



Midtown Corridor Alternatives Analysis

Capital Cost Estimation Methodology and Assumptions

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for





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Introduction

During the Midtown Corridor Alternatives Analysis (AA), a cost estimate was prepared for each of the alternatives included in the study. The cost estimate reflects the alternative refinements that were made during the AA process, based on stakeholder input. This estimate can be considered a “snapshot in time” and was developed to provide a high-level analysis of the cost impacts associated with the alternative refinements.

This report summarizes the assumptions and changes that were used to develop the cost estimate.

Alternatives Overview

The Midtown Corridor AA evaluated four build alternatives. The following is a summary of each alternative for which costs were prepared. Concept plans for each alternative can be found in Appendix A.

Double/Single-Track Rail in the Midtown Greenway: Two concepts were developed for the rail alternative in the Midtown Greenway. The main difference between them is the amount of single track included in the alignment. Under both concepts, it assumed that at all station locations, the alignment would be double-track through the station platform. For costing purposes, this alternative assumes the vehicle to be a light rail transit (LRT) vehicle operating as a single car train as opposed to a smaller, streetcar-type vehicle.

- **Concept 1:** This alternative has a combination of single- and double-track rail service operating in the Midtown Greenway between the Green Line and Blue Line LRT. The alignment begins as double-track at the West Lake station located adjacent to the proposed Green Line LRT station and immediately transitions to single-track after the station. It continues east and crosses over Dean Parkway on the existing bridge, prior to becoming double-track at the Calhoun Beach station. The alignment continues as double-track adjacent to the Greenway trail between the Calhoun Beach station and the Bloomington Avenue station. It then becomes single-track prior to the bridge at 17th Avenue and continues to the Midtown station, adjacent to the Hiawatha LRT station. The alignment transitions to double-track immediately prior to the Midtown Station.

Under this concept, portions of the Midtown Greenway trail are shifted or modified to accommodate the alignment. A short segment of trail is shifted at the West Lake station to make room for the station platform. The trail is shifted slightly between the Calhoun Beach station and James Avenue, which includes new pedestrian bridges over the Lake of the Isles channel and Calhoun Parkway. There also are trail modifications between the Hennepin Avenue station and Colfax Avenue as well as between 12th and 17th avenues. The existing access ramp from 13th Avenue requires reconstruction to accommodate the shift of the trail.

- **Concept 2:** This alternative has a combination of single- and double-track rail service operating in the Midtown Greenway between the Green Line and Blue Line LRT. This concept includes single-track segments as identified in concept 1 as well as an additional single-track segment



between Hennepin Avenue and Blaisdell Avenue. The additional single-track segment would begin under the existing Hennepin Avenue Bridge, continuing to Blaisdell Avenue, generally located within the center portal of the existing bridges. The additional single-track segment would reduce the quantity of retaining walls required in this area and eliminate the trail modifications that are identified between Hennepin Avenue and Colfax Avenue in concept 1.

Enhanced Bus on Lake Street: This alternative provides arterial bus rapid transit (BRT) service along Lake Street between the Green Line and Blue Line LRT. A station also is included east of Hiawatha at Minnehaha Avenue as a turnaround point. Corridor improvements are limited to station areas. Improvements include adding 9-inch raised platforms, transit signal priority at intersections, and station amenities such as shelters, branding, and off-board fare collection.

Dual Alternative: This alternative combines the double/single-track rail in the Midtown Greenway alternative with the enhanced bus on Lake Street alternative. In this alternative the enhanced bus service on Lake Street runs between the Hennepin Avenue station and the station at Minnehaha Avenue while the double/single-track rail in the Midtown Greenway remains unchanged. Capital costs were developed for two different track types in this alternative, ballasted and turf track.

Dual Alternative with Enhanced Bus Extension to St. Paul: This alternative is the same as the dual alternative, except the BRT service on Lake Street is extended on Lake Street and Marshall Avenue to Snelling Avenue where it terminates at a station on Snelling Avenue, near University Avenue. The station at Minnehaha Avenue with this alternative is located on Lake Street, as opposed to the turnaround location with the enhanced bus on Lake Street alternative. Capital costs were developed for two different track types in this alternative, ballasted and turf track.

