

August 2016

TRAVEL DEMAND FORECASTING REPORT

RED ROCK
SOUTHEAST CORRIDOR

Your Ticket to the Southeast Metro.

PREPARED FOR

Red Rock Corridor Commission

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List of Acronyms

ACS	American Community Survey
BRT	Bus Rapid Transit
CBD	Central Business District
CTPP	Census Transportation Planning Products
CRT	Commuter Rail Transit
FTA	Federal Transit Administration
HBW	Homed-Based Work
HIS	2010 Twin Cities Home Interview Survey
KNR	Kiss-and-Ride
LEHD	Longitudinal Employer-Household Dynamics
OD	Origin-Destination
PNR	Park-and-Ride
VHT	Vehicle Hours Traveled
VMT	Vehicle Miles Traveled
WCRRA	Washington County Regional Railroad Authority

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Executive Summary

The purpose of this Travel Demand Forecast Report is to document the ridership demand for the Red Rock Corridor alternatives. The forecasts are based on socioeconomic and network assumptions for the year 2040, as developed by the Metropolitan Council, as well as estimated socioeconomic and network assumptions for the year 2024. The report includes the following major sections:

- Service Assumptions and Modeling Methodology
- Regional Forecast Summary
- Corridor Forecast Summary
- Project Forecast Summary
- Interim Year (2024) Forecast Summary
- Sensitivity Testing

Key ridership information from all full model runs is summarized below in **Table 1**. These values were used within the **Alternative Evaluation Technical Memorandum** to compare alternatives and evaluate potential phasing options for the corridor.

Table 1: Summary of Red Rock Corridor Transit Ridership by Year and Alternative

YEAR	ALTERNATIVE	DESCRIPTION	RT 361/364 /365	RT 367	RT 363	BRT	TOTAL
2024	No Build	Existing Routes Only	1,350	-	-	-	1,350
	RT 367	Peak Hour Commuter Express Service from Hastings to Minneapolis via Newport	1,310	100	-	-	1,410
	RT 367/363	Route 367 plus All-Day 30-Minute Local Service between Cottage Grove and Saint Paul	1,270	110	540	-	1,920
	Alternative 2B (Interim)	BRT Along Highway 61 to Cottage Grove Park & Ride	1,270	-	-	1,550	2,820
2040	No Build	Existing Routes Only	1,650	-	-	-	1,660
	Alternative 1	BRT Along Highway 61 to Hastings with a Highway Orientation	1,500	-	-	1,250	2,750
	Alternative 2A	BRT Along Highway 61 to Hastings with a Community Orientation (via 95th Street)	1,600	-	-	2,150	3,750
	Alternative 2B	BRT Along Highway 61 to Hastings with a Community Orientation (via Jamaica Avenue)	1,600	-	-	2,200	3,800

Introduction

The Red Rock Corridor is a proposed 30-mile transitway, connecting the Twin Cities' southeastern suburbs to downtown Saint Paul. **Figure 1** shows the general study area for this project. Previous studies have assessed the feasibility of transit service between Minneapolis and Red Wing, but BRT service would be between Saint Paul and Hastings for the purposes of this Implementation Plan. The corridor has national, statewide, and regional significance as a transportation route for automobile, truck, freight, and passenger rail travel.

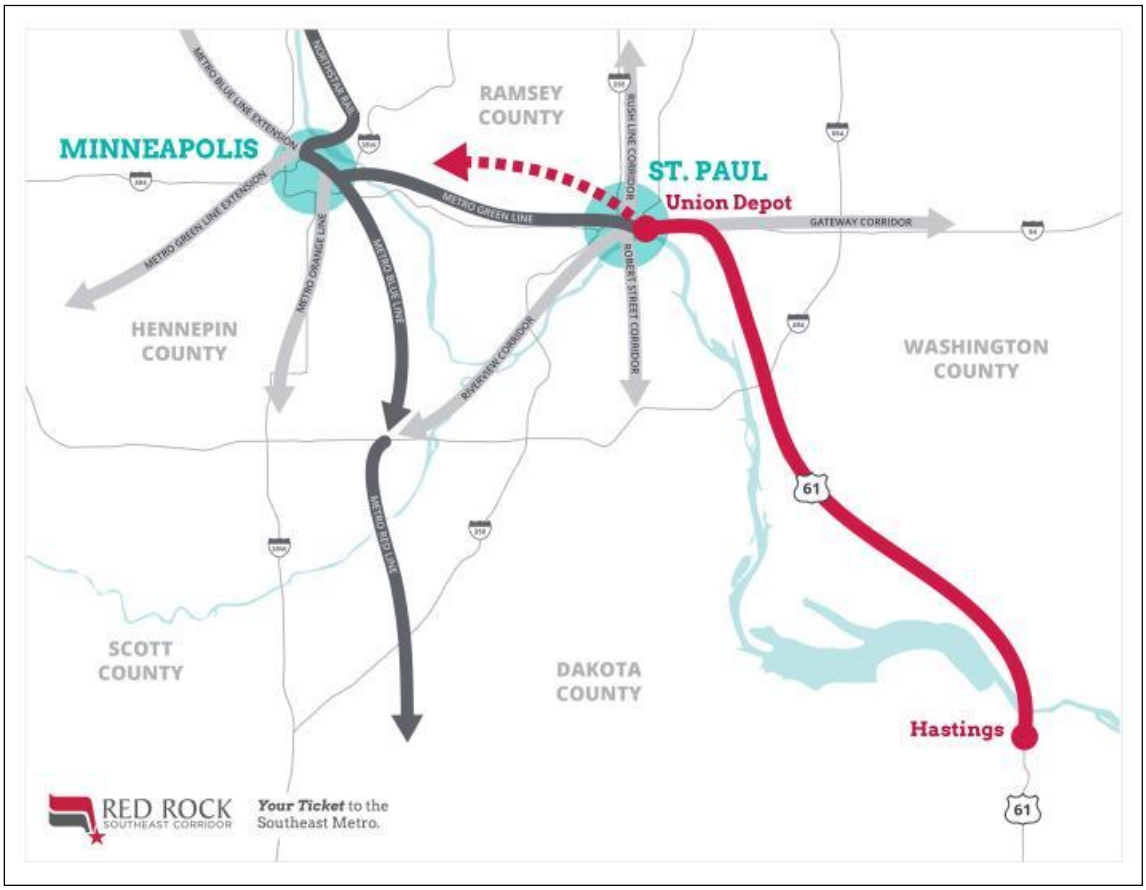


Figure 1: Project Study Area

A single BRT alternative was analyzed as part of the Red Rock Alternatives Analysis Update (AAU). As part of the Implementation Plan process, however, commuter rail was not advanced for further analysis, and the Red Rock Corridor Commission (RRCC) recommended exploring additional BRT alignments within the BRT corridor. For the Implementation Plan, three build alternatives were analyzed in the Red Rock Corridor from Hastings to the Union Depot in St. Paul. These are described as follows:

- **Alternative 1:** BRT with stops at the Union Depot, Lower Afton Park & Ride, Newport Transit Station, 70th Street Station, Langdon Village Station, and the Hastings Depot. Parking is assumed at all stations, with the exception of the 70th Street Station. This is the alternative that resulted from the AAU. This is shown in **Figure 2**.
- **Alternative 2A:** BRT via 95th Street with stops at the Union Depot, Mounds Boulevard Station, Earl Street Station, Etna Street Station, Lower Afton Park & Ride, Newport Transit Station, St. Paul Park Station, 80th Street Station, 95th Street Station, the Hastings Depot, Lions Park Station, and the Dakota County Offices Station. The Mounds Boulevard, Earl Street, and Etna Street Stations are shared with the Gateway Corridor and utilize the transit-only guideway being developed for that corridor. This is shown in **Figure 3**.

- **Alternative 2B:** BRT via Jamaica Avenue with the same stops as Alternative 2A with two modifications: elimination of the 95th Street Station and alternative routing along the east side of Highway 61 in Cottage Grove to serve a station at Jamaica Avenue. This is also shown in **Figure 3**.

