Technical Memo 4: Initial Screening of MnPASS and BRT Alternatives

Highway 169 Mobility Study

Draft

Minnesota Department of Transportation

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Table of Contents

Introduction 1

Purpose 1

Methodology 1

BRT Alternatives Considered 1

MnPASS Alternatives Considered 3

Screening Criteria 6

BRT Screening Criteria 6

MnPASS Termini Screening Criteria 8

MnPASS Cross Sections Screening Criteria 9

Application of Screening Criteria 9

Results and Rationale 14

BRT 14

MnPASS Termini 14

MnPASS Cross Sections 15

Alternatives advanced for further study 15

List of Figures

Figure 1. Initial BRT Alternatives 2

Figure 2. Potential MnPASS Alternatives' Termini 4

Figure 3. Standard MnPASS Lane Left of General Purpose Lane Configuration 5

Figure 4: Minimum-Width MnPASS Lanes, General Purpose Lanes, and Shoulders Configuration 5

Figure 5: Single-Lane-Reversible MnPASS Configuration 6

Figure 6: Double-Lane-Reversible MnPASS Configuration 6

Figure 7: LEHD Analysis Areas 7

List of Tables

Table 1: Longitudinal Employer-Household Dynamics Analysis 8

Table 2. BRT Alternatives Screening Results 10

Table 3. MnPASS Termini Options Screening Results 11

Table 4. MnPASS Cross Section Options Screening Results 13

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Introduction

Purpose

The purpose of this initial screening analysis is to select up to three alternatives for further study and detailed evaluation in the *Highway 169 Mobility Study*. The alternatives that progress will undergo further technical analysis to understand their suitability for the stated purpose, need, and goals of the Project. This memo will detail the reasons that two combined bus rapid transit (BRT) and MnPASS alternatives, as well as an additional stand-alone MnPASS alternative, were chosen as the best alternatives to meet the purpose and need of the study and undergo further investigation into their costs, benefits, and impacts to the corridor.

Methodology

This Highway 169 Mobility Study builds on the results of the *Highway Transitway Corridor Study* (2014) and *MnPASS System Study Phase 2* (2010) and will develop and evaluate potential options for improving transit and reducing congestion on Highway 169 between Marschall Road in Shakopee and Trunk Highway (TH) 55 in Golden Valley. To be consistent with regional policy and the results of previous studies, the *Highway 169 Mobility Study* will focus on a constrained set of alternatives: highway bus rapid transit (BRT); MnPASS Express Lanes; and spot mobility improvements such as the addition of auxiliary lanes or interchange modifications.

