NORTH I-25 EIS

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FEIS Parking Demand

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INTRODUCTION

This technical report describes the forecasting process for the developing the number of parking spaces at carpool lots and transit stations. Parking estimation for carpool lots and transit park-n-ride facilities are independent processes. Though carpool and transit parking uses may occupy the same location, the travel markets served are different; therefore, the analysis was performed separately. The analysis for carpool lots is presented initially, and transit estimates are described in a later section of this document. The final section presents the combined results by location.

CARPOOL LOT PARKING NEEDS ANALYSIS

Overview

This section documents the forecasting process used to estimate future parking demand for the year 2035 at each of the proposed carpool lots identified by the North I-25 EIS study.

Carpool lots provide added convenience for travelers who wish to share rides with other travelers in the region. Carpooling increases efficiency of the roadway system by increasing the number of people per vehicle and reducing the number of vehicles. Therefore, providing convenient and sufficient carpool parking is part of the overall congestion management strategies for this project. The congestion management plan included a screening process for carpool lot selection. Criteria for this screening includes1:

- Potential for undeveloped land;
- Regional connectivity (connections to communities either on the east or west sides of the corridor)
- Traffic access (access points from frontage roads)
- Potential for environmental impact
- Practicability, as defined by the cost effectiveness (demand versus the construction cost)

The results of the screening process identified the following carpool lots as part of the North I-25 EIS project.

- SH-7
- SH-52
- SH-119

[1] Refer to the *Carpool Lot Location Technical Memorandum* in the DEIS Parking Results section of this appendix for details.

- SH-66
- SH-56
- SH-60
- SH-402
- SH-392
- SH-68
- Prospect
- SH-14
- SH-1

Existing Conditions

An inventory of the existing carpool lot parking utilization was performed by the project team on August 29, 2006[2]. These results were compared against previous inventories performed over the previous two years. From these observations, the number of utilized spaces and the parking lot supply were determined. **Table 1** shows a summary of this information.

Table 1:
Carpool Lot Field Observations

Parking Lot Location	Existing Conditions		
	# of Spaces Available	# of Spaces Utilized	% Utilized
SH 7 East	***30***	***16***	***53%***
SH 7 West	***75***	***19***	***25%***
SH 52	94	36	38%
SH 119	102	36	35%
SH 66	53	27	51%
SH 56	48	14	29%
SH 60	32	30	94%
SH 402	71	52	73%
US 34	108	105	91%
SH 392	38	36	95%
Harmony	248	175	71%
Total	**899**	**546**	**61%**

Source: Field counts performed 8/29/2006

Bold Italic is data based on previous counts performed 4/22/2004

[2] See Carpool Summary Report for detailed information related to parking survey. October 2006.

Carpool Parking Scenarios

Carpool parking demand at each of the carpool parking lots was forecasted for 2035 for the FEIS Preferred Alternative and FEIS Phase 1 Alternative. The parking demand estimates from the DEIS for Package A and B were not updated and are considered valid for the purposes of comparing alternatives.

Travel behavior and carpool characteristics are expected to differ with each of the above mentioned scenarios. The following forecasting technique accounts for this expected change in carpool demand.

Baseline for New Carpool Lots

For those proposed carpool parking locations that do not have current parking facilities, a baseline was established. This was established by spreading the demand amongst neighboring facilities. For example, the current carpool lot users that use the existing Harmony lot were grouped with lots at SH-1, CR-50, SH-14, and Prospect. Refer to **Figure 1**, for grouping and total parking demand within each of the groups.

The group demand was then spread amongst the individual lots based on the adjacent interchange traffic volumes. For example, the existing daily interchange volume for the Harmony Group is as follows:

- Harmony: 32,776 vehicles per day or 45.6%
- Prospect: 14,007 vehicles per day or 19.5%
- SH-14: 16,625 vehicles per day or 23.1%
- SH-1: 8,494 vehicles per day or 11.8%

