CHAPTER 4 TRANSPORTATION IMPACTS

This chapter compares the impacts of the No-Action Alternative, Package A, Package B, and the Preferred Alternative on each mode of the transportation system. Impacts are presented by package.

What's in Chapter 4?

Chapter 4 Transportation Impacts

4.1 Compatibility with Transportation Plans and Policies

Several planning agencies have published plans and policies outlining their future transportation investment goals. This section describes the compatibility of the No-Action Alternative and the North I-25 build packages (Package A, Package B, and the Preferred Alternative) with existing local and regional transportation plans and policies.

4.1.1 No-Action Alternative

The No-Action Alternative generally would not be compatible with regional transportation plans and policies because it does not accommodate planned upgrades along I-25. It also would not provide regional multi-modal connections to the Denver Metro Area or to communities in northern Colorado.

4.1.2 Package Compatibility

Package A, Package B, and the Preferred Alternative would be compatible with most local and regional transportation plans. These plans describe various roadway and transit improvements. In most cases, the build packages would not preclude these improvements.

Package A, Package B, and the Preferred Alternative are specifically compatible with the following plans for the reasons stated:

- The Denver Regional Council of Governments' *2035 RTP* (DRCOG, 2007) because the design in each package accommodates lane expansion and interchange improvements up to SH 7.
- The *North Front Range 2035 Regional Transportation Plan* (NFRMPO and others, 2007) because each package includes expansion of I-25 and the I-25 interchange designs accommodate expansion of Prospect Road, Harmony Road, and US 34. The NFRMPO's 2035 fiscally constrained plan identifies some funding for I-25 improvements and commuter rail right-of-way preservation.
- The *Upper Front Range 2035 Regional Transportation Plan* (FHU, 2008a) because the US 85 corridor vision calls for increased carpooling, vanpooling, and construction of park and ride facilities.

- The *Larimer County Transportation Plan* (FHU and others, 2006) because the I-25 interchange design in each package accommodates expansion of SH 392 and SH 402. Package A and the Preferred Alternative include right of way acquisition along the BNSF rail line. All build packages include transit service between Larimer County communities and from Larimer County communities to the Denver Metro Area.
- The City of Loveland *2030 Transportation Plan* (LSA Associates, 2007) because the I-25 interchange design in each package would accommodate expansion of Crossroads Boulevard, SH 402, and improvements to the US 34/I-25 interchange complex.
- The City of Fort Collins *2004 Transportation Master Plan* (PBS&J and others, 2004) because the I-25 interchange design in each package would accommodate expansion of Harmony Road and improvements to SH 14.
- The FasTracks Plan because Package A and the Preferred Alternative would extend planned FasTracks rail service to the northern communities. The RTD transit expansion project includes two commuter rail lines extending north toward the project area, terminating in Thornton and in Longmont. In addition, none of the packages would preclude other planned FasTracks improvements.

All three packages are generally compatible with the following plans because they would not preclude the investment types being considered:

- *Weld County Roadway Classification Plan* (FHU, 2002b)
- *Greeley Comprehensive Transportation Plan* (LSA, 2010)

Not all of the improvements included in Package A, Package B, and the Preferred Alternative are included in the fiscally constrained plan for DRCOG. CDOT has submitted amendments requesting DRCOG to include Phase 1 Preferred Alternative improvements in the fiscally constrained plan. The amendments are expected to be adopted in September 2011. Adoption of these amendments must occur prior to inclusion of these improvements in a Record of Decision (ROD).

4.1.2.1 PACKAGE A

General Purpose Lanes

The additional general purpose lanes (GPLs) and upgraded interchanges on I-25 included in Package A would be compatible with the *North Front Range 2035 Regional Transportation Plan,* which includes widening I-25 to six lanes and improving deficient interchanges on I-25. The planned improvements would further be compatible with the mission of the *Upper Front Range 2035 Regional Transportation Plan* to meet the needs of all travelers in the Upper Front Range. The improvements also would be compatible with the *2035 Statewide Transportation Plan's* goal to increase mobility, reduce congestion, and accommodate growth in freight transportation.

Commuter Rail

The Package A commuter rail component generally would be compatible with NFRMPO and UFRRPC goals to provide a multi-modal transportation system that includes passenger rail. Though generally compatible with the Fort Collins *2004 Master Transportation Plan*, Package A commuter rail would use some of the same right-of-way as the proposed Mason Transportation corridor bus rapid transit (BRT).

Package A commuter rail would connect to and be compatible with the rail lines planned by RTD in the DRCOG area. These two lines are the Northwest Rail Corridor and North Metro Corridor. The commuter rail would operate as an extension of the North Metro train service with every other train traveling north to Fort Collins.

Commuter Bus

The Package A commuter bus would be compatible with the mission of the City of Greeley's *Comprehensive Transportation Plan and the Upper Front Range Regional Transportation Plan* to implement a convenient multi-modal transportation system and to provide service to and from Denver.

4.1.2.2 Package B

Tolled Express Lanes

The addition of capacity and improved interchanges along I-25 under Package B would be compatible with DRCOG's *2035 MVRTP, North Front Range 2035 Regional Transportation Plan* and Upper Front Range *2035 Regional Transportation Plan*. The tolled express lanes (TELs) also would be compatible with the *Statewide 2035 Transportation Plan* goals to increase mobility, reduce congestion, and accommodate future travel modes. All of these plans' goals are to increase mobility, reduce congestion, and accommodate future travel modes. However, DRCOG's *2035 MVRTP* is the only plan that specifically includes a "managed" lane type such as the TELs in Package B.

Bus Rapid Transit

BRT in Package B generally would be compatible with NFRMPO and UFRRPC goals to provide a multi-modal system with regional transit service along I-25.

4.1.2.3 Preferred Alternative

General Purpose Lanes

The additional general purpose lanes (GPLs) and upgraded interchanges on I-25 included in the Preferred Alternative would be compatible with the *North Front Range 2035 Regional Transportation Plan,* which includes widening I-25 to six lanes and improving deficient interchanges on I-25. The planned improvements would further be compatible with the mission of the *Upper Front Range 2035 Regional Transportation Plan* to meet the needs of all travelers in the Upper Front Range. The improvements also would be compatible with the *2035 Statewide Transportation Plan's* goal to increase mobility, reduce congestion, and accommodate growth in freight transportation.

Tolled Express Lanes

The addition of capacity and improved interchanges along I-25 under the Preferred Alternative would be compatible with DRCOG's *2035 MVRTP, North Front Range 2035 Regional Transportation Plan* and Upper Front Range *2035 Regional Transportation Plan*. The tolled express lanes (TELs) also would be compatible with the *Statewide 2035 Transportation Plan* goals to increase mobility, reduce congestion, and accommodate future travel modes. All of these plans' goals are to increase mobility, reduce congestion, and accommodate future travel modes. DRCOG's *2035 MVRTP* is the only plan that specifically cites the need for a "managed" lane type such as the TELs in the Preferred Alternative.

Commuter Rail

The Preferred Alternative commuter rail would be compatible with NFRMPO and UFRRPC goals to provide a multi-modal transportation system that includes passenger rail and the Fort Collins *2004 Master Transportation Plan.* The Preferred Alternative rail line would be compatible and complementary to the Mason Transportation Corridor BRT.

The Preferred Alternative commuter rail would connect to and be compatible with the rail lines planned by RTD in the DRCOG area. These two lines are the Northwest Rail Corridor and North Metro Corridor.

Commuter Bus

The Preferred Alternative commuter bus would be compatible with the mission of the City of Greeley's *Comprehensive Transportation Plan and the Upper Front Range Regional Transportation Plan* to implement a convenient multi-modal transportation system and to provide service to and from Denver.

4.2 TRAVEL DEMAND

This section describes the regional travel demand forecasting model and measures used to compare the three build packages to the No-Action Alternative. Travel demand includes measures such as highway volumes, transit ridership, miles of travel, and hours of travel.

4.2.1 Overview of Travel Forecasting

Travel demand forecasts were prepared using a multi-modal regional TransCAD travel demand model. Travel models are standard planning tools that produce estimates of future roadway traffic volumes and transit ridership based on the existing and proposed transportation network and future population and employment projections.

Due to the large regional study area, the NFRMPO and DRCOG regional models were merged into a combined multi-modal model for the North I-25 Draft EIS forecasting effort. A Travel Forecasting Working Group met periodically to review the technical process of combining the two models. The technical group included modeling staff from NFRMPO, DRCOG, RTD, CDOT, the City of Fort Collins, and the consultant team. Complete documentation of the development, validation, and application of the North I-25 EIS Combined Travel Model is available in the technical reports *Development and Validation of the North I-25 EIS Combined Travel Model* and *North I-25 EIS Travel Demand Model Application and Results,* included in Appendix G of the *Alternatives Development and Screening Report (*FHU and Jacobs, 2011a*).*

Travel forecasts are for the year 2035. The combined travel model is based on the *North Front Range 2035 Regional Transportation Plan* (adopted by NFRMPO in December 2007) and the DRCOG *2035 Regional Transportation Plan* (adopted by DRCOG in December 2007). These plans include forecasts of 2035 population and employment, a major input to the travel model. Projects included in the 2035 travel demand forecasting model include planned local roadway capacity improvements that are considered very likely to occur. Information on the specific projects included in the background travel demand forecasting network is included in the *North I-25 Draft EIS Travel Demand Model Application and Results* (Appendix G, FHU and Jacobs, 2010).

2035 was used as the year of analysis as it provides a common point for fair comparison for all alternatives. 2035 is the most up-to-date socio-economic projection data from the NFRMPO and DRCOG. Each build alternative is designed to meet the 2035 travel demand; the analysis assumes the alternative would be fully constructed in 2035 and impacts are based on implementation by 2035. This process of developing alternatives identifies the capital requirements for transportation improvements. It is acknowledged that current funding projections will not fully address the identified capital needs. However, if funding becomes available, it is CDOT's intent to complete construction of the improvements by 2035.

The North I-25 EIS combined travel model is limited in its capability for forecasting toll volumes. For this reason, the traffic forecasts for the express lanes of Package B and the Preferred Alternative were prepared by Wilbur Smith Associates, a firm that has expertise in toll and revenue forecasting. The estimates were developed, based on 2035 travel demand, from the *North I-25 EIS Combined Travel Model*, included in Appendix G (FHU and Jacobs, 2011a).

4.2.2 Hours and Miles of Travel

Vehicle miles of travel (VMT) is a common measurement of the amount of vehicle travel in a specified area. VMT, along with vehicle hours of travel (VHT), result in the calculation of average vehicular speed. **Table 4-1** provides a comparison of these measures under existing conditions, the No-Action Alternative and each build alternative. The results are shown for two categories in the study area, the first are freeways – fully grade-separated, access controlled facilities including I-25 and portions of I-76, US 36, E-470, and NW Parkway, and the second are other facilities – these are all other types of roadways included in the travel model such as US 85, Harmony Road, and SH 119. In the entire regional study area, the total VMT for any of the packages slightly exceeds 52 million per day in 2035. The amount of total VMT would be somewhat higher for the build alternatives compared to the No-Action Alternative, indicating an increased overall mobility in the regional study area due to the capacity improvements on I-25. VHT would decrease in each build package, as a result of slightly higher average freeway speeds.

In other words, under each build alternative, travelers would be able to make longer trips at a faster average speed than compared to the No-Action Alternative. The Preferred Alternative would provide the highest increase in VMT while still reducing VHT.

4.2.3 Highway Volumes

Figure 4-1 provides a relative comparison of total daily traffic volumes in the I-25 corridor under existing conditions, the No-Action Alternative, and the build alternatives. As shown, projected traffic volumes for the No-Action Alternative and each build alternative generally follow the same patterns as existing traffic volumes. For instance, existing traffic volumes on I-25 are lowest at the north end and steadily increase south to about SH 402. South of SH 402, daily traffic volumes remain relatively the same to SH 119 and then begin to steadily increase south of SH 119, with the highest volumes recorded at the southern end of the corridor, which is just north of US 36 in the Denver Metro Area. The Preferred Alternative would have higher daily traffic volumes than Package A and Package B along I-25 between SH 14 and SH 60, similar daily traffic volumes between SH 60 and SH 7, and higher volumes than Package A south of SH 7.

Table 4-1 Daily VMT, VHT, and Average Speed

Vehicle Miles of Travel (VMT)					
	2001 Existing	**2035 No-Action**	**2035 Package A**	**2035 Package B**	**2035 Preferred Alternative**
Freeway	9,709,000	16,666,000	17,663,000	17,162,000	17,739,000
Other Facilities	17,462,000	35,744,000	35,095,000	35,454,000	35,066,000
Total	**27,171,000**	**52,410,000**	**52,758,000**	**52,616,000**	**52,805,000**
Vehicle Hours of Travel (VHT)					
	2001 Existing	**2035 No-Action**	**2035 Package A**	**2035 Package B**	**2035 Preferred Alternative**
Freeway	168,000	363,000	364,000	360,000	361,000
Other Facilities	584,000	1.354.000	1,331,000	1,333,000	1,320,000
Total	**752,000**	**1,717,000**	**1,695,000**	**1,693,000**	**1,681,000**
Average Speed (MPH)					
	2001 Existing	**2035 No-Action**	**2035 Package A**	**2035 Package B**	**2035 Preferred Alternative**
Freeway	58	46	49	48	49
Other Facilities	30	26	26	27	27
Total	**36**	**31**	**31**	**31**	**31**

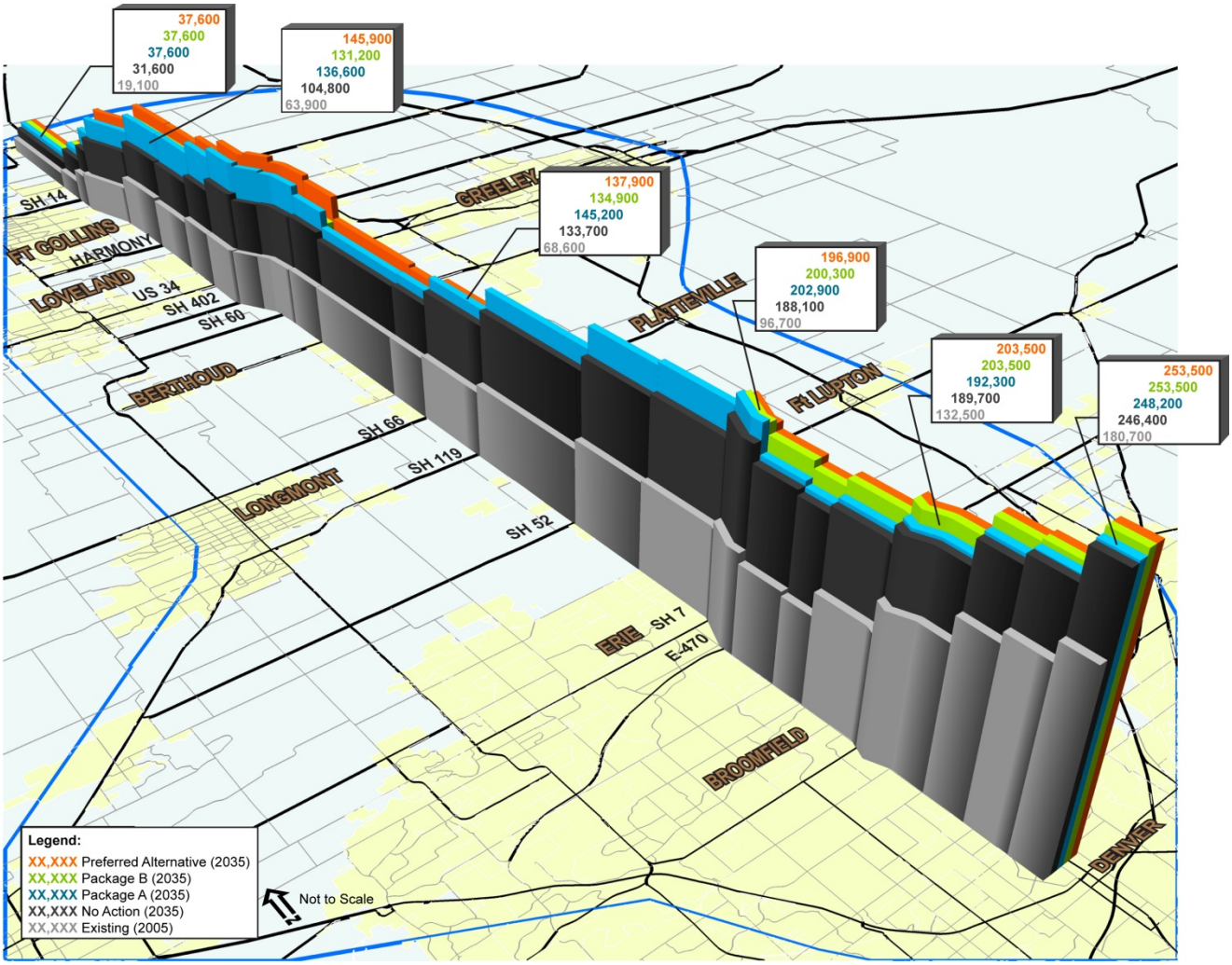
Note: Area of analysis is the regional study area.

Table 4-2 provides detailed daily traffic volumes for existing conditions, the No-Action Alternative, Package A, Package B, and the Preferred Alternative. Existing traffic volumes range from a combined north-south volume of 19,100 vehicles-per-day just south of SH 1 to over 180,000 vehicles-per-day south of 84th Avenue. Projected 2035 traffic volumes are much higher than existing conditions between SH 1 and SH 7.

As shown in **Table 4-2**, under both the No-Action Alternative and Package A, projected 2035 daily traffic volumes would range from about 35,000 vehicles-per-day south of SH 1 to about 250,000 vehicles-per-day south of 84th Avenue. Between Harmony Road and SH 7, Package A would have daily traffic projections from 10,000 to 40,000 vehicles-per-day higher than No-Action Alternative daily traffic projections.

Package B daily volume projections (2035) in the GPLs generally would be less than No-Action Alternative daily volumes. However, Package B would carry additional traffic volumes in the TELs, which would create higher overall volume in the corridor than under No-Action Alternative conditions. TELs would have projected daily traffic volumes ranging from a low of 8,000 vehicles-per-day near the Prospect Road interchange to a high of nearly 48,000 vehicles-per-day in the southern section of the corridor. Traffic assignments for the TELs were performed with toll rates ranging from $0.05 to $0.50 per mile. Optimal tolls would manage the demand in the TELs while maximizing revenue.

Figure 4-1 Mainline I-25 Daily Traffic Volume Comparison



Note: All volumes are shown in Table 4-2.

Preferred Alternative daily volume projections (2035) in the GPLs generally would be somewhat higher than the No-Action Alternative daily volumes. Like Package B, the Preferred Alternative would carry additional traffic volumes in the TELs. The Preferred Alternative would carry higher overall volume in the corridor than under No-Action Alternative conditions. TELs would have projected daily traffic volumes ranging from a low of 13,000 vehicles-per-day near the Prospect Road interchange to a high of nearly 45,000 vehicles-per-day in the southern section of the corridor. Traffic assignments for the TELs were performed with toll rates ranging from $0.05 to $0.50 per mile. Optimal tolls would manage the demand in the TELs while maximizing revenue.

Capacity improvements, whether they are additional GPLs or TELs, typically would attract more travel to the improved highway corridor. The increased travel demand would occur on parallel arterial roads such as US 287 and US 85 under the No-Action Alternative.

Transit ridership projections indicate that transit would attract less than 7,000 riders per day. Because this volume is an order of magnitude smaller than vehicle volumes anticipated on I-25 and because these transit trips would have been made on I-25 as well as other parallel facilities, the presence of transit would not noticeably affect highway volumes in either Package A, Package B, or the Preferred Alternative.

Table 4-2 Mainline I-25 Daily Traffic Volume Comparison

	Daily Traffic Volumes South of Interchange								
	Existing	2035 No-Action	2035 Package A	2035 Package B			2035 Preferred Alternative		
				General Purpose	TEL	Total	General Purpose	TEL	Total
SH 1	19,100	31,600	37,600	37,600	0	37,600	37,600	0	37,600
Mountain Vista	24,700	51,000	57,700	57,700	0	57,700	57,700	0	57,700
SH 14	40,800	72,300	93,000	83,600	8,400	92,000	84,700	12,900	97,600
Prospect	46,300	90,700	114,500	86,700	22,000	108,700	102,500	19,500	122,000
Harmony	61,200	104,800	136,600	108,300	22,900	131,200	126,000	19,800	145,900
SH 392	57,700	103,700	137,400	105,100	26,900	132,000	122,100	23,400	145,500
Crossroads Blvd.	63,900	113,300	150,500	108,200	26,700	134,900	128,500	25,000	153,500
US 34	64,400	127,400	160,600	124,400	24,700	149,100	140,900	24,800	165,700
SH 402	62,500	120,900	156,800	113,700	31,600	145,400	136,600	31,400	168,000
CR 16	63,800	122,000	154,500	112,200	26,200	138,400	132,900	29,600	162,500
SH 60	65,100	124,300	144,900	108,200	22,400	130,600	133,700	23,600	157,300
SH 56	65,000	116,800	128,000	100,300	20,600	120,900	114,400	19,100	133,500
CR 34	65,100	118,700	128,800	105,100	16,900	122,000	114,300	16,000	130,300
SH 66	68,600	133,700	145,200	117,700	17,100	134,900	123,300	14,600	137,900
SH 119	77,000	149,200	167,300	132,300	24,200	156,500	130,000	21,600	151,700
SH 52	86,800	163,000	188,600	137,600	32,900	170,500	137,000	30,400	167,400
CR 8	89,000	166,100	191,800	143,900	30,500	174,400	143,000	28,000	171,000
SH 7	96,700	188,100	202,900	176,300	24,100	200,300	175,400	21,500	196,900
E-470	87,200	172,000	176,300	157,500	32,500	190,000	160,000	30,000	190,000
144th Avenue	87,200	167,500	171,400	144,500	39,200	183,700	147,000	36,700	183,700
136th Avenue	104,600	174,600	178,100	156,300	34,100	190,500	158,900	31,600	190,500
120th Avenue	132,500	189,700	192,300	165,300	38,300	203,500	167,800	35,700	203,500
104th Avenue	154,800	211,000	213,600	174,400	47,500	221,900	177,000	45,000	221,900
Thornton Pkwy.	164,100	219,700	220,600	200,700	23,600	224,300	200,700	23,600	224,300
84th Avenue	180,700	246,400	248,200	247,900	5,600	253,500	247,900	5,600	253,500

4.2.4 Effects on Arterials

In general, the increased traffic on I-25 with the build alternatives would reduce traffic on the roadways parallel to I-25. A screenline analysis was conducted to assess the magnitude of this effect. Traffic on all roads crossing each screenline was tabulated and compared for each package. **Figure 4-2** presents the results in terms of daily volumes in 2035. In the northern area, Package A generally would reduce arterial volumes compared to the No-Action Alternative; the total screenline reduction on arterials would range from 10,000 to 35,000 vehicles per day. Package B would have less effect on removing vehicles from parallel arterials, with reductions ranging from 5,000 to 15,000 vehicles per day. This difference is due to Package A attracting more traffic to I-25 than Package B. The Preferred Alternative also reduces arterial volumes compared to the No-Action Alternative; the total screenline reduction on arterials would range from 5,000 to 25,000 vehicles per day. On the southernmost screenline in the Denver Metro Area, Package B and the Preferred Alternative would reduce arterial volumes due to the capacity addition of the TELs, while Package A would result in no net change on arterial traffic.

Overall, the magnitude of the effect on arterials would be relatively small, as the changes are spread among many individual roads. The effect on peak-hour arterial conditions would not be notable.

4.2.5 Highway Users

Daily highway users (people) were determined for existing conditions, the No-Action Alternative, Package A, Package B, and the Preferred Alternative. Users were calculated by adding the daily vehicle volume on I-25 to the entering on-ramp volumes at each interchange and multiplying by the average vehicle occupancy. **Figure 4-3** gives a comparison of daily users.

Of the three build packages, Package B would serve the fewest users and the Preferred Alternative would serve the highest number of system users. The number of users expected on the Preferred Alternative is over 990,000 daily and would more than double the number of users served today.