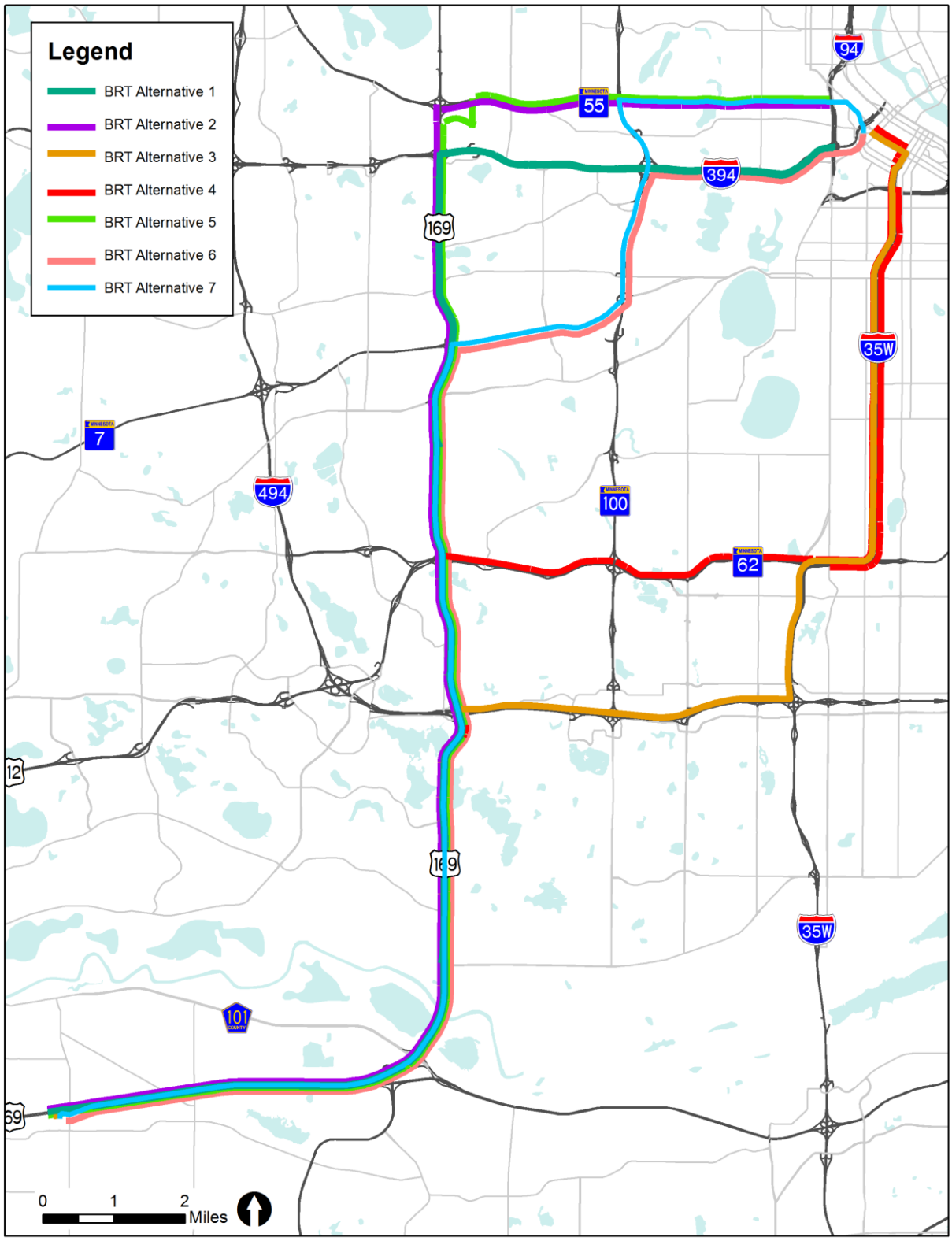
The initial screening analysis began by identifying the universe of BRT and MnPASS alternatives along Highway 169.

BRT Alternatives Considered

The initial screening identified seven BRT alternatives. All BRT alternatives considered begin at Marschall Road, end in downtown Minneapolis, and travel on Highway 169 for at least some of their route. Listed below and shown in Figure 1 are the seven BRT alignments included in the initial screening analysis.

1. Marschall Road to Downtown Minneapolis via US-169, I-394
2. Marschall Road to Downtown Minneapolis via US-169, TH 55
3. Marschall Road to Downtown Minneapolis via US-169, I-494, I-35W
4. Marschall Road to Downtown Minneapolis via US-169, TH 62, I-35W
5. Marschall Road to Downtown Minneapolis via US-169, Betty Crocker Drive, TH 55
6. Marschall Road to Downtown Minneapolis via US-169, TH 7, TH 100, I-394
7. Marschall Road to Downtown Minneapolis via US-169, TH 7, TH 100, TH 55

Figure 1. Initial BRT Alternatives



MnPASS Alternatives Considered

Termini Options

Three southern termini and four northern termini were identified as alternatives for MnPASS implementation. Unlike the BRT alternatives, all MnPASS alternatives considered were on Highway 169. All termini are existing interchanges with Highway 169. The three southern termini are all south of the Minnesota River and the four northern termini are all north of the Minnesota River. All termini considered are listed below and shown in Figure 2.

