



West Broadway Transit Study

Detailed Definition of Alternatives

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DRAFT Prepared by the
SRF Consulting Group Team

for





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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 study is considering a range of alternatives that would meet the purpose and need for the project.

The West Broadway Transit Study's Initial Screening Analysis (under separate cover) advanced two alternatives for more detailed analysis and comparison to the no-build alternative. The alternatives include arterial bus rapid transit (BRT) service from downtown Minneapolis to downtown Robbinsdale, and streetcar service from downtown Minneapolis to North Memorial Medical Center in Robbinsdale. These alternatives are described in more detail in the following sections. The purpose of this Detailed Definition of Alternatives Report is to define these alternatives in detail sufficient to study the impacts and to form the basis of cost estimates for each alternative.

2040 No-Build Alternative

The no-build alternative is included in every transit study to establish a starting point for evaluating the benefits and costs of the build alternatives, as well as to identify the consequences of doing nothing. The year 2040 no-build scenario includes all funded transitways identified in the Metropolitan Council 2040 Transportation Policy Plan (TPP) adopted in January, 2015. The Nicollet-Central modern streetcar is not identified as a funded transitway in the current TPP and therefore will not be included in the 2040 No-Build scenario. Potential ridership changes due to interaction with a Nicollet-Central streetcar will be explored as a sensitivity test.

Each of the projects listed below has an associated local service connectivity plan. The no-build alternative also assumes the changes outlined in these plans, along with all other local and regional bus improvements as consistent with guidance from the Metropolitan Council.

Light Rail Transit (LRT)

- METRO Green Line Extension (Southwest)
- METRO Blue Line Extension (Bottineau)

Highway BRT

- METRO Orange Line (I-35W BRT)
- METRO Gold Line (Gateway BRT)

Arterial BRT

- Snelling Avenue (A Line)
- Penn Avenue (C Line)
- Chicago-Emerson/Fremont Avenue (D Line)



Build Alternatives

Option 1: Arterial Bus Rapid Transit from Downtown Minneapolis to Downtown Robbinsdale

Mode Description

This alternative assumes arterial BRT operations between Downtown Minneapolis and the Robbinsdale Transit Center in downtown Robbinsdale. BRT is an enhanced transit service that features high-frequency rides, distinct vehicles, limited stops, and incorporate many of the premium characteristics of light rail transit (LRT).

The BRT vehicles operate in mixed traffic similar to a local bus. In contrast to traditional buses, BRT vehicles are specialized to accommodate more passengers and allow for rapid boarding and alighting through off-board fare collection. Vehicles can be either standard 40 foot buses or articulated 60 foot buses. The vehicles come in diesel, natural gas, and hybrid propulsion options. BRT vehicles and stations typically have a unique and identifiable appearance and branding to distinguish them from regular bus service, and stations typically contain shelters with heat and light, specialized landscaping, furniture, raised curbside platforms, distinguishable wayfinding pylons, and real-time bus arrival signs. Stations are integrated with existing pedestrian and bicycle circulation. An example of a BRT bus vehicle and station is shown in Figure 1 above.

Alignment

The arterial BRT alignment is approximately 7 miles long and operates in mixed-traffic from downtown Minneapolis to downtown Robbinsdale. The alignment utilizes future C and D Line BRT stations on 7th and 8th streets in downtown Minneapolis between 11th Avenue S and Hennepin Avenue. The alignment turns north at Hennepin Avenue and west on Washington Avenue, where it moves into the North Loop neighborhood. The alignment turns north at 10th Avenue N, where it runs for one block to N 2nd Street. It then continues north on N 2nd Street through the North Washington Jobs Park before turning westward onto West Broadway Avenue. The alignment continues on West Broadway Avenue until reaching the intersection of Lowry Avenue, Oakdale Avenue and Theodore Wirth Parkway at the Minneapolis and Robbinsdale border. BRT vehicles would utilize existing ramps to move from W Broadway Avenue to Oakdale Avenue at this intersection. The alignment continues west on Oakdale Avenue past North Memorial Medical Center, and turns north at France Avenue. It continues on France Avenue past 36th Avenue where it turns into W Broadway Avenue. It then continues north on West Broadway Avenue where it would terminate at the future Robbinsdale Station along the METRO Blue Line Extension. Refer to Figure 2 below for the proposed arterial BRT alignment.

This option would include 19 new stations, located approximately every 1/3 mile. The option would also utilize 6 proposed C and D Line BRT stations in downtown Minneapolis. A detailed set of alignment

Figure 1: MAX BRT in Kansas City, Missouri



Photo courtesy netdensity.net.