Figure 4-2 Daily Highway Users (People) on I-25

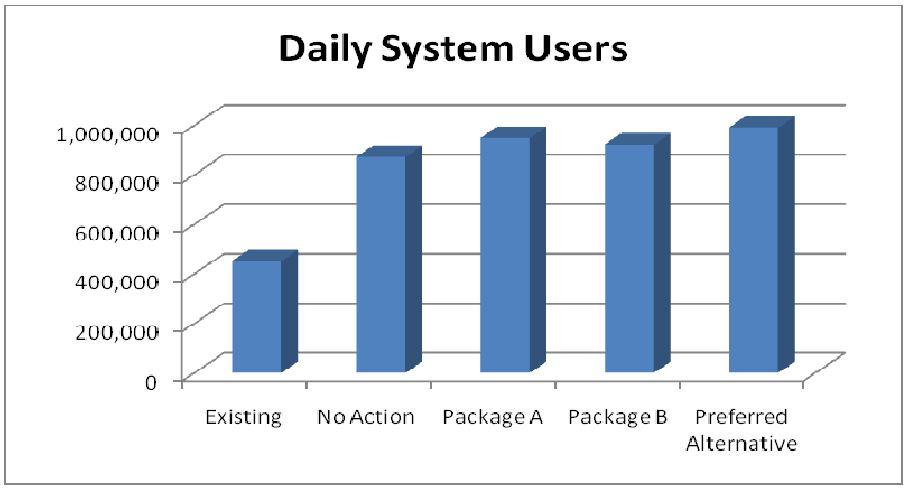
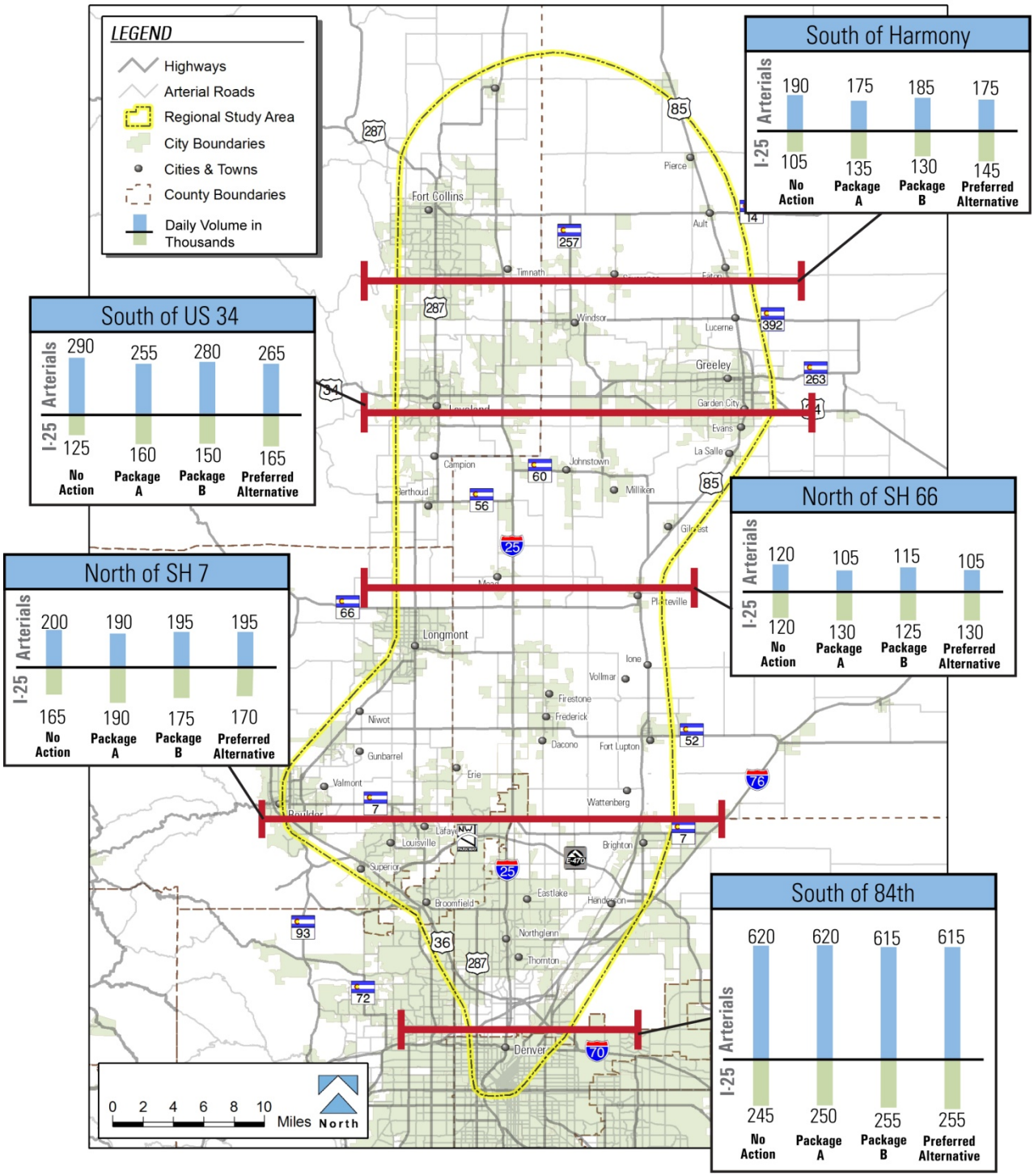


Figure 4-3 Parallel Arterial Effects (2035 Daily Volumes)



4.2.6 Transit Ridership

Table 4-3 displays the transit ridership forecasts for each of the package components. Since the No-Action Alternative does not include any regional transit, this alternative is not included in the table. The daily ridership (the total number of daily route boardings) results are for trips in both directions on an average weekday in 2035.

Package A commuter rail would attract 4,200 average weekday trips in 2035. Commuter bus to/from downtown Denver would attract 1,200 trips per day. Commuter bus service to/from DIA would attract another 450 daily trips.

Package B BRT service to/from downtown Denver would attract over 6,450 trips per day in 2035. The BRT service to/from DIA would attract another 350 daily trips.

Preferred Alternative commuter rail would attract 2,700 average weekday trips in 2035. Express Bus service on I-25 would attract 3,100 riders per day. Commuter bus on US 85 to/from downtown Denver would attract 400 trips per day. Express bus service to/from DIA would attract 300 trips per day in 2035. Feeder buses would serve passengers who transfer to commuter rail in Package A and BRT in Package B, as well as passengers who travel community-to-community without boarding the commuter rail or BRT. Package A would generate more feeder bus ridership than Package B because Package B BRT would serve Fort Collins and Greeley directly; therefore, less feeder bus service would be required.

The feeder bus service provided in the Preferred Alternative to support Commuter Rail and Express Bus would attract 1,650 riders per day. This is similar to the feeder bus ridership of Package B because the amount of feeder bus service is less compared to Package A due to the provision of Express Bus serving Fort Collins and Greeley.

4.2.6.1 Effect of Updated Forecasting Data on Transit Ridership

The ridership forecasts are estimated using a multimodal travel demand model that was combined from the NFRMPO and DRCOG regional travel demand models to cover the entire study area of the North I-25 EIS. As with any simulation model, there are uncertainties associated with its forecasts and any forecast is considered a “snapshot in time” of the best information available. The output largely depends upon the major input assumptions of future population and employment and travel behavior parameters. During the final stages of development of the FEIS, DRCOG and RTD incorporated new information into their 2035 regional travel model regarding both socio-economic conditions and travel behavior parameters (the NFRMPO did not update its 2035 model during this timeframe). These updates affected the ridership projections for many of the planned RTD FasTracks corridors. The new projections were for the most part notably higher than RTD’s previous corridor ridership forecasts and transit trips as a whole were higher.

These model updates would similarly alter to some extent the ridership projections produced by the North I-25 EIS combined model. Because the FEIS was near completion, it was not possible to implement the changes into the combined model. However, to gauge the magnitude of the effect these specific changes would have on the transit ridership forecasts for Package A, Package B, and the Preferred Alternative, an expert panel was convened. The panel consisted of travel model experts and socio-economic development experts from CDOT, the FHWA, the FTA, RTD, DRCOG, NFRMPO, and the consultant team. After consideration of the specific changes for socio-economics and model parameters by mode and geographic

location, and with the acknowledgment of the uncertainties inherent in such an exercise, the expert panel developed a range for potential updated 2035 ridership projections. The panel determined that upon implementation of these changes to the forecasting process the Preferred Alternative commuter rail in 2035 might attract between 3,500 and 4,300 daily riders instead of 2,700; the express bus 2035 daily ridership might be between 3,600 and 4,400 instead of 3,400 riders per day. Total 2035 regional transit ridership forecasts for the Preferred Alternative would be in the range of 7,550 to 9,200 riders per day, compared to 6,500 with previous forecasts. Similar effects would be realized for transit ridership in Package A and Package B. Package A commuter rail daily ridership might range between 5,400 and 6,600; commuter bus daily ridership might range between 1,300 and 1,500 in 2030; BRT ridership in Package B might range between 7,100 and 8,700 riders per day.

Further information on the nature of these changes is in the technical report *North I-25 EIS Travel Demand Model,* which is included in *Appendix G* of the *Alternatives Development and Screening Report* (FHU and Jacobs, 2011a).

Table 4-3 2035 Weekday Transit Ridership

Package A	**Daily Riders**
Commuter Rail: Fort Collins to/from Thornton*	4,200
Commuter Bus to/from Downtown Denver	1,200
Commuter Bus to/from DIA	450
Feeder Bus (sum for all routes)	4,200
Total Regional Riders**	**5,850**
Package B	**Daily Riders**
BRT: Fort Collins/Greeley to/from Downtown Denver	6,450
BRT: Fort Collins to/from DIA	350
Feeder Bus (sum for all routes)	1,700
Total Regional Riders**	**6,800**
Preferred Alternative	**Daily Riders**
Commuter Rail: Fort Collins to/from Thornton*	2,700
Commuter Bus to/from Downtown Denver	400
Bus: North Front Range to/from Downtown Denver	3,100
Bus: Erie to/from DIA	300
Feeder Bus (sum for all routes)	1,650
Total Regional Riders**	**6,500**

* Ridership totals the amount of passenger activity on the extended service to the north of RTD FasTracks system (does not include ridership on the FasTracks portion of the route).

** Total Regional Riders does not include feeder bus riders.

4.2.6.2 PACKAGE A

Figure 4-4 displays the ridership results for station-to-station volumes, station activity, mode of access for the main Package A components, and feeder bus ridership by route. Some key findings are described below:

- Daily rail ridership would increase from north to south, as activity grows towards the metropolitan area and the Denver Central Business District (CBD), regardless of the component.
- The South Transit Center in Fort Collins would generate the most ridership activity, followed by the Erie rail station in southwest Weld County and the 4th Street station in downtown Loveland.
- For the commuter bus route, the stops along US 85 generally would attract equal amounts of riders. The exception would be the south Greeley park-and-ride, which would attract more riders than the other stops.
- Overall, the mode split of passengers accessing a rail station in Package A would be about 45 percent driving, 30 percent walking, and 25 percent taking the bus. This would vary by station depending on the amount of bus service, the surrounding land use development pattern, and whether a park-and-ride is provided.

Table 4-4 displays ridership activity for the Package A commuter rail stations.

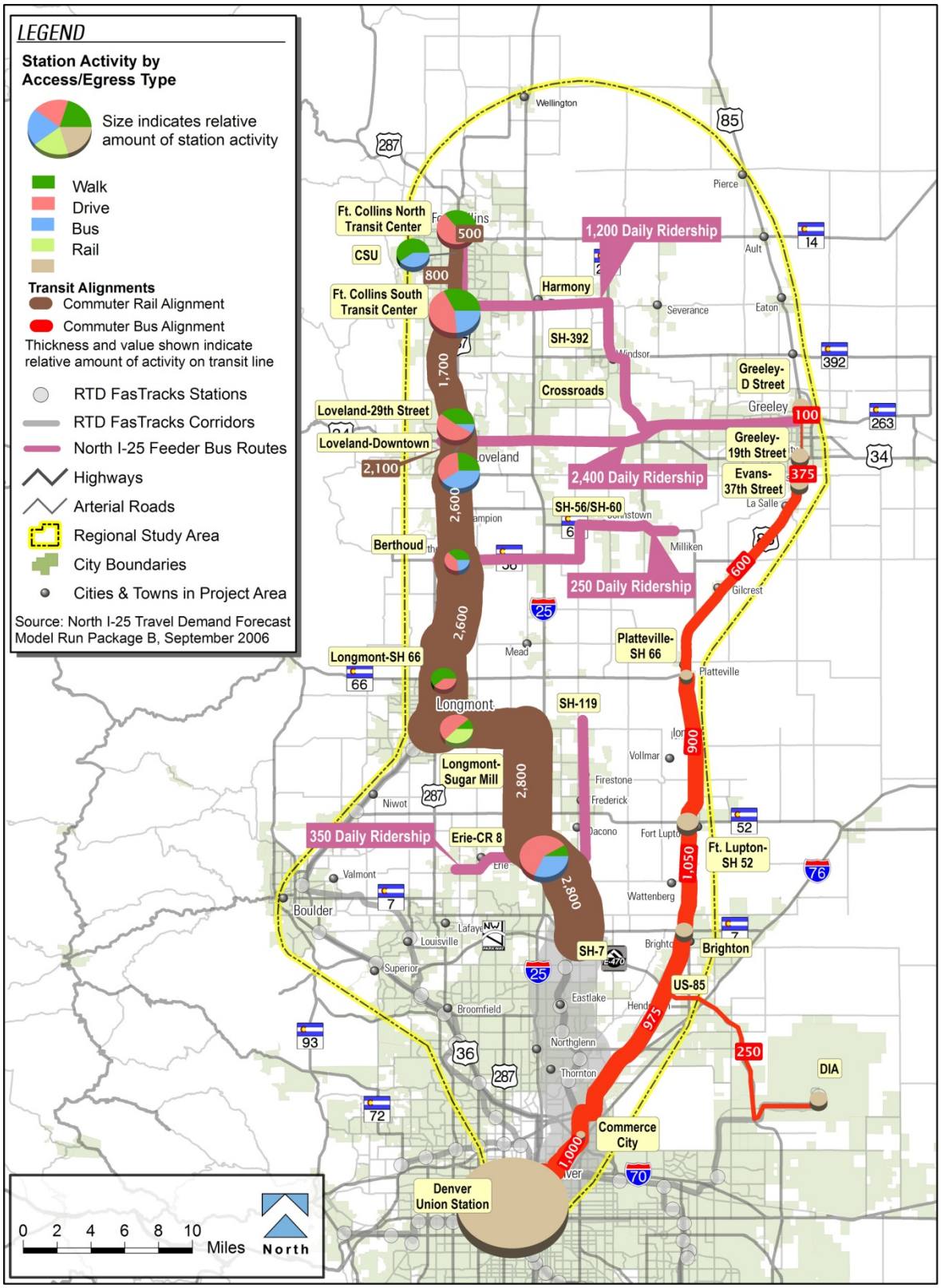
The forecasted Package A 2035 daily commuter rail ridership of 4,200 riders is comparable to current ridership at several newer commuter rail systems across the U.S., including Sounder (Seattle), Altamont Commuter Express (San Jose), and Coaster (San Diego) . However, these other rail systems typically operate at lower service frequencies and, thus, have lower operating costs than would be associated with the commuter rail system proposed for Package A. Also, Package A ridership is low when compared to more established systems such as Tri-Rail (Florida) and Trinity Railway Express (Dallas-Fort Worth).

Table 4-4 Package A Commuter Rail Station Activity (2035)

Station	Boardings and Alightings in 2035
Fort Collins – North Transit Center	500
Fort Collins – CSU	350
Fort Collins – South Transit Center	850
Loveland – 29th Street	450
Loveland – 4th Street Downtown	550
Berthoud – SH 56	200
Longmont – SH 66	200
Longmont – Sugar Mill	350
Erie – WCR 8	750

Note: Sugar Mill and WCR 8 stations are only included if a commuter rail line is built between Longmont and the FasTracks North Metro Corridor rail line.

Figure 4-4 Package A 2035 Station-to-Station Daily Ridership



4.2.6.3 PACKAGE B

Figure 4-5 displays the ridership results for station-to-station volumes, station activity, mode of access for the main Package B components, and feeder bus ridership by route. Some key findings are described below.

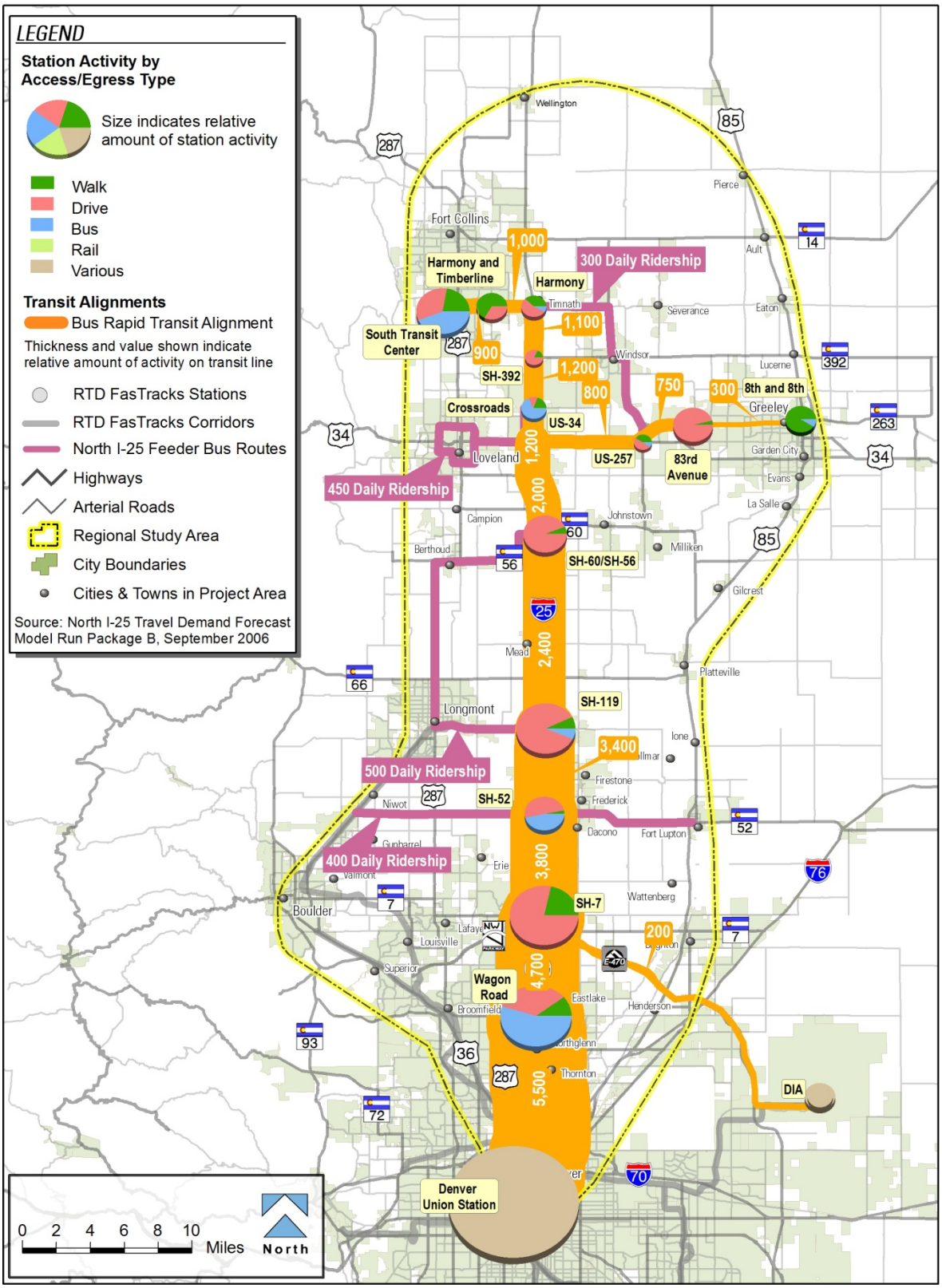
- BRT ridership would grow steadily from both Fort Collins and Greeley to downtown Denver .
- The SH 119 and SH 7 BRT stations along I-25 would generate higher-than-average ridership.
- Overall, the mode split of passengers accessing a BRT station would be about 65 percent drive, 20 percent walk, and 15 percent bus. This would be somewhat different than the access mode split observed in Package A because the BRT would be located in the I-25 corridor farther away from population and employment centers, thereby increasing the number of riders who would arrive by automobile.

Table 4-5 summarizes station activity for Package B BRT. As shown, the highest station activity in northern Colorado would occur at SH 7, SH 119, Fort Collins' South Transit Center, and the SH 56/SH 60 station.

Table 4-5 Package B Bus Rapid Transit Station Activity (2035)

Station	Boardings and Alightings in 2035
Fort Collins – South Transit Center	900
Fort Collins – Harmony and Timberline	300
Fort Collins – I-25 and Harmony	200
I-25 and SH 392	100
I-25 and Crossroads	200
Greeley 8th and 8th	300
Greeley US 34 and 83rd Avenue	500
Greeley US 34 and SH 257	100
I-25 and SH 56/60	600
I-25 and SH 119	1,100
I-25 and SH 52	500
I-25 and SH 7	1,500
Wagon Road	1,600
Downtown Denver	5,400
Denver International Airport	300

Figure 4-5 Package B 2035 Station-to-Station Daily Ridership



4.2.6.4 PREFERRED ALTERNATIVE

Figure 4-6 displays the ridership results for station-to-station volumes, station activity, mode of access for the main Preferred Alternative components, and feeder bus ridership by route. Some key findings are described below.

- While overall regional ridership is comparable to Package A and Package B, ridership on each type of service would be lower than their respective components in either Package A or Package B because the Preferred Alternative includes both commuter rail and express bus service on I-25 . Potential riders would be able to choose the service that best suits their trip needs.
- Bus and rail ridership would grow steadily from both Fort Collins and Greeley to downtown Denver.
- The Fort Collins South Transit Center and Longmont Sugar Mill Commuter Rail stations would generate higher-than-average station ridership activity.
- The SH 119 and SH 7 Bus stations along I-25 would generate higher-than-average station ridership activity.
- Overall, the access type at stations would be similar to that seen in either Package A or Package B.

Table 4-6 summarizes station activity for the Preferred Alternative. As shown, the highest station activity in northern Colorado would occur at SH 119, SH 7, Fort Collins' South Transit Center, and the Sugar Mill stations.

Table 4-6 Preferred Alternative Station Activity (2035)

Station	Boardings and Alightings in 2035
Commuter Rail	
Fort Collins – North Transit Center	150
Fort Collins – CSU	150
Fort Collins – South Transit Center	900
Loveland – 29th Street	400
Loveland – 4th Street Downtown	400
Berthoud – SH 56	150
Longmont – SH 66	200
Longmont – Sugar Mill	500
Erie – WCR 8	300

Table 4-6 Preferred Alternative Station Activity 2035 (Cont.)

Express Bus	Boardings and Alightings in 2035
Fort Collins – South Transit Center	50
Fort Collins – I-25 and Harmony	150
I-25 and SH 392	75
I-25 and Crossroads	50
Greeley 8th and 8th	225
Greeley US 34 and 83rd Avenue	350
Greeley US 34 and SH 257	75
I-25 and SH 56/60	200
I-25 and SH 119	525
I-25 and SH 52	25
I-25 and CR 8	375
I-25 and SH 7	1,850
Downtown Denver	2,750
Denver International Airport	100

4.2.6.5 Transit Market Share

Each build alternative would provide transit service from the northern communities to downtown Denver. The transit share of the travel market of commuters who reside in the northern area (north of SH 66) and work in the Denver CBD is presented in **Table 4-7**. Each package would capture a large share of the downtown Denver commuter market, but the total number of these specific commuters is expected to be relatively small – about 2,400 per weekday.

Table 4-7 Transit Market Share of Northern Commuters to Downtown Denver

Market Share	No-Action	Package A	Package B	Preferred Alternative
Percent that use transit	<1%	55%	45%	50%

Note: Northern commuters refers to commuters north of SH 66.

4.2.6.3 Transit Ridership for Special Events

While the transit planning industry standard is weekday ridership forecasts, it is recognized that regional transit service from the northern communities to Denver would attract substantial interest from riders for special events, as well as weekend travel. For the North I-25 study, a household travel survey was conducted to gain an understanding of special event travel. The estimated additional daily riders, averaged over a year, are tabulated in **Table 4-8**. As shown, on average the build alternatives could generate up to 500 additional weekday and over 1,000 additional weekend trips for special events such as sporting events and theater visits in 2035. The variations among the alternatives are due to the different corridors that are served with premium transit service.

Figure 4-6 Preferred Alternative 2035 Station-to-Station Daily Ridership

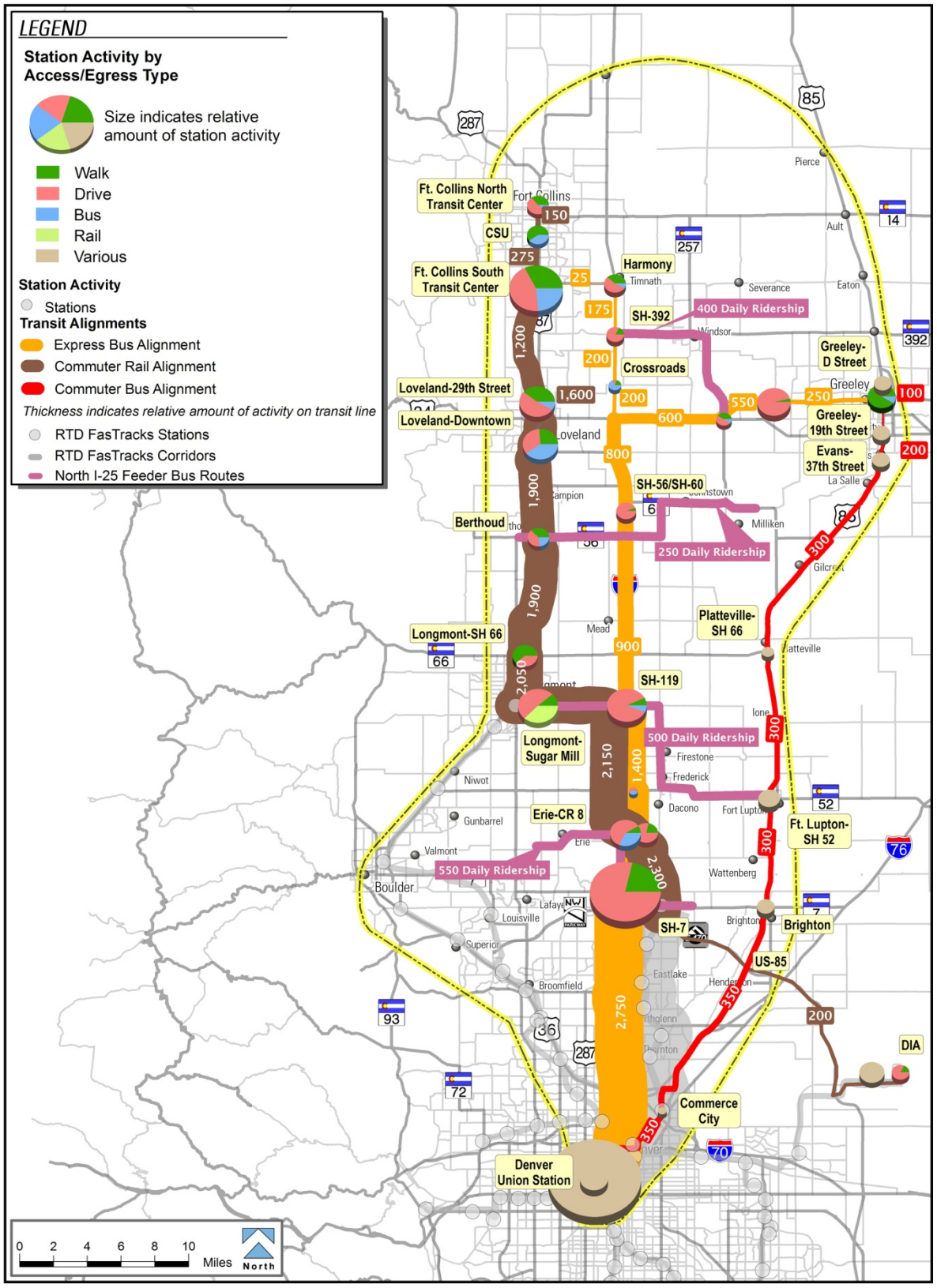


Table 4-8 Additional Average Ridership in 2035 Generated by Special Event Travel

Time Period	Package A	Package B	Preferred Alternative
Weekday	225 - 475	225 – 450	250 – 500
Weekend	650 -1,200	550 – 1,075	700 – 1,250

Annual riders in 2035 due to special events would be approximately 209,000 for Package A, about 177,000 for Package B, and about 212,000 for the Preferred Alternative.

