

Metro Transit  
Arterial Transitway Corridors Study

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**Technical Memorandum #4**  
**Evaluation and Prioritization**

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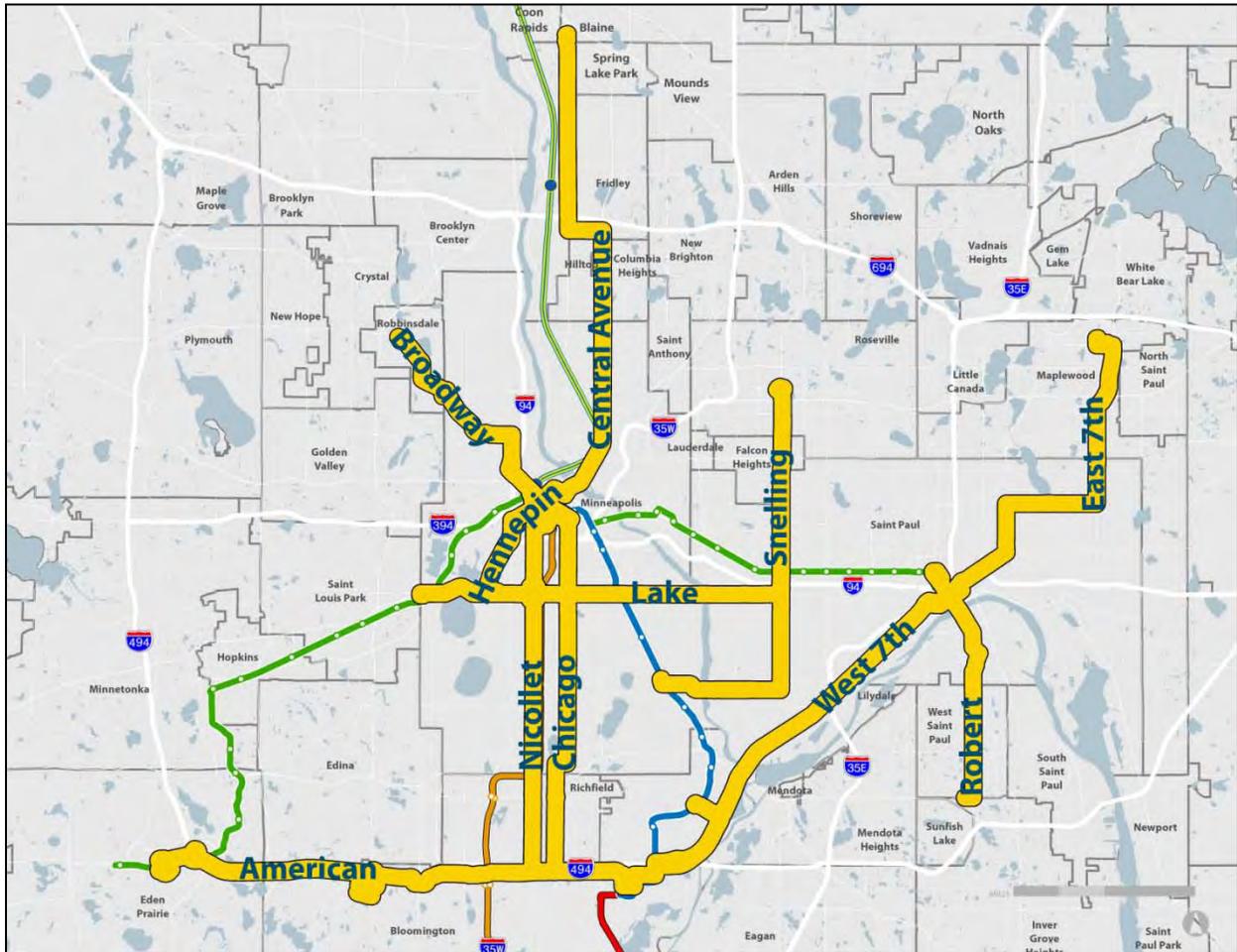
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## Introduction

The purpose of the Arterial Transitway Corridors Study (ATCS) is to develop a facility and service plan to enhance efficiency, speed, reliability, customer amenities, and transit market competitiveness on 11 high-demand local bus corridors identified for arterial bus rapid transit (Rapid Bus) in the Metropolitan Council's 2030 Transportation Policy Plan, shown in Figure 1.

