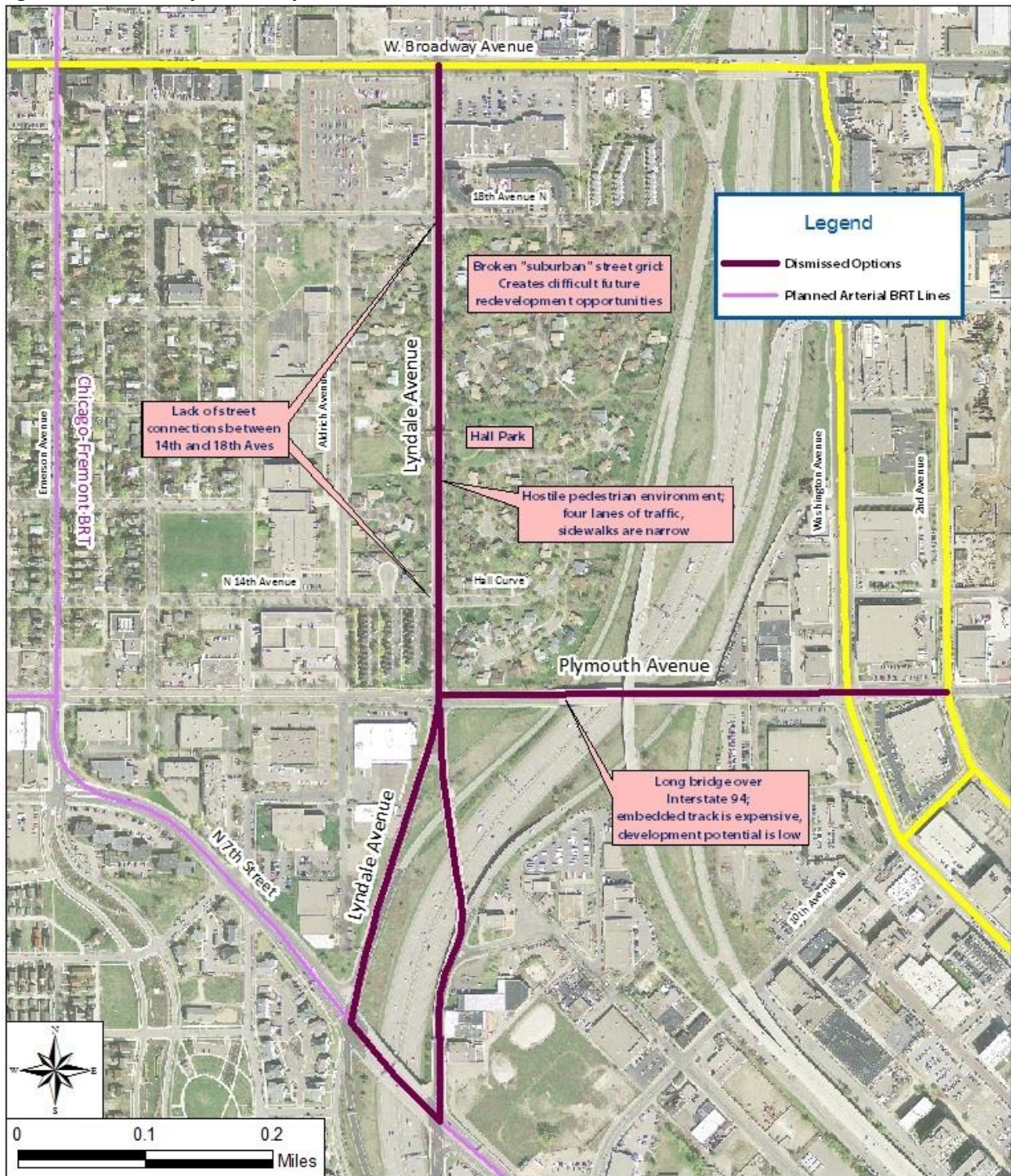




Figure 4: Dismissed McNair Avenue & Glenwood Parkway Alternative

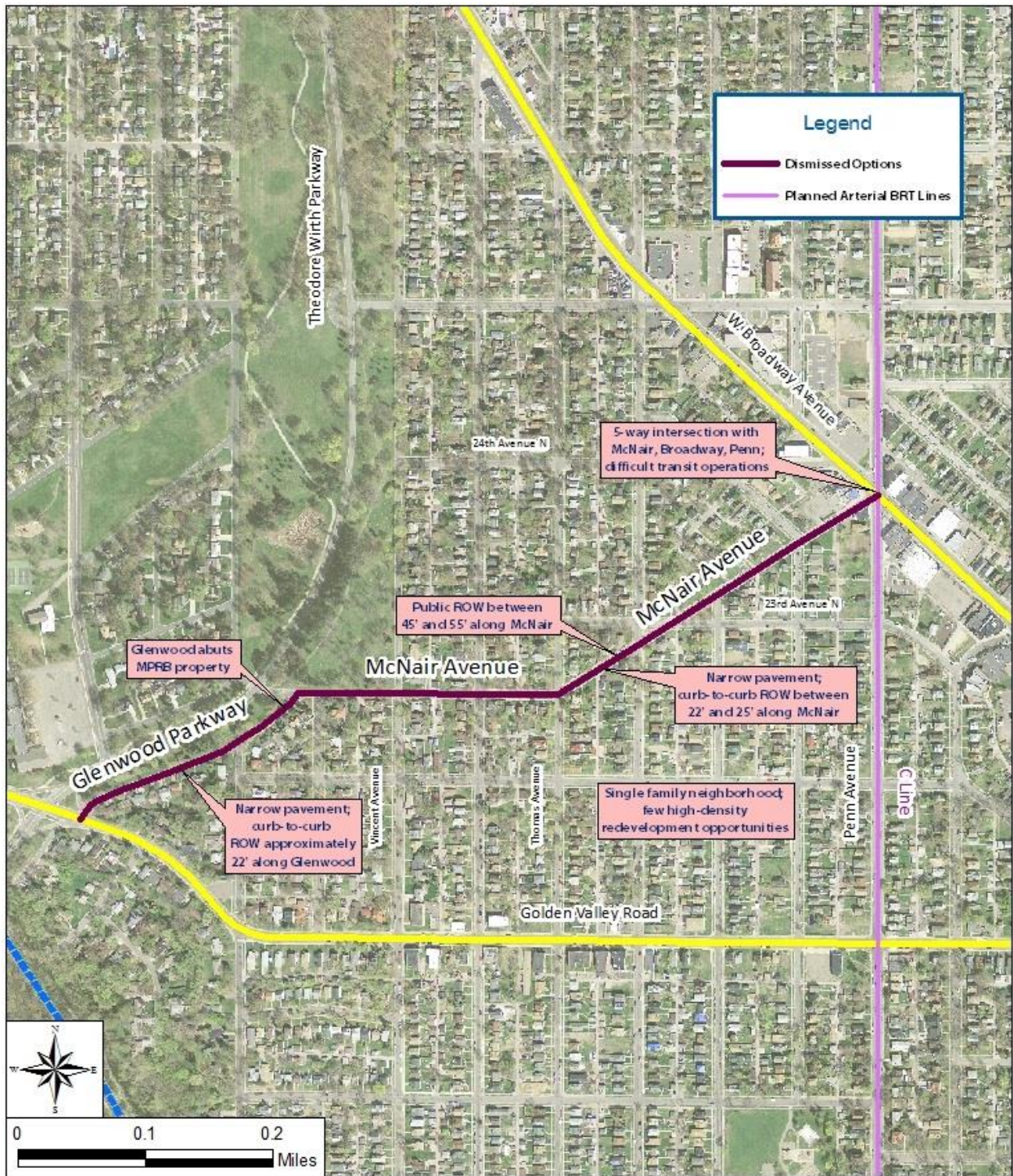
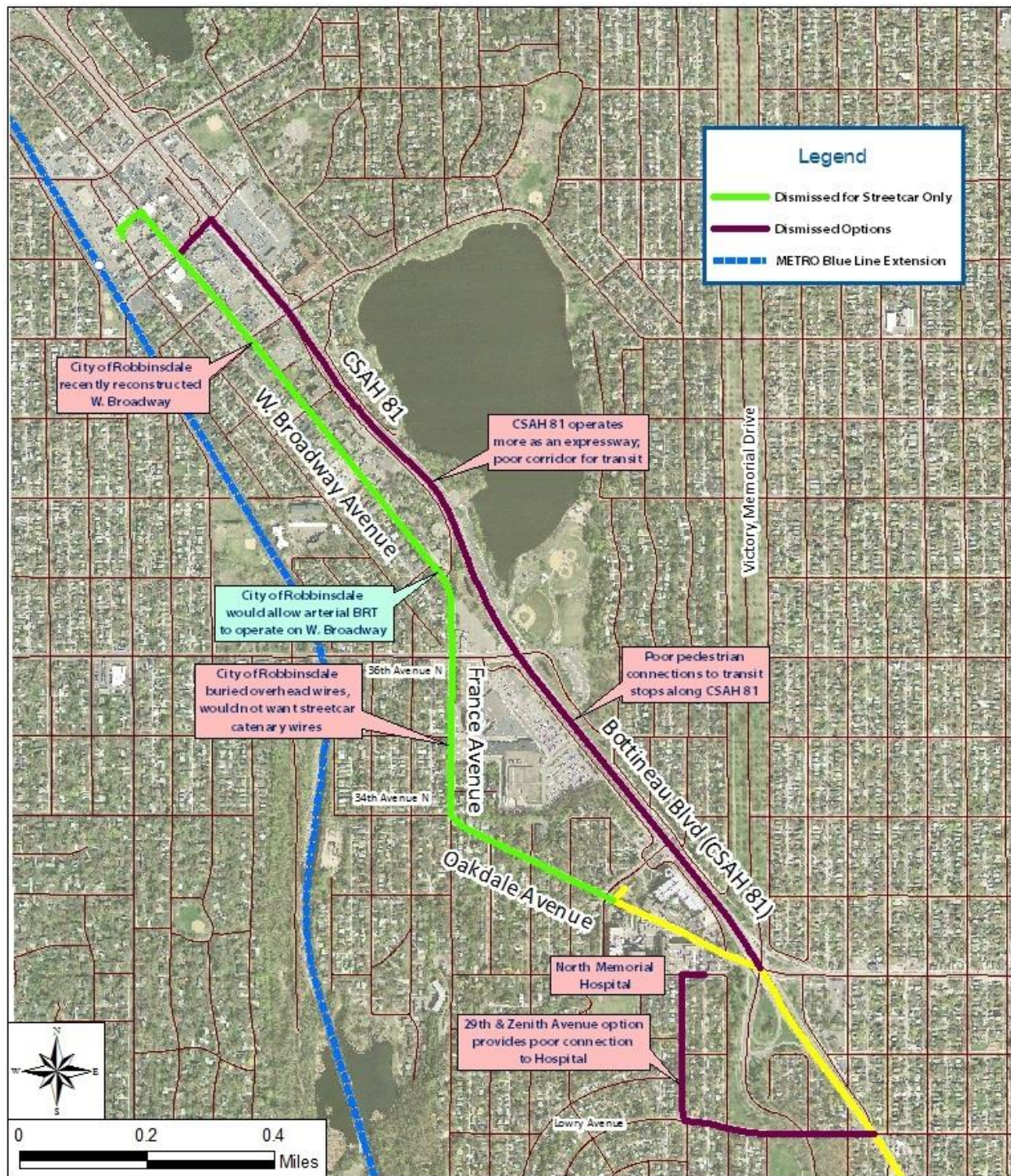




Figure 5: Dismissed Alternatives in Robbinsdale



3. Streetcar Alternative

Streetcar service is very similar to Light Rail Transit (LRT) service with the exception that right-of-way (ROW) for streetcars is shared with automobiles. Because of the increased interaction with traffic,



streetcars cannot provide the same convenience and frequency of service as LRT; however, streetcars can be more attractive in areas where dedicated ROW for LRT is unavailable or would be too costly to obtain. Streetcars are typically single vehicles, ranging in width from 7 feet, 6.5 inches to 8 feet, 8 inches and ranging in length from 66 to 95 feet. The turning radius of streetcars varies based on the vehicle type, typically ranging from 60 to 82 feet. Streetcars are typically powered from overhead catenary wires that are suspended above the track alignment. The majority of the streetcar line would be comprised of embedded track to allow for mixed traffic operations, with the potential for some ballasted track in areas not accessible to traffic.