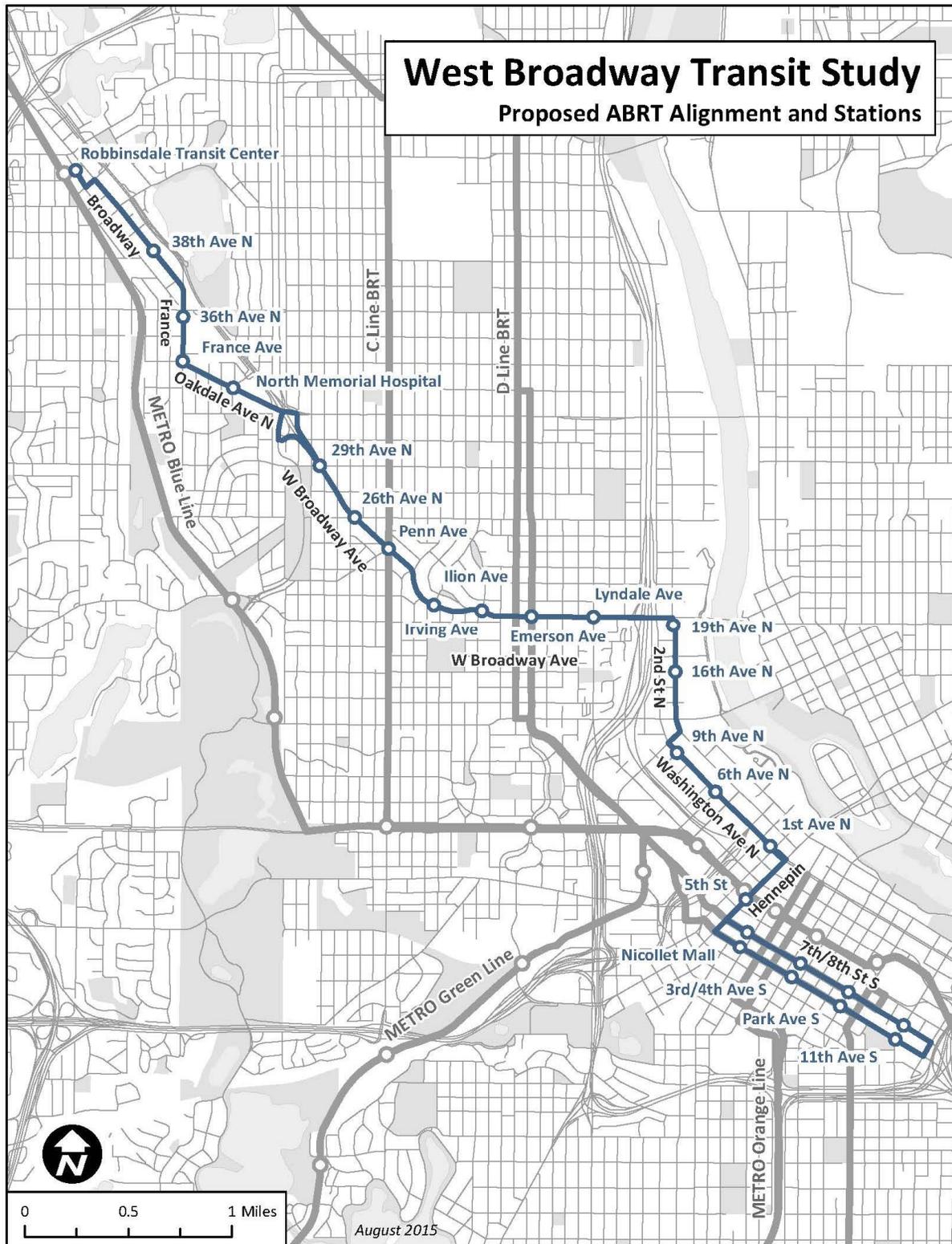


concept drawings for this alignment is included in Appendix A. It is assumed that a 40 foot BRT bus would be used, and would be designed with low floors to allow for near-level boarding.

This option also assumes transit signal priority (TSP) investments at 26 intersections along the alignment. TSP technology facilitates the movement of transit vehicles through traffic signal-controlled intersections. TSP improves transit travel time reliability and decreases transit travel times while minimizing impacts to normal traffic operations.



Figure 2: West Broadway Arterial BRT Alignment & Station Locations





Arterial BRT Stations

Station locations along the proposed arterial BRT alignment are proposed based on the following criteria:

- Station spacing approximately every 1/3 mile
- Connection to existing transit service and transfer points
- Access to employment, commercial, and other important destinations

The arterial BRT option includes 19 new stations, as shown in Table 1 below. This option will also operate on 7th and 8th Streets in downtown Minneapolis and will utilize 3 proposed C Line BRT stations (6 one-way station locations). The utilized C and D Line BRT stations are shown in Table 2.

Table 1: Proposed Arterial BRT Stations

Station ID	Street	Intersecting Street
1a	8th Street S	11 th Avenue S
1b	7 th Street S	11 th Avenue S
2	Hennepin Ave	5 th Street S
3	N Washington Ave	N 1 st Ave
4	N Washington Ave	N 6 th Ave
5	N Washington Ave	N 9 th Ave
6	2 nd Street North	N 16 th Ave
7	2 nd Street North	N 19 th Ave
8	W Broadway Ave	Lyndale Ave N
9	W Broadway Ave	Emerson Ave N
10	W Broadway Ave	Irving Ave N
11	W Broadway Ave	Ilion Ave N
12	W Broadway Ave	Penn Ave N
13	W Broadway Ave	N 26 th Ave
14	W Broadway Ave	N 29 th Ave
15	Oakdale Ave	North Memorial Medical Center
16	Oakdale Ave N	France Ave N
17	France Ave N	N 36 th Ave
18	W Broadway Ave	3810 W Broadway Ave
19	W Broadway Ave	Robbinsdale Transit Center

Table 2: Utilized C and D Line BRT Stations for West Broadway Arterial BRT

Station ID	Street	Intersecting Street
C1	8 th Street S (EB)	Nicollet Mall
C2	8 th Street S (EB)	3 rd /4 th Ave S
C3	8 th Street S (EB)	Park Ave S
C4	7 th Street S (WB)	Park Ave S
C5	7 th Street S (WB)	3 rd /4 th Ave S
C6	7 th Street S (WB)	Nicollet Mall



Station Platforms

Raised platforms are proposed for all stations to allow for convenient and efficient near-level boarding and alighting. Three (3) types of station platform configurations are proposed for stations along the arterial BRT route, as described below:

1. Bump-out Platform
2. Curbside Platform
3. Floating Platform

Bump-out Platforms

Bump-out platforms are assumed at station locations where there is existing on-street parking or excess roadway width. A bump-out platform is a section of the sidewalk that is extended from the existing roadway curb to the edge of the through lane for slightly longer than the length of the proposed platform. Existing on-street parking is eliminated at the bump-out platform locations. Bump-out platforms allow for station siting where available sidewalk space is limited, and enable transit vehicles to access stations without having to pull out of the through lane. The transit vehicle serving a bump-out platform operates within the outside travel lane, and thus interacts with moving and turning vehicles.