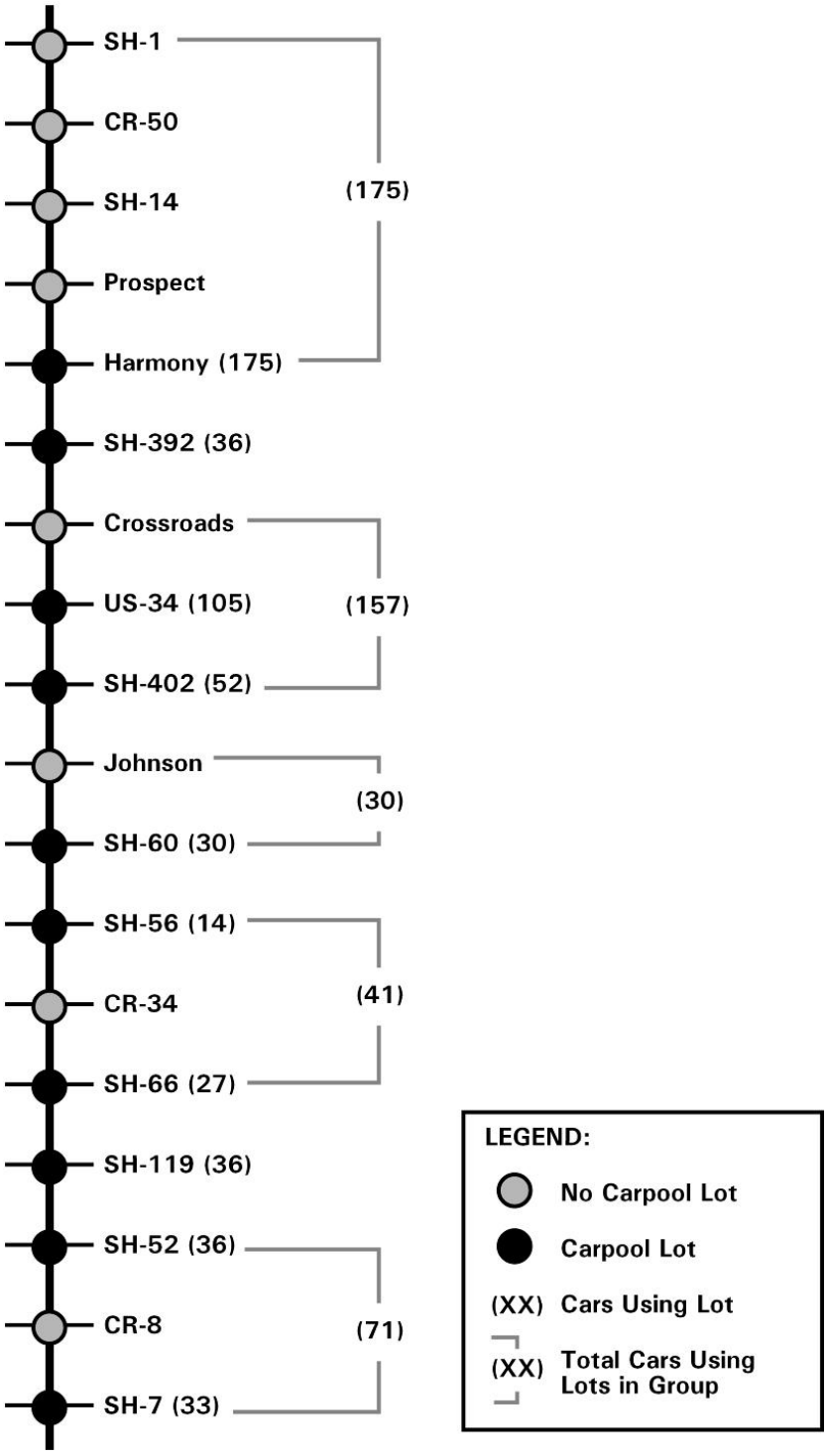

Figure 1:
Existing Demand and Carpool Lot Grouping

Using the existing group demand of 175 vehicles (at Harmony Road as an example), this equates to:

- Harmony: 80 existing carpool vehicles or 45.6%
- Prospect: 35 existing carpool vehicles or 19.5%
- SH-14: 41 existing carpool vehicles or 23.1%
- SH-1: 21 existing carpool vehicles or 11.8%

These numbers were then used as the baseline for future projections. The above traffic volumes utilized 2005 daily traffic projections directly from the travel model. To determine growth rates, future 2035 daily volumes are used from the model.

Parking Lot Grouping Methodology:

Grouping of the lots was based on geographic proximity and perceived shared travel markets. Aerials, knowledge of the corridor, and available lands for development were all considered during the grouping process.

