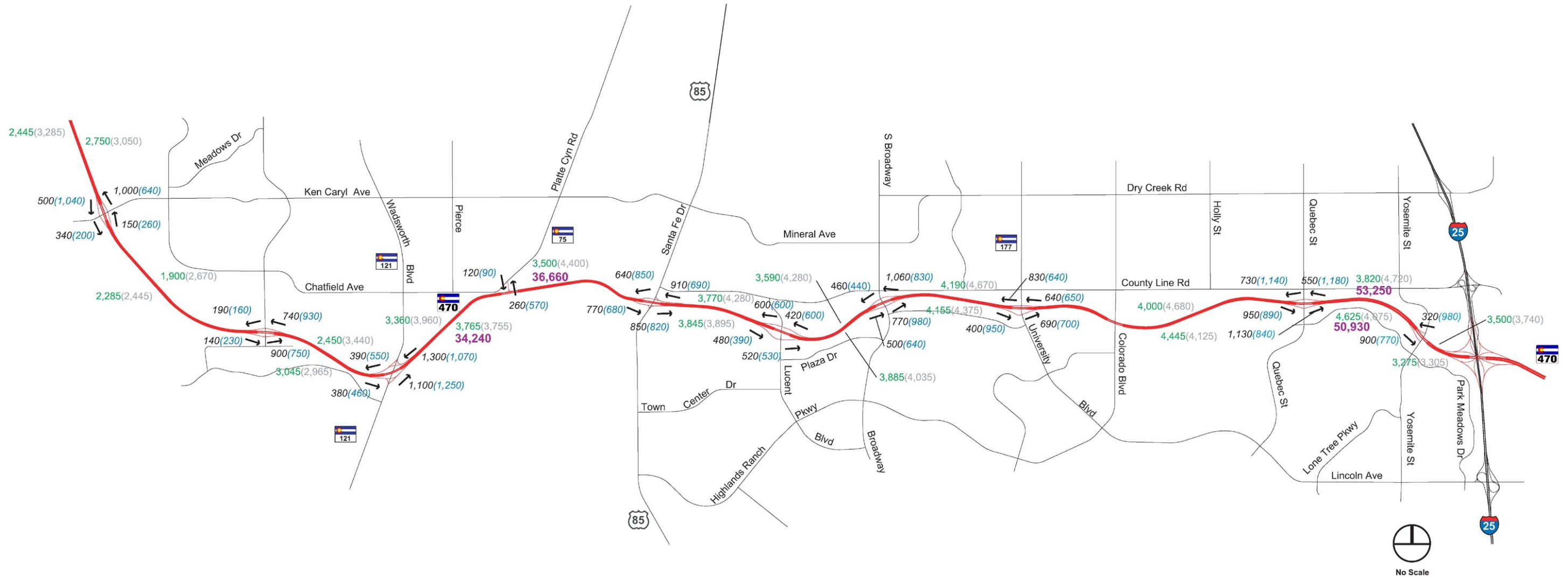


Figure 4.2
Existing Freeway Volume (View 2)



LEGEND

- 00,000 average daily traffic volume
- 000(000) am(pm) peak hour ramp volumes
- 000(000) am(pm) peak hour volumes

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4.2.2 Hourly Distribution

The hourly distribution is used to determine what periods have the highest volumes, and thus to define peak and off-peak hours. Table 4.1 shows the existing hourly distribution for the eastern and western segments of C-470. Table shows that the AM and PM peak hours last approximately 1.5 and 3 hours, respectively.