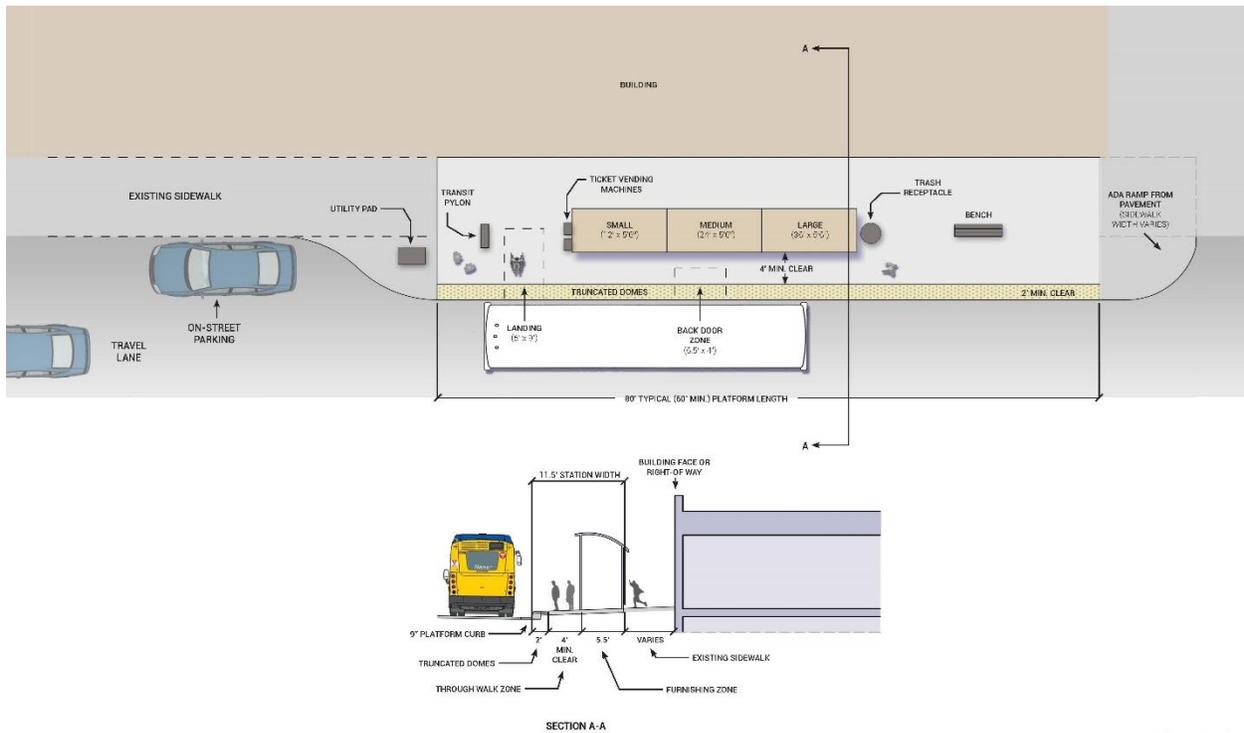
Desired station areas will be 11'-6" wide and 80 feet in length, with a minimum length of 60 feet. Depending on sidewalk and property constraints, bump-out widths range from a minimum 2' curb extension to a full 8' curb extension.

Some platforms will require partial bump-outs to accommodate the station area where there is not currently on-street parking and existing sidewalk space is too limited for a curbside platform. The extent of the curb extension will depend on the existing roadway configuration and site constraints, but will generally vary between 2 and 4 feet.

See Figure 3 below for a concept rendering of a bump-out arterial BRT platform.



Figure 3: Typical Bump-out Platform



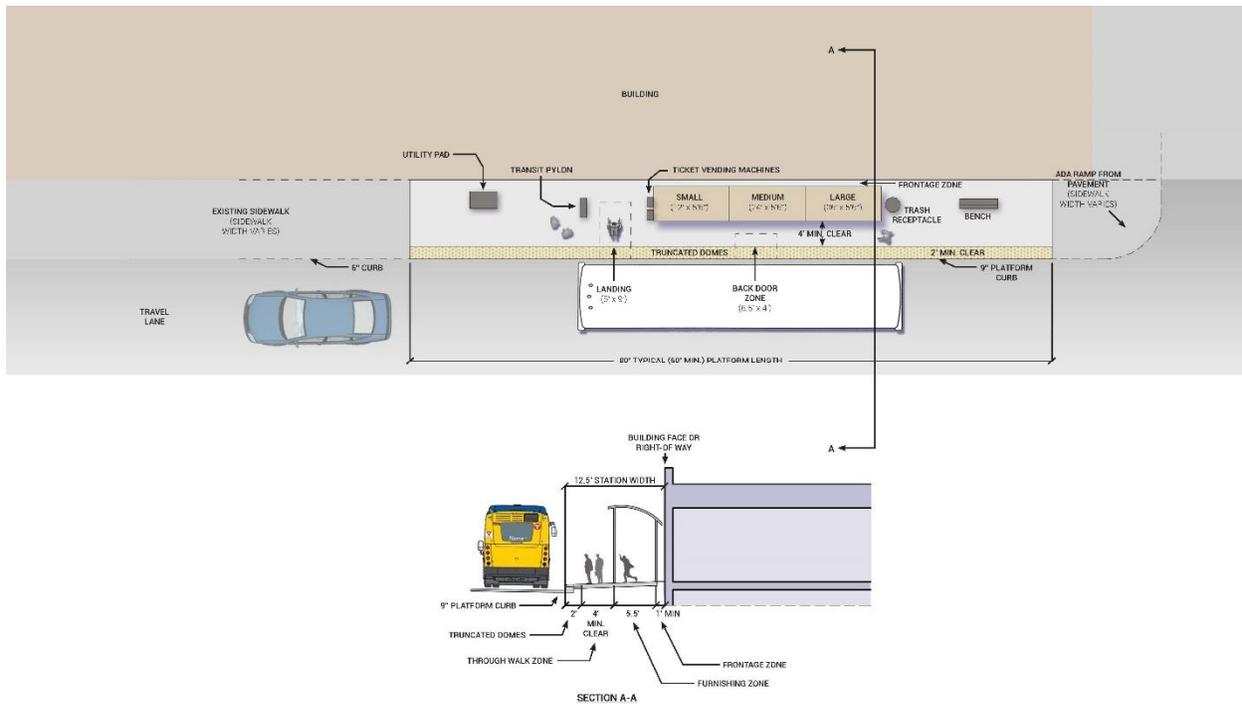
Curbside Platforms

At locations where bump-out platforms are not feasible due to existing site constraints, standard curbside platforms are assumed. Curbside platforms are located adjacent to the roadway curb of a street and are typically integrated into the surrounding sidewalk. Platforms will ideally be 11'-6" wide and 80' in length, with a minimum length of 60'. Platforms will ideally be 12'-6" wide at locations the pedestrian walkway is in front of a shelter that abuts a building. The additional one foot will be used as an offset frontage area between the shelter and building. The transit vehicle serving a curbside platform operates within the outside motor vehicle travel lane, and thus interacts with moving and turning vehicles, as well as any parked cars adjacent to the station area.

See Figure 4 below for a concept rendering of a typical curbside arterial BRT platform with a sidewalk-abutting building.



