CHAPTER 4 TRANSPORTATION IMPACTS

This chapter compares the impacts of the No-Action Alternative and Packages A and B on each mode of the transportation system. Impacts are presented by package, but, in some cases, are also presented by component for more detailed information (see **Chapter 2** *Alternatives* for more information about package components). Reporting by component was most effective for impacts that could be defined within finite limits, such as transit ridership, station boardings, or highway volumes. System-wide impacts, such as vehicle miles of travel (VMT), were more appropriately reported by alternative because VMT is affected by all the interrelated parts of a transportation system.

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 (Packages A and B) 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

Packages A and B would be compatible with most local and regional transportation plans. These plans describe various roadway and transit improvements. In most cases, neither Package A nor Package B would preclude these improvements.

Packages A and B are specifically compatible with the following plans for the reasons stated:

- The Denver Regional Council of Governments' (DRCOG, 2005) *2030 Metro Vision Regional Transportation Plan* (*Metro Vision*) because the design in each package accommodates lane expansion and interchange improvements up to SH 7.

- The *North Front Range 2030 Regional Transportation Plan* (NFRMPO and others, 2004) because the I-25 interchange design in each package accommodates lane expansion on Prospect Road, Harmony Road, and US 34. The NFRMPO's 2030 fiscally constrained plan identifies some funding for I-25 improvements and commuter rail right-of-way preservation.
- The *Upper Front Range 2030 Regional Transportation Plan* (FHU, 2004) because the I-25 interchange design in each package accommodates the expansion of SH 52.
- The *Draft Larimer County Transportation Plan* (FHU and others, 2006) because the I-25 interchange design in each package accommodates expansion of SH 392.
- The City of Loveland *2030 Transportation Plan* (LSA Associates, 2007) because the I-25 interchange design in each package accommodates expansion of Crossroads Boulevard.
- The City of Fort Collins *2004 Transportation Master Plan* (PBS&J and others, 2004) because the I-25 interchange design in each package accommodates expansion of Harmony Road.
- The FasTracks Plan because Package A 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, neither Package A nor B would preclude other planned FasTracks improvements.

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

- *Weld County Roadway Classification Plan* (FHU, 2002a)
- *Greeley Comprehensive Transportation Plan Mobility 2020* (FHU, 2002b)

Improvements included in Packages A and B are not included in the fiscally constrained plans for the Upper Front Range or DRCOG.

4.1.2.3 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 2030 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 2030 Regional Transportation Plan* to meet the needs of all travelers in the Upper Front Range. The improvements also would be compatible with the *2030 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. However, both of these plans identified commuter rail as being needed along the I-25 corridor rather than the BNSF corridor based on the results of a transportation alternatives feasibility study previously conducted in the area.

Though generally compatible with the Fort Collins *2004 Master Transportation Plan*, Package A's commuter rail line component would use some of the same right-of-way as the proposed Mason Transportation corridor bus rapid transit (BRT). The City of Fort Collins has received approval from FTA to proceed into project development for design and construction of the Mason Corridor. The North I-25 EIS process will evaluate options to address the potential rail and BRT right-of-way conflict. These options include but are not limited to: modifying the location of the rail alignment; modifying the amount of double-track rail and any associated rail operations; or ending the Package A rail alignment at the southern Mason Corridor BRT terminus and requiring a direct transfer of transit passengers.

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.

Commuter Bus

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

4.1.2.4 PACKAGE B

Tolled Express Lanes

The addition of capacity and improved interchanges along I-25 under Package B would be compatible with DRCOG's *Metro Vision, North Front Range 2030 Regional Transportation Plan* and Upper Front Range *2030 Regional Transportation Plan*. The tolled express lanes (TELs) also would be compatible with the *Statewide 2030 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 *Metro Vision* is the only plan that specifically cites the need for 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. However, both plans identified commuter rail along I-25 as the preferred mode, not BRT.

4.2 TRAVEL DEMAND

This section describes the regional travel demand forecasting model and measures used to compare the two 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 2008 technical reports *Development and Validation of the North I-25 Draft EIS Combined Travel Model* (Jacobs, 2008e) and *North I-25 Draft EIS Travel Demand Model Application and Results* (Jacobs, 2008f).

Travel forecasts are for the year 2030. The combined travel model is based on the *North Front Range 2030 Regional Transportation Plan* (adopted by NFRMPO September 2, 2004) and the DRCOG *2030 Regional Transportation Plan* (adopted by DRCOG January 19, 2005). These plans include forecasts of 2030 population and employment, a major input to the travel model. Projects included in the 2030 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* (Jacobs, 2008f).

The North I-25 Draft 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 were prepared by Wilbur Smith Associates, a firm that has expertise in toll and revenue forecasting. The estimates were developed, based on 2030 travel demand, from the North I-25 EIS combined travel model (Wilbur Smith Associates, 2008).

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 Packages A and B. In the entire regional study area, the total VMT for any of the packages approaches 50 million VMT per day in 2030. The amount of total VMT would be somewhat higher for Packages A and B compared to the No-Action Alternative, indicating an increased overall mobility in the regional study area due to the capacity improvements on I-25. For Package B, VHT would increase along with increased VMT, but average freeway speed indicates that the increased travel would occur at a slightly higher speed than under the No-Action Alternative. For Package A, VHT would slightly decrease, resulting in a somewhat higher average freeway speed.

In other words, under Package A and Package B, travelers would be able to make longer trips at a faster average speed than compared to the No-Action Alternative. Since Package A includes I-25 capacity improvements for all travelers while Package B offers capacity improvements only for high-occupancy and single-occupancy vehicle travelers willing to pay a toll, the mobility benefits of Package B would be slightly less than those of Package A.

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

	Vehicle Miles of Travel (VMT)			
	2001 Existing	**2030 No-Action**	**2030 Package A**	**2030 Package B**
Freeway	9,709,000	15,712,000	16,559,000	16,071,000
Other Facilities	17,462,000	32,972,000	32,588,000	33,053,000
Total	**27,171,000**	**48,684,000**	**49,147,000**	**49,124,000**
	Vehicle Hours of Travel (VHT)			
	2001 Existing	**2030 No-Action**	**2030 Package A**	**2030 Package B**
Freeway	168,000	325,500	330,400	327,300
Other Facilities	584,000	1,206,100	1,196,700	1,205,100
Total	**752,000**	**1,531,600**	**1,527,100**	**1,532,300**
	Average Speed (MPH)			
	2001 Existing	**2030 No-Action**	**2030 Package A**	**2030 Package B**
Freeway	58	48	50	49
Other Facilities	30	27	27	27
Total	**36**	**32**	**32**	**32**

Note: Area of analysis is the Regional Study Area

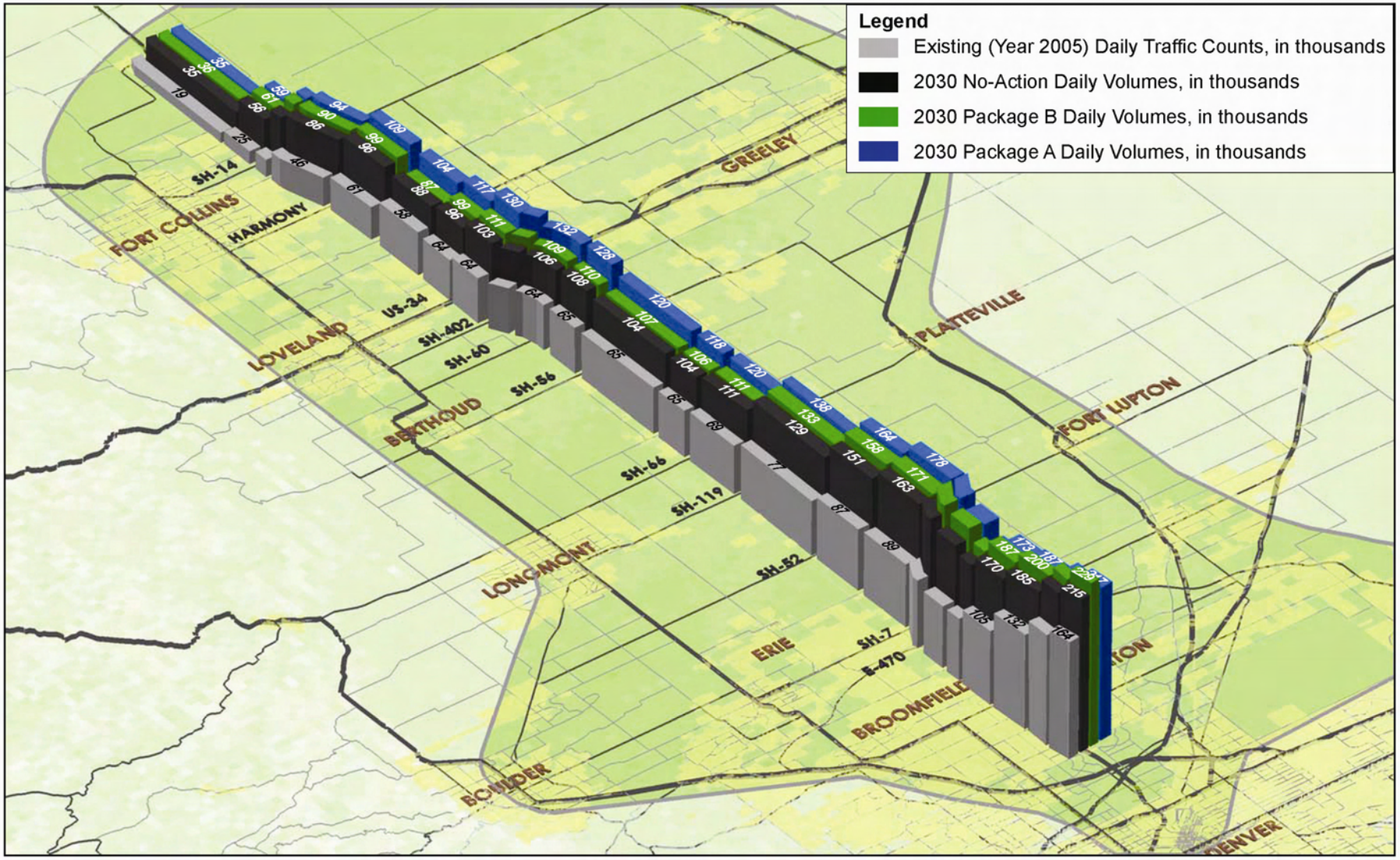
4.2.3 Highway Volumes

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 Packages A and B. As shown, projected traffic volumes for the No-Action Alternative and both Packages A and B 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. Package A would have higher daily traffic volumes than Package B along I-25 between SH 14 and SH 7, while Package B would have the higher daily traffic volumes south of SH 7.

Table 4-2 provides more detailed daily traffic volumes for existing conditions, the No-Action Alternative, and Packages A and B. 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 2030 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 daily traffic volumes would range from about 35,000 vehicles-per-day south of SH 1 to about 235,000 vehicles-per-day south of 84th Avenue. However, between Harmony Road and SH 7, Package A would have daily traffic projections from 10,000 to 20,000 vehicles-per-day higher than No-Action Alternative daily traffic projections.

Package B daily volume projections 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 9,000 vehicles-per-day near the Prospect Road interchange to a high of over 47,000 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 $3.00 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: Actual volumes are shown in **Table 4-2**.*

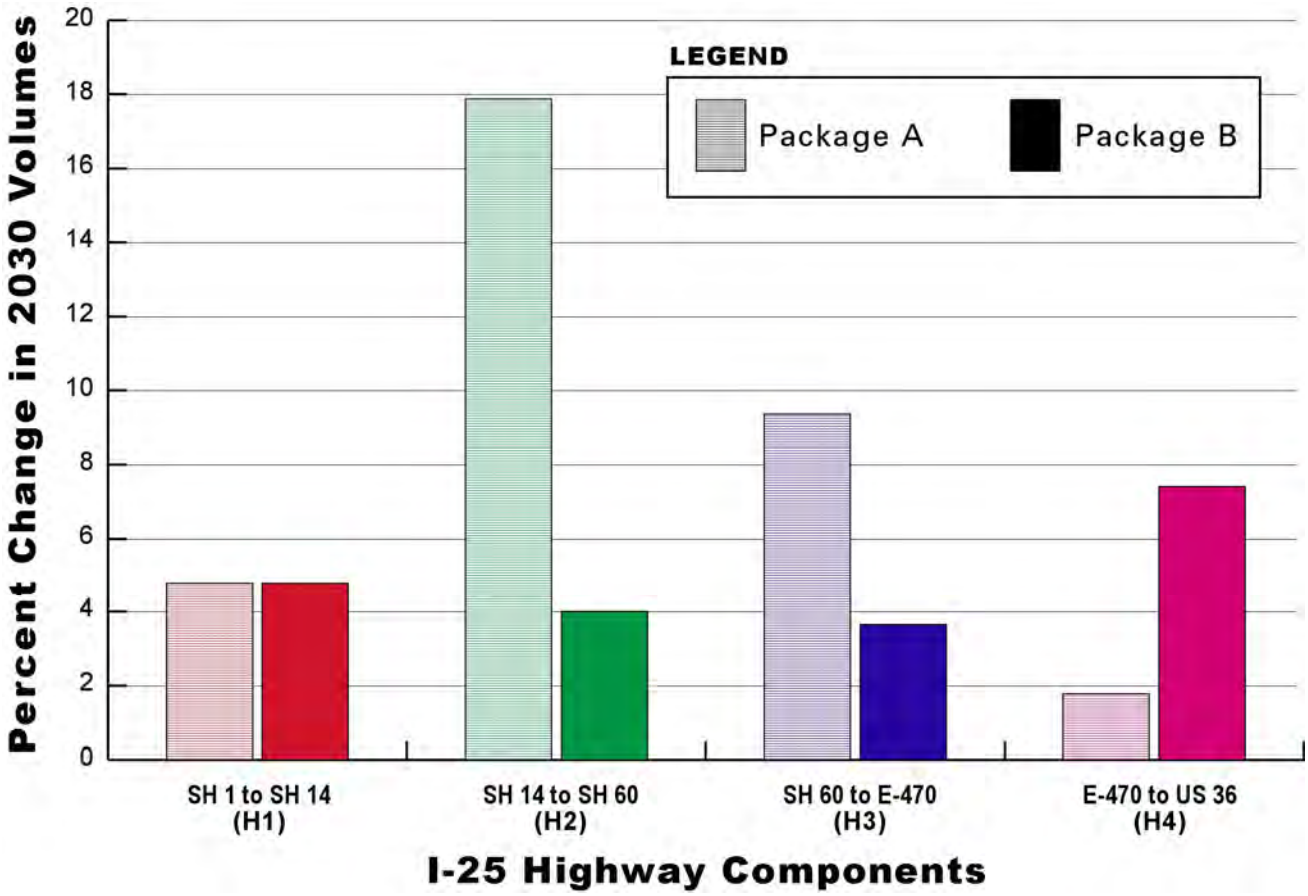
Table 4-2 Mainline I-25 Daily Traffic Volume Comparison

	Daily Traffic Volumes South of Interchange					
	Existing General Purpose Lanes	No-Action General Purpose Lanes	Package A General Purpose Lanes	Package B General Purpose Lanes	Package B Tolled Express Lanes	Package B Total Volume
SH 1	19,100	34,500	35,400	35,800	0	35,800
Mountain Vista	24,700	56,400	59,300	59,500	0	59,500
SH 14	40,800	80,700	82,700	75,800	9,700	85,500
Prospect	46,300	86,300	93,600	72,300	17,900	90,200
Harmony	61,200	96,000	109,600	72,300	26,400	98,700
SH 392	57,700	88,000	103,600	68,100	18,900	87,000
Crossroads Blvd.	63,900	96,300	116,500	74,700	23,800	98,500
US 34	64,400	103,100	130,100	87,900	23,100	111,000
SH 402	62,500	106,500	132,500	86,500	28,000	114,500
CR 16	63,800	105,500	126,700	83,000	26,300	109,300
SH 60	65,100	108,400	127,600	88,300	21,900	110,200
SH 56	65,000	104,400	119,600	86,600	19,000	105,600
CR 34	65,100	104,500	118,100	90,200	17,000	107,200
SH 66	68,600	110,700	119,800	95,300	15,700	111,000
SH 119	77,000	129,300	138,400	113,300	20,100	133,400
SH 52	86,800	151,100	163,600	127,200	30,300	157,500
CR 8	89,000	163,000	177,600	147,800	23,400	171,200
SH 7	96,700	174,200	187,300	161,800	23,400	185,200
E-470	87,200	167,200	172,700	143,200	36,600	179,800
144th Avenue	87,200	153,400	157,400	128,700	36,600	165,300
136th Avenue	104,600	170,100	173,400	160,000	27,300	187,300
120th Avenue	132,500	184,500	187,500	172,200	27,300	199,500
104th Avenue	154,800	203,000	205,700	169,600	47,400	217,000
Thornton Pkwy.	164,100	214,500	217,100	200,700	27,800	228,500
84th Avenue	180,700	232,100	234,500	236,400	9,200	245,600

Capacity improvements, whether they are additional GPLs or TELs, typically would attract more travel to the improved highway corridor. The increased travel demand would consist of travel that would occur on arterial roads such as US 287 and US 85 under the No-Action Alternative. **Figure 4-2** compares the percent increase in 2030 total daily traffic volumes (travel demand) on I-25 generated by Packages A and B in relation to the No-Action Alternative. Between SH 1 and E-470, Package A capacity improvements would generate more new travel demand along I-25 than Package B. Likewise, Package B would attract more travel to I-25 from the alternate routes between E-470 and 84th Avenue because the TELs increase corridor capacity along this stretch of I-25.