4.2.6.4 Effect of Price of Fuel

Travel forecasts assume the relative price of fuel would remain constant into the future. In the travel model, this means that the future portion of a household's income devoted to transportation remains the same as today. This is standard transportation planning practice because of the uncertainty of predicting the price of fuel. Observed transit ridership commonly rises upon large increases in fuel costs. For example, transit ridership rose two to 30 percent on U.S. transit systems following the increase in the price of fuel during 2008, with rail systems generally realizing larger increases than bus systems (American Public Transportation Association [APTA], 2008). In the circumstances of considerably higher fuel costs, future ridership could be substantially higher than standard forecasts indicate. The testing of increased fuel price scenarios with the North I-25 EIS travel model indicated that riders making longer trips are more likely to switch to transit than those making shorter trips, and that a doubling of fuel costs could increase transit ridership up to 90 percent. The transit systems included in the build alternatives would have adequate capacity for expansion to accommodate these higher demands, if necessary.

4.2.7 Effect of Induced Growth on Transit Ridership

4.2.7.1 Induced Travel

Induced travel refers to the potential increase in travel that occurs after a transportation improvement – highway widening or transit investment – is completed. Different types of induced travel have been observed:

- Shift in travel from other routes: trips that were already being made but which are attracted to the improved roadway.
- Shift in travel from other modes: trips that were already being made but which are attracted to the improved transit service.
- Shift in travel to different destinations: trip makers choosing different destinations due to the improved travel times offered by the new or improved travel mode.
- Shift in travel patterns due to new land use development near the transportation facilities: Transportation improvements, (both highway and transit) that affect the land use development patterns in a region. (See **Section 4.2.7.2** for more detail.)
- An overall increase in travel demand: generation of trips that would not have otherwise been made (See **Section 4.2.7.3** for more detail.)

The North I-25 Regional Travel Demand Model accounts for the first three induced travel types. That is, a shift from other routes, modes and different destinations are handled within its normal process and the results are documented throughout this Chapter.

However, the travel model accounts for neither potential changes to land use development patterns nor induced overall travel demand. The travel model does not account for land use changes because a separate independent model estimates future land use development patterns. This land use forecast model allocates socioeconomic regional control totals of population and employment forecasts geographically across the region, and provides a major data input to the travel model. The travel model is unable to account for induced travel demand because the location where trips are generated and the overall number of trips generated is determined by the land use data set, which does not vary for different alternatives. Therefore, the travel demand is the same for each alternative, including No-Action. The next two sections discuss these possible effects to future travel demand in more detail.

4.2.7.2 Potential Effect of Induced Land Use Growth

Both highway and transit improvements influence future land use development patterns. The potential effects of each alternative on future land use are described in **Section 3.1** *Land Use* In general, enhanced transportation infrastructure (particularly if there is new access proposed, either a transit station or a new interchange) attracts greater development densities. An expert panel reviewed the Draft EIS packages with regard to induced land use growth implications. The insights offered by the expert panel remain valid for the Preferred Alternative because it is a combination of Package A and Package B.

Highway improvements are expected to induce only limited growth. The NFRMPO includes the current trends of development growth near I-25 in its current socio-economic 2035 projections that are used in the model; the effect of additional induced growth is expected to be limited because there are no new interchanges. Therefore, the travel generation due to induced growth along the highway would be relatively minor.

Transit investments affect the type and intensity of development that occurs near stations. Many regions, including both the NFR and DRCOG regions, plan to encourage increased density of development near transit stations. The Regional Transportation District (RTD), in the DRCOG region, has developed a "*Strategic Plan for Transit Oriented Development (TOD)*" that identifies goals and implementation strategies for intensifying development near its FasTracks corridors. The NFRMPO has recognized the desirability of developing near transit investments and has taken transit improvements into consideration in its land use model. In general, transit improvements, especially rail, provide opportunities for increased investment in communities.

The panel suggested that the BNSF corridor would experience relatively more aggressive reallocation of land use near existing downtown areas and proposed rail stations. These conclusions remain valid today and are strengthened by recent information from DRCOG and RTD.

It is difficult to quantify the impact of increased development along a proposed transit corridor. This is because of limited availability of empirical data. Major transit investments in the western U.S. are a relatively recent occurrence and each transit corridor has unique characteristics. However, it is generally accepted that TOD will result in: a) fewer "external" vehicle trips because of increased density and the mix of uses within the development, and b) additional ridership on nearby transit services. Recent information from DRCOG and RTD suggests that

the effect of a reallocation of population and employment centers near RTD's planned FasTracks rail stations depends on the specific plans of each community in the region. The FasTracks corridors with communities actively seeking to encourage TOD might see increases in corridor daily ridership as high as 35 percent, while transit corridors that serve communities without TOD policies in place may experience little to no increase in ridership. Ridership along the North I-25 commuter rail would likely be increased by induced growth in the vicinity of rail stations, and the overall effect would be dependent on the TOD policies of each community.

4.2.7.3 Potential Effect of Increased Overall Demand

Transportation investments, especially highway improvements, have been observed to increase overall travel demand irrespective of additional growth. Essentially, with the improved mobility provided by improvements, some travelers will choose to make trips that they previously would not have made.

Much research into this subject has been conducted, but because of the complexities inherent in any case study, it is difficult to quantify the effect. Depending on the amount of previously un-served demand, the amount of congestion experienced, and the scope of improvements, induced demand can range from a minor increase to an increase that eventually results in similar travel conditions as existed before the improvement.

In the North I-25 regional study area, congestion on I-25 is projected to be widespread during the peak hours in the No-Action Alternative. However, it is unlikely that a great number of trips will be suppressed by these conditions. It is more likely that travelers will elect to make a trip in the off-peak hours or select an alternate route for their trip. Therefore, it is not expected that a large number of additional trips would be generated by any build alternative.

These effects are not limited to highway improvements; some transit investments can have similar outcomes for induced travel. The improved connectivity and lowered transit travel times provided by the North I-25 transit improvements would likely induce a slight increase in transit demand. As with highway improvements, it is difficult to quantify the effects of induced travel demand from transit projects.

4.3 Travel Time

4.3.1 Existing Travel Time

In September and October 2004, travel time was recorded along I-25 between SH 1 and downtown Denver during AM and PM peak hours. Five runs were recorded in each direction during each peak period with the average of these summarized in **Table 4-9**. As shown, the AM southbound and PM northbound peak hours experienced the longest travel times in the corridor at just over an hour each.

Table 4-9 Existing Peak-Hour Travel Time

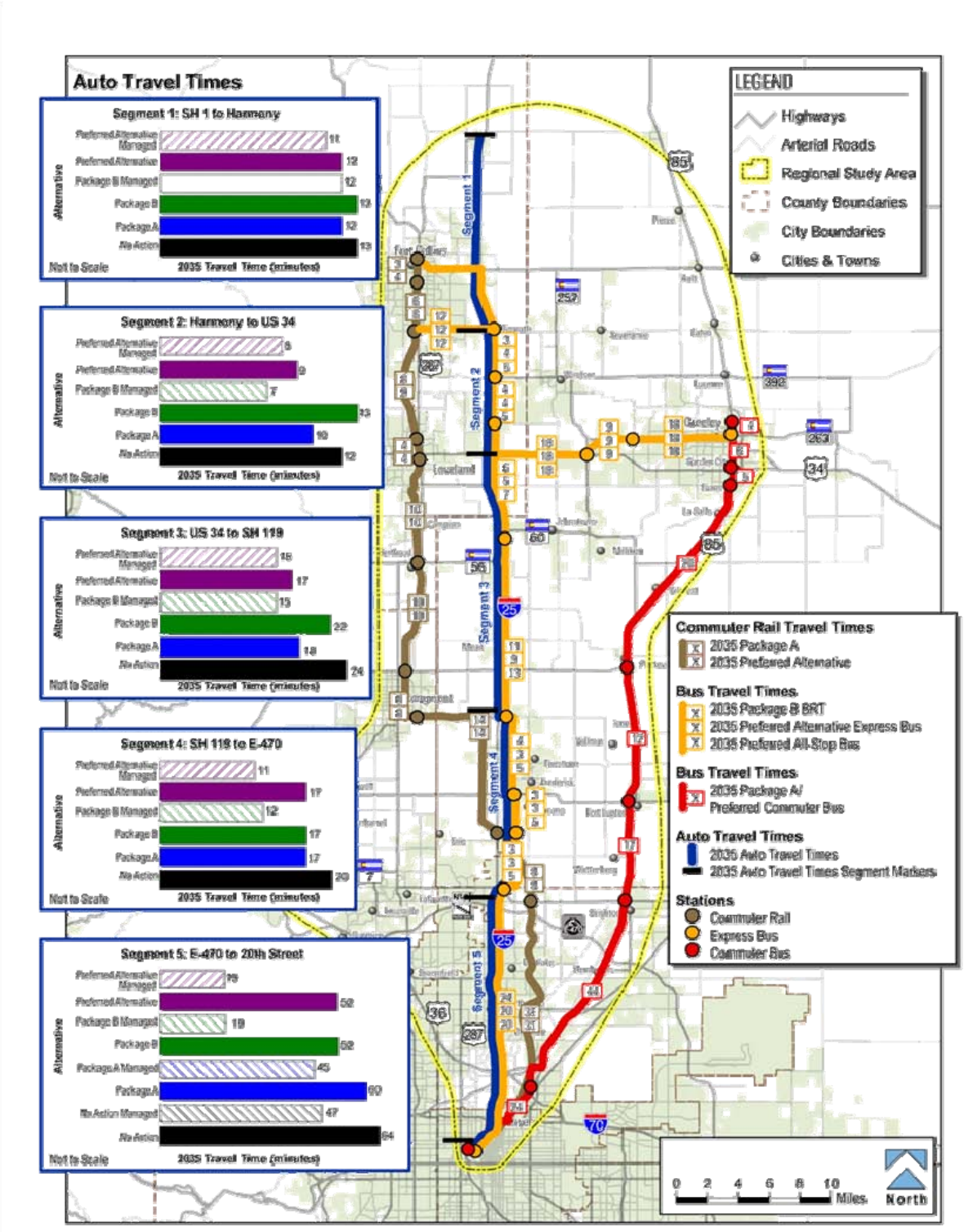
I-25	AM Peak Hour		PM Peak Hour	
	Northbound	Southbound	Northbound	Southbound
SH 1 to 20th Street	58 minutes	66 minutes	68 minutes	66 minutes

Source: Travel Time Surveys, September and October 2004.

4.3.2 2035 Travel Time

Estimated travel times for the package are presented for the AM peak southbound direction for the year 2035. **Figure 4-7** shows comparative travel times by segment for components of the No-Action Alternative and Package A, Package B, and the Preferred Alternative.

Figure 4-7 2035 Travel Time Comparison

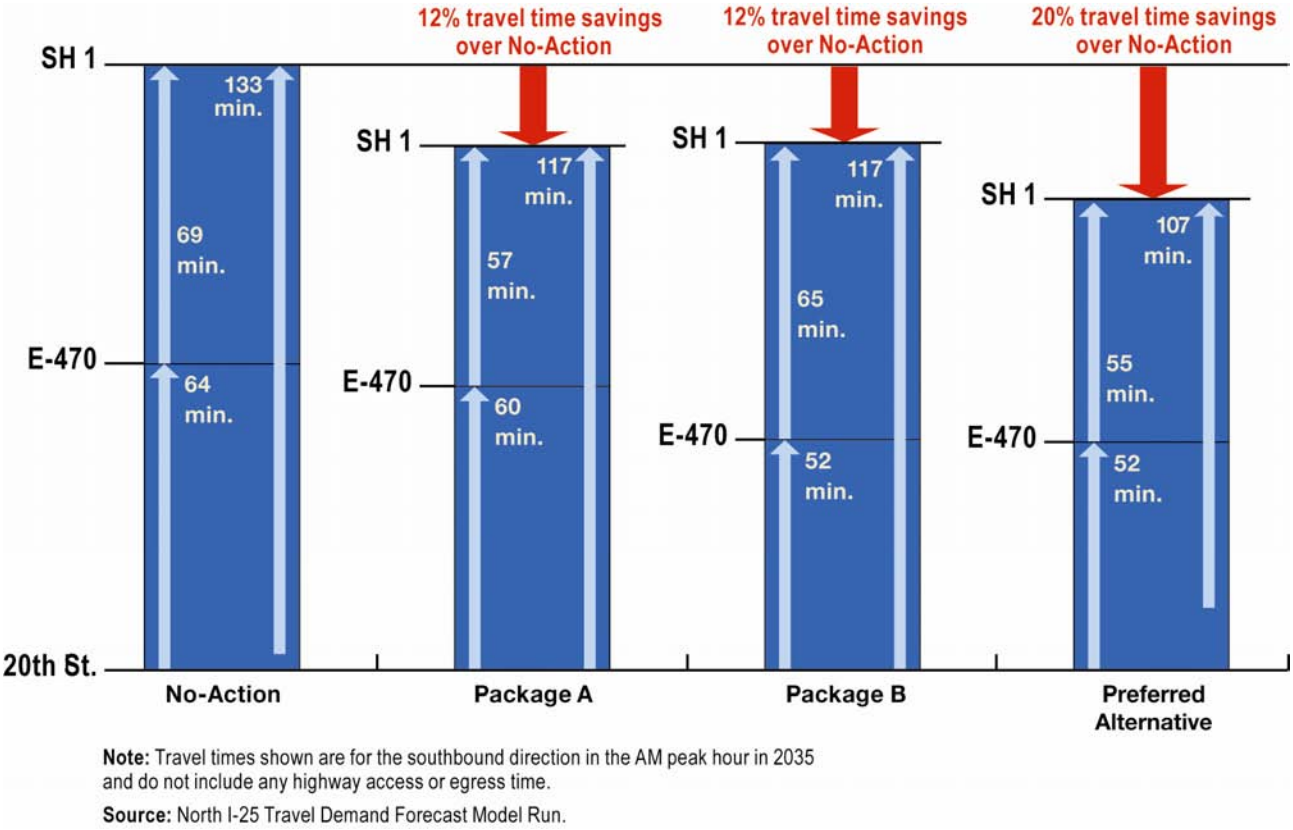


4.3.2.1 HIGHWAY TRAVEL TIME

Figure 4-8 summarizes the 2035 travel time for I-25 in the GPLs for the entire length of the corridor from SH 1 to 20th Street, including the travel time to E-470. The three packages are compared to the No-Action Alternative travel time. As shown, Packages A and B would result in 16-minute travel-time savings between SH 1 and 20th Street; the Preferred Alternative would result in a 26-minute travel time savings over the same section.

Overall, Packages A and B would improve travel time in the GPLs 12 percent while the Preferred Alternative would improve the travel time by 20 percent. This includes the improvement realized in the GPLs between E-470 and 20th Street with the addition of TELs in Package B and the Preferred Alternative.

Figure 4-8 SH 1 to 20th Street - General Purpose Lane Travel Time

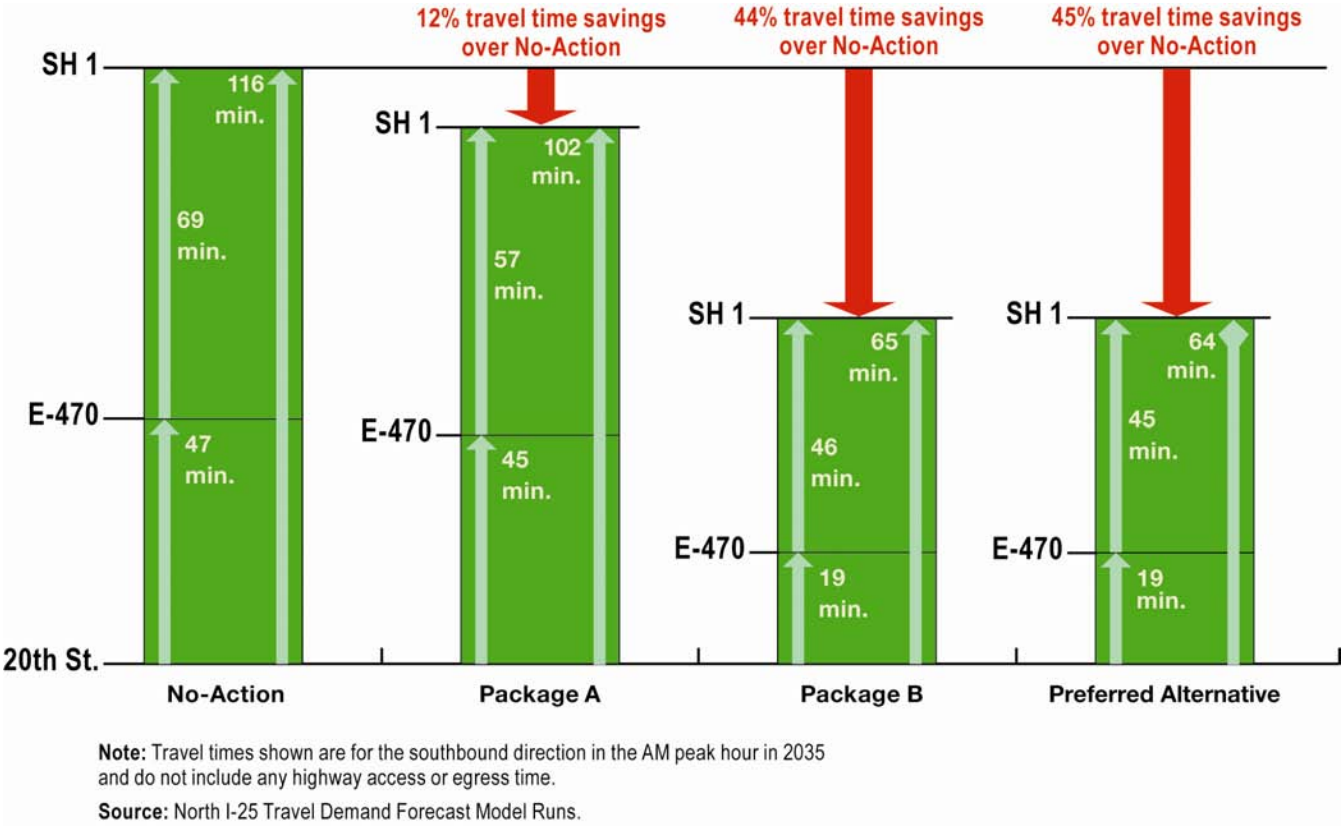


Note: Travel times shown are for the southbound direction in the AM peak hour in 2035 and do not include any highway access or egress time.

Source: North I-25 Travel Demand Forecast Model Run.

Figure 4-9 summarizes the 2035 travel time for I-25 from SH 1 to 20th Street using TELs whenever they are available (south of 84th Avenue under the No-Action Alternative and Package A; south of SH 14 in Package B and the Preferred Alternative). Because Package A and the No-Action Alternative would still use the GPLs between SH 1 and E-470, travel time savings would be the same as that shown above. Package B and the Preferred Alternative would experience a large travel time savings in this section. When compared to the No-Action Alternative (116 minutes), the TEL in Package B (65 minutes) or in the Preferred Alternative (64 minutes) would achieve overall reductions of almost 50 percent in travel time between SH 1 and 20th Street.

Figure 4-9 SH 1 to 20th Street – Tolled Express Lane Travel Time



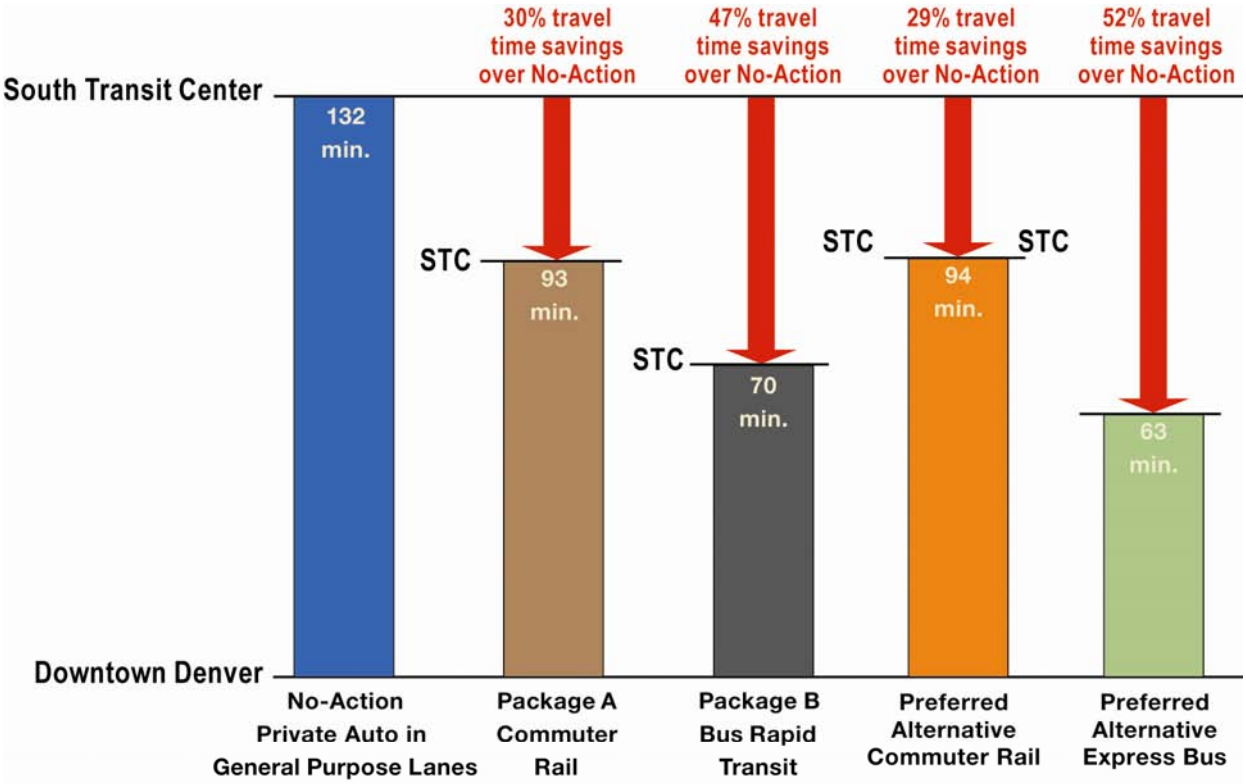
Note: Travel times shown are for the southbound direction in the AM peak hour in 2035 and do not include any highway access or egress time.

Source: North I-25 Travel Demand Forecast Model Runs.

4.3.2.2 Transit Travel Time

Figure 4-10 compares 2035 transit travel time from the Fort Collins South Transit Center to downtown Denver via commuter rail, or BRT, or express bus, to private automobiles traveling along Harmony Road and I-25. As shown, under the No-Action Alternative, it would take 132 minutes to make this trip via private automobile. Commuter rail would improve this travel time by 30 percent to 93 minutes. Package B BRT would have a travel time savings of 47 percent (70 minutes) over No-Action GPLs; this travel time savings would result in transit, carpools, and vanpools competing favorably with the private single-occupant automobile in the I-25 GPLs. Transit travel time from the Fort Collins South Transit Center to downtown Denver under the Preferred Alternative would be either 94 minutes on commuter rail or 63 minutes via express bus. The Preferred Alternative express bus is faster than the BRT in Package B due to the express limited-stop route having fewer station stops than the BRT service.

