

Loveland - 29th St. and BNSF DEIS Commuter Rail Station Evaluation

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August 20, 2007

Introduction

The North I-25 DEIS Package A alternative considers a single commuter rail route that will extend from the end of the planned RTD North Metro Commuter Rail Line and terminate in the city of Fort Collins. Proposed stations will be located in Erie, Longmont, Berthoud, Loveland, and Fort Collins.

The proposed commuter rail route follows the existing BNSF alignment which generally parallels the US 287 alignment from Fort Collins to Longmont. Between the Sugar Mill station in Longmont and the North Metro end-of-line station at SH-7, the alignment will parallel SH-119, WCR-7, and the UP Dent line. A map of the commuter rail route with station locations is provided in Figure 1.

The proposed 29th Street and BNSF commuter rail station and platform will be located on the BNSF rail line just south of 29th Street. Parking for the station will be located on the southwest corner of the intersection of 29th Street and Garfield Avenue. This Park-and-Ride will consist of 144 parking spaces with one access point on 29th Street and two access points on Garfield Avenue.

This report documents potential traffic impacts the proposed commuter rail station may have within the vicinity of 29th Street between Lake Drive and Lincoln Avenue, and provides technical documentation of the traffic data analysis. The other commuter rail stations are addressed in separate reports.

Existing Conditions

The proposed study area includes the following roadways and intersections.

29th St. is a four-lane east-west arterial roadway that bisects the town of Loveland. Bike lanes are also provided in either direction of travel. Intersections on 29th St. consist of one and two-way stops (side streets), a signalized railroad crossing, and several four-way traffic signals. The speed limit along 29th St. is posted at 35 mph. Left and right turn lanes are found at the signalized intersections allowing for a better flow of traffic.

The station area includes the following intersections:

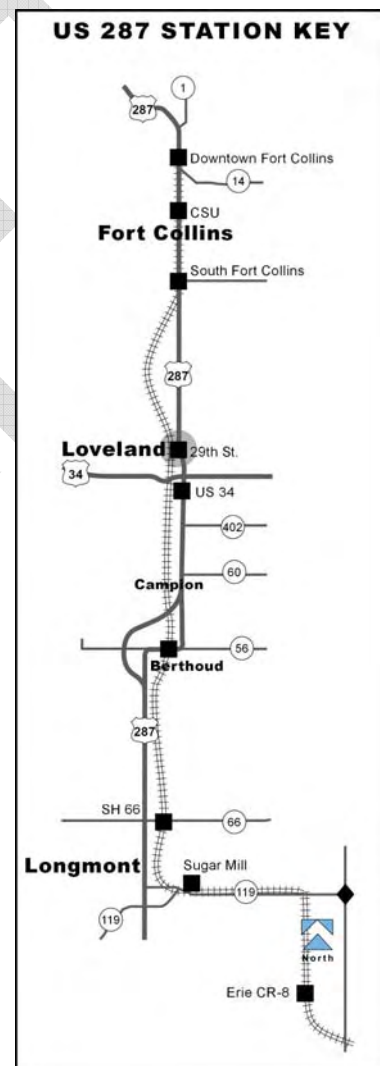


Figure 1. Vicinity Map

Lake Drive & 29th St.

Lake Dr. is located just west of the BSNF crossing and consists of two lanes with a posted speed limit of 25 mph. Lake Dr. is unique in that it consists of two offset and opposing “T” intersections with 29th St., providing access to the surrounding neighborhood. For this analysis, the Lake Drive intersection was analyzed as two separate intersections. Because Lake Dr. is a minor two lane neighborhood street, the intersections are controlled by single stop signs.

Lake Crest Pl. & 29th St.

Lake Crest Pl. is a two-lane neighborhood access road located between Lake Dr. and the BNSF railroad crossing. This intersection is “T” shaped and controlled with one stop sign on Lake Crest Pl. The posted speed limit along Lake Crest Pl. is 25 mph.

Garfield Ave & 29th St.

Garfield Ave is a two lane north/south arterial that connects US-287 to 1st St. The Garfield Ave and 29th St. intersection is located between the BSNF railroad and US-287. All four approaches of this signalized intersection include a designated left turn lane and a crosswalk. The posted speed limit along Garfield Ave. is 35 mph.

US-287 (N. Buchanan Ave.) & 29th St.

US-287 (N. Buchanan Ave.) is a four-lane north/south highway spanning between the state’s north and south borders. The intersection of US-287 and 29th St. is skewed because US-287 crosses 29th St. from the northwest to the southeast. All approaches have single left and right turn lanes, and the east and northbound right turn lanes are right turn bypasses. The posted speed limit along US-287 through the intersection is 35 mph.

Lincoln Ave. & 29th St.

Lincoln Ave. is a two-lane roadway which starts south at US-287 and extends north and turns into E. 37th St. This signalized intersection is located just to the east of the US-287 on 29th St. Left turn lanes and crosswalks are found on all approaches, while designated right turn lanes are only on the Lincoln Ave. approaches. Bike lanes are also found on all approaches. The posted speed limit on Lincoln Ave. is 25 mph.

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 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

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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
B	> 10 to <= 20	> 10 to <= 15
C	> 20 to <= 35	> 15 to <= 25
D	> 35 to <= 55.0	> 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 2a 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. As shown, the ADT on 29th Street in the study area approximately ranges between 14,000 – 22,000 vehicles per day (vpd), and the ADT on US-287 is about 23,000 – 29,000 vpd. ADT on Garfield Avenue ranges between 6,500 – 16,000 vpd.