Transit ridership projections indicate that transit would attract less than 6,000 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 or Package B.

Figure 4-2 Percent Increase in I-25 2030 Total Daily Traffic Volumes over No-Action Alternative

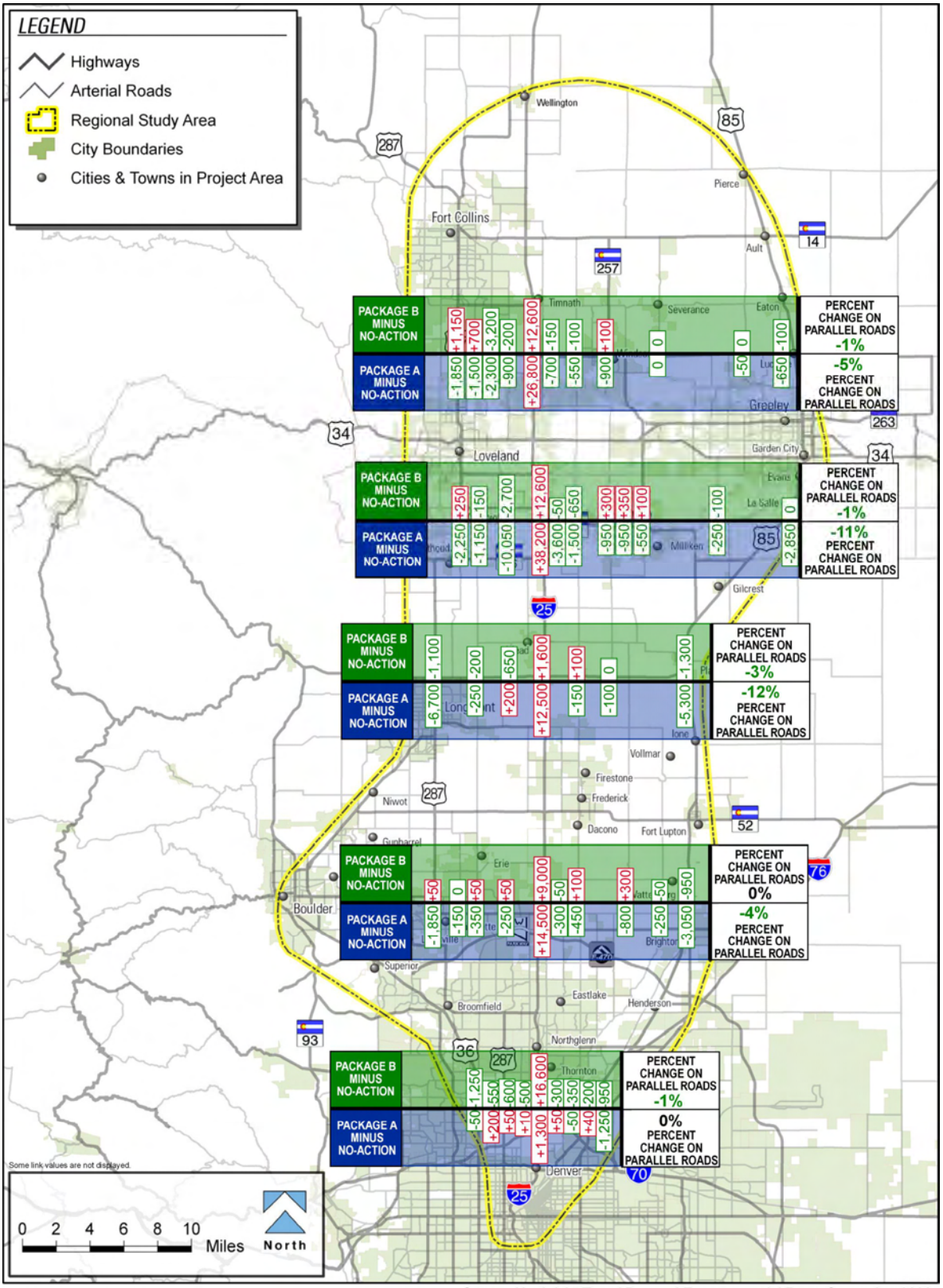


4.2.4 Effects on Arterials

In general, the increased traffic on I-25 with Packages A and B 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 4-3** presents the results in terms of daily volumes in 2030. 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 0 percent to 12 percent. Package B would be about the same as the No-Action Alternative, with reductions ranging from 0 percent to 3 percent. This difference is due to Package A attracting more traffic to I-25 than Package B. On the southernmost screenline in the Denver Metro Area, Package B would reduce arterial volumes due to its 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 can be seen on the daily changes on individual roads. The effect on peak-hour arterial conditions would not be noticeable.

Figure 4-3 Parallel Arterial Effects for Packages A and B (2030 Daily Volumes)



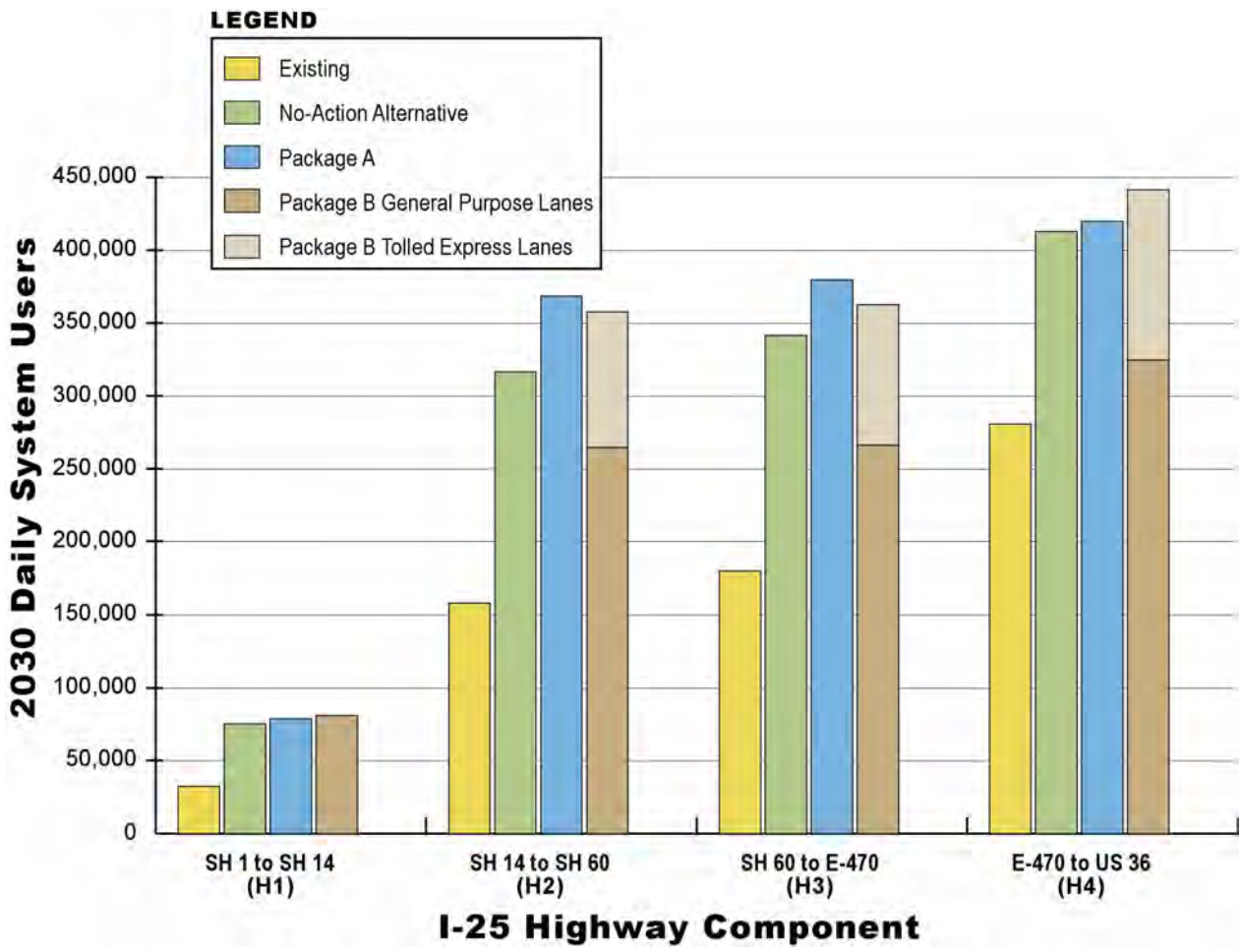
Source: North I-25 Travel Demand Forecast model Runs, September 2006

4.2.5 Highway Users

Daily highway users (people) were determined by component for existing conditions, the No-Action Alternative, and Packages A and B. 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 4-4** gives a comparison of daily users by component for existing conditions, the No-Action Alternative, and Packages A and B.

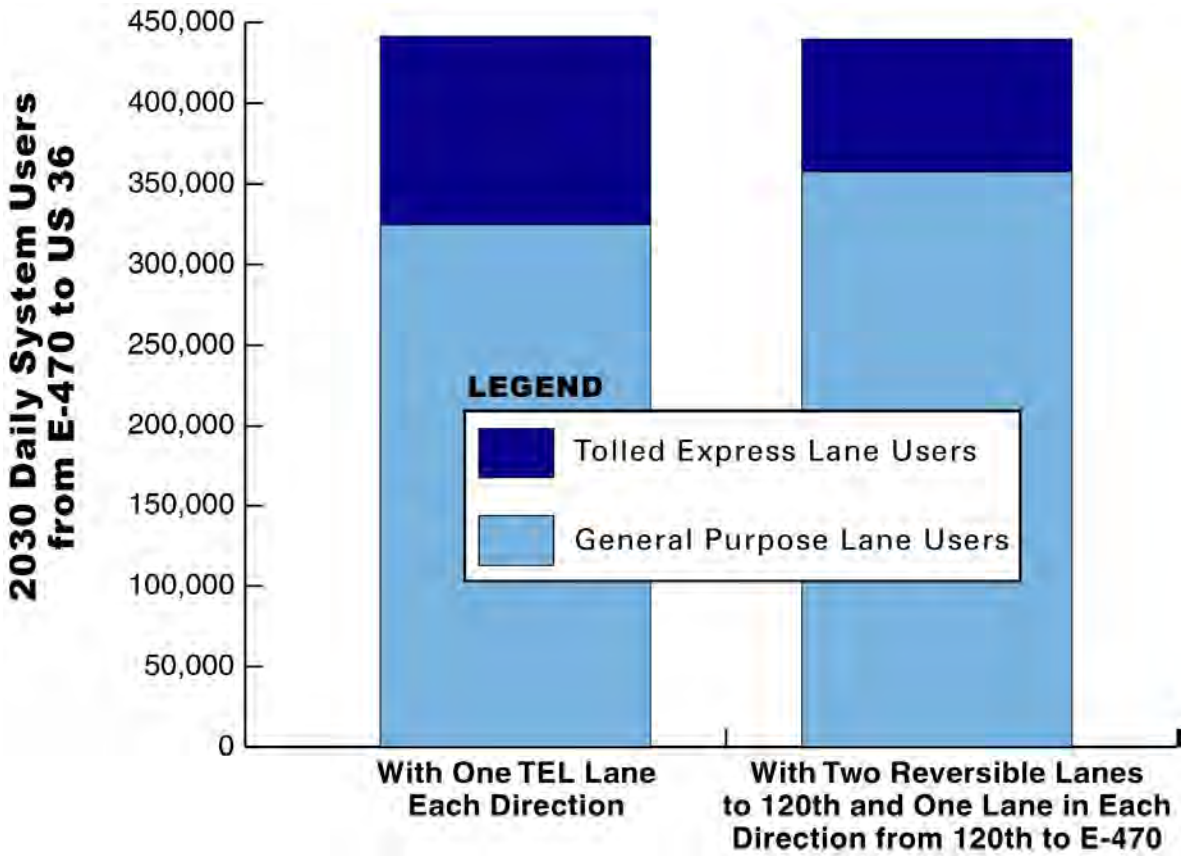
Package A, between SH 14 and E-470, would generate the highest corridor vehicular volumes and as expected would serve the highest level of highway users. Between E-470 and 84th Avenue, Package B would serve the most users due to the increased corridor capacity associated with extending the TELs to the existing express lanes south of 84th Avenue. Since Package B would serve fewer users than Package A between SH 14 and E-470, the TELs likely would attract very few new high-occupancy vehicles (HOVs) and essentially would be used by HOV users who would already be using the GPLs in Package A.

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



Package B users shown in **Figure 4-4** depict the situation when the TELs south of 120th Avenue are one lane in each direction. An alternative scenario would be to extend the existing reversible TEL north from 84th Avenue to 120th Avenue and then continue it as a one-lane TEL in each direction north of 120th Avenue. In terms of total system users, both alternatives would generate about an equal number of users from SH 1 to US 36. **Figure 4-5** shows that, between the two TEL options, total system users south of E-470 are about the same. However, TEL users on reversible lanes to 120th Avenue would be about 30 percent lower than TEL users on one-lane in each direction.

Figure 4-5 Users from E-470 to US 36 (One Tolled Express Lane in Each Direction versus Two Reversible Tolled Express Lanes)



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 2030.

Package A commuter rail would attract 4,300 average weekday trips. Commuter bus to/from downtown Denver would attract 1,200 trips per day. Commuter bus service to/from DIA would attract another 350 daily trips.

Package B BRT service to/from downtown Denver would attract over 5,650 trips per day. The BRT service to/from DIA would attract another 200 daily trips.

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.

Table 4-3 2030 Weekday Transit Ridership

Package A	Daily Riders
Commuter Rail: Fort Collins to/from Thornton*	4,300
Commuter Bus to/from Downtown Denver	1,200
Commuter Bus to/from DIA	350
Feeder Bus (sum for all routes)	5,100
Total Regional Riders**	**5,850**
Package B	**Daily Riders**
BRT: Fort Collins/Greeley to/from Downtown Denver	5,650
BRT: Fort Collins to/from DIA	200
Feeder Bus (sum for all routes)	1,600
Total Regional Riders**	**5,850**

* *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.*

4.2.6.3 PACKAGE A

Figure 4-6 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 Erie rail station in southwest Weld County would generate the most ridership activity, followed by the 4th Street station in downtown Loveland and the South Transit Center in Fort Collins.
- 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.

Figure 4-6 Package A 2030 Station-to-Station Daily Ridership

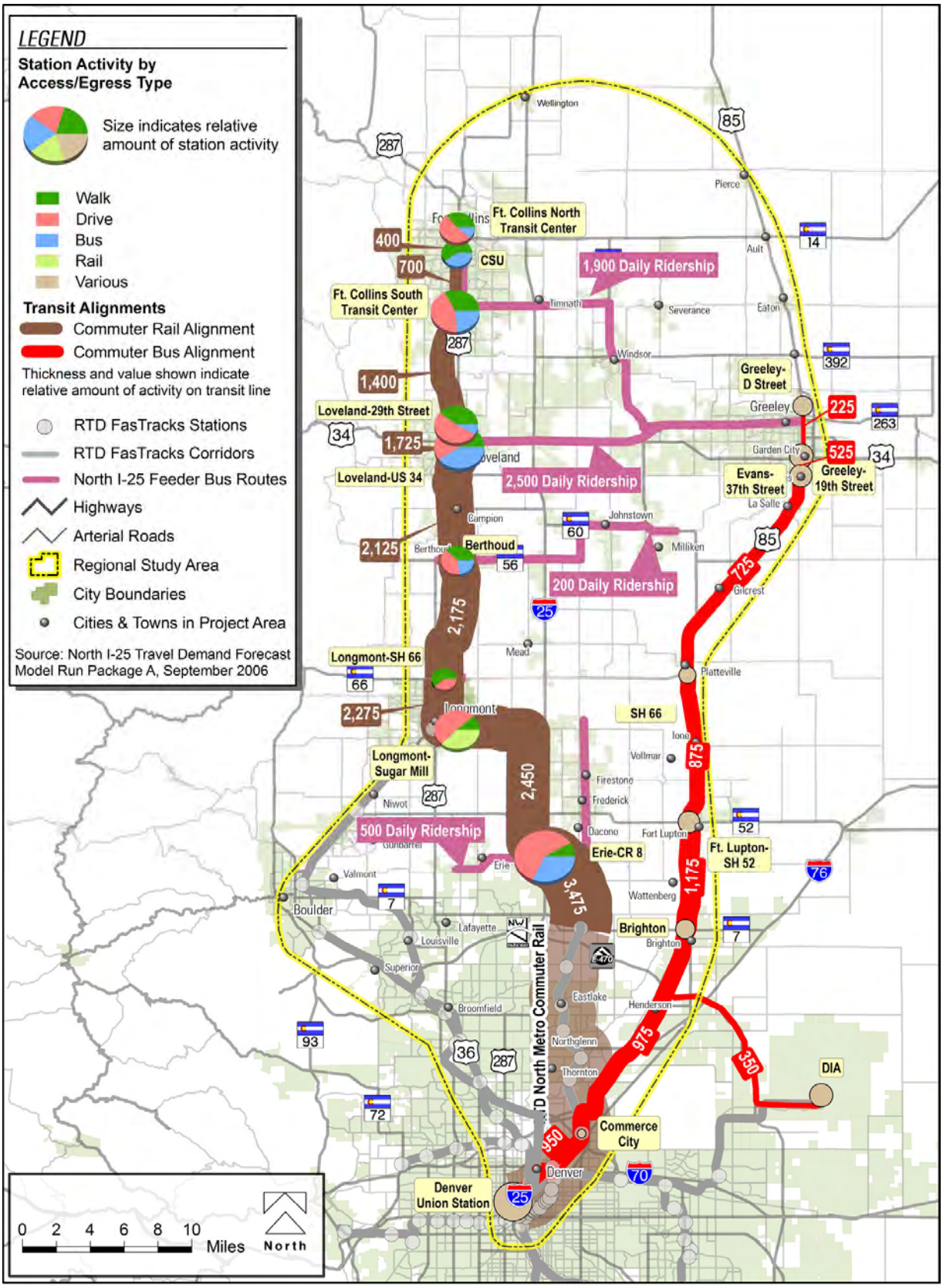


Table 4-4 Package A Commuter Rail Station Activity (2030 Riders)

Station	Package A Commuter Rail
Fort Collins – North Transit Center	400
Fort Collins – CSU	300
Fort Collins – South Transit Center	750
Loveland – 29th Street	600
Loveland – 4th Street Downtown	800
Berthoud – SH 56	350
Longmont – SH 66	200
Longmont – Sugar Mill	650
Erie – WCR 8	1,150

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.