Parking Demand Based on Traffic Demand

The first step in the forecasting process is to correlate parking trends with trends in traffic demand. For the purposes of this analysis, the correlation is based on the year 2035 Preferred Alternative traffic demand at interchanges. The 2035 data set accounts for regional land use development for future scenarios.

Currently along the I-25 corridor some of the interchanges are approaching capacity and others have excess capacity. To account for this, the same interchange grouping used above was used to better reflect growth patterns. This 'averages' high growth at one interchange with that of the adjacent interchange, which might be much lower. Refer to **Figure 2** for growth rates. In general, these growth rates are then applied to the base year utilization to calculate future demand for the carpool group.

This method accounts for travel growth near each of the carpool parking locations; however, additional analysis is needed to accurately account for the effect of High Occupancy Vehicle (HOV) lanes in some of the future build scenarios.

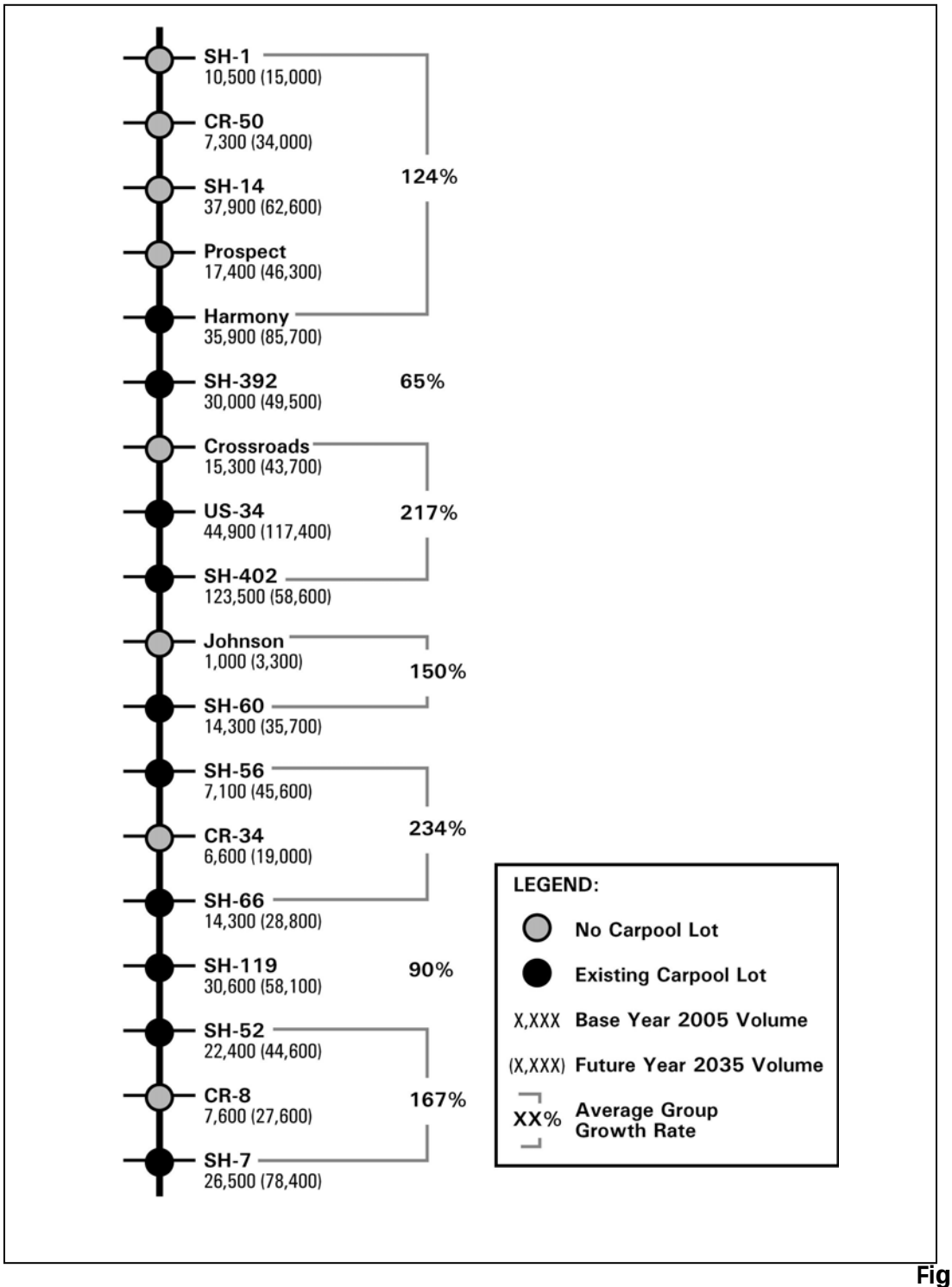

Figure 2:
Carpool Growth Percentages

HOV Lane User Adjustment

To account for changes in HOV usage under each of the build scenarios, three model runs[3] from Level 3 modeling that isolated the amount of HOV traffic on general purpose lanes were compared. The 2030 No-Action and 2030 Non-HOV Alternative model runs included a representative segment of I-25 south of SH 52 that tracked HOV trips on I-25. The HOV Alternative from Level 3 was also examined.

The HOV lane use volumes from these runs were used to calculate the affect of capacity increases on carpooling – and therefore carpool lot utilization. **Table 2** shows the volumes on the HOV links for each test run[4]. In addition to the No-Action Alternative, the test runs include the Non-*HOV Alternative* to identify the effect of capacity increases in the form of general purpose lanes, and the *HOV Alternative* to identify the effect of *HOV* lanes.

Table 2:
Change in HOV Traffic along I-25

			Daily Volume
No-Action (P 20)	Southbound	HOV	3,800
		GP	66,300
	Northbound	HOV	3,800
		GP	63,400
Non-HOV Alternative	Southbound	HOV	4,200
		GP	72,200
	Northbound	HOV	4,200
		GP	69,200
	HOV Change from No-Action		**9.4%**
	Total Change from No-Action		**8.9%**
HOV Alternative	Southbound	HOV	4,500
		GP	68,200
	Northbound	HOV	4,500
		GP	65,700