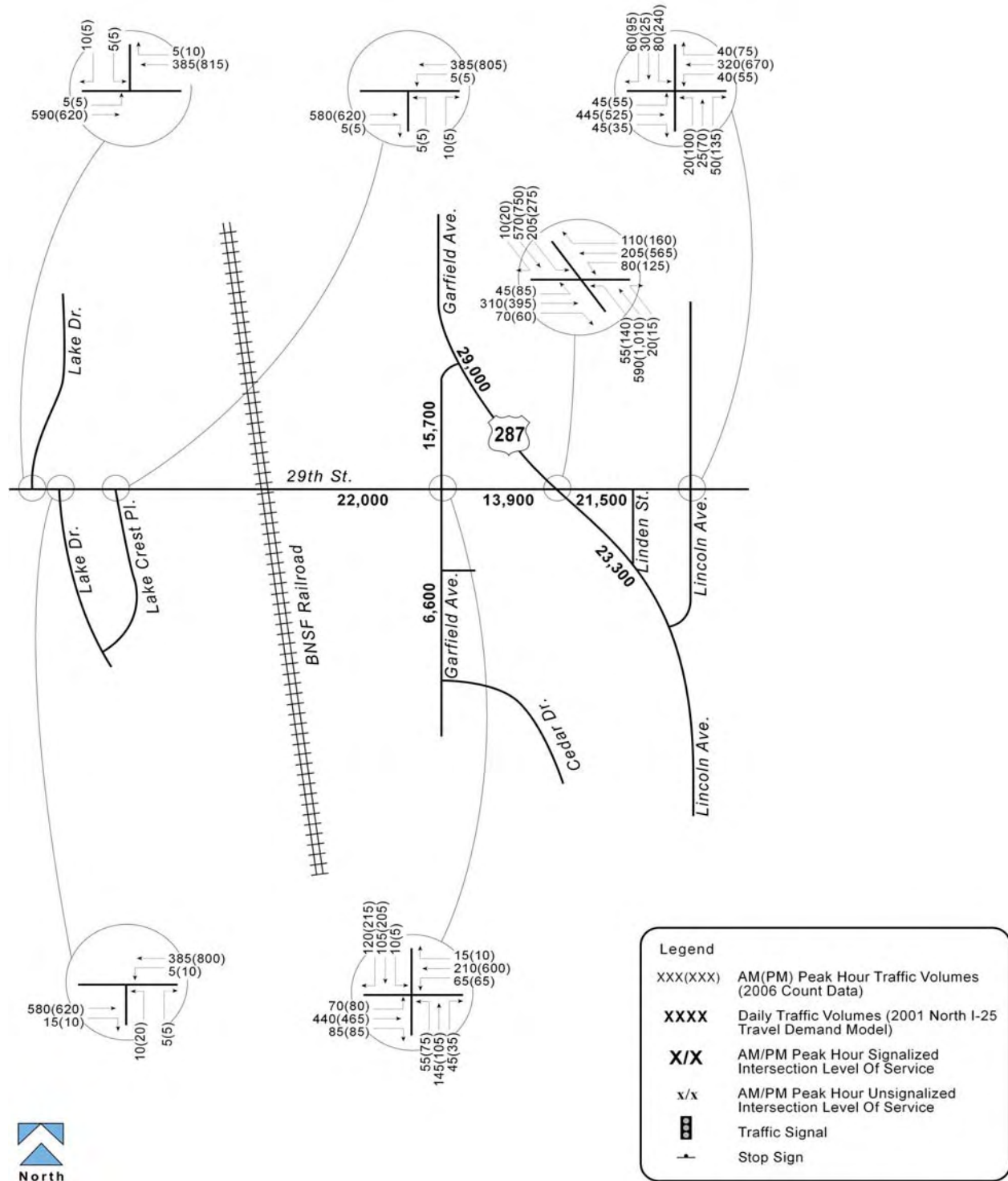
Figure 2b and Table 2 illustrate existing peak period levels of service at the signalized and unsignalized intersections within the study area. Currently, the intersection of US 287 and 29th Street operates at an acceptable overall LOS C during both AM and PM peak hours; however, the westbound right turn movement operates at LOS F in the AM and PM peak hours. The 29th Street/Garfield Avenue intersection currently operates with an overall acceptable LOS and delay; however, the northbound left turn movement operates at LOS F in the PM peak hour.

Table 2. Existing Intersection LOS and Delay

Intersection / Movement	Level of Service		Delay (seconds)	
	AM	PM	AM	PM
29th St. and Lincoln Ave.	B	B	15	17
29th St. and US 287	C	C	28	34
29th St. and Garfield Ave.	B	C	18	20
29th St. and Lake Crest Pl. (unsignalized)				
Westbound Left Turn	A	A	<1	<1
Northbound Approach	B	C	11	17
29th St. and Lake Dr. (north) (unsignalized)				
Eastbound Left Turn	A	A	0.2	0.2
Southbound Approach	B	C	12	23
29th St. and Lake Dr. (south) (unsignalized)				
Westbound Left Turn	A	A	<1	<1

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Northbound Approach	C	C	15	23
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Figure 2a. Existing Conditions – Volumes

