

CHAPTER 4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter describes the existing social, physical, and biological environment of the C-470 Corridor and discloses the effects that would occur under the No-Action Alternative and the Proposed Action, which were described in **Chapter 2**. It also describes mitigation for adverse effects for the Proposed Action. The No-Action Alternative includes no mitigation.

In this chapter, resource topics are organized into the social, physical, and biological environments, followed by a table that summarizes effects and mitigation measures. A cumulative effects discussion follows the summary table. These sections are found on the following page numbers:

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Some of the data collected as part of the 2006 EA remain valid for use in this Revised EA, and have been used if feasible. However, where conditions have changed or required analytical methods have changed, new data were collected during 2013 to 2015. Revised analysis is necessary also because the Proposed Action design in 2015 varies from the Preferred Action in the 2006 EA.

4.2 SOCIAL ENVIRONMENT

The social environment of the C-470 project area consists of the people and businesses that exist within one mile of the highway. Transportation improvements can affect the social environment both positively and negatively by altering economic development patterns or changing land use. Social

environment effects were evaluated for the following topics:

- 4.2.1 Demographics
- 4.2.2 Minority and low income populations
- 4.2.3 Economic considerations
- 4.2.4 Land use
- 4.2.5 Right-of-way
- 4.2.6 Parks and recreation
- 4.2.7 Land and Water Conservation Fund assisted properties

4.2.1 Demographics

Data from the 2010 Decennial Census were examined to determine the characteristics of the residents within the project area. The project area population consists of persons living within approximately one mile of C-470. This area is composed of 73 Census block groups within 30 Census tracts. The same area corresponds to 88 Transportation Analysis Zones used for traffic modeling by DRCOG when that agency makes small area forecasts for population and employment.

General Population Characteristics: The 2010 Census population within the C-470 Corridor area was 114,465 residents. The total population of the three counties that C-470 traverses was 1.4 million. **Table 4-1** shows the 2010 Census population and its change from 2000 for the project area and for Arapahoe, Douglas, and Jefferson Counties.

**Table 4-1
Population Growth, 2000 to 2010**

Area	Population		Percent Growth
	2000	2010	
Arapahoe County	487,967	572,003	17.2%
Douglas County	175,766	285,465	62.4%
Jefferson County	527,056	534,543	1.4%
3-County Total	1.2 million	1.4 Million	16.9%
C-470 Corridor	103,467	114,465	10.6%

The 13.75-mile C-470 study corridor is located mostly (75 percent) within Douglas County, which had the smallest population but the highest growth rate of three counties. About one third of Douglas County's population lives in Highlands Ranch (unincorporated area) just south of the freeway. 2010 Census population totals for the three cities along the C-470 Corridor were:

- Centennial 100,377
- Littleton 41,737
- Lone Tree 10,218

Municipal populations are included in the county totals reported in the table, but only portions of these cities are within the C-470 Corridor area.

Table 4-2 shows the projected population from 2010 to 2035 for the three counties. The C-470 Corridor will have approximately 40,000 additional residents while the surrounding three-county area is expected to add half a million new residents. The rate of growth within the C-470 Corridor (34 percent between 2010 and 2035) will be comparable to that within the three-county area as a whole (35.1 percent).

No-Action Alternative Impacts on Population: The DRCOG population forecasts were made in conjunction with the *2035 Metro Vision Regional Transportation Plan* (RTP) that did

not include C-470 improvements at the time. The RTP was later amended to include the C-470 Proposed Action. This did not necessitate or result in a change to regional population and employment forecasts.

Proposed Action Impacts on Population: Planned population growth of 34 percent in the C-470 project area and 35.1 percent growth result in the need for improvements on C-470, which DRCOG has identified as a "key congested area". C-470 has been congested for more than a decade, which is why the 2006 EA was begun in 2003. The Proposed Action responds to existing conditions and planned growth; it is not expected to affect future growth. It supports the Metro Vision land use plan which calls for infill and densification within the established regional growth boundaries, providing adequate mobility to planned Urban Centers. No mitigation is needed.

4.2.2 Minority and Low Income Populations

In 1994, Presidential Executive Order 12898 directed every Federal agency to make environmental justice part of its mission by identifying and addressing the effects of all programs, policies, and activities on minority populations and low-income populations. The U.S. Department of Transportation (USDOT) and FHWA have internal agency orders and guidance to implement environmental justice

Table 4-2
Projected Population Growth, 2010 to 2035

Area	Projected Population			Growth in Population		
	2010	2020	2035	2010 to 2020	2020 to 2035	2010 to 2035
Arapahoe County	574,819	667,037	805,459	13.8%	20.8%	40.1%
Douglas County	287,124	351,832	454,908	18.4%	29.3%	58.4%
Jefferson County	535,651	575,088	627,315	6.9%	9.1%	17.1%
3-County Total	1.4 million	1.6 million	1.9 million	12.3%	18.4%	35.1%
C-470 Corridor	119,527	134,675	160,129	11.2%	18.9%	34.0%

Source: Colorado Department of Local Affairs (DOLA) County Projections for July 1 of each year; and DRCOG 2010 Cycle 2 Forecasts, 2,832-zone system. 2010 DOLA projections differ slightly from actual 2010 Census results.

ENVIRONMENTAL JUSTICE

The three fundamental principles at the core of Environmental Justice, as expressed by Executive Order 12898 are:

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on tribal governments, minority, and low-income populations
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations

policies. The current USDOT and FHWA guidance documents are discussed in the Environmental Justice Technical Report that is provided in **Appendix E**.

Minority populations include both racial and ethnic minorities. The Census Bureau definition of race is separate and distinct from Hispanic or Latino, which is considered an ethnicity. Thus, non-minority persons are

those who reported that they were both “white only” and “not Hispanic or Latino”.

