

# Midtown Corridor Alternatives Analysis Detailed Definition of Alternatives

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for



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## Introduction

Metro Transit is undertaking an alternatives analysis (AA) to study transit improvements in the Midtown Corridor. The AA is considering a range of alternatives that would meet the purpose and need for the project.

The Midtown Corridor AA's *Initial Screening Analysis* (under separate cover) advanced three alternatives for more detailed analysis and comparison to the no-build alternative. The three build alternatives include: enhanced bus on Lake Street, double/single-track rail in the Midtown Greenway, and a dual alternative; a combination of enhanced bus on Lake Street and rail in the Midtown Greenway. Each of the alternatives is 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.

## **2030 No-Build Alternative**

The no-build alternative is included in every AA to establish a starting point for evaluating the benefits and costs of other alternatives, as well as to identify the consequences of doing nothing. The 2030 nobuild alternative includes current services as well as planned enhancements to the existing transit as stated in the Metropolitan Council's 2030 Transportation Policy Plan, as amended in May 2013. These changes are based upon approved funding and are being built into the operational planning. The 2030 no-build alternative assumes that no significant additional transit service changes will be made within the Midtown Corridor, representing a fiscally constrained plan that is consistent with service policies. However, the 2030 no-build alternative includes several other significant improvements to the regional transit system, as outlined in Table 1. Each of the projects in Table 1 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.

Type of Transit Improvement	Project
Light rail transit	<ul> <li>Central Corridor LRT (Green Line) LRT</li> <li>Southwest LRT (future Green Line extension)</li> <li>Bottineau LRT (future Blue Line extension)</li> </ul>
Highway BRT	• I-35W BRT (future Orange Line)
Arterial BRT (enhanced bus)	<ul> <li>West Broadway</li> <li>Chicago-Emerson/Fremont</li> <li>Snelling Avenue</li> <li>Central Avenue</li> <li>Nicollet Avenue</li> </ul>

#### Table 1: Regional Transit Improvements Included in the No-Build Alternative

## **Build Alternatives**

This section defines and describes the characteristics for the three build alternatives.

## **Enhanced Bus on Lake Street**

This alternative assumes enhanced bus operations on Lake Street. Enhanced bus is a transit mode that uses bus vehicles while incorporating many of the premium characteristics of light rail transit (LRT). The project's enhanced bus alternative runs in mixed traffic similar to a local bus, and it incorporates limited-stop service, technology improvements, and branding to differentiate the service from regular bus routes. The primary objective of enhanced bus is to provide faster and more frequent service as well as an improved customer experience. Faster service is accomplished by reducing signal and passenger boarding delay, and stopping at fewer locations. An improved passenger experience is achieved through more comfortable vehicles, stations, information technology, and improved service reliability.

The enhanced bus on Lake Street alignment is a little over four miles long and operates almost exclusively along Lake Street in mixed-traffic. The alignment begins at the planned Green Line (Southwest LRT) West Lake Street Station and ends just beyond the Blue Line (Hiawatha LRT) Midtown Station at Minnehaha Avenue, as shown in Figure 1. A former streetcar corridor and current high frequency bus corridor, Lake Street is the primary east-west commercial corridor in south Minneapolis and contains a mix of retail and residential uses. The majority of the alignment has two travel lanes per direction and street parking is allowed in many locations. A small section of Lake Street between Dupont Avenue South and East Lake Calhoun Parkway operates as a one-way pair with Lagoon Ave; the alternative follows this existing traffic pattern. The alternative has 14 stations, located approximately every 1/3 mile. A detailed set of alignment drawings for this alignment is included in Appendix A. It is assumed that a 60' articulated bus would be used for enhanced bus operations. An example of an enhanced bus vehicle and station is shown in Figure 2. Buses would be designed with low floors to allow for near-level boarding. A full list of design assumptions for the enhanced bus design vehicle is included in Appendix B.