Capital Cost Methodology

Capital cost estimates were prepared using the format and procedures currently required for project evaluation by the Federal Transit Administration (FTA). FTA methodology uses standard cost categories (SCC), grouping costs by various components such as guideway, stations, operations and maintenance facilities, sitework, signalization and communications systems, right-of-way acquisition, and vehicles. Soft costs or professional/technical services are included for items such as engineering, construction services, insurance, and owner's costs. This also includes contingencies for uncertainty in both the estimating process and the scope of the project. The cost estimates for LRT and BRT follow the same principles, using similar level of detail for each transit mode.

At this early study stage, there was not sufficient definition or detail to prepare true construction cost estimates for the various alternatives under consideration. Rather, capital cost estimates were developed using representative typical unit costs or allowances on a per unit basis that is consistent with the level of alternatives definition. Capital cost estimates will need to be refined when additional studies are conducted to further the design of the corridor.

The following parameters were used to develop the capital cost estimate:

- Base Year: Year 2013
- Allocated Contingencies: Allocated contingencies are contingencies that are associated with individual cost estimate categories. These contingencies are intended to compensate for unforeseen items of work, quantity fluctuations, and variances in unit costs that develop as the project progresses through the various stages of design development. The level of allocated contingency applied to each cost category reflects the relative potential variability of those estimates. The following allocated contingencies were used for the capital cost estimates:
 - SCC 10 - SCC 50: Infrastructure – 20%
 - SCC 60: Right-of-way – 100%
 - SCC 70: Vehicles – 5%
 - SCC 80: Professional services – 0%
- Unallocated Contingency: An unallocated contingency of 20 percent is included in the capital cost estimates. This contingency is applied to the total estimated capital cost for each alternative and is added to any specific estimating contingencies that are included or allocated to the various cost categories.

The level of detail of the capital cost estimates for this study corresponds with the current level of alternatives definition, engineering, and environmental analyses. The level of estimating detail typically increases as the project progresses through the various phases of development during the AA study, environmental impact studies, preliminary engineering, and final design.

FTA Standard Cost Categories (SCC)

The following section describes each SCC and the items included in each.

SCC 10 - Guideway

This category includes costs associated with all the civil and structural costs directly associated with construction of the guideway structures, roadbed, and pavement or track.

The following are the costs associated with the double/single-track rail in the Midtown Greenway alternative:

- Two different track type costs were estimated for both of the double/single-track rail alternatives: ballasted and turf track. Both cost scenarios assume that one track type is provided for the entire alignment length of the Midtown Greenway. Further refinement could show that a combination of ballast and turf track segments strikes the appropriate balance.
- Grading and drainage is included for subgrade preparation of the ballasted or turf track.
- Special trackwork for transitions into/out of single-track segments and to facilitate movements between eastbound and westbound tracks.

There were no guideway costs associated with the enhanced bus on Lake Street alternative, as the construction impacts will be limited to station areas.

SCC 20 - Stations

This category includes costs associated with station platforms, ramps, platform fixtures, canopies, and passenger amenities as well as costs for vertical circulation (elevators and stairs) to the platform, where necessary.

Stations for the double/single-track rail in the Midtown Greenway alternative are assumed to be center loading platforms that are 90 feet long by 20 feet wide. This category also includes a shelter that is similar in concept, but roughly one-third of the length of an LRT platform. Vertical circulation includes provisions for stairs and an elevator within an enclosed building to provide access between stations that are located within the Midtown Greenway and the adjacent street. Stations that are located on at-grade intersections will require pedestrian railroad crossings.

The following stations on the Midtown Greenway include vertical circulation:

- Hennepin Avenue
- Lyndale Avenue
- Nicollet Avenue
- I-35W/Stevens Avenue
- Chicago Avenue
- Bloomington Avenue

The following stations on the Midtown Greenway are at-grade:

- West Lake Street
- Calhoun Beach
- 5th Avenue
- Midtown

Stations for the enhanced bus on Lake Street alternative and the Lake Street alignment portion of the Dual Alternatives are similar in concept to those developed as part of the Arterial Transitway Corridors Study (ATCS). The minimum length of station platform areas is 60 feet and the maximum length is 100 feet, which provides room to combine the local bus stop with the enhanced bus station. Shelters are a modular concept that can be used to create various configurations based on constraints and ridership demand at each station. Four major classifications of shelters were assumed: extra small, small, medium, and large. Stations located on a bumpout were assumed to include a windscreen, except for the extra small shelter.

