



# US 85 Commuter Bus - Greeley DEIS Evaluation

Page 1 of 20

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## Introduction

The North I-25 DEIS Package A alternative considers two commuter bus routes: one that would extend from the Denver Union Station (DUS), and a second that would extend from the Denver International Airport (DIA). Both routes will terminate in Greeley. Line stations will be located at designated existing transit stops in Denver, Commerce City, and Brighton, as well as new proposed stops in Fort Lupton, Platteville, Evans, and Greeley.

The proposed commuter bus route generally follows the existing US 85 alignment. The end-of-line station along with a parking/development opportunity is proposed in the vicinity of the US 85/D Street intersection. A map of the proposed commuter bus routes showing the station locations is provided in Figure 1.

This report documents the potential traffic impacts of the proposed end-of-line commuter bus station in the vicinity of the US 85/D Street intersection in Greeley, and provides technical documentation of the traffic data analysis. The other proposed commuter bus stations are addressed in separate reports.

## Existing Conditions

The proposed commuter bus station is located at the US 85/D Street intersection and would have approximately 40 parking spaces. The surrounding area includes several land use types, including residential, commercial, retail development, gas stations, and small offices.

The proposed study area includes the following routes and intersections:

### United States Highway 85 (US 85)

US 85 is a four lane divided highway from I-76 exit 12 north through Brighton, Platteville, and Greeley to the north side of Ault. The expressway has grade-separated interchanges at SH 7, SH 52, US 34, and USB 85 (Business Route 85).

### 8th Ave/US 85 and D Street intersection

The 8th Avenue/US 85/D Street intersection is unsignalized. The posted speed limit on 8th Avenue near the intersection is 40 mph and is 25 mph on D Street. Intersection geometry on the eastbound and westbound approaches consists of a shared through/left turn lane, and a right-turn lane. The southbound and northbound approaches

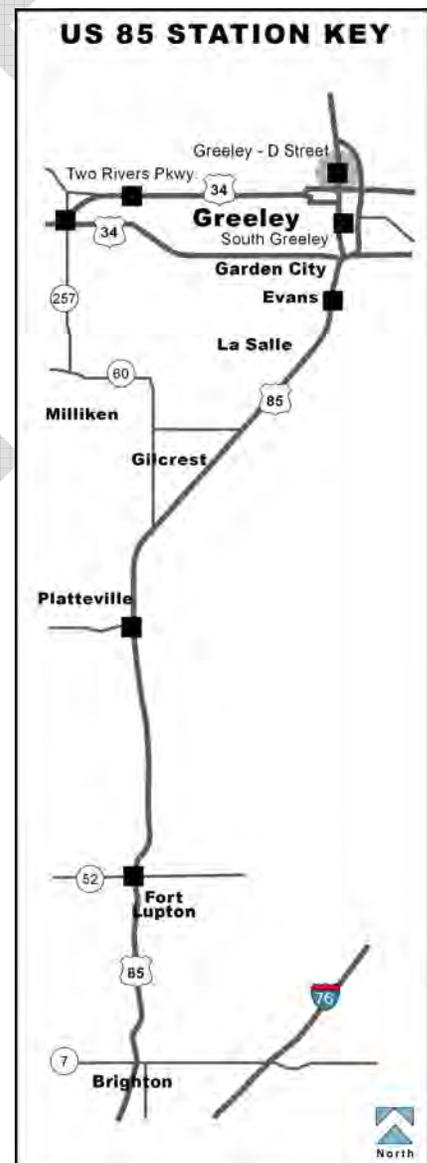


Figure 1. Vicinity Map

consist of two through lanes, a separate right turn lane and an exclusive left turn lane. 8th Avenue carries heavy north-south through traffic during peak hours.

## 11th Avenue/D Street intersection

The 11th Avenue/D Street intersection is unsignalized. D Street runs in the east-west direction while 11th Avenue runs in north-south direction. The intersection geometry on eastbound approach consists of a shared through/right turn lane and an exclusive left-turn lane. The westbound approach consists of a shared through/right turn/left turn lane. The southbound approach consists of a through lane, a shared through/left turn lane, and an exclusive right turn lane. The northbound approach consists of a through lane, a shared through/left turn lane, and a separate right turn lane. The posted speed limit near the intersection on D Street is 25 mph and is 40 mph on 11th Avenue. 11th Avenue is a major street and carries moderate north-south through traffic during peak hours.

## 1st Street/US 85 intersection

The 1st Street/US 85 intersection is unsignalized. A driveway access is provided on the westbound approach of the intersection. The intersection geometry on the eastbound approach consists of a shared through/left/right turn lane. The southbound approach consists of a through lane, a shared through/left turn lane, and a separate right turn lane. The northbound approach consists of a shared through/right turn lane, and a shared through/left turn lane. The posted speed limit near the intersection on US 85 is 40 mph and is 25 mph on 1st Street. At the intersection, US 85 carries heavy northbound and southbound through traffic while 1st Street, a minor street, carries residential and commercial traffic to/from the neighborhoods.