Figure 4: Typical Curbside Platform



Floating Platform

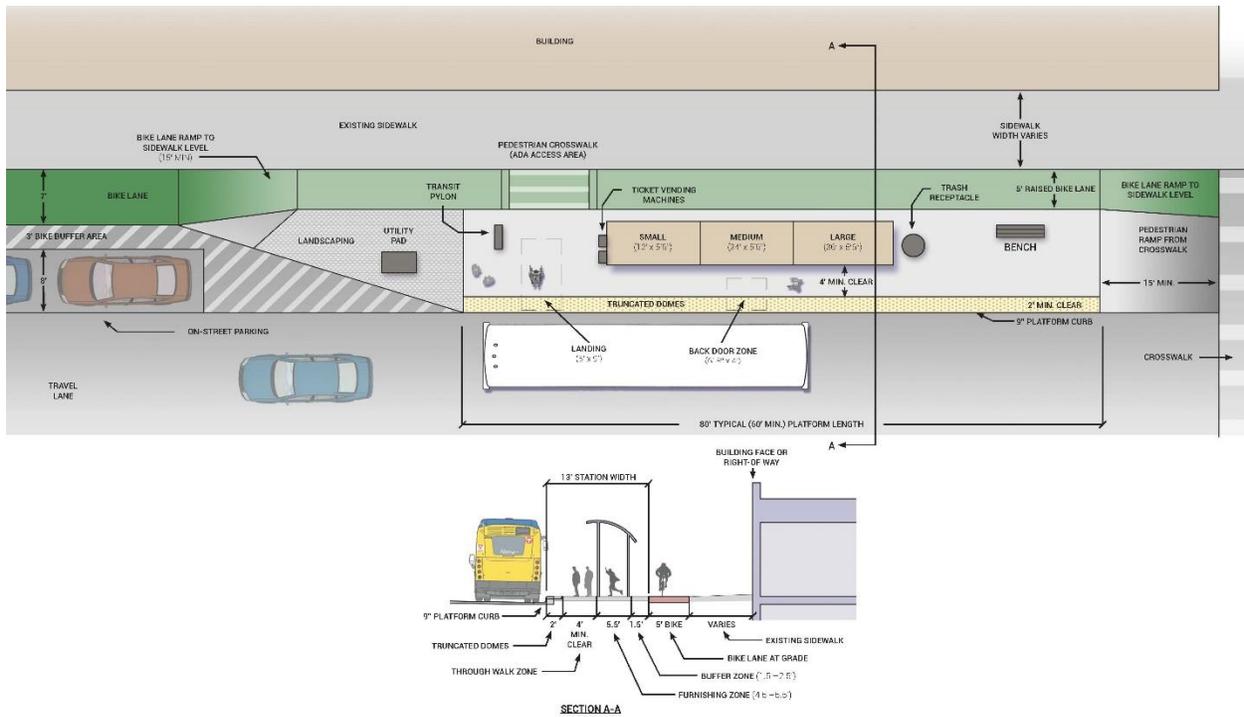
Floating platforms are assumed at station locations where there is existing on-street parking and an on-street bike lane. Similar to a bump-out platform, existing on-street parking is eliminated at the floating platform locations by extending the curb to the edge of the through lane for the length of the platform. Floating platforms allow for placement of a station where curbside bicycle lanes need to be maintained. The bike lane is placed behind the platform station area to prevent mixing zone issues with bicyclists and transit vehicles. Existing sidewalk space is preserved, especially important in commercial and retail districts with high pedestrian traffic, outdoor dining, or other sidewalk uses.

Pedestrians can access floating platforms from the existing sidewalk across the raised bike lane and via ramps from the pavement-level crosswalk area. Both pedestrian and bike lanes contain ramps from the crosswalk area to match the sidewalk elevation, which allows for easier platform snow removal and maintenance. Transit vehicles serving a floating platform operate within the outside motor vehicle travel lane, and thus interact with moving and turning vehicles. Transit vehicles are able to access stations while maintaining consistent forward direction without having to move to and from the curb.

Platforms will be typically 13 feet wide and 80 feet in length, with a minimum length of 60 feet depending on available space. Bike lanes behind the platform locations will be a minimum of 5 feet, and will contain 15 foot-long ramps from the pavement level to the platform level on either side of the station area. See Figure 5 below for a concept rendering of a typical floating arterial BRT platform.



Figure 5: Typical Floating Platform



Station Siting

The Arterial Transit Corridors Study (ATCS) recommends farside stations wherever possible; therefore, farside stations were assumed at all accommodating locations. Farside stations are located just after an intersection, and benefit transit operations because they eliminate right-turn conflicts with stopped transit vehicles at the nearside of the intersection. Farside stations also maximize transit signal priority (TSP) effectiveness.

Nearside stations were assumed in locations where existing site conditions could not accommodate farside stations. Nearside stations are located just before an intersection and are less desirable because they minimize TSP effectiveness and do not address conflicting right-turn movements.



To determine the siting of the station platforms, the following criteria were considered:

- Space available on street, sidewalk, and within the public right-of-way
- Existing driveway access
- Right turning movements
- Parking impacts
- Crosswalk locations, pedestrian and bicycle access, and area circulation
- Signal timing

Table 3 below summarizes the station types, placement, and street parking impacts at all proposed new arterial BRT stations. In some cases, the removal of street parking spaces is required for the siting of BRT platforms. However, some station locations will cause the removal of nearby existing bus stops, and therefore potentially allow the addition of on-street parking spaces.



Table 3: Arterial BRT Station Summary

Station ID	Street	Intersecting Street	Station Type	Shelter Size	Station Location	Net Parking Impacts
1a	8 th Street S	11 th Avenue S	Bump-out	Medium	Nearside	5 spaces lost
1b	7 th Street S	11 th Avenue S	Bump-out	Medium	Farside	4 spaces lost
2	Hennepin Ave	N 5 th Street	Bump-out SB Curbside NB	Large	Farside SB Nearside NB	None
3	N Washington Ave	N 1 st Ave	Floating	Medium	Farside WB Nearside EB	5 spaces lost
4	N Washington Ave	N 6 th Ave	Floating	Large	Farside	1 space added
5	N Washington Ave	N 9 th Ave	Floating	Large	Farside	10 spaces lost
6	2 nd Street North	N 16 th Ave	Floating	Small	Nearside	12 spaces lost
7	2 nd Street North	N 19 th Ave	Floating	Small	Farside	12 spaces lost
8	W Broadway Ave	Lyndale Ave N	Bump-out	Large	Farside	None
9	W Broadway Ave	Emerson Ave N	Bump-out	Large	Nearside	8 spaces lost
10	W Broadway Ave	Irving Ave N	Bump-out	Small	Farside	2 spaces lost (rush hour restricted, non-metered)
11	W Broadway Ave	Ilion Ave N	Curbside	Small	Farside	4 spaces lost (rush hour restricted, non-metered)
12	W Broadway Ave	Penn Ave N	Bump-out WB Curbside EB	Large (NB only)	Farside	None
13	W Broadway Ave	N 26 th Ave	Bump-out WB Curbside EB	Small	Farside WB Nearside EB	None
14	W Broadway Ave	N 29 th Ave	Bump-out WB Curbside EB	Small	Nearside	None
15	Oakdale Ave	North Memorial Medical Center	Bump-out	Large	Nearside WB Farside EB	None
16	Oakdale Ave N/France Ave N		Bump-out	Small	Nearside	None
17	France Ave N	N 36 th Ave	Bump-out SB Curbside fill-in SB	Medium	Nearside NB Farside SB	None
18	W Broadway Ave	3810 W Broadway Ave	Bump-out NB Curbside SB	Medium	Midblock	1 space lost
19	W Broadway Ave	Robbinsdale Transit Center	TBD	Small (One)	Robbinsdale LRT Station	None