	HOV Change from No-Action		**17.6%**
	Total Change from No-Action		**4.0%**

[3] Package 20 (Level 3 2030 No-Action), Package 19 (Level 3 2030 Package 1), both with addition of short HOV only segment to isolate HOV traffic south of SH 52.
[4] Test runs were performed during the Level 3 screening process.

For the FEIS Phase 1 Alternative, it was assumed that no additional HOV traffic would occur. For the Preferred Alternative, which includes both General Purpose widening and TEL lane widening, it was assumed that an average of the two effects would occur, or an increase in HOV traffic of approximately 14%.

Summary

By combining the results from the interchange growth and HOV analyses, both the increases in demographic growth (traffic growth) and the effect of adding transportation facilities that encourage carpooling are taken into account. This method for calculating future carpool parking space demand by site is summarized by the equation below:

FPD = ((BU * (1 + IG) * (1 + HOV)) * (1 + CC)) *LS

Where:

FPD – Future Parking Demand at a specific location

BU – Base Utilization

IG – Interchange Growth Percentage

HOV – HOV Lane Usage Adjustment

CC – Capacity Contingency of 15%

LS – Lot Share of group percentage

A capacity contingency is provided to account for expected variations in parking demand during special events or peak periods. It also provides additional spaces to accommodate efficient parking turn-over.

The results of the recommended method are shown in **Table 3**.

Table 3:
Carpool Lot Capacity Projection Results

Parking Lot Location	Phase 1		Preferred Alternative	
	Estimated Demand	Projected Spaces*	Estimated Demand	Projected Spaces**
SH 7	86	100	89	120
CR 8	32	40	31	40
SH 52	53	60	51	70
SH 119	65	70	68	90
SH 66	39	40	38	50
CR 34	0	0	0	0
SH 56	60	70	61	80
SH 60	73	80	73	90
SH 402	188	220	191	250
US 34 & SH 257	67	70	46	60
Crossroads	153	150	143	190
SH 392	54	60	59	80
Harmony	154	180	160	210
Prospect	86	100	86	110
SH-14	109	130	117	150
Mountain Vista	0	0	0	0
SH-1	28	30	28	40
Total	**1,219**	**1,400**	**1,242**	**1,630**

**Added a 15% contingency capacity (rounded to nearest five)*

***Added a 15% contingency capacity and applied the 14% HOV factor (rounded to nearest five)*

Final recommendations for lot sizes will be combined with needs for park-n-rides to support proposed transit stations. Further evaluation during design resulted in lot sizes being adjusted to fit terrain or being re-allocated to reduce impacts.