Data from the 2010 Census were examined to determine the presence of minority or low income populations along the C-470 Corridor. **Table 4-3** shows year 2010 Census race and ethnicity data for the C-470 project area, the three counties where the highway is located, and the State of Colorado.

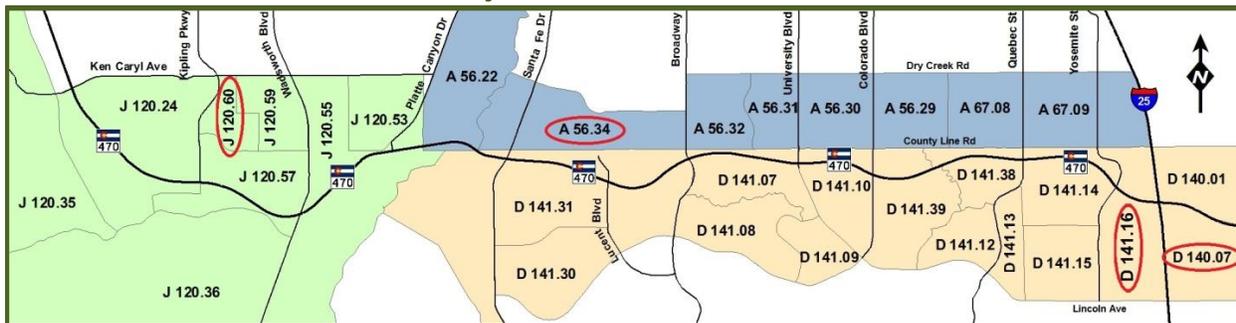
Among the 30 Census Tracts examined, the one with the highest percentage of minorities had 23.4 percent minorities, which is well above the 13.3 percent for the project area, but very consistent with the surrounding counties. This tract also had the highest percentage of African-Americans, at 3.7 percent (compared with 1.2 percent for the project area). This was Douglas County Census Tract 140.07, located southeast of the I-25/C-470 interchange. **Figure 4-1** indicates this location. These percentages are not high in comparison with surrounding counties or the state, but only in comparison with the rest of the project area.

The population of the C-470 project area is substantially more non-minority than its surrounding counties and state.

Table 4-3
Year 2010 Race and Ethnicity in C-470 Project Area and Surrounding Counties

Population by Race and Ethnicity	C-470 Project Area		Three-County Total	State of Colorado
	Persons	Percent of Total	Percent of Total (1,392,011)	Percent of Total (5,029,196)
RACE				
White Alone	104,309	91.1%	82.3%	81.3%
Asian	3,937	3.4%	3.9%	2.8%
African-American	1,346	1.2%	4.8%	4.0%
Other or Combined Races	4,873	4.3%	9.0%	11.9%
Total	114,465	100.0%	100.0%	100.0%
ETHNICITY				
Not Hispanic or Latino	106,622	93.1%	85.4%	89.3%
Hispanic or Latino	7,843	6.9%	14.6%	20.7%
Total	114,465	100.0%	100.0%	100.0%
TOTAL MINORITY				
Non-Minority	99,190	86.7%	80.5%	70.0%
Minority	15,275	13.3%	19.5%	30.0%
Total	114,465	100.0%	100.0%	100.0%

Figure 4-1
Project Area Census Tracts



Note: Letters and colors denote Arapahoe (A), Douglas (D) and Jefferson (J) counties. Tracts highlighted with an oval had the highest percentages of minority or low-income individuals, as detailed in this section.

Figure 4-1 highlights three additional Census tracts, two with minority concentrations and one with relatively low income. Douglas County Census Tract 141.16, immediately southwest of the I-25/C-470 interchange, had the highest percent of Asians, at 9.6 percent, which is well above the level for the surrounding counties and state. This tract had 250 persons from the country of India.

Jefferson County Census Tract 120.60, located north of C-470 along Kipling Parkway, had the highest reported percentage of Hispanic residents, at 11.1 percent. This is well below the level for the surrounding counties and state, but higher than the project area average of 6.9 percent.

The fourth Census tract highlighted in **Figure 4-1** pertains to low-income populations, discussed below.

Low-Income Populations: The U.S. DOT Order 5610.2 defines low-income as “a household income at or below the Department of Health and Human Services poverty guidelines.” The *CDOT NEPA Manual* contains detailed procedures for identifying low-income populations to be considered for environmental justice analysis of CDOT transportation projects, consistent with FHWA guidance (CDOT, 2014).

Using the CDOT procedures, it was estimated that 5.9 to 6.9 percent of the households in the C-470 project area meet the low-income threshold. This is slightly higher than the percentage for Douglas County, but lower than the levels for Jefferson County (11.2 percent) and Arapahoe County (14.2 percent).

In the C-470 project area, the Census tract with the greatest percentage of low-income households (14.8 percent) was Arapahoe County Census Tract 56.34, indicated in **Figure 4-1**. This tract includes the Wolhurst Community, located immediately adjacent to C-470 at Santa Fe Drive. Wolhurst is a mobile home community for persons aged 55 years or older, many of whom are retirees. The Wolhurst Community was the only area of environmental justice concern in the 2006 C-470 EA. Extensive outreach was conducted with Wolhurst residents at that time.

Jefferson County Census Tract 120.60, noted earlier as having the project area’s highest prevalence of Hispanic residents, had the second greatest prevalence of low-income households (13.4 percent).

The third greatest prevalence of low-income households (12.7 percent) was found in Douglas County Census Tract 140.07, east of I-25, discussed earlier as the tract with the

project area's highest concentration of racial minorities.

Households with Limited English Proficiency: Jefferson County Census Tract 120.60, already discussed above with respect to Hispanic ethnicity and low income, also had the project area's highest prevalence (5.8 percent) of households where no one over age 14 speaks English very well (ACS, 2014).

