

# CHAPTER 1 PURPOSE AND NEED

## 1.1 INTRODUCTION

The Colorado Department of Transportation (CDOT) and Federal Highway Administration (FHWA) have identified a need for improvements to the C-470 Corridor from Kipling Parkway to Interstate 25 (I-25). The project area, as shown in **Figure 1-1** spans portions of Arapahoe, Douglas, and Jefferson counties. This Purpose and Need presents the project need and provides an introduction and foundation for alternatives developed and analyzed as part of this C-470 Corridor Environmental Assessment (EA).

## 1.2 PURPOSE

The purpose of this project is to address congestion from Kipling Parkway to I-25, reduce traveler delay, and improve reliability for corridor users. The project seeks to select an implementable transportation alternative that provides reliability, maintains travel times; provides reliable travel choices to accommodate an expected increase in the intensity and duration of congestion forecasted for the design year 2025.

## 1.3 NEED FOR ACTION

Since its completion in 1990, C-470 has served the transportation needs of communities throughout the southwest Denver metropolitan area including Littleton, Lakewood, Greenwood Village, Lone Tree, Centennial, Highlands Ranch, Ken Caryl, and portions of unincorporated Douglas and Jefferson Counties. Presently, C-470 carries 80,000 to 100,000 vehicles per day in the busiest reaches. These existing volumes are significantly higher than the 20-year build scenario developed in 1980 that forecasted an average of only 25,000 to 30,000 vehicles per day between Kipling Parkway to I-25 for the year 2000. A four-lane urban freeway, such as C-470, operating at level of service (LOS) D can carry approximately 80,000 vehicles per day or 8,000 vehicles per hour.

### 1.3.1 Population and Employment Growth Leads to Congestion

Recent population growth and continued land development in the western end of the C-470 Corridor EA project area combined with expected commercial growth at the eastern end

**Figure 1-1  
C-470 Corridor Project Area**



of the Corridor along I-25 will further congest C-470. Full build-out of Highlands Ranch is expected by 2015, resulting in a total of approximately 37,000 homes and 100,000 residents, based on the approved Highlands Ranch Planned Unit Development for this area and the Douglas County Comprehensive Master Plan 2020.

Employment in the I-25 Corridor from I-225 to Lincoln Avenue is projected to grow from the existing 117,000 jobs to a total of 163,000 jobs by 2025, with nearly all growth occurring by 2020, according to the *Urban Corridor Analysis* conducted for Greenwood Village by the Denver Regional Council of Governments (DRCOG) (2003). The planned extension of the Southwest Corridor light rail transit (LRT) along Santa Fe Drive, then east to Lucent Boulevard will provide opportunities for redevelopment along the Santa Fe Drive corridor, including additional industrial, residential, and commercial land uses in both the short- and long-term horizons. These land use changes will lead to increased vehicle trips on the C-470 Corridor, and will contribute to higher levels of congestion.

### 1.3.2 Congestion

Congestion is measured by the LOS the roadway facility provides to the public. LOS is a rating

system used in traffic engineering to measure the operational conditions of freeways, roadways, interchanges, and intersections. The variables considered in this rating system include speed, travel time, vehicular delay, traffic interruptions, and freedom to maneuver. There are six LOS categories ranging from “A” to “F.” LOS A represents ideal flow conditions with little or no delay; LOS F represents stop and go flow conditions with extreme delays. CDOT has established LOS D as the acceptable level of service for urban freeway facilities.

The 2003 traffic volumes and LOS were analyzed for the C-470 mainline. The volumes and LOS are listed in **Table 1-1**. The data clearly indicates that existing volumes currently result in worse than acceptable LOS on most segments.