**Figure 1. Arterial Transitway Study Corridors**



This purpose of this memorandum is to document the methodology used for evaluating the 11 corridors based on the work completed in the Concept Development phase of the study. In the Concept Development phase, the following tasks were completed for the 11 corridors:

- Corridor concept development
- Operating plans
- Capital cost estimates
- Operations and maintenance (O&M) cost estimates
- Ridership forecasting

This technical memorandum documents the process of evaluating the 11 corridors and prioritizing the corridors for near-term implementation of Rapid Bus. The evaluation process uses a tiered approach.

- The first tier includes a quantitative evaluation of the 11 corridors based on criteria that were developed to meet the goals and objectives identified during the first phase of the ATCS.
- The second tier includes a qualitative evaluation which takes into account readiness measures. Readiness measures help differentiate which corridors could be implemented first from those that require further study and/or depend on implementation of other planned investments.

The evaluation and readiness criteria are described in more detail in the following sections, along with priorities for near-term implementation.

## Evaluation Criteria

Evaluation criteria were developed based on the goals identified for the ATCS. The project goals are to:

1. Provide mobility benefits by connecting major destinations along the study corridors more quickly with more frequent transit service.
2. Implement affordable transit improvements.
3. Seamlessly integrate with existing and planned transit systems.
4. Provide an enhanced customer experience by developing passenger infrastructure and information commensurate with existing and planned levels of transit service.
5. Support anticipated corridor growth and redevelopment.

### **Goal 1: Provide mobility benefits by connecting major destinations along the study corridors more quickly with more frequent transit service.**

Goal 1 consists of two categories of evaluation measures: **transit market indicators** and **rapid bus mobility outcomes**.

#### **Transit Market Indicators**

Transit market indicators use demographic and socio-economic factors to identify potential transit markets. Generally, transit markets are defined by areas of high employment and population. Transit-dependent populations are defined as people who rely on public transportation for daily trips. Several demographic factors can be used in assessing transit dependency; for this evaluation, the number of people in households over 16 without vehicles was used.

The three measures used as transit market indicators are:

- Measure 1-A Jobs within ½ mile of corridor (2008 data)
- Measure 1-B Population within ½ mile of corridor (2010)
- Measure 1-C Transit-dependent population within ½ mile of corridor (2000)

#### **Rapid Bus Mobility Outcomes**

The second category of evaluation measures for Goal 1 focuses on the mobility benefits of implementing Rapid Bus in each of the corridors. Mobility benefits can be quantified by reductions in travel time

through the corridor, an increase in the number of transit riders in the corridor, and user benefits. User benefits for the Rapid Bus corridors are defined based on the travel time savings accrued by transit riders, including the estimated value of travel time savings to new riders. The four measures used to evaluate improved mobility are:

- Measure 1-D Percent decrease in end-to-end travel time
- Measure 1-E 2030 corridor ridership (weekday)
- Measure 1-F Rapid Bus increase over 2030 “baseline” corridor ridership (weekday)
- Measure 1-G User benefits (annual hours)

### **Goal 2: Implement affordable transit improvements.**

Measures under Goal 2 focus on how affordable each Rapid Bus corridor is to construct, operate, and maintain. The four measures used to evaluate affordability of the corridors are:

- Measure 2-A O&M cost per Rapid Bus passenger (annualized 2030 passengers)
- Measure 2-B Rapid Bus passengers per in-service hour (annual average)
- Measure 2-C Capital cost per corridor mile (2011 dollars)
- Measure 2-D Capital cost per Rapid Bus passenger (2011 dollars, 2030 annual passenger trips)

### **Goal 3: Seamlessly integrate with existing and planned transit systems.**

Measures in Goal 3 gauge each corridor’s ability to seamlessly connect to existing and planned transit systems. This includes the amount of existing transit service that can be replaced by Rapid Bus service, the percentage of local bus boardings that are within one stop of the proposed Rapid Bus stations, and the number of fixed guideway transitways connecting with each Rapid Bus corridor. The three measures used to evaluate seamless integration with existing and planned transit are:

- Measure 3-A Percent of Rapid Bus service hours “paid for” by existing service hours
- Measure 3-B Percent of existing local bus corridor boardings proximate to proposed Rapid Bus stations
- Measure 3-C Number of connections to fixed guideway transitway corridors

### **Goal 4: Provide an enhanced customer experience by developing passenger infrastructure and information commensurate with existing and planned levels of transit service.**