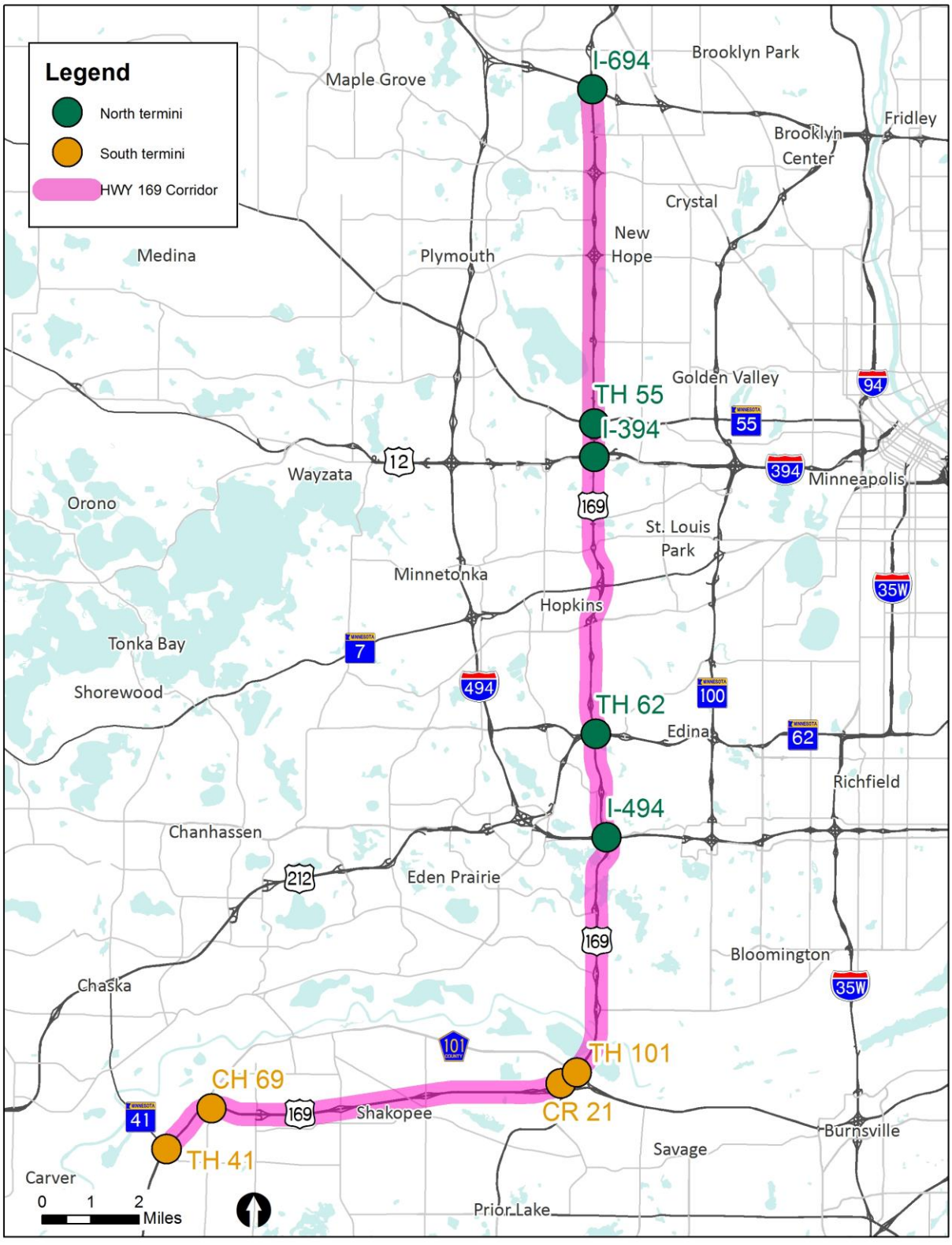
Southern Termini

1. TH 41
2. TH 101
3. CR 21

Northern Termini

1. I-394 / TH 55
2. I-494
3. TH 62
4. I-694

Figure 2. Potential MnPASS Alternatives' Termini



Cross Section Options

Four MnPASS cross sections were selected as possibilities for MnPASS implementation. Two alternatives have MnPASS lanes on the left next to general purpose lanes, and two more featured reversible lanes of differing widths. Alternatives with MnPASS lanes to the left of general purpose lanes had different widths of lanes and shoulders. Listed below and shown in Figure 3, Figure 4, Figure 5, and Figure 6 are the four MnPASS cross sections considered.

1. Standard lane left of general purpose lane
2. Minimum lanes and shoulder width adjacent to general purpose lane
3. Single lane reversible
4. Double lane reversible