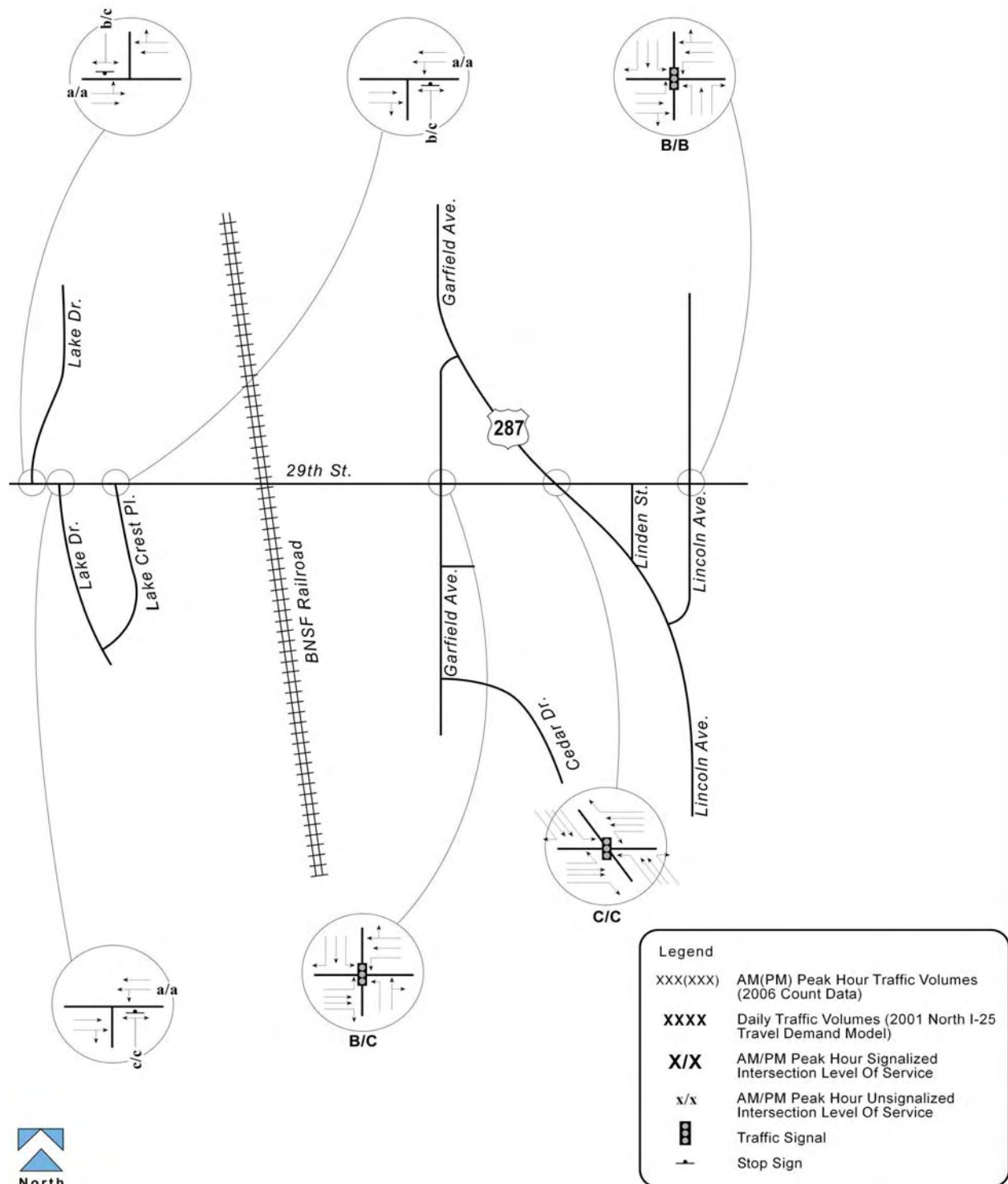


Figure 2b. Existing Conditions – Levels of Service

2030 Conditions

2030 traffic projections were developed for the two 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 29th Street 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 Traffic (ADT) on 29th Street is around 19,000 – 31,000 vehicles per day (vpd), and the ADT on US-287 is about 37,000 – 44,000 vpd. ADT on Garfield Avenue ranges between 8,000 – 12,000 vpd. This represents significant growth in the area compared to existing conditions.

During the AM peak hour, major traffic on 29th Street would flow easterly and during the PM peak hour major traffic would flow westerly. US-287 would carry almost same amount traffic in north-south direction during AM peak and during the PM peak major traffic flows would be northerly towards the Fort Collins area.

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 rail station and park-and-ride lots 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.

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Figure 3. No Action Alternative

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LEGEND

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

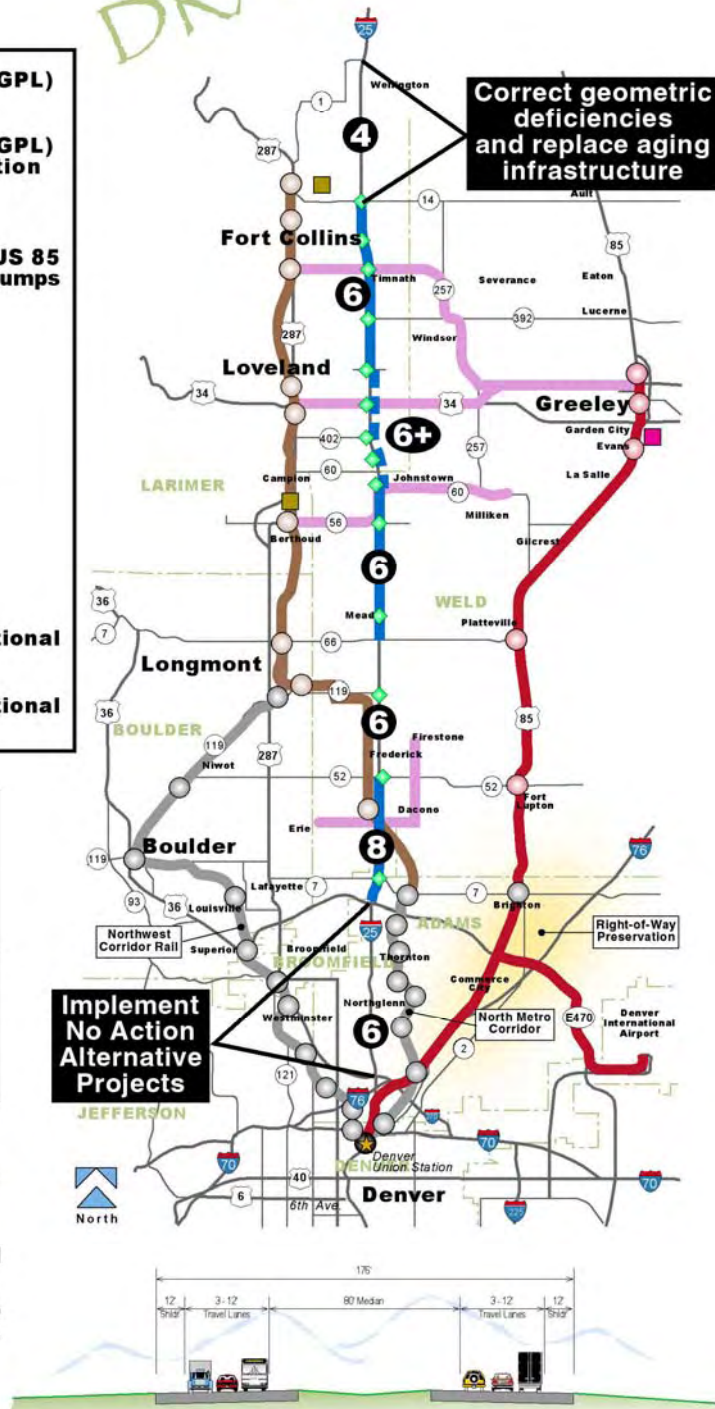
Congestion Management Measures include:

- 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 Locators 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.