TRANSIT PARKING NEEDS ANALYSIS

Overview

The following is an outline of the procedure used to estimate needed parking spaces for 2035 at proposed transit stations for the North I-25 FEIS Phase 1 Alternative and Preferred Alternative. Again, the parking demand estimates from the DEIS for Package A and B were not updated and are considered valid for the purposes of comparing alternatives. Note, the number of needed parking spaces at carpool lots along I-25 is estimated separately, as described earlier in this document.

The North I-25 travel model does not directly produce transit parking spaces as an output. The estimation procedure uses travel model output data together with observed field data to calculate a needed number of park-n-Ride spaces. The results of the procedure are presented and a comparison to other corridors in Denver and other cities is also provided.

Step 1. Number of Spaces for Each Transit Corridor

First, the total number of spaces needed for each route was estimated.

- Summed the 2035 regional travel model drive person-trips to/from corridor park-n-Rides for each major transit route – Commuter Rail on the BNSF line and Commuter Bus on US-85 and Express Bus on Harmony Road, US-34, and I-25. Additional demand is likely to occur at each station for other transit activity; however, for the North I-25 EIS, it has been determined that parking will only be provided for the major transit routes.

- Noted that the FEIS travel models result in the following percentages of drive-access trips for each corridor:

    - Commuter Rail: 44 percent

        - Similar commuter rail systems have been observed to attract higher drive access percentages of between 53 and 84 percent[5]; as a conservative measure, therefore, the drive access percentage for the North I-25 Commuter Rail system was adjusted to 52 percent.[6]

    - Commuter Bus: 62 percent in Phase 1; 61 percent in Preferred Alternative

        - Adjustments were made at stations where the model seemed unreasonably low and the resulting drive access percentage was 73 percent in Phase 1 and 72 percent in Preferred Alternative.

    - Express Bus: 52 percent in Phase 1; 44 percent in Preferred Alternative

5 Passenger Origin Mode Choice Summary Supplemental Information for Existing Commuter Rail System, Carter & Burgess, January 2006

6 The North I-25 travel model is calibrated to current RTD conditions. The rail mode is therefore based on observed patterns for Light Rail. Since commuter rail attracts fewer local trips, the drive access percentage was adjusted to better reflect empirical data for other commuter rail systems.

- Adjustments were made at stations where the model seemed unreasonably low and the resulting drive access percentage was 69 percent in Phase 1 and 64 percent in Preferred Alternative.

- Converted the total model drive person trips[7] to parking spaces, by using observed field data from RTD.

- The average ratio of drive access person trips per utilized parking space at existing RTD park-n-Rides (that share long regional travel characteristics as expected to occur in the North Front Range) results in a divisor of 2.7[8]. This factor converts a trip into and out of a park-n-Ride (which the model counts as two trips) to one total person-trip, accounts for auto-occupancy and parking turnover rates, and provides for 15% additional capacity for circulation and turnover during peak occupancy.

- Calculated a proposed number of total parking spaces for each major route.

- Calculated the ratio of total parking spaces for the corridor to total daily ridership, and compared the results with other areas. The results are **presented** in the **Table 4**.

As shown in the table, the ratios of riders per space for the North I-25 transit alternatives fall at or below RTD corridors, but are higher than corridors in San Jose, San Diego, and Seattle that have been identified as peer rail systems. However, it should be noted that a riders per space ratio of less than two is not reasonable, as a round-trip transit user is counted as two riders, but can only park once. Still, the low riders per space ratios for those corridors may also be a result of high drive access percentages and lack of turnover, which is a result of schedules that are designed for peak hour-peak direction travel only. Also, note that it is known that the RTD Southwest/Central corridor has insufficient spaces for park-n-Ride demand, and therefore its riders per space ratio is relatively high.

7 Drive person trips is the modeled two-way person trip total in and out of park-n-Rides.
8 Divisor of 2.7 based on an analysis of current utilization at selected RTD park-n-Rides that generally serve long-haul regional routes as compared to 2005 Model person trips to these park-n-Rides. As a comparison, the divisor for system-wide park-n-Rides is 3.1. Selected park-n-Rides: Commerce City, Franktown, Pinery, C-470/University, Superior/Louisville, Highlands Ranch Town Center, Flatirons/US-36, Parker, Lincoln/Jordan, US-85/Bridge, Broomfield, Longmont Depot, Niwot, Table Mesa, Wagon Road, Littleton Mineral.