Table 4.1
Existing Hourly Distribution

Hour	EB	WB	AM Peak Percents		PM Peak Percents		Peak Periods
			EB	WB	EB	WB	
6:00 AM	5,401	6001	82.5	83.9			
7:00 AM	6,545	7154	100.0	100.0			AM Peak
8:00 AM	5,353	5946	81.8	83.1			
9:00 AM	3,916	4755	59.8	66.5			
10:00 AM	3,824	4533	58.4	6.4			
11:00 AM	4,079	4838	62.3	67.6			
12:00 PM	3,896	4875	59.5	68.1			
1:00 PM	3,937	5103			60.7	64.8	
2:00 PM	4,446	5743			68.6	73.0	
3:00 PM	4,929	7187			76.0	91.3	PM Peak
4:00 PM	5,932	7871			91.5	100.0	PM Peak
5:00 PM	6,485	7305			100.0	92.8	PM Peak
6:00 PM	4,839	6083			74.6	77.3	
7:00 PM	3,281	3877			50.6	49.3	

4.2.3 Vehicle Classification

To determine the percentages of cars and trucks along the corridor, vehicle classification data were collected along C-470. The classification counts, conducted in three locations along the corridor in June 2003, indicate that a maximum volume of 92 trucks travel the corridor during the AM peak hours 7:00 a.m. to 9:00 a.m. and 50 travel during the PM peak hours 5:00 p.m. to 7:00 p.m. Truck volumes in the three locations are shown in Table 4.2.

Table 4.2
Heavy Vehicle Volumes along C-470

Truck Volumes	AM			PM		
	South of Hampden	North of Hampden	East of Santa Fe	South of Hampden	North of Hampden	East of Santa Fe
Dir 1- WB/NB	70	78	61	50	49	25
Dir 2 – EB/SB	86	92	54	20	27	40

4.2.4 Travel Time Observations

Manual and automated travel time observations from I-25 to I-70 were completed as part of this study. Manual travel time observations consisted of a driver beginning at one end of the corridor and recording the time required to reach each subsequent interchange during the AM and PM peak hours. The average travel speed, number of stops, and total delay for each section were also recorded. Two runs in each direction during each peak hour on different days were performed to provide a sample representation of average conditions. The second type of travel time observation was completed with the aid of strategically mounted antennas similar to those used at electronic toll collection zones. Each antenna records arrival times of drivers with Express Toll transponders, allowing the calculation of an overall trip time. With the exception of one run, the average travel time in each direction ranged from 9 to 13 minutes, with an overall speed of around 60 mph. The AM and PM peak hour travel time observations are noted in Table 4.3.

Table 4.3
Summary of AM Travel Time Observations (sec)

Node Name	Length (feet)	Run #1 AM WB	Run #2 AM WB	Run #1 AM EB	Run #2 AM EB
I-25	0	0	0	0	0
Yosemite Street	1584	20	20	36	35
Quebec Street	7498	83	85	155	148
Colorado Boulevard	10718	122	125	216	211
University Boulevard	5333	80	82	103	98
Broadway	7603	112	117	161	156
Lucent Boulevard	6389	90	95	93	91
Santa Fe Drive	7392	111	116	131	126
Platte Canyon Road	16315	124	128	187	181
Wadsworth Boulevard	8026	123	130	187	180
Kipling Parkway	7762	107	108	163	160
Ken Caryl Avenue	11880	172	179	127	121
Bowles Avenue	12038	178	180	131	128
Belleview Avenue	5280	161	163	76	74
US 285	5861	73	75	79	76
Morrison Road	7656	99	101	84	81
I-70	20909	289	297	216	206
Total (Minutes)		32	33	36	35

Table 4.4
Summary of PM Travel Time Observations (sec)

Node Name	Length (feet)	Run #1 PM WB	Run #2 PM WB	Run #1 PM EB	Run #2 PM EB
I-25	0	0	0	0	0
Yosemite Street	1584	18	18	20	21
Quebec Street	7498	427	404	102	109
Colorado Boulevard	10718	444	432	152	160
University Boulevard	5333	99	96	77	82
Broadway	7603	90	86	109	115
Lucent Boulevard	6389	76	72	90	95
Santa Fe Drive	7392	318	329	103	110
Platte Canyon Road	16315	181	189	116	122
Wadsworth Boulevard	8026	86	84	118	123
Kipling Parkway	7762	82	83	103	108
Ken Caryl Avenue	11880	126	122	164	172
Bowles Avenue	12038	128	127	135	140
Belleview Avenue	5280	98	64	95	102
US 285	5861	101	79	98	105
Morrison Road	7656	108	104	106	113
I-70	20909	246	245	434	465
Total (Minutes)		44	42	34	36