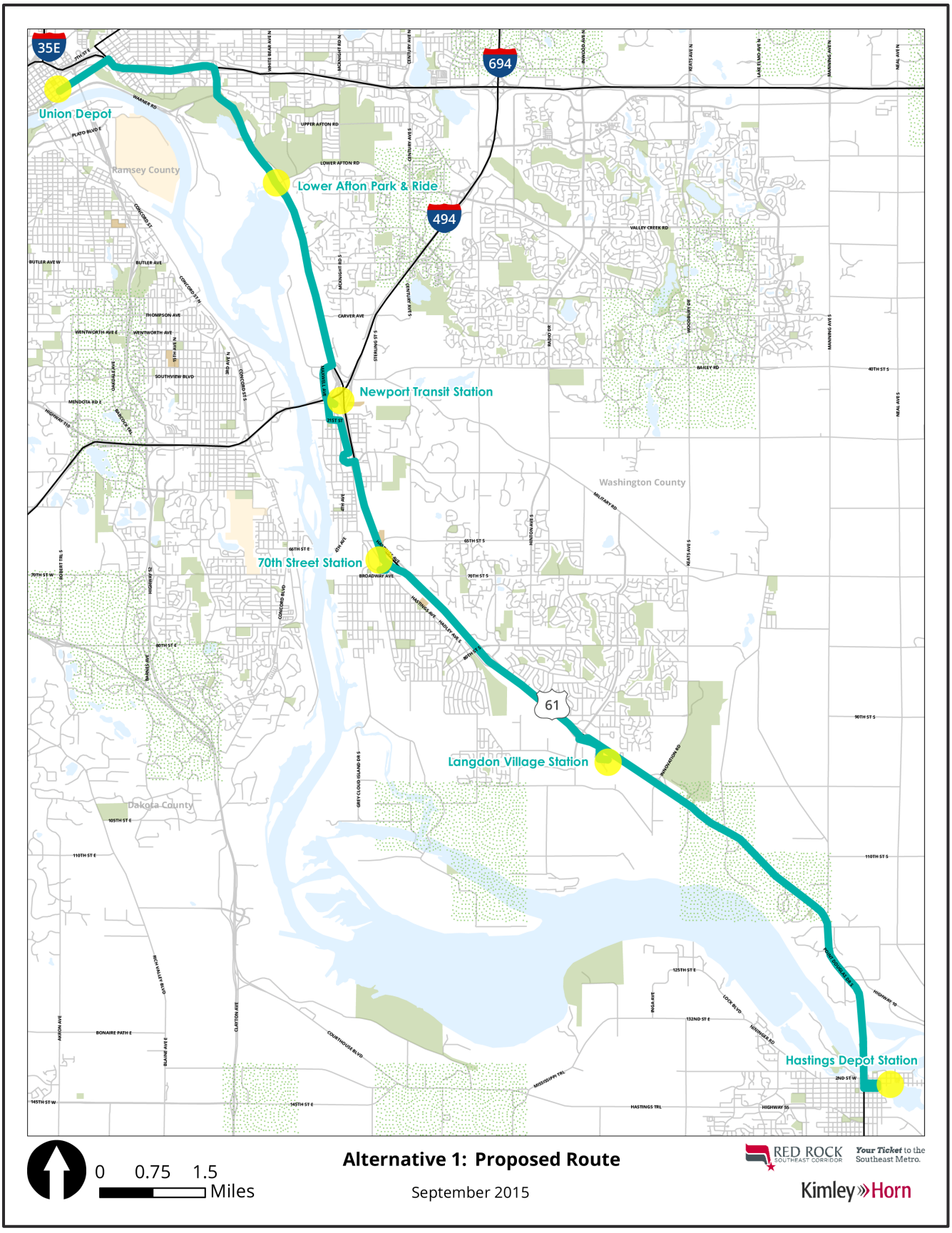


Figure 2: Red Rock Alternative 1 Alignment and Stations

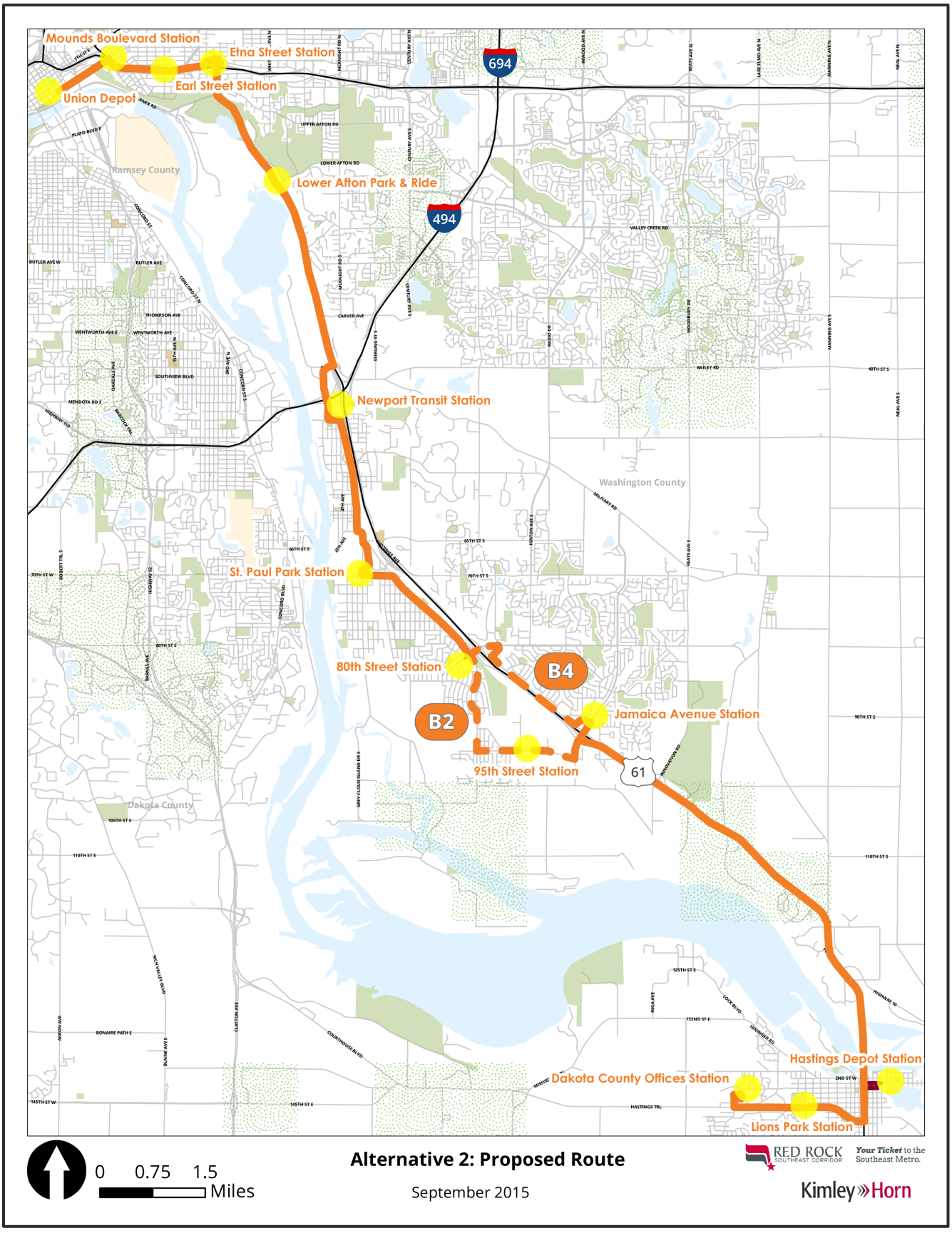


Figure 3: Red Rock Alternative 2A and 2B Alignment and Stations

Service Assumptions and Modeling Methodology

Table 2 shows the travel times assumed between stations for each alternative. Headways for all alternatives are assumed to be 15 minutes for the peak and midday time periods and 30 minutes for night and weekend service. Buses would run in both directions all day. Within the model, headways were modeled at 15 minutes for both peak and off-peak time periods, including night service. Service frequencies were therefore modeled at a greater rate than the assumed service headways from 7 pm to midnight; however, this small discrepancy should have a very little impact on total ridership. Weekend service was not modeled.

Table 2: Red Rock Build Alternatives, Travel Time between Stations (in minutes)

STATION	TYPE	ALTERNATIVE 1	ALTERNATIVE 2A (VIA 95TH STREET)	ALTERNATIVE 2B (VIA JAMAICA AVENUE)
Union Depot	Walk-up	-	-	-
Mounds Boulevard	Walk-up	-	3:03	3:03
Earl Street	Walk-up	-	2:20	2:20
Etna Street	Walk-up	-	2:04	2:04
Lower Afton Park & Ride	Park-and-ride	9:24	3:28	3:28
Newport Transit Station	Park-and-ride	5:20	5:20	5:20
70th Street	Walk-up	7:12	-	-
St. Paul Park	Walk-up	-	9:55	9:55
80th Street	Park-and-ride	-	5:47	5:47
95th Street	Walk-up	-	7:31	-
Jamaica Avenue	Walk-up	-	-	9:12
Langdon Village	Park-and-ride	7:32	-	-
Hastings Depot	Park-and-ride	13:36	11:56	11:56
Lions Park	Walk-up	-	8:33	8:33
Dakota County Offices	Park-and-ride	-	3:56	3:56
Total Time		**43:04**	**63:53**	**65:34**

Park-and-ride access was modeled using the "AUTOCON" process in the CUBE PT transit path builder. Other key parameters include a maximum backtracking distance of two miles and 25 percent of the distance to the Saint Paul Central Business District (CBD).

Table 3 shows connector and demographic information for each station including drive access connections modeled, the number of zones connected to each station by drive access, and the population and number of households in those zones. **Figure 4** shows the modeled drive access travel sheds for each zone. The maximum actual drive access distance can be longer than that specified in the AUTOCON program due to the necessity to include other logical zones to serve a particular station. All other model application procedures are consistent with those outlined in the **Red Rock Model Methodology Report**.

Table 3: Red Rock Auto Access Connector Summary and Auto Access Travel Shed Demographics

PARK-AND-RIDE STATION	DISTANCE TO SAINT PAUL CBD	MAXIMUM DRIVE ACCESS DISTANCE SETTING	MAXIMUM DRIVE ACCESS DISTANCE	NUMBER OF ZONES	POPULATION	HOUSEHOLDS
Lower Afton	4.7	5.0	6.0	22	62,960	25,610
Newport	8.1	8.0	8.4	32	89,920	35,890
80th Street	12.3	9.0	6.2	15	55,790	21,360
Langdon Village	14.9	9.0	8.6	7	21,900	8,290
Hastings Depot	21.7	17.0	18.0	15	43,856	17,980
Dakota County	25.0	17.0	18.5	10	44,081	18,138

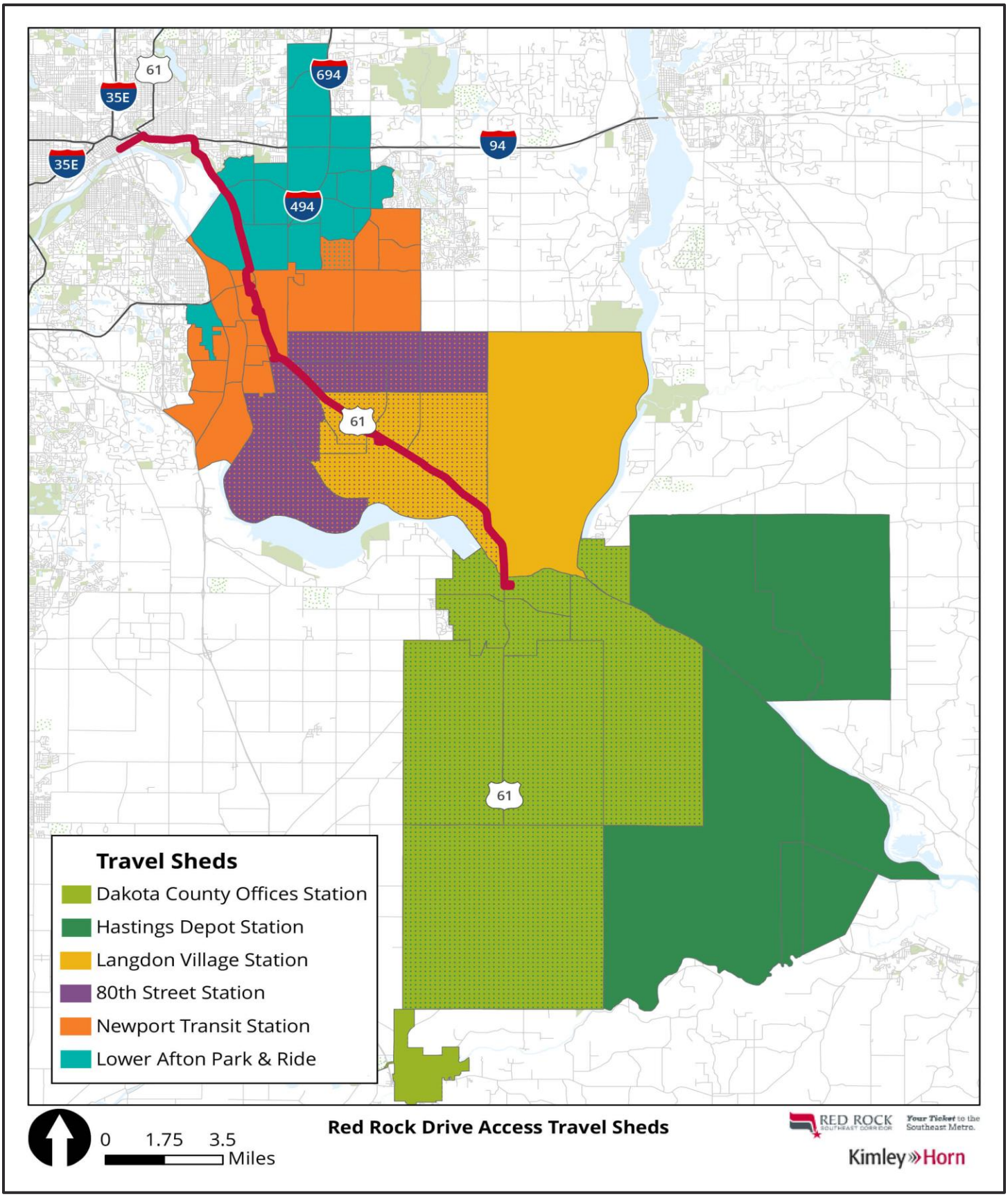


Figure 4: Red Rock Drive Access Travel Sheds

Regional Forecast Summary

The 2040 regional network is consistent with the future year network assumed within the Metropolitan Council's Transportation Policy Plan. Key transit infrastructure includes a full METRO Green Line between downtown Saint Paul and Eden Prairie and a full METRO Blue Line between Mall of America and Brooklyn Park. Highway BRT lines include the METRO Red Line, the METRO Orange Line, and the dedicated BRT METRO Gold Line (Gateway Corridor). Arterial BRT lines are also included for the A Line (Snelling Avenue) in Saint Paul, the C Line (Penn Avenue) and the Chicago-Freemont arterial BRT line in Minneapolis. **Figure 5** shows a map of the major transitways planned in the region. In the Red Rock Corridor, Routes 361, 364, and 365 (peak only) remain. **Table 4** shows a regional summary of the population, households, and employment for 2040, and the percent growth for the total region from 2010 to 2040.