According to Census data, 82 of the 1,417 households in this tract speak Spanish rather than English. This Spanish-speaking population with limited English proficiency (LEP) is found in the Dakota Station neighborhood, which is not immediately adjacent to C-470. All other Census tracts in the project area had much lower LEP prevalence, ranging from zero to 3.6 percent.

To encourage awareness and participate in the NEPA decision-making process, CDOT will prepare outreach materials in Spanish to distribute or post in the Dakota Station neighborhood in advance of the Public Hearing for the Revised EA. This is not mitigation of a project impact, but instead part of the public involvement process. CDOT routinely publicizes the availability of resources to accommodate Spanish speakers at public hearings.

No-Action Alternative Impacts on Minority and Low-Income Populations: The No-Action Alternative consists of only routine maintenance on C-470, such as resurfacing and re-striping. These activities would affect and benefit all C-470 users alike and would not disproportionately affect any low-income or minority population.

Proposed Action Impacts on Minority Populations: The project area for C-470 improvements is a heavily non-minority corridor. No residences or businesses will be relocated, so there would be no effect on the cohesion of any ethnic neighborhood. Transportation benefits from the Proposed

Action would accrue to all C-470 users regardless of race or ethnicity.

Proposed Action Impacts on Low-Income Populations: C-470 widening would require reconfiguration of the westbound C-470 on-ramp at Santa Fe Drive, adjacent to the low-income Wolhurst mobile home community. The existing noise barrier would be replaced with a new barrier of equal or greater height, length and aesthetic quality, slightly north of the existing wall location. Replacement of the existing noise wall is due to design of the Proposed Action. It is unrelated to the neighborhood's low-income status. No other specific neighborhood would be directly affected by the Proposed Action.

Ramp reconfiguration, noise wall demolition and noise wall replacement adjacent to the southern edge of the Wolhurst Community would have construction impacts including dust generation, noise and vibration.

Another issue relating to low-income persons is the Proposed Action's addition of new lanes for which users would pay a toll. The Proposed Action would maintain two free general purpose lanes in each direction as well as adding the tolled express lanes, thus giving motorists a choice. No existing free lanes would be converted to toll lanes.

The charging of tolls on proposed new express lanes could be considered an economic disadvantage to low-income individuals, as they perhaps could not afford to pay the tolls on a regular basis. This was a consideration during the 2006 EA alternatives evaluation, but experience from other tolled express lanes has demonstrated that individuals from all income levels use tolled facilities. While lower-income individuals may not use the facility as frequently as those with higher incomes, the data suggest that the imposition of tolls does not preclude low-income individuals or households from using the facility at times when minimizing traffic delay is of importance (FHWA, 2014).

An economic equity issue raised elsewhere in the U.S. has been the requirement to have a transponder and a prepaid account to access toll lanes, as this would be a hardship for low-income persons. The Proposed Action would not require the use of a transponder in the vehicle. For vehicles without a transponder, toll collection would also be accomplished by photo surveillance of license plates and mailing toll bills to the vehicle owner, as is currently done on toll highway E-470 immediately east of the C-470 project area.

On E-470, customers without a transponder pay higher costs to cover administration and postage for paper billing. This is expected to be the case for C-470 as well.

Extensive public outreach by the C-470 Corridor Coalition in 2012 determined that tolled lanes were the preferred funding approach over sales tax and property tax increases. With a user fees approach, low-income populations do not have to pay additional taxes.

The addition of auxiliary lanes under the Proposed Action would improve traffic flow and safety for all motorists, whether they use the tolled express lanes or not.

In summary, there is minimal presence of minority and low-income households in the project area, no households would be displaced, no person would be required to use the toll lanes or obtain a transponder, and all C-470 users would benefit from the addition of auxiliary lanes. It is concluded that no disproportionate high or adverse impacts to low-income and minority populations are anticipated with the Proposed Action.

Mitigation of Proposed Action Impacts to Low-Income Populations: The construction impact mitigation strategies used near the Wolhurst Community are the same strategies that would be used throughout the C-470 Corridor. No separate additional mitigation is necessary for environmental justice reasons.

4.2.3 Economic Conditions

County-level socio-economic conditions are available in community profiles prepared by DRCOG. **Table 4-4** provides indicators for the year 2010, enabling a county-by-county comparison. About 75 percent of the C-470 project is in Douglas County, 20 percent in Jefferson County, and 5 percent in Arapahoe County.

The three counties are comparable in their rates of employment per capita, with approximately one person employed per every two residents. Key differences between counties appear in education and income levels. Of the three counties, Douglas County has the highest percentage of college-educated adults, and the highest percentage of workers employed in the business, science and arts sector of the economy. Douglas County has the highest household income and the lowest poverty rate. Arapahoe County is the most urban of the three counties, 45 percent of its workers in DRCOG-designated Urban Centers.

No-Action Alternative Economic Impacts:

With no improvements to C-470, the economic costs associated with congestion would continue to increase. Congestion could affect business location decisions and individual home rental/purchase decisions by making other less congested areas in the region more economically attractive.

No property would be removed from local property tax rolls because no new ROW would be required under the No-Action Alternative. Therefore, the property tax base would not be affected.

Figure 4-2 presents DRCOG-prepared 2010 employment density and projected job growth locations along C-470 through the year 2035. According to the DRCOG small area forecasts (TAZ data), employment in the project area is predicted to increase by 56,000 jobs, from 82,000 in 2010 to 138,000 in 2035. This 68 percent increase in jobs is double the 34 percent projected population growth rate for the area, which was reported in **Table 4-2**.