Station Shelters and Amenities

Each arterial BRT station will include a specially-designed arterial BRT shelter. Shelters will be sized as a small, medium, or large based on various factors, including existing and forecast passenger demand, and site constraints at each station location. Stations serving opposite directions at the same intersection do



not always have two of the same sized shelters. Small shelters are a minimum 3'-4" wide and 12' long. Medium shelters are 5'-3" wide and 24' long. Large shelters are 5'-3" wide and 36' long. See Figure 6 for proposed configurations of shelters.

Figure 6: Shelter Configurations



Small Shelter (3'4" X 12')



Medium Shelter (5'3" X 24')



Large Shelter (5'3" X 36')

All station platforms are equipped with automated ticket vending machines (TVMs) for off-board fare collection. Transit pylons on the station platform contain real time signage.



Station areas will incorporate other functional elements and amenities to accommodate passenger needs and establish a safe, comfortable, and convenient transit experience. These elements include:

- Bike racks
- Trash receptacles
- Static signage for stop/route/system information
- Security cameras
- Benches
- Additional lighting (as needed)

Operations and Maintenance Facility (OMF)

The arterial BRT alternative assumes that all project operating and maintenance needs, as well as vehicle storage, will be located at an expanded Metro Transit bus facility. The study assumes that the project would only be responsible for a portion of the facility expansion costs based on the number of buses required for the transit line. This assumption was made because other regional transportation projects would also be contributing to the need for an expanded facility and therefore these projects also are responsible for a portion of the costs.

Private Property Acquisition

Some partial and full property acquisitions will be required to sustain appropriate transit station platform lengths and widths, station area improvements, and associated furnishings. The Hennepin County parcel IDs, owners, area of acquisition, type of acquisition, and the station locations for the arterial BRT option are listed in Table 4.

Table 4: Arterial BRT Property Acquisitions

Parcel ID	Station Location	Acquisition Type	Parcel Owner	Acquired Area
Publicly Owned				
1602924230189	Ilion Ave Station EB	Partial	City of Minneapolis	425 sf (0.01 ac)
1602924230040	Ilion Ave Station WB	Partial	City of Minneapolis	475 sf (0.01 ac)
Total				0.02 ac
Privately Owned				
0802924420057	29 th Ave Station EB	Partial	Joann M C Baker	325 sf (0.01 ac)
Total				0.01 ac

Service Plan

The arterial BRT alternative includes elimination of four of the five northern branches of the local Route 14 and replacement of this service with modifications and extensions to local Routes 7 and 30. Details of this service restructuring are shown in Table 5, and a map of the proposed route changes is shown in Figure 7.