The forecasted 2030 daily commuter rail ridership of 4,300 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).

A separate analysis was conducted to investigate the potential ridership under the scenario of commuter rail as an extension of the FasTracks Northwest Rail Corridor to Longmont, instead of an extension of FasTracks North Metro Corridor line to Thornton. This option would eliminate the construction of new track between Thornton and Longmont, and the Sugar Mill and Erie stations. Similar service frequencies were assumed for this scenario as in Package A. The commuter rail weekday ridership in 2030 under this scenario would be 3,300 riders per day. The station activity was the same or higher than in Package A for the stations between Fort Collins and Longmont. As a result, the station-to-station ridership between Fort Collins and Longmont was slightly higher than in Package A.

The Package A overall ridership of 4,300 is higher due to additional riders attracted to the rail line between Longmont and the North Metro Corridor end-of-line in Thornton.

4.2.6.4 PACKAGE B

Figure 4-7 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 119, SH 7, SH 52, Fort Collins' South Transit Center, and the SH 56/SH 60 station.

Table 4-5 Package B Bus Rapid Transit Station Activity (2030 Riders)

Station	Boardings in 2030
Fort Collins – South Transit Center	600
Fort Collins – Harmony and Timberline	400
Fort Collins – I-25 and Harmony	200
I-25 and SH 392	150
I-25 and Crossroads	200
Greeley 8th and 8th	300
Greeley US 34 and 83rd Avenue	350
Greeley US 34 and SH 257	100
I-25 and SH 56/60	600
I-25 and SH 119	1,550
I-25 and SH 52	700
I-25 and SH 7	1,200
Wagon Road	450
Downtown Denver	4,800
Denver International Airport	200

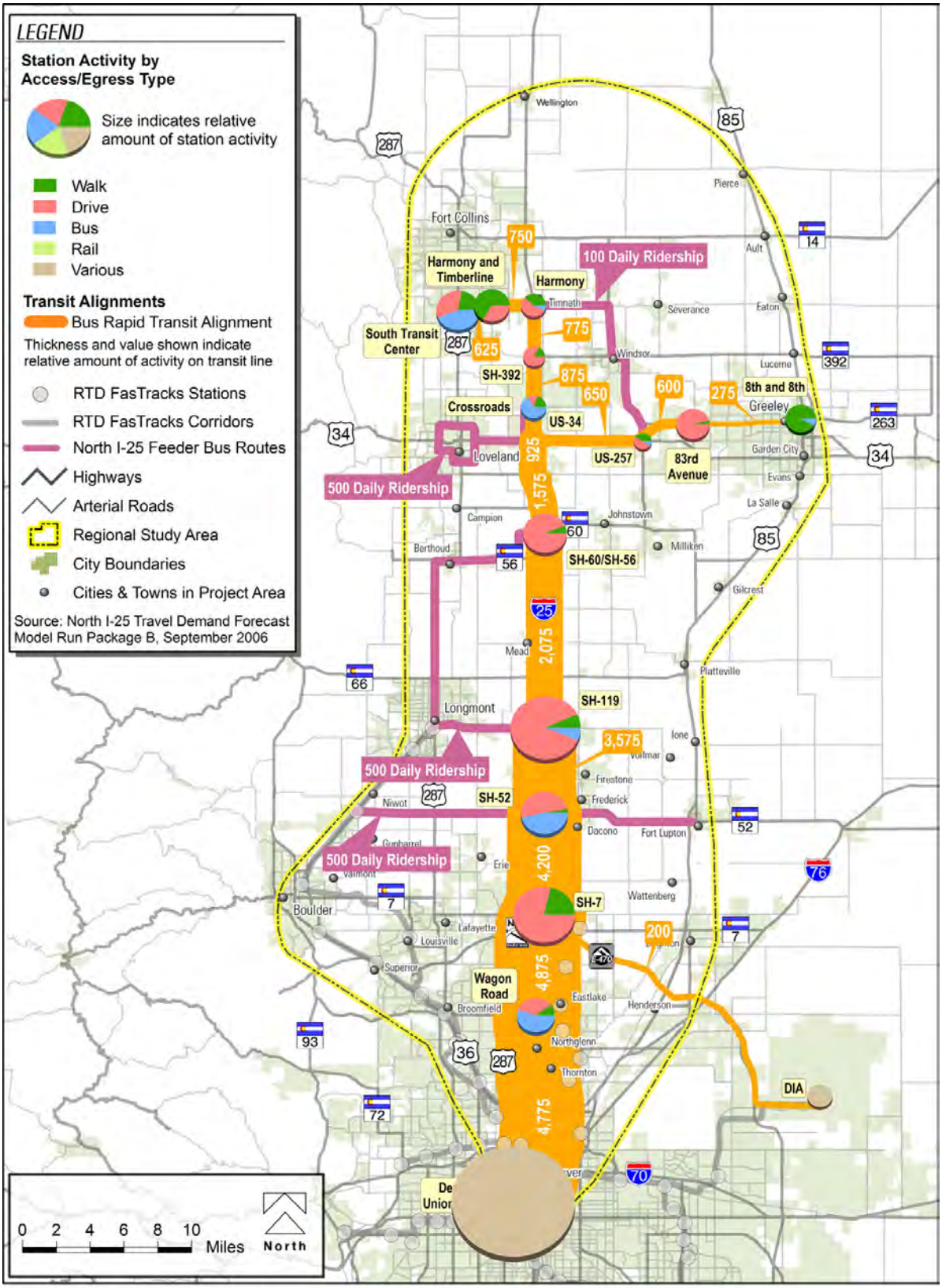
4.2.7 Transit Market Share

Packages A and B would provide long-haul 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 4-6**. Each package would capture a large share of the downtown Denver commuter market, but the total number of these commuters is expected to be relatively small – about 2,100 per weekday.

4.2.8 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 4-7**. As shown, Package A could generate nearly 500 additional weekday and over 1,000 additional weekend trips for special events such as sporting events and theater visits. Package B also would see an increase in ridership but somewhat less than under Package A.

Figure 4-7 Package B 2030 Station-to-Station Daily Ridership



Map Document - C&B: (Package_B_eis.mxd)
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Table 4-6 Transit Market Share of Northern Commuters to Downtown Denver

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

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

Table 4-7 Additional Average Ridership Generated by Special Event Travel

Time Period	Package A	Package B
Weekday	250 - 475	200 – 400
Weekend	650 -1,175	500 – 1,000

4.2.9 Effect of Price of Fuel

Travel forecasts assume the relative price of fuel would remain constant into the future. 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 an average of 9 percent on U.S. transit systems following the increase in the price of fuel during the fall of 2005 (American Public Transportation Association [APTA], 2005). In the circumstances of significantly higher fuel costs, future ridership could be substantially higher than standard forecasts indicate. The testing of increased fuel price scenarios with the 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 Package A or Package B transit ridership up to 90 percent. The transit systems included in both Package A and B would have adequate capacity for expansion to accommodate these higher demands, if necessary.

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 4-8**. 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 4-8 Existing Peak-Hour Travel Time

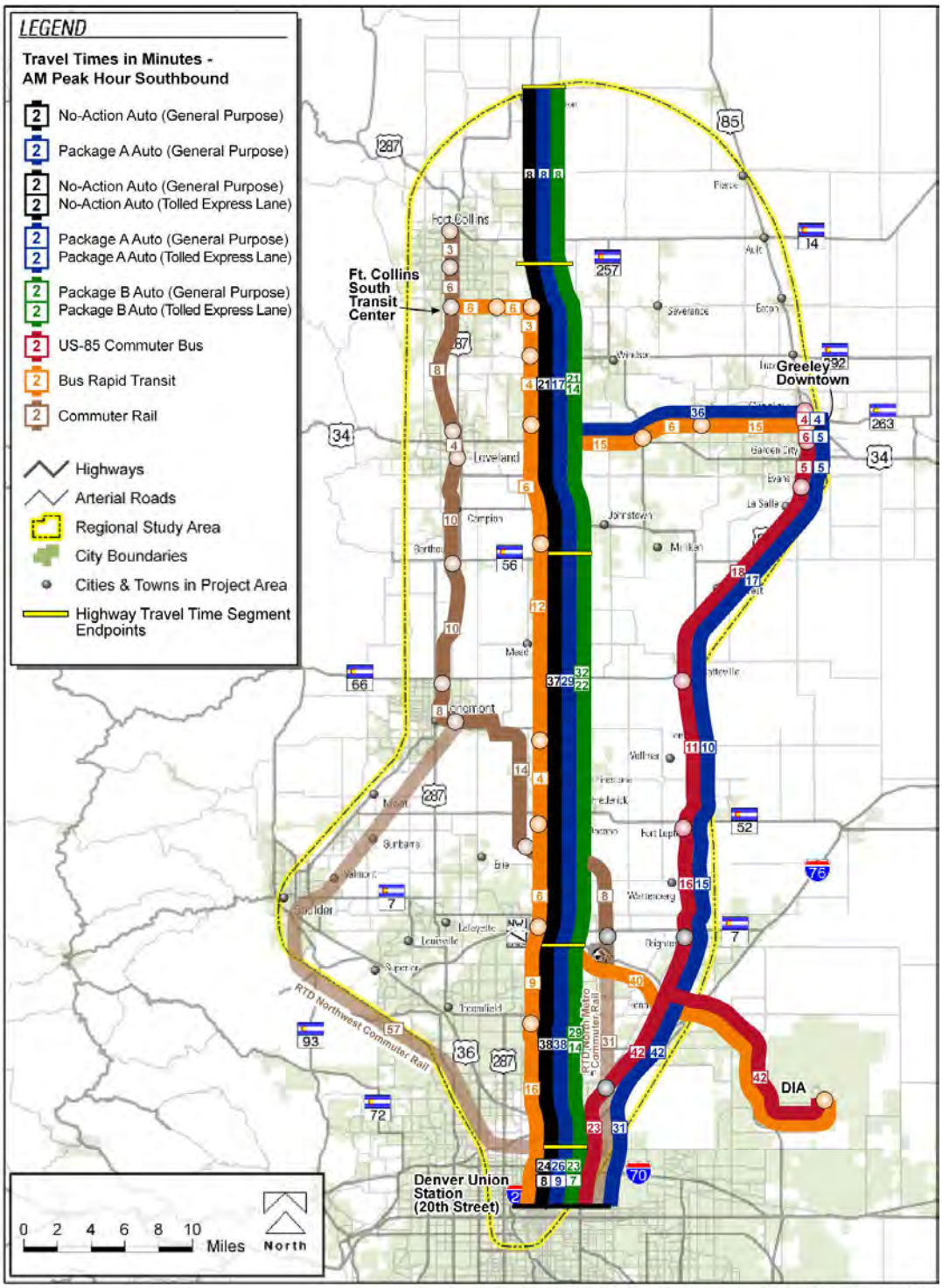
I-25	AM Peak Hour		PM Peak Hour	
	Northbound	Southbound	Northbound	Southbound
SH 1 to 20th Street	58 minutes	66 minutes	68 minutes	66 minutes

Source: Travel Time Surveys, September and October 2004.

4.3.2 2030 Travel Time

Estimated travel times for the package components are presented for the AM peak southbound direction for the year 2030. **Figure 4-8** shows comparative travel times by segment for components of the No-Action Alternative and Packages A and B.

Figure 4-8 2030 Travel Time Comparison



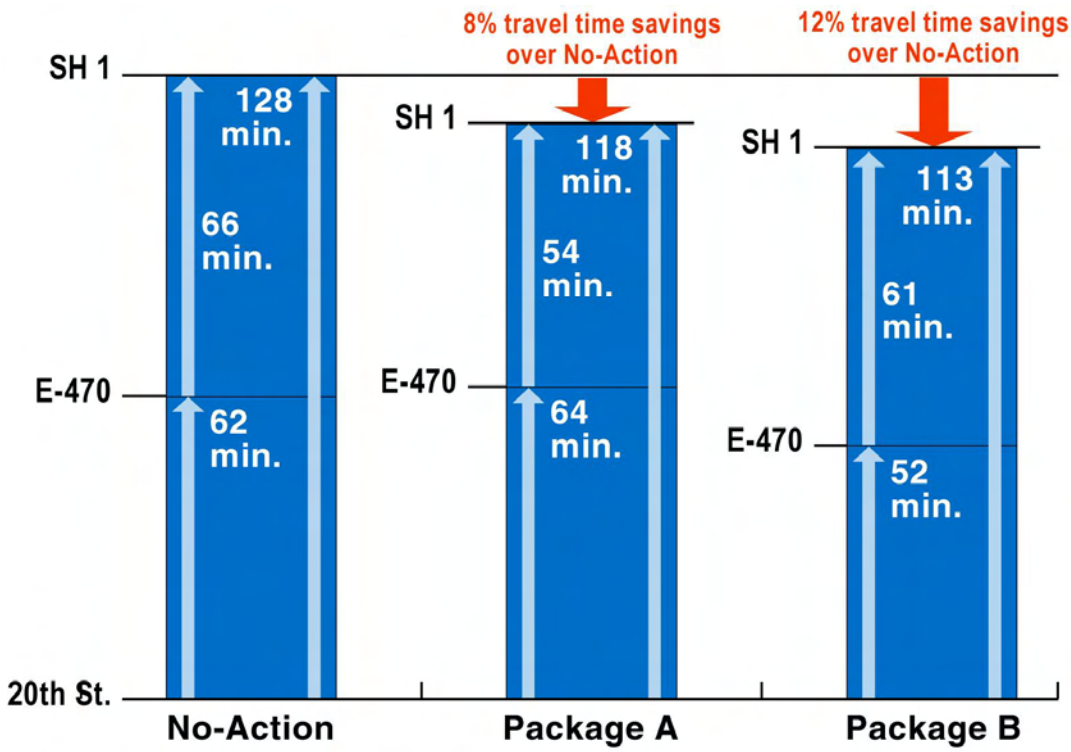
Source: North I-25 Travel Demand Forecast Model Runs, September 2006

4.3.2.3 HIGHWAY TRAVEL TIME

Figure 4-9 summarizes the 2030 travel time for I-25 for the entire length of the corridor from SH 1 to 20th Street, including the travel time to E-470 in the GPLs. The two packages are compared to the No-Action Alternative travel time. As shown, Package A would result in a 10-minute travel-time savings between SH 1 and 20th Street; Package B would result in a 15-minute travel-time savings over the same section.

Overall, Package A would improve travel time in the GPLs by 8 percent while Package B would improve the travel time by 12 percent. This reflects the improvement realized between E-470 and 20th Street with the addition of a TEL in Package B.