DRAFT



NOT TO SCALE

TYPICAL I-25 CROSS SECTION - 6 GENERAL PURPOSE LANES

Figure 4. Package A Alternative

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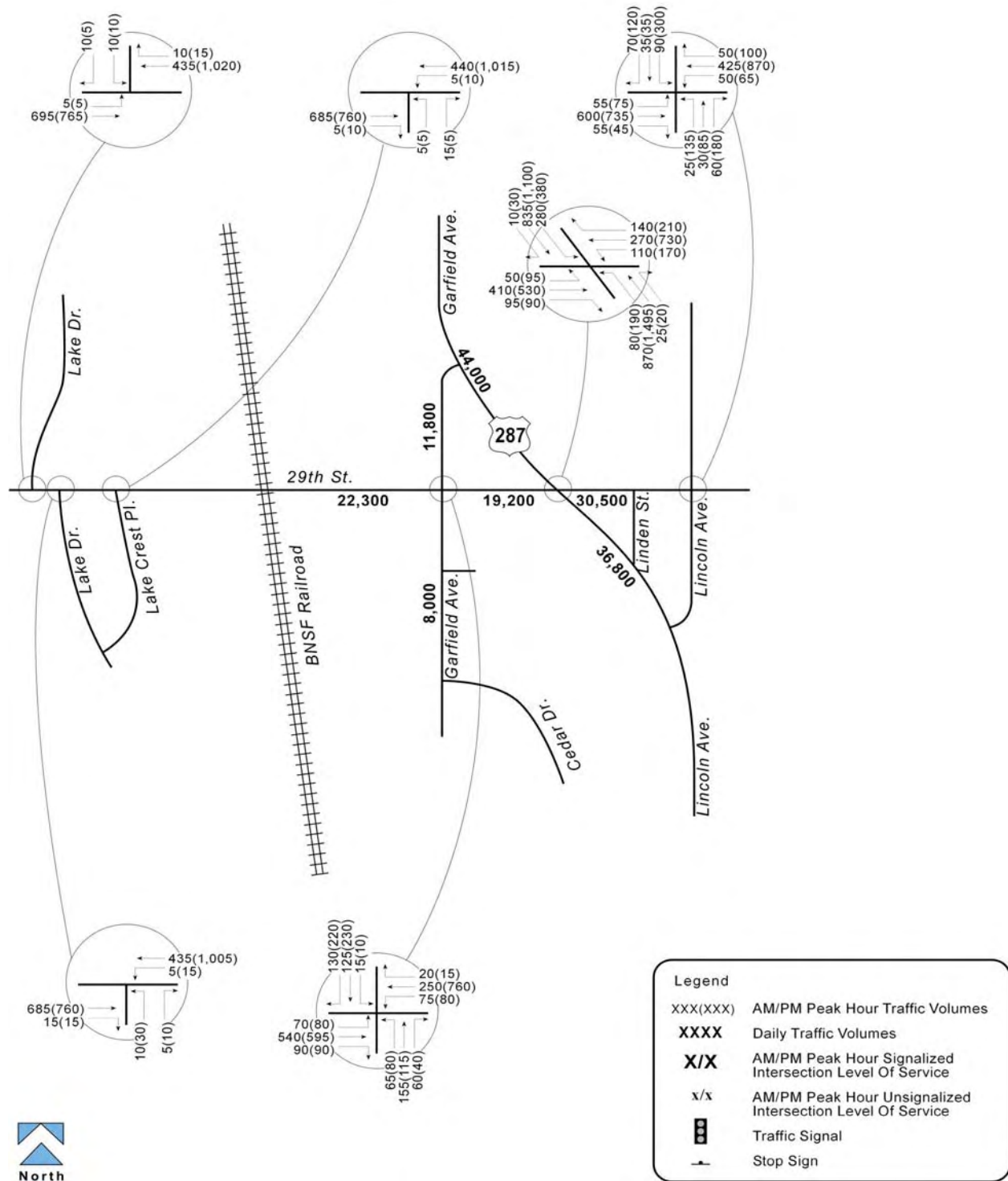


Figure 5. 2030 No Action Forecasts

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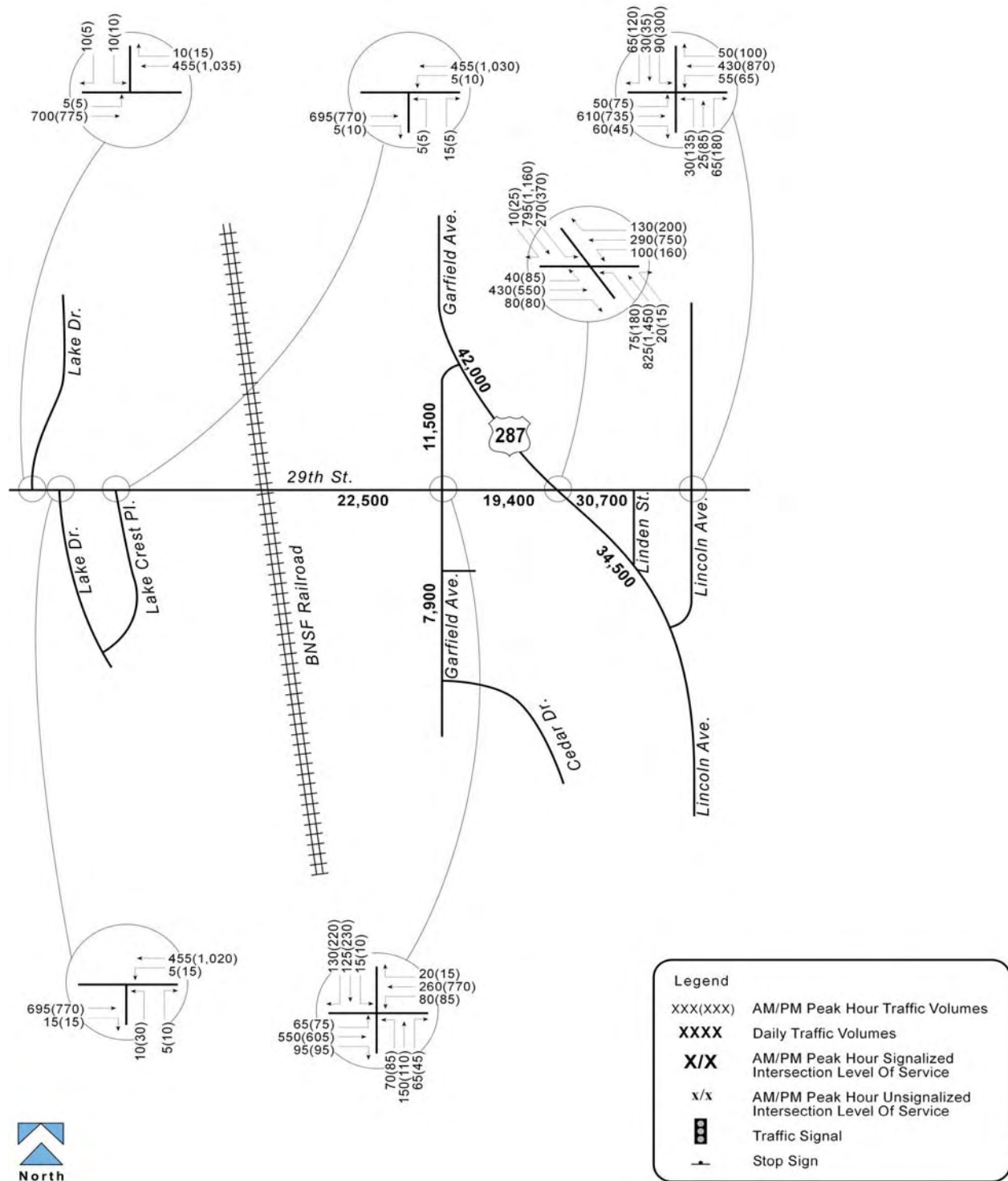