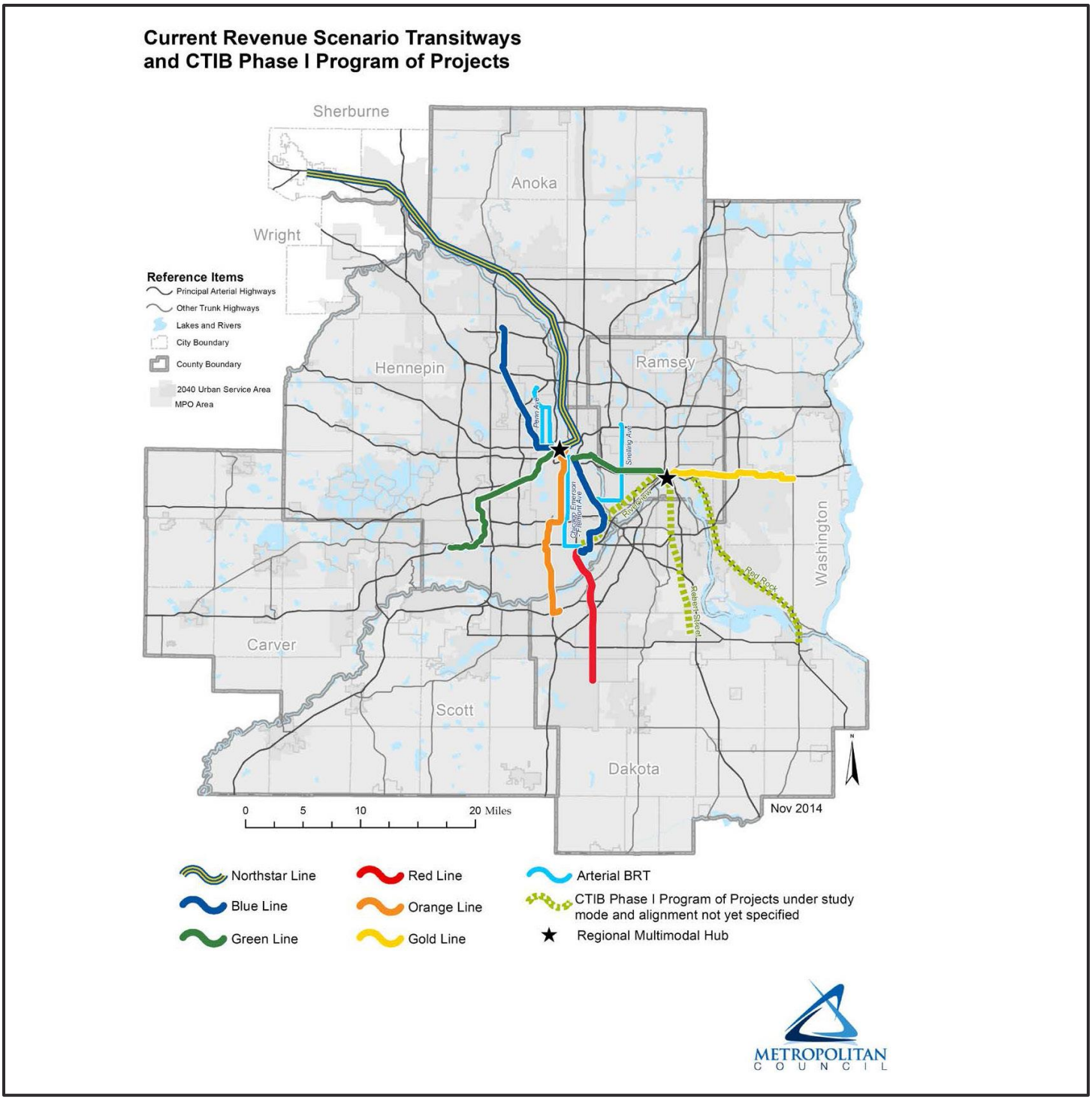


Figure 5: Regional Transitways Plan from the 2040 Policy Plan

Table 4: Red Rock 2040 Demographics

MEASURE	7-COUNTY	RING COUNTIES	TOTAL REGION	PERCENT GROWTH FROM 2010
Population	3,672,888	1,073,255	4,746,143	37%
Households	1,508,756	384,777	1,893,533	41%
Retail Employment	384,923	-	-	-
Non-retail Employment	1,717,249	-	-	-
Total Employment	2,102,172	401,726	2,503,898	42%

Table 5 shows the change in regional linked transit trips. From 2010 to 2040 there is a 57 percent increase in regional transit trips. This increase reflects the change in population and households and significant service improvements with new fixed-guideway and BRT service.

The Red Rock alternatives create 900 new transit trips for Alternative 1 and between 1,500 and 1,600 new transit trips for Alternatives 2A and 2B. These new trips account for between 71 and 75 percent of the Red Rock BRT project trips. VMT savings is 10,100 vehicle-miles per day for Alternative 1 and about 19,000 vehicle-miles per day for Alternative 2A and 2B. VHT savings range from 300 vehicle-hours per day for Alternative 1 and 500 vehicle-hours per day for Alternatives 2A and 2B.

Table 5: Red Rock Regional Linked Average Weekday Transit Trips, Rounded to the Nearest 100 Trips except for BRT

MODE	2010	2040			
		NO BUILD	ALTERNATIVE 1	ALTERNATIVE 2A (VIA 95TH STREET)	ALTERNATIVE 2B (VIA JAMAICA AVENUE)
Local Bus	133,800	164,800	164,800	164,700	164,700
Express Bus	36,600	57,300	57,000	56,800	56,800
Light Rail	21,900	73,800	73,800	73,700	73,700
BRT – Red Rock	0	0	1,250	2,150	2,200
Commuter Rail	1,400	8,800	8,800	8,800	8,800
Total	**193,700**	**304,700**	**305,500**	**306,200**	**306,200**
New Transit Trips	-	-	900	1,500	1,600
VMT Saved	-	-	10,100	18,900	19,200
VHT Saved	-	-	300	500	500

Corridor Forecast Summary

For the purposes of summarizing trips in the corridor, the aggregated zones are summarized into a limited number of districts, as shown in **Figure 6**. The Red Rock Corridor includes the Woodbury, Newport, Cottage Grove, and Hastings districts. The most common destinations are the Minneapolis and Saint Paul CBDs (for work trips) and the Midway area between the CBDs, which serves as the attraction for University of Minnesota trips and the home end of reverse-commuter trips.

Tables 6 through 10 show transit trips and transit mode shares between selected districts for the 2010, 2040 No Build, and 2040 Build Alternatives. The row headings in these tables represent the home end of the trip, and the column headings represent the non-home end. These tables show that the majority of new transit trips occur between Hastings or Cottage Grove and the Minneapolis and Saint Paul CBDs and the Midway area.

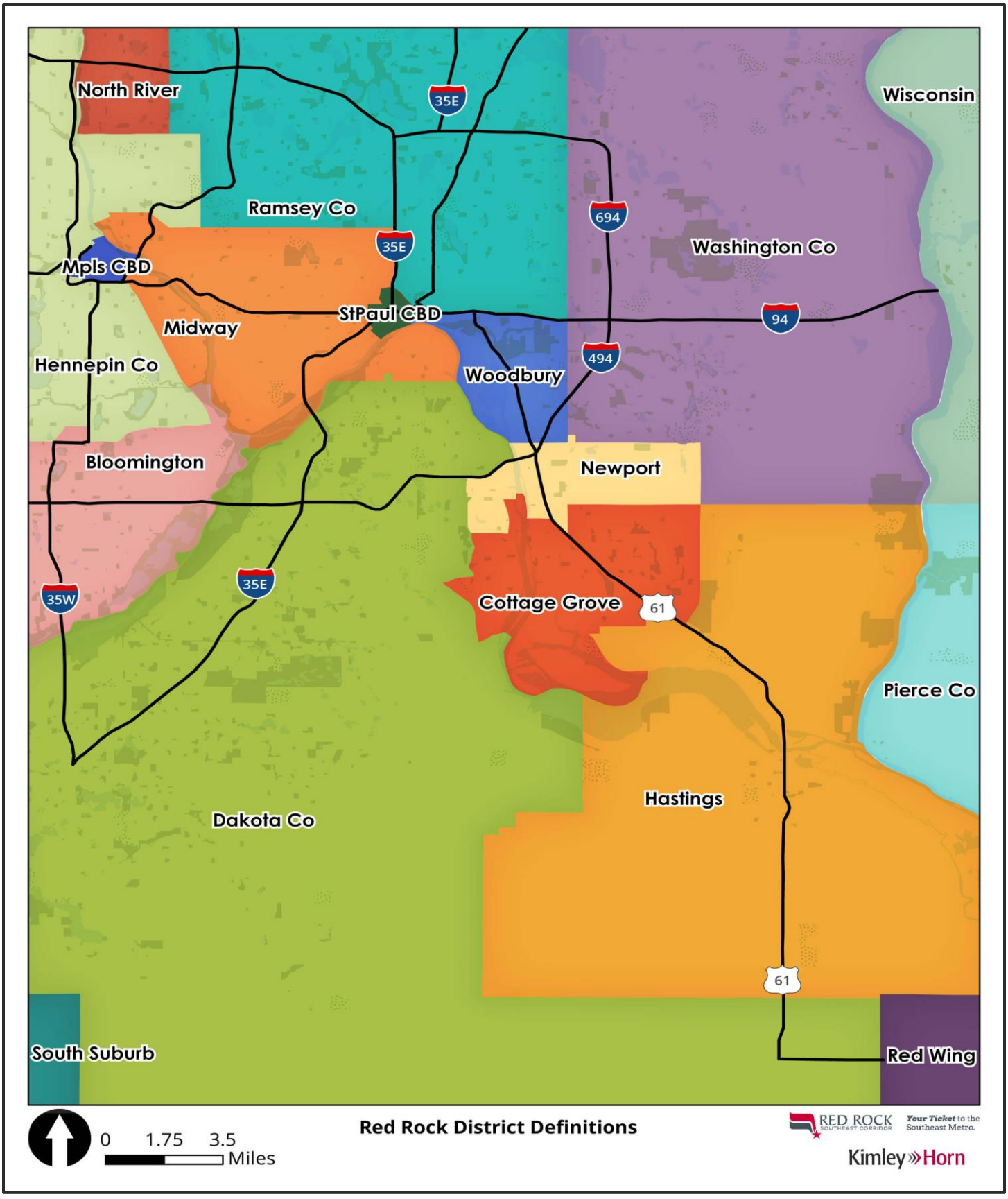


Figure 6: Red Rock District Definitions

Table 6: Red Rock 2010 Corridor Transit Trips and Transit Mode Share

NON-HOME END / HOME END	MINNEAPOLIS CBD		SAINT PAUL CBD		MIDWAY		HASTINGS		COTTAGE GROVE		NEWPORT		WOODBURY		TOTAL	
Minneapolis CBD	3,080	5%	170	22%	1,450	5%	0	0%	0	2%	0	1%	0	3%	4,700	5%
Saint Paul CBD	210	38%	750	4%	930	3%	0	0%	0	1%	0	2%	30	4%	1,920	4%
Midway	8,420	19%	3,650	7%	16,560	3%	0	0%	10	1%	20	1%	50	2%	28,710	4%
Hastings	40	13%	10	1%	20	1%	0	0%	0	0%	0	0%	0	0%	70	0%
Cottage Grove	220	18%	160	4%	180	1%	0	0%	20	0%	20	0%	10	0%	610	0%
Newport	50	19%	80	5%	90	2%	0	0%	10	0%	20	0%	10	1%	260	1%
Woodbury	200	22%	350	6%	370	3%	0	0%	0	0%	0	0%	70	1%	990	3%
Total	**12,230**	**11%**	**5,170**	**6%**	**19,600**	**3%**	**0**	**0%**	**50**	**0%**	**70**	**0%**	**160**	**1%**	**37,270**	**3%**