4.2.5 Levels of Service/Densities

Current LOS and densities along C-470 were calculated using Highway Capacity Software (HCS). Based on the analysis, the segment of C-470 between Quebec Street and Platte Canyon Road has the lowest LOS (E-F) and highest densities for both the AM and PM peak hour in the east- and westbound direction. Table 4.4 summarizes the HCS analysis.

Table 4.5
AM/PM Peak Hour C-470 Freeway Segment LOS/Density Summary

From	To	WB C-470 Freeway Segments		EB-470 Freeway Segments	
		LOS	Density (sec)	LOS	Density (sec)
I-25	Yosemite Street	C/C	21.6/21.6	C/C	21.9/19.1
Yosemite Street	Quebec Street	C/C	23.4/27.7	D/C	27.5/23.5
Quebec Street	University Boulevard	F/F	-/-	F/E	-/43.2
University Boulevard	Broadway	F/F	-/-	F/F	-/-
Broadway	Lucent Boulevard	E/F	37.0/-	E/E	39.6/40.9
Lucent Boulevard	Santa Fe Drive	E/F	40.7/-	F/E	-/43.2
Santa Fe Drive	Platte Canyon Road	E/F	35.4/-	E/E	38.6/36.4
Platte Canyon Road	Wadsworth Boulevard	D/E	33.2/39.8	E/E	38.6/36.4
Wadsworth Boulevard	Kipling Parkway	C/D	23.3/31.1	D/D	27.9/26.1
Kipling Parkway	Ken Caryl Avenue	C/C	18.5/23.2	C/C	20.8/21.4
Ken Caryl Avenue	Bowles Avenue	C/D	26.0/26.7	C/D	22.2/29.5
Bowles Avenue	Quincy Avenue	D/D	32.3/27.3	C/E	22.0/39.3
Quincy Avenue	US 285	F/D	-/28.9	C/F	22.5/-
US 285	Morrison Road	D/C	35.0/20.8	B/D	16.1/31.2
Morrison Road	I-70	D/C	31.0/18.6	B/D	14.0/26.1

4.2.6 Congestion/Queue Observations

To identify areas where the volume to capacity ratio (V/C) was close to 1.0, or where the intersection was oversaturated, a Synchro model was developed for the arterial street network. The intersections identified in the Synchro analysis were then visited during the AM and PM peak hours to field verify queue lengths. The field-measured queue lengths were later used to calibrate the micro-simulation model.

4.2.7 Speed Profiles

Travel speed measurements were collected in both directions during the AM and PM peak hour between I-25 and I-70. The travel speed ranged from 45 mph to 63 mph. Table 4.5 summarizes the recorded travel speed for each segment.

Table 4.6
Summary of AM Average Speed (mph)

Node Name	Length (feet)	Run #1 AM WB	Run #2 AM WB	Run #1 AM EB	Run #2 AM EB
I-25	0	0	0	0	0
Yosemite Street	1584	60.1	58.9		31.1
Quebec Street	7498	61.1	59.9	33	34.6
Colorado Boulevard	10718	59.4	57.8	33.8	34.6
University Boulevard	5333	59.8	58.1	35.3	37.1
Broadway	7603	60.3	57.9	32.2	33.1
Lucent Boulevard	6389	60.8	57.5	46.9	47.9
Santa Fe Drive	7392	58.1	55.7	38.5	40.1
Platte Canyon Road	16315	58.2	56.3	59.5	61.6
Wadsworth Boulevard	8026	59.1	55.8	29.3	30.5
Kipling Parkway	7762	60.3	59.5	32.5	33.2
Ken Caryl Avenue	11880	60.4	58.1	63.8	66.7
Bowles Avenue	12038	59.7	59	62.7	64.3
Bellevue Avenue	5280	50.5	49.8	47.4	48.5
US 285	5861	48.4	46.8	50.6	52.4
Morrison Road	7656	54.1	52.9	62.2	64.2
I-70	20909	58.7	57.2	66	65.1