The enhanced bus on Lake Street alternative also assumes transit signal priority (TSP) investments at 27 intersections along the Lake Street alignment. TSP technology facilitates the movement of transit vehicles through traffic signal-controlled intersections. TSP improves transit travel time reliability and decrease transit travel times while minimizing impacts to normal traffic operations.



#### Figure 1: Enhanced Bus on Lake Street Alternative



Figure 2: Enhanced bus in Kansas City, Missouri



## **Enhanced Bus Stations**

The enhanced bus on Lake Street alternative has 14 stations, located approximately every 1/3 mile, in the following locations:

- West Lake Station
- Calhoun Parkway West
- Knox Avenue
- Hennepin Avenue
- Dupont Avenue
- Lyndale Avenue
- Nicollet Avenue

- I-35W
- Portland Avenue
- Chicago Avenue
- Bloomington Avenue
- Cedar Avenue
- Midtown Station
- Minnehaha Avenue

The station concepts and locations assumed in this AA are based on the assumptions presented in Metro Transit's *Arterial Transitway Corridors Study* (ATCS). ATCS placed stations at locations with high existing stop-level ridership and also at locations to maximize connections to existing bus routes. Appendix C contains a detailed station description table identifying the location, size and configuration of each station location. Appendix A contains plan view drawings of the assumed enhanced bus station configurations along Lake Street and also contains more detailed drawings of two typical station layouts.

#### **Station Platforms**

Bump-out platforms were assumed at station locations where there is existing on-street parking on Lake Street. 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 the length of the proposed platform. Once the bump-out platform ends, the sidewalk transitions back to the typical sidewalk width. Existing on-street parking is eliminated at the bump-out platform locations. 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. In this alternative four curbside stations were assumed in the eastbound direction and seven in the westbound direction, as listed below:

## Eastbound Curbside Stations:

- West Lake Station
- Calhoun Parkway West
- Knox Avenue
- Midtown Station

#### Westbound Curbside Stations:

- West Lake Station
- Calhoun Parkway West
- Knox Avenue
- Dupont Avenue South
- Nicollet Avenue South
- Chicago Avenue South
- Midtown Station

Both bump-out and curbside station platforms were designed to accommodate "near-level" boarding. Near-level boarding assumes nine-inch station platforms, as opposed to the typical six-inch curb, to narrow the gap between the sidewalk and first step of the bus.

Platform lengths for both types of stations were identified as 60, 80 or 100 feet depending on existing site conditions.

#### **Station Siting**

Farside stations were assumed wherever existing site conditions allowed. A farside stop is located just after an intersection with another roadway. Transitway operations benefit from farside stations over nearside stations because they eliminate right-turn conflicts with stopped transit vehicles at the nearside of the intersection and they also maximize TSP effectiveness. The majority of the enhanced bus stations are farside stations.

Nearside stations were used in locations where existing site conditions could not accommodate farside stations. A nearside station is located just before an intersection with another roadway. Nearside stations are less desirable than farside stations because they minimize TSP effectiveness and do not address conflicting right-turn movements.

Five nearside stations were assumed in the eastbound direction and two in the westbound direction, as listed below:

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#### **Eastbound Nearside Stations:**

- Portland Avenue South
- Chicago Avenue
- Bloomington Avenue
- Midtown Station

#### Westbound Nearside Stations:

- Calhoun Parkway West
- Hennepin Avenue
- Dupont Avenue

One mid-block station, a station located approximately midway between intersections, is assumed at the I-35 station location. This station is assumed to be directly under the I-35W bridge to provide a connection to planned Orange Line BRT improvements.

For a full list of farside, nearside and midblock station locations please see Appendix C.

#### **Station Shelters and Amenities**

Each enhanced bus station will include a shelter, designated as extra-small, small, medium, or large based on existing and forecast passenger demand at each station location. Stations at the same intersection do not always have two of the same sized shelters. For example, the Calhoun Parkway West station has a small eastbound station and an extra-small westbound station.