Figure 6. 2030 Package A Background Traffic Forecasts

Park-and-Ride Trip Generation

The number of proposed spaces at the Loveland – 29th Street 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.

- 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
AM Peak Hour			
Trips per occupied space	0.75	87%	13%
PM Peak Hour			
Trips per occupied space	0.50	20%	80%

The Loveland – 29th Street commuter rail station would be located in the southwest corner of the 29th Street/Garfield intersection and would have 144 parking spaces. The future peak hour traffic from the proposed station is shown in Table 4.

Table 4. Future Peak Hour Traffic from Loveland - 29th Street park-and-ride lot

Location	Daily Trips	AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
29th St. PNR Lot	298	85	13	98	13	52	65

Trip Distribution and Assignment

The trip distribution and assignment for the station was determined based on existing and future residential land use patterns in the vicinity of the site. There are three access points to the Loveland – 29th Street park-and-ride lot. Garfield Avenue would have two single lane accesses while the access from 29th Street would be limited to a right-in, right-out movement. This is to help prevent left-turn backups at the nearby 29th Street/Garfield Avenue intersection. 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.

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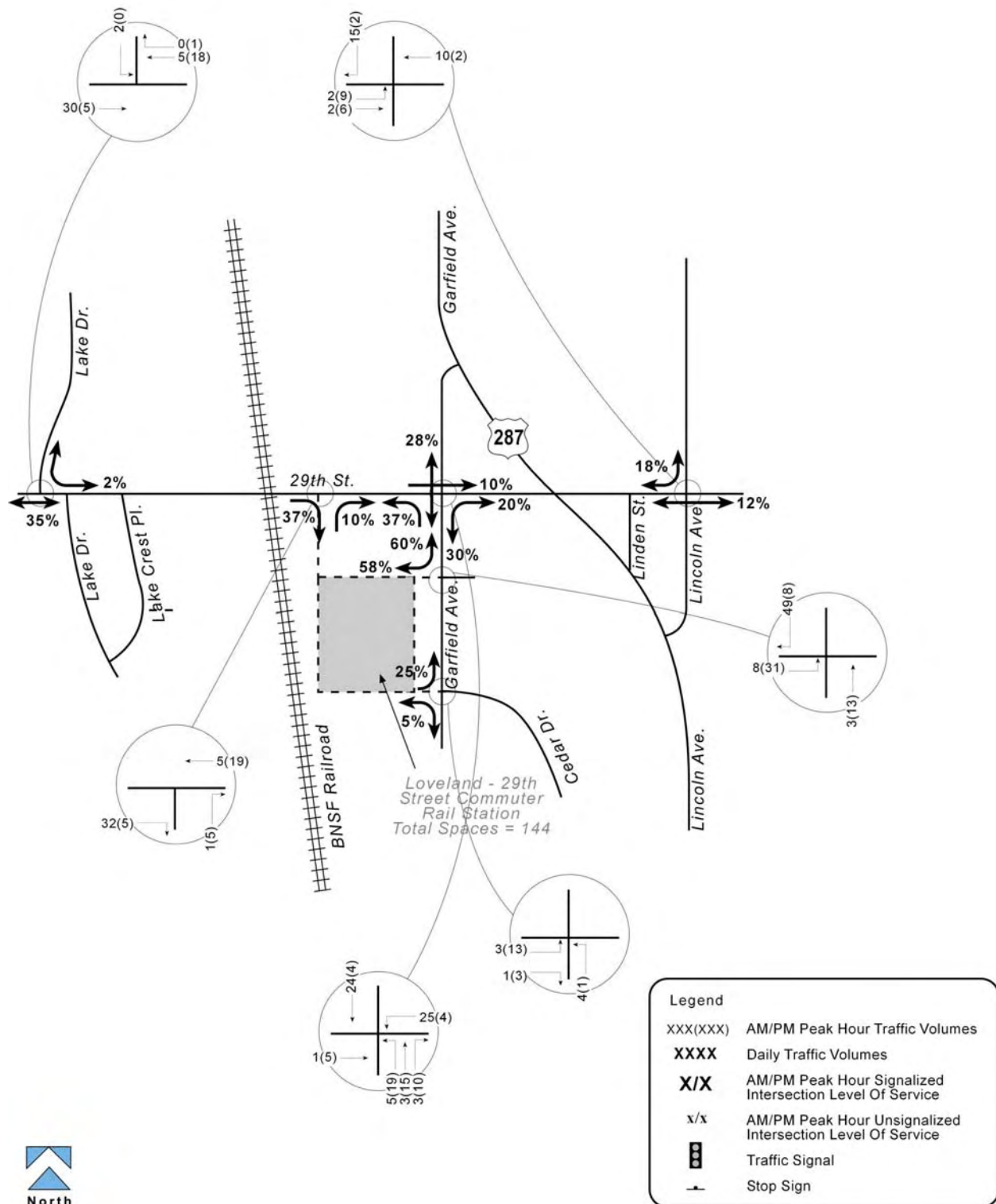