Table 4.7
Summary of PM Average Speed (mph)

Node Name	Length (feet)	Run #1 PM WB	Run #2 PM WB	Run #1 PM EB	Run #2 PM EB
I-25	0	0	0	0	0
Yosemite Street	1584	60	60	54	51.5
Quebec Street	7498	12	12.7	50.1	46.9
Colorado Boulevard	10718	16.5	16.9	48.1	45.7
University Boulevard	5333	36.7	37.9	47.2	44.4
Broadway	7603	57.6	60.3	47.6	45.1
Lucent Boulevard	6389	57.3	60.5	48.4	45.9
Santa Fe Drive	7392	15.9	15.3	49	45.8
Platte Canyon Road	16315	61.5	58.9	63.2	61.5
Wadsworth Boulevard	8026	63.7	65.2	46.4	44.5
Kipling Parkway	7762	64.6	63.8	51.4	49
Ken Caryl Avenue	11880	64.3	66.4	49.4	47.1
Bowles Avenue	12038	64.2	64.7	60.8	58.7
Bellevue Avenue	5280	36.8	56.3	37.9	35.3
US 285	5861	39.6	50.6	40.8	38.1
Morrison Road	7656	48.4	50.2	49.3	46.2
I-70	20909	58	58.2	32.9	30.7

4.2.8 Safety

Compared to other similar roadways around the state, the C-470 corridor from Kipling Parkway to I-25 is a relatively safe, four-lane urban freeway. Based on an analysis conducted by CDOT Region 6 in February 2005, this segment of C-470 had lower than expected accident rates. The CDOT study (Draft Traffic Safety Chapter, For the C-470 Corridor EA, February 2005) looked at an accident history for the 3-year period from January 1, 2000, through December 31, 2002, and analyzed 1,565 mainline accidents. Of these, 1,140 were property damage only, 417 were injury accidents, and eight were fatal accidents. The accident rates on this segment of C-470 were found to be very near or below average, compared with similar four-lane urban freeways in Colorado. However, the accident rate in the section around the Santa Fe Drive Interchange was noticeably above average. Over the 3-year period, accidents occurred in this section at about 30 accidents per mile per year. A similar four-lane urban freeway with similar volumes would typically have 18 accidents per mile per year (APMPY).

The area around the Santa Fe Interchange also had a high accident rate during the study period. The study indicates this segment of C-470 has a high proportion of rear-end accidents. Among the rear-end accidents is a disproportionately higher number that occurred in the westbound direction, particularly during the PM peak period.

Two design features and two operational characteristics are believed to be major contributing factors to the high accident rate at the Santa Fe Drive Interchange. The westbound portion of roadway has a steep downhill grade east of the Santa Fe Drive Interchange. Further, the westbound entrance ramp from Santa Fe Drive is on the inside of a curve, obstructing drivers' vision and making the merge maneuver more difficult. Operationally, this area is congested in the PM peak period, and the high traffic volumes entering and exiting at Santa Fe Drive increase congestion. The combination of congestion, vehicles slowing to enter/exit Santa Fe Drive, the difficult merge, and the downhill grade results in a high accident location with a high proportion of rear-end accidents.

The overall accident rate on the remainder of the corridor suggests that the facility is safe when compared to similar facilities. The pattern of accident types indicates that approximately half of the accidents are rear-end accidents, one quarter involve fixed objects, and the remaining fall into a multitude of categories. Rear-end accidents are often associated with congestion, where rapidly slowing vehicles encounter one another. Any congestion-relieving improvements made to C-470 would likely reduce the number of rear-end accidents. The Draft Traffic Safety Chapter from the C-470 Corridor EA is contained in Appendix A.