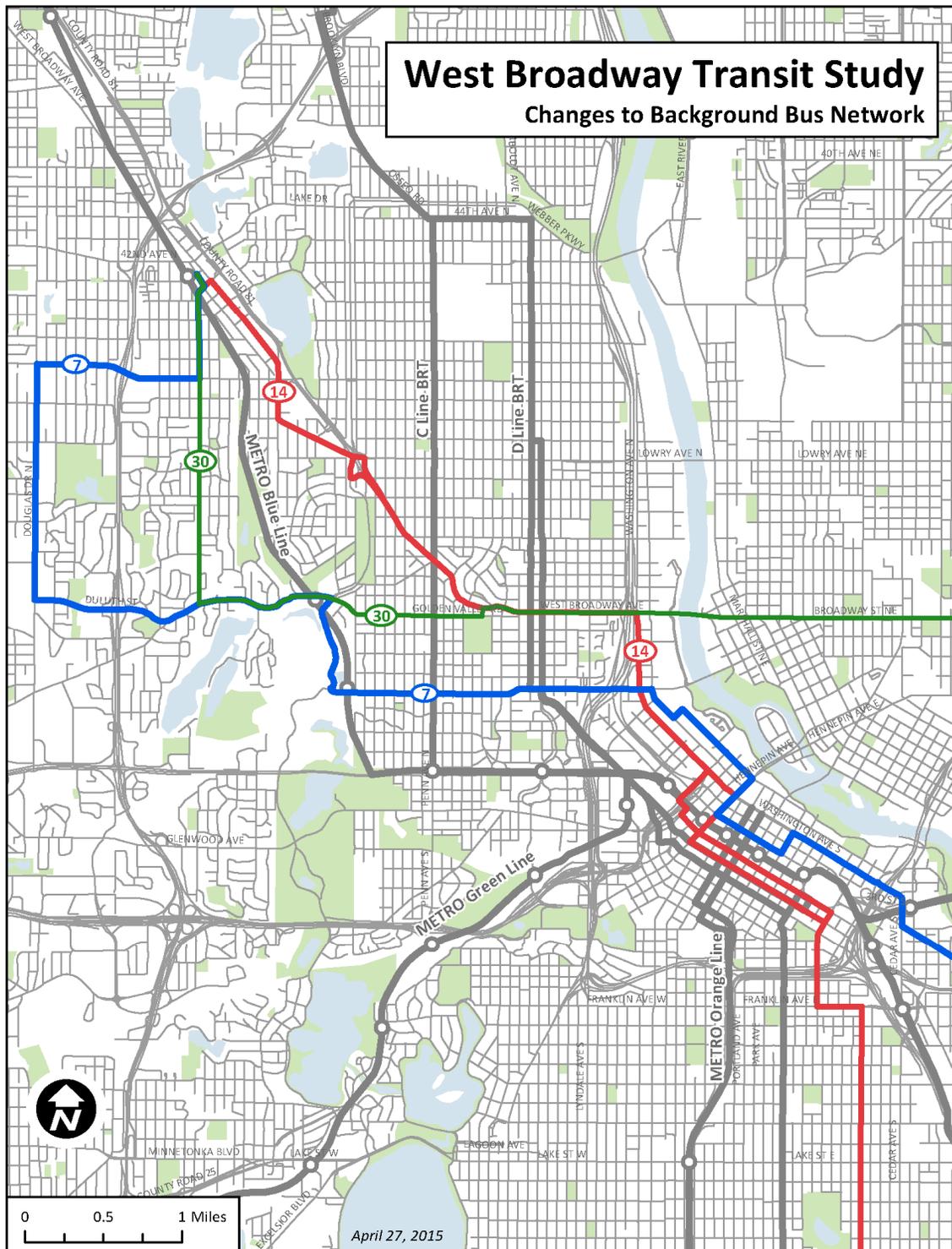


Table 5: Proposed Route Modifications in the West Broadway Corridor

Route Branch	Existing Route	Proposed Route Modifications
14D	<ul style="list-style-type: none"> West on Golden Valley Road and Duluth Street to Douglas Drive in Golden Valley North on Douglas Drive to 36th Avenue East on 36th Avenue to Noble Avenue Noble Avenue north to the Robbinsdale Transit Center 	<p>Under both the arterial BRT and streetcar alternatives, the modified Route 7 will serve the Robbinsdale Transit Center via Golden Valley Road, Duluth Street, Douglas Drive, 36th Avenue, and Noble Avenue with service every 30 minutes.</p> <p>This is an improvement over current service on the 14D, which operates hourly.</p>
14G	<ul style="list-style-type: none"> West on Golden Valley Road and Duluth Street Terminus at the Highway 100 and Duluth Park and Ride on Lilac Drive Operates only on weekends 	<p>Under both the arterial BRT and streetcar alternatives, the modified Route 7 will serve Golden Valley Road, Duluth Street, and the park and ride at Highway 100 with service every 30 minutes.</p> <p>This is an improvement over current service on the 14G, which operates approximately hourly on the weekends.</p>
14L	<ul style="list-style-type: none"> West on Golden Valley Road North on Noble Avenue to the Robbinsdale Transit Center 	<p>Under both the arterial BRT and streetcar alternatives, the modified Route 30 will serve Golden Valley Road, Noble Avenue and the Robbinsdale Transit Center with service every 30 minutes during the peak periods and hourly during off-peak times. This is an improvement over current service on the 14L, which operates approximately 7 daily trips.</p>
14N	<ul style="list-style-type: none"> Northwest on West Broadway West on Oakdale Avenue North on France Avenue West on 36th Avenue North on Noble Avenue to the Robbinsdale Transit Center 	<p>Service on 36th Avenue between Noble Avenue and West Broadway Avenue will be eliminated.</p>
14R	<ul style="list-style-type: none"> Northwest on West Broadway Avenue, west on Oakdale Avenue North on France Avenue and West Broadway Avenue to the Robbinsdale Transit Center 	<p>The Route 14 will operate hourly off-peak and 30-minute peak service alongside arterial BRT service and every 30 minutes alongside streetcar service.</p>



Figure 7: Proposed Changes to the Local Bus Network



Many of these service changes may occur before the West Broadway Transit Project is completed, as part of a restructuring of service in anticipation of the METRO Blue Line Extension opening. Furthermore, transit operations on Theodore Wirth Parkway would require discussion with and agreement from the Minneapolis Park and Recreation Board.



Frequency and Span of Service

Proposed frequencies for arterial BRT service and linked local bus service are presented in Table 6. Note that in addition to arterial BRT service, the Route 14 would operate at 60 minute frequencies along the same route, to provide local access to riders.

Table 6: Proposed Frequencies for Arterial BRT and Linked Local Bus Service

	Weekday		Saturday	Sunday
	<i>Peak</i>	<i>Off-Peak</i>		
Arterial BRT Alternative	15	15	15	15
Route 7	30	30	30	30
Route 14	30	60	60	60
Route 30	30	60	60	60

Travel Time

Travel time on arterial BRT from 11th Avenue South and 7th Street in downtown Minneapolis to the Robbinsdale Transit Center is approximately 44 minutes.



Option 2: Streetcar from Downtown Minneapolis to North Memorial Medical Center

Mode Description

Streetcars share right-of-way space with automobiles, and are attractive in areas where dedicated right-of-way for light rail transit is unavailable. 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. Streetcars are typically powered from overhead catenary wires that are suspended above the track alignment. The majority of the streetcar line proposed under this alternative 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. An example of a streetcar vehicle and station is shown in Figure 8 above.