Figure 7. Park and Ride Lot Trip Distribution and Assignment

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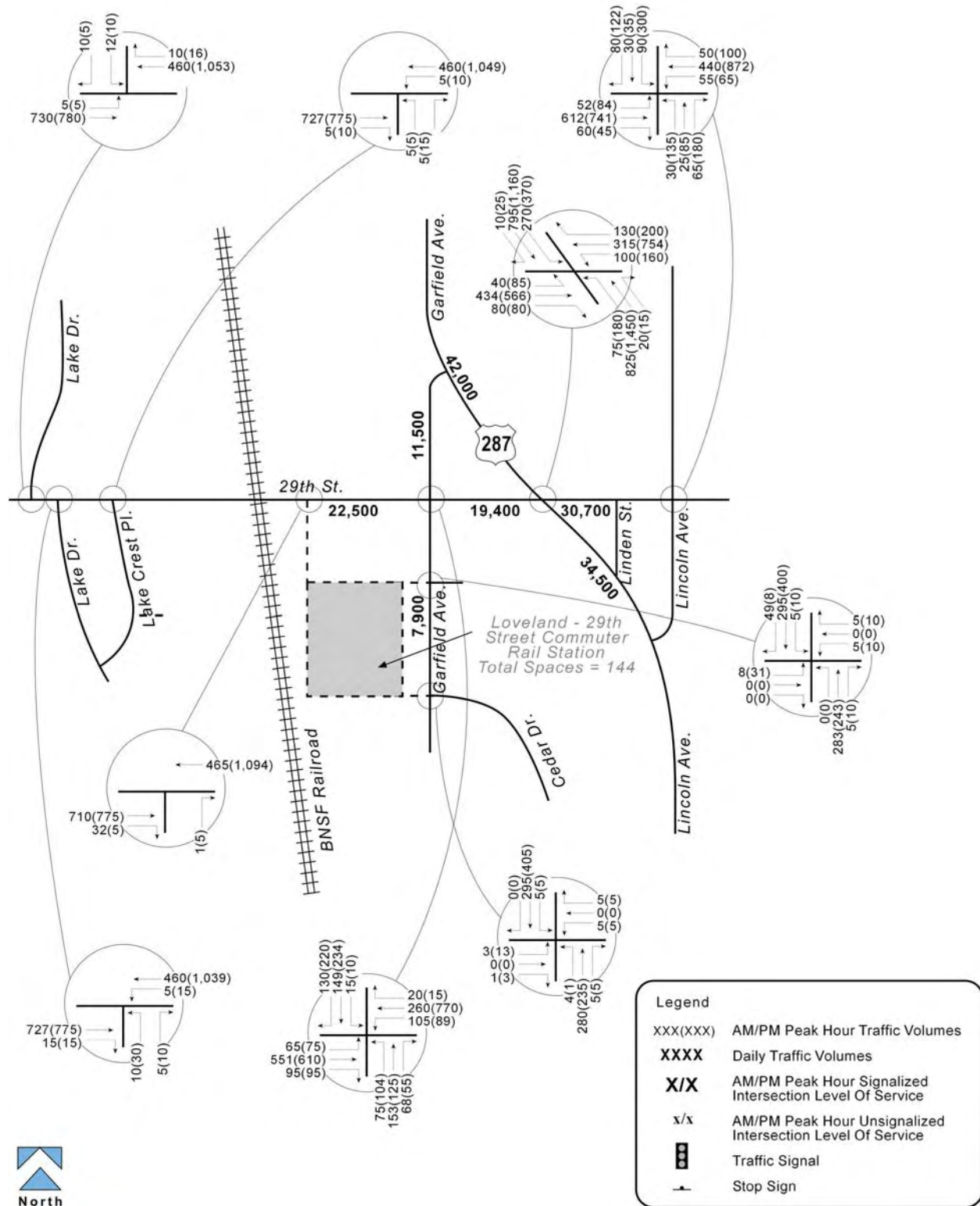


Figure 8. 2030 Package A Total Traffic Forecasts

2030 No Action Traffic Operations

Figure 9 and Table 5 show the projected levels of service at the study area intersections under the No Action scenario. As indicated, the intersection of 29th Street and US 287 is predicted to operate at an acceptable overall LOS during the AM peak hour, but during the PM peak hour, this intersection is predicted to operate at an overall LOS E. The northbound approach at the intersection of 29th Street/Lake Drive (south) is predicted to operate at LOS E in the PM peak hour. However, queue lengths and v/c ratios for this movement indicate adequate operations.

Table 5. 2030 No Action Intersection LOS and Delay

Intersection / Movement	Level of Service		Delay (seconds)	
	AM	PM	AM	PM
29th St. and Lincoln Ave.	B	B	15	19
29th St. and US 287	C	E	26	61
29th St. and Garfield Ave.	B	B	17	16
29th St. and Lake Crest Pl. (unsignalized)				
Westbound Left Turn	A	A	0.4	<1
Northbound Approach	B	C	12	23
29th St. and Lake Dr. (north) (unsignalized)				
Eastbound Left Turn	A	A	<1	<1
Southbound Approach	B	D	14	34
29th St. and Lake Dr. (south) (unsignalized)				
Westbound Left Turn	A	A	<1	<1
Northbound Approach	C	E*	18	37
* Queue lengths for this movement are less than 50 feet and volume/capacity ratios are less than 1.5, so operations are adequate. However, this intersection should be monitored for signal warrant analysis based on future traffic growth.				

2030 Package A Traffic Operations

Figure 10 and Table 6 show the projected levels of service at the study area intersections under the Package A alternative. As indicated, the intersection of 29th Street/US 287 is predicted to operate at an acceptable overall LOS during the AM peak hour, but during the PM peak hour, this intersection is predicted to operate at an overall LOS E. The northbound approach at the intersection of 29th Street/Lake Drive (south) and the southbound approach at the intersection of 29th Street/Lake Drive (north) are predicted to operate at LOS E in the PM peak hour. However, queue lengths and v/c ratios for these movements indicate adequate operations.

Access to the commuter rail station would be provided from 29th Street and Garfield Avenue. As shown on Figure 10 and Table 6, these accesses would be a single lane with stop-control on the station approach, and would operate at adequate levels of service without any need for laneage improvements to 29th Street or Garfield Avenue.