Figure 2 summarizes the peak hour traffic counts collected in August 2006 within the study area. Additionally, Average Daily Traffic (ADT) data was obtained from the North I-25 Travel Demand Model – 2001 base year. Since the study area intersections are minor unsignalized intersections, the 2001 base model does not provide ADT values at these intersections. However, the model does provide ADT values for the US 85/5th Street intersection and the 11th Street/5th Street intersection located just south of the study area. Hence, these intersection ADT values are utilized in calculating growth factors.

As shown, the average daily traffic on US 85 south of the US 85/5th Street intersection is around 12,400 vehicles per day (vpd) and around 18,000 vpd north of the intersection. Average daily traffic on 5th Street west of the intersection is 12,200 vpd and east of the intersection is 5,200 vpd. Average Daily traffic on 11th Avenue south of the 11th Avenue/ 5th Street intersection is around 9,100 vehicles per day (vpd) and around 7,300 vpd north of the intersection. Average daily traffic on 5th Street west of the intersection is 10,600 vpd and east of the intersection is 12,700 vpd.

## Traffic Operations Evaluation

Operational analyses of each key intersection were conducted based on methodology developed in the Highway Capacity Manual (Transportation Research Board, 2000). The result

# US 85 Commuter Bus - Greeley DEIS Evaluation

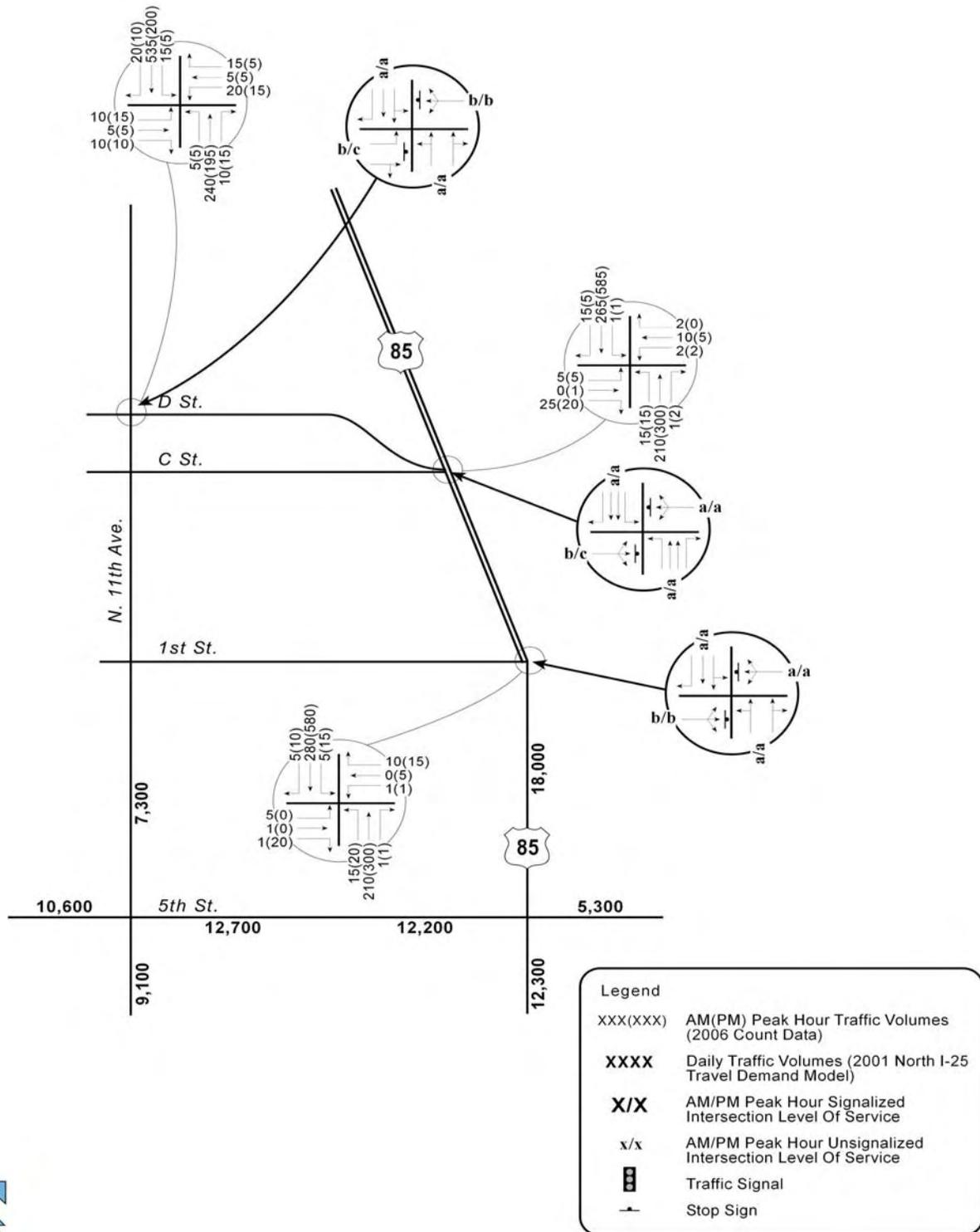


Figure 2. Existing Conditions



of such analysis is a level of service (LOS) rating. Level of service is a qualitative assessment of the traffic flow based on the average stopped delay per vehicles at intersections controlled by traffic signals and stop-signs.