All shelters are equipped with automated ticket vending machines (TVMs) for off-board fare collection. The study also assumes shelters are equipped with 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

#### **Operation and Maintenance Facility (OMF)**

The enhanced bus alternative assumes that all project operating and maintenance needs, as well as vehicle storage, will be located at an expanded Metro Transit facility. The study assumes that the enhanced bus alternative would only be responsible for a portion of the facility expansion costs. 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. A detailed breakdown of the assumed OMF costs will be included in the *Capital Cost Estimates* report.

#### **Service Plan**

The section below presents an overview of the enhanced bus alternative's service plan. A detailed discussion of service plan will be included in the *Operating and Maintenance Cost Estimates* report.

The enhanced bus on Lake Street alternative increases service frequencies on Lake Street throughout the week. The corridor's limited-stop service, Route 53, is replaced by the enhanced bus service. No service changes are made to the local Route 21A; however the local Routes 21D and 21E are eliminated.

## Frequency and Span of Service

The assumed frequencies and span of service for the enhanced bus alternative and Route 21A are shown in Table 2 through Table 4.

Route	Early AM	AM	Midday	PM	Evening	Night
	4a — 5a	5a — 9a	9a -3p	3p — 6p	6p — 10p	10p – 1am
21A	30 min	15 min	15 min	15 min	15 min	20 min
Enhanced Bus	30 min	7.5 min	10 min	7.5 min	10 min	30 min

### Table 2: Weekday Service - Enhanced Bus on Lake Street Alternative

## Table 3: Saturday Service - Enhanced Bus on Lake Street Alternative

Route	Morning	Midday	Midday Evening	
	5a — 9a	9a -3p	6p – 10p	10p – 1am
21A	20 min	15 min	15 min	20 min
Enhanced Bus	15 min	10 min	15 min	30 min

#### Table 4: Sunday Service - Enhanced Bus on Lake Street Alternative

Route	Morning	Midday	Evening	Night
	5a – 9a	9a -3p	6p – 10p	10p – 1am
21A	30 min	15 min	15 min	30 min
Enhanced Bus	15 min	10 min	15 min	30 min

## **Travel Time**

The enhanced bus on Lake Street alternative has 14 station locations, as shown in the schematic in Figure 3. This alternative is estimated to take approximately 32 minutes to travel east from West Lake Station to Minnehaha Station.





## **Double/Single-Track Rail in the Greenway**

The double/single-track rail is being considered in the Midtown Greenway. This alternative uses rail transit technology operating on tracks within an exclusive fixed guideway. The study assumes this alternative uses a single car light rail vehicle (LRV), similar to what is currently in operation on Metro Transit's Blue Line LRT. A modern streetcar could also be used to provide this service. Examples of both LRVs and streetcars are shown in Figure 5. Either an LRV or modern streetcar would be powered by electricity supplied through an overhead catenary wire. A list of design assumptions for the rail alternative vehicle is included in Appendix B.

The double/single-track rail in the Greenway alignment is 4.4 miles long and operates in a dedicated guideway along the Midtown Greenway. The alignment begins at the planned Green Line LRT West Lake Street Station and ends at the Blue Line LRT Lake Street-Midtown Station, as shown in Figure 4. Owned by the Hennepin County Regional Railroad Authority (HCRRA), the Midtown Greenway is a former Canadian Pacific Railway/Soo Line freight rail facility. The property was purchased by HCRRA in 1993 for the purpose of constructing LRT or other transportation systems and associated facilities. One of the unique features of this alternative is that the rail alignment is mostly grade-separated from the existing street network. The alignment's right of way is generally 100 feet wide, but the width between the embankments varies. The alternative leaves the Greenway briefly at the eastern end of the alignment to access the Blue Line station. The alternative has ten potential station locations, located approximately every ½ mile. A detailed set of alignment drawings for this alternative is included in Appendix D.