*Trips rounded to the nearest 10

Table 7: Red Rock Year 2040 No-Build Corridor Transit Trips and Transit Mode Share

NON-HOME END / HOME END	MINNEAPOLIS CBD		SAINT PAUL CBD		MIDWAY		HASTINGS		COTTAGE GROVE		NEWPORT		WOODBURY		TOTAL	
Minneapolis CBD	4,720	4%	520	37%	2,880	6%	0	0%	0	3%	0	2%	0	4%	8,120	5%
Saint Paul CBD	460	40%	830	2%	1,370	3%	0	0%	0	1%	0	1%	40	3%	2,700	3%
Midway	12,780	22%	6,620	11%	21,120	3%	0	0%	20	1%	30	2%	70	2%	40,640	5%
Hastings	120	19%	60	3%	50	1%	0	0%	0	0%	0	0%	0	0%	230	0%
Cottage Grove	330	22%	320	6%	180	1%	0	0%	20	0%	20	0%	0	0%	870	1%
Newport	130	19%	200	6%	130	2%	0	0%	10	0%	20	0%	10	0%	500	1%
Woodbury	390	30%	770	9%	510	3%	0	0%	0	0%	10	0%	90	1%	1,770	4%
Total	**18,930**	**10%**	**9,330**	**8%**	**26,230**	**3%**	**0**	**0%**	**50**	**0%**	**80**	**0%**	**210**	**1%**	**54,820**	**4%**

*Trips rounded to the nearest 10

Table 8: Red Rock Year 2040 Alternative 1 Corridor Transit Trips and Transit Mode Share

NON-HOME END / HOME END	MINNEAPOLIS CBD		SAINT PAUL CBD		MIDWAY		HASTINGS		COTTAGE GROVE		NEWPORT		WOODBURY		TOTAL	
Minneapolis CBD	4,720	4%	520	37%	2,880	6%	0	8%	0	4%	0	2%	0	4%	8,130	5%
Saint Paul CBD	460	40%	830	2%	1,370	3%	0	0%	10	6%	0	2%	40	3%	2,710	3%
Midway	12,780	22%	6620	11%	21,120	3%	0	1%	30	2%	30	2%	70	2%	40,670	5%
Hastings	130	22%	110	5%	90	2%	10	0%	10	0%	0	0%	0	0%	360	0%
Cottage Grove	370	25%	420	7%	240	2%	10	0%	50	0%	20	0%	10	0%	1,120	1%
Newport	140	20%	240	7%	150	2%	0	0%	20	0%	20	0%	10	0%	570	1%
Woodbury	400	30%	800	10%	540	4%	0	0%	10	0%	10	0%	100	1%	1,840	4%
Total	**19,000**	**10%**	**9,540**	**8%**	**26,380**	**3%**	**30**	**0%**	**130**	**0%**	**90**	**0%**	**220**	**1%**	**55,400**	**4%**

*Trips rounded to the nearest 10

Table 9: Red Rock Year 2040 Alternative 2A (via 95th Street) Corridor Transit Trips and Transit Mode Share

NON-HOME END / HOME END	MINNEAPOLIS CBD		SAINT PAUL CBD		MIDWAY		HASTINGS		COTTAGE GROVE		NEWPORT		WOODBURY		TOTAL	
Minneapolis CBD	4,720	4%	520	37%	2,880	6%	0	15%	0	4%	0	2%	0	4%	8,130	5%
Saint Paul CBD	460	40%	830	2%	1,370	3%	0	1%	20	7%	0	2%	40	3%	2,720	3%
Midway	12,780	22%	6,620	11%	21,120	3%	10	2%	40	2%	30	2%	70	2%	40,680	5%
Hastings	150	24%	120	6%	100	2%	80	0%	30	0%	0	0%	0	0%	480	0%
Cottage Grove	390	26%	440	8%	260	2%	20	0%	90	0%	30	0%	10	0%	1,240	1%
Newport	140	20%	230	7%	150	2%	0	0%	20	0%	20	0%	10	0%	570	1%
Woodbury	400	30%	800	10%	540	4%	0	0%	10	0%	10	0%	100	1%	1,850	4%
Total	**19,040**	**10%**	**9,560**	**8%**	**26,410**	**3%**	**120**	**0%**	**200**	**0%**	**100**	**0%**	**230**	**1%**	**55,650**	**4%**

*Trips rounded to the nearest 10

Table 10: Red Rock Year 2040 Alternative 2B (via Jamaica Avenue) Corridor Transit Trips and Transit Mode Share

NON-HOME END / HOME END	MINNEAPOLIS CBD		SAINT PAUL CBD		MIDWAY		HASTINGS		COTTAGE GROVE		NEWPORT		WOODBURY		TOTAL	
Minneapolis CBD	4,720	4%	520	37%	2,880	6%	0	15%	0	4%	0	2%	0	4%	8,130	5%
Saint Paul CBD	460	40%	830	2%	1,370	3%	0	1%	20	7%	0	2%	40	3%	2,720	3%
Midway	12,780	22%	6,620	11%	21,120	3%	10	2%	40	2%	30	2%	70	2%	40,680	5%
Hastings	150	24%	120	5%	100	2%	80	0%	30	0%	0	0%	0	0%	480	0%
Cottage Grove	390	26%	450	8%	260	2%	20	0%	90	0%	30	0%	10	0%	1,260	1%
Newport	140	20%	230	7%	150	2%	0	0%	20	0%	20	0%	10	0%	570	1%
Woodbury	400	30%	800	10%	540	4%	0	0%	10	0%	10	0%	100	1%	1,850	4%
Total	**19,040**	**10%**	**9,560**	**8%**	**26,410**	**3%**	**120**	**0%**	**210**	**0%**	**100**	**0%**	**230**	**1%**	**55,670**	**4%**

*Trips rounded to the nearest 10

Project Forecast Summary

This chapter addresses the characteristics of the project trips—that is, those trips that use the BRT line for each build alternative.

Table 11 summarizes key project ridership characteristics. The primary observations are listed below:

- The BRT alternatives 2A and 2B draw significantly greater ridership than Alternative 1. This is due to greater accessibility to walk-access trips and more accessibility to destinations. The reverse-commute trip share for Alternatives 2A and 2B is also greater as a result of better destination accessibility.
- There is little difference between Alternative 2A and 2B in terms of ridership. There are about 60 more home-end trips using the Jamaica Avenue station than using the 95th Street station.
- The greater accessibility offered by the Alternative 2 BRT alternatives attracts a greater share of transit riders from low income and households without a car when compared with Alternative 1.
- About two-thirds of the trips for all alternatives are work trips.
- The estimated peak vehicle load can be accommodated by standard BRT buses as a seated capacity.
- Drive-access trips account for more than half of the Alternative 1 BRT ridership, whereas the demand on the Alternative 2 BRT alternatives is more evenly split between walk and drive access and transfers from other transit routes.
- Virtually all of the bus/rail access for all alternatives occurs at the Union Depot and Mounds Boulevard Station.
- The park-and-ride station with the largest demand is at the Newport Transit Station, followed by the Lower Afton Park & Ride. These stations offer relatively quick access from freeways and the stations are relatively close to the Saint Paul CBD. The remaining park-and-ride stations show a demand of 50 or fewer vehicles. Park-and-ride vehicle demand assumes a 10% turnover ratio, average vehicle occupancy of 1.1 people, and a 10% additional space allowance. The latter allowance is a design consideration to account for fluctuation in demand and spaces that may become unusable during the day. This demand includes only the BRT line demand and does not include any demand from other lines sharing the same park-and-ride lots.
- The park-and-ride attractiveness of the Dakota County Offices Station in Hastings may be less attractive due to a relatively slow connection to the Hastings Depot, where drivers could access directly.
- The existing Routes 361, 364, and 365 show stable ridership with each build alternative. They offer good travel times and accessibility and some serve other geographic markets, including direct, one-seat trips to the University of Minnesota and the Minneapolis CBD. Only about 100 to 200 riders are diverted from these routes to the BRT alternatives.
- A build-up analysis indicates that about 65 percent of the 2040 Alternative 1 increase in ridership over the 2010 no-build alternative is attributable to the increased service and accessibility provided in the build alternative, with most of the remainder of the demand attributable to growth from 2010 to 2040. A similar analysis shows that about 63/60 percent of the 2040 Alternative 2A/2B ridership increase over the 2010 no-build alternative, respectively, is attributable to the increased service and accessibility provided by the increased service in the build alternatives, with most of the remainder of the demand attributable to growth from 2010 to 2040. Appendix A shows the station ridership for a 2010 “build” condition compared with 2040 totals.
- The distribution of boardings and alightings at the three potential stations in Hastings for the Alternative 2 scenarios is not well-defined by the model results due to the adjacent zone sizes, placement and arrangement of the access connectors. While the model results favor the station near Highway 55 and Westview Drive, a re-distribution of trips to the Hastings Depot and the Dakota County Services Center station could be justified. The combined magnitude of trips at the Hastings stations is, however, reasonable.

Table 11: Red Rock Project Trip Characteristics

MEASURE	ALTERNATIVE 1	ALTERNATIVE 2A (VIA 95TH STREET)	ALTERNATIVE 2B (VIA JAMAICA AVENUE)
Boardings	1,250	2,150	2,200
Reverse Commute	250 (18%)	500 (24%)	500 (23%)
Trips from 0-Auto Households	300 (25%)	750 (34%)	750 (35%)
Home-Based Work Low Income	150 (20%)	300 (23%)	300 (23%)
Work Share	900 (70%)	1,350 (64%)	1,400 (65%)
Peak Vehicle Load	32/Bus	32/Bus	33/Bus
Walk Access	350 (26%)	700 (33%)	750 (34%)
Bus Access	200 (15%)	620 (29%)	650 (29%)
Park-and-ride	700 (56%)	750 (35%)	750 (34%)
Kiss-and-ride	32 (2%)	65 (3%)	70 (3%)
Parking Spaces	330	330	320
Lower Afton	90	80	80
Newport	150	140	140
80th Street	-	40	40
Langdon Village	30	-	-
Hastings Depot	60	50	40
Dakota County Offices	-	20	20
Routes 361/364/365	1,500	1,600	1,600

Figures 7 through 12 show boarding, alighting, and segment passenger loads (i.e., bus riders on the bus) for each alternative for Year 2040 weekday conditions. Also included in these figures are charts showing the distribution of access modes by station. Note that the acronyms “PNR” and “KNR” represent park-and-ride and drop-off (i.e., kiss-and-ride) access to a station. All values are presented in Production/Attraction format, which means that boarding values represent the home end of a trip and attraction values represent the non-home end of a trip (e.g., workplace, shopping, etc.) These figures show a strong commute pattern with the Union Depot

being the primary alighting location for morning trips. From here, travelers proceed to downtown St. Paul destinations or transfer to bus and rail modes for destinations in Minneapolis, the University of Minnesota, or other Midway area destinations.