Figure 3. Standard MnPASS Lane Left of General Purpose Lane Configuration

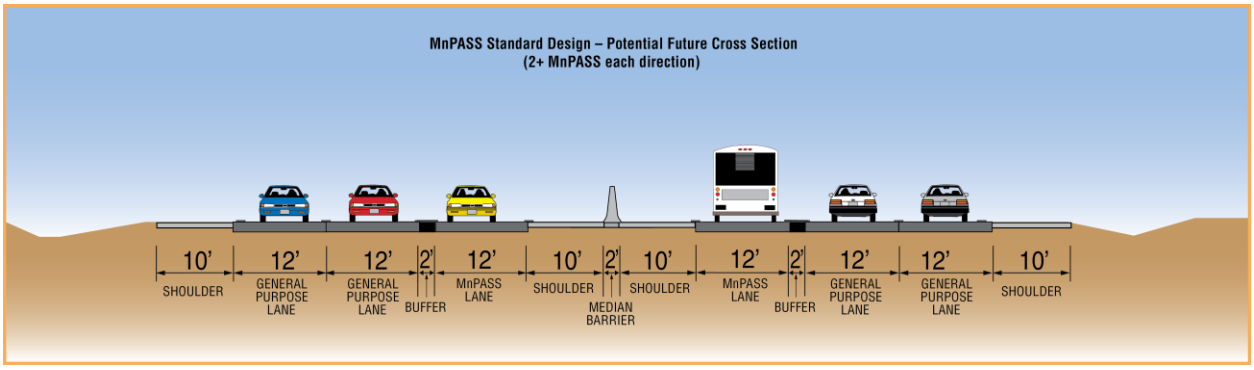


Figure 4: Minimum-Width MnPASS Lanes, General Purpose Lanes, and Shoulders Configuration