Figure 4: Double/Single-Track Rail in the Greenway



#### Figure 5: Double/Single-Track Rail Alternative - Vehicle Design Types



#### **Station Design and Facilities**

The double/single-track rail alternative assumes ten stations in the following locations:

- West Lake Station
- Calhoun Beach
- Hennepin Avenue
- Lyndale Avenue
- Nicollet Avenue

- I-35W
- 5th Avenue
- Chicago Avenue
- Bloomington Avenue
- Midtown Station

The alternative assumes all stations in the Greenway to be approximately the same size and shape; however, the unique existing conditions in the Greenway means the exact layout of each station location will vary slightly. Appendix D shows eight typical cross sections that demonstrate the slight differences between station layouts.

#### **Platform Design**

The double/single-track rail alternative assumes all station platforms in the Greenway use a center platform configuration (one platform is used to serve a train on each side), as shown in Figure 8. Station platforms are approximately 90 feet long and 20 feet wide. Platforms will provide level boarding with the rail vehicle. Also, all platforms will provide pedestrian access to both the Midtown Greenway multi-use trail and the street network above the alignment. Each station is assumed to have at least one TVM for off-board fare collection as well as real time signage, similar to what is in use at existing Metro Transit facilities.

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

- Trash receptacles
- Static signage for stop/route/system information
- Security cameras

Bicycle racks will not be included on the rail platform; however they will be included at street level pedestrian circulation points.

#### **Vertical Circulation**

The study assumes that vertical circulation to and from each station platform will be provided by a structure positioned at the south side of the Greenway embankment, as shown in the alignment drawings in Appendix D and illustrated in Figure 8 through Figure 10. The structure will contain a set of stairs and an elevator. The vertical circulation area will also be equipped with two station markers; one on top of the vertical circulation structure and one placed at street level to provide enhanced visibility, as shown in Figure 9.

#### **Power System**

The study assumes that double/single-track rail in the Greenway is powered by an overhead catenary system (OCS) that provides electricity to the system; similar to how Metro Transit's Blue Line LRT is currently powered. An example of the Blue Line's power infrastructure is shown in Figure 6. This type of power system requires the placement of multiple traction power substations along an alignment to supply electricity to the wire system. This study assumes the project will need four traction power substations, placed approximately every one mile along the alignment. Traction power substations are assumed to be approximately 40 feet long by 15 feet wide and 13 feet high. Modern streetcar would require smaller but more frequently spaced (about every half-mile) traction power substations.

#### Figure 6: Example of Overhead Catenary



#### **Retaining Walls and Fencing**

To construct the rail alternative while minimizing impacts to the trail, modification to the existing retaining walls in the Greenway are required. The alignment drawings in Appendix D highlight the locations where modifications or additions to retaining walls and fencing are necessary. Additional fencing will be required to deter persons from walking onto the tracks, except at pedestrian crossing locations – where appropriate warning devices are provided. New fencing is required at any location that does not have fencing today. In future project stages, existing fencing would need to be reviewed to determine if it needs to be replaced or upgraded with new fencing.

#### **Pier Protection (crash walls)**

Current American Railway Engineering and Maintenance-of-way Association (AREMA) guidelines adopted by the Minnesota Department of Transportation (MnDOT), require all bridges adjacent to rail corridors to be equipped with pier protection. Pier protection is additional structural reinforcement placed at the base of each bridge pier that protects bridge piers from destruction in the face of a train derailment. Some bridge piers in the corridor have existing pier protection, shown in Figure 7. This typical example of pier protection shows a concrete wall surrounding the base of the bridge piers. The study assumes that additional protection will be added to all unprotected bridge piers in the Midtown Greenway.



#### Figure 7: Example of Existing Pier Protection in the Midtown Greenway

## At-Grade Crossing Warning Devices

The double/single-track rail alignment has six at-grade crossings in the following locations:

- James Avenue South
- Irving Avenue South
- Humboldt Avenue South
- 5th Avenue South
- 20th Avenue South
- 21st Avenue South

For a map of these locations please see Appendix D. At-grade rail crossings require warning devices to alert pedestrians, bicyclists and drivers to the approaching arrival of a rail vehicle. The specific type of warning device will be determined through further study and will take into consideration the surrounding environment.