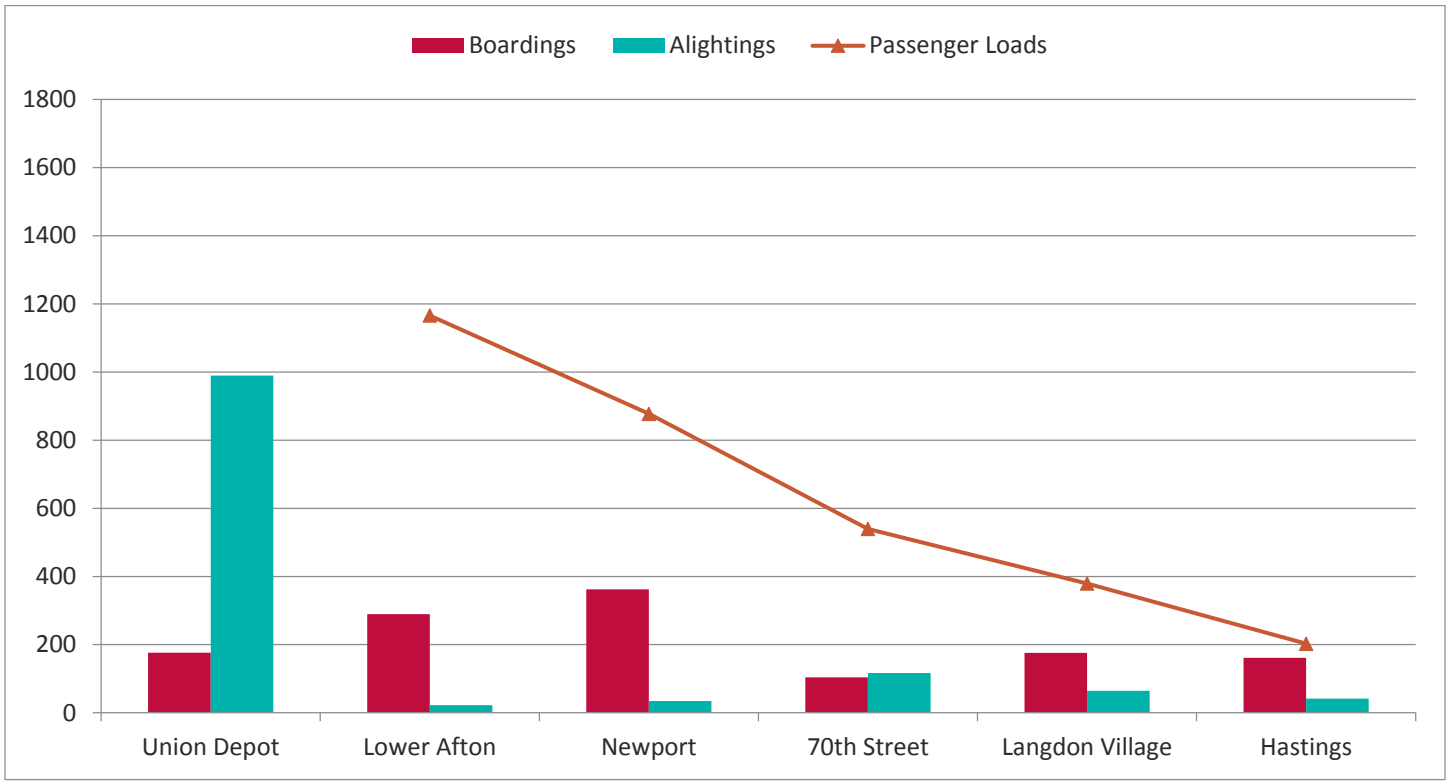


Figure 7: Red Rock Alternative 1 Boardings and Alightings and Link Loads--Year 2040 Average Weekday Trips.

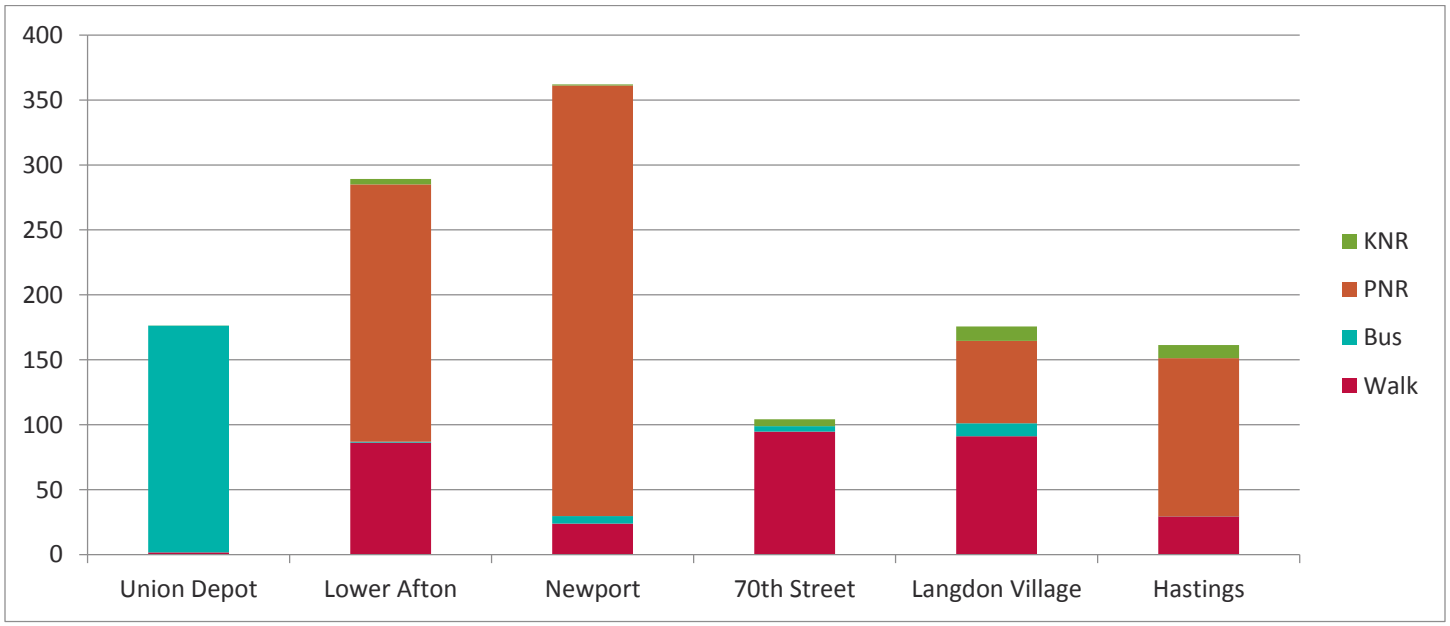


Figure 8: Red Rock Alternative 1 Boardings by Access Mode--Year 2040 Average Weekday Trips.

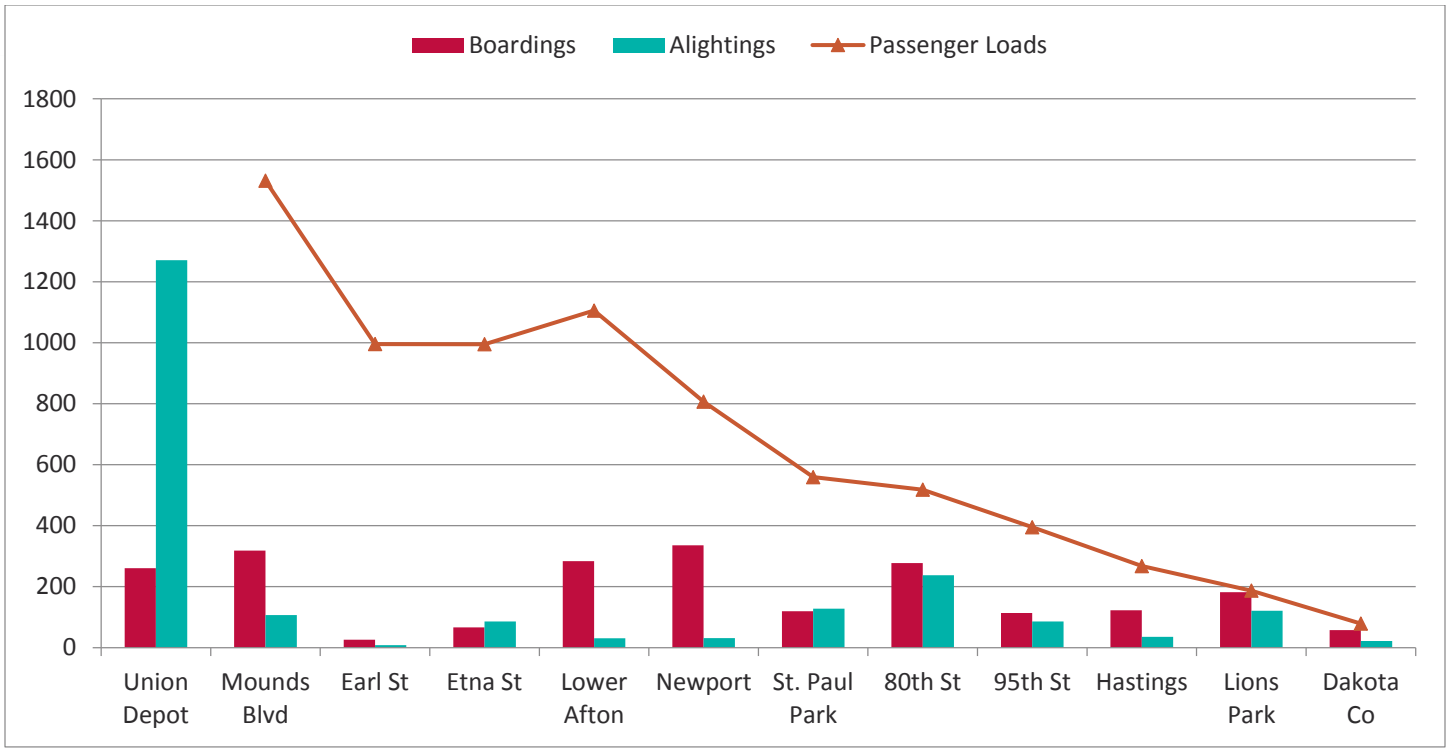


Figure 9: Red Rock Alternative 2A (via 95th Street) Boardings and Alightings and Link Loads--Year 2040 Average Weekday Trips.

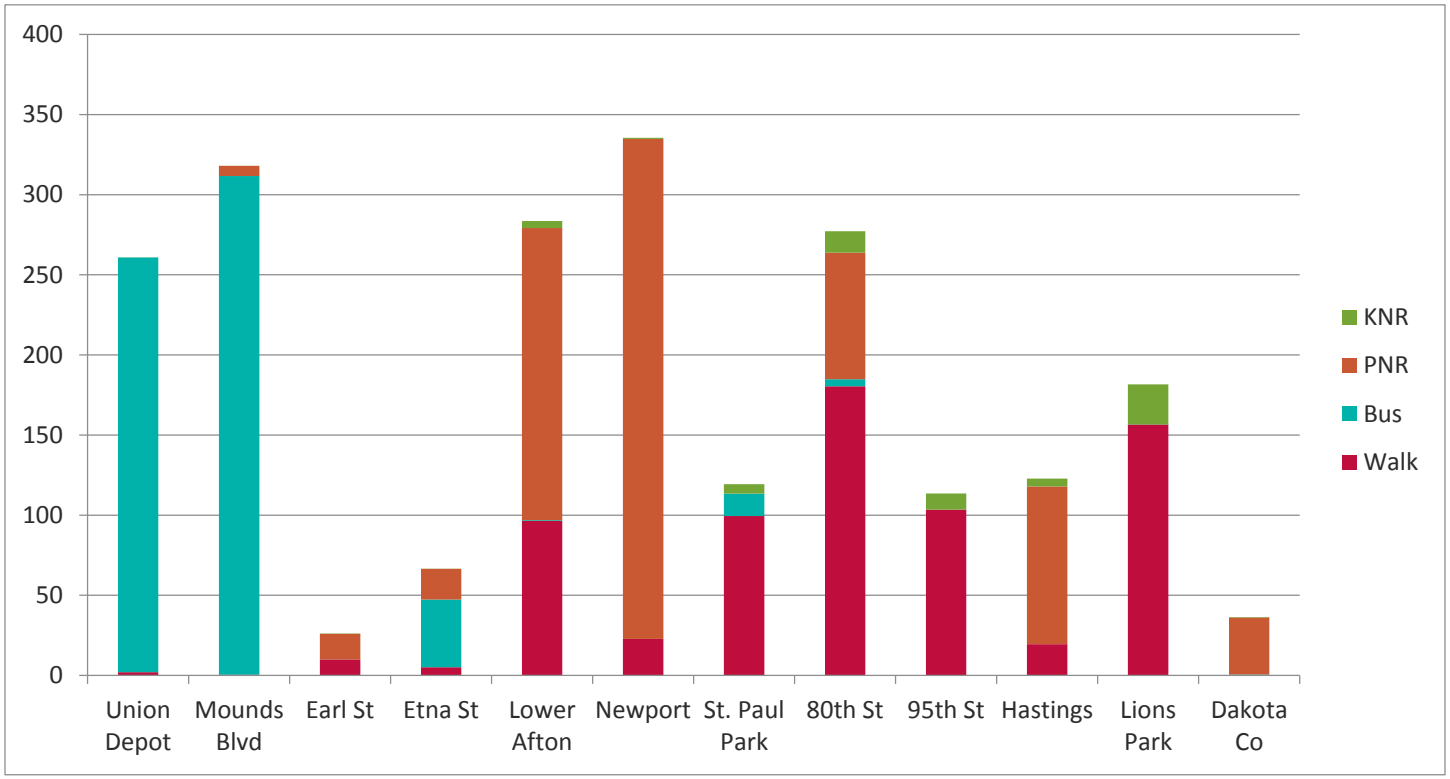


Figure 10: Red Rock Alternative 2A (via 95th Street) Boardings by Access Mode--Year 2040 Average Weekday Trips.