As defined in the ATCS, Rapid Bus stations should be sited at the far sides of intersections, and have bump-outs (curb extensions) and raised platforms. Enhanced passenger shelters vary in size based on existing and forecasted passenger demand at each station; however, all station shelter concepts include ticket vending machines (TVMs) and dynamic information signage. In certain locations, existing site conditions will not allow some or all of these station elements. The purpose of Goal 4 is to identify the extent to which Rapid Bus station concepts do not fit within the existing site conditions. The measure used to evaluate this is:

- Measure 4-A Percent of stations where concept was modified to fit within existing conditions

**Goal 5: Support anticipated corridor growth and redevelopment.**

Growth and redevelopment in a corridor are based on local comprehensive plans including socio-economic data reflecting planned growth by 2030. The two measures used to evaluate anticipated corridor growth and redevelopment are:

Measure 5-A Growth in jobs within ½ mile of corridor (2010-2030)

Measure 5-B Growth in population within ½ mile of corridor (2010-2030)

**Scores**

The measures were scored using a three-point scale (a total maximum score of 3 points per evaluation measure). Figure 2 on the following page shows the scores for each of the evaluation measures in the first tier of the evaluation process.

Figure 2. Evaluation Matrix

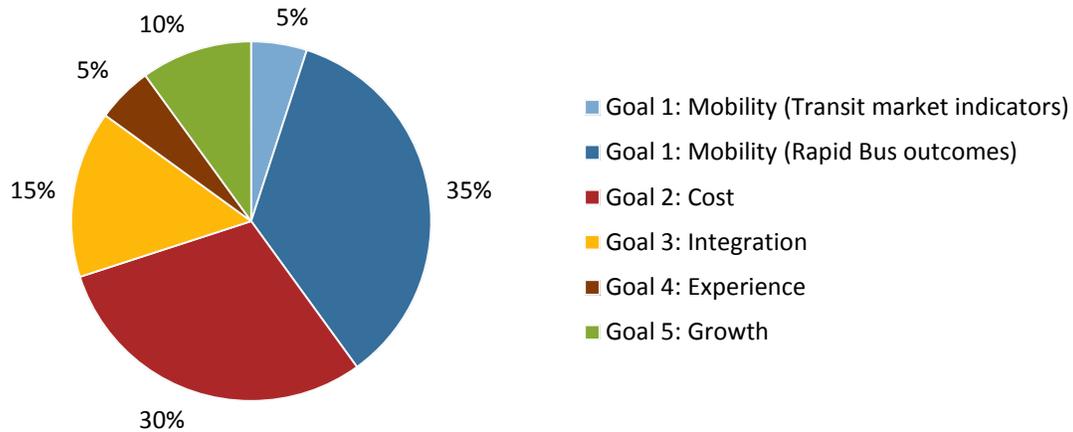
- Key to Symbols**
- Highest performance (3 points)
  - ◐ Medium performance (2 points)
  - Lowest performance (1 point)

	Snelling	Lake	American	Central	Broadway	Hennepin	Nicollet	Chicago	West 7th	East 7th	Robert	
<b>Goal 1: Provide mobility benefits by connecting major destinations</b>												
<i>Transit market indicators (5% of total score)</i>												
1-A	Jobs within ½ mile of corridor (2008)	○	○	◐	●	●	●	●	●	◐	◐	◐
1-B	Population within ½ mile of corridor (2010)	◐	●	○	●	○	●	●	○	◐	○	○
1-C	Transit-dependent persons within ½ mile of corridor	◐	●	○	●	○	●	●	○	◐	○	○
<b>Rapid Bus outcomes (35% of total score)</b>												
1-D	Percent decrease in end-to-end travel time	●	●	●	○	●	○	○	○	○	○	●
1-E	2030 corridor ridership (weekday)	◐	●	○	○	○	●	●	○	○	◐	○
1-F	2030 ridership over 2030 baseline	◐	●	●	●	○	●	○	○	○	◐	○
1-G	User benefits (annual)	●	●	●	●	○	○	○	○	○	○	●
<b>Goal 2: Implement affordable transit improvements (30% of total score)</b>												
2-A	O&M cost per annual Rapid Bus passenger	◐	●	○	○	○	○	●	○	◐	◐	○
2-B	2030 Rapid Bus passengers per in-service hour (annual average)	◐	○	○	○	●	○	○	●	○	◐	○
2-C	Capital cost per corridor mile	●	○	●	○	○	○	○	●	○	○	○
2-D	Capital cost per annual Rapid Bus passenger	●	●	○	○	●	●	○	○	○	○	○
<b>Goal 3: Seamlessly integrate with existing and planned transit systems (15% of total score)</b>												
3-A	Percent of Rapid Bus revenue hours paid for by existing service hours	◐	○	○	○	○	○	●	●	●	○	○
3-B	Percent of existing local bus corridor boardings proximate to proposed stations	◐	●	○	●	●	●	●	●	●	○	●
3-C	Number of connections to fixed guideway transitways	◐	●	●	○	○	○	○	●	○	○	○
<b>Goal 4: Provide an enhanced customer experience (5% of total score)</b>												
4-A	Percent of stations where concept required modification to fit	●	○	●	●	○	○	○	○	○	○	○
<b>Goal 5: Support anticipated corridor growth and redevelopment (10% of total score)</b>												
5-A	Forecasted change in jobs within 1/2 mile of proposed stations	○	○	○	○	○	○	○	●	●	○	○
5-B	Forecasted change in population within 1/2 mile of proposed stations	○	○	○	●	○	○	○	○	○	○	○