#### Figure 8: Double/Single-Trail Rail in the Greenway – Station Layout





Figure 9: Double/Single-Trail Rail in the Greenway – Cross Section A-A, looking south



#### Figure 10: Double/Single-Trail Rail in the Greenway – Cross section B-B, looking west



#### **Operating and Maintenance Facility (OMF)**

The double/single-track rail alternative assumes the construction of new structure is necessary to accommodate the project's fleet of five rail vehicles. To accommodate a fleet of this size, the project assumes OMF facility that is 150'x100' (15,000 square feet), with an additional 4,000 square foot mezzanine level. The OMF facility 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. At the AA study level, a project must identify multiple potential OMF sites; more detailed OMF site analysis will be completed in later project phases. Please see Appendix E for maps of potential OMF site locations for this alternative.

#### **Service Plan**

The section below presents an overview of the rail alternative's service plan. A detailed discussion of service plan changes will be discussed in the *Operating and Maintenance Cost* report. The service plans for Route 53 express route and the local Route 21A do not change, but local Routes 21D and 21E are eliminated.

#### Frequency and Span of Service

The assumed frequencies and span of service for the double/single-track rail alternative, Route 21 and Route 53, are shown in Table 5 through Table 7.

Route	Early AM	AM	Midday	PM	Evening	Night
	4a – 5a	5a — 9a	9a -3p	3p <b>-</b> 6p	6p – 10p	10p – 1am
21A	30 min	15 min	15 min	15 min	15 min	20 min
53	-	15 min	-	-	-	-
Train	30 min	10 min	10 min	10 min	15 min	30 min

#### Table 5: Weekday Service – Double/Single-Track Rail Alternative

#### Table 6: Saturday Service - Double/Single-Track Rail Alternative

Route	Morning	Midday	Evening	Night
	5a — 9a	9a -3p	6p – 10p	10p – 1am
21A	20 min	15 min	15 min	20 min
53	-	-	-	-
Train	15 min	10 min	15 min	30 min

#### Table 7: Sunday Service - Double/Single-Track Rail Alternative

Route	Morning	Midday Evening		Night
	5a – 9a	9a -3p	6p – 10p	10p – 1am
21A	30 min	15 min	15 min	30 min
53	-	-	-	-
Train	15 min	10 min	15 min	30 min

## **Travel Time**

The double/single-track rail alternative has 10 station locations, as shown in the schematic in Figure 11. This alternative takes approximately 13 minutes to travel east from West Lake Station to Midtown Station.



#### Figure 11: Double/Single-Track Rail in the Greenway Schematic

## **Dual Alternative**

The third build alternative is a combination of the first two alternatives: an enhanced bus on Lake Street combined with a double/single track rail in the Greenway, as shown in Figure 12. For the rail portion of the alternative, the alignment and station locations remain the same as previously discussed. However, the alignment and station locations for the enhanced bus are slightly different in the dual alternative than what is assumed in the stand-alone enhanced bus on Lake Street alternative. In the enhanced bus on Lake Street alternative the alignment spanned from West Lake Street Station to the Minnehaha Avenue Station. In the dual alternative, the western terminus is shifted from West Lake Street/Lagoon Avenue one-way couplet, as shown in Figure 12. Hence, this alternative has ten enhanced bus stations versus the 14 stations assumed in the enhanced bus on Lake Street alternative assumes that the enhanced bus would use existing station facilities at the Uptown Transit Center; therefore no detailed drawings of this alignment modification are included in this report. Please refer to Appendix A to see detailed drawings of the other enhanced bus station locations and Appendix D to see detailed drawings of the rail portion of the alternative.

All other previously discussed design assumptions for both alignments remain consistent and are necessary for the dual alternative.