Table 4:
Total Corridor Transit Parking Spaces and Ridership[9]

	Year	Proposed Spaces	Estimated Ridership	Riders per Parking Space
North I-25 Transit Alternatives				
Commuter Rail – Preferred*	2035	595	2,700[10]	4.5
Commuter Bus – Phase 1	2035	85	400	4.7
Commuter Bus – Preferred	2035	120	400	3.3
Express Bus – Phase 1	2035	710	4,000	5.6
Express Bus – Preferred	2035	730	3,400	4.7
* No Commuter Rail in Phase 1				
FasTracks Comparisons				
West	2025	5,700	31,100	5.5
Southwest/Central	2003	4,289*	36,904*	8.6
Southeast	2025	9,482	55,450	5.8
East	2030	7,100	37,000	5.2
Western U.S. Commuter Rail Comparisons				
Altamont Commuter Express (ACE)	2002	1,670*	3,189*	1.9
Coaster	2003	1,805*	5,802*	3.2
Sounder	2004	2,536*	3,452*	1.4

*Observed data. Data for national comparisons were tabulated from a variety of disparate sources, and therefore may not be as comparable.

Step 2. Distribution Among Corridor Stations

- Tabulated the 2035 regional travel model distribution by station of drive access transit boardings for each transit alternative.
- The distribution of parking spaces among stations was adjusted to account for projected future conditions at some station sites and known characteristics of the travel model. Reasons for making substantial changes to the model's parking distribution are described below.

9 Ridership is daily boardings on the rail line.
10 Sum of inbound ons and outbound offs

Commuter Rail

- **Fort Collins North Transit Center** – historically, the DRCOG/RTD model has underestimated drive access demand at end-of-line stations like the North Transit Center. For this reason, the percentage of corridor drive access boardings here was increased slightly, while others were adjusted slightly down in compensation.

- **Loveland – 29th St. and US-34; Berthoud – SH-56** – the US-34 station is envisioned as a downtown station with limited space available. Therefore, demand for this station is shifted to the 29th St. station and the Berthoud station.
- **Erie – CR-8 –** the portion of spaces was increased at this station because it is a shared station with Express Bus and could attract additional activity.

Table 5:
Commuter Rail on BNSF

Station	Modeled Total Boardings (Drive, Walk and Transit Access)	North I-25 DEIS Proposed Spaces	
		Adjusted Distribution	Number of Spaces
Fort Collins North Transit Center	92	10%	**60**
CSU Station (no park-n-Ride)	80	0%	**0**
Fort Collins South Transit Center	804	13%	**105**
Loveland - 29th Street	363	12%	**120**
Loveland - US-34	320	15%	**40**
Berthoud	131	10%	**50**
Longmont - SH-66	156	8%	**30**
Longmont - Sugar Mill	289	14%	**90**
Erie - I-25 & CR-8	137	18%	**100**
Total	4,096[11]	**100%**	**595**

Note: the South Transit Center was increased to 105 to account for additional potential demand from trains running at 60-minute headways through Fort Collins.

Commuter Bus

- **Greeley North and Greeley South –** spaces at these stations were re-allocated to provide more parking at the end-of-line Greeley North station for the same reasons stated above.

[11] Total boardings by station

Table 6:
Package A Commuter Bus on US-85

Station	Modeled Total Boardings (Drive, Walk and Transit Access)	North I-25 DEIS Proposed Spaces	
		Adjusted Distribution	Number of Spaces
Phase 1 Alternative			
Greeley North	7	7%	15
Greeley South	99	40%	20
Evans - 37th Street	83	40%	20
Platteville - SH-66	16	8%	15
Ft. Lupton - SH-52	8	5%	15
Total	**213 / 216**	**100%**	**85**
Preferred Alternative			
Greeley North	10	8%	20
Greeley South	85	35%	30
Evans - 37th Street	83	42%	30
Platteville - SH-66	19	10%	20
Ft. Lupton - SH-52	19	5%	20
Total	**213 / 216**	**100%**	**120**

Express Bus

- **SH-119 and SH-52** – spaces at these stations were re-allocated as a more equitable distribution is expected at these stations that serve the Weld and East Boulder County areas.
- **US-34 & 83rd and US-34 & SH-257** – spaces were re-allocated to be more equal at these stations, based on professional judgment.