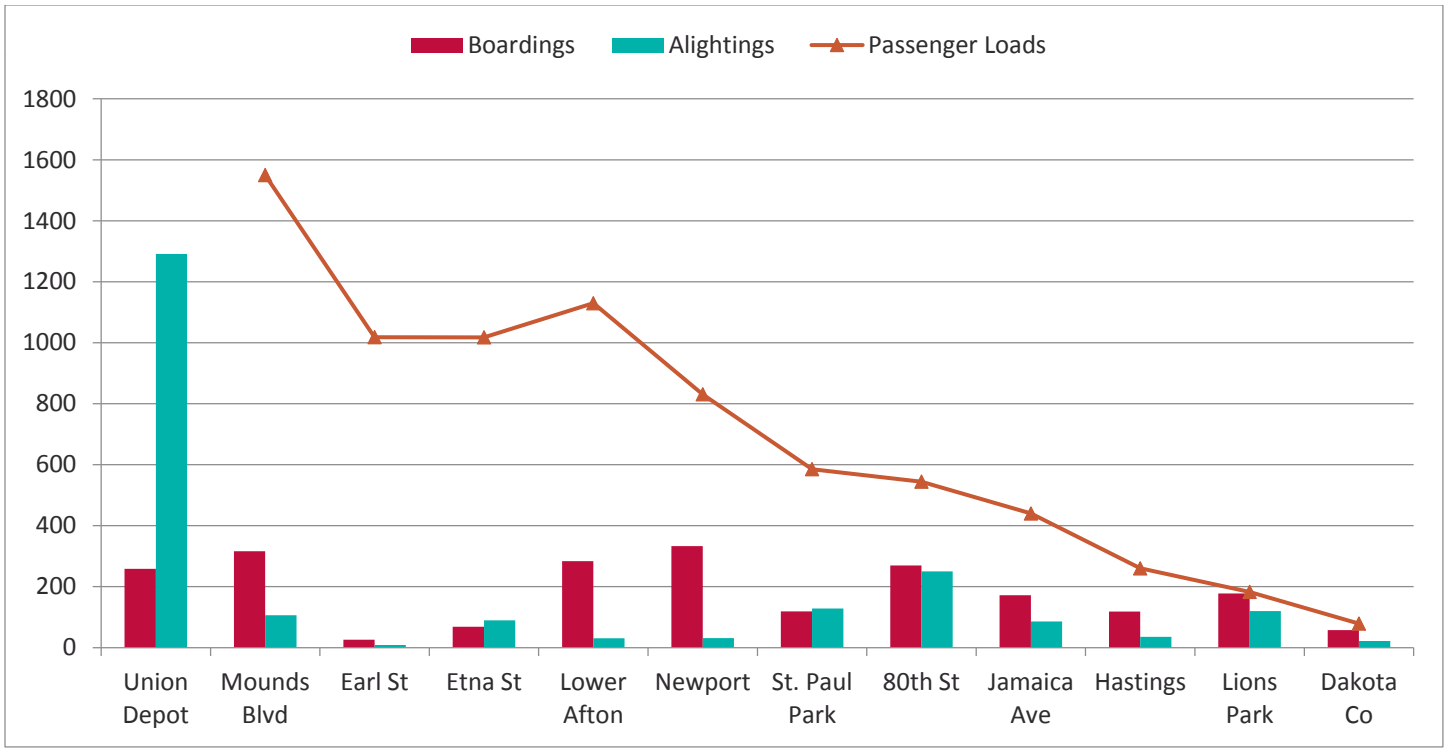


Figure 11: Red Rock Alternative 2B (via Jamaica Ave) Boardings and Alightings and Link Loads--Year 2040 Average Weekday Trips.

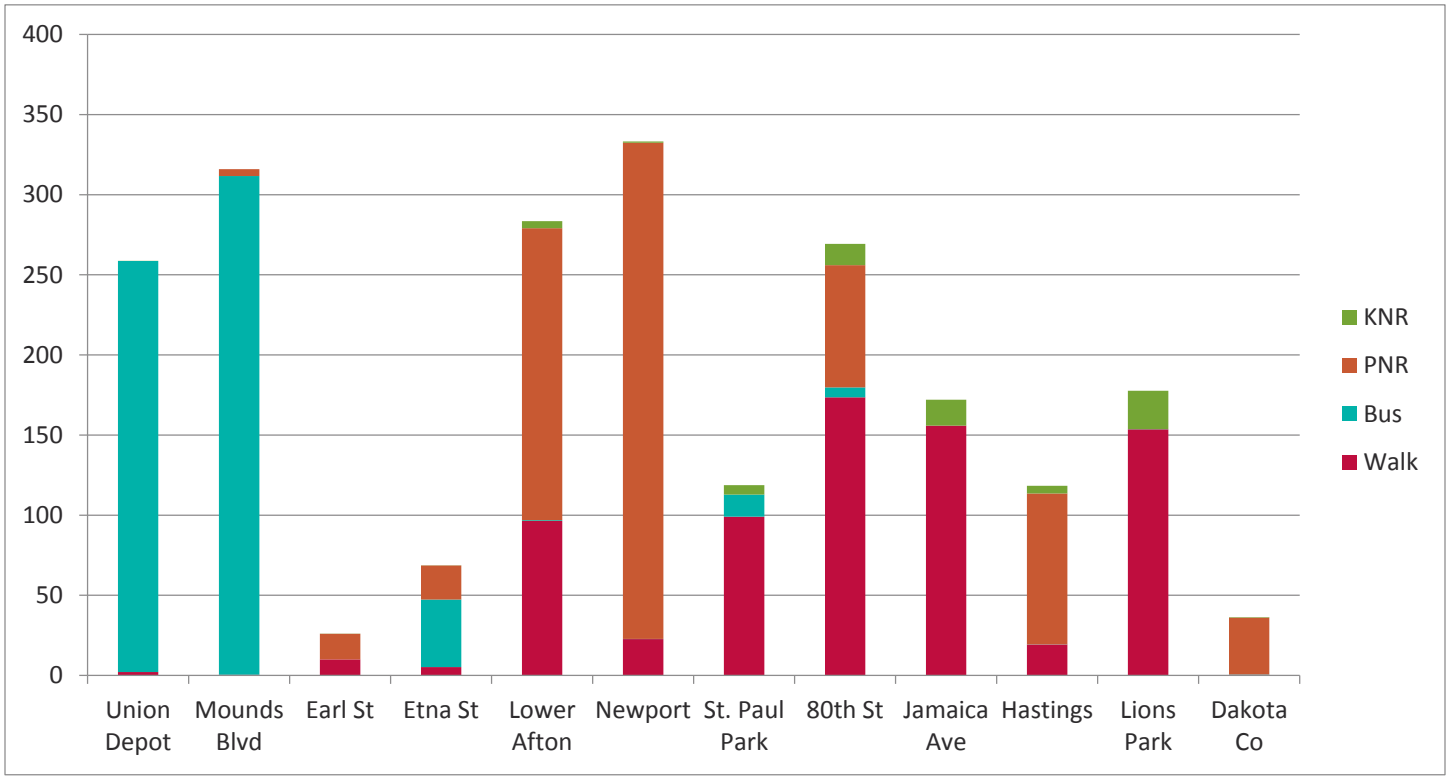


Figure 12: Red Rock Alternative 2B (via Jamaica Ave) Boardings by Access Mode--Year 2040 Average Weekday Trips

Interim Year (2024) Forecast Summary

2024 was selected as an interim year to evaluate additional local and express service within the corridor, as well as an interim build option for the Full Build BRT. Given the lack of all-day local bus service in the corridor, initial implementation of all-day service and additional express bus service was proposed as an initial step in building ridership towards full BRT. Year 2024 represents a reasonable estimate for the time needed to secure funding, implement interim service, and maintain operations for two to three years. This type of service, in 2024, provides better understanding of the performance of interim stages of the Red Rock Implementation Plan, specifically how well transit service and demand are matched in the years between now and full BRT implementation.

A No-Build and three build alternatives were tested for year 2024. The Build alternatives include:

1. Route 367 – Route 367 is a peak-only express service with 30 minute headways, serving Hastings, Newport Transit Station, and the Minneapolis CBD.
2. Route 363 with Route 367 – Route 363 is an all-day local service with 30 minute headways, connecting the Cottage Grove Park and Ride Station with the Union Depot in downtown St. Paul. Other stations served include Jamaica Avenue, 80th Street (East), St. Paul Park, Newport Transit Station, and Lower Afton. Cottage Grove, Newport Transit Station, and Lower Afton were modeled as park-and-ride stations. Route 367 as described above is also included.
3. Alternative 2B (Interim BRT) – As a benchmark comparison to Alternative 2B, interim BRT service with 15 minute headways was modeled, with the same stops as Route 363, but also serving the Gateway (Gold Line) stations at Etna Street, Earl Street, and Mounds Blvd.

Table 12 shows a comparison of existing and No-Build scenarios for current and all future years. The year 2024 socioeconomic data was interpolated between the Metropolitan Council's current 2020 and 2030 forecasts, and the highway and transit networks were represented according to the regional development plan. **Table 12** shows that 2024 represents approximately a midpoint in terms of corridor transit ridership between 2010 and 2040, with a total of 1,350 riders in the No-Build scenario.

Table 12: No-Build Red Rock Corridor Ridership by Year (all numbers rounded to the nearest 10 trips)

TYPE	YEAR	RT 361	RT 364	RT 365	TOTAL
Observed	2010	270	40	500	810
Modeled	2010	310	50	700	1,060
	2024	270	150	930	1,350
	2040	360	220	1,080	1,660

Table 13 shows projected year 2024 boardings by route in the corridor for the No-Build and each build scenario. Route 367 shows 100 to 110 boardings, depending on the scenario. Route 363 has approximately 540 boardings. Finally, Alternative 2B (Interim BRT) service including the Gold Line stations shows a 1,550 boardings, which is about 70 percent of the 2040 Alternative 2B ridership. Note that this interim BRT terminates at the Cottage Grove Park & Ride and does not include service to Hastings, which is included in the Full Build BRT Alternative 2B modeled in 2040.