**Table 4-4
2010 Economic Indicators for the Three C-470 Corridor Project Counties**

Metric	County		
	Arapahoe	Jefferson	Douglas
Population in thousands	572	535	285
County Rank by Population*	3	4	8
Employment in thousands	191	281	147
Employment per capita	0.51	0.53	0.52
Employment in Urban Centers (1,000s)	130	63	147
Percent Employment in Urban Centers	45%	22%	24%
Employment by Sector			
Production and Transportation	9%	8%	5%
Natural Resources and Construction	9%	9%	5%
Sales and Office	27%	26%	27%
Services	16%	14%	11%
Business, Science and Arts	39%	43%	52%
Total	100%	100%	100%
Education: Bachelor's degree or higher	38%	41%	55%
Education: High school diploma only	21%	22%	14%
Median household income	\$59,937	\$67,827	\$101,193
Poverty Rate	9%	6%	2%
Sales tax collections county rank*	2	4	8

* out of 64 Colorado counties Source: DRCOG, 2013b.

Proposed Action Economic Impacts:

Arapahoe, Douglas, and Jefferson Counties would have a temporary increase in construction employment and perhaps local purchases of construction materials. Post-tax worker income is subsequently spent on consumer purchases and thus has a multiplier effect in the local economy.

A recent national study indicated that 10.55 short-term jobs are created for each \$1 million in construction cost (NCHRP, 2012). Thus, about 2,400 short-term jobs would be created within the next several years as the interim phase of the project is built, and additional short-term construction jobs would be created in the future during completion of the Proposed Action.

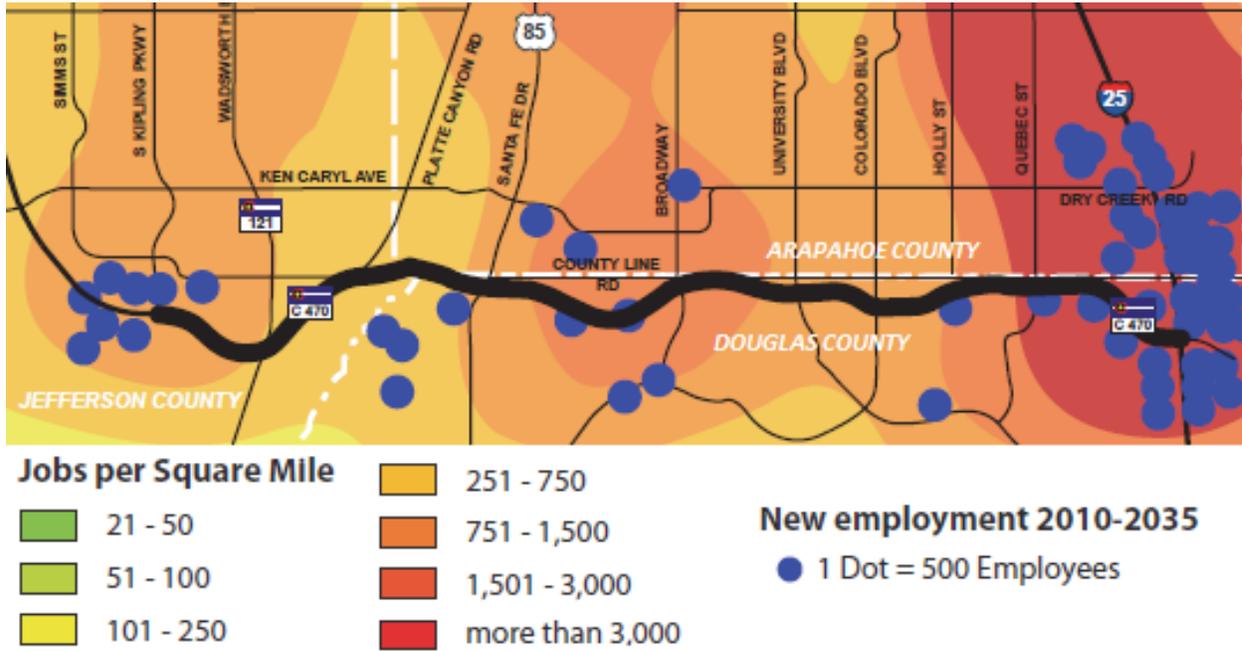
Tolls paid by express lane users represent money that could be spent or invested otherwise, if no tolls were charged. However, paid use of the express would typically occur because the motorist decided the expected time savings for the occupants of that vehicle were more valuable than the amount of the

toll being paid. The Proposed Action would give consumers the choice to purchase travel time savings that would be unavailable without the new lanes.

Once the borrowed construction costs of the Proposed Action are recovered from toll collection, tolls would continue to be collected. These revenues would be used to pay for operation and maintenance of the express lanes, and possibly to pay for future upgrades or expansion of the express lanes on C-470. No C-470 toll revenue would be transferred to other CDOT highways.

Public meeting attendees asked if C-470 toll collection would end once the construction bonds are paid off. The answer is no, CDOT anticipates that toll collection would continue. Toll collection is a mechanism for managing use of the new lanes to ensure they provide reliable trip times.

Figure 4-2
C-470 Corridor Employment Density and Projected Employment Growth



The Proposed Action would require acquisition of some adjacent land for additional ROW. Some of this land is privately owned, and some is owned by government jurisdictions and not subject to property tax. ROW acquisition would result in a minimal reduction to the tax base of local jurisdictions. About 35 acres would be acquired (including permanent easements) spread out over three counties that total 1.5 million acres. The needed land is mostly vacant. No buildings would be removed, and no business or residential relocations would be necessary. The need for roughly 15 acres of temporary easements has also been identified, as detailed in **Section 4.2.5, Right-of-Way**.

Mitigation for Proposed Action Economic Effects: No mitigation measures are anticipated for permanent effects. Temporary congestion effects from construction activities would be mitigated by maintaining access or providing a temporary or alternative access to area businesses during construction. Advance notice and signage for detours will be provided if necessary. In addition, roadway

construction would be conducted in such a way as to minimize travel delay.