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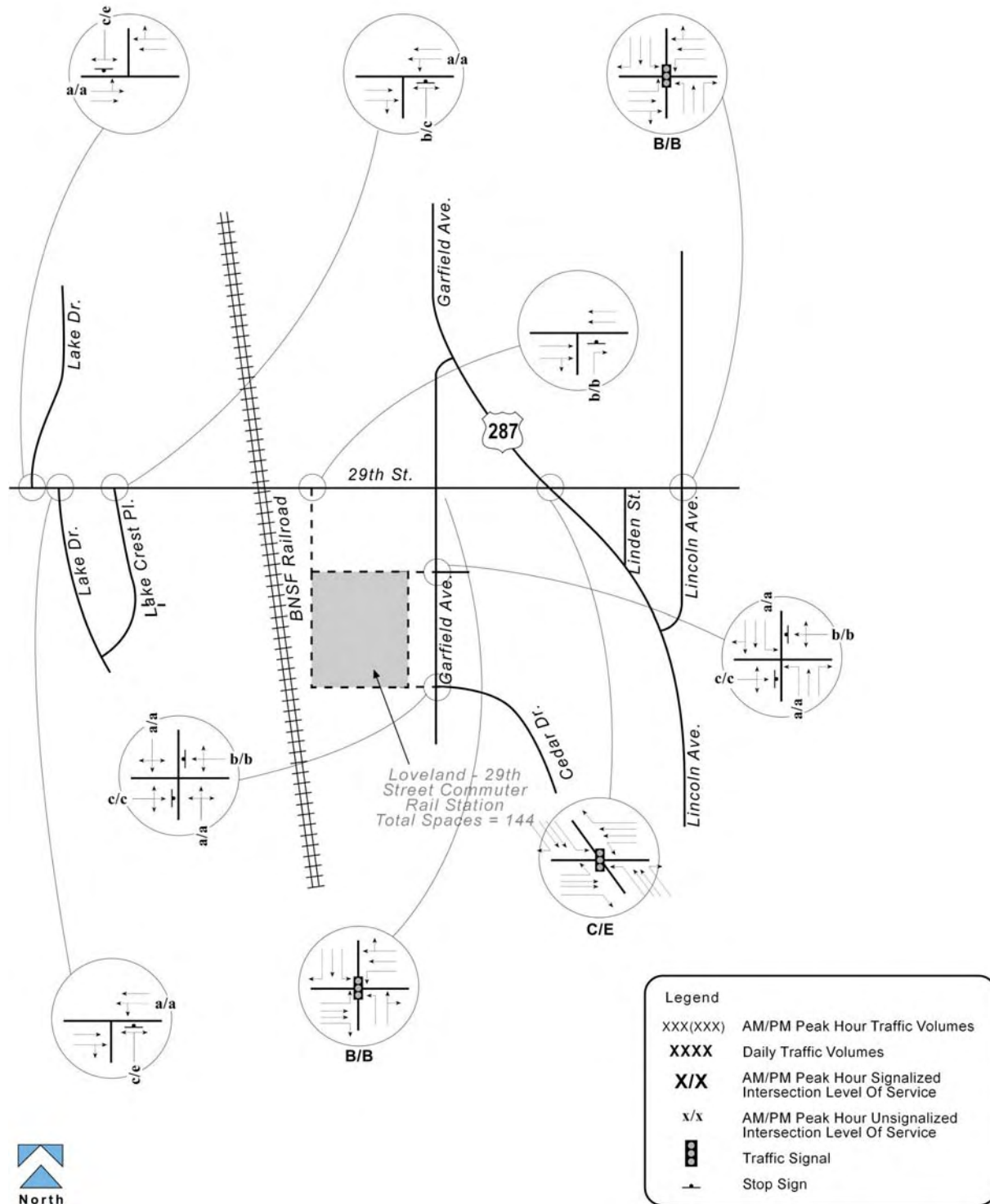


Figure 9. 2030 No Action Levels of Service

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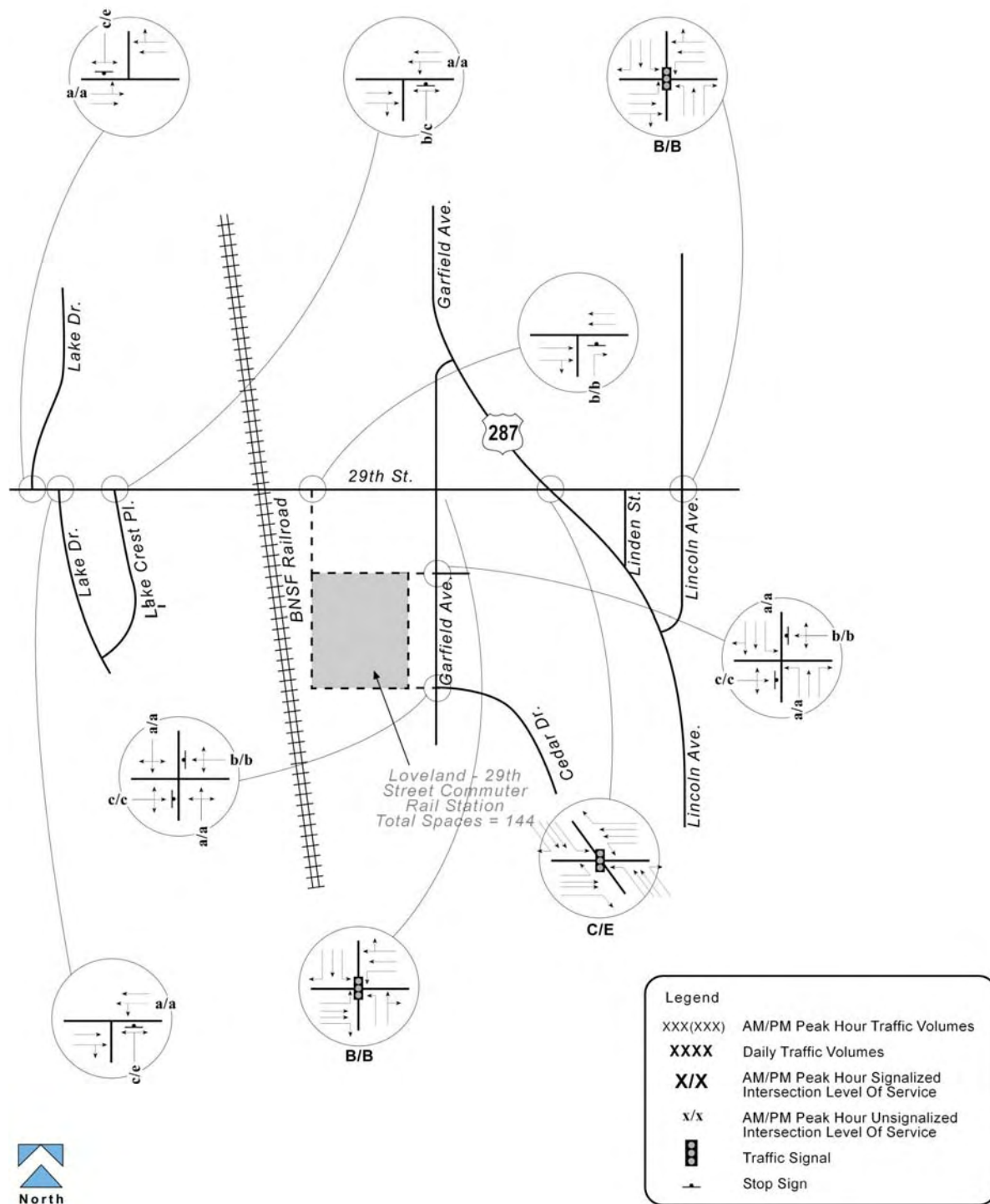