Figure 8: Portland Streetcar in Portland, Oregon



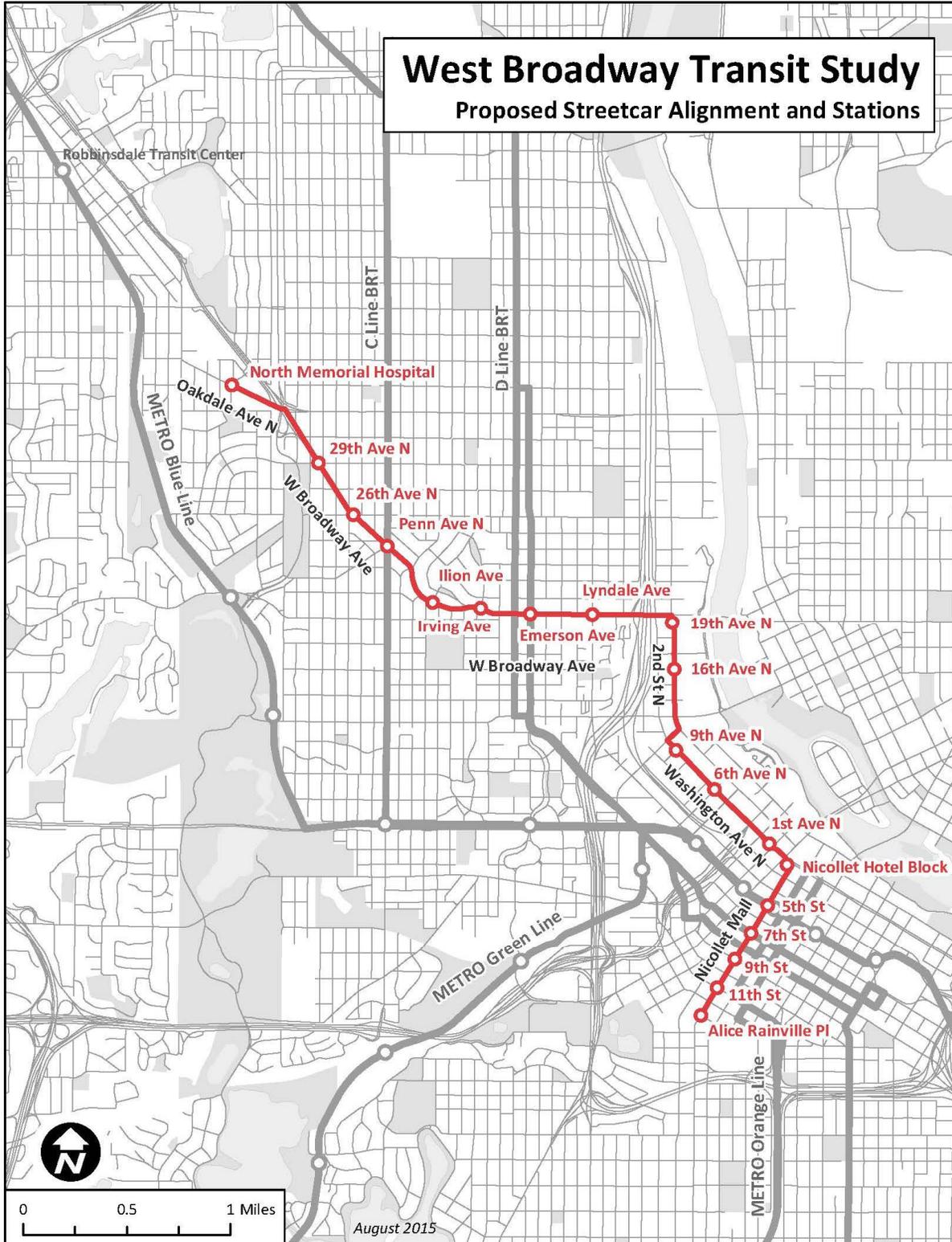
Alignment

The streetcar alignment is approximately 4.9 miles long and operates primarily in mixed-traffic from downtown Minneapolis to the North Memorial Medical Center in Robbinsdale. The alignment interlines with the future Nicollet-Central modern streetcar in downtown Minneapolis near the Minneapolis Convention Center to N Washington Avenue. The West Broadway streetcar alignment begins on a siding stub track on 14th Avenue S between Nicollet Avenue and 1st Avenue S to allow streetcar vehicles to leave the Nicollet-Central alignment for layover and turnaround. From the Nicollet Hotel block, the streetcar continues along the same alignment as the arterial BRT alternative on N Washington Avenue in the North Loop to 10th Avenue N, where it continues east for one block to N 2nd Street. It then continues north on N 2nd Street through the North Washington Jobs Park to W Broadway Avenue. The alignment then continues west on W Broadway Avenue until reaching the intersection of Lowry Avenue, Oakdale Avenue and Theodore Wirth Parkway at the border between Minneapolis and Robbinsdale. Streetcar track would transition into the W Broadway Avenue median area near 29th Avenue in order to connect to the intersection under the flyover bridge. The alignment then travels west on Oakdale Avenue where it would terminate at an off-street station next to North Memorial Medical Center. Refer to Figure 9 below for the proposed streetcar alignment.

An additional streetcar alignment alternative was studied in the North Loop operating as a one-way couplet on N 2nd Street and N Washington Avenue. Streetcars would operate on N 2nd Street in the southeast direction and on N Washington Avenue in the northwest direction.



Figure 9: West Broadway Streetcar Alignment





This option would include 13 new stations, located approximately every 1/3 mile. The line would also utilize 5 proposed Nicollet-Central streetcar stations in downtown Minneapolis. Stations for the streetcar alternative are generally at the same locations as the arterial BRT alternative for the shared alignment segment between the Nicollet Hotel block and North Memorial Medical Center. A detailed set of alignment drawings for this alignment is included in Appendix A.

This option also assumes transit signal priority (TSP) investments at 23 intersections along the alignment. TSP technology facilitates the movement of transit vehicles through traffic signal-controlled intersections. TSP improves transit travel time reliability and decreases transit travel times while minimizing impacts to normal traffic operations.

Streetcar Stations

The streetcar alternative has 13 new stations, located approximately every 1/3 mile, as shown in Table 7 below. The streetcar would also utilize Nicollet-Central Streetcar stations through downtown Minneapolis along the Nicollet Mall. These stations are shown in Table 8.

Table 7: Proposed Streetcar Stations

Station ID	Street	Intersecting Street
1	N Washington Ave	N 2 nd Ave
2	N Washington Ave	N 6 th Ave
3	N Washington Ave	N 9 th Ave
4	N 2 nd St	N 16 th Ave
5	N 2 nd St	N 19 th Ave
6	W Broadway Ave	Lyndale Ave N
7	W Broadway Ave	Emerson Ave N
8	W Broadway Ave	Irving Ave N
9	W Broadway Ave	Ilion Ave N
10	W Broadway Ave	Penn Ave N
11	W Broadway Ave	N 26 th Ave
12	W Broadway Ave	N 29 th Ave
13	Oakdale Avenue	Abbott Ave N/North Memorial Medical Center

Table 8: Utilized Nicollet-Central Stations for West Broadway Streetcar Alternative

Station ID	Street	Intersecting Street
N1	Washington Avenue	Hennepin Avenue (Nicollet Hotel Block)
N2	Nicollet Mall	5 th Street
N3	Nicollet Mall	7 th Street
N4	Nicollet Mall	9 th Street
N5	Nicollet Mall	11 th Street
N6	Nicollet Mall	Alice Rainville Place



Station Platforms

Stations for the streetcar alternative are assumed to be essentially identical in nature to the arterial BRT stations. They will consist of the same three general types of stations, namely bump-out, curbside, and floating platforms. Platform shelters and amenities are assumed to be the same for the streetcar alternative as the arterial BRT alternative.

Station Siting

The streetcar stations have the same general considerations for station siting as the arterial BRT alternative. The only differences on station siting between the two alternatives are listed below.