Figure 4-10 Fort Collins South Transit Center (STC) to Downtown Denver - Transit Travel Time

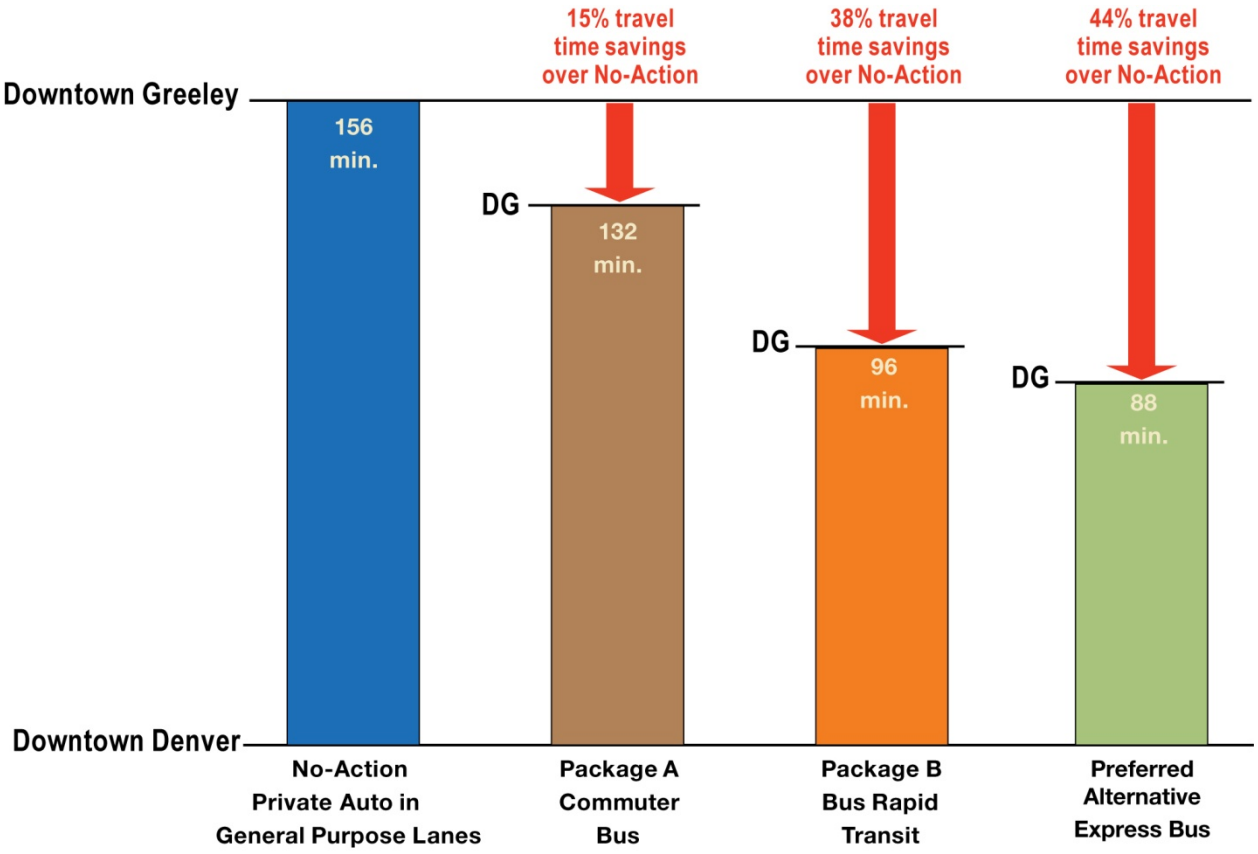


Notes: No-Action travel times shown are for the southbound direction in the AM peak hour in 2035. Travel times include travel on Harmony Road from the proposed site of the South Transit Center to I-25 and from the 20th Street exit to downtown Denver. Transit times are in-vehicle times only with no access/egress, transfer, or wait times. In 2035, it will be possible to use transit for this trip using different services in the No Action; the estimated travel time is 159 minutes.

Source: North I-25 Travel Demand Forecast Model Runs.

Figure 4-11 compares transit travel time from downtown Greeley to downtown Denver via commuter bus, BRT, or express bus, to private automobile traveling along US 85. As shown, under the No-Action Alternative, it would take 156 minutes to make this trip via private automobile in general purpose lanes in 2035. Commuter bus would improve this travel time by 15 percent and BRT would improve travel time by 38 percent, reducing the overall time to 96 minutes. Express bus would improve travel time by 44 percent, with a total travel time of 88 minutes from downtown Greeley to downtown Denver. The Preferred Alternative express bus is faster than the BRT in Package B due to the express limited-stop route having fewer station stops than the BRT service (the express bus all-stop route would be four minutes slower than BRT).

Figure 4-11 Downtown Greeley to Downtown Denver - Transit Travel Time



Note: No-Action and Package B travel times shown are for the southbound direction in the AM peak hour in 2035. Travel times include travel on US 34 from the proposed site of the downtown Greeley transit center to I-25 and from the 20th Street exit to downtown Denver. Transit times are in-vehicle times only with no access/egress, transfer, or wait times.

Source: North I-25 Travel Demand Forecast Model Runs.

4.3.3 Travel Time Reliability

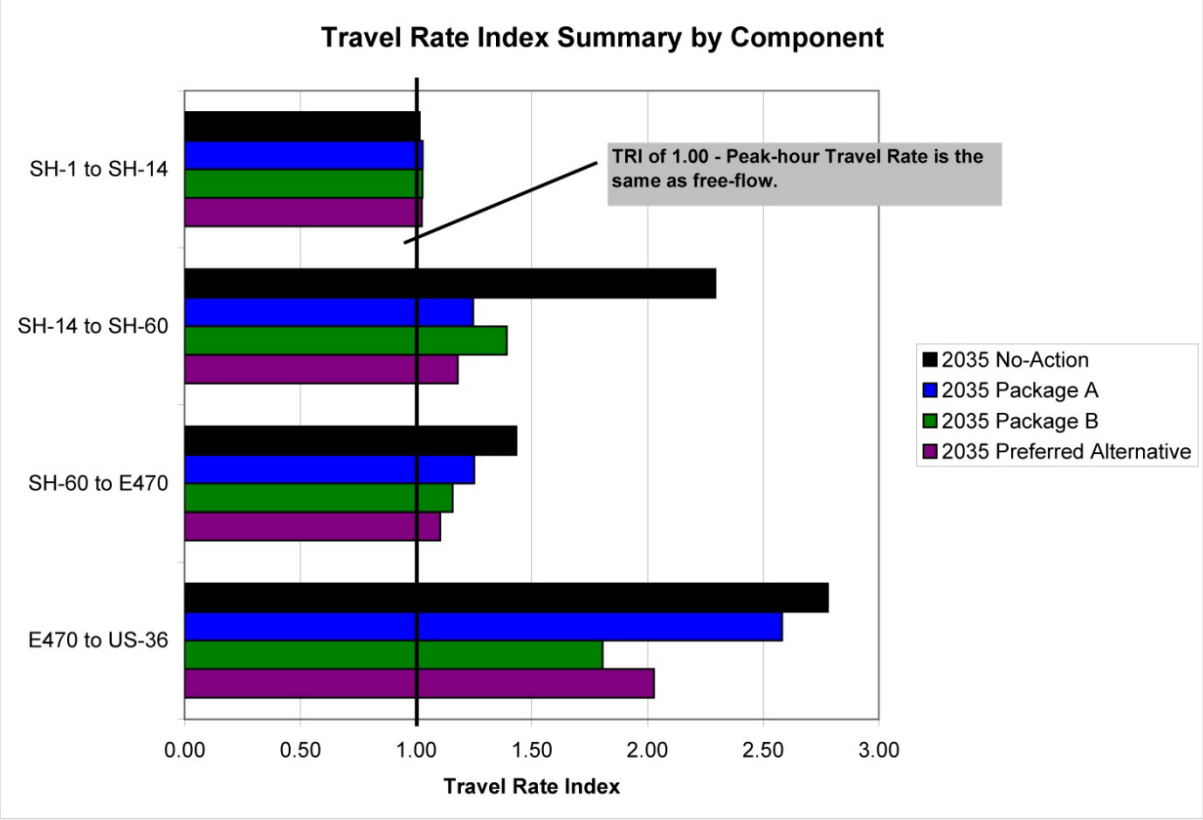
As northern Colorado population and employment grow beyond 2035, the demand on the transportation network also would grow. The No-Action Alternative would experience congestion, long travel times and uncertain travel time reliability on I-25. Package A would address most of this congestion in 2035 but as growth occurs, highway travel times would continue to increase and reliability would decrease in the years beyond 2035. Travel times for commuter rail, however, would remain relatively constant and reliable. Similar to Package A, demand for Package B GPLs would continue to increase with area growth. Package B TELs however, would be managed to maintain a reliable and efficient travel time in 2035 and beyond for bus, for carpools and vanpools, and for single-occupancy vehicles who pay a toll. Reliable travel times through 2035 and beyond would be maintained under the Preferred Alternative with both commuter rail and the TELs. Continued growth beyond 2035 would eventually decrease the reliability of the GPLs.

4.3.4 Travel Rate Index

The travel rate index (TRI) is a measure of congestion developed by the Texas Transportation Institute to measure the amount of extra time it takes to travel during a peak period. It compares the peak hour travel rate to the free-flow (or uncongested) travel rate. A TRI of 1.50, for example, indicates that it would take 50 percent longer to travel on a roadway during the peak hour than it would take to travel during uncongested conditions (on days without crashes or other incidents).

The TRI for general purpose lanes was calculated by component for the No-Action Alternative and the three build packages for the year 2035. The TRI for the TEL of Package B and the Preferred Alternative is not calculated because as managed lanes, the travel times will always be approximate free flow conditions. As shown in **Figure 4-12,** the build packages would provide an improvement in the TRI over the No-Action Alternative. Packages A, B, and the Preferred Alternative have similar TRIs north of E-470, although in two locations, the Preferred Alternative would result in a lower TRI than the other build alternatives. Package B and the Preferred Alternative have a notably lower TRI south of E-470 due to the capacity improvements on I-25 in the Denver metro area.

Figure 4-12 Travel Rate Index Comparison



4.4 LEVEL OF SERVICE

This section compares 2035 level of service (LOS) calculations for mainline I-25 from SH 1 to 84th Avenue, existing I-25 interchange locations from SH 1 to 84th Avenue, and transit station areas. Synchro version 7 was used to calculate signalized and unsignalized LOS based on the methodology documented in the *Highway Capacity Manual* (Transportation Research Board, 2000). Highway Capacity Software 5.2 was used to calculate mainline, merge, diverge, and weave LOS. When possible, results were calibrated and adjusted to reflect existing conditions. Detailed level of service evaluation data are available in separate reports developed for each interchange area, station area, and mainline I-25, these reports are compiled in the *Transportation Analysis Technical Reports* (FHU and Jacobs, 2008) and Addendum (FHU and Jacobs, 2011c).

Figure 4-13 illustrates the differences in the level of service categories for highway segments and intersections. As shown, there are few vehicles and conflicts at LOS A. This yields little delay and higher travel speeds. At the opposite end of the spectrum is LOS F. At LOS F, the number of vehicles exceeds the capacity of the road, creating long delays, queuing, and slow travel speeds.

4.4.1 Existing I-25 Mainline

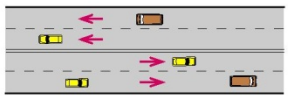
Figure 4-14 graphically depicts existing I-25 mainline level of service. **Figure 4-15** illustrates existing ramp merge/diverge levels of service. Generally, from SH 1 to E-470, mainline levels of service are LOS C or better and ramp merge/diverge levels of service are LOS D or better during peak hours.

South of E-470, existing traffic volumes increase as I-25 enters the Denver Metro Area and, with that, come poor levels of service. In the southbound direction during the AM peak hour, mainline level of service drops to LOS E and F between 120th Avenue and 84th Avenue. In the northbound direction, I-25 during the PM peak hour experiences LOS E and F conditions from north of the 84th Avenue interchange to 104th Avenue interchange.

Figure 4-13 Level-of-Service Category Definitions

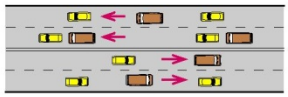
Level of Service - Highway

A



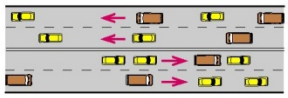
Free flow, low traffic density.

B



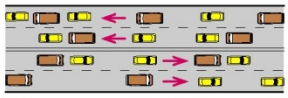
Minimum delay, stable traffic flow.

C



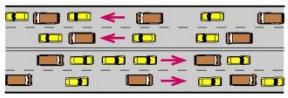
Stable condition, movements somewhat restricted due to higher volumes, but not objectionable for motorists.

D



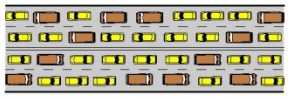
Movements more restricted, queues and delays may occur during short peaks, but lower demands occur often enough to permit clearing, preventing excessive backups.

E



Actual capacity of the roadway involves delay to all motorists due to congestion.

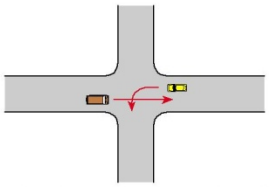
F



Forced flow with demand volumes greater than capacity resulting in complete congestion.

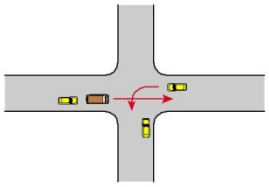
Level of Service - Intersections

A



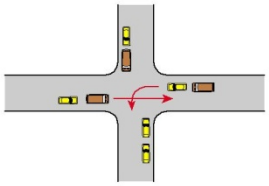
No vehicle waits longer than one signal indication.

B



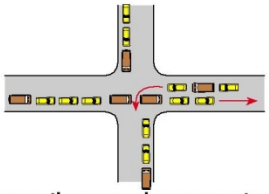
On rare occasions vehicles wait through more than one signal indication.

C



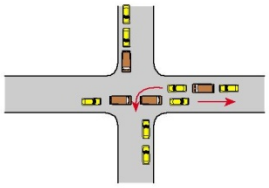
Intermittently vehicles wait through more than one signal indication, occasionally backups may develop, traffic flow still stable and acceptable.

D



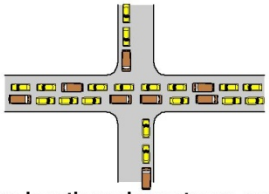
Delays at intersections may become extensive, but enough cycles with lower demand occur to permit periodic clearance, preventing excessive backups. LOS D has historically been regarded as a desirable design objective in urban areas.

E



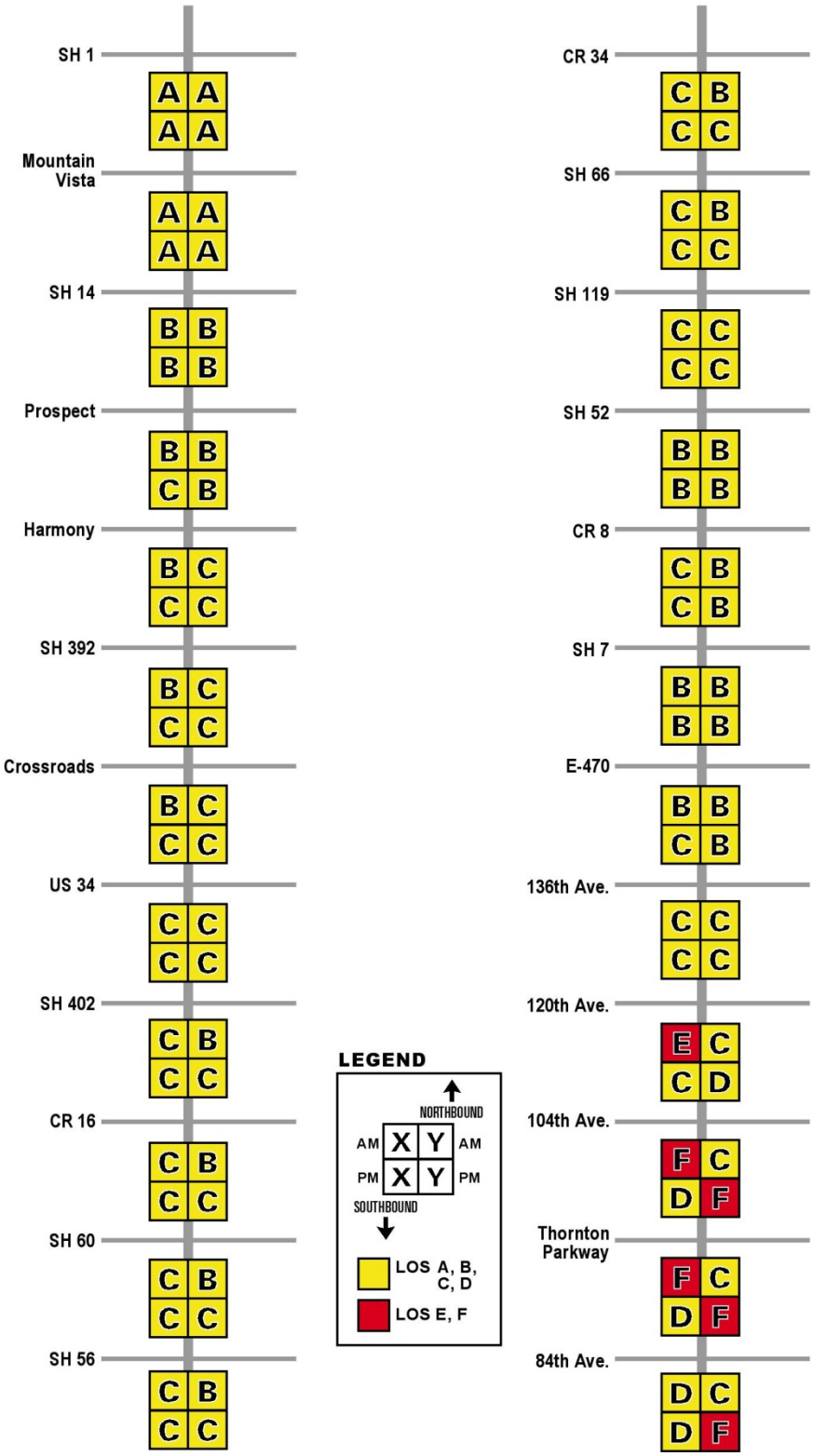
Very long queues may create lengthy delays.

F



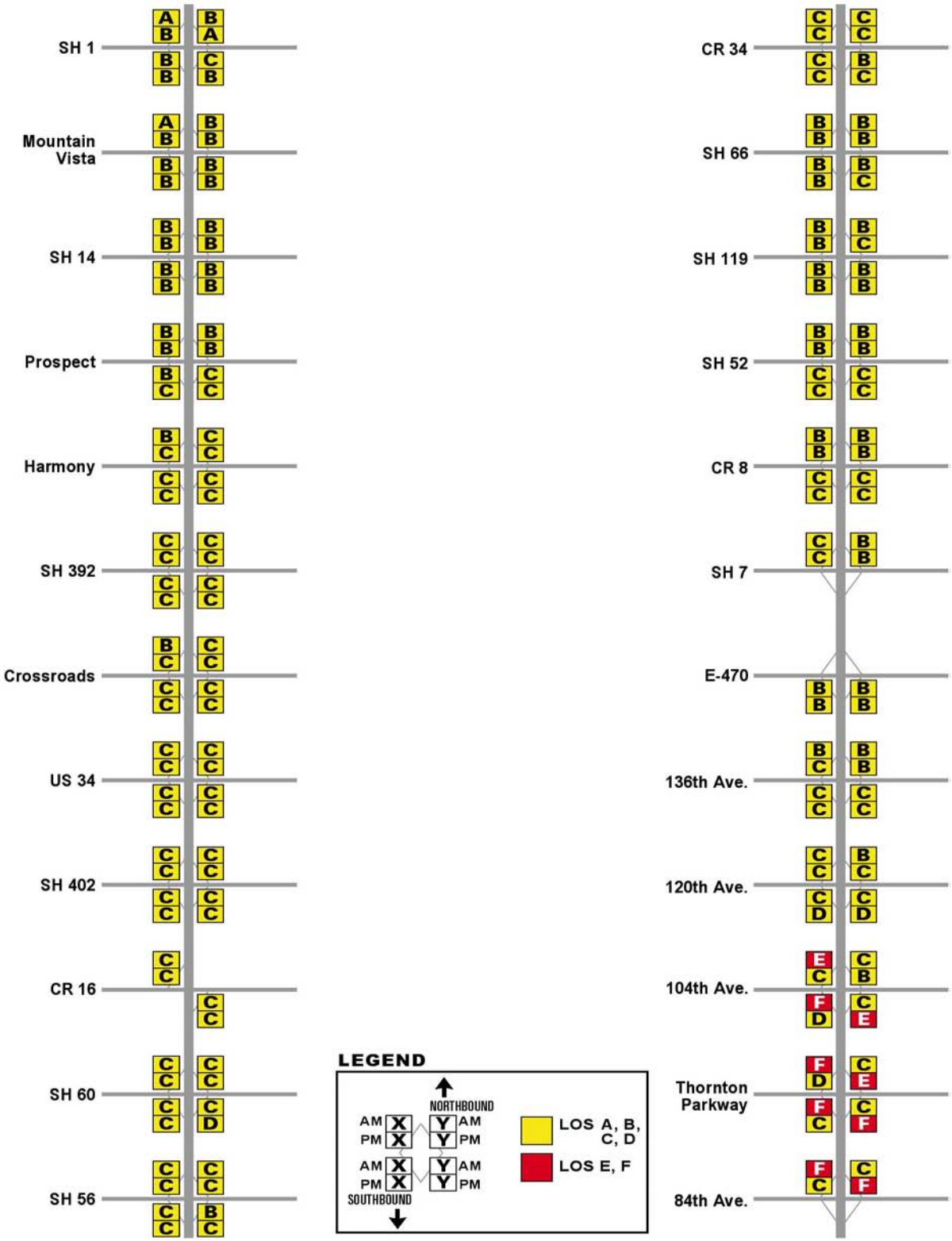
Backups from locations downstream restrict or prevent movement of vehicles out of approach creating "gridlock" condition.

Figure 4-14 Existing Peak Hour I-25 Mainline Level of Service



Note: 144th Avenue interchange was not yet complete when existing conditions data were collected and is therefore not included in this evaluation.

Figure 4-15 Existing Peak Hour I-25 Ramp Merge/Diverge Level of Service



Note: 144th Avenue interchange was not yet complete when existing conditions data were collected and is therefore not included in this evaluation.

4.4.2 2035 I-25 Mainline

All three build packages would reduce congestion north of E-470, providing significant level of service and travel time improvements over No-Action Alternative conditions. The Package B and Preferred Alternative TELs would operate at LOS C or better during both peak hours.

4.4.2.1 General Purpose Lane Operation

Table 4-10 shows the number of mainline I-25 miles operating at LOS E or F for AM and PM peak hours. Between existing and No-Action Alternative conditions, the number of mainline miles at LOS E or F would increase, such that during at least one peak hour all sections of I-25 between SH 14 and US 36 would experience congestion. Package A would eliminate LOS E and F conditions between SH 14 and E-470 during the AM peak hour. The Preferred Alternative would experience the fewest miles of congestion with a total of 11 miles during the AM peak hour and 17 miles during the PM peak hour along the mainline in 2035.Package B and the Preferred Alternative would provide some reduction in miles operating at LOS E or F for the E-470 to US 36 section, while Package A would not.

Table 4-10 Miles of I-25 Operating at LOS E or F (General Purpose Lanes)

Component	AM Peak Hour				
	Existing	No-Action	Package A	Package B	Preferred Alternative
SH 1 to SH 14	0	0	0	0	0
SH 14 to SH 60	0	22	0	7	0
SH 60 to E-470	0	17	0	12	0
E-470 to US 36	4	17	16	11	11
Total	**4**	**56**	**16**	**30**	**11**

Component	PM Peak Hour				
	Existing	No-Action	Package A	Package B	Preferred Alternative
SH 1 to SH 14	0	0	0	0	0
SH 14 to SH 60	0	29	7	17	0
SH 60 to E-470	0	24	15	12	0
E-470 to US 36	4	22	22	16	17
Total	**4**	**75**	**44**	**45**	**17**

Figures 4-16 and **4-17** graphically depict I-25 mainline level of service for the No-Action Alternative and Package A and B in 2035. As shown, under No-Action Alternative conditions, capacity issues would extend north from 84th Avenue past E-470, and include the southbound direction in the morning and both directions in the afternoon. In addition, No-Action Alternative conditions also show capacity issues developing between Harmony Road and SH 66 in both directions during both peak hours.

To maintain reliable speeds and LOS C in the TELs, the toll evaluation varied rates to keep hourly demand at or below 1,600 vehicles per lane and manage slip-ramp volumes. This is referred to as the maximum service volume. However, because HOV travel in the lanes would be free of charge, demand would not be impacted by the toll rate. Demand for HOV travel in the metro area would exceed the maximum service volume in select locations south of E-470 during both peak hours. However, with more refinement to the toll rates and rate structure, it may be possible to reduce volumes in the managed lanes below the maximum service volume. This could be accomplished through slightly higher per-mile toll rates on select segments or by requiring three passengers for HOV use.

As shown in the previous figures, TEL levels of service would be consistently better than the GPL levels of service, which would help to maintain their attractiveness.