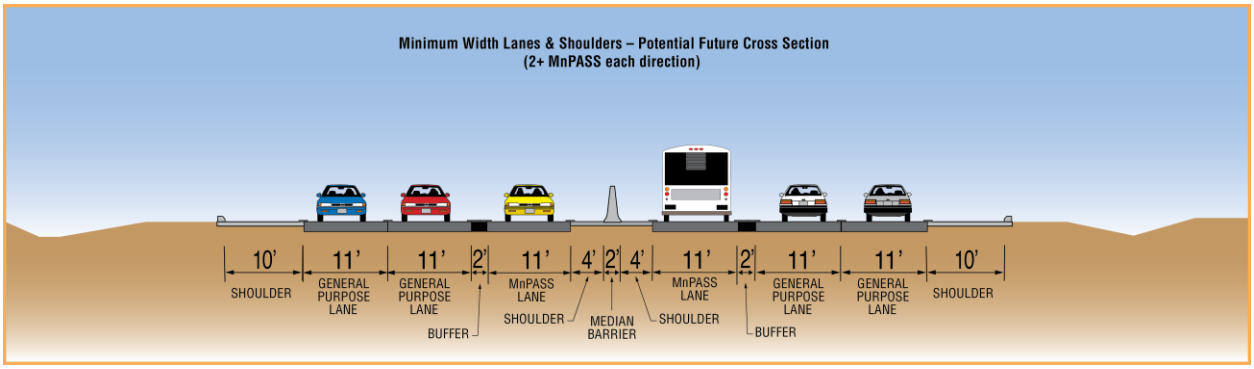


Figure 5: Single-Lane-Reversible MnPASS Configuration

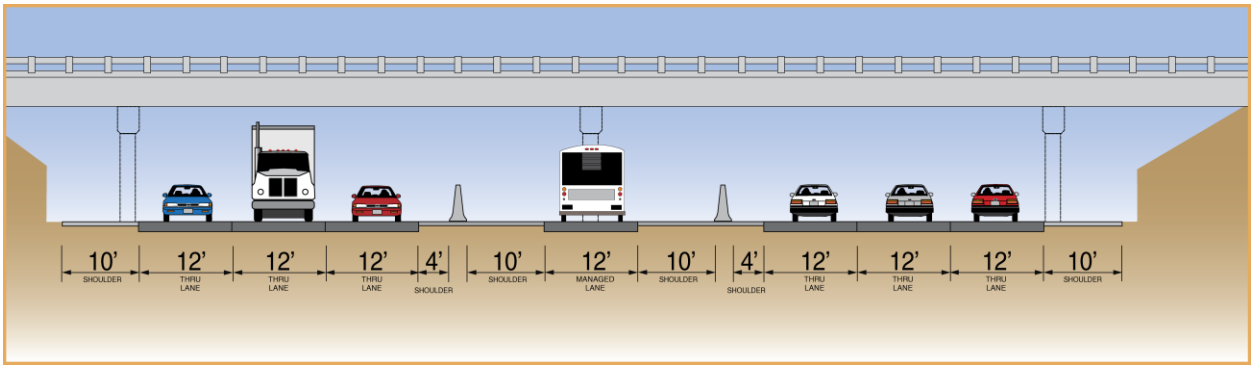
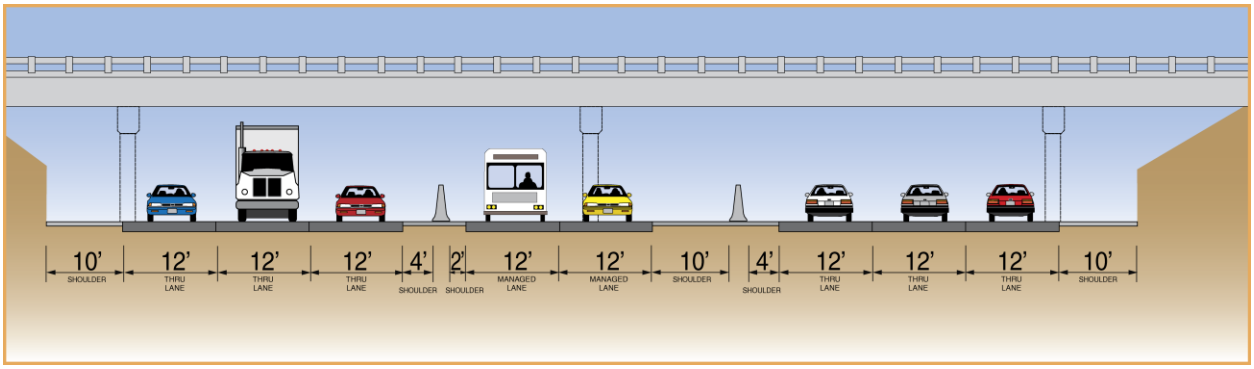


Figure 6: Double-Lane-Reversible MnPASS Configuration



Screening Criteria

Three criteria, outlined below, were used to determine which BRT alternatives best met the purpose and need. Two additional sets of three criteria, also outlined below, were used to determine possible termini and cross sections for MnPASS investments.

BRT Screening Criteria

Screening Criteria 1: Duplication of existing service

Screening criteria 1 assessed whether BRT implementation along the proposed route would duplicate existing or planned transit service. This includes existing local and express bus service, as well as the planned Green Line Extension LRT, Orange Line BRT, and the planned enhanced bus service that will serve the LRT and BRT stations. Alternatives that serve new markets and avoid duplication of current or planned transit service were required to move on for further study.

Screening Criteria 2: Connect directly to downtown Minneapolis

Screening criteria 2 assessed whether the initial BRT alternatives connected directly to downtown Minneapolis. A potential option for BRT routing was not traveling all the way to

downtown Minneapolis but instead terminating at a Green Line Extension LRT station. It was determined that an early termination of the transitway and forced transfer to another transit service was not suitable for the corridor's needs. Alternatives would need to serve downtown Minneapolis to proceed for further study.

Screening Criteria 3: Results of Longitudinal Employer-Household Dynamics Analysis

Screening criteria 3 used Longitudinal Employer-Household Dynamics (LEHD) data to identify the number of home-work trips between selected areas within each alternative, to assess the extent to which the alternatives served origin-destination movements. The analysis considered travel patterns from along Highway 169 south of I-494 to areas along Highway 169 and I-394, along Highway 169 and TH 55, and along I-494 and I-35W, as shown in . All areas included downtown Minneapolis. The number of work trips between Highway 169 south of I-494 and the three selected areas were evaluated by summing the number of work trips in the LEHD data set. Work trips from the area to the Green Line, which was possible with two of the alternative alignments, and work trips to Highway 169 between TH 62 and I-494, which were possible for all three alternative alignments, were counted separately. Alignments with a higher number of work trips would move ahead in the process and undergo further study.