Levels of service are described by a letter designation ranging from “A” to “F”, with LOS A representing essentially uninterrupted flow, and LOS F representing a breakdown of traffic flow with excessive congestion and delay. Signalized intersection analyses result in a level of service rating for each movement and for the entire intersection but typically only the level of service for the entire intersection is reported. For unsignalized intersections a level of service rating is determined for each turn movement that must yield to another turn movement but an overall level of service rating is not determined for the entire intersection. The following table shows how average stopped delay at controlled intersections equates to levels of service.

**Table 1. Equivalent Level of Service to Average Stopped Delay**

Level of Service	Average Delay at Signalized Intersections (sec./veh.)	Average Delay at Stop-Controlled intersections (sec./veh.)
A	0 to <=10	0 to <=10.0
B	> 10 to <= 20	> 10 to <= 15
C	> 20 to <= 35	> 15 to <= 25
D	> 35 to <= 55	> 25 to <= 35
E	> 55 to <= 80	> 35 to <= 50
F	> 80	> 50

Peak hour traffic counts were conducted in August 2006 at the study area intersections. Other background parameters are documented in the *DEIS Traffic Evaluation – Methodology Summary*.

Figure 2 and Table 2 illustrates the existing peak period levels of service at the unsignalized intersections within the study area. Currently, the eastbound approach at the US 85/D Street intersection operates at Level of Service (LOS) B during the AM peak hour and LOS C during the PM peak hour. The eastbound approach at the 11th Avenue/D Street intersection operates at LOS C during the AM peak hour and LOS B during the PM peak hour. The eastbound left turn approach at the US 85/1st Street intersection operates at LOS B during both the AM and PM peak hours.

**Table 2 Existing Intersection LOS and Delay**

Intersection / Movement	Level of Service		Delay (seconds)	
	AM	PM	AM	PM
<b>US 85/C Street/D Street (unsignalized)</b>				
Eastbound Approach	B	C	13	20
<b>11th Avenue/D Street (unsignalized)</b>				
Eastbound Left Approach	C	B	19	13
<b>US 85/1st Street (unsignalized)</b>				
Eastbound Approach	B	B	12	14

## 2030 Conditions

2030 traffic projections were developed for the alternatives being considered:

- 1) No Action Alternative
- 2) Package A: GPL + CR + CB 85

These packages are illustrated in Figures 3 and 4. Since there are no project elements in the Greeley area in Package B, the No-Action results are representative of Package B conditions. In developing peak hour turning movements at the study area intersections, the North I-25 Travel Demand Model – 2001 base year, 2030 No Action, and 2030 Package A results were utilized to calculate the growth factors over a 29 year period. Since the actual traffic counts were conducted in year 2006, the growth factors were adjusted to reflect a 24 year growth rate. These growth factors along with existing turning movement data were used in the NCHRP 255 balancing procedure to develop 2030 peak hour turning movement forecasts. These forecasts were checked for balancing between intersections and reasonableness.

### 2030 No Action Traffic Volumes

The 2030 No Action daily and peak hour projections for the study area intersections are shown in Figure 5. As shown, the average daily volume on US 85 south of the US 85/5th Street intersection is around 16,200 vehicles per day (vpd) and around 29,300 vpd north of the intersection. The average daily traffic projection on 5th Street west of the intersection is 17,300 vpd and east of the intersection is 10,200 vpd. The average Daily traffic projection on 11th Avenue south of the 11th Avenue/5th Street intersection is around 11,900 vehicles per day (vpd) and around 13,800 vpd north of the intersection. The average daily traffic projection on 5th Street west of the intersection is 13,000 vpd and east of the intersection is 17,500 vpd.

### 2030 Package A Traffic Volumes

The same methodology used to develop the 2030 No Action volumes was applied to estimate 2030 background traffic volumes for the Package A alternative. The North I-25 Travel Demand Model does not include park-and-ride patrons in its traffic assignment procedure. Therefore, in addition to these background forecasts – which are shown in Figure 6 – peak hour site traffic associated with the development of the commuter bus station and park-and-ride lot was estimated and assigned to the local road network according to the methodology outlined in the *Park-and-Ride Trip Generation and Distribution Methodology* report. A summary of this methodology and its application for this park-and-ride is provided below.

### Park-and-Ride Trip Generation

The number of proposed spaces at the downtown Greeley park-and-ride lot was determined using the methodology outlined in the North I-25 DEIS Parking Results Report (Carter & Burgess, November 2006). Using the results of this report, trip generation is estimated at each site, by applying the following factors.

### LEGEND

- ★ Major Structure Rehab by 2030
- Minor Structure Rehab by 2030
- Replace / Rehab Pavement by 2030
- Minor Safety Modifications by 2030
- FasTracks Rail Line