Figure 4-16 2035 Peak Hour I-25 Mainline LOS SH 1 to SH 56

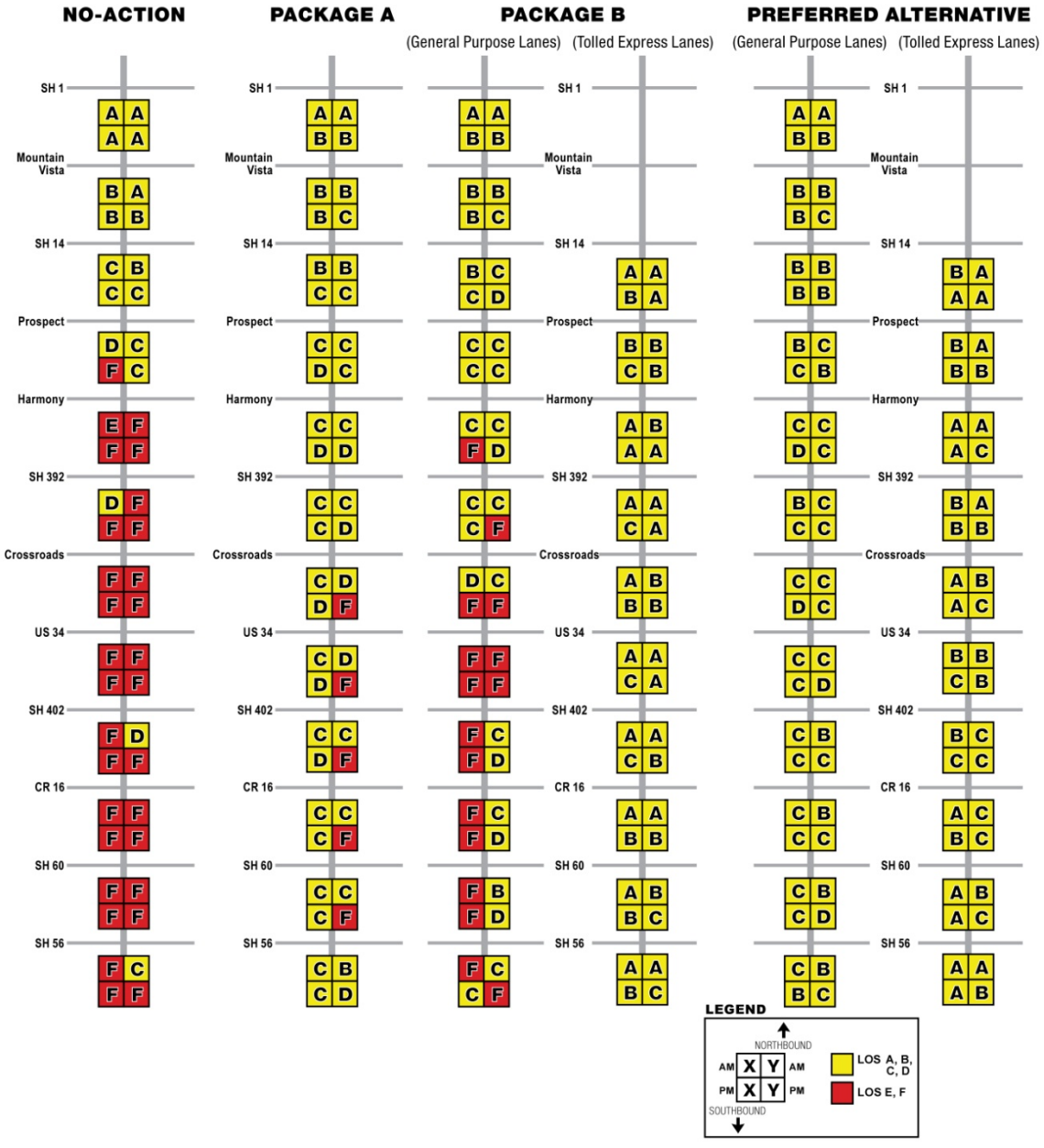
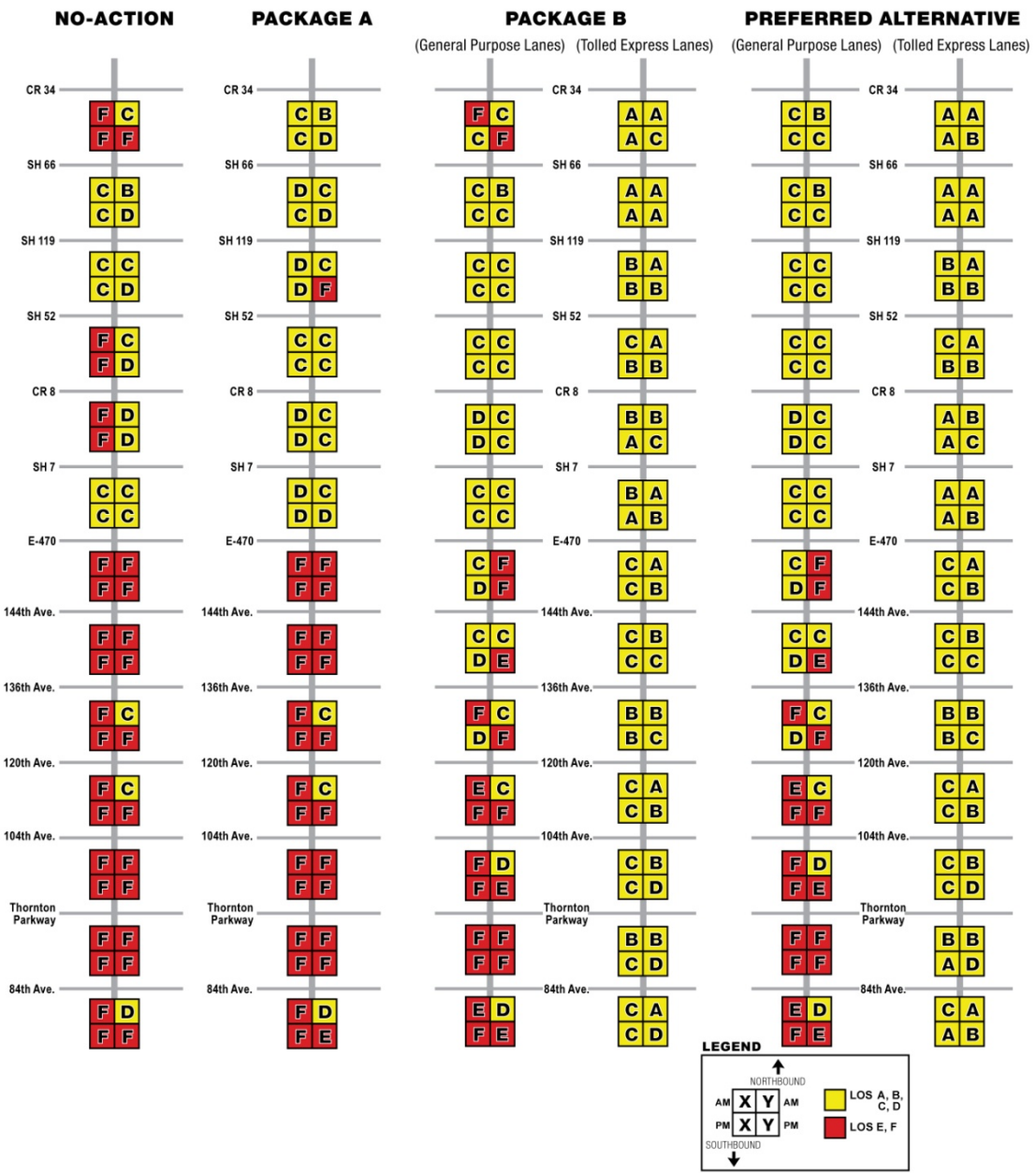


Figure 4-17 2035 Peak Hour I-25 Mainline LOS from CR 34 to 84th Avenue



4.4.2.2 General Purpose Merge/Diverge Ramp Operation

Figures 4-18 and 4-19 illustrates the I-25 ramp merge/diverge levels of service for the No-Action Alternative, Package A, Package B and the Preferred Alternative in 2035. **Table 4-11** provides a summary comparison of interchange ramp merge/diverge operations along GPLs. In the No-Action Alternative, 58 ramp junctions are expected to operate at LOS E or F between SH 14 and US 36 in the AM peak hour and 64 in the PM peak hour. Virtually all merge and diverge points south of E-470 operate over capacity with poor levels of service. As shown, all build packages would improve ramp merge/diverge operations between SH 14 and

E-470 but provide little improvement south of E-470. LOS E and F conditions continue south of E-470, even with Package B or the Preferred Alternative improvements, because 2035 mainline traffic projections exceed the mainline capacity and ramp merge/diverge operations would be dependent on mainline operations.

Table 4-11 2035 Interchange Ramp Merge/Diverge Locations Operating at LOS E or F

Component	Existing		No-Action		Package A		Package B*		Preferred Alternative	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
SH 1 to SH 14	0	0	0	0	0		0	0	0	0
SH 14 to SH 60	0	0	23	24	3	5	14	16	1	1
SH 60 to E-470	0	0	11	21	3	5	7	14	1	3
E-470 to US 36	5	4	24	24	24	24	13	22	11	22
Total	**5**	**4**	**58**	**69**	**30**	**34**	**34**	**52**	**13**	**26**

* Includes both interchange and slip ramp merge/diverge locations with GPLs.

4.4.2.3 TOLLED EXPRESS MERGE/DIVERGE RAMP OPERATION

TEL slip ramps were typically located where 1,000 feet per lane change could be provided between interchange ramp terminals and the slip ramp to avoid creating a weave section. This typically required two-mile spacing between interchanges. Between SH 14 and E-470, TEL ramp junctions would operate at LOS D or better in both Package B and the Preferred Alternative. However, south of E-470, a number of ramp junctions would operate at LOS E or LOS F. This lower operation would primarily be due to high volumes present in the GPLs. **Table 4-12** shows where ramp junctions operate at LOS E or F. As shown in the table, there are 34 TEL ramp junctions with the GPLs. During the AM peak hour, four would operate at LOS E or F, and during the PM peak hour, nine would operate at LOS E or F in both Package B or the Preferred Alternative.

Table 4-12 Summary of Managed Lane Ramp Level of Service

Component	Managed Lane Junctions with GP Lanes	Package B		Preferred Alternative	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
		Managed Lane Ramps Operating at LOS E/F			
SH 14 to SH 60	12	0	0	0	0
SH 60 to E-470	12	0	0	0	0
E-470 to US 36	10	4	9	4	9
Total	**34**	**4**	**9**	**4**	**9**

Figure 4-18 2035 Peak Hour I-25 Ramp Merge / Diverge LOS from SH 1 to SH 56

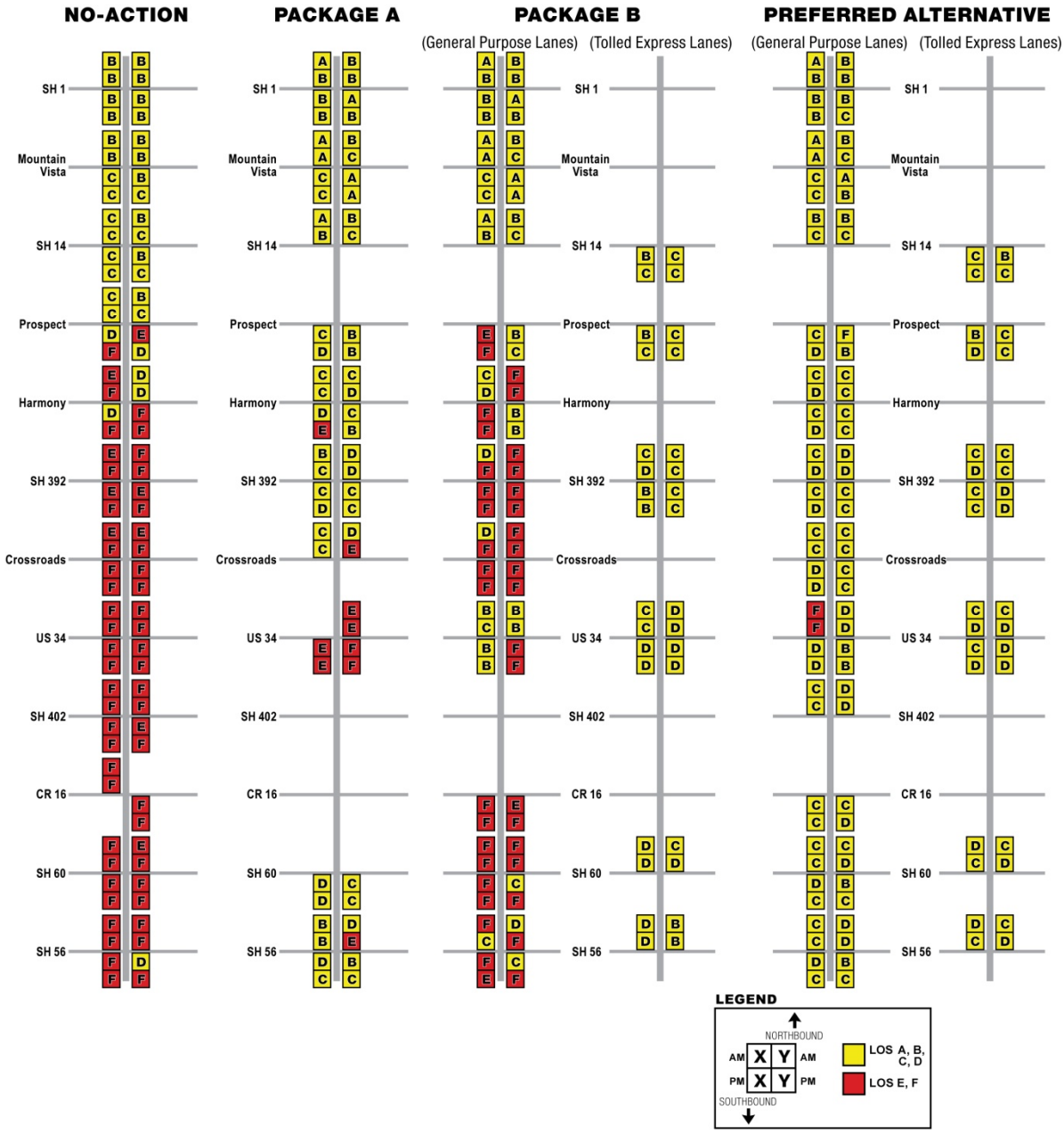
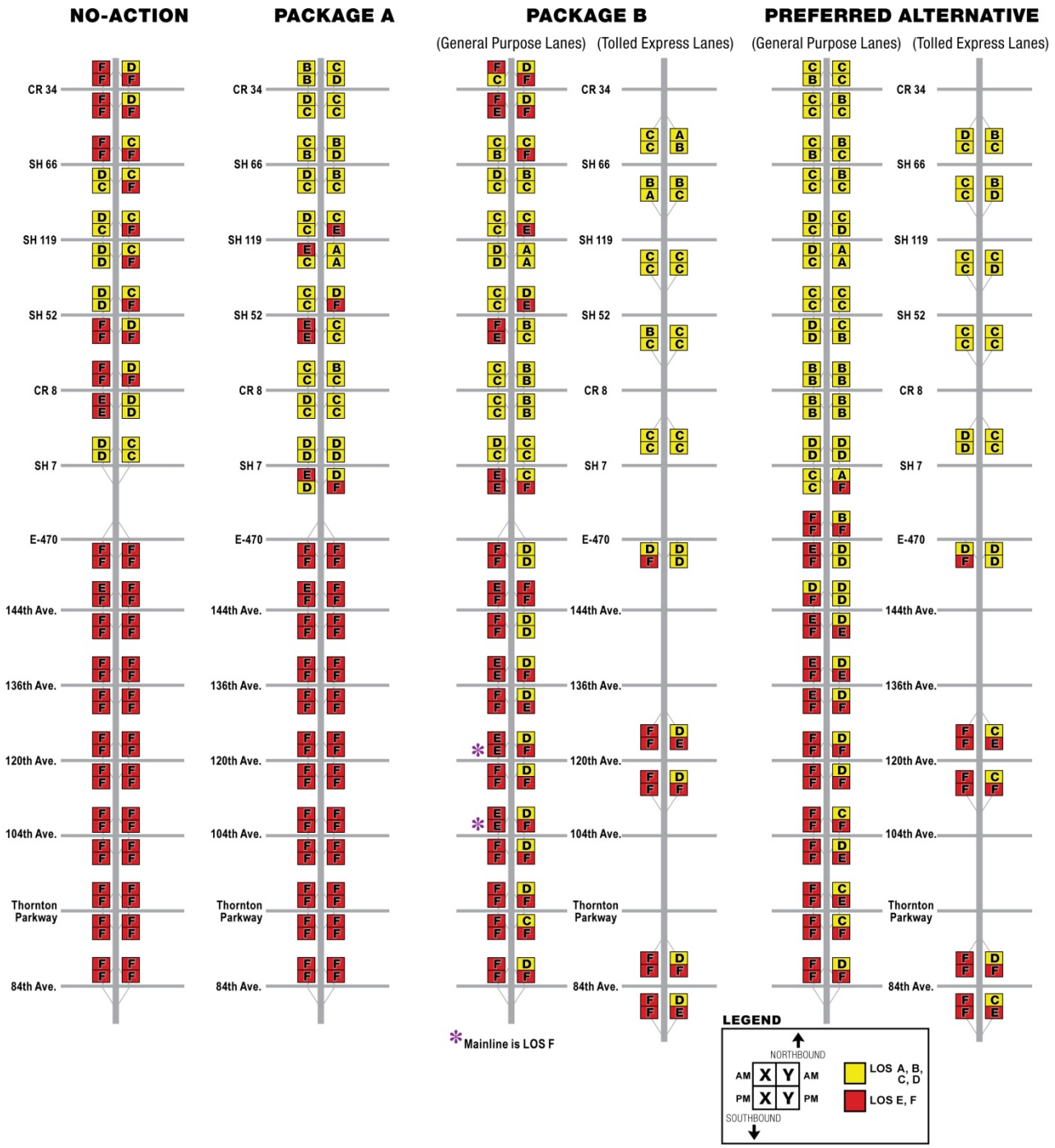


Figure 4-19 **2035 Peak Hour I-25 Ramp Merge / Diverge LOS from CR 34 to 84th Avenue**



4.4.3 US 85 Operation

Under Package A, commuter buses would make six trips per hour (three trips each direction) along US 85 in the peak periods and four trips per hour in the off-peak periods. These trips would have a negligible impact on traffic operation along US 85. Queue jump locations and traffic signal priority were designed along US 85 for the benefit of commuter bus service. Commuter bus operation would only trigger the priority signal system six times during peak hours in Package A. Because of the lengths of the cycles and the green time within each cycle, only 3 percent to 11 percent of signal cycles would receive priority request. The request itself would equal only a 3 percent to 6 percent change in timing. These few green extensions would have a nominal effect on signal operations, and no adverse transportation impact along US 85 would be expected to result from signal priority or queue jumps.

In the Preferred Alternative, commuter buses would make two trips per hour (one trip each direction) during the peak and off-peak periods. These trips would have a negligible impact on traffic operation along US 85. Queue jump locations and traffic signal priority were designed along US 85 for the benefit of commuter bus service. Commuter bus operation would only trigger the priority signal system two times during peak hours in the Preferred Alternative. Because of the lengths of the cycles and the green time within each cycle, only one percent to four percent of signal cycles would receive priority request. The request itself would equal only a 3 percent to 6 percent change in timing. These few green extensions would have a nominal effect on signal operations, and no adverse transportation impact along US 85 would be expected to result from signal priority or queue jumps.

4.4.4 US 34 Operation

In Package B, the BRT leg from Greeley would make four trips per hour along US 34 during the peak periods and two trips per hour during off-peak periods. These trips would have a negligible impact on traffic operation along US 34. Traffic signal priority and queue jumps along US 34 from Greeley to I-25 would trigger signal priority a maximum of four times during the peak hour. Because of the lengths of the cycles and the green time within each cycle, only 5 to 10 percent of signal cycles would receive priority request. The request itself would equal only a 4 percent to 6 percent change in timing. These few green extensions would have a nominal effect on signal operations. No adverse transportation impacts along US 34 would be expected to result from signal priority or queue jumps.

Under the Preferred Alternative, the express bus from Greeley would make six trips per hour (three trips each direction) along US 34 during the peak periods and no trips during off-peak periods. These trips would have a negligible impact on traffic operation along US 34. Traffic signal priority and queue jumps along US 34 from Greeley to I-25 would trigger signal priority a maximum of six times during the peak hour. Because of the lengths of the cycles and the green time within each cycle, only eight to 15 percent of signal cycles would receive priority request. The request itself would equal only a 4 percent to 6 percent change in timing. These few green extensions would have a nominal effect on signal operations. No adverse transportation impacts along US 34 would be expected to result from signal priority or queue jumps.

4.4.5 Harmony Road Operation

In Package B, BRT would make six trips per hour (three trips each direction) along Harmony Road during peak periods and four trips per hour in the off-peak periods. These trips would have a negligible impact on traffic operation along Harmony Road.

In the Preferred Alternative, express bus service along Harmony Road would amount to two trips per hour (one trip each direction) during peak and off-peak periods. These trips would have a negligible impact on traffic operation along Harmony Road.

4.4.6 Downtown Denver Operation

Under Package A, commuter buses would make two trips per hour into downtown Denver and two trips per hour exiting downtown Denver during peak periods. During off-peak hours, only a single trip would enter and exit downtown. These trips would have a negligible impact to traffic operation in downtown Denver.

Package B BRT would make four trips per hour into downtown Denver and four trips out of downtown Denver during peak periods. These trips would have a negligible impact to traffic operation in downtown Denver.

Under the Preferred Alternative, express buses would make eight trips per hour and a commuter bus would make one trip per hour into downtown Denver during the morning peak period. Exiting downtown Denver during the morning peak period would be five express buses and one commuter bus per hour. The entering and exiting numbers would be reversed for the afternoon peak period. During off-peak hours, only four bus trips would enter and exit downtown. During the peak periods, these bus trips would have a minor impact to traffic operation in downtown Denver. During off-peak periods, there would be a negligible impact to traffic operations.

4.4.7 Interchange Operation

Queuing and LOS analyses were conducted at each interchange for the No-Action Alternative and Package A, Package B and the Preferred Alternative. If the level of service of critical movements would be LOS E or F and/or queuing would exceed available storage, then mitigation measures were recommended and included in the design of the build packages. At interchanges, mitigation measures typically involved signalization, increased ramp spacing, increased distance between ramps and frontage road intersections, auxiliary lanes, and/or additional through lanes.

In the No-Action Alternative analysis, it was assumed that existing unsignalized ramp terminal intersections (where the on and off ramps meet the intersecting roads) would be signalized in the future. In general, poor levels of service in the No-Action Alternative would occur at most interchanges between SH 14 and CR 34 and south of 120th Avenue. All three build packages would provide improvements to interchanges between SH 1 and SH 7 and would include upgrades such as wider bridges and ramps to accommodate multiple turn lanes and through lanes. These improvements would provide LOS D or better operations at most ramp terminals. South of E-470, Package B and the Preferred Alternative would provide minor interchange improvements, such as longer ramps and storage bays to accommodate queuing. These types of improvements would not address capacity issues seen in the No-Action Alternative and, as such, LOS E and F operations would be expected to continue for interchanges south of 120th Avenue.

Table 4-13 provides a summary comparison of interchange ramp terminal intersection operations by package. This table shows that interchange designs included in all three build packages would improve operations to LOS D or better for nearly all interchanges from SH 1 to E-470. However, most of the poorly operating ramp terminal intersections south of E-470 would remain congested in all three build packages.

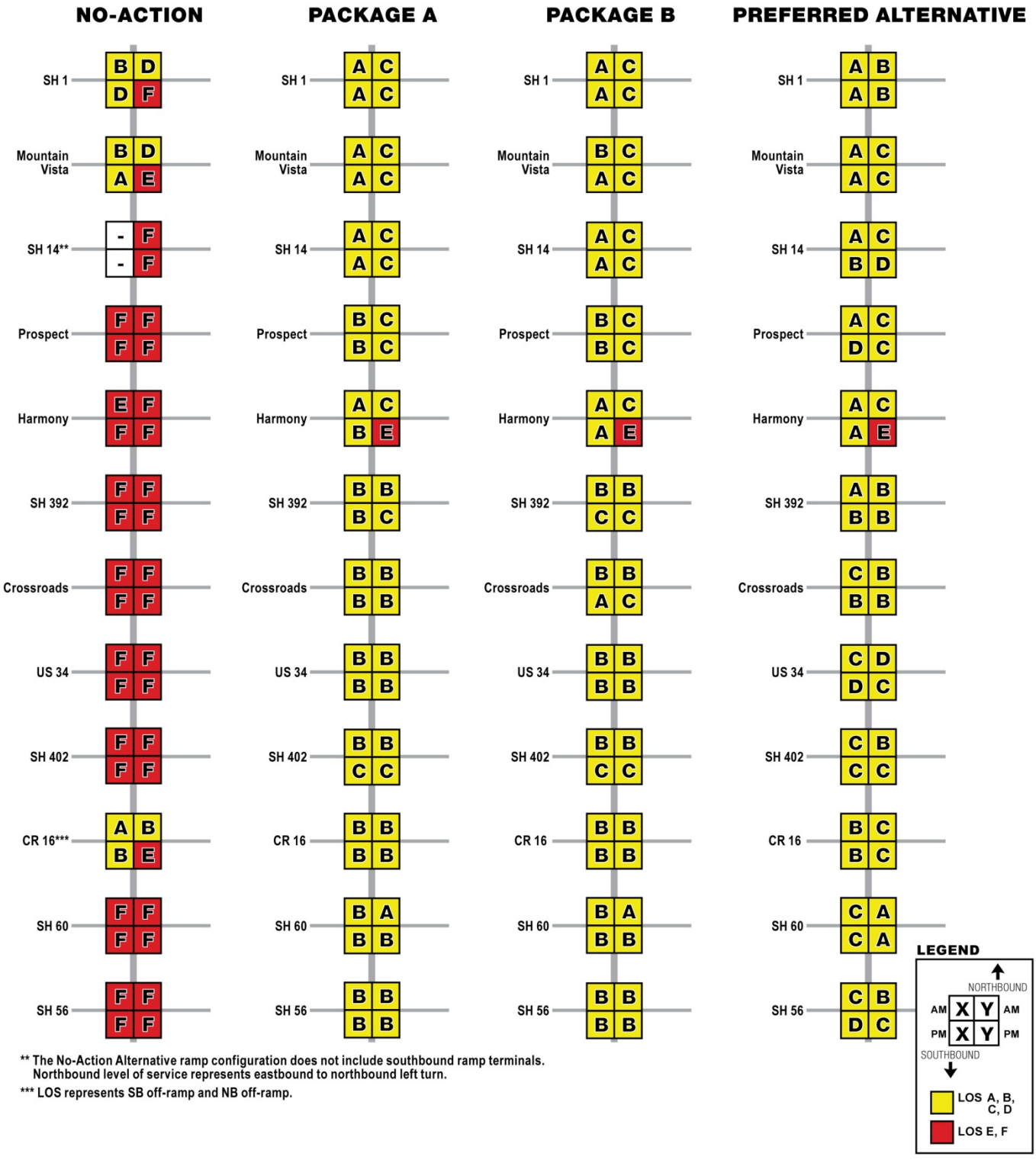
Figures 4-20 and 4-21 provide the level of service for ramp terminal intersection at each interchange for the No-Action Alternative, Package A, Package B and the Preferred Alternative. As shown, the Harmony Road northbound off ramp would operate at LOS E during the PM peak hour under Package A and the Preferred Alternative. Measures to improve operation such as a northbound to westbound flyover were considered. A flyover would impact right-of-way and access along Harmony Road and would have a significantly higher cost. Based on a review of the interchange operation, other facilities with similar volumes, public input and review with the local agencies, it was determined that LOS E operation during the limited period would be preferred to the additional impacts associated with a flyover.