Figure 7: LEHD Analysis Areas

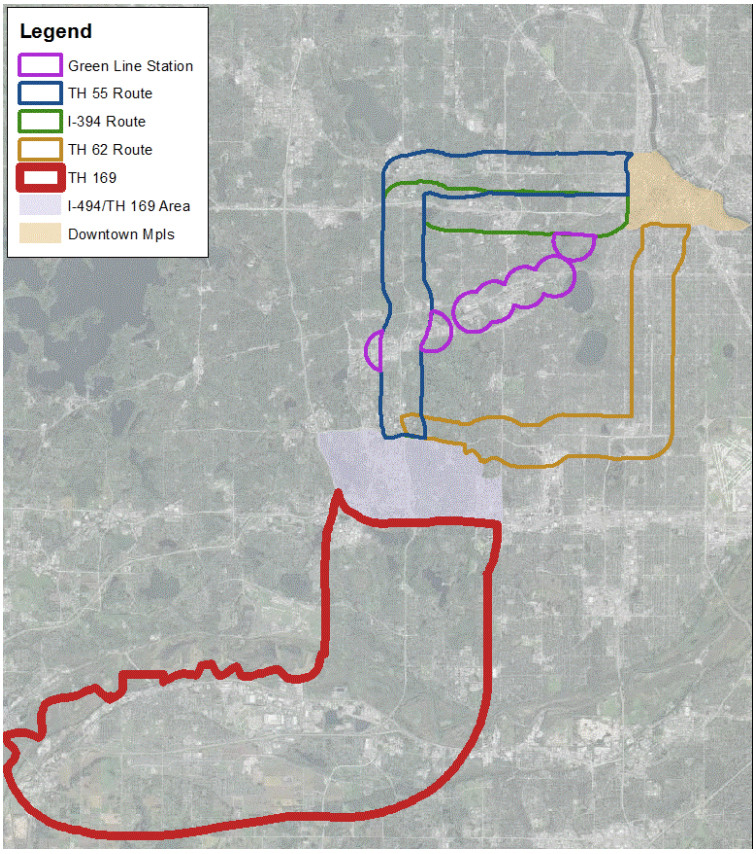


Table 1: Longitudinal Employer-Household Dynamics Analysis

Location	Alignment Work Trips	Green Line*	Downtown Minneapolis	Hwy 169 (494-62)	Total
Hwy 169 & I-394	2,300	1,150	2,850	2,400	8,700
Hwy 169 & Hwy 55	2,250	1,150	2,850	2,400	8,650
Hwy 62 & I-35W	2,550**		2,850	2,400	7,800

*Accessible from I-394 and Hwy 55 alignment options

**Some work trips could be served by Orange Line

MnPASS Termini Screening Criteria

Screening Criteria 1: Implementation feasibility

Screening criteria 1 assessed the feasibility of the northern and southern termini options under consideration. This was done from two perspectives. The first was the geometric suitability of the potential termini and whether junctions with major intersecting roadways would lend themselves to logical MnPASS endpoints. The other was from a cost perspective meant to eliminate options likely to be prohibitively expensive. Termini significantly beyond the study area of this effort were also eliminated as insufficient background data would be available to facilitate a comprehensive assessment.

Screening Criteria 2: Meets existing traffic operations needs

Screening criteria 2 evaluated each termini's ability to meet existing traffic operations needs. The ratio between the volume of vehicles and capacity of the roadway was calculated and mapped as well as the number of hours a day each section of the corridor had congestion. To proceed, a termini option must adequately serve areas in the corridor that had higher volume and capacity ratios, or were frequently congested during the day. Alternatively, termini locations far beyond observed congestion areas were also eliminated as providing additional capacity in these areas would not be expected to provide additional benefits.

Screening Criteria 3: Requires additional analysis

In some instances screening criteria 1 and 2 were not able to fully address the considerations needed to determine the suitability of the termini under consideration. This was typically reflective of unknown changes in traffic conditions that may be expected as a result of future land use development and associated increases in traffic demand. Termini with this designation should be reviewed as traffic forecasts are developed to determine the extent of future operational and congestion issues.

MnPASS Cross Sections Screening Criteria

Screening Criteria 1: Implementation feasibility

Screening criteria 1 assessed whether the MnPASS cross section options could be implemented. Due to right-of-way width requirements and the ability to successfully implement a cross section, not all options were feasible. Options that could be implemented successfully progressed to the next stage of study.

Screening Criteria 2: Meets existing traffic operations needs

Screening criteria 2 evaluated a cross section's ability to address the operational needs of existing traffic. Options that do not offer enough road capacity would not move on to the next stage of study.

Screening Criteria 3: Requires additional analysis

In some instances the basic cross section information was insufficient to adequately address all considerations of proposed MnPASS cross sections. This condition was generally isolated to the Hwy 169 bridge over the Minnesota River, where the structural suitability for future widening or expansion is currently unknown. Alternatives that may be applicable depending on the findings of further investigation of this facility should be maintained until additional detail becomes available.