DRAFT



Figure 3. No Action Alternative



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### LEGEND

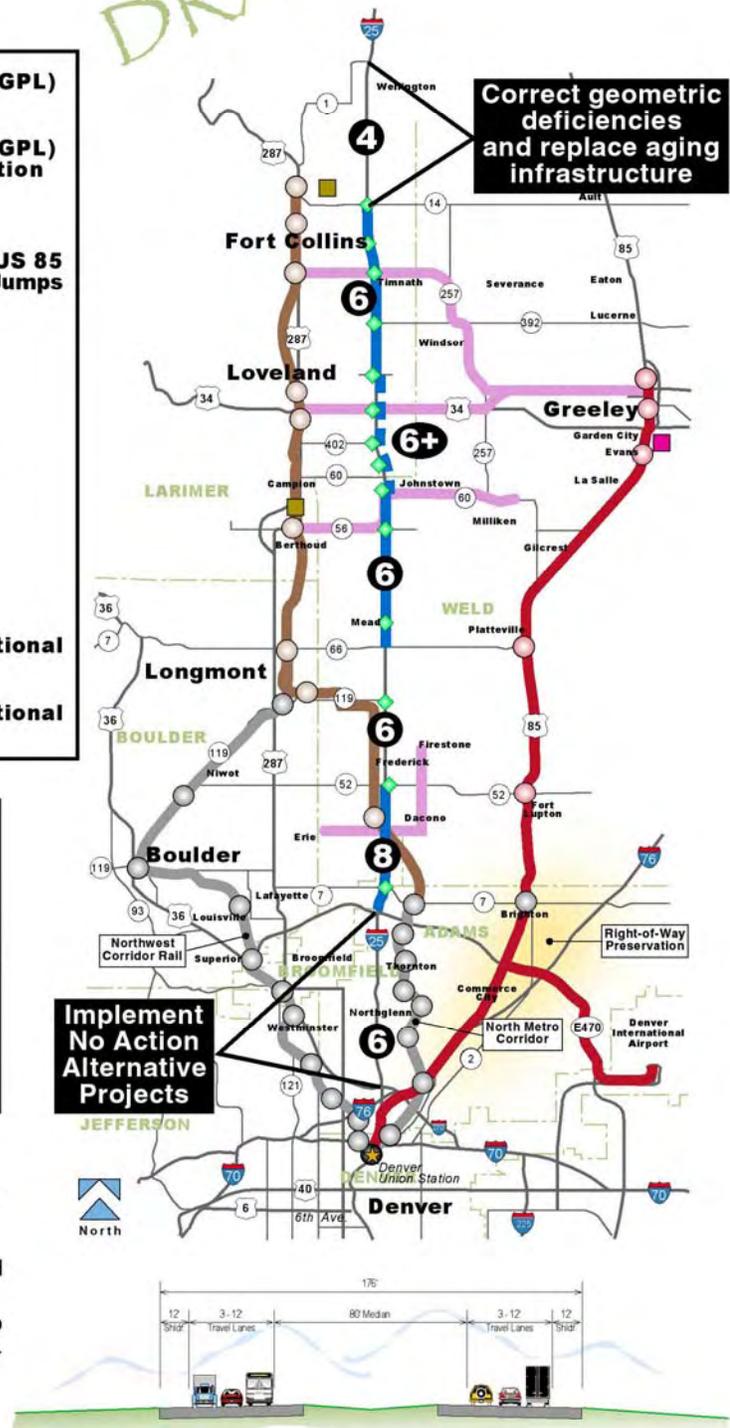
	<b>1 New General Purpose Lane (GPL) in Each Direction</b>
	<b>1 New General Purpose Lane (GPL) + Auxiliary Lane in Each Direction</b>
	<b>Commuter Rail (CR)</b>
	<b>Commuter Bus (CB) Service in US 85 General Purpose Lanes and Que Jumps</b>
	<b>Feeder Bus Service</b>
	<b>Interchange Upgrades</b>
	<b>Number of Lanes</b>
	<b>Commuter Bus Station / Stop</b>
	<b>Commuter Rail Station</b>
	<b>FasTracks Rail Line</b>
	<b>FasTracks Transit Station</b>
	<b>Potential Commuter Rail Operational &amp; Maintenance Facility</b>
	<b>Potential Commuter Bus Operational &amp; Maintenance Facility</b>

**Congestion Management Measures include:**

- Enhanced carpool lot parking capacity and amenities
- Courtesy patrol (incident management) from SH 14 to SH 7
- Variable messaging signs at all transit stations
- Automated Vehicle Locaters on all transit vehicles - "next bus" technology
- Links to local bike and pedestrian systems at station areas
- Support for development of Transportation Management Organization (TMO)