4.2.4 Land Use

Land uses along C-470 generally consist of residential, recreational, commercial and office uses. Because much of the development along C-470 has occurred after or immediately before the highway was built, much of the development was planned to accommodate C-470, allowing open space buffers between the highway and residential or commercial structures.

Three counties and three cities have land use jurisdiction within project area. Additionally, Colorado Parks and Wildlife (operator) leases Chatfield State Park from USACE (owner). **Figure 4-3** indicates where these jurisdictions are found. **Table 4-5** indicates the current land use plans applicable in these jurisdictions.

Additionally, several quasi-governmental special improvement districts (e.g., Highlands

**Figure 4-3
Government Entities with Land Use Jurisdiction**



**Table 4-5
Current Land Use Plans**

Jurisdiction	Current Plan	Note
Jefferson County	Comprehensive Master Plan, 2013	C-470 is included in the South Plains Area of this plan.
USACE	Final Environmental Impact Statement (FEIS) for Chatfield Reservoir Storage Allocation, 2013	USACE plans to increase water storage at Chatfield Reservoir, resulting in relocation of various Chatfield State Park amenities.
City of Littleton	Citywide Plan, 2014	This is a section of the City of Littleton Comprehensive Plan.
Douglas County	Comprehensive Master Plan 2035	Adopted June 2014
City of Centennial	Comprehensive Plan	Adopted 2004
City of Lone Tree	Comprehensive Plan, 2007 –see note	Updated with 2010 Addendum

Ranch Metro District) own open space, parks and recreation facilities that might typically be owned by cities or counties elsewhere.

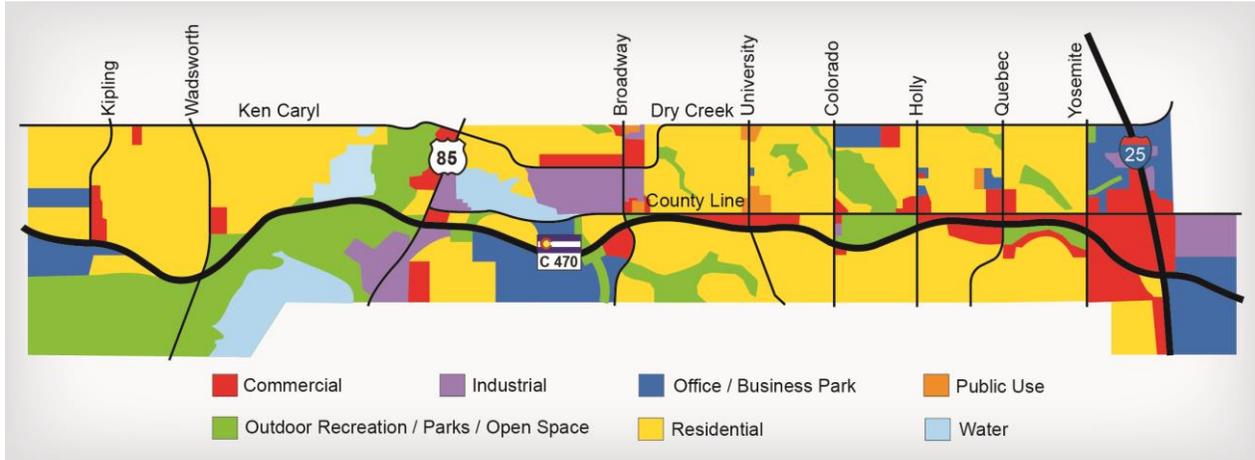
Land use descriptions are codified in local zoning laws and are within the purview of local jurisdictions within the C-470 project area. **Figure 4-4** illustrates general land uses along the corridor, characterized in categories such as residential, commercial, industrial, office, and recreation or open space. Several key concentrations of land uses shown in **Figure 4-4** include the following:

- The predominant land use in this suburban corridor is residential (yellow), sometimes offset from C-470 by other uses such as commercial.
- The office category (dark blue) is clustered near Kipling Parkway (west), south of C 470 near Lucent Boulevard (central), and along I-25 between C 470 and Lincoln Avenue (east).

- Major concentrations of park land and open space (light green) are found west of Santa Fe Drive, especially south of C-470. Recreation land typical surrounds water bodies (light blue).
- Commercial land (red) is concentrated near C 470 interchanges and along County Line Road north of C-470, including the Park Meadows regional shopping mall near I-25.
- Light industrial land (lavender) is found along Santa Fe Drive, south of C-470, near active north-south railroad lines.

The office space concentrations (dark blue) shown in **Figure 4-4** correspond to designated urban centers as identified in the DRCOG 2035 *Metro Vision Plan*, which provides the land use assumptions underlying the DRCOG 2035 *Metro Vision Regional Transportation Plan*. Collectively, the DRCOG member governments have established

Figure 4-4
Existing Land Uses along the C-470 Corridor



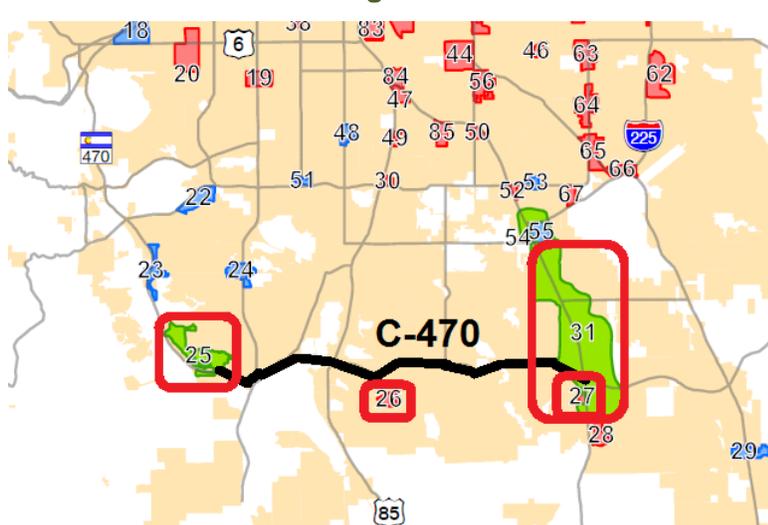
Urban Growth Boundaries to prevent sprawl and make more efficient and sustainable use of public infrastructure. One of the plan’s goals is to locate 50percent of new housing and 75 percent of new employment in urban centers. The location of Urban Centers along and near C-470 are shown in **Figure 4-5**.