#### **Enhanced Bus Extension**

In response to stakeholder feedback, an enhanced bus extension will be studied in conjunction with the dual alternative. The extension extends east of the Minnehaha Avenue station and into Saint Paul. With the extension included, the enhanced bus alignment is approximately eight and a half miles long. East of the Minnehaha Avenue station, the extension continues to operate on Lake Street; after crossing the Mississippi River it operates on Marshall and Snelling avenues, as shown in Figure 14. East of Minnehaha Avenue, the configuration of Lake Street remains generally the same with two travel lanes per direction and street parking in many locations. In contrast, Marshall Avenue consists of one lane per direction with striped bike lanes. Street parking is also allowed in many locations along Marshall Avenue. With the potential extension included, the enhanced bus alignment has 21 proposed station locations, spaced approximately every 0.4 miles.



#### Figure 12: Dual Alternative









## **Enhanced Bus Extension – Station Locations**

As noted above, the dual alternative has a total of 21 enhanced bus stations with the extension included, meaning the extension adds nine stations to the alternative. The project assumes the extension stations are designed and assigned shelter sizes in the same manner as previously described in the enhanced bus alternative. The extension also assumes bump-out station platforms and farside locations wherever possible. Due to existing site constraints, curbside platforms and nearside locations were assumed at some extension station locations. The locations of the extension's nearside and curbside stations are listed below. For a detailed description of each extension station please see Appendix C.

#### Eastbound Curbside Stations:

- Otis Avenue
- Spruce Tree Avenue

#### Westbound Curbside Stations:

- Otis Avenue
- Cretin Avenue
- Spruce Tree Avenue

#### **Eastbound Nearside Stations:**

None

#### Westbound Nearside Stations:

- 31st Avenue South
- Spruce Tree Avenue

#### **Dual Alternative Service Plan**

The section below presents an overview of the alternative's service plan. A detailed discussion of the service plan will be included in the *Operating and Maintenance Cost Estimates* report. The service plan for the local Route 21A local route does not change, but local Routes 21D, 21E and the limited-stop Route 53 are eliminated. These modifications are also assumed when the enhanced bus extension is added to the dual alternative.

#### Frequency and Span of Service

The assumed frequencies and span of service for the dual alternative and Route 21A are shown in Table 8 through Table 10. These frequencies do not change when the extension is added to the dual alternative.

Route	Early AM	AM	Midday	PM	Evening	Night
	4a — 5a	5a – 9a	9a -3p	3p <b>-</b> 6p	6p – 10p	10p – 1am
21A	30 min	15 min	15 min	15 min	15 min	20 min
Enhanced Bus	30 min	7.5 min	10 min	7.5 min	10 min	30 min
Train	30 min	10 min	10 min	10 min	15 min	30 min

#### **Table 8: Weekday Service - Dual Alternative**

#### Table 9: Saturday Service - Dual Alternative

Route	Morning	Midday Evening		Night
	5a – 9a	9a -3p	6p – 10p	10p – 1am
21A	30 min	15 min	20 min	30 min
Enhanced Bus	15 min	10 min	15 min	30 min
Train	15 min	15 min	15 min	30 min

#### Table 10: Sunday Service - Dual Alternative

Route	Morning	Midday	Evening	Night
	5a – 9a	9a -3p	6p – 10p	10p – 1am
21A	30 min	15 min	30 min	30 min
Enhanced Bus	15 min	10 min	15 min	30 min
Train	15 min	15 min	15 min	30 min

#### **Travel Time**

As noted previously, the enhanced bus stop alignment is slightly modified from the enhanced bus on Lake Street alternative's alignment. Instead of terminating at West Lake Station, the enhanced bus in the dual alternative terminates at the Upton Transit Center, as shown in Figure 14. Due to the shorter alignment, the dual alternative enhanced bus travel one-way travel time drops from 32 minutes to 24 minutes. The one-way travel time for the rail portion of the alternative remains at 13 minutes in this alternative, the same one-way travel time as estimated for the double/single track rail alternative.

#### Figure 14: Dual Alternative – Combination of Rail and Enhanced Bus