### Evaluation Weighting

After scoring the corridors on the three-point scale, measures were weighted based on the importance of the overall goal to the Rapid Bus concept. Figure 3 illustrates each of the goals and the corresponding weight applied in the evaluation.

**Figure 3. Goal Weights**



The three-point scale used in Figure 2 was converted to a 100-point scale based on these goal weights. This was done by calculating a factor (goal weight divided by goal maximum points) and applying it to each goal score, as shown in Table 1.

**Table 1. Weighted Scoring (goal weight applied to each goal sum)**

	Goal 1: Mobility (Transit market)	Goal 1: Mobility (Rapid Bus outcomes)	Goal 2: Cost	Goal 3: Integration	Goal 4: Experience	Goal 5: Growth
Maximum raw points	9	12	12	9	3	6
Factor applied	0.56	2.92	2.50	1.67	1.67	1.67
Maximum weighted score	5	35	30	15	5	10
<b>Percent of total score</b>	<b>5%</b>	<b>35%</b>	<b>30%</b>	<b>15%</b>	<b>5%</b>	<b>10%</b>

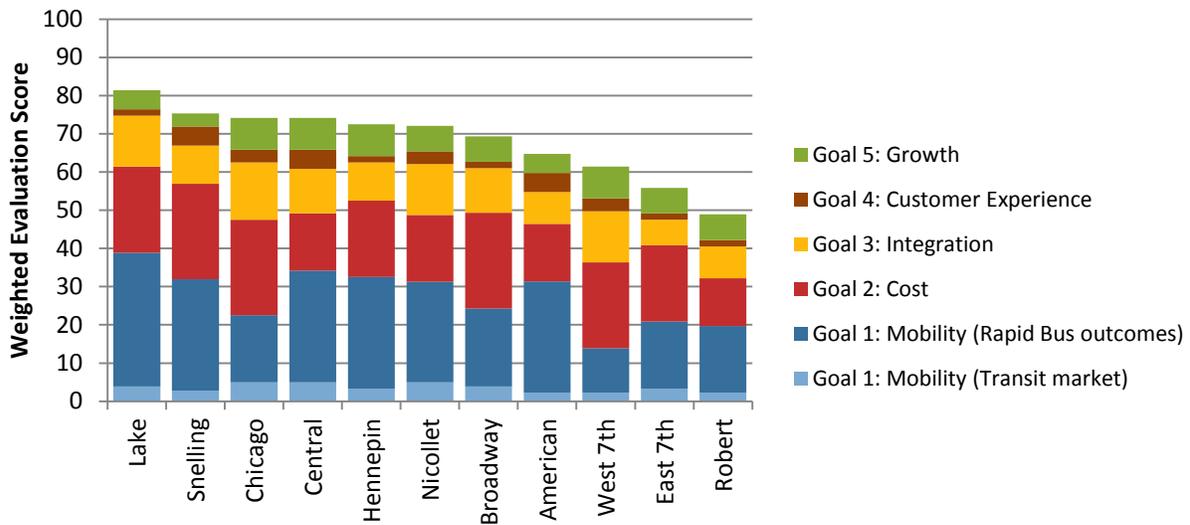
The resulting total weighted evaluation scores for each corridor are shown in Table 2. The results range from a high score of 81 points (Lake Street) to a low score of 49 points (Robert Street).