Table 13: Year 2024 Daily Boardings by Route and Scenario (all values rounded to the nearest 10 trips)

SCENARIO	RT 361	RT 364	RT 365	RT 363	RT 367	BRT	TOTAL
No-Build	270	150	930				1,350
Route 367	270	130	910		100		1,410
Route 363/367	240	100	930	540	110		1,920
Alternative 2B (Interim BRT)	200	80	990			1,550	2,820

Table 14 shows the parking lot demand for each route.

Table 14: Year 2024 Projected New Parking Space Demand

SCENARIO	HASTINGS	COTTAGE GROVE	NEWPORT	LOWER AFTON	TOTAL
Route 367	16		25		41
Route 363/367	17	24	78	41	160
Alternative 2B (Interim BRT)		23	99	72	194

Note: All values are the parking spaces required for new service only, not including demand from existing bus routes.
The estimated parking space demand assumes 1.1 persons/vehicle occupancy, a 10% turnover ratio and a 10% spare allowance.

Figures 13 through 15 show the boardings, alightings, and loads for each scenario. These values are presented in production/attraction format.

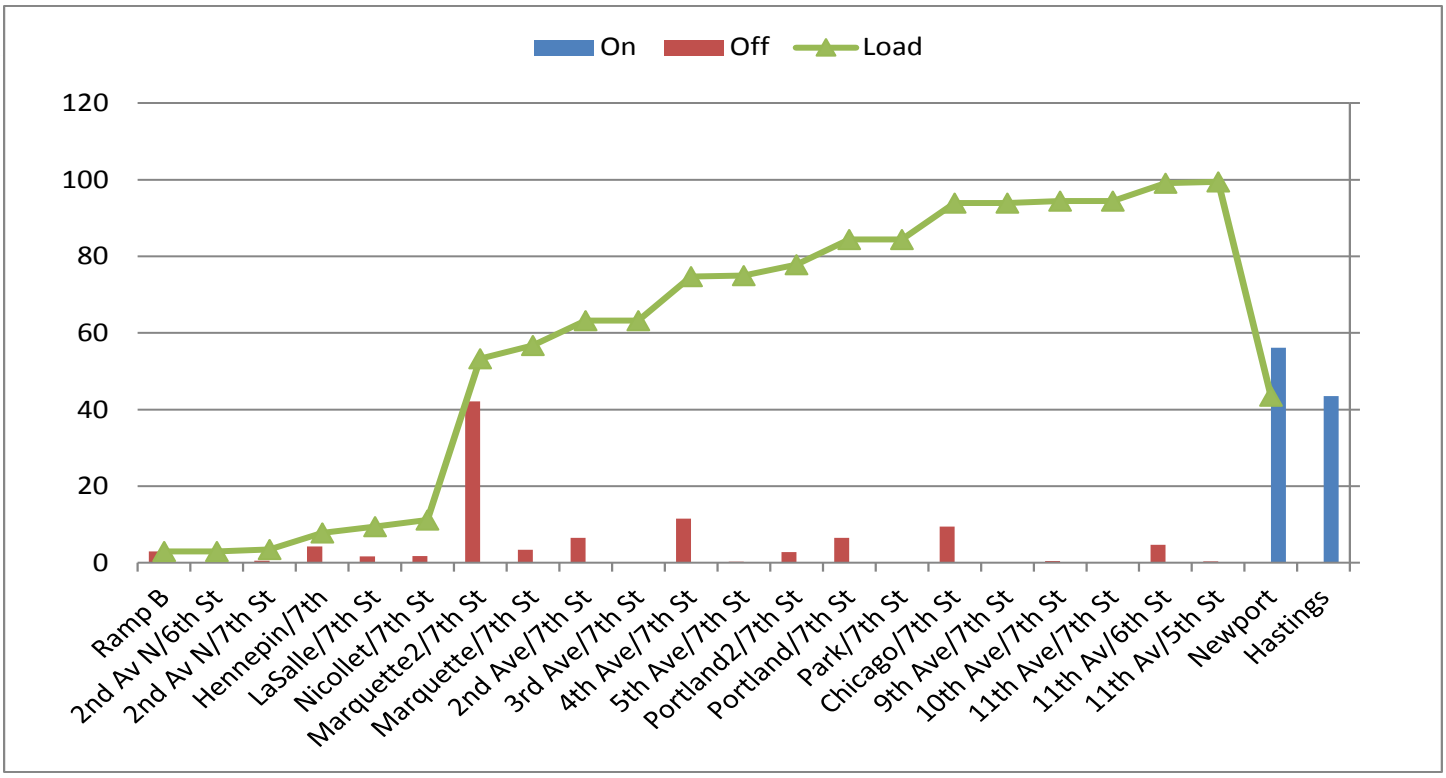


Figure 13: Year 2024 Route 367 Boardings, Alightings, and Loads

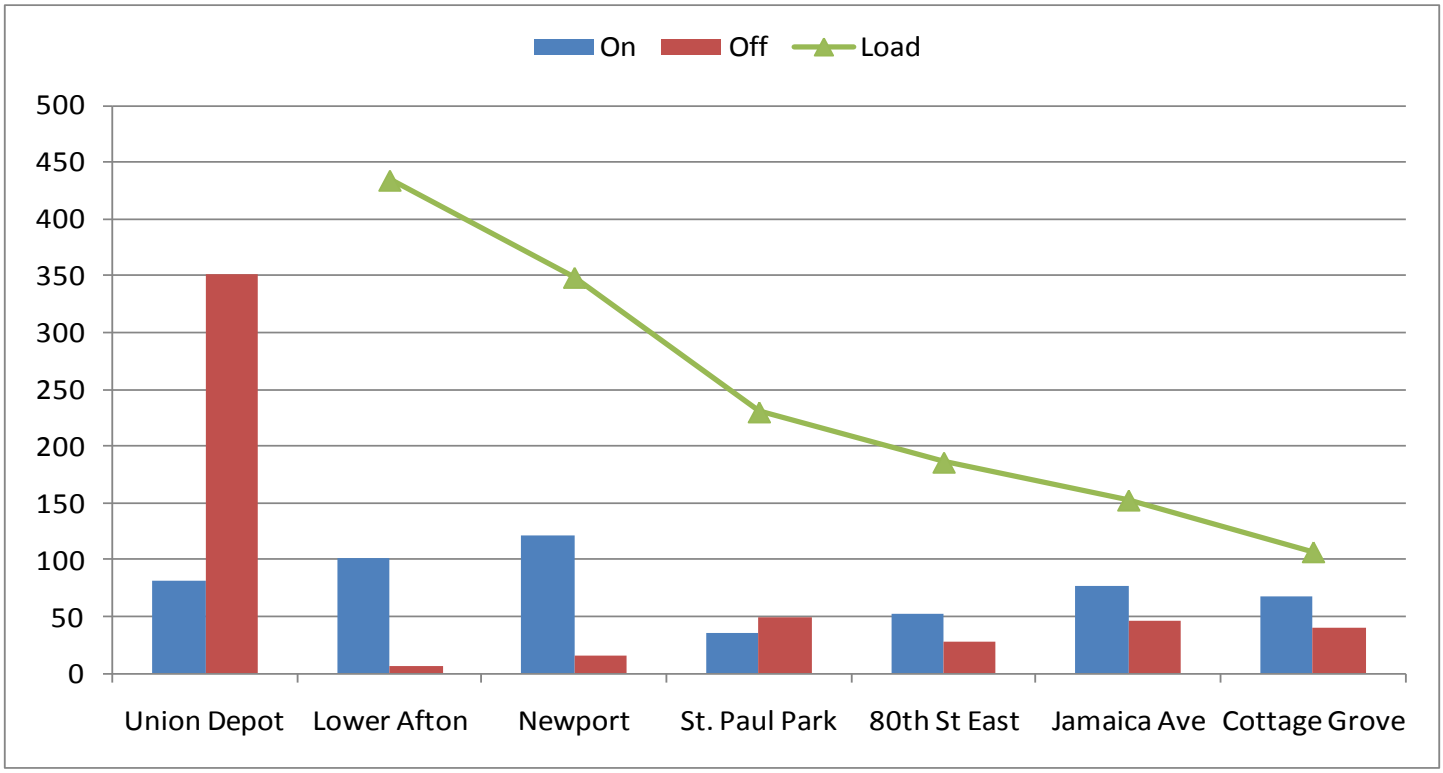


Figure 14: Year 2024 Route 363 Boardings, Alightings, and Loads

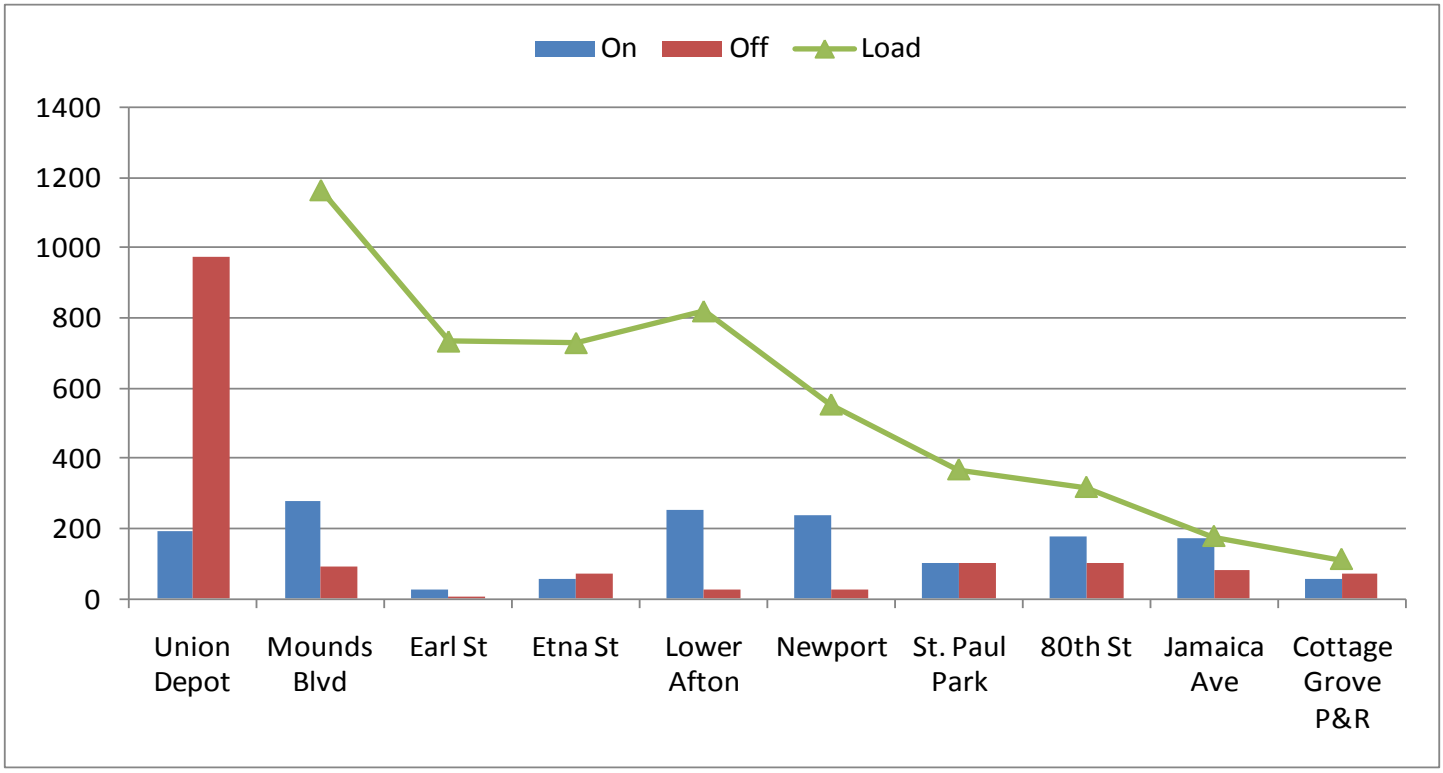


Figure 15: Year 2024 Interim BRT with Gold Line Stations Boardings, Alightings, and Loads

Sensitivity Testing

In order to facilitate a comparison of various interim scenarios, as described in the **Alternative Evaluation Technical Memo**, a series of sensitivity tests were performed using the primary Build alternatives described in this memo. These factors and ridership adjustments can be applied to interim scenarios in order to estimate ridership without performing a full model run.