**NOTE:**

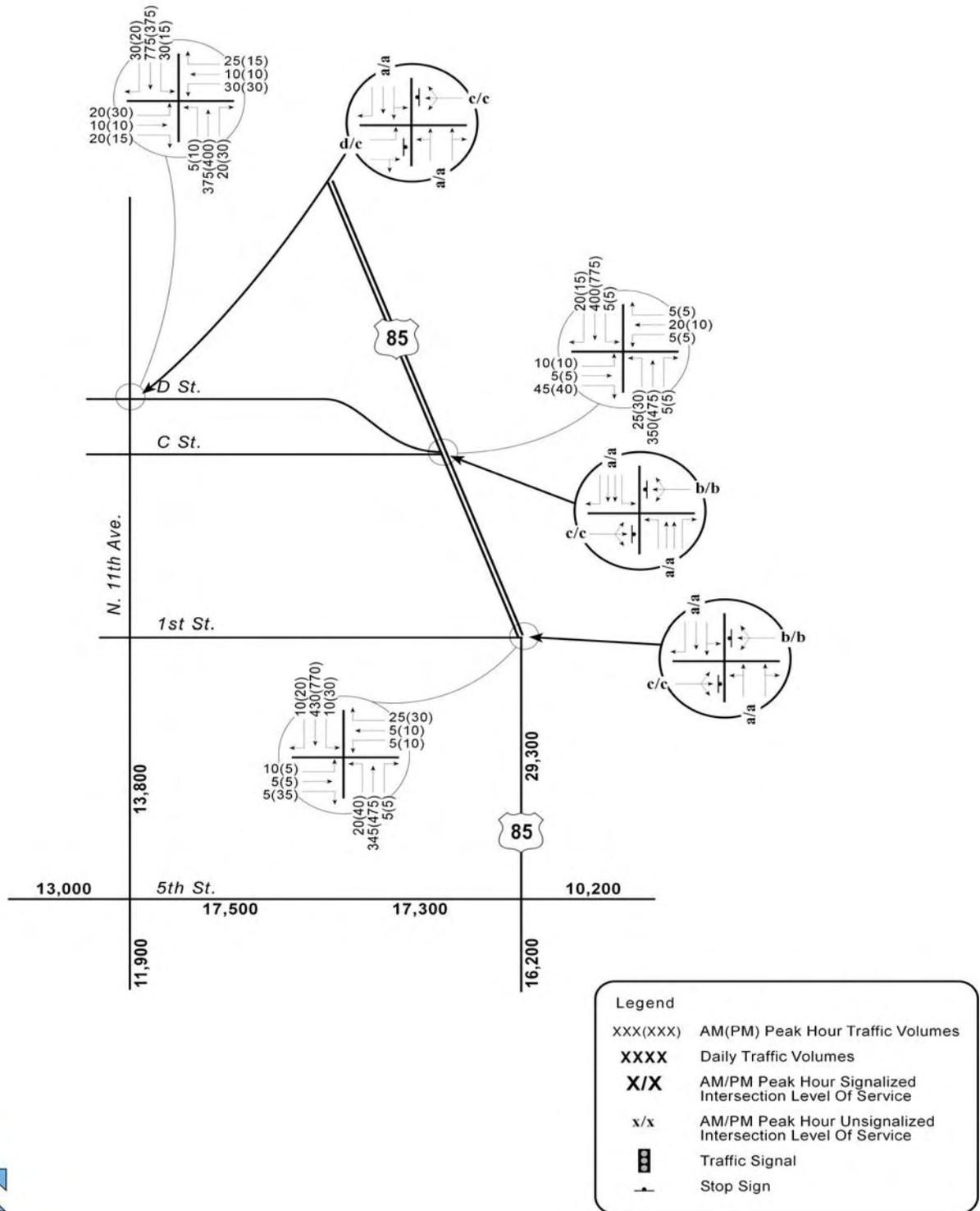
- Select sections of I-25 would require auxiliary lanes and / or an additional through lane in addition to this 6-lane cross section.
- Where widening is needed between SH 66 and SH 7, the median would be used.
- Commuter Rail Service without a Longmont to North Metro connection will also be evaluated.