**Table 2. Weighted Evaluation Score**

	Goal 1: Mobility (Transit market)	Goal 1: Mobility (Rapid Bus outcomes)	Goal 2: Cost	Goal 3: Integration	Goal 4: Experience	Goal 5: Growth	Total
Lake	3.9	35.0	22.5	13.3	1.7	5.0	<b>81.4</b>
Snelling	2.8	29.2	25.0	10.0	5.0	3.3	<b>75.3</b>
Chicago	5.0	17.5	25.0	15.0	3.3	8.3	<b>74.2</b>
Central	5.0	29.2	15.0	11.7	5.0	8.3	<b>74.2</b>
Hennepin	3.3	29.2	20.0	10.0	1.7	8.3	<b>72.5</b>
Nicollet	5.0	26.3	17.5	13.3	3.3	6.7	<b>72.1</b>
Broadway	3.9	20.4	25.0	11.7	1.7	6.7	<b>69.3</b>
American	2.2	29.2	15.0	8.3	5.0	5.0	<b>64.7</b>
West 7th	2.2	11.7	22.5	13.3	3.3	8.3	<b>61.4</b>
East 7th	3.3	17.5	20.0	6.7	1.7	6.7	<b>55.8</b>
Robert	2.2	17.5	12.5	8.3	1.7	6.7	<b>48.9</b>

Figure 4 graphically represents the results of the first tier of evaluation based on the quantitative measures.