Table 4-13 Interchange Ramp Terminal Intersections Operating at LOS E or F Planning Horizon

Component	No-Action		Package A		Package B		Preferred Alternative	
	AM	PM	AM	PM	AM	PM	AM	PM
SH 1 to SH 14	1	3	0	0	0	0	0	0
SH 14 to SH 60	15	16	0	1	0	1	0	1
SH 60 to E-470	5	4	0	0	0	0	0	0
E-470 to US 36	1	4	1	4	1	4	1	4
Total	**22**	**27**	**1**	**5**	**1**	**5**	**1**	**5**

While much effort was taken to develop interchange configurations consistent with each communities' transportation vision during the EIS process, over time the needs of the communities may change. When necessary, communities can work with CDOT and FHWA, at their own expense, to reevaluate alternative interchange configurations and intersection control options to meet their changing needs.

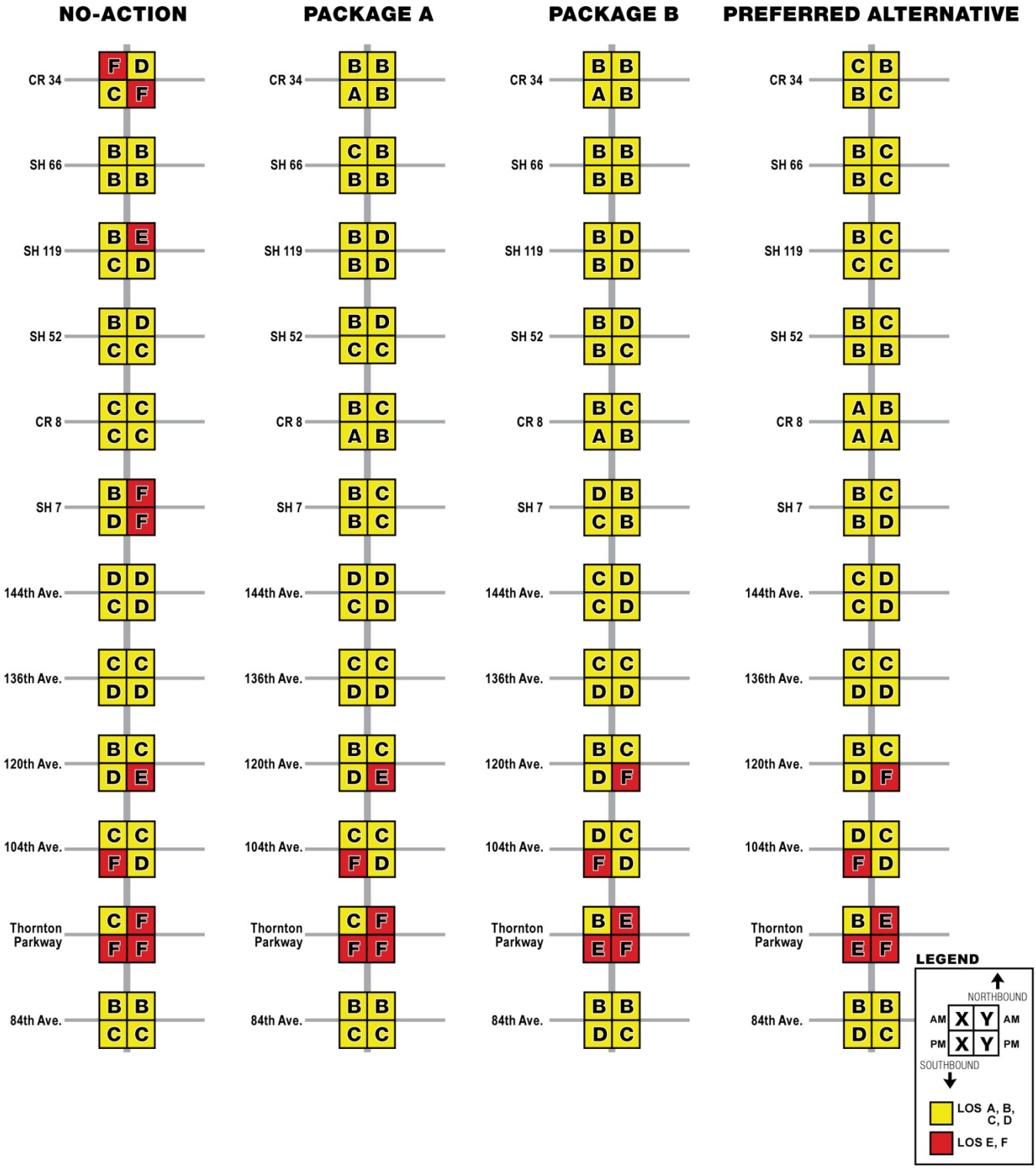
Figure 4-20 Peak Hour I-25 Interchange Ramp Terminal Intersection LOS SH 1 to SH 56 Planning Horizon



** The No-Action Alternative ramp configuration does not include southbound ramp terminals. Northbound level of service represents eastbound to northbound left turn.

*** LOS represents SB off-ramp and NB off-ramp.

Figure 4-21 Peak Hour I-25 Interchange Ramp Terminal Intersection LOS CR 34 to 84th Avenue Planning Horizon



Note: E-470 is a freeway-to-freeway direct connect with I-25 and therefore does not have an LOS for a ramp terminal interchange.

4.4.8 Transit Stations and Car Pool Lots

At intersections providing access to transit stations, queuing and delay were evaluated. If operation was found to be LOS E or F, and queuing would exceed available storage, signalization and/or auxiliary lanes were recommended. All new station access points include left and right turn deceleration lanes to reduce impacts to through traffic and comply with the State Highway Access Code.

A traffic impact analysis was conducted for all commuter rail, bus and BRT stations, and for all carpool lots along the I-25 corridor. Each traffic impact analysis included trip generation estimates for the station or carpool lot, 2035 traffic volume projections for the No-Action Alternative and for either Package A, Package B, or the Preferred Alternative, and levels of service at station accesses and at nearby intersections that would be impacted by station or carpool lot activity (where appropriate). For commuter rail and commuter bus stations, a separate traffic impact report was prepared for each station. For most Package B BRT stations, Preferred Alternative Express Bus stations and for all carpool lots, traffic impact analyses were included as part of an interchange report since these facilities were typically adjacent to the interchange. Each of the following sections provides a summary of the trip generation impact and an intersection level of service impact for each station.

Figure 4-22 summarizes carpool lot analyses for the No-Action Alternative. The No-Action Alternative would consist of existing carpool lots only. Analyses at these locations show that three access points would operate at LOS F.

Package A would expand most existing carpool parking lots to accommodate future demand. Package A also would add new carpool lots at SH 1, SH 14 and Prospect Road. **Figure 4-23** summarizes the results of the transit station and carpool parking lot analyses. At each lot, the driveway access would operate at LOS D or better and the trip generation impact to the major cross street generally would be less than 10 percent.

Package B would consist of the same carpool lots as Package A but some lots would be expanded or new lots added to accommodate parking demands generated by BRT. As shown in **Figure 4-24**, most parking access points would operate at good levels of service and have a relatively small impact to major cross-street traffic volumes. The BRT station at SH 119 would have a traffic impact three times greater than Package A, but a better level of service at the lot access. This is because the traffic impact analysis showed that the station would generate sufficient traffic to warrant signalizing the access point under Package B but not under Package A. Traffic impact analyses at the SH 257/US 34 station show access points operating at LOS F; but indicated that the station would not generate sufficient trips to warrant signalization of the access point.

The Preferred Alternative would include the same carpool lots as Package B but these have been resized to accommodate the travel demand associated with the Preferred Alternative. As shown in **Figure 4-25**, most parking access points would operate at good levels of service and have a relatively small impact to major cross-street traffic volumes. The Express Bus station at SH 119 would have a traffic impact three times greater than Package A, but a better level of service at the lot access. This is because the traffic impact analysis showed that the station would generate sufficient traffic to warrant signalizing the access point under Package B but not under Package A. Traffic impact analyses at the SH 257/US 34 station show access points operating at LOS F; but indicated that the station would not generate sufficient trips to warrant signalization of the access point.

Figure 4-22 No-Action Alternative Carpool Parking Lot LOS Planning Horizon

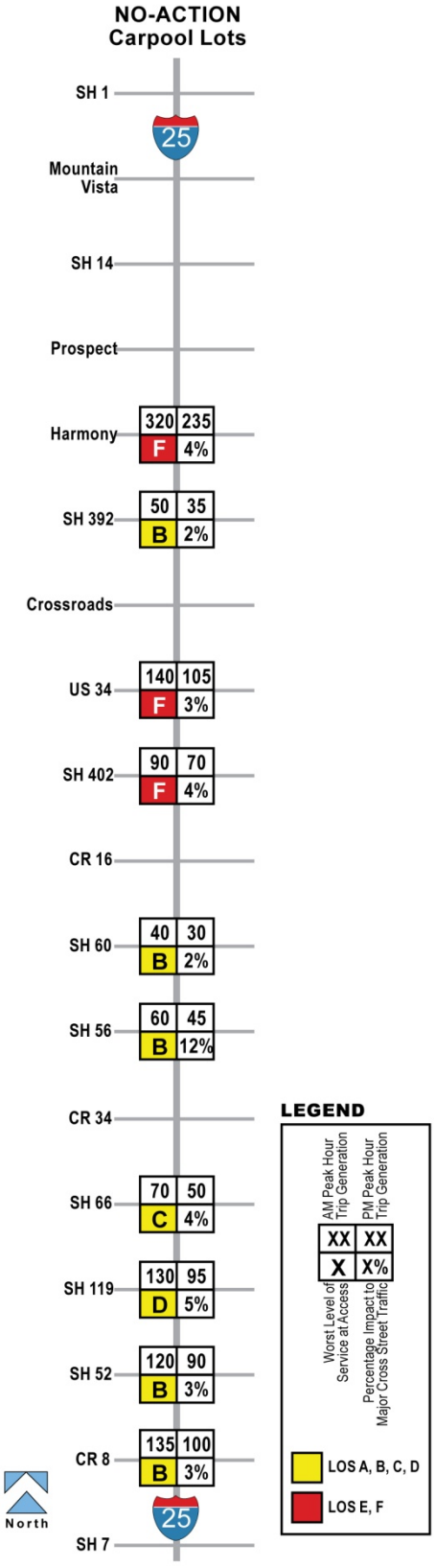


Figure 4-23 Package A Transit Station and Carpool Parking Lot LOS Planning Horizon

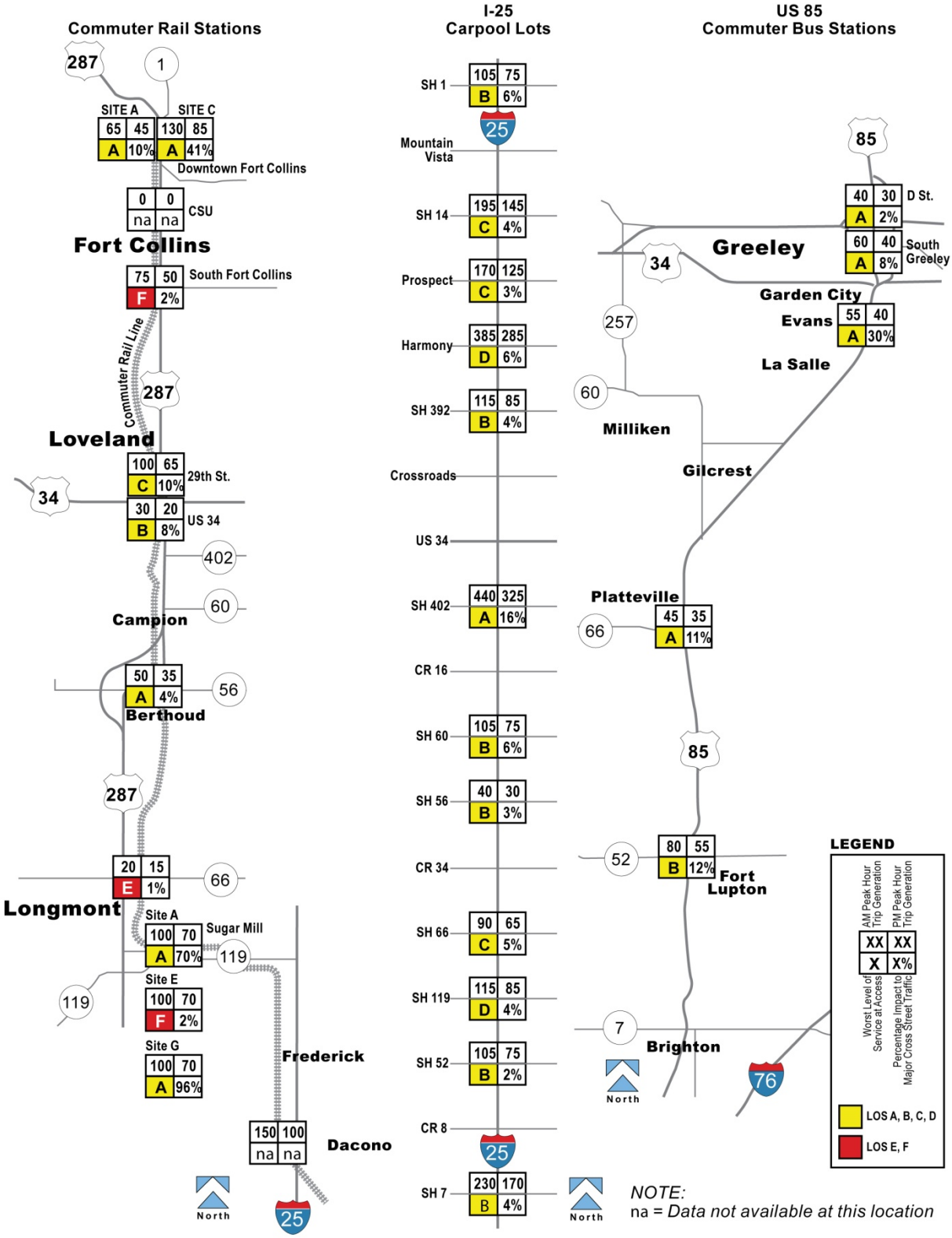


Figure 4-24 Package B Transit Station and Carpool Parking Lot LOS Planning Horizon

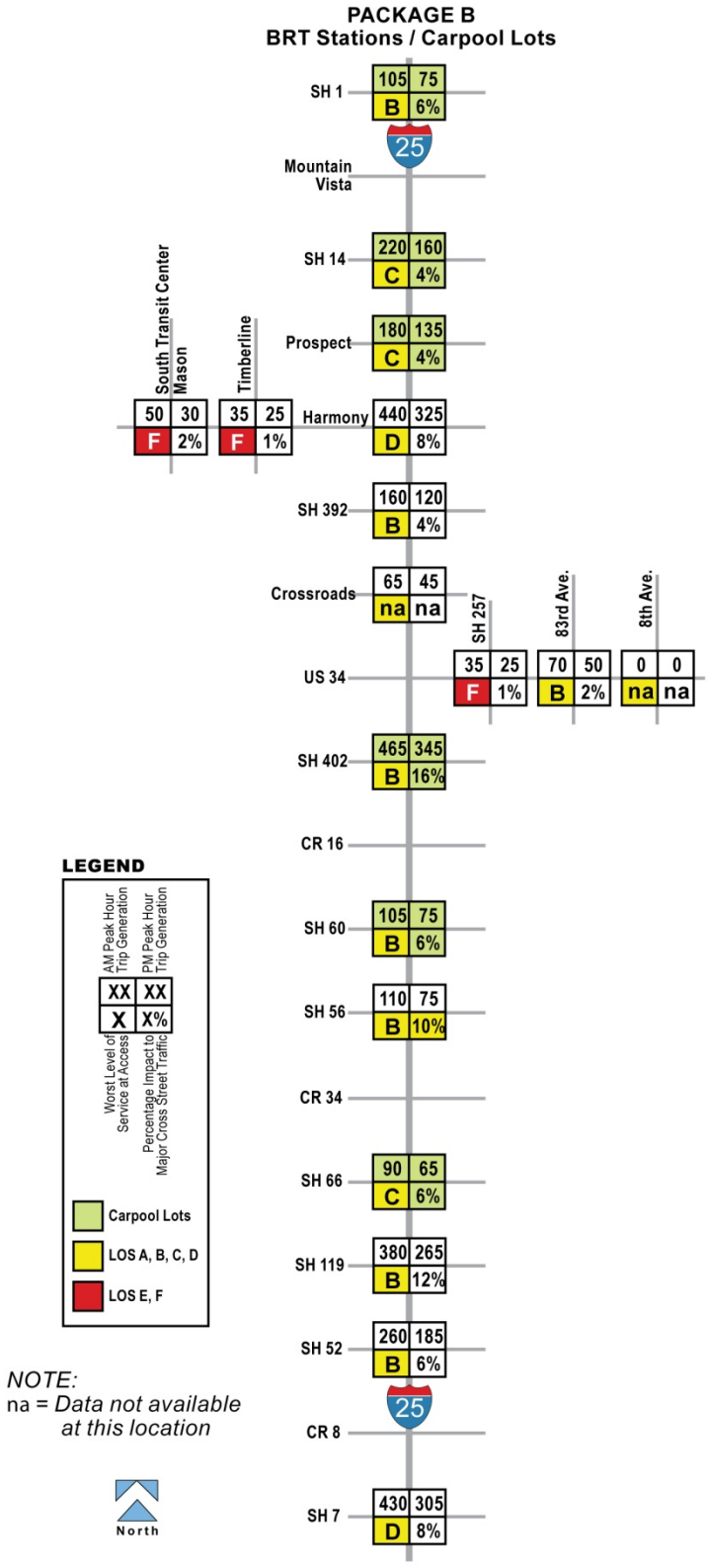
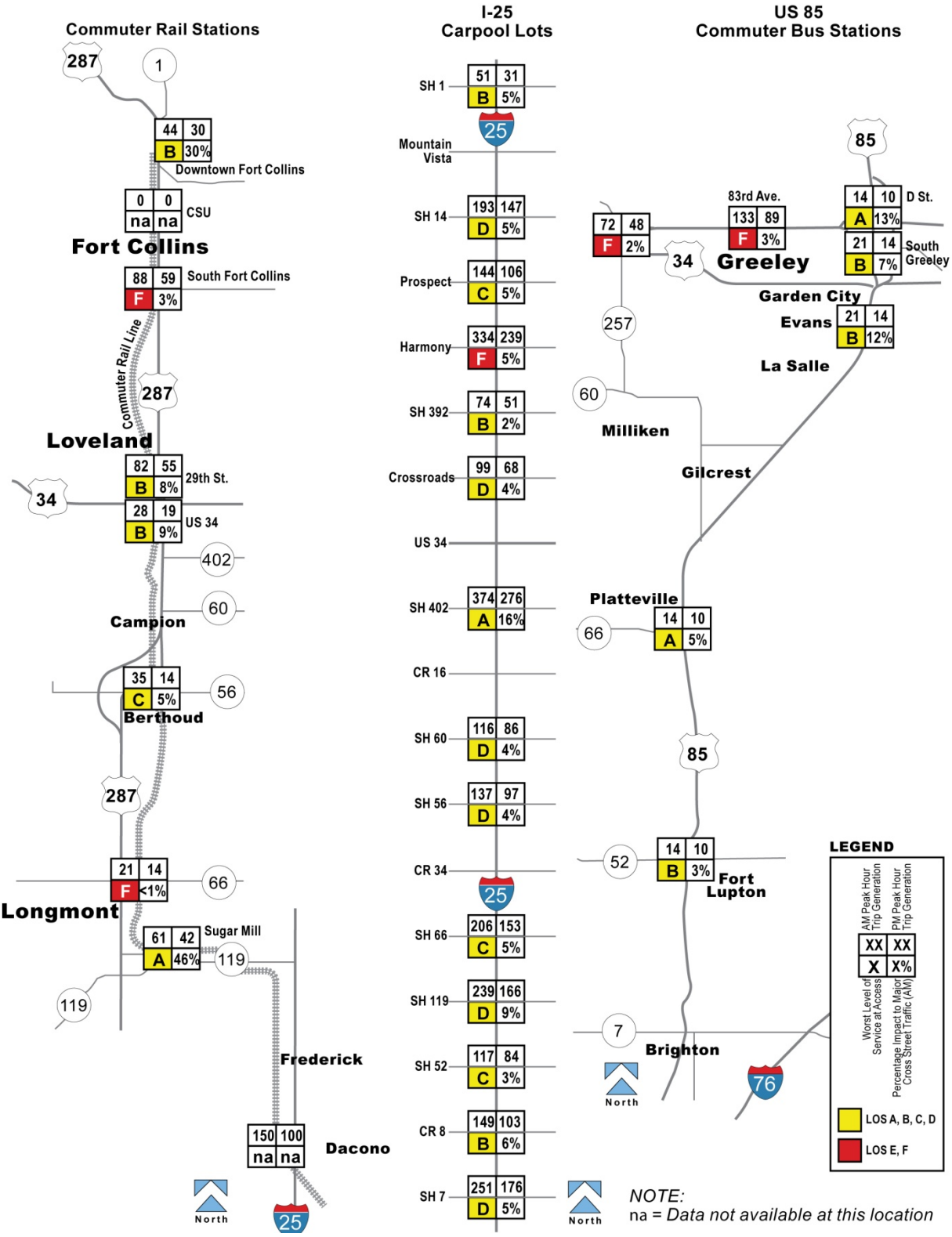


Figure 4-25 2035 Preferred Alternative Transit Station and Carpool Parking Lot LOS Planning Horizon



4.4.9 Maintenance Facilities

4.4.9.1 Package A Commuter Rail Maintenance Facility

An estimated total of 200 daily trips (both in and out) would be generated by approximately 90 employees at the facility.

At the proposed Vine Drive and Timberline site in Fort Collins, traffic generated by the maintenance facility would amount to less than 1 percent of the total traffic in the area throughout the day. It is anticipated that both Vine and Timberline would be widened in 2035 under the No-Action Alternative, and signal warrants would likely be met well before 2035 at this location. Access to the site would be accommodated by a single-lane approach, stop-controlled intersection. A traffic signal would not be warranted at the access location, and the anticipated signalized intersection at Vine and Timberline would accommodate traffic from the site without improvements.

At the proposed site located at CR 10 and CR 15 in Berthoud, traffic generated by the maintenance facility would amount to less than 2 percent of the total traffic along CR 15 throughout the day. Adjacent roads would accommodate anticipated traffic volumes generated by the maintenance facility. Access to Bunyan Avenue (CR 46) would be accommodated by a single-lane approach, unsignalized intersection.

4.4.9.2 Package A Commuter Bus Maintenance Facility

An estimated total of 190 daily trips would be generated by approximately 85 employees at the facility. The facility would accommodate the maintenance of both commuter buses and feeder buses. An additional 130 bus trips also would be generated by commuter buses and feeder buses each day.

Trips generated by the commuter bus maintenance facility would amount to less than two percent of the traffic on Trilby Road in Fort Collins. Because trips to the facility would be spread throughout the day without significant peak hour activity, signalization would not be warranted at either the access from Portner Road or at the existing Trilby Road/Portner Road intersection in Fort Collins. Also, the nearest major intersections, at Lemay Avenue and at College Avenue, are currently signalized and would be able to accommodate this additional traffic. Similarly, an access off 31st Street in Greeley would not require signalization and the intersection of US 85 and 31st Street in Greeley, about 0.4 miles to the west, is currently signalized. The current signal would be able to accommodate this additional traffic.