The following at-grade stations are included in the enhanced bus on Lake Street alternative:

- | | | |
|--------------------|---|----------------------|
| • West Lake Street | • Lyndale Avenue | • Chicago Avenue |
| • Calhoun Parkway | • Nicollet Avenue | • Bloomington Avenue |
| • Knox Avenue | • I-35W/Stevens Avenue/2 nd Avenue | • Cedar Avenue |
| • Hennepin Avenue | • Portland Avenue | • Midtown |
| • Dupont Avenue | | • Minnehaha Avenue |

The following at-grade stations are included in the dual with extension to St. Paul alternative:

- Hennepin Avenue
- Dupont Avenue
- Lyndale Avenue
- Nicollet Avenue
- I-35W/Stevens Avenue/2nd Avenue
- Portland Avenue
- Chicago Avenue
- Bloomington Avenue
- Cedar Avenue
- Midtown
- Minnehaha Avenue
- 31st Avenue South
- 36th Avenue South
- 44th Avenue South
- Otis Avenue
- Cretin Avenue
- Cleveland Avenue
- Fairview Avenue
- Fry Street
- Spruce Tree Avenue

SCC 30 – Support Facilities

The support facilities SCC includes the capital cost of operations, maintenance, and storage facilities for the corridor. Approximately three acres will be required for an operations and maintenance facility for the double/single-track rail alternative. It is assumed that a new facility will be constructed adjacent to the corridor and will include yard track, a light maintenance building that can accommodate enclosed storage of five LRT vehicles, employee parking, and office space.

The requirements for enhanced bus support facilities are dependent on the type of vehicle, the size of the fleet, and the maintenance needs of the system. The enhanced bus alternatives were assumed to use low-floor 60-foot buses. It is currently unclear whether an entirely new facility would be needed to support the enhanced bus on Lake Street alternative or whether existing Metro Transit facilities could be modified and expanded to meet the need. A per bus capital cost was included for a new maintenance facility, or modifications to an existing bus facility, as part of the enhanced bus on Lake Street alternative or the dual alternatives.

SCC 40 – Sitework and Special Conditions

The sitework and special conditions SCC includes estimated costs for all other construction activities that are not accounted for in the guideway, stations, support facilities, or systems categories. Two different sets of line items were used for SCC 40 because the double/single-track rail in the Midtown Greenway alternative and the enhanced bus on Lake Street alternative have very different construction impacts.

The sitework and special conditions unit cost line items for the enhanced bus on Lake Street alternative and the dual alternatives include:

- Curbside and bumpout demolition (each)
- Utilities and drainage improvements (each)
- Install or relocate signal-pole pedestals (each)
- Electrical service (each)
- Additional site improvements (each)
- Curbside and bumpout sidewalk/pedestrian improvements (each)

- Street signage (each)
- Curbside and bumpout street improvements (each)
- Traffic control (each)

The sitework and special conditions unit cost line items for the double/single-track rail in the Midtown Greenway alternative include:

- Common excavation and export for new retaining walls only (cubic yard)
- Removals (route foot)
- Utility allowance – protect in place existing and cathodic protection (each)
- Relocate existing watermain – Lyndale Avenue bridge (lump sum)
- Bridge modifications – new wall and soil strengthening (square foot)
- Bridge abutment reconstruction (each)
- Bridge pier protection (each)
- Horizontal overhead catenary system (OCS) shield (linear foot)
- Retaining walls (square foot)
- Trail modifications (square foot)
- Sidewalk (square foot)
- Trail – retaining wall (square foot)
- Pedestrian bridge (each)
- Landscape allowance (route foot)
- Station landscape allowance (each)
- Fence allowance (linear foot)
- Roadway Reconstruction (square yard)
- Temporary trail (route foot)
- Traffic control allowance (route foot)

Coordination with the Green Line LRT (Southwest) project occurred throughout the project to verify that a platform can be accommodated adjacent to the future Southwest platform at the West Lake Station. Capital cost estimates prepared as part of this project have included costs associated with any modifications required to accommodate a Greenway platform, outside of improvements that the Southwest project are including as part of their capital cost. These modifications include trail and roadway realignment and property acquisition. Planned redevelopment and reconstruction of the Nicollet Avenue Bridge is assumed to accommodate the Midtown project, but construction will be completed by others and is not included as part of this cost estimate.