**Figure 4. Weighted Evaluation Score**



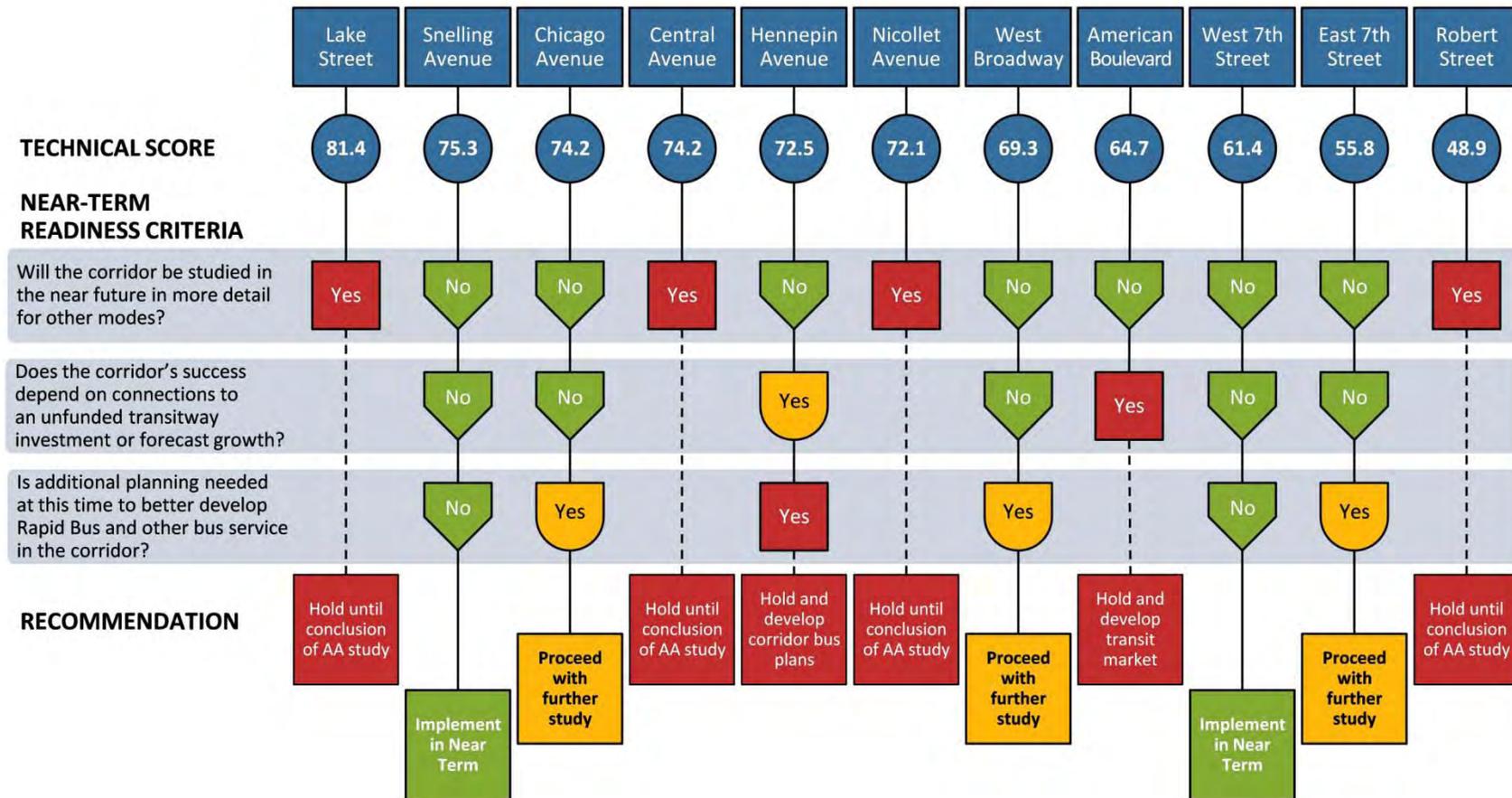
## Readiness Criteria

The first tier of the evaluation process identified the corridors that best met the goals and objectives of the ATCS using quantitative measures. However, decisions to implement Rapid Bus in the corridors will not be based solely on technical merit. In the second tier of evaluation, qualitative evaluation criteria are applied that take into account factors that may influence the ability to quickly implement the Rapid Bus concept in a corridor. The readiness criteria are:

1. Is the corridor going to be studied in the near future in more detail and for other modes?
2. Does the corridor's success depend on (or benefit from) connections to an unfunded transitway investment?
3. Is additional planning needed at this time to refine Rapid Bus in the corridor?

Figure 5 graphically illustrates the subsequent screening process used to apply readiness criteria to the corridors. The readiness criteria and their application to the corridors are described in more detail in the following sections.

Figure 5. Application of Readiness Criteria



## **1. Is the corridor going to be studied in the near future in more detail and for other modes?**

The 11 corridors included in the ATCS are among the strongest transit corridors in the Twin Cities. Some of these corridors have been studied previously by partner agencies. Additional studies will be initiated in the near future on some of these corridors because of the high transit demand and desired transit improvements. For the ATCS corridors where additional in-depth study will be conducted in the near future, Rapid Bus is not recommended for near-term implementation.

The corridors that will be evaluated in upcoming Alternatives Analysis (AA) studies include:

- Lake Street (Midtown Corridor)
- Central Avenue
- Nicollet Avenue
- Robert Street

The information compiled and evaluated in the ATCS for these corridors will serve as an input to the AA studies. The upcoming AA studies will include a comparison of transit modes in greater detail than in any previous studies, including the ATCS. Results of the upcoming AA studies will aid decision makers in selecting the appropriate level of transit investment for the corridors. For this reason, the Lake Street, Nicollet Avenue, Central Avenue, and Robert Street corridors are not recommended for Rapid Bus implementation at this time.

## **2. Does the corridor's success depend on (or benefit from) connections to an unfunded transitway investment?**

The Rapid Bus corridors represent a variety of different markets and locations within the Twin Cities region, including service to downtown Minneapolis, downtown St. Paul, and crosstown corridors. Connections to existing and future transitways are a vital component in the analysis. Major future transitway improvements in the Twin Cities region include Central Corridor LRT (Green Line), Southwest LRT (Green Line), I-35W BRT (Orange Line), and Cedar Avenue BRT (Red Line). Central Corridor LRT (Green Line) and Cedar Avenue BRT (Red Line) are currently under construction. Portions of I-35W BRT (Orange Line) have been constructed. Southwest LRT (Green Line) has been granted approval to begin preliminary engineering; however, no federal funding commitments from Federal Transit Administration (FTA) have been secured at this time. For the ATCS corridors that depend on or benefit from connections to these transitways, Rapid Bus is not recommended for near-term implementation.

The American Boulevard and Hennepin Avenue corridors both benefit from connections to Southwest LRT (Green Line). The American Boulevard corridor also benefits from a future connection to I-35W BRT (Orange Line). Because these fixed guideway transitways are currently unfunded, the American Boulevard and Hennepin Avenue corridors are not recommended for implementation at this time. Once these transitway investments are further along in project development and funding commitments, Rapid Bus implementation in these corridors could be considered.