Figure 4-9 SH 1 to 20th Street - General Purpose Lane Travel Time

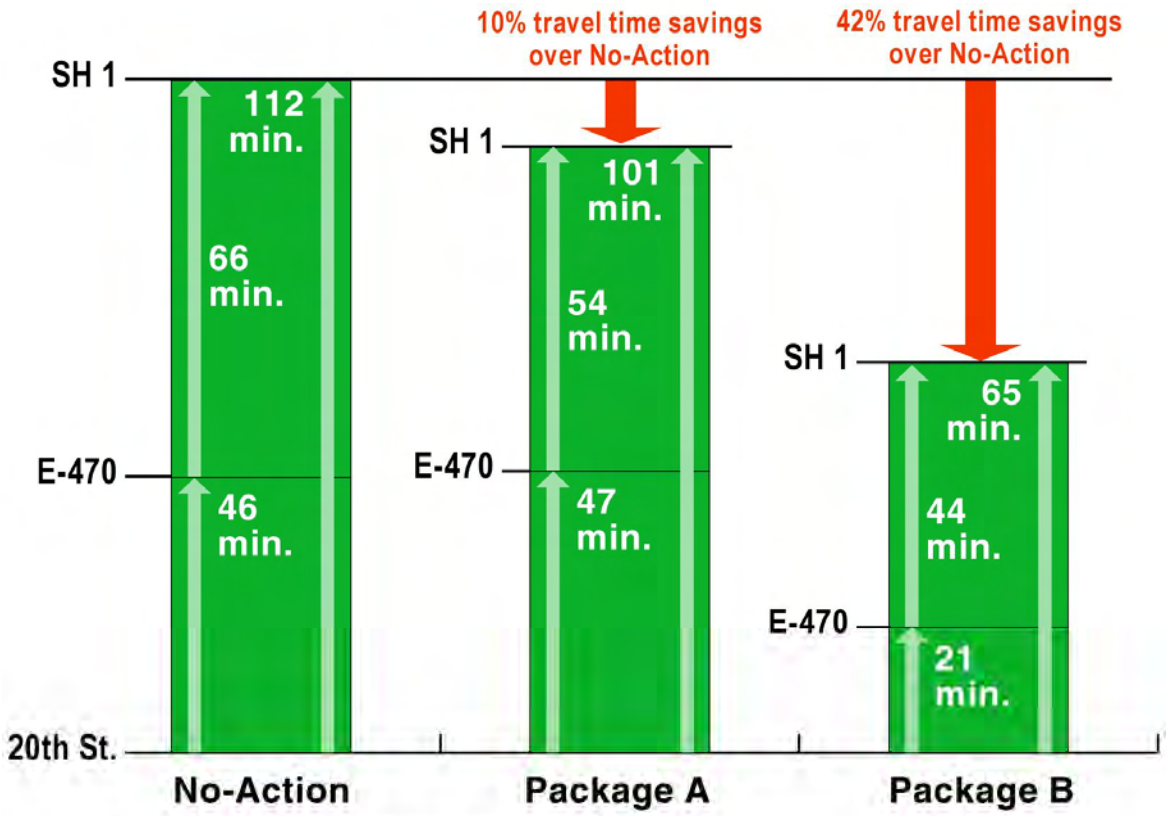


Note: Travel times shown are for the southbound direction in the AM peak hour in 2030 and do not include any highway access or egress time.

Source: North I-25 Travel Demand Forecast Model Runs, September 2006.

Figure 4-10 summarizes the 2030 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 and south of SH 14 in Package B). 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 would experience a larger travel time savings in this section and the largest savings overall at 42 percent. When compared to No-Action Alternative general purpose travel (128 minutes), the TEL (65 minutes) would experience an even greater travel time savings of 49 percent between SH 1 and 20th Street.

Figure 4-10 SH 1 to 20th Street - Tolled Express Lane Travel Time



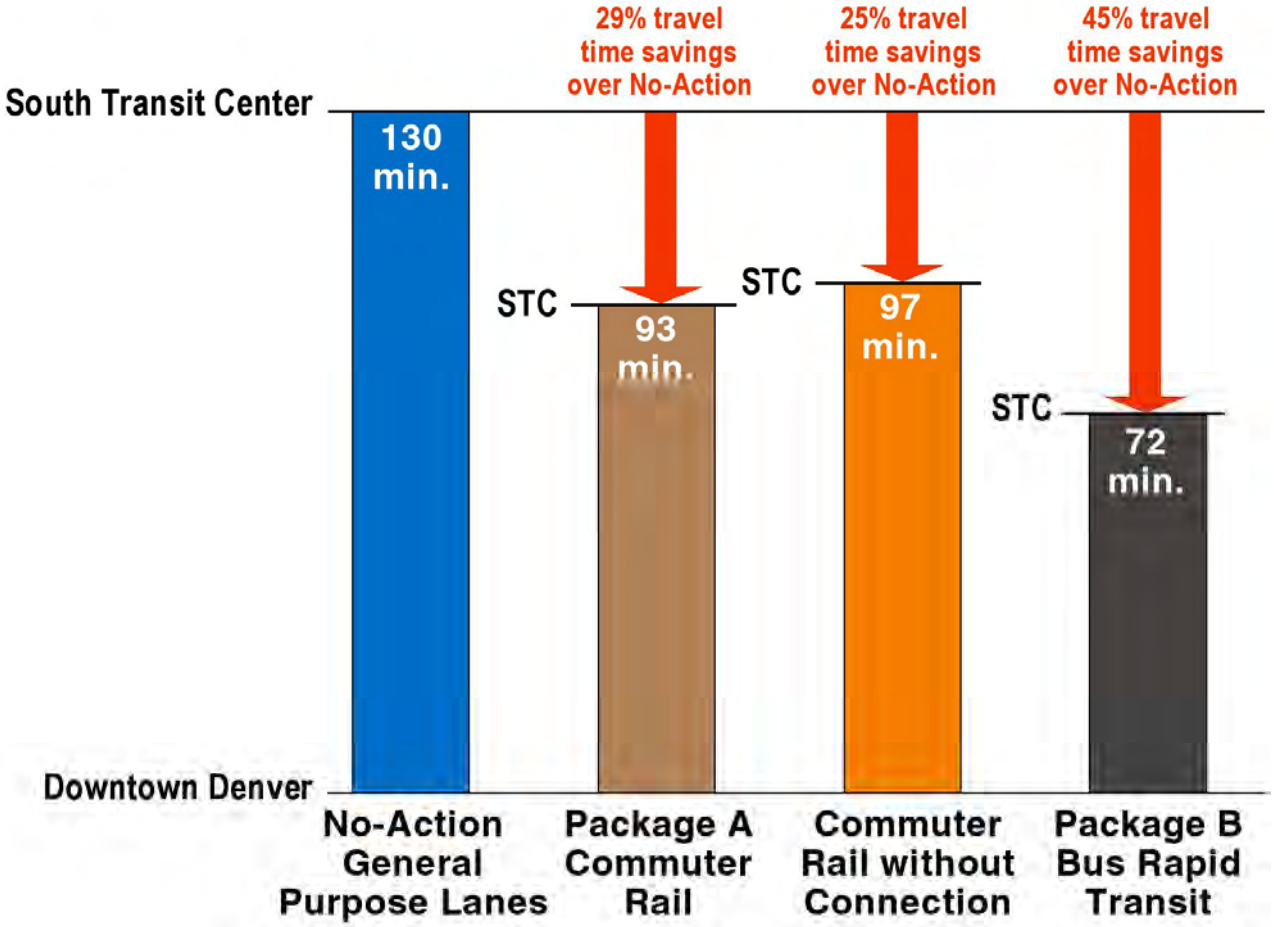
Note: Travel times shown are for the southbound direction in the AM peak hour in 2030 and do not include any highway access or egress time.

Source: North I-25 Travel Demand Forecast Model Runs, September 2006.

4.3.2.4 TRANSIT TRAVEL TIME

Figure 4-11 compares transit travel time from the Fort Collins South Transit Center to downtown Denver via commuter rail connecting to the North Metro Corridor alignment, BRT, and private automobiles traveling along Harmony Road and I-25. As shown, under the No-Action Alternative, it would take 130 minutes to make this trip via private automobile. Commuter rail would improve this travel time by 29 percent to 93 minutes. Commuter rail without a connection to North Metro Corridor would travel to Boulder via the FasTracks Northwest Rail Corridor line to reach Denver Union Station. This route would have a travel time of 97 minutes, 4 minutes longer than the Package A rail option that would connect to the North Metro Corridor. Package B BRT would have a travel time savings of 45 percent (72 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.

Figure 4-11 Proposed Fort Collins South Transit Center (STC) to Downtown Denver - Transit Travel Time

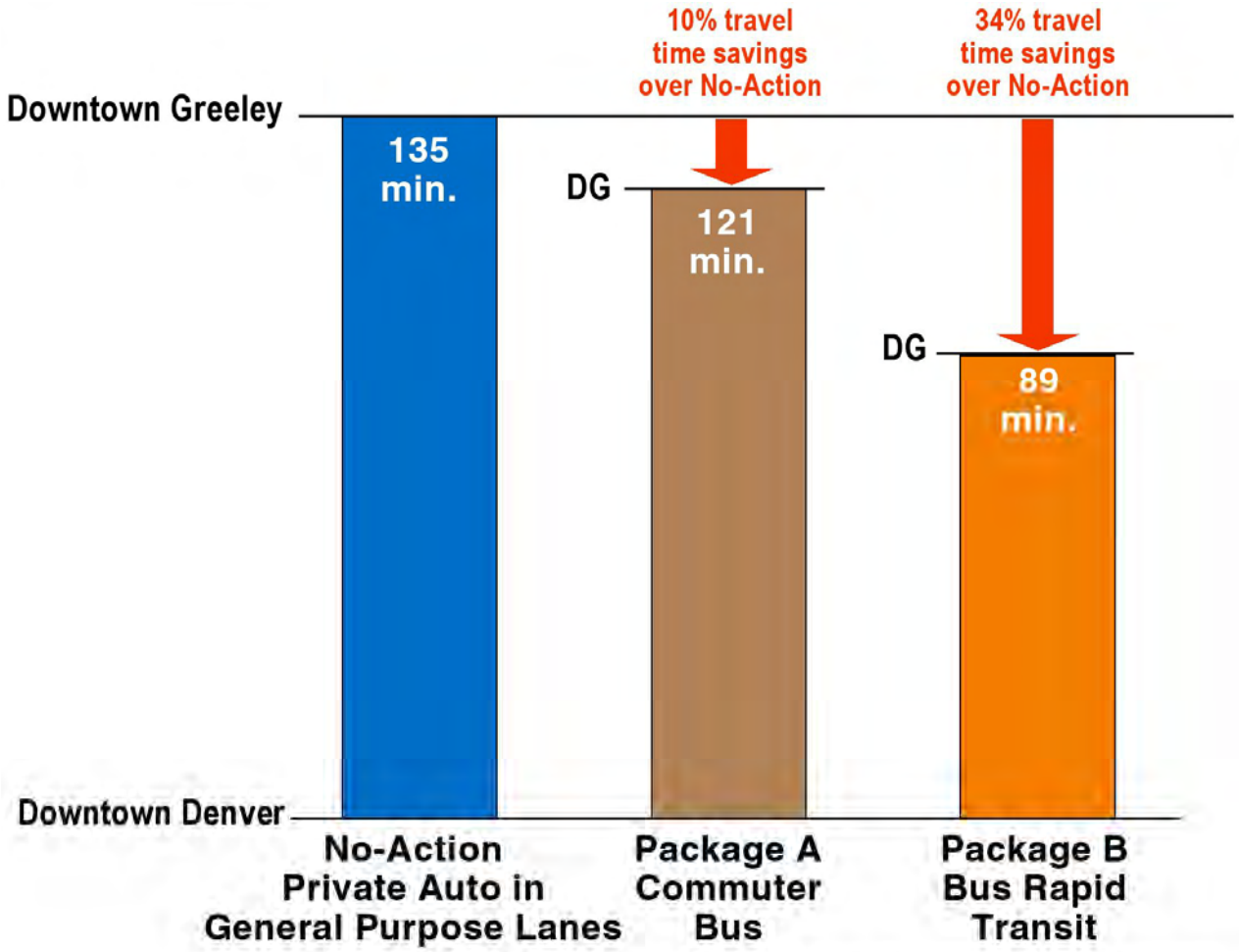


Note: No-Action travel times shown are for the southbound direction in the AM peak hour in 2030. Travel times include travel on Harmony Road from the proposed site of the South Transit Center to I-25 and from the 20th Street exit to downtown Denver. Transit times are in-vehicle times only with no access/egress, transfer, or wait times.

Source: North I-25 Travel Demand Forecast Model Runs, September 2006.

Figure 4-12 compares transit travel time from downtown Greeley to downtown Denver via commuter bus, BRT, and via private automobile traveling along US 85. As shown, under the No-Action Alternative, it would take 135 minutes to make this trip via private automobile in general purpose lanes in 2030. Commuter bus would improve this travel time by 10 percent and BRT would improve travel time by 34 percent, reducing the overall time to 89 minutes.

Figure 4-12 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 2030. 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, September 2006.

4.3.3 Travel Time Reliability

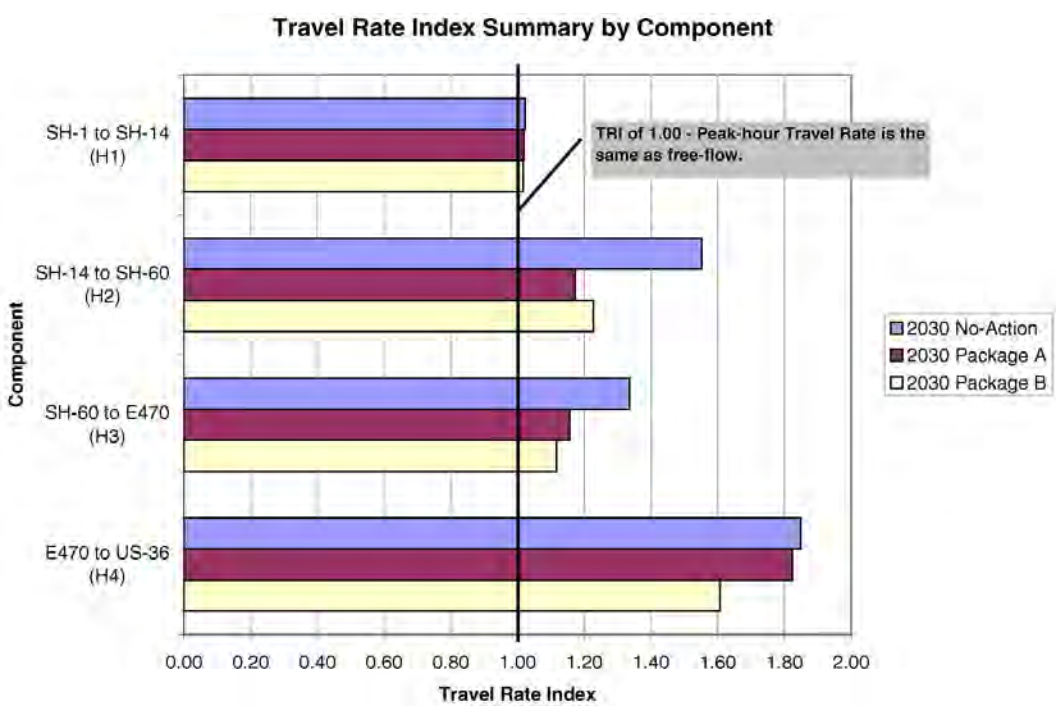
As northern Colorado population and employment grow beyond 2030, the demand on the transportation network also would grow. The No-Action Alternative would experience congestion, long travel times and uncertain travel time reliability on I-25. Package A would address most of this congestion in 2030 but as growth occurs, highway travel times would continue to increase and reliability would decrease. 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 2030 and beyond for bus, for carpools and vanpools, and for single-occupancy vehicles who pay a toll.

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 North I-25 was calculated by component for the No-Action Alternative and Packages A and B scenarios for the year 2030. As shown in **Figure 4-13,** both packages would provide an improvement in the TRI over the No-Action Alternative. Packages A and B have approximately the same TRI north of E-470. Package B has a lower TRI south of E-470 due to the capacity improvements on I-25 in the Denver metro area.

Figure 4-13 Travel Rate Index Comparison



4.4 LEVEL OF SERVICE

This section compares 2030 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 6 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, 2008c).