Figure 10. 2030 Package A Levels of Service

Table 6. 2030 Package A Intersection LOS and Delay

Intersection / Movement	Level of Service		Delay (seconds)	
	AM	PM	AM	PM
29th St. and Lincoln Ave.	B	B	16	19
29th St. and US 287	C	E	31	55
29th St. and Garfield Ave.	B	B	19	17
29th St. and Lake Crest Pl. (unsignalized)				
Westbound Left Turn	A	A	<1	<1
Northbound Approach	B	C	14	24
29th St. and Lake Dr. (north) (unsignalized)				
Eastbound Left Turn	A	A	<1	<1
Southbound Approach	C	E*	15	37*
29th St. and Lake Dr. (south) (unsignalized)				
Westbound Left Turn	A	A	<1	<1
Northbound Approach	C	E*	19	39*
Park and Ride Access/29th St. (unsignalized)				
Northbound Right Turn	B	B	11	11
Park and Ride Access/Garfield Ave. North (unsignalized)				
Eastbound Approach	C	C	16	19
Westbound Approach	B	B	11.6	12
Northbound Left Turn	A	A	<1	<1
Southbound Left Turn	A	A	8	8
Park and Ride Access/Garfield Ave. South (unsignalized)				
Eastbound Approach	B	C	14	16
Westbound Approach	B	B	13	13
Northbound Approach	A	A	<1	<1
Southbound Approach	A	A	<1	<1
* Queue lengths for this movement are less than 50 feet and volume/capacity ratios are less than 1.5, so operations are adequate. However, this intersection should be monitored for signal warrant analysis based on future traffic growth.				

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, the Package A alternative has little impact on the key intersections in the study area, and the park-and-ride access would operate at acceptable levels of service.

Table 7. Intersection Level of Service and Delay

Intersection	No Action		Package A	
	AM Peak	PM Peak	AM Peak	PM Peak
29th St. and Lincoln Ave.	LOS B (15 sec.)	LOS B (19 sec.)	LOS B (16 sec.)	LOS B (19 sec.)
29th St. and US 287	LOS C (26 sec.)	LOS E (60 sec.)	LOS C (31 sec.)	LOS E (55sec.)
29th St. and Garfield Ave.	LOS B (17 sec.)	LOS B (16 sec.)	LOS B (19 sec.)	LOS B (17 sec.)
29th St. and Lake Crest Pl. (unsignalized)				
Westbound Left Turn	LOS A (<1 sec.)	LOS A (<1 sec.)	LOS A (<1 sec.)	LOS A (<1 sec.)
Northbound Approach	LOS B (12 sec.)	LOS C (23 sec.)	LOS B (14 sec.)	LOS C (24 sec.)
29th St. and Lake Dr. (north) (unsignalized)				
Eastbound Left Turn	LOS A (<1 sec.)	LOS A (<1 sec.)	LOS A (<1 sec.)	LOS A (<1 sec.)
Southbound Approach	LOS B (14 sec.)	LOS D (34sec.)	LOS C (15 sec.)	LOS E* (37 sec.)
29 th St. and Lake Dr. (south) (unsignalized)				
Westbound Left Turn	LOS A (<1 sec.)	LOS A (1 sec.)	LOS A (<1 sec.)	LOS A (1 sec.)
Northbound Approach	LOS C (18 sec.)	LOS E* (37 sec.)	LOS C (19 sec.)	LOS E* (39 sec.)
Park and Ride Access/29 th St. (unsignalized)				
Northbound Right Turn	N/A	N/A	LOS B (11 sec.)	LOS B (11 sec.)
Park and Ride Access/Garfield Ave. North (unsignalized)				
Eastbound Approach	N/A	N/A	LOS C (16 sec.)	LOS C (16 sec.)
Westbound Approach	N/A	N/A	LOS B (12 sec.)	LOS B (12 sec.)
Northbound Left Turn	N/A	N/A	LOS A (0 sec.)	LOS A (0 sec.)
Southbound Left Turn	N/A	N/A	LOS A (8sec.)	LOS A (8 sec.)

Table 7. Intersection Level of Service and Delay (continued)

Intersection	No Action		Package A	
	AM Peak	PM Peak	AM Peak	PM Peak
Park and Ride Access/Garfield Ave. South (unsignalized)				
Eastbound Approach	N/A	N/A	LOS B (14 sec.)	LOS C (16 sec.)
Westbound Approach	N/A	N/A	LOS B (13 sec.)	LOS B (13 sec.)
Northbound Approach	N/A	N/A	LOS A (<1 sec.)	LOS A (0 sec.)
Southbound Approach	N/A	N/A	LOS A (<1 sec.)	LOS A (<1 sec.)
* Queue lengths for this movement are less than 50 feet and volume/capacity ratios are less than 1.5, so operations are adequate. However, this intersection should be monitored for signal warrant analysis based on future traffic growth.				

LOS X – Level of service

##.# - Average delay in seconds per vehicle