The forecasted 2010 and 2025 traffic volumes and LOS were also analyzed for the C-470 Corridor. The volumes and LOS are listed in **Table 1-2**. These forecasted volumes represent an increase that ranges from 17 to 25 percent between 2003 and 2010, and a range of ten to thirteen percent between 2010 and 2025. The 2010 volumes and LOS were projected based on land use changes expected between 2003 and 2025. Clearly the anticipated growth in the next seven years will

**Table 1-1  
Existing 2003 AM/PM Peak Hour Traffic Volumes and Levels of Service**

Section	AM/PM Peak Hour Traffic Volume	AM/PM Peak Hour LOS
Ken Caryl Ave to Kipling Pkwy*	4,200/4,700	C/C
Kipling Pkwy to Wadsworth Blvd	5,800/6,400	D/D
Wadsworth Blvd to Santa Fe Dr	7,600/8,100	E/F
Santa Fe Dr to Lucent Blvd	7,900/8,200	F/F
Lucent Blvd to Broadway	7,800/8,300	E/F
Broadway to University Blvd	8,700/9,040	F/F
University Blvd to Quebec St	8,700/8,800	F/F
Quebec St to Yosemite St	8,700/8,800	F/F
Yosemite St to I-25	7,500/7,000	C/C

\* This section is shown to demonstrate lower traffic volumes and acceptable levels of service outside the project area.

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result in a dramatic rise in traffic volumes and congestion, followed by more moderate growth through 2025. Capacity improvements and/or some type of demand management in the corridor will be needed to accommodate the additional travel demand and address congestion and delay both now, and in future years. If such improvements are not constructed in the near term, increased congestion will lead to additional delay in the region.

### 1.3.3 Delay

The resulting delay due to congestion has a severe impact on individuals traveling on and through the C-470 Corridor. Delay is defined as the difference in travel time between uncongested travel at the permitted speed and congested travel. Existing peak hour traveler delay was determined to be 11 to 18 minutes between Kipling Parkway and I-25, meaning that it currently takes an individual an average of 11 to 18 minutes longer to travel during the peak hour on C-470 from Kipling Parkway to I-25 than it would if the Corridor were not congested. This equates to an approximate travel speed of 28 to 36 miles per hour through the corridor. Based on future year travel forecasts and projected speeds, the peak hour traveler delay is projected to reach

approximately 20 to 22 minutes by 2025, between Kipling Parkway and I-25 if no capacity improvements are made to the Corridor. This equates to an average travel speed of approximately 25 miles per hour by 2025. Recurring delay resulting from congestion and related incidents along the corridor contribute to making the highway an unreliable travel choice, especially during peak period travel.

### 1.3.4 Reliability

Under highly congested conditions, travel on the corridor becomes extremely unpredictable. Incidents on the highway, such as a traffic accident, can result in disruption of traffic flow that affects the entire Corridor length. For this reason, the Corridor can be considered very unreliable with regard to travel time, delay, speed, and LOS. Reliability is referred to as the difference between generally occurring travel conditions at a given time to that which occurs during non-typical travel conditions resulting from crashes, sun glare, weather related conditions, etc. Commuters currently experience inconsistencies in travel times and speeds during the peak hour, making it difficult to predict how long the morning or evening commute will take. Reliability will continue to degrade on the

**Table 1-2**  
**2010 and 2025 No-Action AM/PM Peak Hour Traffic Volumes and Levels of Service**

Section	2010 AM/PM Peak Hour volume	2025 AM/PM Peak Hour volume	2010 AM/PM Peak Hour LOS	2025 AM/PM Peak Hour LOS
Ken Caryl Ave to Kipling Pkwy*	5,300/6,100	5,700/6,200	D/D	D/D
Kipling Pkwy to Wadsworth Blvd	6,900/7,700	7,600/8,600	F/F	F/F
Wadsworth Blvd to Santa Fe Dr	8,900/9,700	9,800/10,800	F/F	F/F
Santa Fe Dr to Lucent Blvd	9,300/9,800	10,300/10,900	F/F	F/F
Lucent Blvd to Broadway	9,200/10,200	10,100/11,400	F/F	F/F
Broadway to University Blvd	10,300/11,200	11,500/12,600	F/F	F/F
University Blvd to Quebec St	10,500/10,900	11,800/12,200	F/F	F/F
Quebec St to Yosemite St	10,500/11,000	11,800/12,300	E/E	F/F
Yosemite St to I-25	8,900/8,800	9,900/9,800	C/D	D/D

\* This section is shown to demonstrate lower traffic volumes and acceptable levels of service outside the project area.

corridor as congestion extends beyond the peak periods, making commuting and daily trips on the corridor difficult to predict. Additional travel time data will be collected and analyzed as part of this project.