Figure 4-14 illustrates the differences in the level of services 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 4-15 graphically depicts existing I-25 mainline level of service. **Figure 4-16** 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 4-14 Level-of-Service Category Definitions

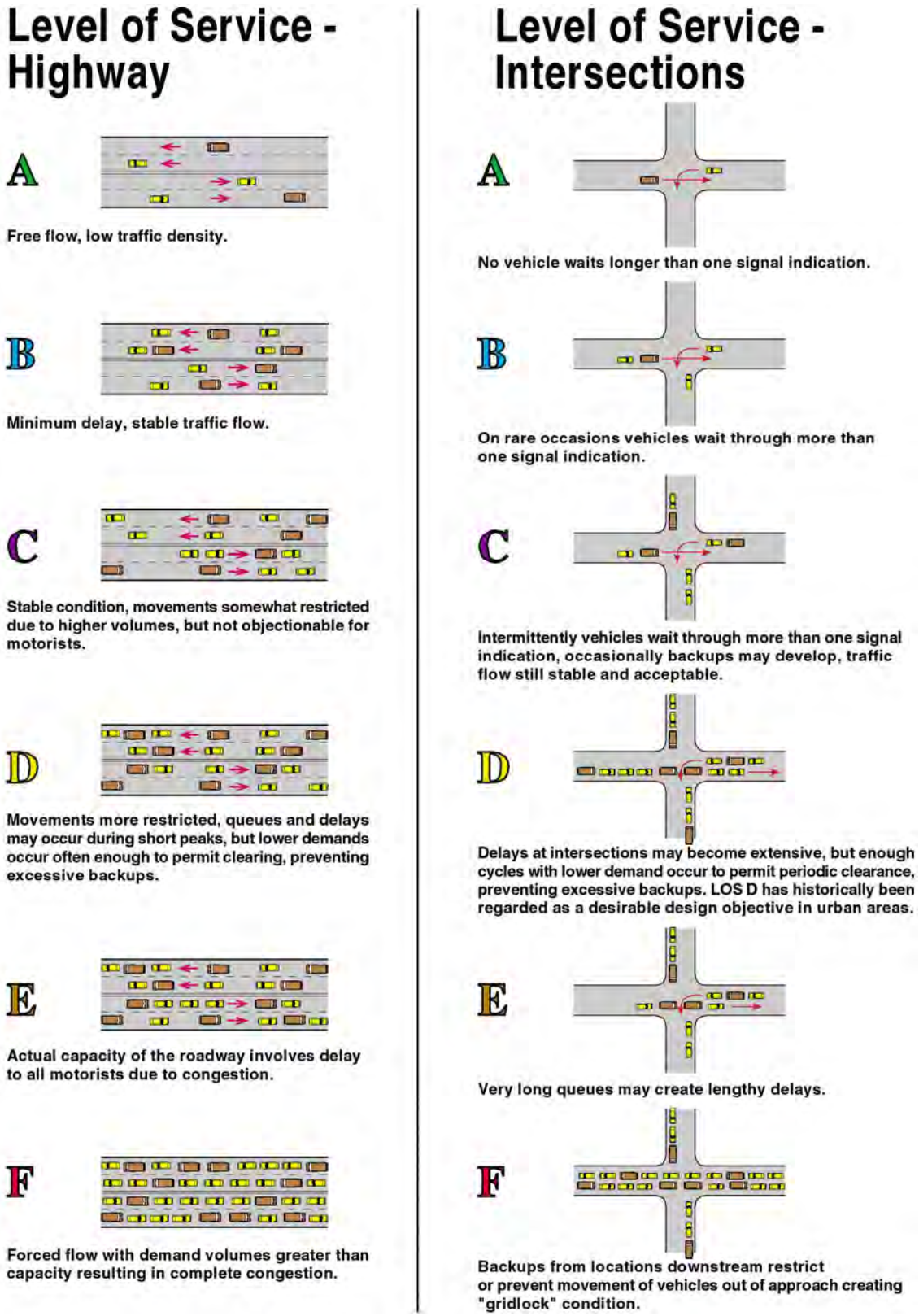
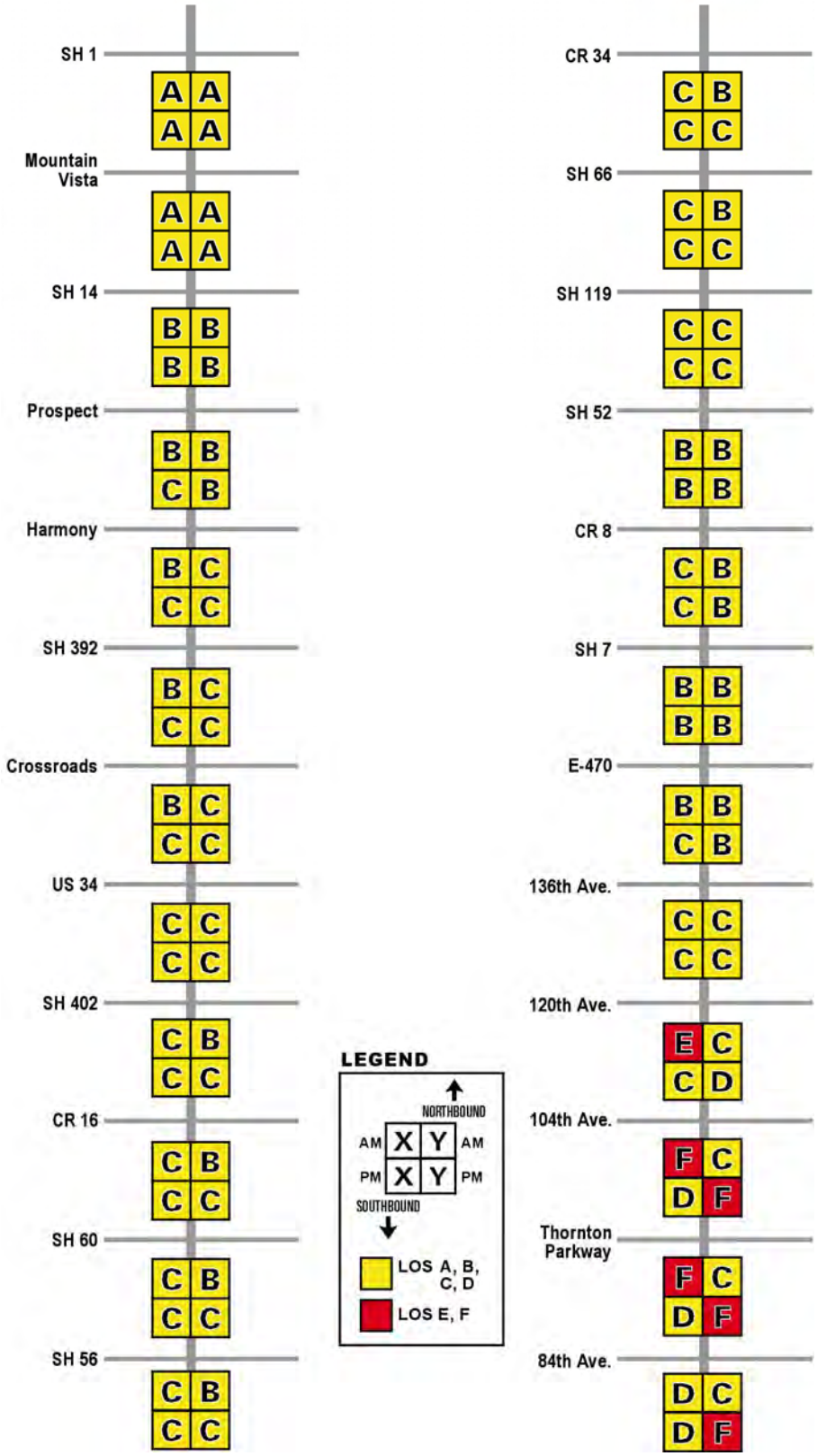
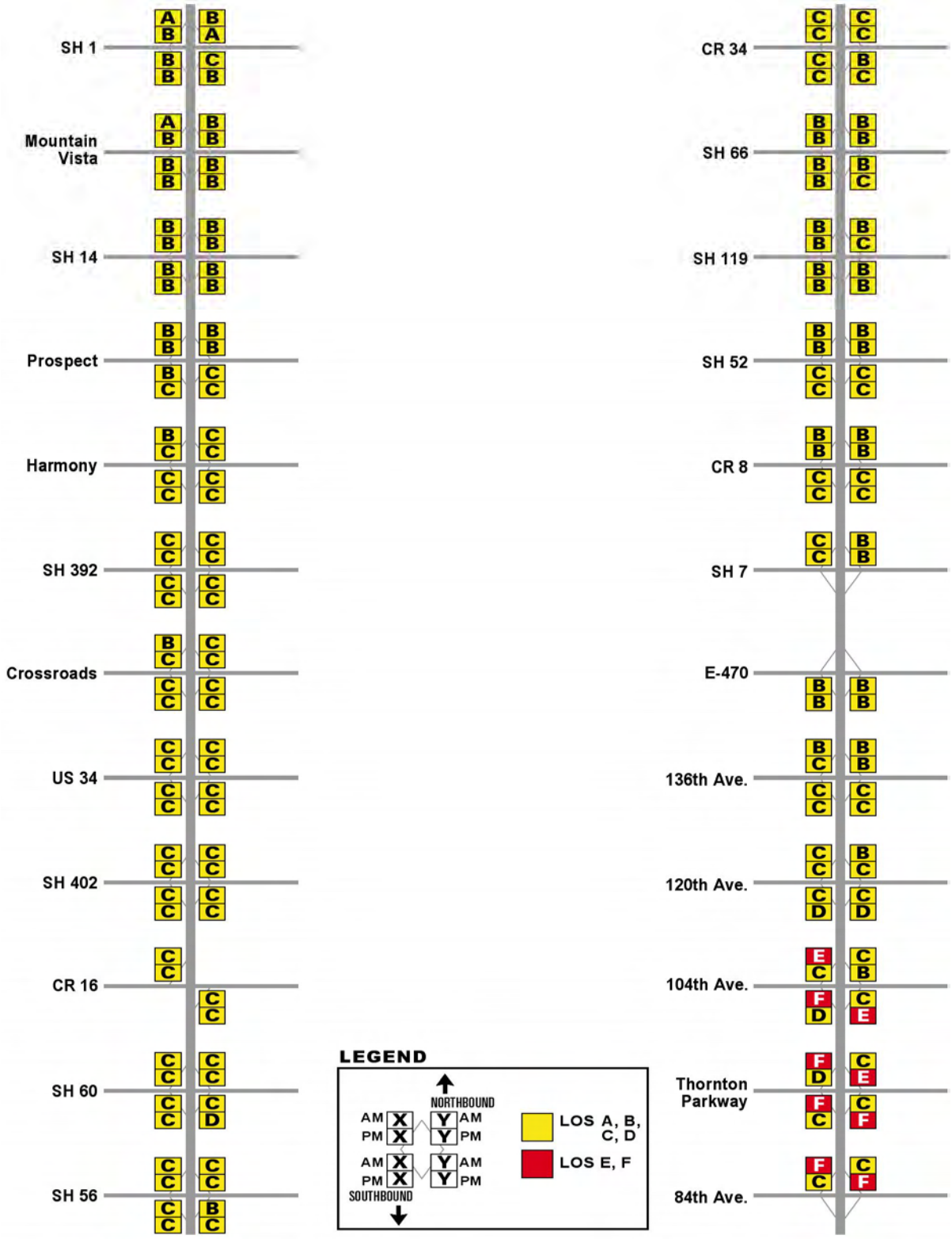


Figure 4-15 Existing Peak Hour I-25 Mainline Level of Service



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

Figure 4-16 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 2030 I-25 Mainline

Both Packages A and B would address congestion north of E-470, providing significant level of service and travel time improvements over No-Action Alternative conditions. Although I-25 carries slightly higher volumes under Package A than Package B, both would offer generally similar levels of service on that section. The Package B TEL generally would operate at LOS C or better during both peak hours. A few TEL sections from E-470 south to 84th Avenue would operate at LOS D.

4.4.2.3 General Purpose Lane Operation

Table 4-9 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. Package B would nearly eliminate LOS E and F conditions between SH 14 and E-470 except for two miles between SH 14 and SH 60. This is a result of the TEL slip ramp located between SH 14 and Prospect. Adding a slip ramp between these two closely spaced interchanges would create a weaving section that would operate below capacity. If chosen as the Preferred Alternative, the slip ramp location would be reviewed during the FEIS to identify a location that would result in acceptable operation. Package B 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 4-9 Miles of I-25 Operating at LOS E or F (General Purpose Lanes)

Component	AM Peak Hour			
	Existing	No-Action	Package A	Package B
SH 1 to SH 14 (H1)	0	0	0	0
SH 14 to SH 60 (H2)	0	0	0	2
SH 60 to E-470 (H3)	0	12	0	0
E-470 to US 36 (H4)	4	11	11	8
Total	**4**	**23**	**11**	**10**

Component	PM Peak Hour			
	Existing	No-Action	Package A	Package B
SH 1 to SH 14 (H1)	0	0	0	0
SH 14 to SH 60 (H2)	0	19	0	3
SH 60 to E-470 (H3)	0	12	0	0
E-470 to US 36 (H4)	4	22	22	19
Total	**4**	**53**	**22**	**22**

Figures 4-17 and **4-18** graphically depict I-25 mainline level of service for the No-Action Alternative and Packages A and B in 2030. 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 would show capacity issues developing between SH 60 and SH 66 in the southbound direction in the morning and between SH 66 and Harmony Road in the northbound direction in the afternoon. In Package B, the weave created by the short interchange spacing and the addition of a TEL slip ramp between SH 14 and Prospect Road would result in LOS E and F operation during both peak hours. This could be improved by moving the TEL slip ramps north of SH 14.

4.4.2.4 TOLLED EXPRESS LANE OPERATION

To maintain reliable speeds and LOS C in the TELs, the toll rates were varied 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 providing two lanes of capacity (Option B2).

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

4.4.2.5 OPTION B2 – REVERSIBLE LANE OPERATION

In this scenario, the existing two-lane reversible high-occupancy toll lanes would be extended north to 120th Avenue. With two lanes of capacity, the maximum service rate would increase to 3,200 vehicles per hour. In this configuration, the maximum service volume would only be exceeded north of 120th Avenue where the two reversible lanes transition back to a single lane in each direction. Increasing the toll rate would reduce the demand in this location but would also reduce demand in the reversible section. This would have the tradeoff of reducing potential revenue generated. A further refinement in this scenario would be to charge higher tolls for trips made in total or in part between E-470 and 120th Avenue, with lower toll rates for trips made along the reversible segment. This was not tested as part of this analysis.

Figure 4-17 2030 Peak Hour I-25 Mainline LOS SH 1 to SH 56

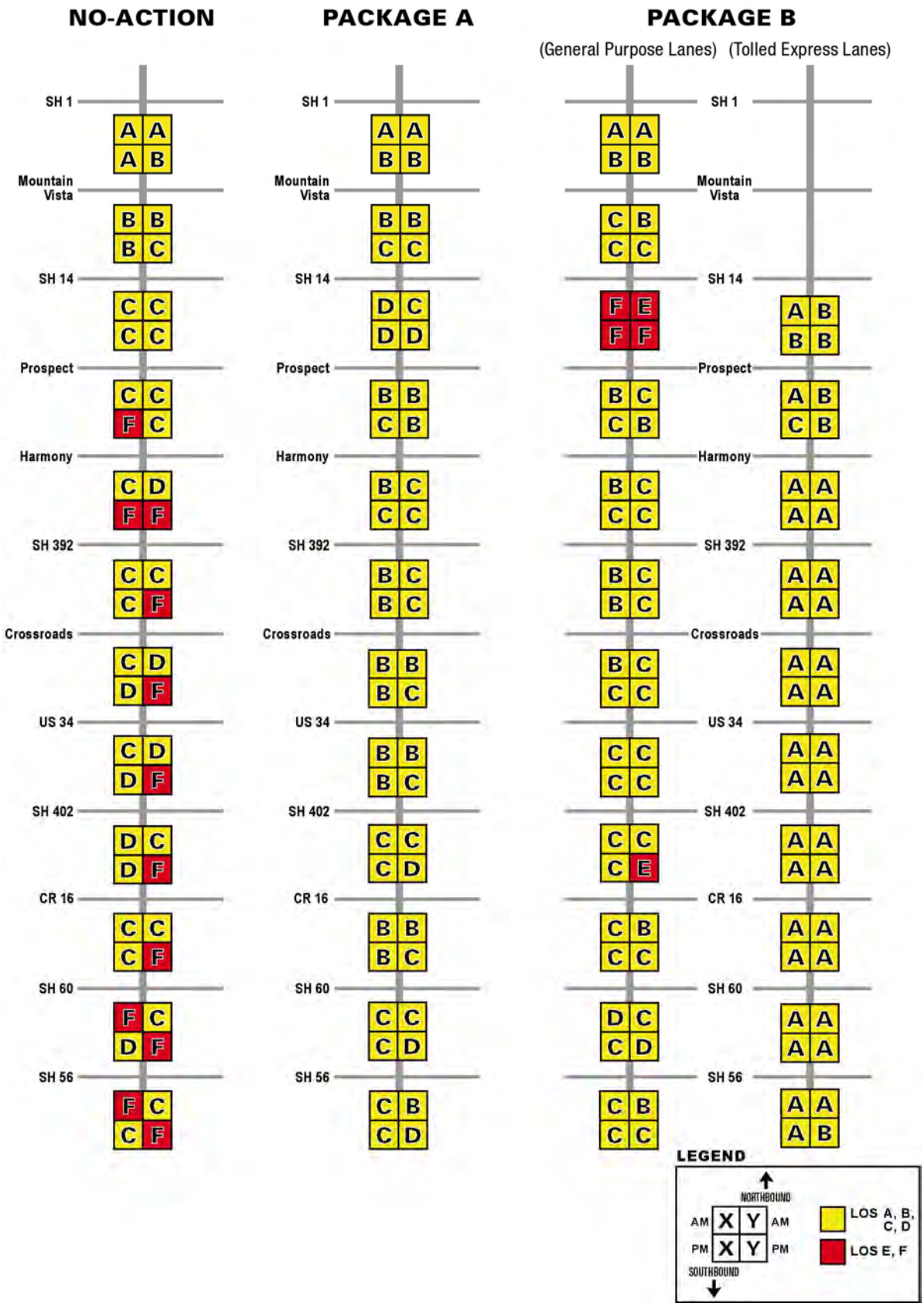
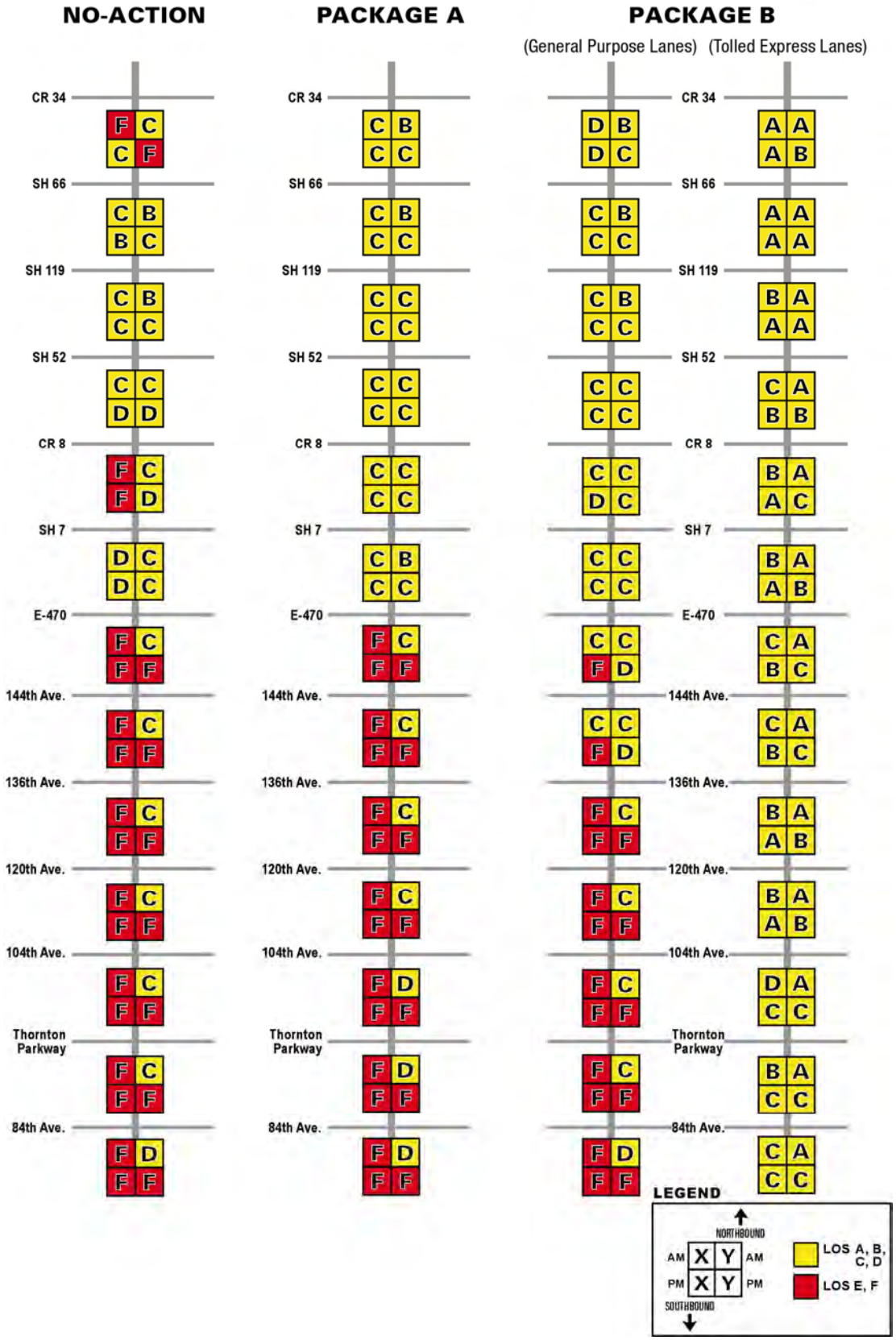