Santa Fe Drive corridor north of C-470 in the City of Littleton is part of a specific redevelopment plan to increase mixed-use development and create stronger connections between land uses and the existing Southwest Corridor light rail service.

The DRCOG 2035 *Metro Vision Plan* recommends redevelopment of older areas to achieve increased development density, especially near light rail stations (transit-oriented development). For example, the

South of Chatfield State Park, the recently approved Sterling Ranch development is expected to add 12,000 homes in the next 25 years, and an adjacent development will add another 1,200 houses. Accessed primarily from Santa Fe Drive (US 85), this growth will

Figure 4-5
DRCOG-Designated Urban Centers



- Urban Centers near C-470**
- 25. C-470 Regional Corridor, 826 acres, west of the C-470 project area, with no light rail service.
 - 26. Highlands Ranch Town Center, 165 acres, immediately south of C-470, close to planned Lucent (light rail) Station on the Southwest Corridor.
 - 27. Lincoln Station Transit Oriented Development, 61 acres, south of C-470 along I-25, served by the Southeast Corridor.
 - 31. I-25 Regional Corridor, 5,956 acres, served by multiple light rail stations on the Southeast Corridor.

increase traffic on C-470, especially at the Santa Fe interchange, and also at the Wadsworth Boulevard interchange.

No-Action Alternative Impacts on Land Use:

The No-Action Alternative would not result in any ROW acquisition or change the access to and from C-470, it would not require a direct change in land use plans, zoning, or land use types within the project area.

Due to increased traffic congestion, the No-Action Alternative could shift projected development and population growth to areas outside of the project area. However, as traffic congestion on C-470 increases, local arterial congestion will also increase. For this reason, the No-Action Alternative could potentially reduce the viability of land for commercial or new home development compared to existing conditions. Indirectly, these factors may result in future modifications to land use or rezonings by local jurisdictions in accordance with market demand.

Proposed Action Impacts on Land Use:

The Proposed Action would occur largely within CDOT ROW and would require no changes in local agency zoning codes. The C-470 Proposed Action would not change any land use except for converting several acres of undeveloped land to highway ROW, mostly for water quality detention purposes. The Proposed Action is compatible with local land use plans, and those plans call for continued development that depends on maintaining adequate mobility.

Land use decisions are made by cities and counties. Local development plans change over time and can be influenced by better transportation access, water availability, economic conditions, and other factors. While some areas may eventually opt to have higher or lower densities or a slightly different mix of uses, the overall land use patterns surrounding C-470 are not expected to change as a result of the Proposed Action.

Mitigation for Proposed Action Land Use

Impacts: Due to lack of land use impacts, no mitigation would be needed.

4.2.5 Right-of-Way

Right-of-way (ROW) is the land on which a highway is constructed and includes ramps, medians, shoulders, drainage ditches, and adjacent land interests owned for highway-related purposes. All highway elements must be located within state-owned ROW or other property under easement or leased to the state. The existing C-470 ROW is generally 300 feet wide along the mainline and varies at interchanges to accommodate ramps.

USACE Easement: The entire C-470 ROW is owned by CDOT, except for the section from Wadsworth Boulevard to Santa Fe Drive. In this three-mile section, C-470 crosses property owned by the USACE under an easement granted to CDOT for the specific purpose of transportation use. The easement on USACE property is approximately 300 feet wide, totaling 124 acres. The easement requires USACE approval of all activity and any proposed changes.

Right-of-way needs for the Proposed Action are detailed in the *Right-of-Way Technical Report* that is provided in **Appendix E**. The results of the analysis are summarized below.

No-Action Alternative Impacts on Right-of-Way:

The No-Action Alternative would require no ROW acquisitions or modifications to USACE easement.

Proposed Action Impacts on Right-of-Way:

The Proposed Action would have right-of-way impacts affecting 35 adjacent land parcels, as indicated in **Figure 4-6** and **Table 4-6**. Of these, 23 are privately owned. CDOT would acquire six parcels totaling 3.48 acres as new right-of-way, including two total acquisitions and four partial acquisitions. These are the only two total acquisitions needed, and since both are vacant parcels, no business or residential relocations would be needed.