Station Design

Streetcar stations are typically spaced at 1/4 or 1/3 mile intervals, or generally every 2 to 3 blocks. Stations typically consist of a boarding platform with raised curb to facilitate near level or level boarding, passenger amenities (i.e. shelters, benches, trash bins, bike loops), wayfinding, real-time information, and fare collection. Platform length depends on the vehicle type and site constraints, but typically varies from 60 to 80 feet. Platforms can be located at the existing curbside which can reduce street parking by at least 150 feet, or can be located on curb bumpouts which removes parking for the length of the bumpout and provides additional space for the station and amenities.

Alignment Alternatives

North Loop

The North Loop segment is approximately 0.9 miles long, running from Hennepin Avenue to Plymouth Avenue in Minneapolis. The City of Minneapolis is in the planning phases for a north-south streetcar line on Nicollet Avenue through downtown. The West Broadway streetcar alignment would likely connect to the streetcar at the Nicollet Hotel block, a site to be developed near Washington Avenue and Hennepin Avenue in downtown Minneapolis. The alignment would run northwest either on Washington Avenue or 2nd Street N through the North Loop neighborhood to Plymouth Avenue.

Washington Avenue in the North Loop segment has right-of-way that is generally 100 feet wide. The roadway from Hennepin to 10th Avenue currently contains four through lanes and curbside metered parking lanes, with turn lanes existing at 3rd, 5th, and 6th Avenues; however, Hennepin County will be restriping Washington Avenue in the 2015 construction season. The roadway from Hennepin to 5th Avenue North will be re-striped to include bike lanes and narrower vehicle travel lanes, and the roadway from 5th Avenue to 10th Avenue will be reconfigured to provide a 3-lane roadway, parking lanes, and buffered bike lanes. Traffic signals exist at the intersections with Hennepin Avenue, 1st Avenue N, 2nd Avenue N, 3rd Avenue N, 5th Avenue N, 6th Avenue N, 10th Avenue N, and Plymouth Avenue. The streetcar alignment would be located in the outside travel lanes in this segment. The configuration of stations would need to accommodate bypass of the on-street bike lanes.

2nd Avenue in the North Loop segment contains right-of-way averaging 80 feet across. The roadway usually contains a 2-lane roadway, two standard bike lanes and curbside metered parking lanes. Traffic signals exist at the intersections with Hennepin Avenue, N 1st Avenue, N 3rd Avenue, N 10th Avenue, and Plymouth Avenue. The streetcar alignment would be located in the traffic lanes for this segment.



If the streetcar alignment runs along Washington Avenue through the North Loop and 2nd Street through the North Washington Jobs Park, the alignment would run along N 10th Avenue for one block between the two streets. The obtuse angle from 10th Avenue to 2nd Street would be more favorable for a streetcar turning radius requirement than providing the connection on Plymouth Ave N.

Both Washington Avenue and 2nd Street through the North Loop would generate similar ridership figures; however, each corridor poses different advantages and disadvantages. 2nd Street has a smaller right-of-way and carries less traffic, which may help travel time. 2nd Street also runs through primarily developed land, which means initial ridership may be higher than Washington Avenue. However, potential TOD development would be lower on 2nd than on Washington Avenue, and the lack of a public connection from the south to 2nd Street between 5th Avenue and 10th Avenue would isolate a large majority of the North Loop. Comparatively, if the transitway was placed on Washington Avenue, higher traffic counts and wider right-of-way may impact travel time. However, many vacant lots nearby contain high TOD potential, and the corridor contains more connections from the south than 2nd Street.

Initial design constraints in this segment include the implementation of streetcar on the bridges over the freight rail tracks where the Northstar Line operates. Streetcar implementation would require partial reconstruction of the bridge decks to accommodate direct fixation track. The Washington Avenue bridge over the freight tracks historically carried streetcar vehicles, and both bridges have capacity to allow heavy truck traffic, but further analysis is required to determine if the bridges will need to be replaced or require significant structural modifications to accommodate streetcars.

The streetcar alignment could also use both Washington Avenue and 2nd Street as a one-way couplet in the North Loop area. This could provide access to a larger service area, but would require reconstruction of two bridges over the Northstar line, as opposed to one bridge using a two-way alignment. Pedestrian connections from 2nd Street to Washington Avenue would also need to be added between 5th Avenue and 10th Avenue, as there is currently no access between those streets in this area. There is currently a pedestrian and bicycle connection between 6th and 7th Avenues, but is not associated with public property and passes through the property at 700 Washington Avenue.

North Washington Jobs Park

The North Washington Jobs Park segment is approximately 0.5 miles long, running from Plymouth Avenue to West Broadway Avenue in Minneapolis. From Plymouth Avenue, the streetcar alignment would continue to run north through the North Washington Jobs Park on either Washington or 2nd Street until West Broadway Avenue, where it would turn west onto Broadway.

Washington Avenue in the Jobs Park segment has right-of-way that is generally 100 feet wide. The roadway contains four undivided travel lanes and curbside parking lanes. An off-ramp from Interstate 94 approaches Washington at 17th Avenue N, and the two roads at the intersection include turn lanes. Washington Avenue abuts Interstate 94 to the west from 15th Avenue N to West Broadway Avenue. Traffic signals exist at the intersections with 17th Avenue N and West Broadway Avenue. The streetcar alignment would be located in the outside travel lanes in this segment. Bus pull out areas also exist to the south of Broadway Avenue and 17th Avenue N which could be utilized for streetcar stations.



2nd Street N in the Jobs Park segment has right-of-way that is generally 80 feet wide. The roadway contains two travel lanes, two standard bike lanes, and curbside parking lanes. Only one traffic signal exists at the intersection of 2nd Street and West Broadway Avenue. The streetcar alignment would be located in the traffic lanes for this segment. The configuration of stations would need to accommodate bypass of the on-street bike lanes.

Both corridors currently have primarily industrial uses and publically operated facilities owned by the City of Minneapolis. However, a large portion of land west of Washington Avenue is MnDOT-owned right-of-way for Interstate 94, and would be difficult to redevelop in the future. Washington Avenue is also farther away from West River Road and the adjacent park space compared to 2nd Street. Traffic counts along 2nd Street are also much lower than Washington Avenue. For these reasons, the preliminary potential for TOD appears to be higher along 2nd Street.