Application of Screening Criteria

All alternatives were measured against the evaluation criteria to determine if they met the criteria. Alternatives that performed well on the criteria were advanced for further study. Alternatives that did not meet the criteria were eliminated from further study. If the criteria was met by all alternatives, only the alternatives that best met the criteria were selected in the interest of carrying only three alternatives or fewer to the next analysis.

The PMT, TAC, and PAC reviewed the screening analysis findings and selected two BRT and MnPASS combined alternatives and one stand-alone MnPASS alternative for further study.

Table 2. BRT Alternatives Screening Results

		Screening Criteria			
	Alternatives	**Duplication of existing service**	**Connect to Downtown Minneapolis**	**Results of Longitudinal Employer-Household Dynamics Analysis**	**Results**
1	**Marschall Road to Downtown Mpls via US 169, I-394**	Retain	Retain	Retain	Retain
2	**Marschall Road to Downtown Mpls via US 169, TH 55**	Retain	Retain	Eliminate from full analysis * Very similar to Alternative 5 * However, Alternative 5 serves major employer at General Mills	Eliminate
3	**Marschall Road to Downtown Mpls via US 169, I-494, I-35W**	Eliminate from full analysis * Travels along I-494 corridor which is already served by frequent bus service on American Boulevard (540, 15-minute rush hour headways and 542, 30-minute rush hour headways) * Also travels along I-35W where many express routes run and the site of the future Orange Line	-	-	Eliminate
4	**Marschall Road to Downtown Mpls via US 169, TH 62, I-35W**	Retain	Retain	Eliminate from full analysis * Does not serve Origin / Destination trip pairs as effectively * Only serves 7,800 total daily work trips compared to at least 8,650 for Alternatives 1 and 2	Eliminate
5	**Marschall Road to Downtown Mpls via US 169, Betty Crocker Drive, TH 55**	Retain	Retain	Retain	Retain

		Screening Criteria			
	Alternatives	**Duplication of existing service**	**Connect to Downtown Minneapolis**	**Results of Longitudinal Employer-Household Dynamics Analysis**	**Results**
6	**Marschall Road to Downtown Mpls via US 169, TH 7, TH 100, I-394**	Eliminate from full analysis * Redundant with Green Line extension service * Local Route 9 runs on Glennwod Avenue (15-minute rush hour headways) * Local Route 12 runs from Opus to Excelsior Boulevard (15-minute rush hour headways) * Local Route 604 on Excelsior Blvd, Louisiana Ave, and I-394 (two rush hour trips)	-	-	Eliminate
7	**Marschall Road to Downtown Mpls via US 169, TH 7, TH 100, TH 55**	Eliminate from full analysis * Redundant with Green Line extension service * Local Route 9 runs on Glenwood Avenue (15-minute rush hour headways) * Local Route 12 runs from Opus to Excelsior Boulevard (15-minute rush hour headways) * Local Route 604 on Excelsior Blvd, Louisiana Ave, and I-394 (two rush hour trips)	-	-	Eliminate

Table 3. MnPASS Termini Options Screening Results

		Screening Criteria			
	Alternatives	**Implementation Feasibility**	**Existing Traffic Operations Needs**	**Requires Additional Analysis**	**Results**
1a	**Southern Termini: TH 41**	Retain	* Current operational needs do not exist all the way to TH 41	Yes	Retain * Adjust terminus to CH 69 and as far as needed pending traffic forecasts demonstrating need

		Screening Criteria			
	Alternatives	**Implementation Feasibility**	**Existing Traffic Operations Needs**	**Requires Additional Analysis**	**Results**
1b	**Southern Termini: TH 101 (on 101)**	Retain	Eliminate from full analysis * Existing hours of congestion exist on both northbound and southbound US 169 past TH 101 during AM and PM times * Volume / capacity limits exist on both northbound and southbound US 169 past TH 101 during AM and PM times	No	Eliminate
1c	**Southern Termini: CR 21 (on 21)**	Retain	Eliminate from full analysis * Existing hours of congestion exist on both northbound and southbound US 169 past CR 21 during AM and PM times * Volume / capacity limits exist on both northbound and southbound US 169 past CR 21 during AM and PM times	No	Eliminate
2a	**Northern Termini: I-494**	Retain	Retain	No	Retain
2b	**Northern Termini: TH 62**	Retain	Eliminate from full analysis * No existing congestion on US-169 from I-494 to TH 62 * No pressures on volume / capacity ratio along US-169 from I-494 to TH 62	No	Eliminate
2c	**Northern Termini: I-394/TH 55**	Retain	Retain	No	Retain
2d	**Northern Termini: I-694**	Eliminate from full analysis * Not feasible to include additional 7 miles of US-169 from TH 55 to I-694 * Focus of study is US-169 south of TH 55 / I-394	-	No	Eliminate