**Figure 4-6
Location of Right-of-Way Impacts**



Table 4-6
Right-of-Way Impacts of the Proposed Action
 (Listed from west to east across the project area)

Map ID	Current Land Use	Size of Total Parcel (acres)	Size of Parcel Impact (acres)			Percent of Parcel	For Water Qual.
			Acquisition	Easement			
				Permanent	Temporary		
1	vacant	18.05	0.74			4%	0.74
2*	vacant	1.33		1.33		100%	1.33
3	vacant	13.96		12.88		92%	12.88
4	vacant	7.77		7.77		100%	7.77
5	commercial	13.48		0.76		6%	
6	vacant	3.47		3.47		100%	3.47
7	vacant	2.90		0.24		8%	
8	vacant	18.32			5.88	32%	5.88
9	vacant	3.26		2.22		68%	
10	vacant	26.51		1.06		4%	
11	vacant	13.82			9.78	58%	
12	park land**	3.31			0.18	5%	
13	commercial	0.55			0.03	5%	
14	commercial	1.73			0.05	3%	
15	commercial	1.90			0.08	4%	
16	commercial	1.40			0.04	3%	
17	apartments	36.15			0.39	1%	
18	soccer field**	1.95			0.12	6%	
19	vacant	1.51	0.08			5%	
20	vacant	1.64	0.09			5%	
21	commercial	4.09			0.03	1%	
22	commercial	3.63			0.05	1%	
23	commercial	2.96			0.08	3%	
24	commercial	2.48			0.02	1%	
25	commercial	14.78		0.10		1%	
26	vacant (2)	8.89		1.48	0.18	19%	
27	vacant	9.58	0.04			<1%	
28	C-470 ramp	2.18	2.18			100%	
29	C-470 ramp	0.35	0.35			100%	
30	commercial	1.51		0.11		7%	
31	detention pond	3.00			0.13	4%	
32	vacant (2)	0.86			0.10	12%	
33	commercial	12.54			0.07	1%	
34	commercial	14.20			0.01	<1%	
35	commercial	12.03		0.13		1%	
TOTAL ACRES			3.48	31.42	15.42		32.07
PARCELS AFFECTED			6	12	18		
NUMBER OF IMPACTS			6	13	20		

* Shaded rows indicate parcels owned by governmental or quasi-governmental entities.

** The "soccer field" temporary easement is vacant land located away from the soccer field and not used for any recreational purpose. All impacts to commercial properties affect unused land adjacent to C-470 ROW, not developed portions of those parcels. No relocation would be needed for any residence, business or other developed land use.

The Proposed Action would result in acquisition of 13 permanent easements from 12 other parcels. These easements total 31.42 acres.

Additionally, an estimated 20 temporary easements totaling 15.42 acres would be

needed. Temporary easements are acquired where access is needed to an owner's property only during construction, sometimes for utility relocation. Typically, permanent physical modifications such as grade changes are not allowed within temporary easement areas.

As noted earlier, the existing C-470 ROW is generally 300 feet wide along the mainline and is wider at interchanges to accommodate ramps. About two-thirds of the ROW impacts of the Proposed Action arise from the need to provide comprehensive stormwater management and detention for highway runoff. This is a requirement today that was not in effect when C-470 opened in 1990.

During the concept design process, efforts were made to avoid and minimize the need for ROW acquisition. This was accomplished by investigating the optimal horizontal and vertical alignment, and by incorporating retaining walls and other features that would limit the required ROW width.

Some of the ROW needed for the Proposed Action is private property that has not been entered for inspection or appraisal. A well database search performed in 2015 indicates that a number of wells exist throughout the formerly agricultural C-470 corridor. Any well(s) found on needed ROW would be taken into account in determining the value of the property.

CDOT will continue to work with affected property owners through final design to further avoid and minimize the need for ROW acquisition.

Proposed Action ROW Impact Mitigation: Property owners would be compensated for the value of the land acquired through the ROW acquisition process, in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

All impacted owners will be notified of CDOT's intent to acquire an interest in their property. Each will receive a written offer letter of just compensation specifically describing those property interests. A CDOT ROW specialist will be assigned to each property owner to provide assistance with this process.

If any property is altered within a temporary easement during construction, CDOT will

restore the property condition or (more typically) compensate the owner for the damage.

4.2.6 Parks and Recreation

Existing parks and recreation facilities in the C-470 project area include state and local parks, trails, a community swimming pool, and golf courses. There are also open space properties within the project area that are not actively used for public recreation.

Recreational resources within and adjacent to the project area are mapped in **Figure 4-7**.