Figure 4-18 2030 Peak Hour I-25 Mainline LOS from CR 34 to 84th Avenue



4.4.2.6 General Purpose Merge/Diverge Ramp Operation

Figures 4-19 and 4-20 illustrates the I-25 ramp merge/diverge levels of service for the No-Action Alternative and Packages A and B in 2030. 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. **Table 4-10** provides a summary comparison of interchange ramp merge/diverge operations along GPLs. In the No-Action Alternative, several ramp junctions are expected to operate at LOS E or F between SH 14 and US 36, with the majority of poor operations occurring south of E-470. As shown, both Packages A and B 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 A and B improvements, because 2030 mainline traffic projections exceed the mainline capacity and ramp merge/diverge operations would be dependent on mainline operations.

Table 4-10 2030 Interchange Ramp Merge/Diverge Locations Operating at LOS E or F

Component	Existing		No-Action		Package A		Package B*	
	AM	PM	AM	PM	AM	PM	AM	PM
SH 1 to SH 14 (H1)	0	0	0	0	0	0	0	0
SH 14 to SH 60 (H2)	0	0	8	21	0	0	0	0
SH 60 to E-470 (H3)	0	0	6	9	0	0	0	2
E-470 to US 36 (H4)	5	4	11	24	11	24	13	28
Total	**5**	**4**	**25**	**54**	**11**	**24**	**13**	**30**

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

4.4.2.7 Tolled Express Merge/Diverge Ramp Operation

Between SH 14 and E-470, TEL ramp junctions would operate at LOS D or better. However, south of E-470, many ramp junctions would operate at LOS E or F. This lower operation primarily would 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.

Table 4-11 Summary of Managed Lane Ramp Level of Service and Impact to General Purpose Lane Level of Service

Component	Managed Lane Junctions with GP Lanes	AM Peak Hour	PM Peak Hour
		Managed Lane Ramps Operating at LOS E/F	Managed Lane Ramps Operating at LOS E/F
SH 14 to SH 60	12	0	0
SH 60 to E-470	12	0	1
E-470 to US 36	10	4	8
Total	**34**	**4**	**9**

Figure 4-19 2030 Peak Hour I-25 Ramp Merge / Diverge LOS from SH 1 to SH 56

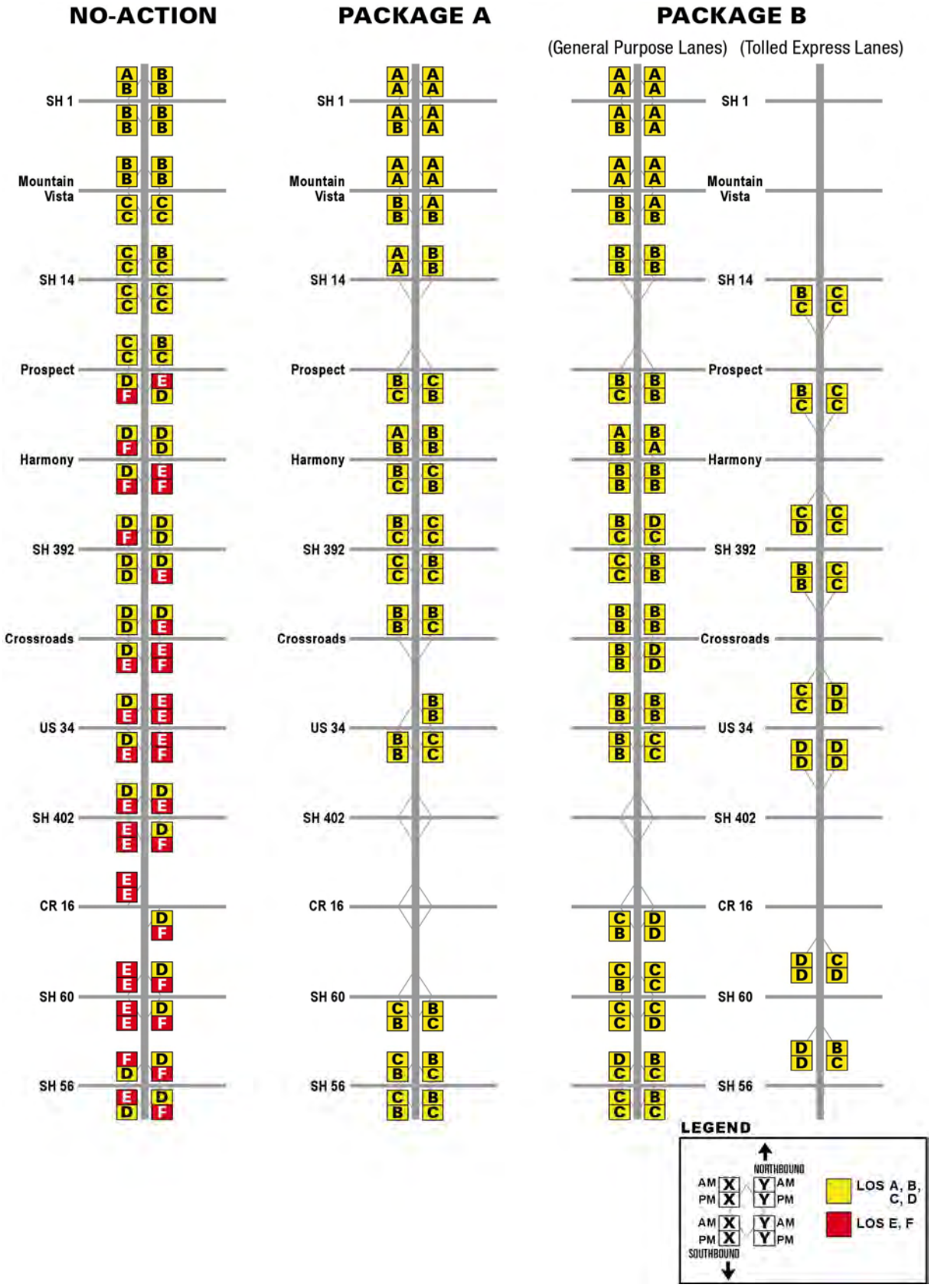
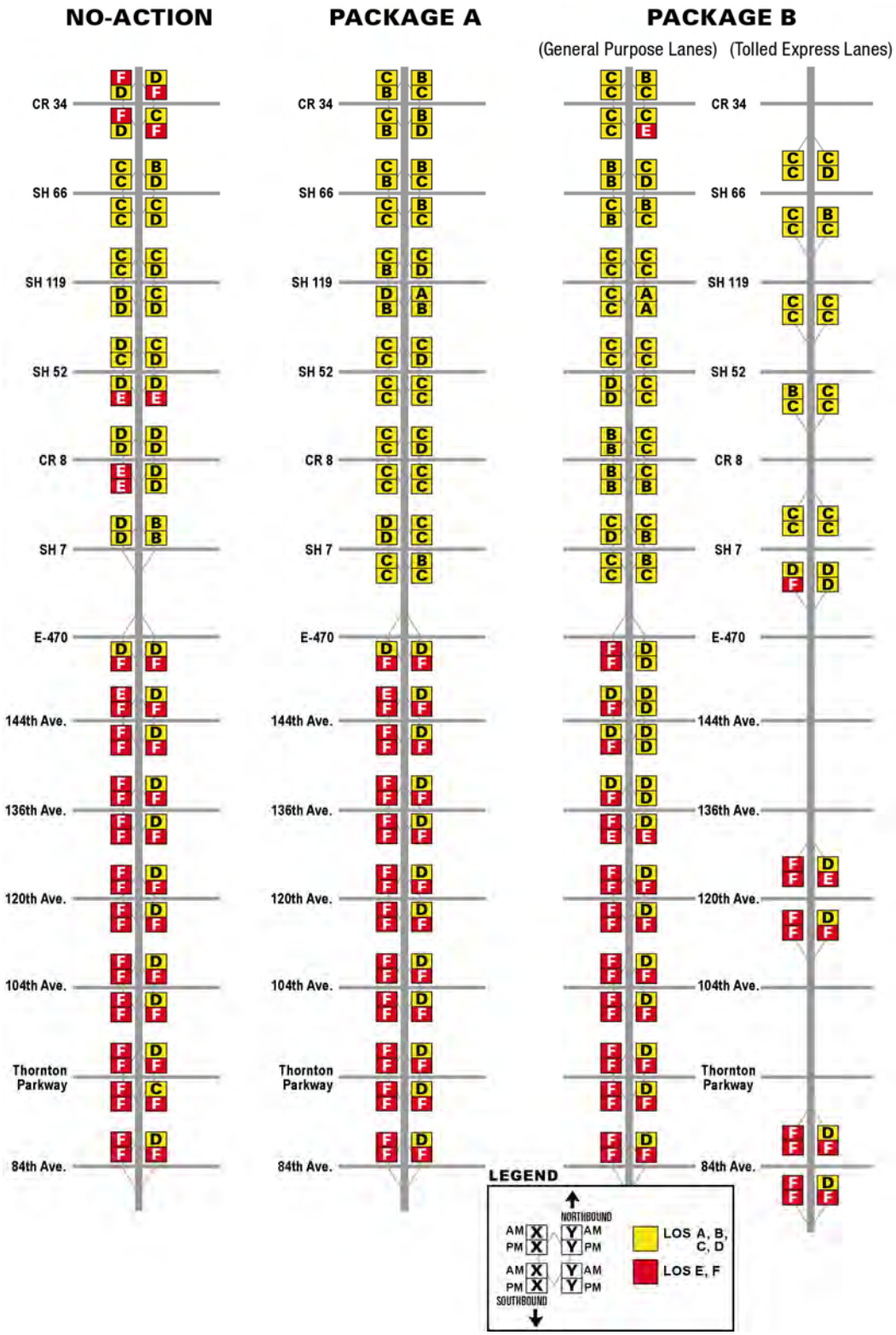


Figure 4-20 2030 Peak Hour I-25 Ramp Merge / Diverge LOS from CR 34 to 84th Avenue



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 four times during peak hours. 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.

4.4.4 US 34 Operation

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 six 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.

4.4.5 Harmony Road Operation

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.

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 also 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.

4.4.7 Interchange Operation

Queuing and LOS analyses were conducted at each interchange for the No-Action Alternative and Packages A and B. 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. 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 SH 402 and south of 120th Avenue. Both Packages A and B 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, both packages 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.

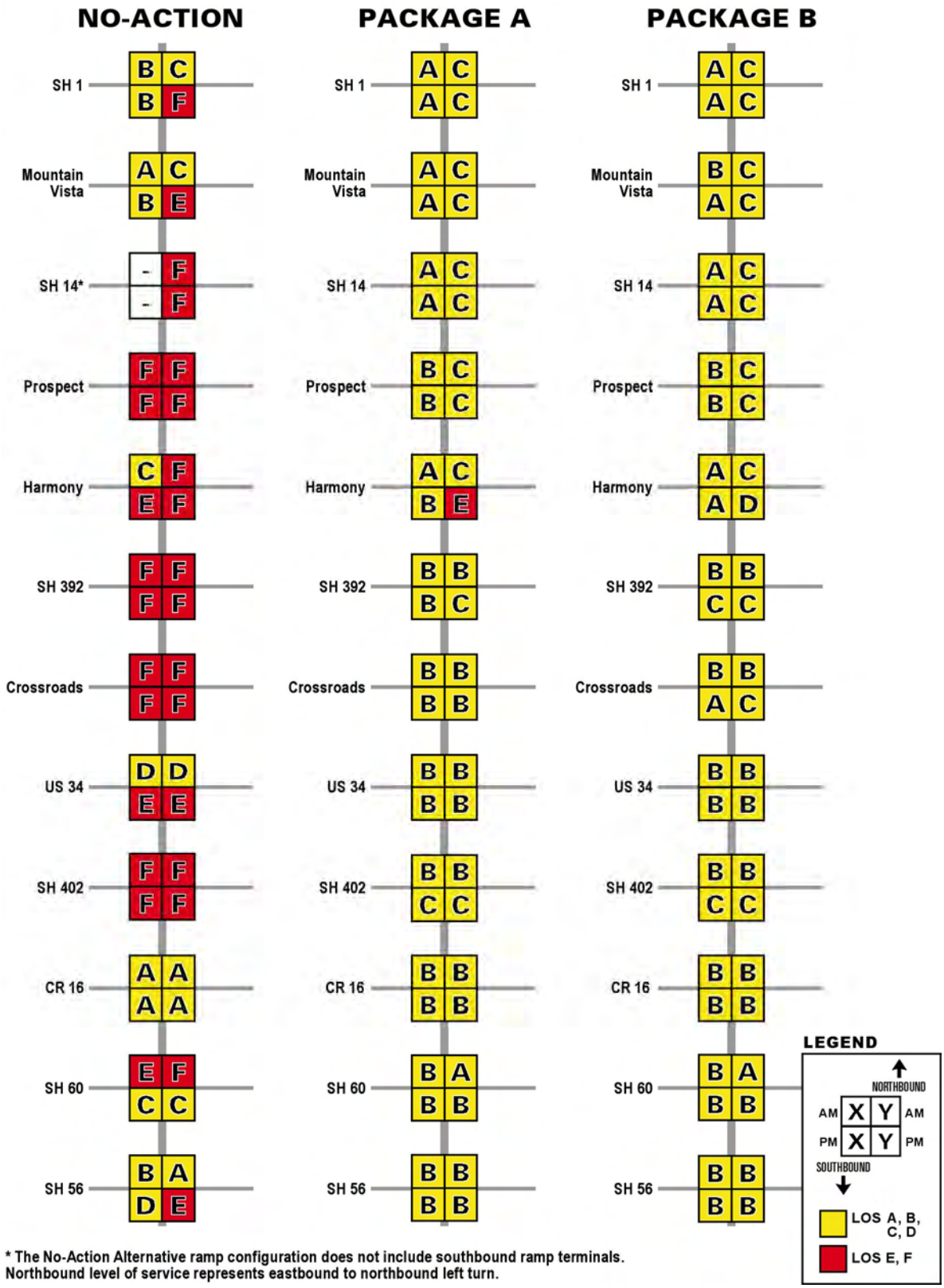
Table 4-12 provides a summary comparison of interchange ramp terminal intersection operations by package component. This table shows that both Package A and B interchange designs would improve operations to LOS D or better in 2030 for nearly all interchanges from SH 1 to E-470. However, most of the poorly operating ramp terminal intersections south of E-470 would remain congested in both Packages A and B.