Table 7:
Express Bus

Station	Modeled Total Boardings (Drive, Walk and Transit Access)	Travel Demand Model Estimate of 2035 Parking Demand		North I-25 DEIS Proposed Spaces	
		Distribution	Parking Demand	Distribution	Number of Spaces
Phase 1 Alternative					
Fort Collins - I-25 & Harmony	954	30%	210	30%	210
SH 119	943	39%	280	30%	210
SH 7	537	14%	100	25%	180
US 34 & 83rd	355	17%	120	15%	110
Total	**2,789**	**100%**	**710**	**100%**	**710**
Preferred Alternative					
Fort Collins South Transit Center	10	0%	2	1%	25
Fort Collins - I-25 & Harmony	161	7%	50	8%	50
SH 392	75	2%	16	2%	15
Crossroads	15	1%	5	1%	15
SH 56/60	192	9%	62	10%	60
SH 119	501	31%	223	25%	150
SH 52	21	0%	2	7%	40
CR-8	224	5%	34	5%	45
SH 7	879	16%	114	15%	130
US 34 & 83rd	348	26%	189	15%	130
US 34 & SH 257	31	1%	7	11%	70
Total	**2,505**	**99%**	**720**	**100%**	**730**

SUMMARY OF PARKING SPACE PROJECTIONS

Estimates of the 2035 demand for parking spaces have been developed for the FEIS alternatives. There are proposed carpool lots near select interchanges along I-25, and future transit stations with parking lots (park-and-rides) throughout the study area. At locations where the carpool lot and transit park-and-ride are in the same vicinity, the carpool lot and park-and-ride are combined into one facility.

Combined Results

Combined facilities are planned at locations on the I-25 corridor where the carpool lot and transit park-and-ride are in the same vicinity. Note carpoolers form a different travel market than transit users, and so the carpool lot sizes are not affected because of transit improvements. In addition, some lot sizes are limited by constraints at the selected sites, and demand from those lots was shifted to other locations. The final 2035 results for Phase 1 and the Preferred Alternative are displayed in **Table 8**. Build out is the maximum demand from either Phase 1 or the Preferred Alternative, with exceptions as noted.

Table 8:
Transit and Carpool Lot
Parking Spaces by Station and/or Interchange

	Phase 1 Demand			Preferred Alternative Demand				Site Size Limit	Build Out[1]
Location	Bus	Carpool	Total	Rail	Bus	Carpool	Total		
I-25 Interchanges									
I-25 & SH 7	180	100	280		130	120	250		280
I-25 & CR 8		40	40	100	45	40	185		185
I-25 & SH 52		60	60		40	70	110		110
I-25 & SH 119	210	70	280		150	90	240		280
I-25 & SH 66		40	40			50	50		50
I-25 & SH 56		70	70		60	80	140		140
I-25 & SH 60		80	80			90	90		90
I-25 & SH 402		220	220			250	250		285
I-25 & Crossroads		150	150		15	190	205	130	130
I-25 & SH 392		60	60		15	80	95		95
I-25 & Harmony	210	180	390		50	210	260	350	350
I-25 & Prospect		100	100			110	110		110
I-25 & SH 14		130	130			150	150		150
I-25 & SH 1		30	30			40	40		40
US 34 Corridor									
83rd	110		110		130		130		195
SH 257		70	70		70	60	130	105	105
BNSF Corridor									
North Transit Center				60			60		60
CSU									0
South Transit Center				105	25		130		130
N Loveland				120			120		120
Downtown Loveland				40			40		40
Berthoud				50			50		50
North Longmont				30			30		30
Sugar Mill				90			90		90
US 85 Corridor									
Greeley D Street	15		15		20		20		20
Greeley 19th St	20		20		30		30		30
Evans	20		20		30		30		30
Platteville	15		15		20		20		20
Fort Lupton	15		15		20		20		20
TOTAL	795	1,400	2,195	595	850	1,630	3,075		3,235

Notes:
1) Build out is the maximum demand from either Phase 1 or the Preferred Alternative, with the following exceptions:
a) The I-25 & Harmony site is limited to 350 spaces; additional Phase 1 demand is accommodated at Prospect and SH 392
b) The Crossroads and SH 257 sites are limited to 130 and 105 spaces, respectively; additional demand is accommodated at 83rd and SH 402

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