Table 4. MnPASS Cross Section Options Screening Results

		Screening Criteria			
	Alternatives	**Implementation Feasibility**	**Existing Traffic Operations Needs**	**Requires Additional Analysis**	**Results**
3a	**Standard left adjacent to general purpose lane**	Retain	Retain	No	Retain Preferred alternative
3b	**Minimum width (lanes and shoulders) left adjacent to general purpose lane**	Retain	Retain	No	As needed
3c	**Single lane reversible**	Retain	Retain	Yes	Retain
3d	**Double lane reversible**	Does not meet criteria * Too difficult to implement	Does not meet criteria * Low operational need for double lanes with existing conditions	No	Eliminate

Results and Rationale

The results of the screening analysis are shown above in Table 2, Table 3, and Table 4**Error! Reference source not found.**. Two combined BRT and MnPASS alternatives along with one stand-alone MnPASS alternative were retained for full analysis.

BRT

Alternatives 6 and 7, which run along TH 7, offer service that is duplicative of future investments such as the Green Line Extension. Other local bus routes travel along the corridor. Alternative 3 uses I-35W to travel into Downtown Minneapolis which duplicates service that will be offered by the Orange Line. The route along I-494 also currently has local bus service.

The routes from the LEHD Analysis show that, while the four remaining alternative routes are similar, Alternative 4 along TH 62 and I-35W would serve fewer trips. The duplication of Orange Line service along I-35W was also still an issue.

Of the remaining three Alternatives, two of them were very similar. Alternatives 2 and 5 both used TH 55 to travel to Downtown Minneapolis but Alternative 5 used Betty Crocker Drive to serve the General Mills headquarters before continuing on TH 55. Alternative 5's ability to serve a major employer and traffic generator is superior and led to the elimination of Alternative 2.

The remaining two alternatives were Alternative 1, which traveled from Marschall Road to Downtown Minneapolis via Highway 169 and I-394, and Alternative 5 which traveled from Marschall Road to Downtown Minneapolis via Highway 169, Better Crocker Drive, and TH 55.

MnPASS Termini

Of the southern termini all three could be implemented feasibly. However, none of the three met existing traffic operations needs. Options 1b and 1c did not go far enough south and Option 1a extended far past current congestion. Option 1a with a terminus of Marschall Road instead of Highway 41 was selected to proceed for further analysis as it best matched current and future traffic operations needs, as documented in the *Existing Conditions and Market Analysis Technical Memo*.

With the northern termini, three options could be implemented feasibly with only Option 2b unfeasible with its route seven miles north of TH 55 to I-694. Option 2c was eliminated from full analysis because there was limited congestion between I-494 and TH 62, limiting the efficacy of MnPASS in that segment. This left two options remaining for a northern termini: 2a which stops at I-394/TH 55, or 2b which stops at I-494.

MnPASS Cross Sections

Three of the four cross sections could be implemented feasibly; only the double lane reversible was considered too difficult to implement. Additionally, existing traffic needs do not require that level of implementation. The standard MnPASS lane widths left of the general purpose lanes were identified as the preferred cross section. The minimum widths of lanes and shoulders for a MnPASS lane left of the general purpose lanes was retained as option that could be used when needed due to right of way limitations. The single lane reversible cross section was retained for further study pertaining to expansion opportunities of the Bloomington Ferry bridge.

Alternatives advanced for further study

Concepts were developed for each of the three alternatives carried forward for detailed study:

- Alternative 1: BRT on Highway 169, Betty Crocker Drive, General Mills Boulevard, and I-394 between Marschall Road and downtown Minneapolis and MnPASS on Highway 169 between Marschall Road and TH 55.
- Alternative 2: BRT on Highway 169, Betty Crocker Drive, General Mills Boulevard, and TH 55 between Marschall Road and downtown Minneapolis and MnPASS on Highway 169 between Marschall Road and TH 55.
- Alternative 3: MnPASS on Highway 169 between Marschall Road and I-494.

Please see the *Detailed Definition of Alternatives* memo for full descriptions and diagrammatic concepts of each alternative.