NOT TO SCALE

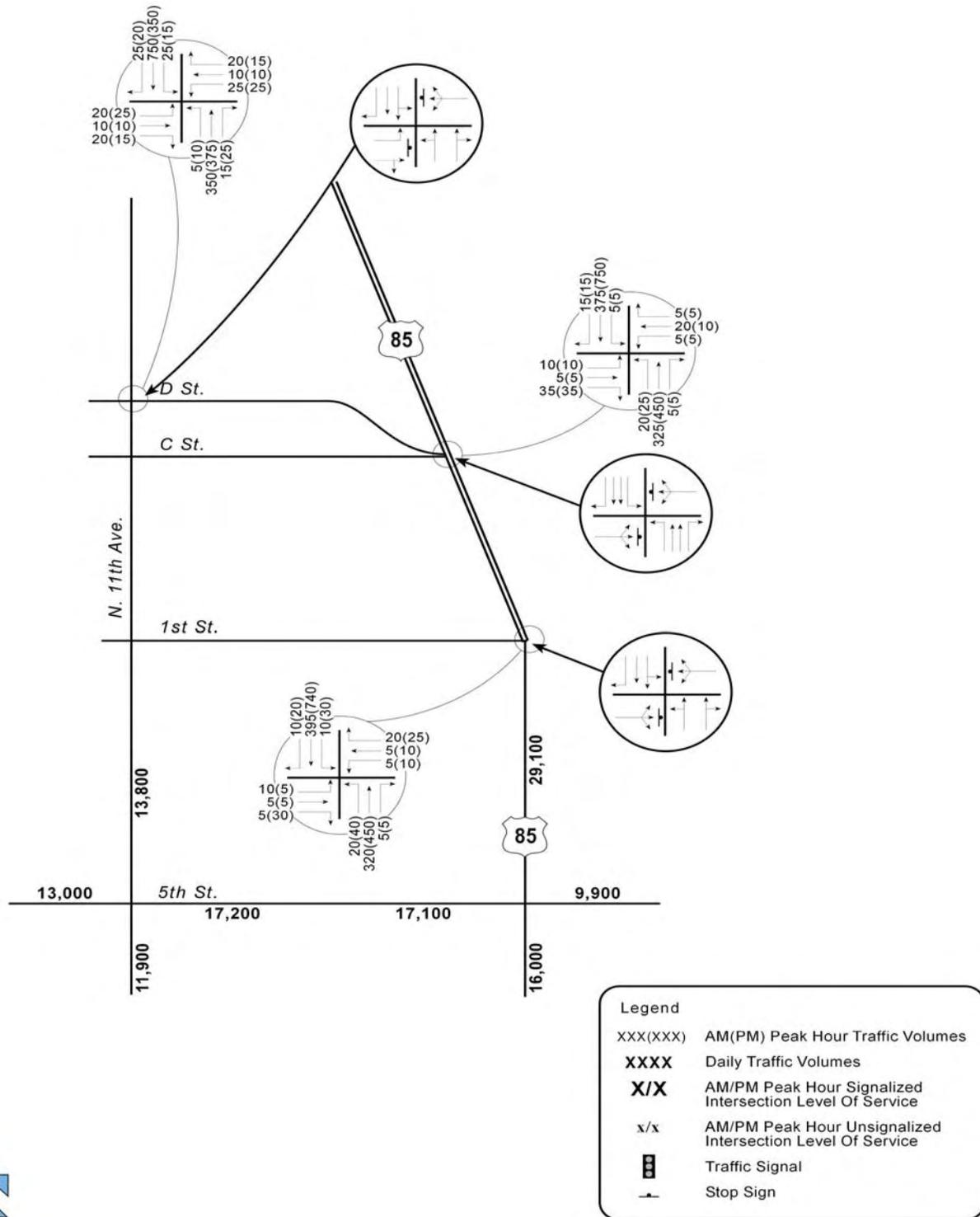
Figure 4. Package A Alternative

# US 85 Commuter Bus - Greeley DEIS Evaluation



**Figure 5. 2030 No Action Forecasts and Levels of Service**

# US 85 Commuter Bus - Greeley DEIS Evaluation



**Figure 6. 2030 Package A Background Traffic Forecasts**



- First, a conservative estimate of maximum utilized spaces is determined by multiplying the number of spaces provided by 90 percent (or 0.9). This is referred to as the *number of occupied spaces*.
- Then, the number of occupied spaces is multiplied by the factors shown in Table 3.

**Table 3 – Peak Hour Trip Generation for North I-25 EIS Park-and-Ride Lots**

	Trip Rate	Entering	Exiting
<b>AM Peak Hour</b>			
Trips per occupied space	0.75	87%	13%
<b>PM Peak Hour</b>			
Trips per occupied space	0.50	20%	80%

The Greeley commuter bus station would be located on the northwest corner of the US 85//D Street intersection and would have 40 parking spaces. The future peak hour traffic from the proposed station is shown in Table 4 below.

**Table 4 Future Peak Hour Traffic from the Greeley Park-and-Ride Lot**

Location	Daily Trips	AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
Greeley PNR Lot	90	25	5	30	3	10	13

**Trip Distribution**

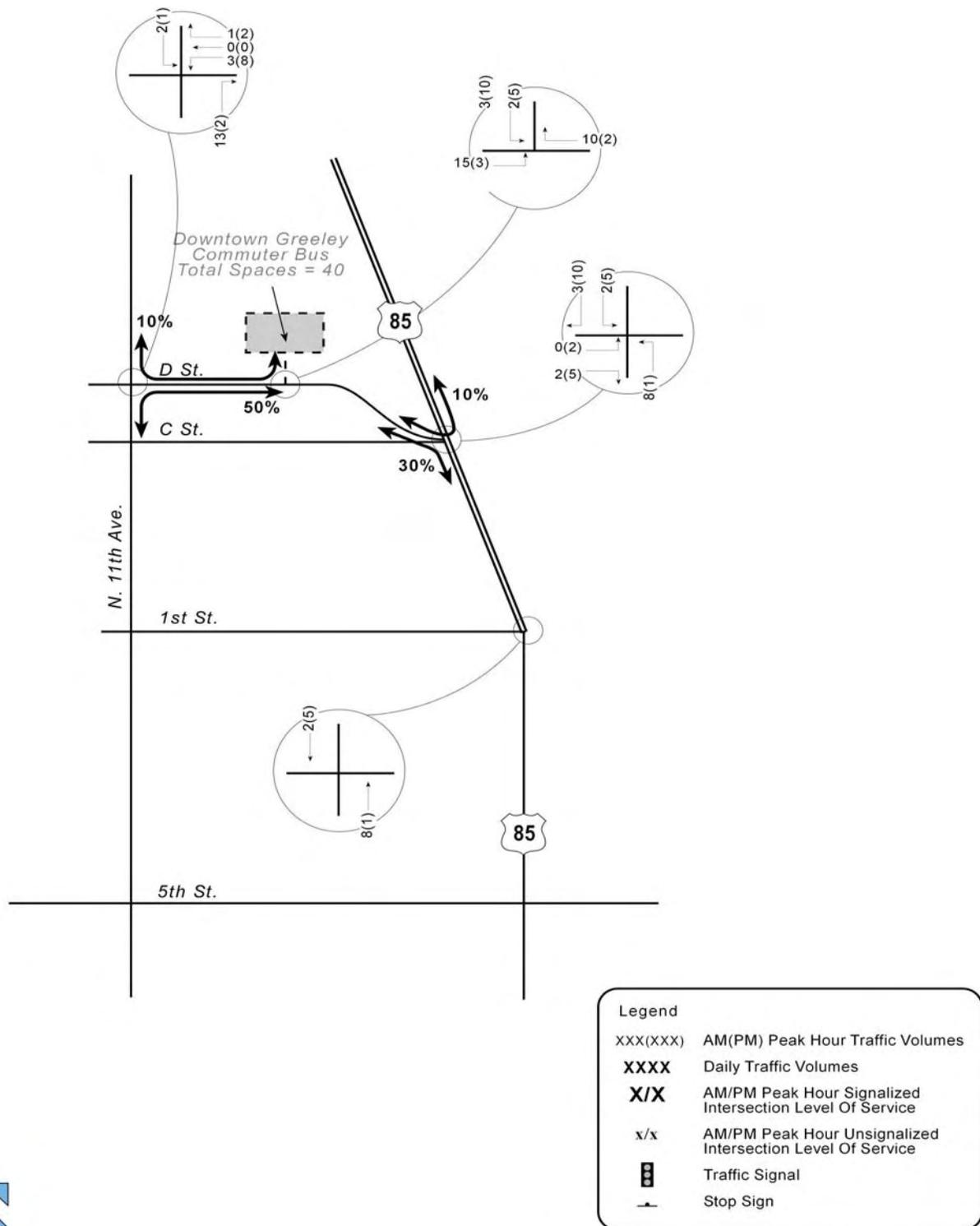
The trip distribution and assignment for the station was determined based on existing and future land use patterns in the vicinity of the site. It was assumed that the access to the station would be provided from D Street. The peak hour trip generation and distribution estimates for the proposed park-and-ride lot are shown in Figure 7. These peak hour trip generation estimates were combined with the background traffic projections to arrive at the total 2030 Package A peak hour projections in Figure 8. In general, daily traffic is projected to be less along US 85 in the Package A alternative, as more regional traffic is attracted to the improved I-25 corridor.