Initial design constraints include managing various existing overhead power wires throughout the segment, and turning radius constraints onto West Broadway Avenue.

North Minneapolis, Golden Valley, and Robbinsdale

The North Minneapolis segment runs from Washington Avenue to Girard Avenue along West Broadway Avenue. From Girard Avenue, there are two streetcar alignment alternatives that would continue from North Minneapolis segment; one that terminates in Golden Valley near Courage Kenny Rehabilitation Institute, and one that continues northwest on West Broadway and terminates in Robbinsdale at North Memorial Hospital. The North Minneapolis segment and the two alternatives are described below.

North Minneapolis

The North Minneapolis segment is approximately 0.75 miles long between Washington Avenue and Girard Avenue along West Broadway Avenue. The roadway has right-of-way that is generally 80 feet wide. West Broadway primarily consists of four undivided travel lanes, curbside parking, and turn lanes at some intersections. Many businesses abut the street right-of-way, especially on the south side of the street. Traffic signals exist at the intersections of the I-94 southbound ramps, 4th Street N, Lyndale Avenue, Aldrich Avenue, Dupont Avenue, Emerson Avenue, Fremont Avenue, and Girard Avenue.

Some initial concerns in the section between I-94 and Girard include parking reductions near Friedman's shoe store at the corner of Broadway and 4th Street N, as well as potential center turning lane reductions throughout the corridor. Streetcar in this section would be side-running instead of center-running, due to the less intrusive nature of side-running construction.

Golden Valley Road Alternative

The Golden Valley Road alternative is approximately 1.75 miles long. The streetcar alignment would run west on West Broadway from Girard Avenue, turn south onto Knox Ave N, and then turn west onto Golden Valley Road. Road right-of-way that is generally 80 feet on West Broadway to Knox Avenue, 60 feet on Knox Avenue to Golden Valley Road, and 65 feet on Golden Valley Road to the alignment terminus. With the exception of the four lane segment of West Broadway, the majority of the alignment consists of a two lane segment with two parking lanes and occasional turning lanes. Traffic signals exist



at the intersections of Girard and Irving Avenues with West Broadway Avenue, and Penn Avenue, Russell Avenue, and Hidden Lakes Parkway with Golden Valley Road.

The transition from West Broadway Avenue to Golden Valley Road presents technical challenges for a streetcar due to the tight curves needed to make the movement. One option would be to have one-way, single-track pairing between Girard Avenue and Knox Avenue in this constrained area. Either option will likely need to take right-of-way from nearby properties to build the necessary curves.

The alignment would run west down Golden Valley Road and meet with the Golden Valley Road Station along the METRO Blue Line Extension. To avoid a challenging turnaround at the freight rail trench, the line would continue west for about ¼ mile to the Courage Kenny Rehabilitation Institute. The routing from Xerxes Ave to Courage Kenny may be technically challenging due to the relatively steep slopes of Golden Valley Road in this area. The alignment would also have to cross Theodore Wirth Parkway at a currently complicated 4-way stop intersection, which may pose technical challenges. The streetcar could operate on a tail track stub at a station near the Courage Kenny Center, and make the reverse crossover through a new signal at Hidden Lakes Parkway.

Robbinsdale Alternative

The North Minneapolis segment for the Robbinsdale alternative is approximately 2.25 miles long. The streetcar alignment would run west on West Broadway from Girard Avenue and continue along West Broadway Avenue towards North Memorial Hospital. West Broadway right-of-way ranges between 70 and 80 feet, and varies between 60 and 100 feet near North Memorial Hospital. West Broadway Avenue consists of four lanes in all areas, with some sections containing parking lanes, intersection turning lanes, center turning lanes, and center medians. Traffic signals exist at Irving, Knox, Logan, Penn, 26th, and 29th Avenues.

One major challenge will be the Theodore Wirth Parkway and Lowry Avenue interchange with CSAH 81. There are several streetcar alignment options to transition from West Broadway Avenue to the terminus station at the North Memorial hospital campus, and each has design constraints associated. There is adequate space to run the alignment to the median of CSAH 81, transition down to the Lowry and Theodore Wirth intersection, and then run the alignment at-grade to Oakdale Avenue. This would require transitioning the streetcar alignment from a side-running to a center-running alignment at a signalized intersection near 30th Avenue. The alignment would continue on Oakdale Avenue and terminate near the grassy open area at the northwest corner of the intersection of Abbott & Oakdale, with the terminus station adjacent and parallel to Abbott Avenue.

A pedestrian tunnel that connects the main buildings on the North Memorial Hospital campus currently runs underneath Oakdale Avenue, but the specific location and depth of the tunnel is currently unknown. Future coordination with North Memorial Hospital must occur to analyze the potential impacts to this pedestrian tunnel due to construction of the streetcar alignment.

Refer to **Figure 6** for the streetcar alignment alternatives. The streetcar routing options for the West Broadway Transit Study are illustrated by a yellow line. **Figure 7** provides a detailed view of the



alignment alternatives near the North Memorial Hospital campus. **Figure 8** provides detailed streetcar routing options within the North Loop and North Washington Jobs Park segments.