### **3. Is additional service planning needed to refine Rapid Bus in the corridor?**

In addition to the AA studies mentioned in the previous sections, other transitway studies are currently underway for the Bottineau Transitway and the Gateway Corridor. While not directly studying the same alignments reviewed in the ATCS, these corridor studies may influence the implementation of Rapid Bus in the West Broadway Avenue and East 7th Street corridors, respectively. Identifying a preferred transitway alternative on Bottineau and Gateway may help determine and/or refine the alignment and service configuration of Rapid Bus in the corridors. Once these studies have selected a preferred alignment and mode, more informed decisions could be made about how and when to implement Rapid Bus in the corridors as part of a greater discussion of transit network connections to the transitways.

For this reason, it is recommended that Rapid Bus not be implemented on West Broadway or East 7th Street in the near term, but that service and concept plans continue to be studied to refine the Rapid Bus concepts in these corridors as they relate to ongoing transitway studies. In addition, because West Broadway and Chicago Avenue present an opportunity for an interlined Rapid Bus service and local service replacement, it is recommended that Rapid Bus on Chicago Avenue not be implemented in the near term.

## **Results**

Of the 11 corridors studied in the ATCS, six are screened from immediate near-term implementation due to additional upcoming studies or performance dependent on unfunded fixed guideway transitways. The remaining five corridors are either recommended for near-term implementation or further study and concept refinement.

### **Corridors for Near-Term Implementation**

Based on the evaluation and readiness criteria presented in the previous sections, it is recommended that Rapid Bus be implemented in the near term on Snelling Avenue and West 7th Street.

#### **Snelling Avenue**

The Snelling Avenue corridor has the highest evaluation score of the remaining corridors following the readiness screening process. Service changes related to implementation of Rapid Bus on the Snelling Avenue corridor could be coordinated with Central Corridor LRT (Green Line) service restructuring activities. In addition, a roadway construction project on Snelling Avenue beginning in 2012 presents opportunities for coordination in building Rapid Bus facilities on the corridor.

#### **West 7th Street**

Recent changes in bus service design in the West 7th Street corridor have proven to be effective in testing strategies incorporated in the Rapid Bus concept. Limited-stop Route 54 currently makes stops at approximately the same spacing in the corridor as a Rapid Bus line would, providing a fast trip for passengers. The route's high-frequency service and limited stops have proven effective in attracting passengers. Since stops have already been consolidated in the corridor, additional steps of adding transit signal priority, off-board fare collection, and upgraded passenger amenities would be relatively

quick and effective to implement. The high-frequency service operating in the corridor could be replaced by Rapid Bus on a near one-to-one ratio.

Similar to Snelling Avenue, service changes related to implementation of Rapid Bus on the West 7th Street corridor could be coordinated with Central Corridor LRT (Green Line) service restructuring activities, as well as bus service restructuring for the opening of the Union Depot. In addition, the West 7th Street corridor has some readily available funding that could help offset the cost to fully implement Rapid Bus in the corridor.

However, long-term construction in the Bloomington South Loop District is scheduled for 2012 through 2014. Construction presents coordination opportunities for building Rapid Bus infrastructure; however, the impacts of the construction on Rapid Bus would threaten service reliability and could potentially dilute the Rapid Bus brand in the region. It is recommended that Rapid Bus on West 7th be implemented in the near term, but after construction is complete.

### **Corridors for Further Study**

While not recommended for implementation in the near term, three corridors are identified for further planning with potential for subsequent implementation: Chicago Avenue, West Broadway Avenue, and East 7th Street.

#### **Chicago Avenue**

Existing travel patterns present opportunities to connect the West Broadway and Chicago Avenue corridors through an interlined Rapid Bus service. Stakeholders have also expressed interest in interlining Chicago Avenue Rapid Bus with Rapid Bus service on Fremont-Emerson in north Minneapolis, a corridor not studied in the ATCS. This interlining combination would present additional opportunities for local bus replacement on Route 5, which travels on Chicago Avenue in south Minneapolis and Fremont-Emerson in north Minneapolis.

Chicago Avenue scored highly in the evaluation process documented earlier in this memorandum, suggesting that Rapid Bus would perform well in this corridor. While the corridor is not recommended for Rapid Bus implementation in the near term, interlining concepts and alternative alignments and termini should continue to be investigated for the Chicago Avenue corridor.

#### **West Broadway Avenue**

As noted in the previous section, plans for the Bottineau Transitway include some transitway alternatives that travel on West Broadway Avenue on the alignment studied in the ATCS. West Broadway Avenue should continue to be studied for Rapid Bus implementation, along with the Fremont-Emerson corridor.