A roadway facility will be considered reliable if it either operates at LOS D or actively manages congestion to provide a readily available choice to a congested condition. Potential solutions to address the need for a reliable corridor include capacity improvements that would achieve LOS D or better, or provide a means for active management of the facility. If improvements are not made in the corridor, congestion and delay will continue to increase, which may lead to an increase in recurring accidents.

### 1.3.5 Safety

While the corridor as a whole can be characterized as a relatively safe highway, the Santa Fe Drive interchange area stands out with regard to recurring accidents that have been attributed to specific geometric attributes of the highway and interchange. Accident rates on mainline C-470 are below the statewide average for highways with similar characteristics, while rates at the Santa Fe Drive interchange are above the state average. Given the relative lack of accidents along the corridor with the exception of the Santa Fe Drive interchange, possible solutions as part of this corridor project include early action geometric improvements specifically to the Santa Fe Drive interchange that would address the need to reduce congestion and increase safety.

### 1.3.6 Implementation

Due to the recent severe budgetary shortfalls in CDOT's program, the ability to implement improvements in the near future is difficult to predict. Most segments of the C-470 Corridor are already operating at an unacceptable LOS. Therefore, it is necessary to identify improvements that can be implemented in the short term. This project considers short-term and long-term improvements, defined as 2010 (short-term) and 2025 (long-term), based on the expediency

within which they can be implemented. The year 2010 was selected as the short-term horizon because it is a reasonable timeframe within which projects can undergo environmental analysis during the NEPA decision-making process and be designed and constructed. Short-term solutions to address the needs of this corridor include minor improvements that can be funded within CDOT's current budgetary constraints or those that have a self-funding mechanism.

## 1.4 SUMMARY

Congestion, delay, and reliability concerns form the basis of the need for improvements to C-470 from Kipling Parkway to I-25. Existing congestion on C-470 will be compounded by planned development and redevelopment along the Corridor. This will worsen existing delay, will decrease reliability, and there will be limited ability to provide relief during unstable conditions. Safety related accidents at the Santa Fe Drive interchange would continue to increase as a result of increased congestion.

The need for the project is based on the following:

#### *Congestion*

- Existing peak hour volumes on the C-470 Corridor between Kipling Parkway and I-25 range from 5,800 to 9,000 vehicles
- By 2025, peak hour volumes will increase 30 to 40 percent through the corridor
- By 2025, mainline C-470 will operate at approximately 30 percent over capacity relative to CDOT's acceptable LOS of 8,000 vehicles per hour during the peak hour
- Existing peak hour LOS on the corridor ranges from LOS C to LOS F
- By 2025, nearly every link on the corridor will operate at LOS F during the peak hour

1 *Delay and Reliability*

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- 3 ■ Existing peak hour delay on C-470
- 4 between Kipling Parkway and I-25 is
- 5 estimated at approximately 15 minutes
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- 7 ■ By 2025, the peak hour delay between
- 8 Kipling Parkway and I-25 will exceed 35
- 9 minutes, resulting in over 2,900 vehicle
- 10 hours of delay
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12 *Safety*

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- 14 ■ The Santa Fe Drive interchange is a high
- 15 accident location with a high proportion of
- 16 rear-end collisions that can be alleviated by
- 17 improved geometrics
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51 The needs for improvement to the C-470

52 Corridor are present and will become worse as

53 population, employment and resulting traffic

54 levels increase. Current funding shortfalls lend

55 to the development of an improvement alter-

56 native that may be implemented in phases based

57 on funding and the expediency of project devel-

58 opment. The alternatives development and

59 screening process will be discussed in detail in

60 **Chapter 2.**

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