Each bridge along the Midtown Greenway will require slightly different modifications to accommodate the double/single-track rail system and will be designed on a case-by-case basis if the project moves forward. For the purpose of this high-level cost estimate, a line item was added for bridge modifications that portrays the cost to add soil strengthening and new retaining walls at bridges with shallow abutments, where tracks or trail will be constructed through existing abutment slopes.

SCC 50 – Systems

The systems SCC includes capital costs for many elements including train control signals, communication systems, central control hardware and software, traction power substations, overhead catenary systems, underground duct banks, automated fare collection, grade crossing protection, and roadway traffic signal systems. Two different sets of line items were used for SCC 50, as the double/single-track rail in the Midtown Greenway alternative and the enhanced bus on Lake Street alternatives have distinct system differences between LRT and BRT.

The systems unit cost line items for the enhanced bus on Lake Street alternative and the dual alternatives include:

- Transit signal priority (TSP) (each)
- TSP central system upgrades (lump sum)
- Station communication allowance (each)
- Fare collection allowance (each)
- Fare enforcement equipment (each)
- On-board GoTo validator (each)

The systems unit cost line items for the double/single-track rail in the Midtown Greenway alternative include:

- Train control – interlocking, signals, and switches (each)
- S/C duct bank Allowance (route-foot)
- Station train-to-wayside Communications (TWC) allowance (each)
- Crossing protection – pedestrian and grade crossing (each)
- Mainline traction power substation (TPSS) (each)
- OCS foundation and pole allowance (route foot)
- OCS simple catenary allowance (track foot)
- Station communication allowance (each)
- System communication allowance (route foot)
- Fare collection allowance (each)
- Central control allowance (route-foot)

SCC 60 – Right-of-Way

The right-of-way SCC includes costs for acquisition of right-of-way needed for construction and operation of the project. In the Midtown Corridor, right-of-way requirements are anticipated along portions of the corridor, at stations, at traction power substations, and at the operations and maintenance facility; however, the specific needs and actual costs will not be known until detailed design is underway.

For this AA study, a high-level review of the right-of-way impacts was performed to determine partial and full parcel acquisitions for the project. The unit costs reflect the general land use characteristics of the area.

The right-of-way unit cost line items include:

- Purchase or lease of real estate (square foot)
- Relocations (lump sum)

The enhanced bus on Lake Street alternative and the Lake Street alignment of the dual alternative include construction of station areas that are located within the existing public roadway right-of-way. No permanent right-of-way acquisition is anticipated.

The double/single-track rail in the Midtown Greenway alternative will include limited right-of-way impacts along the corridor due to trail relocations and vertical circulation buildings. A full parcel take is anticipated on the eastern portion of the corridor, where the alignment runs through an undeveloped parcel owned by Soo Line Railroad. This parcel is approximately 0.3 acres and is located between 21st Avenue and Hiawatha Avenue, immediately south of 28th Street. It also is anticipated that three acres of right-of-way is necessary to construct a new operations and maintenance facility adjacent to the corridor.

SCC 70 – Vehicles

The vehicles SCC includes costs for single LRT vehicles and low-floor, 60-foot articulated BRT buses. Vehicle quantities include a 20 percent spare ratio and were updated based on the most current operating and ridership information. This category also includes an allowance for other service vehicles to support operations and maintenance.

The vehicle unit cost line items include:

- LRT vehicle Metro Transit Type II LFLRV (each)
- Low-floor, 60-foot bus (each)
- Nonrevenue vehicle allowance (route foot)
- Spare parts allowance (each)

Table 1 - Vehicle Quantities

Alternative	LRT Vehicles	BRT Vehicles
Double-/Single-Track Rail in the Midtown Greenway	5	
Enhanced Bus on Lake Street (Green Line to Blue Line)		21
Dual Alternative (Green Line to Blue Line)	5	9
Dual Alternative with Enhanced Bus Extension to St. Paul	5	16



SCC 80 – Professional Services

Cost estimates for the professional services SCC were generated by applying assumed rates to different categories of the estimate. Table 2 lists the professional services assumptions that were incorporated into the capital cost estimates.