Figures 4-21 and 4-22 provide the level of service for ramp terminal intersection at each interchange for the No-Action Alternative and Packages A and B. As shown, the Harmony Road northbound off ramp would operate at LOS E during the PM peak hour under Package A. 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 4-12 2030 Interchange Ramp Terminal Intersections Operating at LOS E or F

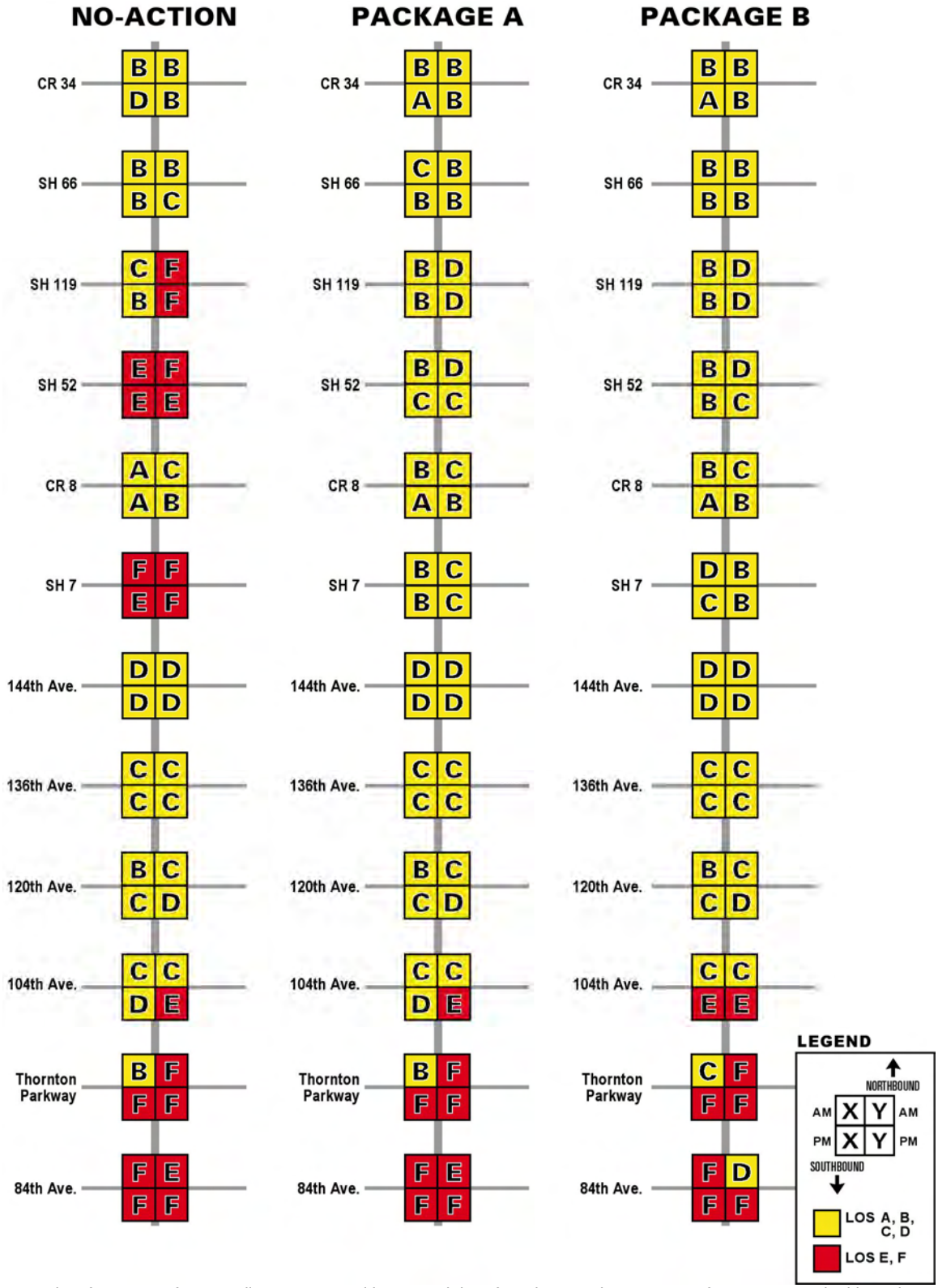
Component	No-Action		Package A		Package B	
	AM	PM	AM	PM	AM	PM
SH 1 to SH 14 (H1)	0	2	0	0	0	0
SH 14 to SH 60 (H2)	10	13	0	1	0	0
SH 60 to E-470 (H3)	7	6	0	0	0	0
E-470 to US 36 (H4)	3	5	3	5	2	6
Total	**20**	**26**	**3**	**6**	**2**	**6**

Figure 4-21 2030 Peak Hour I-25 Interchange Ramp Terminal Intersection LOS SH 1 to SH 56



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

Figure 4-22 2030 Peak Hour I-25 Interchange Ramp Terminal Intersection LOS CR 34 to 84th Avenue



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.

4.4.8.3 I-25 CORRIDOR

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, 2030 traffic volume projections for the No-Action Alternative and for either Package A or B, 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 BRT 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 4-23 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 4-24** 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 4-25**, most parking access points would operate at good levels of service and have a relatively small impact to major cross-street traffic volumes. The 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.

Figure 4-23 No-Action Alternative Carpool Parking Lot LOS

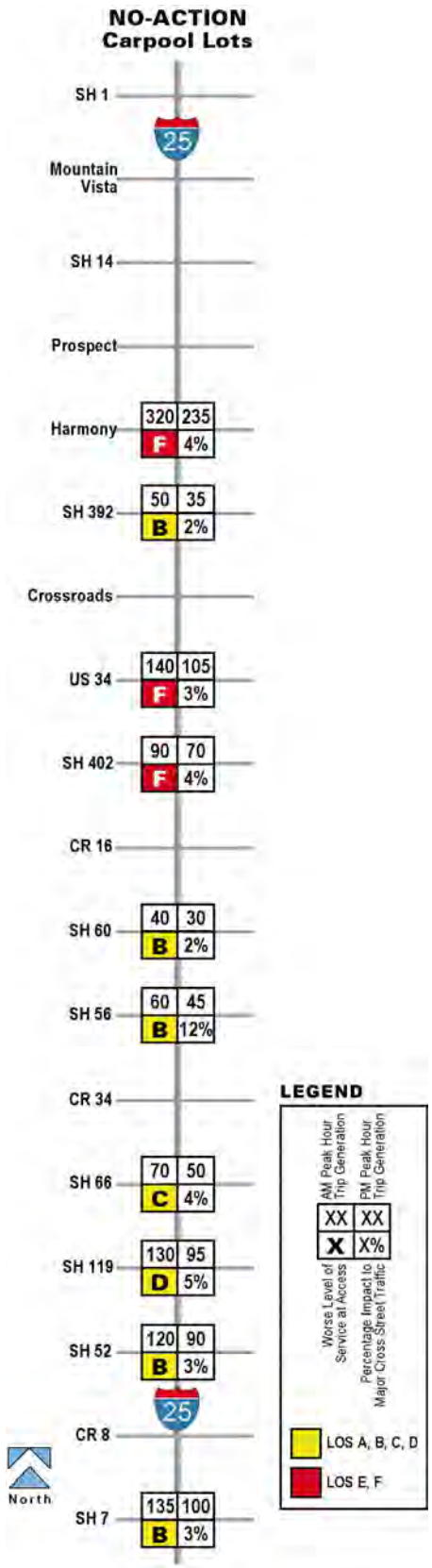


Figure 4-24 Package A Transit Station and Carpool Parking Lot LOS

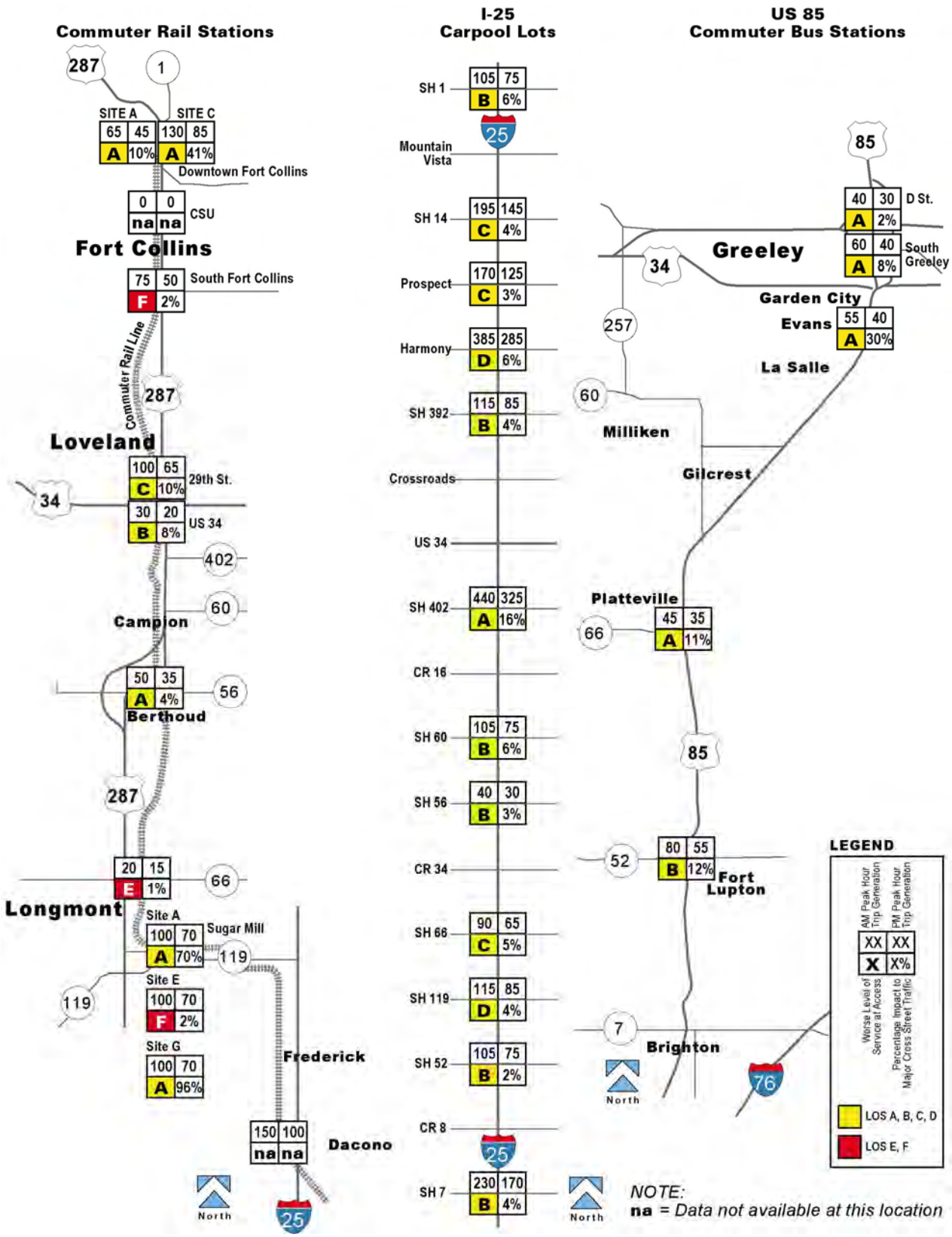
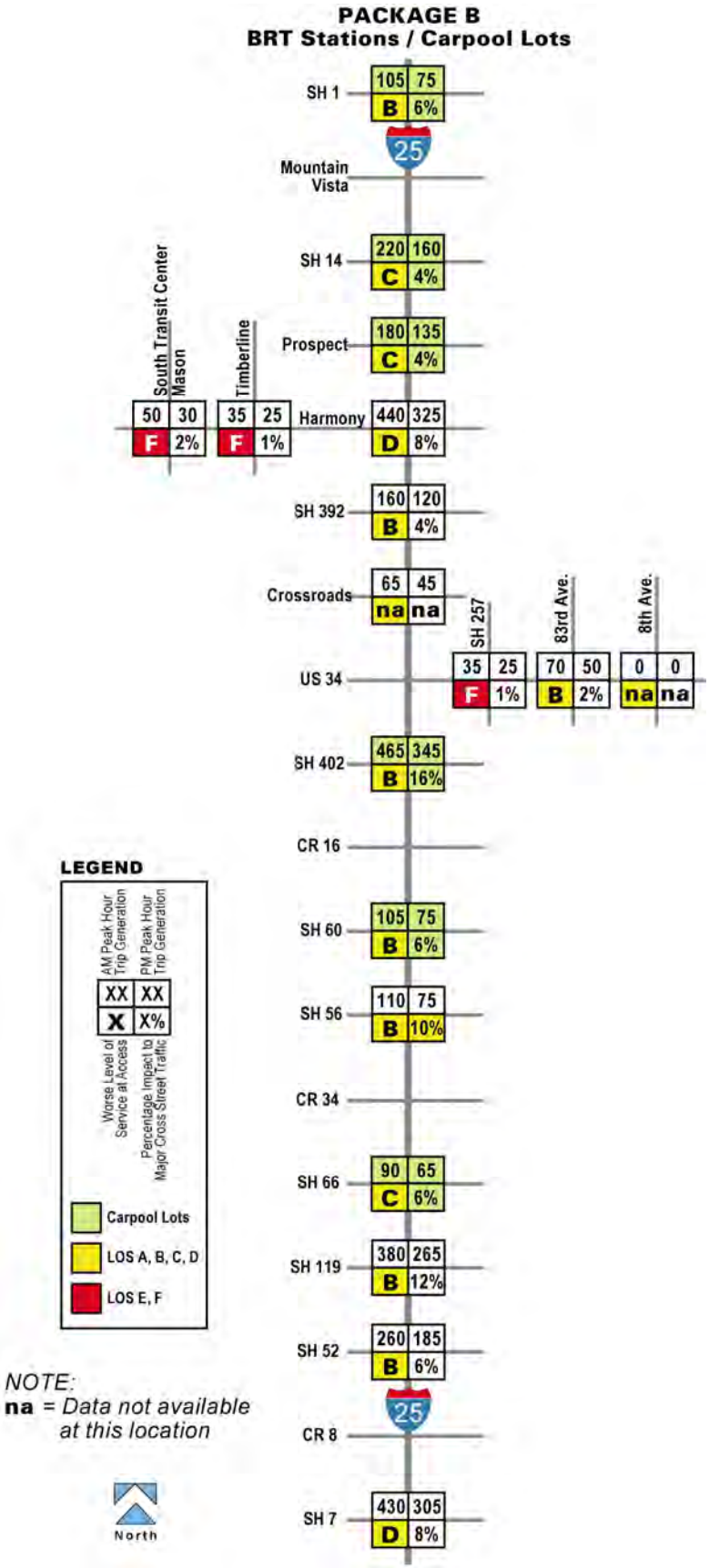


Figure 4-25 Package B Transit Station and Carpool Parking Lot LOS



4.4.9 Maintenance Facilities

4.4.9.3 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 Vine Drive and Timberline in Fort Collins, traffic generated by the proposed 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 2030 under the No-Action Alternative, and signal warrants would likely be met well before 2030 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. Similarly, roads adjacent to the site located at CR 46 and US 287 in Berthoud 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.

4.4.9.4 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 2 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.

4.4.9.5 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.

4.5 TRANSIT OPERATIONS

The addition of transit services in either Package A or B would have some impact to existing transit services in northern Colorado and Denver. **Table 4-13** compares the number of annual revenue hours of transit service currently operated in northern Colorado with the hours of service in Packages A and B. Package A would result in a 150 percent increase in service hours over the No-Action Alternative. Package B would result in a 140 percent increase in service hours over the No-Action Alternative.

Table 4-13 Annual Revenue Hours of Service

Component	Revenue Hours of Service			
	Existing	No-Action	Package A	Package B
Bus	101,719	101,719	231,739	243,529
Rail	0	0	23,370	0
Total	**101,719**	**101,719**	**255,109**	**243,529**

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), and in the City of Greeley on the local system (Greeley Evans Transit). Loveland's service (CoLT) consists of the FoxTrot, which connects it to Fort Collins, and two local routes. With the exception of the FoxTrot, there are no inter-city bus services available in the regional study area.

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

4.5.2.3 COMMUTER RAIL

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.

In Package A some riders would shift from the FasTracks Northwest Rail Corridor and North Metro Corridor rail lines to the Package A commuter rail. 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 2 percent. These riders would instead board the rail extension at one of the Package A stations. The decrease to the Northwest Rail Corridor line would be greater than the impact to the North Metro Corridor rail line because the rail connection between

Longmont and the North Metro Corridor rail line would provide a slightly faster travel time to Denver Union Station from Longmont.

The addition of a second track for commuter rail in Atwood Street in Longmont will result in the removal of on-street parking on both sides of the street between 3rd Street and 8th Street. Northbound roadway traffic will 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 will be shifted to alley access or cross-street access where necessary.

4.5.2.4 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.

4.5.3 Package B

4.5.3.3 Bus Rapid Transit

BRT service would terminate at the South Transit Center in Fort Collins, fostering connectivity to/from 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.

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 12 percent while the North Metro Corridor stations would decrease approximately 3 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.

4.5.3.4 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 Transit User Experience

The user experience while waiting for transit services would be quite different between Packages A and B. 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.

4.6 SAFETY

Both 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 2030. 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. Both packages would replace all interchanges considered functionally obsolete north of E-470. **Table 4-14** summarizes the functionally obsolete interchanges that would be replaced or modified under each package.