Figure 6: Streetcar Alignment Alternatives

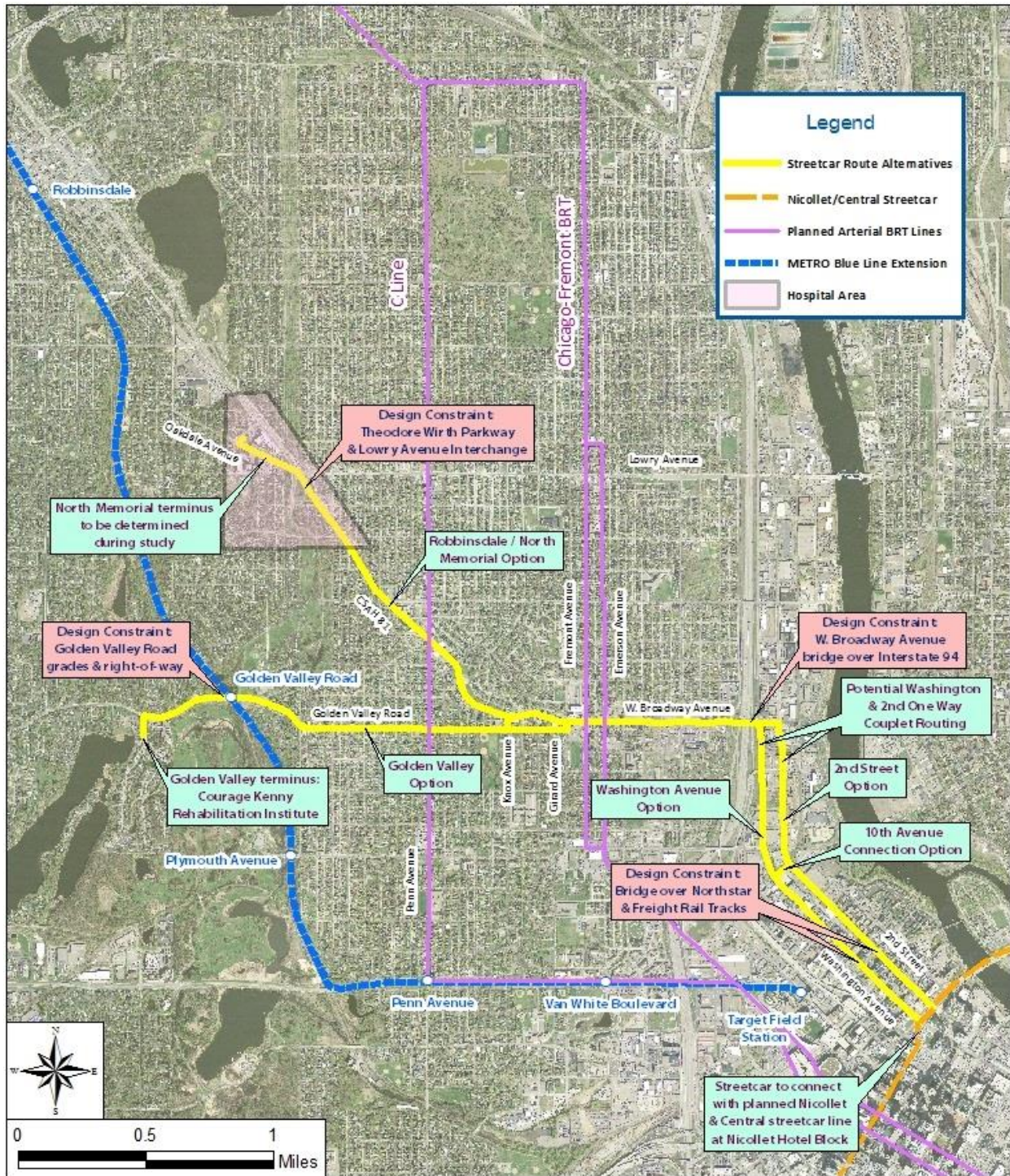




Figure 7: North Memorial Streetcar Alignment Alternatives

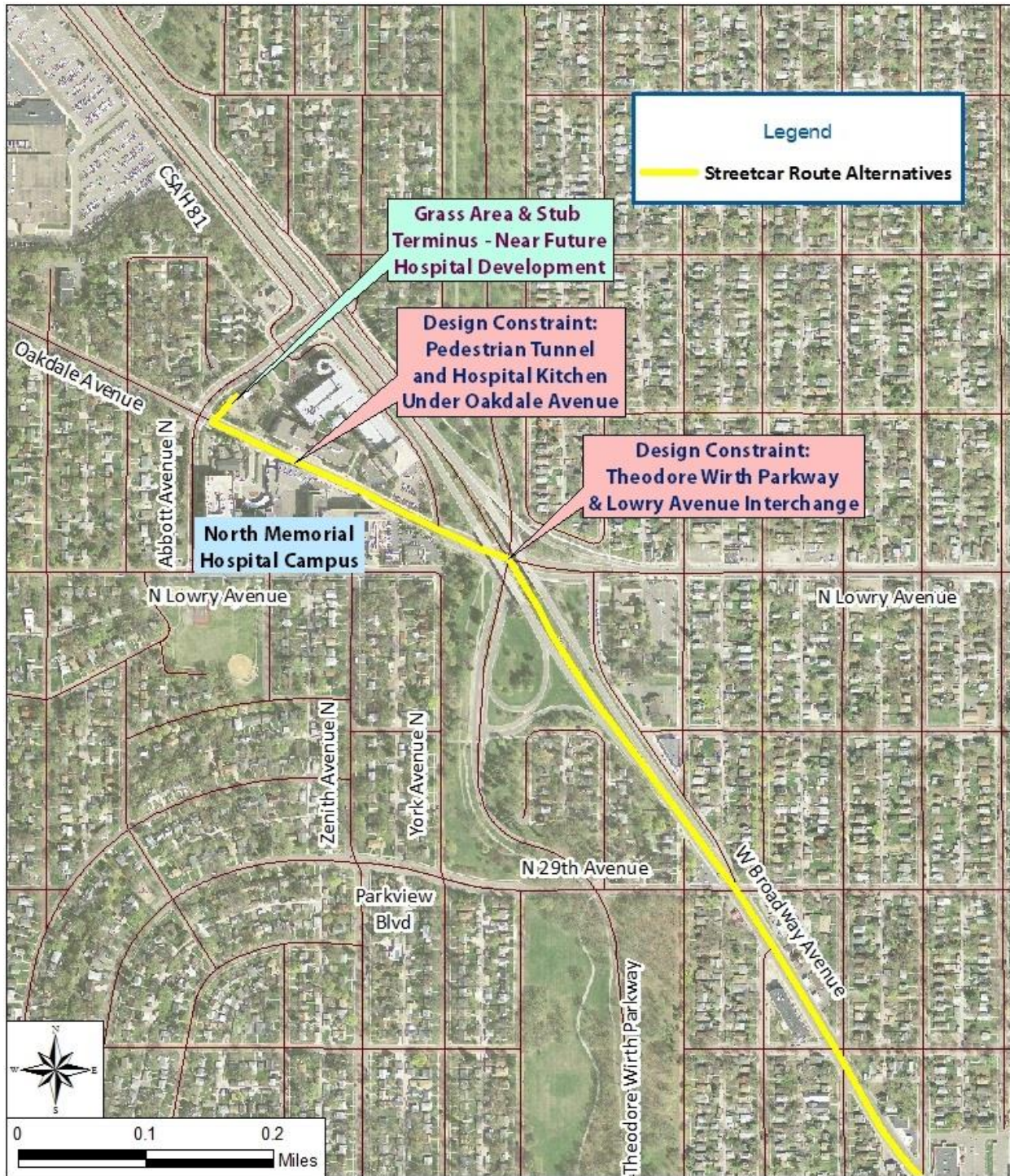
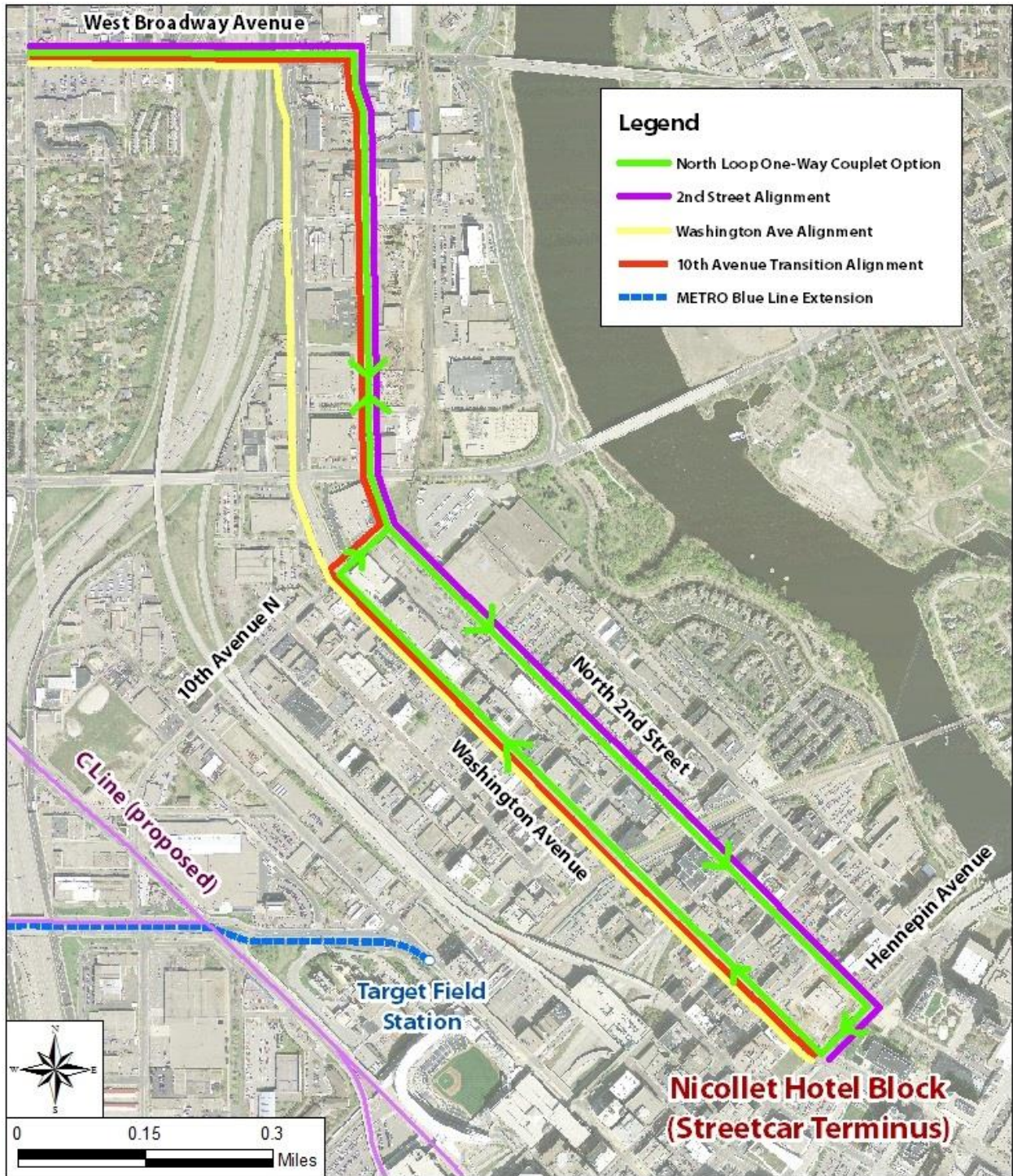




Figure 8: North Loop & Jobs Park Streetcar Options





4. Arterial BRT Alternative

BRT is an enhanced bus service that features high-frequency rides and limited stops along defined routes. In comparison to traditional buses, BRT vehicles are specialized to accommodate more passengers and allow for rapid boarding and alighting. Vehicles range in size from 40 feet to 60 foot articulated buses, and come in diesel, natural gas, and hybrid propulsion options. BRT vehicles typically have a unique appearance and branding to distinguish them from regular bus service.

Station Design

BRT stations are typically spaced at 1/3 to 1/2 mile intervals to provide a higher speed of service. Stations have similar configurations and amenities to streetcar stations, and can also have raised boarding platforms to accommodate near level or level boarding. Platform length depends on the vehicle type, operational requirements, and site constraints, but typically varies from 60 to 80 feet. Stations can be located at the near side or far side of an intersection, but the far side location is preferred to enhance operational characteristics using transit signal priority (TSP) at the traffic signal.

Alignment Alternatives

North Loop & Downtown

Similar to a streetcar alignment, the arterial BRT route would run northwest from Hennepin Avenue along either Washington Avenue or 2nd Street to Plymouth Avenue, where it would continue running north.

Arterial BRT routing east of Hennepin Avenue through the downtown core is yet to be determined. Routes along Washington Avenue to Downtown East or along Nicollet Mall to the proposed east-west transit spine on 7th and 8th Streets are all possibilities.

Hennepin County is reconstructing Washington Avenue between Hennepin Avenue and 5th Street South in 2016. Coordination between the West Broadway Transit Study project team and Hennepin County will be required to determine the feasibility of placing arterial BRT infrastructure within the reconstructed corridor. Based on the project's assumed station spacing, this portion of the reconstructed section of Washington Avenue would likely include a stop in each direction near proposed bus stops around 4th Street South. The BRT corridor would continue down Washington Avenue past Interstate 35W, and would contain a terminus station on Cedar Avenue above the METRO Green Line's West Bank Station. The route may also create a loop utilizing 3rd Street S, 19th Avenue S, and Riverside Avenue to include a stop located near the University of Minnesota's Carlson School of Management.