- Terminus station at the North Memorial Medical Center, which would be integrated in a future plaza
- The southbound 29th Ave station is required to be situated on the farside of the intersection for streetcar
- An alternative streetcar station option exists near the 2nd Avenue North intersection, instead of the 1st Avenue North intersection as shown in the arterial BRT alternative.

Table 9 below summarizes the station types, placement, and impacts on street parking of all the proposed streetcar stations.

Table 9: Streetcar Station Summary

Station ID	Street	Intersecting Street	Station Type	Shelter Size	Station Location	Net Parking Impacts
1	N Washington Ave	N 1 st Ave	Floating	Medium	Farside	5 spaces lost
2	N Washington Ave	N 6 th Ave	Floating	Large	Farside	1 space added
3	N Washington Ave	N 9 th Ave	Floating	Large	Farside	10 spaces lost
4	N 2 nd St	N 16 th Ave	Floating	Small	Nearside	12 spaces lost
5	N 2 nd St	N 19 th Ave	Floating	Small	Farside	12 spaces lost
6	W Broadway Ave	Lyndale Ave N	Bump-out	Large	Farside	None
7	W Broadway Ave	Emerson Ave N	Bump-out	Large	Nearside	8 spaces lost
8	W Broadway Ave	Irving Ave N	Bump-out	Small	Farside	2 spaces lost (rush hour restricted, non-metered)
9	W Broadway Ave	Ilion Ave N	Curbside	Small	Farside	4 spaces lost (rush hour restricted, non-metered)
10	W Broadway Ave	Penn Ave N	Bump-out WB Curbside EB	Large (NB only)	Farside	None
11	W Broadway Ave	N 26 th Ave	Bump-out WB Curbside EB	Small	Farside WB Nearside EB	None
12	W Broadway Ave	N 29 th Ave	Bump-out WB Curbside EB	Small	Nearside WB, Farside EB	None
13	Oakdale Ave	North Memorial Medical Center	Off-Street	Large	Plaza area near hospital	None



Power System

The study assumes that the streetcar alternative is powered by an overhead catenary system (OCS) that provides electricity to the system, similar to the METRO Blue Line LRT and Green Line LRT power systems. This type of power system requires the placement of four traction power substations (TPSS) along the alignment, which will supply electricity to the wire system. These TPSS will be located approximately every one mile along the alignment. TPSS are assumed to be about 400 square feet in size, but will require approximately 1,000 square feet of land for safety clearance and other equipment.

At-Grade Crossing Warning Devices

Streetcars operating in mixed-traffic along public roadways have at-grade crossings at every intersection. Streetcars operate similar to bus vehicles in that operators recognize and react to potential conflicts with vehicles and pedestrians within the right-of-way. Operating rules are established by the streetcar operator which detail the way in which streetcars operate within the system. Typically there are no wayside crossing bells along streetcar alignments, but streetcars are equipped with a bell that can be rung if the operator sees a potential conflict with a pedestrian or vehicle.

Operations and Maintenance Facility (OMF)

The streetcar alternative assumes that construction of a new maintenance facility is necessary to accommodate the project's streetcar vehicle fleet. For this corridor, it is estimated that eight streetcar vehicles will be required – six to be used in service and two spares. To accommodate a fleet of this size, the project assumes an OMF that is 150'x100' (15,000 square feet), with an additional 4,000 square foot mezzanine level. The OMF includes administrative space, shop space, two single-position shop tracks with open floor pits and overhead work areas, plus a third track for a heated carwash. It is assumed that the OMF will not have wheel truing at this facility. It is assumed that approximately 3 acres is required for the facility. At the transit study level, a project must identify multiple OMF sites; more detailed OMF site analysis will be completed in later project phases. Please see Appendix B for maps of potential OMF site locations for this alternative.

Private Property Acquisition

Some partial and full property acquisitions will be required to sustain appropriate transit station platform lengths and widths, station area improvements, and associated furnishings for a streetcar alternative. To accommodate streetcar geometry, alignment differences, and land for an Operations Maintenance Facility (OMF), more properties will be needed for the streetcar option than for arterial BRT. The Hennepin County parcel IDs, owners, area of acquisition, type of acquisition, and the station locations for the streetcar option are listed in Table 10.



Table 10: Streetcar Property Acquisitions

Parcel ID	Station Location	Acquisition Type	Parcel Owner	Acquired Area
Publicly Owned				
1602924230189	Ilion Ave Station EB	Partial	City of Minneapolis	425 sf (0.01 ac)
1602924230040	Ilion Ave Station WB	Partial	City of Minneapolis	475 sf (0.01 ac)
Total				0.02 ac
Privately Owned				
1602924240189	Irving Ave Station EB	Full	Carole Gail Cera	4,452 sf (0.10 ac)
0802924430074	29 th Ave Station EB	Full	Pair Of Dice Pizza LLC	1,303 sf (0.03 ac)
0802924430102	29 th Ave Station EB	Full	Pair of Dice Pizza LLC	9,957 sf (0.23 ac)
0802924240064	North Memorial Medical Center Station	Partial	North Memorial Medical Ctr	17,075 sf (0.40 ac)
Total				0.76 ac
Streetcar OMF Potential Sites				
1502924310113 1502924310052	Streetcar OMF	Full	American Steel & Ind. Supply	2.67 ac
1502924310125	Streetcar OMF	Full	Sari K Golden Inc.	2.96 ac
1502924340119 1502924340110 1502924310127	Streetcar OMF	Full	MDMH LLC	3.35 ac

Service Plan

The streetcar alternative would include the same route modifications as the arterial BRT alternative. Four of the five northern branches of the local Route 14 would be eliminated and replaced with extensions to local Routes 7 and 30, which would run more frequently than the various branches of the Route 14. Details of this service restructuring are shown in Table 5 and a map of the proposed route changes is shown in Figure 7.

Frequency and Span of Service

Proposed frequencies for streetcar service and linked local bus service are presented in Table 11. Note that the Route 14 would operate at 30 minute frequencies, to continue to provide the full-length trip to the Robbinsdale Transit Center.

Table 11: Proposed Frequencies for Streetcar and Linked Local Bus Service

	Weekday		Saturday	Sunday
	Peak	Off-Peak		
Streetcar Alternative	15	15	15	15
Route 7	30	30	30	30
Route 14	30	30	30	30
Route 30	30	60	60	60

Travel Time

Travel time on streetcar from Nicollet Mall and Alice Rainville Place in downtown Minneapolis to North Memorial Medical Center is approximately 33 minutes.