4.4.9.3 Package B BRT Maintenance Facility

An estimated total of 200 daily trips would be generated by approximately 90 employees at the facility. The facility would accommodate the maintenance of both BRT vehicles and feeder buses. An additional 150 bus trips also would be generated by commuter buses and feeder buses each day.

The proposed maintenance facility at Portner Road in Fort Collins would generate about 200 employee and 150 bus trips per day. This would amount to less than 2 percent of the total traffic on Trilby Road. Because these trips would be spread throughout the day, signal warrants would not be met at the access intersection. Also, the nearest major intersections, at Lemay Avenue and at College Avenue, are currently signalized and would be able to accommodate this additional traffic. Similarly, an access off 31st Street in Greeley would not

require signalization and the intersection of US 85 and 31st Street in Greeley, about 0.4 miles to the west, is currently signalized; the current signal would be able to accommodate this additional traffic.

4.4.9.4 Preferred Alternative Commuter Rail Maintenance Facility

The site located at CR 15 and CR 10 in Berthoud is included in the Preferred Alternative. An estimated total of 200 daily trips (both in and out) would be generated by approximately 90 employees at the facility. Traffic generated by the maintenance facility would amount to less than 2 percent of the total along CR 15 throughout the day. Adjacent roads would accommodate anticipated traffic volumes generated by the maintenance facility. Access to Bunyan Avenue (CR 10) would be accommodated by a single-lane approach, unsignalized intersection.

4.4.9.5 Preferred Alternative Express Bus/Commuter Bus Maintenance Facility

The facility proposed at 31st Street and 4th Avenue in Greeley is included in the Preferred Alternative. It would accommodate the maintenance of express buses, commuter buses, and feeder buses. An estimated total of 200 daily vehicle trips would be generated by approximately 90 employees at the facility. An additional 150 trips would be generated by buses each day.

Because these trips would be spread throughout the day, signal warrants would not be met at the access intersection off 31st Street in Greeley. The intersection of US 85 and 31st Street in Greeley, about 0.4 miles to the west, is currently signalized. The current signal would be able to accommodate this additional traffic.

4.5 Transit Operations

The addition of transit services in the build alternatives would have some impact to existing transit services in northern Colorado and Denver. **Table 4-14** compares the number of annual revenue hours of transit service currently operated in northern Colorado with the hours of service in Packages A, B and the Preferred Alternative. Package A would result in a 150 percent increase in service hours, and Package B would result in a 140 percent increase in service hours over the No-Action Alternative. The Preferred Alternative would more than double transit service in the area, increasing service hours by 115 percent.

The Preferred Alternative has fewer revenue hours of service than the other build alternatives because of differences in the operating plans. Revenue hours of service are the hours of operation when transit trains or buses are available to carry passengers. Package A includes an extensive regional feeder bus system, which accrues numerous revenue hours due to slow moving buses, while the Preferred Alternative has a more focused feeder system. The BRT system of Package B has frequent and robust I-25 bus service, including 10-minute frequency on the trunk line, to provide a regional transit system to roughly match the capacity of the commuter rail of Package A. The frequency of the Express Bus in the Preferred Alternative is scaled back due to the inclusion of commuter rail.

Table 4-14 Annual Revenue Hours of Service

Component	Revenue Hours of Service				
	Existing	No-Action	Package A	Package B	Preferred Alternative
Bus	101,720	101,720	231,740	243,530	196,980
Rail	0	0	23,370	0	23,200
Total	**101,720**	**101,720**	**255,110**	**243,530**	**220,180**

Table 4-15 lists the fleet requirements for each package of the three build packages.

Table 4-15 Fleet Requirements by Package

	Package A	Package B	Preferred Alternative
Peak Buses	32	36	33
Fleet Buses	38	43	41
Peak Rail Cars	20	N/A	24
Fleet Rail Cars	24	N/A	29
Peak Consist	3	N/A	3
Base Consist	2	N/A	2

N/A=Not applicable

4.5.1 Existing Conditions

Currently, bus service in the regional study area north of SH 52 is offered from Longmont to Denver on RTD's "L" route and between Longmont and Boulder on the "J" route and the "BOLT" route. RTD also provides local service in the City of Longmont. Bus service also is available in the City of Fort Collins on the local system (TransFort), in the City of Greeley on the local system (Greeley Evans Transit), and in the City of Loveland (COLT). A pilot program in 2010 has initiated service between Fort Collins, Loveland, and Longmont called the FLEX.

South of SH 52, RTD bus service is available to member cities with major access and transfer points at the Wagon Road park-n-Ride at I-25 and 120th Avenue and downtown Denver.

4.5.2 Package A

4.5.2.1 Commuter Rail

Commuter rail would have no impact to the planned MAX BRT service in Fort Collins. The commuter rail and the MAX BRT would have shared stations at Downtown Fort Collins, CSU, and the South Transit Center, fostering connectivity between the two services.

Local bus routes in Loveland and Longmont would have slight route modifications in order to serve the new commuter rail stations in those cities.

Package A commuter rail service would be operated as a seamless extension of RTD's FasTracks North Metro Corridor service, with few noticeable impacts to RTD passengers. Because the service would be operated as an extension, there would be no additional trains at Denver Union Station. However, passengers to/from the north would use Denver Union Station and other stations within the FasTracks service district; therefore, there would be more passenger activity at these FasTracks stations. North Metro Corridor trains continuing to Fort Collins could be more crowded, and there could be less seating available for RTD area patrons.

The addition of a second track for commuter rail on Atwood Street in Longmont would result in the removal of on-street parking on both sides of the street between 3rd Street and 8th Street. Northbound roadway traffic would be shifted from west of the train tracks to east of the train tracks. In addition, driveway access to parcels along the east side of Atwood Street would be shifted to alley access or cross-street access where necessary. The double track system for Package A commuter rail was considered to be a conservative system therefore, no further consideration was given to providing an additional maintenance road in this package.

4.5.2.2 Commuter Bus and Feeder Bus

The new commuter bus service also would connect to existing and future feeder and local bus routes on the east side of the project area. In downtown Denver, commuter bus service would circulate through downtown with a layover location similar to existing FREX service. Because it remains on street, it would not impact operations or capacity at Denver Union Station.

As a result of the new feeder routes, Fort Collins Route 5, 6, and 7 would be extended to the Harmony Road Park-n-ride.

4.5.2.3 Effect on RTD Ridership

In Package A some riders would shift from the FasTracks North Metro Corridor rail line to the Package A commuter rail. Ridership on the Northwest Rail Corridor would remain approximately the same. North Metro Corridor ridership would be reduced, by 22 percent. These riders would instead board the rail extension at one of the Package A stations.

4.5.3 Package B

4.5.3.1 Bus Rapid Transit

BRT service would terminate at the South Transit Center in Fort Collins, fostering connectivity to/from the MAX BRT and local routes. Some of the South Transit Center's bus bay capacity (three vehicles per hour) would be utilized for Package B BRT vehicles. In downtown Denver, BRT vehicles would connect with FasTracks and other RTD services at, but would remain on-street and circulate through downtown. This would add ten vehicles to the downtown street system during the peak hours, on streets that currently serve FREX routes. This is considered to be a nominal impact by both the City and County of Denver and by RTD; therefore, no mitigation measures are required.

4.5.3.2 Effect on RTD Ridership

Package B BRT would decrease ridership on FasTracks Northwest Rail Corridor and North Metro Corridor rail lines by providing an entirely new mode of travel. Ridership at the Northwest Rail Corridor stations would drop approximately 10 percent while the North Metro

Corridor stations would decrease approximately 26 percent. The decrease to the Northwest Rail Corridor line reflects faster travel times on BRT for some residents of Longmont, Broomfield, Westminster, and Thornton to downtown Denver.

4.5.3.3 Feeder Bus

As a result of the new feeder bus routes in Loveland, the COLT crosstown route would be extended to the Crossroads station. Future local service also would connect to BRT service as applicable.

4.5.4 Preferred Alternative

4.5.4.1 Commuter Rail

Commuter rail would have no impact to the planned MAX BRT service in Fort Collins. The commuter rail and the MAX BRT would have shared stations at Downtown Fort Collins, CSU, and the South Transit Center, fostering connectivity between the two services.

Local bus routes in Loveland and Longmont would have slight route modifications in order to serve the new commuter rail stations in those cities.

Preferred Alternative commuter rail service would be operated as a seamless extension of RTD's FasTracks North Metro Corridor service, with few noticeable impacts to RTD passengers. Because the service would be operated as an extension, there would be no additional trains at Denver Union Station. However, passengers to/from the north would use Denver Union Station and other stations within the FasTracks service district; therefore, there would be more passenger activity at these FasTracks stations. North Metro Corridor trains continuing to Fort Collins could be more crowded, and there could be less seating available for RTD area patrons.

For planning evaluation purposes, diesel multiple units were initially assumed as a commuter rail technology for the North I-25 EIS rail line. Planning for the North Metro corridor has progressed and identified electric multiple units as its vehicle technology. Prior to implementation of commuter rail for North I-25, vehicle technologies available at that point in time will be assessed to identify a technology suitable for both corridors to maintain interoperability.

The addition of a passing track for commuter rail on Atwood Street in Longmont would result in a slightly narrower cross section along Atwood Street from 22 feet to 20 feet northbound and southbound. The cross section include a 12-foot travel lane and an 8-foot parking lane in each direction.

4.5.4.2 Express Bus

Express bus service would terminate at the South Transit Center in Fort Collins, fostering connectivity to/from the MAX BRT and local routes. Some of the South Transit Center's bus bay capacity (two vehicles per hour) would be utilized for express bus vehicles. In downtown Denver, express bus vehicles would connect with FasTracks and other RTD services, but would remain on-street and circulate through downtown. This would add thirteen vehicles to the downtown street system during the peak hours, on the grid streets that currently serve FREX routes. This is considered to be a nominal impact by both the City and County of Denver and by RTD; therefore, no mitigation measures are required.

4.5.4.3 COMMUTER BUS

The commuter bus service would connect to existing and future feeder and local bus routes on the east side of the project area. In downtown Denver, commuter buses (one per hour each direction) would circulate through downtown with a layover location similar to existing FREX service at Elitch Gardens. Because the buses remain on street, they would not impact operations or capacity at Denver Union Station.

4.5.4.4 EFFECT ON RTD RIDERSHIP

The combination of routes in the Preferred Alternative would cause some riders to shift from the FasTracks Northwest Rail Corridor and North Metro Corridor rail lines to the commuter rail or bus lines. Ridership on the Northwest Rail Corridor would drop approximately 10 percent, mostly at the Longmont station. Boardings at the North Metro Corridor end-of-line station at SH 7 would be similarly affected, dropping corridor ridership by 13 percent. These riders would instead board the rail extension at one of the Preferred Alternative stations.

4.5.5 Transit User Experience

The user experience while waiting for transit services would be quite different between Package A, Package B, and the Preferred Alternative. Package A commuter rail users would wait on a station platform located along the existing BNSF freight rail line and an arterial street. Package A commuter bus users would wait at a station located off of US 85. Package B BRT users would wait on a platform located in the median of I-25. Under Package B, the high traffic volumes and speeds along I-25 would create a loud and relatively less pleasant experience when waiting for transit than under Package A commuter rail or commuter bus.

Under the Preferred Alternative, commuter rail users would wait on a station platform located along the existing BNSF freight rail line and an arterial street. Commuter bus users would wait at a station located off US 85. Express bus users would wait on a platform located near I-25, usually near an interchange. Unlike Package B, the express bus stations along I-25 for the Preferred Alternative are not located in the median of the freeway.

4.6 SAFETY

All three build packages would improve safety conditions for the traveling public, when compared to the No-Action Alternative. Safety improvements would come in the form of:

- Replacing functionally obsolete I-25 infrastructure
- Upgrading existing treatments at at-grade crossings for commuter rail
- Providing an alternative transportation mode that is safer than highway travel
- Improving highway geometry

4.6.1 Functionally Obsolete I-25 Infrastructure

Without upgrades, many interchanges north of SH 66 and south of E-470 would be considered functionally obsolete in 2035. Functionally obsolete structures would create safety concerns because they generally do not provide adequate spacing between intersections to accommodate the necessary queuing. In addition, they would operate over capacity, creating long delays and frustrating drivers. All three build packages would replace all interchanges

considered functionally obsolete north of E-470. **Table 4-16** summarizes the functionally obsolete interchanges that would be replaced or modified under each package.

Table 4-16 Functionally Obsolete Interchange Modifications

Structure Location	No-Action	Package A	Package B	Preferred Alternative
SH 1	Minor Rehab	New Structure	New Structure	New Structure
Mountain Vista	No Modifications	New Structure	New Structure	New Structure
SH 14	Minor Rehab (EB) Major Rehab (WB)	New Structure	New Structure	New Structure
Prospect	Minor Rehab	New Structure	New Structure	New Structure
Crossroads Boulevard	Minor Rehab (SB)	New Structure	New Structure	New Structure
US 34	Minor Rehab	New Structure	New Structure	New Structure
SH 402	Minor Rehab (SB)	New Structure	New Structure	New Structure
CR 16	Minor Rehab	New Structure	New Structure	New Structure
SH 60	Minor Rehab (SB)	New Structure	New Structure	New Structure
SH 56	Minor Rehab	New Structure	New Structure	New Structure
CR 34	No Modifications	New Structure	New Structure	New Structure
SH 52	Minor Rehab	Widened Structure	Widened Structure	Widened Structure
136th Avenue	Minor Rehab	Minor Rehab	Minor Rehab	Minor Rehab
120th Avenue	Minor Rehab	Minor Rehab	Minor Rehab	Minor Rehab

In total, Package A would construct 87 new structures compared to 94 new structures in Package B and in the Preferred Alternative. Package A would modify 15 existing structures while Package B would modify 24. Package A would rehabilitate 22 structures while Package B and the Preferred Alternative would rehabilitate 16 structures (see **Table 4-17**).

Table 4-17 Structure Replacement Summary

	No Action	Package A	Package B	Preferred Alternative
New Structures	0	87	94	94
Existing Structures Modified	0	15	24	24
Major Rehabilitations	4	0	0	0
Minor Rehabilitations	64	22	16	16

4.6.2 Commuter Rail Grade Crossings

Rail service at new grade crossings and additional rail service at existing crossings would increase the exposure for motorists crossing the commuter rail alignment. The commuter rail design includes grade separations or lights and gates at each crossing affected by Package A or the Preferred Alternative. With these improvements, the overall exposure factor along the commuter rail alignment would be reduced to levels better than along the freight rail alignment under the No-Action Alternative. A list of each of the grade crossing improvements included in Package A and the Preferred Alternative is provided in **Chapter 2** *Alternatives*.

4.6.3 Safety Statistics for Rail versus Highway

Commuter rail transit generally provides safer operations for passengers than both bus and highway facilities. Data from the National Transit Database (NTD) (FTA, 2006d) and the National Highway Traffic Safety Administration [NHTSA], 2006) show that passenger rail systems result in noticeably fewer annual injuries than highway facilities. Over the 4-year period from 2002 through 2005, commuter rail had an annual average of 18 injuries and travel on highways resulted in an annual average of 59 injuries per 100 million passenger miles traveled. Bus facilities generally have similar safety statistics to highways.

4.6.4 Highway Crash Prediction

Accident prediction estimates in the Draft EIS were provided by CDOT Division of Transportation Development. The same prediction methodology was used for crash prediction in this Final EIS. Safety Performance Functions (SPFs) developed by CDOT Safety and Traffic Branch were used for highway crash prediction. The SPF relates the number of lanes and the average annual daily traffic volume to the number of anticipated crashes on a particular section of freeway. While the estimation of crashes for Package A is relatively straightforward using the SPFs, estimating crashes for Package B and the Preferred Alternative required a more complex set of estimations. Detailed information about the safety analysis can be found in the Safety Analysis of Alternatives (CDOT, 2007).

Table 4-18 summarizes the predicted crash estimates for Package A, Package B and the Preferred Alternative. As shown, the build packages are expected to experience between 4,000 and 4,400 crashes annually. The total column is the sum of predicted injury, fatality and property damage only crashes.

The analysis found that on I-25, the No Action Alternative has the highest crash rate. The difference between Package A and the Preferred Alternative is less than two percent, and the difference between the Preferred Alternative and Package B is about eight percent. The Preferred Alternative crash prediction is somewhat higher than Package A or B because it carries more vehicles and has more lanes on I-25 than either of the other packages. By comparing the predicted crashes to the vehicle miles of travel on I-25 the build packages can be evaluated on their safety relative to the demand each package accommodates. The No-Action Alternative would experience the highest number of crashes per vehicle miles of travel at 1.41. Package B would experience the lowest rate at 1.32.

Table 4-18 2035 Crash Prediction Comparison

		No Action		Package A		Package B		Preferred Alternative	
		Injury + Fatality	Total	Injury + Fatality	Injury + Fatality	Injury + Fatality	Total	Injury + Fatality	Total
SH 1	SH 14	34	91	40	110	43	121	43	121
SH 14	SH 60	256	972	326	1,210	297	963	364	1,213
SH 60	E-470	496	1,876	560	2,079	530	1,809	550	1,895
E-470	US 36	261	1,036	214	839	301	1,168	300	1,170
Total		1,047	3,975	1,140	4,238	1,171	4,061	1,257	4,399
Annual VMT (in millions)		2,818		3,196		3,079		3,214	
Accidents Per Million VMT		1.41		1.33		1.32		1.37	

4.7 FREIGHT TRAFFIC

Freight mobility in the study area is provided by both trucks on the highway network and trains on the rail network. This section describes these components.

4.7.1 Truck Freight

Currently, freight traffic on I-25 ranges from 2,300 trucks-per-day on the north end of the corridor, near SH 1, to 11,200 trucks-per-day on the south end near the Denver Metro Area. This constitutes between 11 and 14 percent of the total daily traffic volume on the highway. Future freight traffic is anticipated to grow at an annual rate that would range from just over 2 percent on the south end to slightly more than 3 percent on the north end. This would constitute between 8 percent and 14 percent of the total traffic on the corridor. These percentages are not anticipated to differ substantially under the No-Action Alternative or the three build packages.

Under the No-Action Alternative, truck traffic would be subjected to 67 minutes of delay between SH 7 and 20th Street due to congestion along the corridor compared to existing travel time. Under all the build packages, freight traffic would benefit from level of service and travel-time improvements over No-Action Alternative conditions north of E-470. Package B and the Preferred Alternative would also provide some travel time improvement south of E-470 with the additional lanes being added to that section. The Preferred Alternative would provide the improvement to travel time and operations for freight traffic. It is worth noting, however, that trucks would be prohibited from using the TELs in Package B and the Preferred Alternative. Therefore, they would be subject to the higher traffic densities in GPLs in those packages.

Package A, Package B, and the Preferred Alternative would re-grade I-25 north of WCR 34, between WCR 38 and SH 56, north of SH 402, and south of US 34 so that the maximum grade on the corridor would be 4 percent. The regraded sections would enable heavy vehicles to better maintain the posted speed limit throughout the corridor than under the No-Action Alternative.

4.7.2 Rail Freight

There are several existing rail lines in the project vicinity that carry freight into, out of, and through the study area. The busiest rail freight line is the Union Pacific Greeley Subdivision, which parallels US 85 on the east side of the study area and serves 24 to 26 freight trains per day. The BNSF Front Range subdivision generally parallels US 287 on the west side of the study area, and carries 3 to 5 freight trains per day. Both railroads operate branch lines in the study area that serve up to one round trip per day. The Great Western Railroad operates several lines within the study area which typically serve several trains per week. Details of these operations are presented in the Existing Rail Conditions White Paper (August 2004) developed in support of the North I-25 EIS.

Under the No-Action Alternative, freight activity on these rail lines would be relatively unaffected by highway growth. As private entities, the railroads are expected to manage rail freight traffic growth within their corridors. Under Package A, one new track would be constructed adjacent to the existing BNSF Front Range subdivision track between Fort Collins and Longmont. Crossovers would be provided to allow freight and passenger traffic to use either track as appropriate to maintain both commuter train and freight train movements. Given the current train movements on this BNSF line, it is anticipated that freight traffic could be maintained in conjunction with passenger traffic. Under Package B, there are no modifications anticipated for the freight rail network, and conditions would be similar to the No-Action scenario. Under the Preferred Alternative, new track adjacent to the existing BNSF Front Range subdivision track would only be constructed for three segments. These passing track segments would allow for holding freight or commuter rail trains while oncoming commuter rail trains pass. Given the current freight train movements on this BNSF line, it is anticipated that the single track with segments of new passing track could accommodate both freight and passenger traffic.

4.8 PEDESTRIAN AND BICYCLE SYSTEMS

Packages A, B, and the Preferred Alternative would have both physical and temporary operational impacts to bicycle and pedestrian systems. More detailed information about impacts to existing and planned trails is provided in **Section 4.9.2** *Packages A, B, and the Preferred Alternative* of this EIS and in **Appendix C**.

Bicycle and pedestrian facilities include sidewalks, marked and unmarked bicycle routes, bicycle lanes, and a variety of trail types. On-street bicycle routes typically include signing and striping to separate bicycles from vehicular traffic, or they may exist informally, established by consistent use by bicyclists. On-street bicycle routes are designed to promote local trips, regional commuting, and connections to off-street trails. Off-street bikeways, trails, or paths are typically physically separated from vehicular traffic through the use of barriers or by following separate routes. These off-street bikeways can provide regional links for bicyclists, pedestrian, equestrians, or other recreational users.

The regional study area includes numerous communities, each having varying degrees of existing and planned bicycle/pedestrian facilities. To document the bicycle/pedestrian facilities within the regional study area, GIS data, public bicycle/trail maps, comprehensive plans, and a variety of planning maps were collected from municipalities, counties, and state agencies during the Draft EIS. The mapping included trails, paths, bicycle lanes, and bicycle routes. Due to the size and complexity of the regional study area, sidewalks were not accounted for under

bicycle/pedestrian facilities unless the sidewalk was specifically designated on a locally approved plan or map as being for the sole purpose of recreation. This section only includes bicycle/pedestrian facility data within approximately 750 feet on either side of where improvements are proposed (see **Figure 4-26**). Reports or documents used in gathering data are listed in **Chapter 11** *References*.

4.8.1 Existing Conditions

Figure 4-26 illustrates the three major regional trails located in the project area. The American Discovery Trail corridor is comprised of both on-street and off-street facilities. This trail is part of a larger, national system that provides bicyclists a route across the United States. The Colorado Front Range Trail (CFRT) corridor is a collaborative effort which is being overseen by Colorado State Parks. The CFRT corridor has existing and proposed sections from numerous municipalities that allow for non-motorized vehicles to travel along the Front Range from New Mexico to Wyoming. The St. Vrain Valley trail is a portion of the CFRT; however, this is a loop trail that connects many communities within the center of the regional study area. There are also numerous proposed bicycle/pedestrian facilities in the project area. **Figure 4-26** also shows the bicycle and pedestrian facilities mapped for the project area with the regional facilities highlighted.

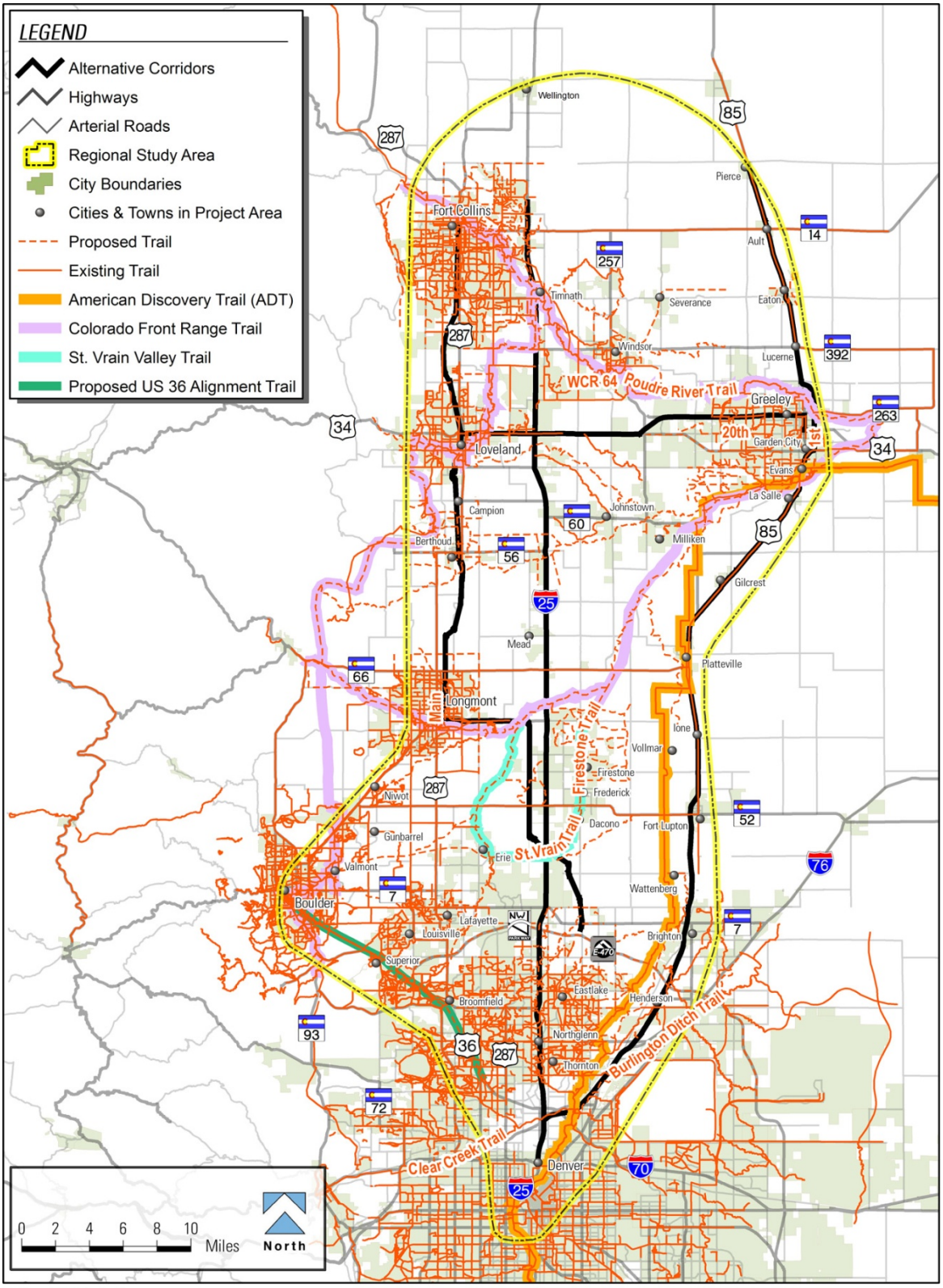
4.8.2 No-Action Alternative

The No-Action Alternative generally would not affect bicycle/pedestrian facilities along the I-25 corridor. However, programmed safety improvements to interchanges and standard maintenance to existing structures might result in minor effects. Under the No-Action Alternative, traffic congestion would worsen, and increased vehicle emissions would continue to deteriorate regional air quality. This could affect bicycle/pedestrian users, particularly near heavily-used roadways.