The arterial BRT corridor may also turn down Nicollet Mall at the corner of Nicollet and Washington, and then operate as a one-way couplet on 7th Street S and 8th Street S. The buses would continue southeast and would likely turn around at Chicago Avenue near Hennepin County Medical Center. The BRT buses would be able to utilize the planned station infrastructure that will be implemented for the upcoming C Line BRT project.



North Washington Jobs Park

Arterial BRT will continue northwest on either Washington Avenue or 2nd Street from Plymouth Avenue to West Broadway Avenue, where the line would turn west. Existing bus pull out areas on Washington Avenue south of Broadway Avenue and 17th Avenue N which could be utilized or reconfigured for arterial BRT stations. Due to lower development potential, stations would not likely be implemented between Plymouth and West Broadway Avenues.

North Minneapolis

Arterial BRT would continue to run in mixed traffic along West Broadway Avenue until Knox Avenue. The line would then either turn south onto Knox Avenue and then west onto Golden Valley Road, or would continue northwest along West Broadway Avenue.

Golden Valley Road Alternative

Arterial BRT would continue west along Golden Valley Road until Courage Kenny, where it would terminate at a station near Hidden Lakes Parkway. The arterial BRT line would also maintain a station and connection with the planned METRO Blue Line Extension near the existing BNSF freight trench.

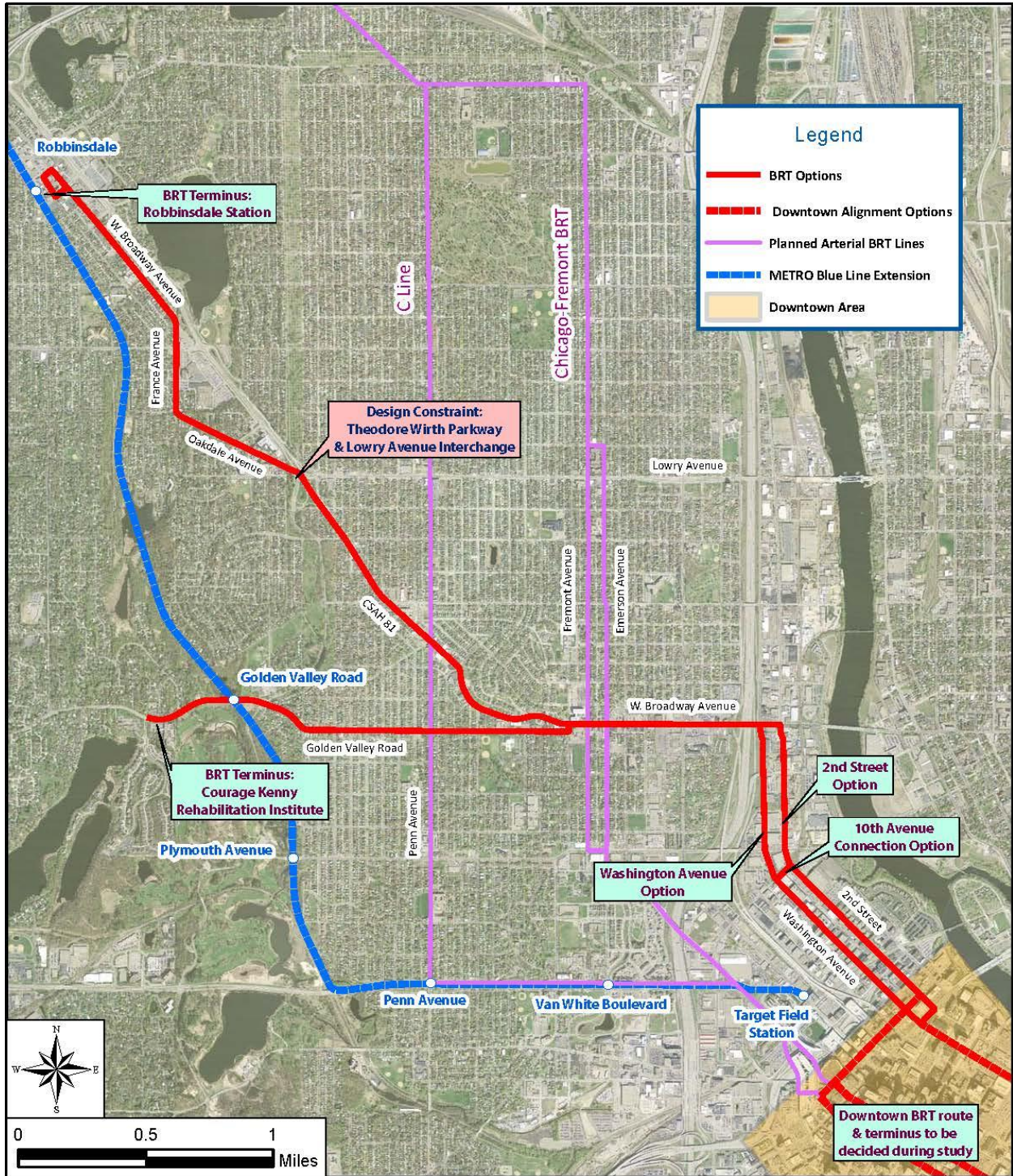
Robbinsdale Alternative

Arterial BRT would continue northwest along West Broadway Avenue until the Theodore Wirth Parkway interchange, where it would exit and continue along Oakdale Avenue through the North Memorial Hospital campus. The BRT line could either use a newly constructed bus-only off ramp in the center median at the interchange, or utilize the existing ramps to access the two roadways.

The arterial BRT line would then continue along Oakdale, France, and Broadway Avenues through downtown Robbinsdale to the Robbinsdale Station of the METRO Blue Line Extension. To access the LRT station, the line would turn left onto 41st Avenue N and terminate at the Hubbard Transit Center. Refer to **Figure 9** for the arterial BRT alignment alternatives. The BRT routing options for the West Broadway Transit Study are illustrated by a red line.