#### **East 7th Street**

Several preliminary concepts for the Gateway Corridor include transitway alternatives on a portion of the corridor studied in the ATCS. While this may not preclude the operation of Rapid Bus in this corridor, the ATCS decision-making process will benefit from more fully developed Gateway Corridor concepts. In addition, other service planning efforts completed during the ATCS process indicate that a portion of the

East 7th corridor may be served with an extension of West 7th Street Rapid Bus. While East 7th Street is not recommended for Rapid Bus implementation in the near term, alternative service plans and coordination with a potential Gateway Corridor transitway should continue to be studied.

### **Local Support**

Local support is needed for any project to be successful. Metro Transit is committed to working with the project partners to identify the appropriate transit investments in the 11 corridors. As projects are programmed for implementation, Metro Transit will work closely with the project partners to refine the Rapid Bus concept to fit within the context of each community.

## Appendix: Evaluation Matrix of Values

#	Measure	Snelling	Lake	American	Central	Broadway	Hennepin	Nicollet	Chicago	West 7th	East 7th	Robert
<b>Goal 1: Provide mobility benefits by connecting major destinations</b>												
<i>Transit market indicators</i>												
1-A	Jobs within ½ mile of corridor (2008)	44,342	41,374	92,406	199,268	168,713	152,488	164,158	204,841	99,817	79,712	69,829
1-B	2010 Population within ½ mile of corridor	56,000	83,600	31,300	81,599	53,313	46,800	91,300	95,500	39,900	58,600	32,000
1-C	Transit-dependent persons within ½ mile of corridor	17,491	29,330	6,505	26,105	20,206	15,638	32,744	33,481	12,781	17,427	10,990
<i>Rapid Bus outcomes</i>												
1-D	% decrease in end-to-end travel time	27.2%	30.6%	22.2%	16.0%	24.5%	17.0%	20.0%	10.3%	4.8%	11.3%	20.5%
1-E	2030 corridor ridership (weekday)	8,720	18,100	4,140	14,410	6,000	23,090	20,270	15,400	7,100	13,300	7,000
1-F	2030 ridership over 2030 baseline	2,950	3,810	3,700	3,670	800	5,990	2,970	2,100	1,100	2,200	1,000
1-G	User benefits (annual hours)	430,000	303,000	314,000	234,000	53,000	78,000	88,600	112,000	3,000	32,000	64,000
<b>Goal 2: Implement affordable transit improvements</b>												
2-A	O&M cost per Rapid Bus passenger (annualized passengers)	\$2.09	\$1.85	\$3.10	\$2.21	\$2.05	\$2.32	\$2.18	\$1.89	\$2.40	\$2.23	\$3.49
2-B	2030 Rapid Bus passengers per in-service hour (annual average)	81.2	80.5	51.9	58.8	92.9	74.4	70.3	92.0	68.1	73.4	55.3
2-C	Capital cost per corridor mile	\$2,764,603	\$5,024,468	\$1,257,173	\$4,314,222	\$3,274,865	\$5,036,253	\$5,966,251	\$4,140,077	\$2,113,455	\$3,238,470	\$3,177,224
2-D	Capital cost per annual Rapid Bus passenger	\$9	\$9	\$14	\$14	\$9	\$8	\$12	\$10	\$11	\$12	\$18
<b>Goal 3: Seamlessly integrate with existing and planned transit systems</b>												
3-A	Percent of Rapid Bus revenue hours paid for by existing service hours	45%	57%	19%	59%	56%	10%	72%	63%	94%	20%	-49%
3-B	Percent of existing local bus corridor boardings proximate to proposed Rapid Bus stations	97%	98%	90%	98%	100%	99%	99%	99%	100%	96%	99%
3-C	Number of connections to fixed guideway transitways	2	4	4	2	3	3	2	4	3	1	1
<b>Goal 4: Provide an enhanced customer experience</b>												
4-B	Percent of stations where concept required modification to fit	10%	26%	0%	13%	38%	33%	18%	19%	19%	30%	44%
<b>Goal 5: Support anticipated corridor growth and redevelopment</b>												
5-A	Forecasted change in jobs within 1/2 mile of proposed stations	-3,516	1,772	26,015	28,901	28,287	27,491	28,365	42,434	40,577	31,372	30,592
5-B	Forecasted change in population within 1/2 mile of proposed stations	6,310	13,835	8,062	25,159	10,467	29,517	19,834	12,113	14,019	12,129	16,809