4.8.3 Package A

Improvements along I-25 generally would facilitate future bicycle/pedestrian travel, because reconstruction plans would include provisions for future bicycle/pedestrian facilities. Widening activities along I-25 would temporarily impact several bicycle/pedestrian facilities where they cross the interstate, but the improved interchanges would improve connections to sidewalks. In addition, the new bridges over waterways included in the accompanying drainage design would accommodate planned future trails. Existing and proposed bicycle and pedestrian crossings along the commuter rail alignment would generally have an additional track to cross and result in additional delays to crossing bicycle or pedestrian traffic at the rail stations. At the rail stations, the pedestrian overpass would provide a safe pedestrian connection over the rail and connect to the nearest local road. The feeder bus routes and commuter bus service would not noticeably affect bicycle/pedestrian facilities, other than providing an incentive and transportation option for bicyclists and pedestrians to access commuter rail via the bus service.

Figure 4-26 Bicycle and Pedestrian Facilities within the Regional Study Area



Note: Excludes sidewalks.

4.8.4 Package B

Impacts for Package B attributable to improvements along I-25 generally would be the same as those described for Package A. However, transit station connections to existing and proposed bicycle and pedestrian facilities would be located along the interstate alignment rather than along the BNSF alignment or US 85. Proposed BRT service mostly would occur within existing right-of-way and therefore would not directly impact bicycle/pedestrian facilities. However, proposed queue jumps along US 34 would require acquisition of some new right-of-way within Greeley, which could affect some pedestrian and bicycle crossing facilities. Similarly, feeder bus routes would not noticeably affect bicycle/pedestrian facilities, other than providing an incentive and transportation option for bicyclists and pedestrians to access BRT via the bus service.

4.8.5 Preferred Alternative

Improvements associated with the Preferred Alternative would generally facilitate future bicycle/pedestrian travel, because reconstruction plans would include provisions for future bicycle/pedestrian facilities. Widening activities along I-25 would temporarily impact several bicycle/pedestrian facilities where they cross the interstate, but the improved interchanges would improve connections to sidewalks. In addition, the new bridges over waterways included in the accompanying drainage design would accommodate planned future trails.

Proposed express bus service would mostly occur within existing right-of-way and therefore would not directly impact bicycle/pedestrian facilities. At stations, a proposed pedestrian overpass would connect land uses and trail systems on the east and west of I-25. The proposed overpasses would provide a safe pedestrian connection across I-25. Proposed queue jumps along US 34 would require acquisition of some new right-of-way within Greeley, which could affect some pedestrian and bicycle crossing facilities.

A number of the existing and proposed bicycle and pedestrian crossings along the commuter rail alignment would have an additional track and/or maintenance road to cross resulting in additional delays to crossing bicycle or pedestrian traffic. At two of the rail stations, a pedestrian overpass would provide a safe pedestrian connection over the rail. At rail stations where there is no pedestrian pass, pedestrians would be directed to the nearest local road.

The feeder bus routes and commuter bus service would not noticeably affect bicycle/pedestrian facilities, other than providing an incentive and transportation option for bicyclists and pedestrians to access commuter rail via the bus service.

4.9 CONSTRUCTION IMPACTS

This section describes construction impacts for all four alternatives. It also describes construction methods for highway and transit components as well as mitigation considerations.

4.9.1 No-Action Alternative

The No-Action Alternative would involve minimal construction over what is currently programmed, approved, and funded and therefore would result in minimal construction impacts.

4.9.2 Package A, Package B, and the Preferred Alternative

Construction of Package A, Package B, or the Preferred Alternative would create short-term construction impacts throughout the construction period. Construction detours would create short-term impacts on local traffic circulation and congestion. Delays to the traveling public and inconvenience to corridor residents (partial closures where only local traffic is allowed) would occur. Bridge reconstruction would result in the partial closure of local streets and highway ramps. Detour traffic would put additional pressure on adjacent streets. Lane closures on I-25 would most likely occur during night-time periods or on weekends. Ramp closures at interchanges could also occur.

Temporary Impacts to Bicycle and Pedestrian Facilities

The North I-25 EIS has identified the following seven pedestrian and bicycle facilities which may be temporarily impacted during the construction phase of Package A, Package B, or the Preferred Alternative:

- Spring Creek Trail, City of Fort Collins (Package A)
- Lanyon Park Trail, City of Longmont (Package A and Preferred Alternative)
- Box Elder Creek Trail, Town of Wellington (Package B and Preferred Alternative)
- Big Dry Creek Trail, City of Westminster (Package B and Preferred Alternative)
- Harmony Road Bike Lane, City of Fort Collins (Package A, B, and Preferred Alternative)
- 30 Road Bike Lane, City of Loveland and City of Fort Collins (Package A, B, and Preferred Alternative)
- McWhinney Boulevard On-Street Facility, City of Loveland (Package A, B, and Preferred Alternative)
- Hillsborough Ditch Trail, City of Loveland (Package A, B, and Preferred Alternative)
- Kennedy Street On-Street Facility, City of Northglenn (Package A, B, and Preferred Alternative)
- Ken Pratt Boulevard On-Street Facility, City of Longmont (Preferred Alternative)

All of the identified facilities are affected under the potential construction scenarios through a closure. Regardless of the construction scenario, the duration of closure would be less than the time needed for construction of the full project. Additionally, there will be no alteration to the existing trail alignments, no changes in ownership, nor any permanent adverse physical effects to the resource. For additional information regarding effects to recreational trails, see **Section 5.4** *Use of Sections 4(f) Resources*.

4.9.2.1 CONSTRUCTION METHODS

The highway and transit construction methods presented in this section were developed to ensure that the project as defined is constructible. The final construction staging and the benefits of constructing specific elements first (e.g., the transit component) will not be determined until final design. Appropriate public input will be incorporated. Innovative traffic management techniques will be considered as the final design proceeds after completion of the Final EIS.

4.9.2.2 HIGHWAY CONSTRUCTION METHODS

Highway construction methods would not vary significantly between Package A, Package B, and the Preferred Alternative. In general, highway construction would likely occur in the following order: utility relocation/adjustments, bridge reconstruction/widening, roadway demolition, excavation and grading, storm sewer, retaining walls and pavement. It is anticipated that the highway would be opened in stages as it is constructed. Sequencing of construction packages and the overall timeframe of construction have not been finalized and would be dependent on funding. If the construction methods described in this section change substantially after selection of a contractor, the contractor will coordinate with CDOT and the public. If the changed construction methods result in additional environmental impacts, these will be evaluated in a supplemental NEPA study.

Under Package B and the Preferred Alternative, construction of the TELs would include additional signing/striping, buffers, and barriers. These elements would be constructed in the same way as the adjacent GPLs. In addition, the electronic system required for the management of the lanes (toll collection and/or enforcement) will need to be installed. These structures are similar to facilities already constructed along toll roads and managed lanes in the Denver area, and do not present construction issues.

4.9.2.3 TRANSIT CONSTRUCTION METHODS

The disparate transit systems included in the build packages would require differing construction approaches. However, some elements would be common to both systems, including stations, park-and-ride facilities, and carpool lots.

Commuter rail, BRT/Express Bus, and commuter bus stations typically would include boarding and alighting platforms constructed of either pre-cast or cast-in-place concrete. Simple pre-fabricated canopy structures and other station amenities (benches, ticket machines, etc.) would be installed after completion of concrete work. The park-and-ride lots and carpool lots would be constructed using methods similar to those for roadway construction, including cast-in-place concrete (curb and gutter, walks, etc.), asphalt paving (parking surfaces), and station amenities (landscaping, lighting, etc.).

Commuter Rail

Construction of the commuter rail system of Package A or the Preferred Alternative would involve three major components in addition to stations: trackwork, grade crossings/separations, and signal/communication systems. These are described below. In general, the new track and/or maintenance road would be constructed at-grade at the same elevation as the adjacent BNSF track between Fort Collins and downtown Longmont. New track would be constructed from downtown Longmont to the FasTracks North Metro end-of-line station on Thornton. Under the Preferred Alternative, new passing track would be

constructed at four locations along the line and a maintenance road would be constructed adjacent to the BNSF track between Fort Collins and downtown Longmont. At locations where grade separations are constructed, substantial earthwork would be required. Typically, the commuter rail system would be constructed in the following order: site preparation and clearing, utility relocation, grading, ballast, ties, track installation, stations, and signal/communication systems.

For trackwork, the rail, ballast, ties, and other track components would be delivered by rail and/or truck. It is anticipated that other activities, such as grading/excavation and construction of bridges, and retaining walls would be constructed using conventional methods, and materials would be hauled by truck.

Several different approaches would be used for grade crossings. For at-grade crossings, it is anticipated that weekend crossing closures would be required, as is typical when freight railroads reconstruct grade crossings. These closures would allow for installation of ballast, ties, and rail across the roadway plus the replacement of the roadway surface. Although it is possible to perform these tasks at night, freight railroads have found greater efficiencies can be achieved with one 48-hour to 60-hour weekend closure per crossing than with several weeks of 8-hour to 10-hour night-time closures. For grade separations, the general sequence would be to build the approaches within the railroad right-of-way and then use either night or weekend closures to erect the girders and bridge decks at the actual separation. For pedestrian overpasses, stair and elevator towers would be erected in the rail corridor or station area. Freight rail traffic would be suspended for several hours to erect the girders and bridge decks. Given the relatively low freight train density along the BNSF line, it is anticipated that this suspension could be scheduled with the railroad to minimize freight disruptions.

The signal system would be installed to ensure safe operation of commuter rail trains and freight trains on the track. It would consist of a network of signals, switches, and ancillary equipment installed after track construction is complete. This network would monitor and control train movements plus control crossing protection for at-grade crossings. The communication system would use a fiber-optic backbone to transmit data throughout the system back to the central control facility. Components that may be connected to this backbone include closed-circuit television, a public address system, variable message signs, and a voice communication system. Installation generally would include trenching for the backbone and connecting lines, installation of cabinets and other elements, and then connecting them all together.

Bus Rapid Transit/ Express Bus

Construction of the TELs generally would follow the same approach as described earlier for highway construction. Amenities specific to BRT and Express Bus would include pedestrian overpasses between parking facilities and platforms. These would be erected over the I-25 travel lanes and would require night-time closures of the interstate for girder and bridge deck construction. This would be similar to the erection of new or replacement roadway overpasses.

4.9.3 Construction Mitigation Measures

The FHWA requires the development of a traffic management plan (TMP) for all projects (see 23 CFR 630, Subpart J). The plan development process is outlined in the Guide, *Developing and Implementing Transportation Management Plans for Work Zones* (FHWA, 2005). It is

assumed that this guide will be followed during the development of traffic control for the North I-25 project. The guide lays out the development of TMPs, subject to public input. Plans would include:

- TMP Roles and Responsibilities
- Project Description
- Existing and Future Conditions
- Work Zone Impacts Assessment Report
- Work Zone Impact Management Strategies
- TMP Monitoring
- Contingency Plans
- TMP Implementation Costs

Elements specific to North I-25 that should become part of the plan include:

- Maintain the same number of existing lanes on I-25 at all times except during off-peak travel times.
- Coordinate bridge demolition and detour routes to avoid overloading local streets with detour traffic.
- Limit peak period ramp closures to low-volume interchanges.
- Limit closure of high-volume ramps to nights or weekends.
- Maintain access to local businesses/residences.
- Begin implementation of travel demand management programs. The federal rule defines the following travel demand management strategies in the Guide (FHWA, 2005), some of which are already proposed as part of the North I-25 effort (marked with an asterisk below), and some of which should be evaluated for use during construction:
  - Transit service improvements*
  - Transit incentives
  - Shuttle services
  - Ridesharing / carpooling incentives*
  - Park-and-ride promotion*
  - HOV lanes
  - Toll / congestion pricing
  - Ramp metering*
  - Parking supply management
  - Variable work hours
  - Telecommuting

4.10 SUMMARY OF TRANSPORTATION FINDINGS

Package A, Package B, and the Preferred Alternative would have similar physical and operational impacts on transportation facilities. Most notably, they would handle the vehicle volumes on I-25 and in the project area very similarly. For example, differences would be expected in the total VMT and freeway VMT generated; however, there would be very minor differences in delay and travel time, which indicates that the alternatives would handle traffic with similar effectiveness. Put another way, the build packages would attract different levels of traffic, but from the driver's perspective, each package would function similarly: drivers would experience similar travel times and similar levels of traffic delay. The exception to these general findings would be the difference between GPLs and TELs. According to the transportation analysis, the difference in travel time between the Package A GPLs and the TELs in Package B or the Preferred Alternative would be substantial, as the travel time with the TELs is about half that of the GPLs on I-25 between SH 1 and 20th Street.

Similarly, although the transit components of the build packages would operate differently and use different modes and availability of service, they attract transit ridership of the same order of magnitude. For Package A, commuter rail and commuter bus combined would attract slightly less ridership than the BRT in Package B. The Preferred Alternative generates an amount of ridership in-between that of Package A and Package B. However, the user experience and travel time would be different between the alternatives. Passengers on commuter rail have a different experience than passengers on buses, but commuter rail from Fort Collins to Denver would take about 30 minutes longer than BRT or express bus.

Key transportation impact findings are summarized below.

Compatibility with area plans:

- Packages A, B, and the Preferred Alternative were designed to accommodate future population and employment growth, increased traffic volumes, and expansion plans of municipalities in the regional study area, and to be compatible with both regional and local area transportation plans. Transit improvements were designed to connect and be compatible with RTD's planned FasTracks rail system. Highway improvements were designed to be compatible with DRCOG's 2035 MVRTP and the North Front Range 2035 Regional Transportation Plan. Funding for improvements to I-25 and passenger rail right-of-way preservation are included in the NFR Fiscally Constrained 2035 RTP and the DRCOG Fiscally Constrained 2035 RTP.

Travel Demand:

- Transportation analyses used 2035 travel demand forecasts. These forecasts were produced through the use of a multi-modal travel demand model, which was developed by combining the existing DRCOG and NFRMPO travel demand models. Additional expertise was utilized for toll and revenue forecasts.

- Package A projected 2035 daily traffic volumes between SH 1 and E-470 would generally be 10 percent to 30 percent higher than the No-Action Alternative, while Package B 2035 daily traffic projections would be about 5 percent to 25 percent higher than the No-Action Alternative. The Preferred Alternative projected 2035 daily traffic volumes would generally be 5 percent to 40 percent higher than the No-Action Alternative.

- In general, the increased traffic on I-25 with the build alternatives would reduce traffic on the roadways parallel to I-25. Package A and the Preferred Alternative would have a greater effect on parallel arterial volumes than Package B in the northern area. In the Denver metropolitan area, only Package B and the Preferred Alternative have some effect on parallel arterials due to the addition of the TELs.
- The build alternatives would attract more highway users (people) to I-25 than the No-Action Alternative. Package B would generate slightly more total users than Package A, The Preferred Alternative would have the highest level of users at over 990,000 daily.
- The transit components of Package A, Package B, and the Preferred Alternative would not appreciably reduce I-25 highway traffic volumes because transit ridership projections are an order of magnitude smaller than vehicular demand projections.
- Transit ridership (not including the feeder buses) in 2035 would be about 5,800 riders per day for Package A, about 6,800 riders for Package B, and about 6,500 riders per day for the Preferred Alternative. Station activity for commuter rail, BRT, and express bus would increase from north to south while station activity for the commuter bus generally would be the same at stations along the route.

System Operation:

- In 2035, travel time from SH 1 to 20th Street using GPLs would be 16 minutes faster in Package A and 15 minutes faster in both Package B and the Preferred Alternative than the No-Action Alternative travel time.
- In 2035, Package B travel time from SH 1 to 20th Street when using the TELs would be 51 minutes faster than the No-Action Alternative. The Preferred Alternative travel time in the TELs from SH 1 to 20th Street would be 57 minutes faster than the No-Action Alternative in 2035.
- Packages A, B and the Preferred Alternative would experience similar peak hour operation at the interchange ramp terminals but the Preferred Alternative would operate with substantially fewer miles of congestion than either Package A or Package B.
- South of E-470, Package B and the Preferred Alternative would experience fewer miles of congestion than Package A due to the increased capacity with the additional TELs.
- Using Package A commuter rail for a trip from Fort Collins' South Transit Center to Denver Union Station would be 39 minutes faster than driving in the No-Action Alternative in 2035. Using Package B BRT for the same trip would be 62 minutes faster than driving in the No-Action Alternative. Under the Preferred Alternative, commuter rail for a trip from Fort Collins' South Transit Center to Denver Union Station would be 38 minutes faster than driving; and express bus would be 69 minutes faster than driving in the No-Action Alternative.
- Using Package A commuter bus for a trip from downtown Greeley to downtown Denver would be 24 minutes faster than driving in the No-Action Alternative. Using Package B BRT for the same trip would be 60 minutes faster than driving in the No-Action Alternative. Using the Preferred Alternative express bus would be 68 minutes faster than driving in the No-Action Alternative in 2035.

Safety:

- Package A, Package B and the Preferred Alternative would modify newer interchange structures, rehabilitate older structures, or replace the existing structures to address geometric and capacity-related safety concerns.
- To minimize the potential for conflict between the proposed commuter rail line and private automobiles, railroad grade crossings were designed to comply with both FRA and RTD safety standards through either grade separation or other treatment and warning methods. Along the BNSF alignment in Package A and the Preferred Alternative, existing grade separations would be maintained but no new structures would be added. For the new alignment from Longmont to North Metro Corridor in Package A, six new grade separations would be incorporated into Package A and the Preferred Alternative.
- Package A, Package B and the Preferred Alternative are expected to experience approximately the same number of total crashes in 2035 with slightly fewer injury and fatality crashes anticipated under Package B.
- Barrier-separated sections of Package B were predicted to have fewer accidents than the same sections of I-25 in Package A.

Freight Traffic on I-25:

- Package A, Package B nor the Preferred Alternative would affect the current growth rate for freight traffic (estimated to be two percent on the south end and three percent on the north end). In general, freight traffic would benefit from improved traffic operations in the GPLs in Package A and the Preferred Alternative and re-grading of the highway to a maximum grade of four percent included in all build packages. Travel time and operation would be most improved for freight traffic in the Preferred Alternative. In Package B and the Preferred Alternative, freight traffic would be prohibited from using the TELs.

Pedestrian and Bicycle Systems:

- The No-Action Alternative generally would not affect bicycle/pedestrian facilities along the I-25 corridor.
- All build package improvements along I-25 generally would facilitate future bicycle/pedestrian travel, because reconstruction plans would include provisions for future bicycle/pedestrian facilities to cross the interstate and new bridges over waterways would accommodate planned trails.
- Pedestrian and bicycle connections to transit stations in Package A and the Preferred Alternative would be located along the BNSF rail line, US 85 and I-25.
- Pedestrian and bicycle connections to transit stations in Package B would be focused along I-25.
- Proposed queue jumps along US 34 and US 85 would require acquisition of some new right-of-way, which could affect some pedestrian crossings and on-street bicycle facilities.

Construction Impacts:

- Highway construction methods would be similar for all build packages, although Package B and the Preferred Alternative would require additional signage and striping, as well as

installation of the toll collection system. In all packages, new highway segments would open as phases are completed and a design-build method could be sought for any of the package improvements.

- Transit construction methods in Package A and the Preferred Alternative would temporarily disrupt freight rail traffic for the construction of grade crossing improvements and construction of the vertical elements of the commuter rail stations.
- Transit construction methods in Package B would require night-time closures of the interstate to install the vertical elements of the BRT stations in the interstate median.
- Regardless of the package selected, there would be temporary noise, vibration, and visual impacts, although they would be minimized as much as possible. Furthermore, mitigation measures would be needed to avoid air quality, water quality, and traffic impacts. The 404 permit would assign additional detailed mitigation measures.
- Under all build packages, travel demand management measures could be used to minimize traffic impacts.

Differences and similarities between packages are listed below. Details are provided in the **Tables 4-18** through **4-21** that follow.

Similarities among the Build Alternatives:

- Plan compatibility
- Impacts to bicycle and pedestrian facilities
- Daily average speed on I-25
- Operation of I-25 from SH 1 to SH 14

Small Differences among the Build Alternatives:

- Total volumes on I-25 south of 136th Avenue
- Daily freeway VMT
- Automobile travel time during peak periods on I-25 GPLs
- Ridership on commuter transit services
- Number of carpool lots with access at LOS E or F
- Number of structures being replaced or modified north of E-470

Large Differences among the Build Alternatives:

- Traffic volumes on I-25 between Prospect Road and CR 34
- Automobile travel time on I-25 in TELs compared to GPLs
- Operation on I-25 between E-470 and US 36
- Transit user experience
- Transit travel times between modes
- User safety on commuter rail versus highway or bus

Table 4-19 Effect on Highway Travel Demand

Evaluation Factor	No-Action	Package A	Package B	Preferred Alternative
Daily Users on I-25 (People)	871,700	947,300	921,000	990,200
Average daily traffic volumes SH 1 to E-470	119,500	140,700	132,100	141,700
Average daily traffic volumes E-470 to US 36	201,500	204,000	212,900	212,900
Vehicle Miles of Travel Freeway	16,666,000	17,663,000	17,162,000	17,739,000
Vehicle Hours of Travel Freeway	363,000	364,000	360,000	361,000
Average Freeway Speeds	46	49	48	49
Daily volumes on northern parallel arterials	--	Reduced 5-13% compared to No-Action	Reduced 3-4% compared to No-Action	Reduced 3-13% compared to No-Action
Daily volumes on southern parallel arterials	--	No net change	Slight reduction	Slight reduction

Table 4-20 Physical Characteristics

Evaluation Factor	No-Action	Package A	Package B	Preferred Alternative
New Structures	0	87	94	94
Modified Structures	0	15	24	24
Rehabilitated Structures (Major and Minor)	68	22	16	16
Bicycle and pedestrian facilities	No direct physical impact; increase in traffic congestion and vehicle emissions could affect users of proximate facilities	Temporary closures on trails that cross the interstate due to widening and construction Additional track crossing for trail users crossing the commuter rail alignment New connections to pedestrian facilities at interchanges	Temporary closures on trails that cross the interstate due to widening and construction New connections to pedestrian facilities at interchanges and at BRT station areas	Additional track crossing for trail users crossing the commuter rail alignment Temporary closures on trails that cross the interstate due to widening and construction New connections to pedestrian facilities at interchanges and at Express Bus station areas

Table 4-21 Summary of I-25 Operation Evaluation

Evaluation Factor	No-Action	Package A	Package B	Preferred Alternative
Travel Time (minutes)				
General purpose lanes - SH 1 to 20th St.	133	117	117√	107√
Tolled express lanes - SH 1 to 20th St.	116	102	65√	64√
Mainline I-25 at LOS E or F (miles)				
AM peak hour	56	16	30	11√
PM peak hour	75	44	45	17√
Merge/Diverge Locations at LOS E or F				
AM peak hour	58	30	34	13√
PM peak hour	64	34	52	26√
Interchanges at LOS E or F				
AM peak hour	20	3	2	1√
PM peak hour	26	6√	6√	6√
Annual Crashes (predicted)	3,975	4,238	4,061	4,399
Crashes per VMT	1.41	1.33	1.32√	1.37

√ Indicates package with best evaluation factor value.

Table 4-22 Summary of Transit Operation Evaluation

Evaluation Factor	No-Action	Package A	Package B	Preferred Alternative
Ridership(daily riders)				
On commuter services	0	5,850	6,800√	6,500
Special event weekday	N/A	225 to 475	225 to 450	250 to 500√
Special event weekend	N/A	650 to 1,200	550 to1,075	700 to 1,250√
Market Transit Share (percent)				
Commuters to Denver living north of SH 66	<1%	55%√	45%	50%
Travel Time (minutes)				
South Transit Center to Downtown Denver	132 minutes (in GPLs) 159 minutes via FREX	93 minutes	70 minutes	94 minutes (commuter rail) 63 minutes (express bus)√
Downtown Greeley to Downtown Denver	156 minutes (in GPLs)	132 minutes	96 minutes	88 minutes√

√ Indicates package with best evaluation factor value.
N/A=Not Applicable

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