BRT Factor

Conversion of a local bus service to a BRT service assumes a variety of improvements including new buses, level or near-level boarding, station enhancements and amenities, off-board fare collection, and real time arrival information. BRT service typically also assumes increased frequency, so a ridership increase associated with changing from local to BRT service is related to both factors (BRT amenities that increase the attractiveness of the services as well as an increase in frequency). In order to test the relative significance of the BRT factor—that is, the ridership increase associated with BRT amenities only with no increase in frequency—a model run was completed using the Route 363 service plan modeled as BRT service. In the year 2024, ridership on the route increased by around 10 percent (600 trips compared to 540 trips on Route 363). This factor can therefore reasonably be applied to other scenarios within the corridor to determine what ridership increase could be expected purely from BRT enhancements and no changes to the service plan.

Gateway Stations

A separate analysis was conducted using the Year 2040 Alternative 2A to evaluate the impact of the shared Gateway stations (Mounds Blvd., Earl Street, and Etna St.) on the Alternative 2A ridership. The approach was to examine a selected station assignment for these stations and to produce a model run for Alternative 2A without these stations. This allows us to understand where the trips that use these stations are coming from and going to, as well as showing the ridership impact of not having these stations.

Table 15 shows the station to station flows for Alternative 2A, with the Gateway stations highlighted. Most of the activity occurs at the Mounds Boulevard Station. Note that 200 trips board and alight at the Gateway stations from the Red Rock stations to the south. Most, if not all of these trips would likely be lost from the Red Rock line if the Gateway stations are removed. Additionally, 410 trips board and alight at Union Depot, and these trips would be either lost or would shift to the Gateway Line if the Gateway stations are removed. Some increase in Red Rock trips would also be expected due to the reduction in travel time, but with the Gateway stations adding less than three minutes of overall travel time, this effect can be assumed to be small for the various interim scenarios. A ridership increase of 5 percent was assumed. The test model using Alternative 2A confirmed these assumptions.

Table 16 shows the station to station flows for Alternative 2B, although no comparison model run was completed with the Gateway stations for this alternative.

Based on this analysis and a review of Gateway station boardings and alightings for the various scenarios, the following trips can be assumed to be subtracted from total corridor ridership if the Gateway connection is not included as part of the scenario. Following the removal of these trips, a ridership increase of 5 percent may be assumed to take into account the travel time savings.

- Alternative 2A – Year 2040
  - 600 trips (25 to 30 percent of total ridership)
- Alternative 2B – Year 2040
  - 600 trips (25 to 30 percent of total ridership)
- Interim BRT (to Cottage Grove) – Year 2024
  - 500 trips (30 to 35 percent of total ridership)

Table 15: Year 2040 Alternative 2A Station To Station Flows (Trip Totals Rounded, blank cells are non-zero, less than 5)

	Union Depot	Mounds Blvd	Earl St	Etna St	Lower Afton	Newport	St. Paul Park	80th St	95th St	Hastings	Lions Park	Dakota Co	Total
Union Depot	0	60		0	20	20	60	30	30	5	40		265
Mounds Blvd	320	0	0	0								0	320
Earl St	20	0	0	0		5	5					0	30
Etna St	10	0		0	10	5	20	10	10		5	0	70
Lower Afton	240	10		20	0		5	10				0	285
Newport	250	10		20		0	5	40				0	325
St. Paul Park	70			10			0	20	5		5	0	110
80th St	180	5		20			20	0	30	5	10		270
95th St	50			10			5	40	0		5	0	110
Hastings	60	5		5			5	30	5	0	10	10	130
Lions Park	80	5		10			5	60	10	10	0	10	190
Dakota Co		0	0		0	0	0			10	40	0	50
Total	1,280	95	0	95	30	30	130	240	90	30	115	20	2,155

Table 16: Year 2040 Alternative 2B Station To Station Flows (Trip Totals Rounded, blank cells are non-zero, less than 5)

	Union Depot	Mounds Blvd	Earl St	Etna St	Lower Afton	Newport	St. Paul Park	80th St	Jamaica Ave	Hastings	Lions Park	Dakota Co	Total
Union Depot	0	60		0	20	20	60	30	30	5	40		265
Mounds Blvd	320	0	0	0								0	320
Earl St	20	0	0	0		5	5					0	30
Etna St	20	0		0	10	5	20	10	10		5	0	80
Lower Afton	240	10		20	0		5	10				0	285
Newport	250	10		20		0	5	40				0	325
St. Paul Park	70			10			0	20	5		5	0	110
80th St	180	5		20			20	0	20	5	10	0	260
Jamaica Ave	80			10			10	60	0		5	0	165
Hastings	50	5		5			5	20	5	0	10	10	110
Lions Park	80	5		10			5	50	10	10	0	10	180
Dakota Co		0	0		0	0	0			10	40	0	50
Total	1,310	95	0	95	30	30	135	240	80	30	115	20	2,180

Hastings Stations

As noted previously, the distribution of boardings and alightings within Hastings is not well-defined due to the zonal structure in the model. The overall total number of boardings and alightings within all of Hastings, however, is reasonably estimated by the model.

In order to estimate the impact of adding or removing Hastings stations to any interim BRT option, productions and attractions at each of the Hastings stations were reviewed for all three primary alternatives. The results indicate that the Hastings Depot alone contributes approximately 200 daily trips to Red Rock ridership (+15 to 20 percent), based on a review of productions and attractions from the 2040 Alternative 1 model. By adding two additional Hastings stops, overall Hastings ridership would be expected to increase to 400 trips per day, including some travel within Hastings (+20 to 25 percent).

Based on this review, it was determined that by extending service from Cottage Grove to the Hastings Depot, a 20 percent increase in corridor-wide ridership could be expected.

Conclusion

Key ridership information from all full model runs is summarized below in **Table 17**. These values were used within the **Alternative Evaluation Technical Memorandum** to compare alternatives and evaluate potential phasing options for the corridor.

Table 17: Ridership Results Summary

YEAR	ALTERNATIVE	DESCRIPTION	RT 361/364 /365	RT 367	RT 363	BRT	TOTAL
2024	No Build	Existing Routes Only	1,350	-	-	-	1,350
	RT 367	Peak Hour Commuter Express Service from Hastings to Minneapolis via Newport	1,310	100	-	-	1,410
	RT 367/363	Route 367 plus All-Day 30-Minute Local Service between Cottage Grove and Saint Paul	1,270	110	540	-	1,920
	Alternative 2B (Interim)	BRT Along Highway 61 to Cottage Grove Park & Ride	1,270	-	-	1,550	2,820
2040	No Build	Existing Routes Only	1,650	-	-	-	1,660
	Alternative 1	BRT Along Highway 61 to Hastings with a Highway Orientation	1,500	-	-	1,250	2,750
	Alternative 2A	BRT Along Highway 61 to Hastings with a Community Orientation (via 95th Street)	1,600	-	-	2,150	3,750
	Alternative 2B	BRT Along Highway 61 to Hastings with a Community Orientation (via Jamaica Avenue)	1,600	-	-	2,200	3,800

In addition to the results from these full model runs, a series of sensitivity tests were performed to allow for use of off-model adjustments to estimate ridership from a variety of scenarios. These ridership estimates and correction factors are summarized below:

- BRT Factor
  - Ridership should be increased by 10% compared to traditional bus service with no changes to the service plan
- Removal of Gateway Stations
  - Year 2024: Subtract 500 trips compared to Interim BRT service to Cottage Grove as a consequence of the station removal, and add 5% of the remaining ridership to account for a faster travel time due to the removal of station stops
  - Year 2040: Subtract 600 trips compared to Full Build BRT (Alternative 2B) service to Hastings as a consequence of the station removal, and add 5% of the remaining ridership to account for faster travel time due to the removal of station stops
- Extension to Hastings Depot
  - Ridership should be increased by 20% compared to service terminating in Cottage Grove

Appendix A

Year 2010 and 2040 "Build" Boardings and Alightings

Tables A-1 through A-3 show a comparison of the Red Rock ridership by station for 2010 and 2040 conditions. Socioeconomic growth during this period account for about 35 to 40 percent of the 2040 ridership, depending upon the alternative, with Alternative 1 at the low end of this range and Alternative 2B at the high end.

Table A-1: Alternative 1 2010 vs. 2040 Growth by Station (rounded to the nearest 10)

	Year 2010			Year 2040			YR2040 - YR2010		
Station	On	Load	Off	On	Load	Off	On	Load	Off
Union Depot	110		650	180		990	70		340
Lower Afton	250	750	20	290	1,170	20	40	420	0
Newport	170	510	30	360	880	30	190	370	0
70th Street	90	350	70	100	540	120	10	190	50
Langdon Village	130	250	50	180	380	60	50	130	10
Hastings	90	120	20	160	200	40	70	80	20
Total	830	750	830	1,270	1,170	1,270	440	420	440

Table A-2: Alternative 2A 2010 vs. 2040 Growth by Station (rounded to the nearest 10)

	Year 2010			Year 2040			YR2040 - YR2010		
Station	On	Load	Off	On	Load	Off	On	Load	Off
Union Depot	130		890	260		1,270	130		380
Mounds Blvd	160	1,020	50	320	1,530	110	160	510	60
Earl St	70	780	10	30	1,000	10	-40*	220	0
Etna St	60	740	10	70	1,000	90	10	260	80
Lower Afton	240	690	20	280	1,110	30	40	420	10
Newport	130	460	20	340	810	30	210	350	10
St. Paul Park	80	340	70	120	560	130	40	220	60
80th St	190	320	100	280	520	240	90	200	140
95th St	70	240	80	110	390	90	40	150	10
Hastings	70	150	20	120	270	40	50	120	20
Lions Park	110	120	70	180	190	120	70	70	50
Dakota Co	30	50	10	40	80	0	10	30	-10
Total	1,350	1,020	1,350	2,140	1,530	2,140	790	510	790

*A decrease in boardings is due to the Gateway BRT being present in 2040, but not in 2010

Table A-3: Alternative 2B 2010 vs. 2040 Growth by Station (rounded to the nearest 10)

	Year 2010			Year 2040			YR2040 - YR2010		
Station	On	Load	Off	On	Load	Off	On	Load	Off
Union Depot	120		890	260	0	1,290	140		400
Mounds Blvd	160	1,000	50	320	1,550	110	160	550	60
Earl St	70	780	10	30	1,020	10	-40*	240	0
Etna St	60	740	10	70	1,020	90	10	280	80
Lower Afton	240	690	20	280	1,130	30	40	440	10
Newport	130	460	20	330	830	30	200	370	10
St. Paul Park	80	340	70	120	590	130	40	250	60
80th St	190	320	110	270	540	250	80	220	140
Jamaica Ave	140	250	70	170	440	90	30	190	20
Hastings	70	90	20	120	260	40	50	170	20
Lions Park	30	50	40	180	180	120	150	130	80
Dakota Co	20	20	0	40	80	0	20	60	0
Total	1,300	1,000	1,300	2,180	1,550	2,180	880	550	880

*A decrease in boardings is due to the Gateway BRT being present in 2040, but not in 2010