Figure 9: Arterial BRT Alignment Alternatives





5. Potential Station Locations

Preliminary station locations were determined for the corridor as part of the Arterial Transitway Corridors Study in 2012. Specific station locations will be refined during the West Broadway Transit Study through community involvement activities and more detailed analysis. Certain areas within the corridor are optimal for station placement, such as locations adjacent to major employment centers, transit transfer points, and important community centers. Throughout the concept development process, station locations for both arterial BRT and streetcar will be assumed to be identical where the two alternatives operate congruently, except in the downtown Minneapolis area. Potential arterial BRT station locations will be determined once a preferred routing through downtown is chosen. Coordination with North Memorial Hospital is also required to determine a preferred station location near the hospital.

A list of potential station locations is shown below in **Tables 1 through 5**.

Table 1: Potential Station Locations in the North Loop Segment

Street	Intersection
Washington Avenue	Hennepin (streetcar terminus)
Washington Avenue	2nd Avenue N
Washington Avenue	6th Avenue N
Washington Avenue	10th Avenue/Plymouth Avenue midblock
2nd Street N (alternative)	2nd Avenue N
2nd Street N (alternative)	4th/5th Avenue N midblock
2nd Street N (alternative)	7th/8th Avenue N midblock
2nd Street N (alternative)	10th Avenue/Plymouth Avenue midblock

Table 2: Potential Station Locations in the North Washington Jobs Park Segment

Street	Intersection
Washington Avenue	17th Avenue N
Washington Avenue	W Broadway Avenue
2nd Street N (alternative)	17th Avenue N
2nd Street N (alternative)	W Broadway Avenue
West Broadway Avenue (alternative)	2nd Street/Washington Avenue midblock

Table 3: Potential Station Locations in the North Minneapolis Segment

Street	Intersection
West Broadway Avenue	Lyndale Avenue
West Broadway Avenue	Bryant Avenue
West Broadway Avenue	Emerson/Fremont Avenue midblock
West Broadway Avenue	Irving Avenue
West Broadway Avenue	Knox Avenue

**Table 4: Potential Station Locations in the Golden Valley Alternative**

Street	Intersection
Golden Valley Road	Penn Avenue N
Golden Valley Road	Thomas/Upton Avenue N midblock
Golden Valley Road	METRO Blue Line – Golden Valley Road Station
Golden Valley Road	Courage Kenny Rehabilitation Institute (terminus)

Table 5: Potential Station Locations in the Robbinsdale Alternative

Street	Intersection
West Broadway Avenue	Morgan Avenue N
West Broadway Avenue	Penn Avenue N
West Broadway Avenue	N 26th Avenue
West Broadway Avenue	N 29 th Avenue
West Broadway Avenue	North Memorial Hospital (streetcar terminus)
West Broadway Avenue (BRT only)	France & Oakdale Avenue
France Avenue (BRT only)	36th Avenue
West Broadway Avenue (BRT only)	3810 W Broadway Avenue
West Broadway Avenue (BRT only)	METRO Blue Line – Robbinsdale Station (BRT terminus)

6. Other Facilities

An operations and maintenance facility (OMF) would be required for implementation of the streetcar alternative. The OMF would include yard track, vehicle storage, light maintenance, employee parking, and office space. It is assumed that approximately 3 acres is required for the facility, assuming a fleet of 6 streetcars. As part of this study, potential sites will need to be identified along the corridor that conform to the adjacent land uses and provide easy access to the mainline. Streetcar service also requires traction power substations (TPSS) located at approximately 1 mile spacing to provide the catenary power supply. Locations for TPSS will not be identified as part of this study, and will need to be determined in a future design phase.

It is assumed that an OMF would not be required for the arterial BRT alternative, as vehicles could be stored and maintained at an existing facility.

7. Right-of-Way

It is assumed at this stage of project development that there will be limited right-of-way acquisitions required to implement arterial BRT or streetcar in the West Broadway corridor. Right-of-way acquisitions for BRT would be limited to those station areas with constrained widths for placement of station amenities. It is assumed that the streetcar alternative would require approximately 3 acres of right-of-way for an OMF, as well as limited right-of-way acquisitions at constrained station areas. Additional right-of-way could be required for segments of the streetcar alignment at locations with constrained width available for turning operations.



8. Preliminary Capital Costs

Streetcar

At this stage of the project, assumed capital costs per mode and alignment are based on other similar projects, and will be further refined and developed as the project definition is advanced. Other examples of costs for streetcar projects around the country have ranged between \$5 million and \$60 million per mile. Local examples include the 2013 Midtown Corridor Alternatives Analysis with a \$50 million per streetcar mile cost, and the Nicollet-Central Modern Streetcar with a \$58 million per streetcar mile cost estimate. Elsewhere in the country, the Extension project in Kenosha, WI will cost approximately \$5 million per streetcar mile; however, this extension project is not seeking an FTA-guided federal funding match, and connects with existing streetcar infrastructure.

The West Broadway corridor will operate on historic trolley corridors in Minneapolis, and the project is seeking federal funding matches, and costs are anticipated to be similar to the Nicollet-Central Streetcar line. The route from the Nicollet Hotel block to North Memorial Hospital is approximately 4.0 miles long, and will require several existing bridge modifications, earthwork, limited right-of-way purchases, an operations & maintenance facility, and station infrastructure. Using an assumed range of \$50-\$60 million per mile, the capital costs would be approximately \$200-\$240 million. If the route terminates at the corner of Penn & Broadway Avenues, the corridor will be approximately 2.9 miles long and would cost approximately \$145-\$175 million.

The Golden Valley Road alternative to Courage Kenny Rehabilitation Institute is approximately 3.9 miles long, and would have similar costs as the North Memorial Hospital alternative.

Arterial BRT

The cost to implement arterial BRT on the West Broadway corridor is assumed to be similar to the upcoming A Line BRT project on Snelling Avenue and Ford Parkway. The capital costs for the 10 mile route are estimated to be approximately \$15 million, or \$1.5 million per mile.

The Robbinsdale alternative from Nicollet Hotel Block to downtown Robbinsdale is approximately 5.5 miles long. The extension option through downtown along Washington Avenue to the West Bank Station is approximately 1.5 miles long. Using an assumed unit cost of \$1.0-\$2.0 million per mile, the capital cost for the 7 mile corridor would be between \$7.0 and \$14 million, unless other roadway reconstruction costs were to be included. The Golden Valley alternative from West Bank Station to Courage Kenny Rehabilitation Institute is 5.5 miles long, and would cost between \$5.5 and \$11 million.