Table 2 - Professional Services Estimated Rates

Description	Construction	Right-of-way	Vehicles
Preliminary engineering	2%	-	-
Final design	5%	2%	1%
Project management for design and construction	2%	2%	2%
Construction administration and management	8%	1%	-
Insurance	4%	-	-
Legal, permits, and review fees by other agencies	1%	5%	-
Surveys, testing, investigation, and inspection	2%	10%	2%
Agency force account work	6%	10%	1%
Total	30%	30%	6%



Capital Cost Estimate Summary

Tables 3 and 4 below summarize the capital costs for each of the alternatives, for each concept identified above, included in the Midtown Corridor AA.

Table 3 – Concept 1 Capital Cost Estimate Summary

	Double/Single Track Rail in the Midtown Greenway Total (2013\$)	Enhanced Bus (Green Line to Blue Line) Total (2013\$)	Dual Alternative (Green Line to Blue Line) Total (2013\$)	Dual Alternative w/ Enhanced Bus Extension to St. Paul Total (2013\$)
10 GUIDEWAY & TRACK ELEMENTS	\$15,800,000 (ballasted) \$32,500,000 (turf track)	\$0	\$15,800,000 (ballasted) \$32,500,000 (turf track)	\$15,800,000 (ballasted) \$32,500,000 (turf track)
20 STATIONS, STOPS, TERMINALS, INTERMODAL	\$18,000,000	\$5,600,000	\$22,500,000	\$24,600,000
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	\$10,800,000	\$1,800,000	\$11,100,000	\$11,100,000
40 SITEWORK & SPECIAL CONDITIONS	\$43,900,000	\$2,800,000	\$46,700,000	\$48,600,000
50 SYSTEMS	\$31,100,000	\$5,500,000	\$35,800,000	\$39,200,000
SUBTOTAL – INFRASTRUCTURE (ballasted track)	\$119,600,000	\$15,700,000	\$131,900,000	\$139,300,000
60 ROW, LAND, EXISTING IMPROVEMENTS	\$3,100,000	\$0	\$3,100,000	\$3,100,000
70 VEHICLES	\$19,100,000	\$20,200,000	\$27,800,000	\$34,500,000
80 PROFESSIONAL SERVICES	\$31,500,000	\$5,100,000	\$35,000,000	\$37,200,000
90 UNALLOCATED CONTINGENCY	\$23,900,000	\$6,500,000	\$27,600,000	\$30,100,000
Total – Ballasted Track	\$197,200,000	\$47,500,000	\$225,400,000	\$244,200,000
Total – Turf Track	\$220,800,000		\$248,900,000	\$267,900,000

Table 4 – Concept 2 Capital Cost Estimate Summary

	Double/Single Track Rail in the Midtown Greenway Total (2013\$)	Enhanced Bus (Green Line to Blue Line) Total (2013\$)	Dual Alternative (Green Line to Blue Line) Total (2013\$)	Dual Alternative w/ Enhanced Bus Extension to St. Paul Total (2013\$)
10 GUIDEWAY & TRACK ELEMENTS	\$14,900,000 (ballasted) \$29,900,000 (turf track)	\$0	\$14,900,000 (ballasted) \$29,900,000 (turf track)	\$14,900,000 (ballasted) \$29,900,000 (turf track)
20 STATIONS, STOPS, TERMINALS, INTERMODAL	\$18,000,000	\$5,600,000	\$22,500,000	\$24,600,000
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	\$10,800,000	\$1,800,000	\$11,100,000	\$11,100,000
40 SITEWORK & SPECIAL CONDITIONS	\$36,310,000	\$2,800,000	\$39,100,000	\$41,040,000
50 SYSTEMS	\$33,100,000	\$5,500,000	\$37,700,000	\$41,100,000
SUBTOTAL – INFRASTRUCTURE (ballasted track)	\$113,100,000	\$15,700,000	\$125,300,000	\$132,700,000
60 ROW, LAND, EXISTING IMPROVEMENTS	\$3,100,000	\$0	\$3,100,000	\$3,100,000
70 VEHICLES	\$19,100,000	\$20,200,000	\$27,800,000	\$34,500,000
80 PROFESSIONAL SERVICES	\$29,800,000	\$5,100,000	\$33,300,000	\$35,600,000
90 UNALLOCATED CONTINGENCY	\$22,800,000	\$6,500,000	\$26,500,000	\$29,000,000
\$47,500,000	\$187,900,000	\$47,500,000	\$216,000,000	\$234,900,000
Total – Turf Track	\$209,200,000		\$237,200,000	\$256,100,000