Table 4-14 Functionally Obsolete Interchanges

Structure Location	No-Action	Package A	Package B
SH 1	Minor Rehab	New Structure	New Structure
Mountain Vista		New Structure	New Structure
SH 14		New Structure	New Structure
Prospect	Minor Rehab	New Structure	New Structure
SH 392	Minor Rehab	New Structure	New Structure
Crossroads Boulevard		New Structure	New Structure
US 34	Minor Rehab	New Structure	New Structure
SH 402		New Structure	New Structure
CR 16	Minor Rehab	New Structure	New Structure
SH 60		New Structure	New Structure
SH 56	Minor Rehab	New Structure	New Structure
CR 34		New Structure	New Structure
104th Avenue	Major Rehab	Major Rehab	New Structure*
84th Avenue	Major Rehab	Major Rehab	New Structure*

* Structure would be replaced under reversible scenario (Option B2).

In total Package A would construct 84 new structures compared to 96 new structures in Package B. Package A would modify 13 structures while Package B would modify 23. Package A would rehabilitate 8 structures while Package B would rehabilitate 1 structure.

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. 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 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, 2006) 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 were provided by CDOT Division of Transportation Development. 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 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 4-15 summarizes the predicted crash estimates for Package A and Package B. As shown, both A and B are expected to experience approximately the same number of total crashes in 2030 with slightly fewer injury and fatality crashes anticipated under Package B. The total column is the sum of predicted injury, fatality and property damage only crashes.

The analysis found that 3,466 accidents per year would be expected in the Package A scenario while 3,410 would be expected in Package B. The difference is less than 2%, and given the variety of assumptions required for forecasting that difference was not substantial. Similarly, Package A is expected to produce 977 injury and fatal accidents per year while Package B is expected to produce 959. Again, the difference is less than 2% and too small to be meaningful.

For those segments that have barrier separated lanes in Package B, 24% less total accidents and 18% less injury and fatal accidents are expected to occur in the Package B scenario than on the same segments in Package A. Where Package B segments have buffer separated express lanes, 4% more total accidents and 2% more injury and fatal accidents are expected to occur than on the same segments in Package A. The much greater length of the buffer separated segments erases the safety dividend of the barrier separated segments.

Safety performance of the segments south of 120th Avenue would be improved in the Package Option B2, (where the existing 2 barrier separated reversible HOT lanes would be extended north from US 36 to 120th), with a safety dividend of about 16 less accidents and 4 less injury and fatal accidents each year between US 36 and 120th.

Table 4-15 2030 Crash Prediction Comparison

	Package A		Package B	
	Injury + Fatality	Total (I+F+PDO)	Injury + Fatality	Total (I+F+PDO)
SH 1 - SH 14 (H1)	19	60	25	76
SH 14 - SH 60 (H2)	228	780	202	638
SH 60 - E-470 (H3)	535	1,764	489	1,694
E-470 to US 36 (H4)	195	862	243	1,002
Total	**977**	**3,466**	**959**	**3,410**

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 significantly under the No-Action Alternative or Packages A or B.

Under the No-Action Alternative, truck traffic would be subjected to significant delays due to overall congestion along the corridor. Under either Package A or B, freight traffic would benefit from level of service and travel-time improvements over No-Action Alternative conditions north of E-470. It is worth noting, however, that trucks would be prohibited from using the TELs in Package B. Therefore, they would be subject to the higher traffic densities in GPLs in that package. South of E-470, freight traffic would benefit from the moderate travel-time savings in GPLs provided by Package B versus under the No-Action Alternative or Package A. Again, however, truck traffic would be prohibited from using the TELs in that section, so they would not benefit from the significant travel-time savings in those lanes.

Both Packages A and B would re-grade of 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 me 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.

4.8 PEDESTRIAN AND BICYCLE SYSTEMS

Each of the build packages 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 and B* of this Draft 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.

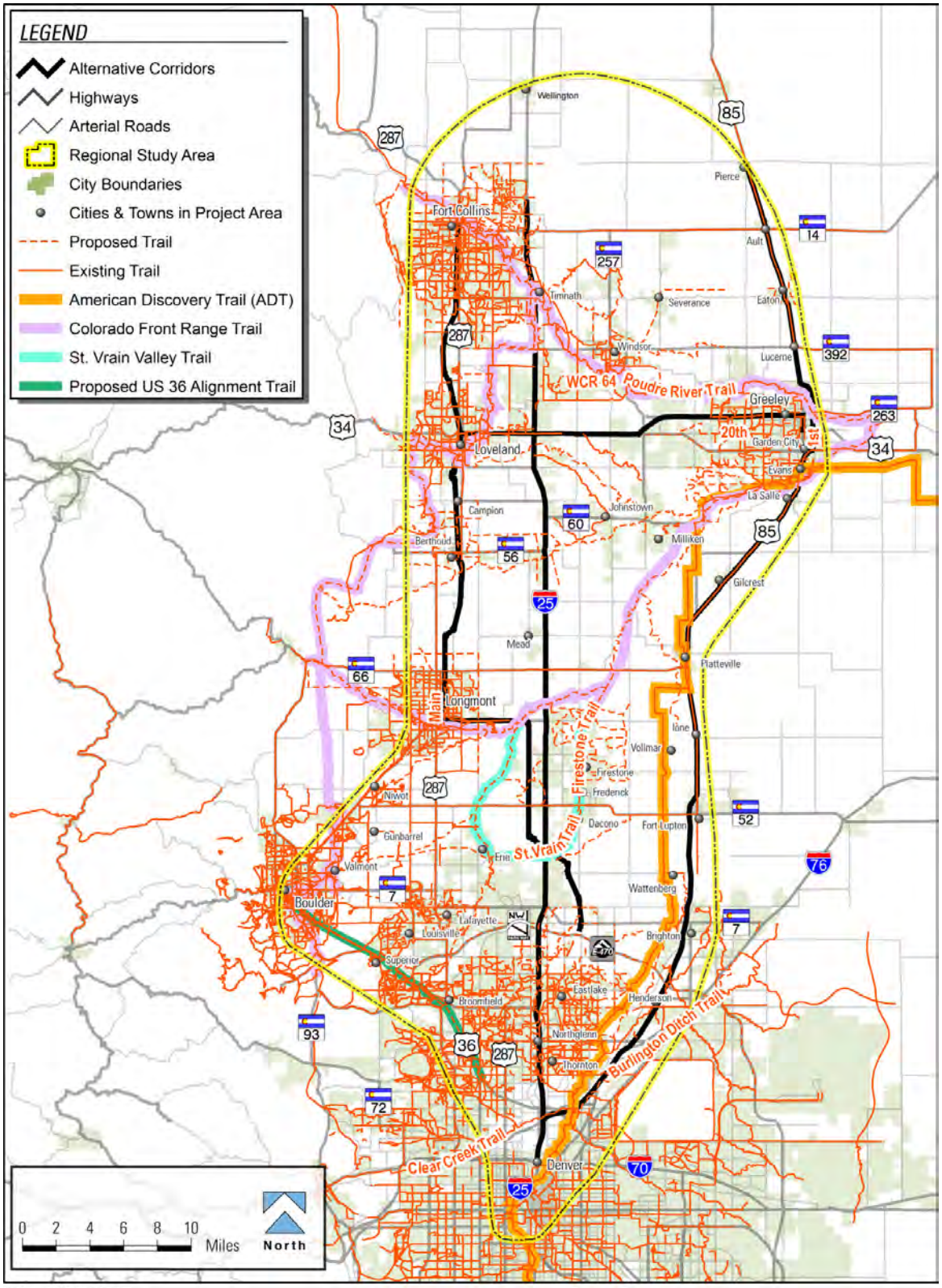
The regional study area includes numerous communities, each having varying degrees of existing and planned bicycle/pedestrian facilities. To document the bicycle/pedestrian facilities within the regional study area, GIS data, public bicycle/trail maps, comprehensive plans, and a variety of planning maps were collected from municipalities, counties, and state agencies. The mapping included trails, paths, bicycle lanes, and bicycle routes. Due to the size and complexity of the regional study area, sidewalks were not included as bicycle/pedestrian facilities unless 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 10 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. In addition to the proposed facilities included in the tables, there is one potential future facility near the US 85 station areas: an on-street facility is proposed at 30th Street by the City of Evans. **Figure 4-26** also shows the bicycle and pedestrian facilities mapped for the project area with the regional facilities highlighted.

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



Map Document: C&B (Trails_eis.mxd)
2/22/2007

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.

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.

4.9 CONSTRUCTION IMPACTS

This section describes construction impacts for all three 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 Packages A and B

Construction of either build package (Package A or B) 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 Occupancy of Bicycle and Pedestrian Facilities

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

- Spring Creek Trail, City of Fort Collins
- Fossil Creek Drive Trail, City of Fort Collins
- Lanyon Park Trail, City of Longmont
- 120th Avenue Transit Station Underpass, City of Northglenn
- Box Elder Creek Trail, Town of Wellington
- Big Dry Creek Trail, City of Westminster
- Farmers Highline Canal Trail, City of Northglenn

All localities meet the criteria noted in 23 C.F.R. 771.135(p) (7). The identified facilities are similarly affected under the two potential construction scenarios: either a temporary closure so as to lengthen an existing underpass or a temporary closure to allow for the construction of an additional railway track. Regardless of the construction scenario, the duration of occupancy would be less than the duration needed for construction of the full project. Additionally, there will be no alteration to the existing trail alignments, no changes in ownership, nor any temporary and/or permanent adverse physical effects with the activities or purpose of the resource. Correspondence letters received from entities with jurisdictions are included in **Appendix B**.

4.9.2.3 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.

4.9.2.4 HIGHWAY CONSTRUCTION METHODS

Highway construction methods would not vary significantly between Packages A and B. 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, 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.

4.9.2.5 TRANSIT CONSTRUCTION METHODS

The disparate transit systems included in the two 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, 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.). There is an option for a parking structure at the downtown transit center commuter rail station in Fort Collins. If this option is pursued, potential constriction impacts will be further evaluated in the Final EIS. The majority of the station efforts would be ancillary to the construction of the main transit components, described below.

Commuter Rail

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

Construction of the BRT TELs generally would follow the same approach as described earlier for highway construction. Amenities specific to BRT 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

Construction impacts to traffic will be presented to the public as part of the construction phase public involvement program, occurring after completion of the Final EIS and Record of Decision (ROD). Public suggestions for mitigation measures will be incorporated into the mitigation plan, where appropriate.

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

Packages A and B 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, the largest differences would be in the total VMT and freeway VMT generated; however, there would be very minor differences in delay and travel time, which indicates that both packages 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 Package B TELs would be substantial, with approximately 53 minutes saved with the Package B TELs on I-25 between SH 1 and 20th Street.

Similarly, although the transit components of the two packages would operate differently and use different modes and availability of service, Packages A and B would attract similar levels of transit ridership. For Package A, commuter rail and commuter bus combined would attract almost exactly the same ridership as BRT service in Package B. However, the user experience and travel time would be different between the packages. Commuter rail from Fort Collins to Denver would take 21 minutes longer than BRT. However, BRT service from Greeley to Denver would take about the same amount of time as commuter bus.

Key transportation impact findings are summarized below.

Compatibility with area plans:

- Packages A and B 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 *Metro Vision* and the *North Front Range 2030 Regional Transportation Plan*.
  Minor funding for improvements to I-25 and passenger rail right-of-way preservation are included in the NFRMPO 2030 fiscally constrained transportation plan but not included in the Upper Front Range or DRCOG fiscally constrained transportation plans.

Travel Demand:

- Transportation analyses used 2030 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 daily traffic volumes between SH 14 and E-470 would be 9 percent to 18 percent higher than the No-Action Alternative, while Package B 2030 daily traffic projections would be only 4 percent higher than the No-Action Alternative.

- Package A would have a greater effect on parallel arterial volumes than Package B. With Package A, arterial volumes would be about 4 percent to 12 percent lower than in the No-Action Alternative, while in Package B arterial volumes would be 0 percent to 3 percent lower.

- Both Package A and B 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 transit components of both Package A and Package B would not appreciably reduce I-25 highway traffic volumes because transit ridership projections are an order of magnitude smaller than vehicular demand projections.
- In Packages A and B, transit ridership (not including the feeder buses) would be about 5,850 riders per day. Station activity for commuter rail and BRT 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 2030, travel time from SH 1 to 20th Street using GPLs would be 10 minutes faster in Package A and 15 minutes faster in Package B than the No-Action Alternative travel time.
- In 2030, Package B travel time from SH 1 to 20th Street when using the TELs would be 47 minutes faster than the No-Action Alternative.
- Packages A and B would experience similar peak hour operation along mainline I-25 and at the interchange ramp terminals.
- South of E-470, Package B 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 37 minutes faster than driving in the No-Action Alternative. Using Package B BRT for the same trip would be 58 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 14 minutes faster than driving in the No-Action Alternative. Using Package B BRT for the same trip would be 46 minutes faster than driving in the No-Action Alternative.

Safety:

- Packages A and B would modify newer interchange structures, rehabilitate older structures, or replace the existing structures to address geometric and capacity-related safety concerns.
- Package B would replace two aging interchange bridges on I-25 south of E-470 not replaced in Package A.
- 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, 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 the design.
- Packages A and B are expected to experience approximately the same number of total crashes in 2030 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:

- Neither Package A nor Package B would affect the current growth rate for freight traffic (estimated to be 2 percent on the south end and 3 percent on the north end). In general, freight traffic in Packages A and B would benefit from improved traffic operations in the GPLs and re-grading of the highway to a maximum grade of 4 percent. In Package B, freight traffic would be prohibited from using the TEL.

Pedestrian and Bicycle Systems:

- The No-Action Alternative generally would not affect bicycle/pedestrian facilities along the I-25 corridor.
- Package A 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.
- 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 queue jumps along US 34 would require acquisition of some new right-of-way within Greeley, which could affect some pedestrian crossings and on-street bicycle facilities.

Construction Impacts:

- Highway construction methods would be similar for both Packages A and B, although Package B would require additional signage, striping, and barriers as well as installation of the toll collection system. In both packages, new highway segments would open as phases are completed and a design-build method could be sought for either package.
- Transit construction methods in Package A 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 both 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 4-16** through **4-19** that follow.

Package Similarities:

- Plan compatibility
- Total volumes on I-25 north of E-470
- Impacts to bicycle and pedestrian facilities
- Daily average speed on I-25
- Ridership on commuter transit services
- Operation of I-25 from SH 1 to SH 14

Small Differences between Packages:

- Daily freeway VHT
- Daily total VHT
- Automobile travel time on I-25 GPLs north of E-470
- Miles of I-25 operating at LOS E or F in AM peak hour north of E-470
- Number of carpool lots with access at LOS E or F
- Number of structures being replaced or modified north of E-470

Large Differences between Packages:

- Daily freeway VMT (Package A is higher)
- Traffic volumes between E-470 and US 36
- Automobile travel time on I-25 in TELs
- Automobile travel time on I-25 in the GPLs between E-470 and US 36
- Operation on I-25 between E-470 and US 36
- Feeder bus ridership
- Transit user experience
- Transit travel times
- User safety on commuter rail versus highway or bus

Table 4-16 Effect on Highway Travel Demand

Evaluation Factor	No-Action	Package A	Package B
Daily Users on I-25 (People)	805,700	868,800	869,600
Average daily traffic volumes SH 1 to E-470	105,500	119,000	109,500
Average daily traffic volumes E-470 to US 36	189,300	192,600	203,300
Vehicle Miles of Travel Freeway	15,712,000	16,559,000	16,071,000
Vehicle Hours of Travel Freeway	325,500	330,400	327,300
Average Freeway Speeds	48	50	49
Daily volumes on northern parallel arterials	--	Reduced 4-12%	Reduced 0-3%
Daily volumes on southern parallel arterials	--	No net change	Slight reduction

Table 4-17 Physical Characteristics

Evaluation Factor	No-Action	Package A	Package B
New Structures	0	84	96
Modified Structures	0	13	23
Rehabilitatesd Structures (Major and Minor)	27	6	1
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

Table 4-18 Summary of I-25 Operation Evaluation

Evaluation Factor	No-Action	Package A	Package B
Travel Time (minutes)			
General purpose lanes - SH 1 to 20th Street	128	118	113√
Tolled express lanes - SH 1 to 20th Street	112	101	65√
Mainline I-25 at LOS E or F (miles)			
AM peak hour	23	11	10√
PM peak hour	53	22√	22√
Merge/Diverge Locations at LOS E or F			
AM peak hour	25	11√	13
PM peak hour	54	24√	30
Interchanges at LOS E or F			
AM peak hour	20	3	2√
PM peak hour	26	6√	6√
Annual Crashes (predicted)	N/A	3,466	3,410

√ Indicates package with best evaluation factor value.

Table 4-19 Summary of Transit Operation Evaluation

Evaluation Factor	No-Action	Package A	Package B
Ridership(daily riders)			
On commuter services	0	5,850√	5,850√
Special event weekday	N/A	250 to 475√	200 to 400
Special event weekend	N/A	650 to 1,175√	500 to1,000
Market Transit Share (percent)			
Commuters to Denver living north of SH 66	<1%	55%√	50%
Travel Time (minutes)			
South Transit Center to Downtown Denver	130 minutes (in GPLs)	93 minutes	72 minutes√
Downtown Greeley to Downtown Denver	135 minutes (in GPLs)	121 minutes	89 minutes√

√ Indicates package with best evaluation factor value.