**2030 No Action Traffic Operations**

Figure 5 shows the projected levels of service at the study area intersections under no action scenario. For the purpose of the No Action analysis it was assumed that the US 85 would remain as a four-lane roadway, since that geometry is more representative of true future no action conditions in the area.

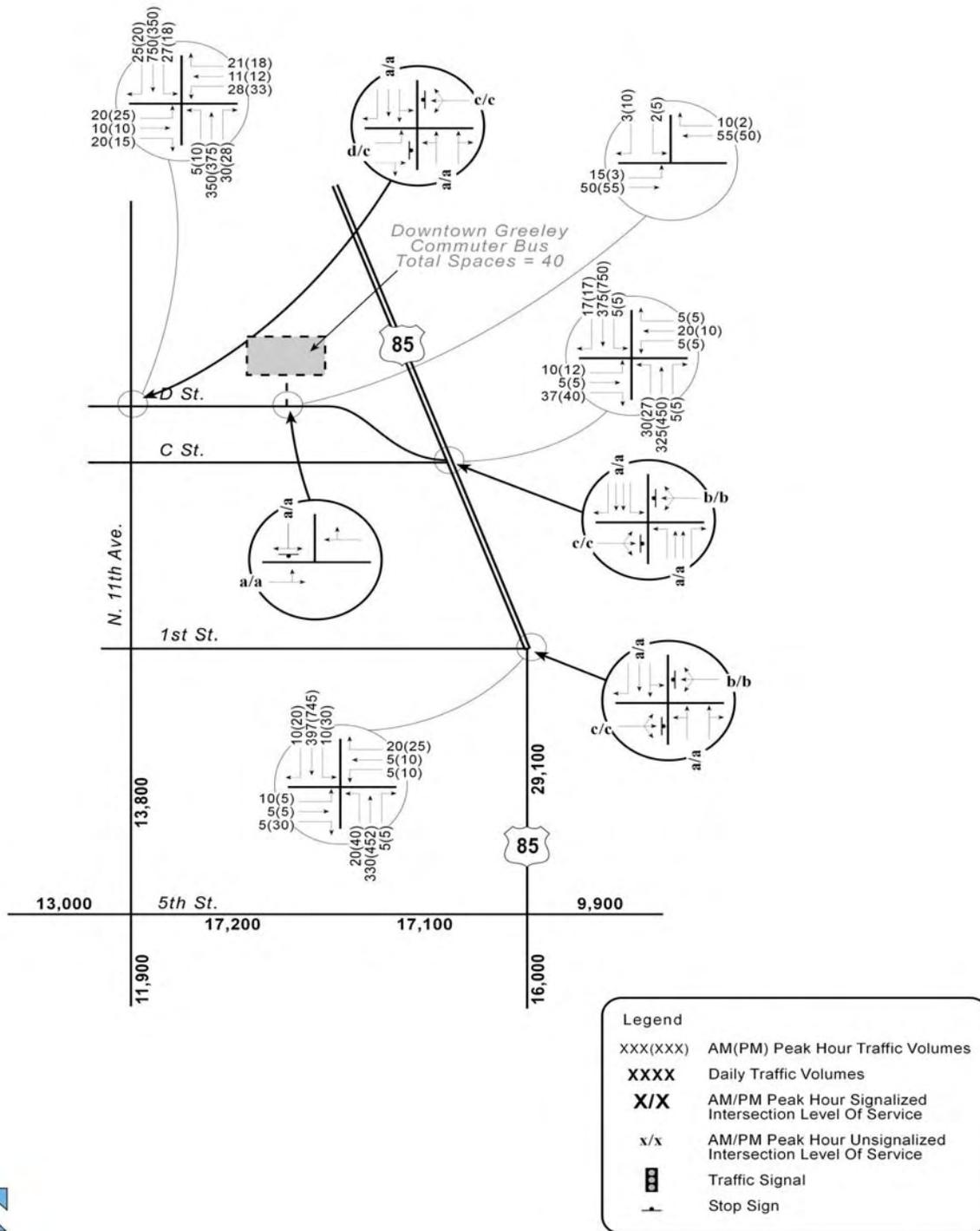
As Figure 5 and Table 5 indicate, the eastbound approach at the US 85/D Street intersection would operate at Level of Service (LOS) C during both the AM and PM peak hours. The eastbound left approach at the 11th Avenue/D Street intersection would operate at LOS D during the AM peak hour and LOS C during the PM peak hour. The eastbound approach at the US 85/1st Street intersection would operate at LOS C during both the AM and PM peak hours.

# US 85 Commuter Bus - Greeley DEIS Evaluation



**Figure 7. Park and Ride Lot Trip Distribution and Assignment**

# US 85 Commuter Bus - Greeley DEIS Evaluation



**Figure 8. 2030 Package A Total Traffic Forecasts and Levels of Service**

**Table 5 2030 No Action Intersection LOS and Delay**

Intersection / Movement	Level of Service		Delay (seconds)	
	AM	PM	AM	PM
<b>US 85/C Street/D Street (unsignalized)</b>				
Eastbound Approach	C	C	18	20
<b>11th Avenue/D Street (unsignalized)</b>				
Eastbound Left Approach	D	C	29	18
<b>US 85/1st Street (unsignalized)</b>				
Eastbound Approach	C	C	17	20

**2030 Package A Traffic Operations**

**Total Traffic LOS**

As Figure 8 and Table 6 indicate, the eastbound approach at the US 85/D Street intersection would operate at Level of Service (LOS) C during both the AM and PM peak hours. The eastbound left approach at the 11th Avenue/D Street intersection would operate at LOS D during the AM peak hour and LOS C during the PM peak hour. The eastbound approach at the US 85/1st Street intersection would operate at LOS C during both the AM and PM peak hours. These are the same levels of service as in the No Action scenario.

**Table 6 2030 Package A Intersection LOS and Delay**

Intersection / Movement	Level of Service		Delay (seconds)	
	AM	PM	AM	PM
<b>US 85/C Street/D Street (unsignalized)</b>				
Eastbound Approach	C	C	18	23
<b>11th Avenue/D Street (unsignalized)</b>				
Eastbound Left Approach	D	C	28	17
<b>US 85/1st Street (unsignalized)</b>				
Eastbound Approach	C	C	16	24
<b>Park-n-Ride Access/D Street (unsignalized)</b>				
Southbound Approach	A	A	9	9

**Station Access**

Access to the commuter bus station will be provided from D Street. As shown on Figure 8 and in Table 6, this access would be a single lane with stop-control on the station approach, and would operate at acceptable levels of service without any need for laneage improvements to D Street.

**Proposed Mitigation**

The Package A alternative includes six general purpose lanes on I-25 and commuter rail in addition to the proposed bus routes. This would result in more trip attractions towards I-25 lowering the average daily traffic and peak hour traffic volumes on US 85. The results of the traffic analysis indicate that without any improvements, the intersections in the vicinity of the

# US 85 Commuter Bus - Greeley DEIS Evaluation

proposed commuter bus station would operate at an acceptable LOS without causing any major time delays or queue backups.

Furthermore, improvements along US 85 in the vicinity of the commuter bus station were identified in CDOT's *US 85 Access Control Plan*, December 1999.

## Alternatives Evaluation Comparison

### Traffic Operational Analysis

Table 7 compares the levels of service and delay at the study area intersections for the two packages. As the table indicates, without any widening or improvements, the area in the vicinity of the Greeley commuter bus station would operate at acceptable levels of service.

**Table 7. Intersection Level of Service and Delay**

Intersection	No Action		Alternative A	
	AM Peak	PM Peak	AM Peak	PM Peak
US 85/C Street/D Street (unsignalized)				
Eastbound Approach	LOS C (18 sec.)	LOS C (20 sec.)	LOS C (18 sec.)	LOS C (23 sec.)
11th Avenue/D Street (unsignalized)				
Eastbound Left Approach	LOS D (29 sec.)	LOS C (18 sec.)	LOS D (28 sec.)	LOS C (17 sec.)
US 85/1st Street (unsignalized)				
Eastbound Approach	LOS C (17 sec.)	LOS C (20 sec.)	LOS C (16 sec.)	LOS C (24 sec.)
Park-n-Ride Access/D Street (unsignalized)				
Southbound Approach	N/A	N/A	LOS A (9 sec.)	LOS A (9 sec.)

LOS X – Level of service

##.# - Average delay in seconds per vehicle