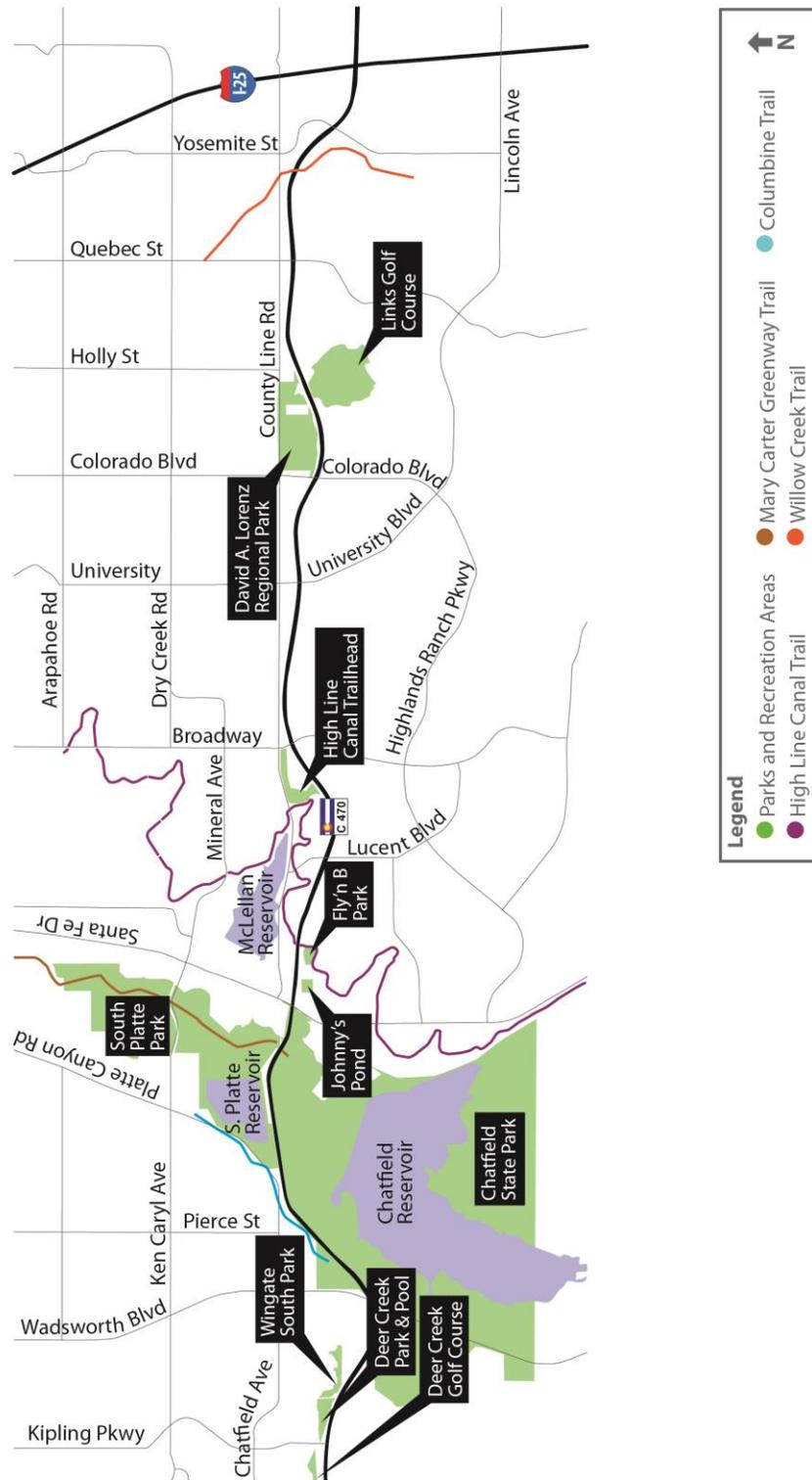
The preeminent recreational resource along C-470 is Chatfield State Park, which includes Chatfield Reservoir. This park attracts 1.6 million visits annually from the Denver metro area and beyond. Encompassing over 5,300 acres, it is by far the largest park in the project area, with boating, fishing, camping, hiking, biking, bird watching and many other activity choices. At the park's northern end, near C-470, is a very popular off-leash dog area that attracts a half million annual visits.

Colorado Parks and Wildlife (CPW) leases the Chatfield property from the U.S. Army Corps of Engineers, which operates the Chatfield Dam for water storage and flood control along the South Platte River.

Across C-470, north of Chatfield State Park, is the regional South Platte Park operated by the South Suburban Parks and Recreation District (SSPRD), offering several small lakes with fishing and bird-watching opportunities. This 880-acre park is just under one fifth the size of its enormous neighbor to the south. The newest lake in this park, South Platte Reservoir, was converted from a gravel pit in 2006. It is used for water supply and not available for active recreation. Within the park, land to the east of the South Platte River is a wildlife viewing area that includes an unpaved East Trail that ends at the north side of C-470.

SSPRD's Mary Carter Greenway Trail connects Chatfield State Park and South Platte Park by crossing under C-470 on the

Figure 4-7
Location of Park and Recreation Resources



west bank of the South Platte River. This is a regional trail, continuing for miles northward. It is estimated that this trail connection under C-470 was used 115,710 times in 2007, an average of 317 users per day (USACE, 2014).

SSPRD's David A. Lorenz Regional Park offers a number of athletic fields looking down over C-470. At its eastern end, east of Big Dry Creek, the park's minimally developed land is used as a disc golf course, with several holes located very close to C-470.

Fly'n B Park and the nearby Johnny's Pond are two new local parks located just south of C-470 between Santa Fe Drive and the Erickson Drive underpass of C-470. These are operated by the Highlands Ranch Metropolitan District (HRMD).

Several schools located adjacent to the south side of C-470 have their own athletic fields (e.g., baseball and soccer) that are not available for public use and are not considered public recreation areas.

Each of the two privately owned golf courses along C-470 has one or more holes located within 100 feet from the freeway.

CDOT's 26-mile paved C-470 Trail (also called the Centennial Trail) is discussed in **Chapter 3, Transportation Resources**. It is not considered a recreational trail, although some recreational use does take place. Non-motorized C-470 Corridor trips may be made safely on this trail rather than the freeway's shoulder. Similarly, on-street bike lanes and sidewalks along the arterial streets that cross C-470 are considered facilities for non-motorized transportation, not recreational facilities.

The Foothills Park and Recreation District (FHPRD) Columbine Trail does not cross C-470 but is near it on the north side between Massey Draw and Platte Canyon Road

Most recreational trails in the project area provide access to the C-470 Trail for

connectivity purposes. A short portion of the C-470 Trail also serves as part of the High Line Canal Trail. The combined trail that crosses under C-470 is maintained by HRMD.

The easternmost recreational resource along the corridor is the Willow Creek Trail, which crosses through a culvert under C-470 west of Yosemite Street. This trail is maintained by SSPRD. It is not part of the C-470 Trail.

No-Action Alternative Impacts on Parks and Recreational Areas: The No-Action Alternative would have no direct effects to recreational resources within the project area. Vehicular access to and from the corridor's recreation resources could become more difficult as a result of increased delay from congested conditions on C-470.

Proposed Action Impacts on Parks and Recreational Areas: **Table 4-7** indicates how the various recreational resources along the C-470 Corridor would be affected by the Proposed Action. The impacts of the Proposed Action would be temporary closures and detours for several trails.

Temporary closure of the Mary Carter Greenway Trail –This crossing under C-470 must be closed when the existing bridges are demolished and removed, and when new bridges are constructed overhead. The trail itself will be reconstructed as shown in **Figure 4-8**, improving vertical clearance and sight distance for trail users.

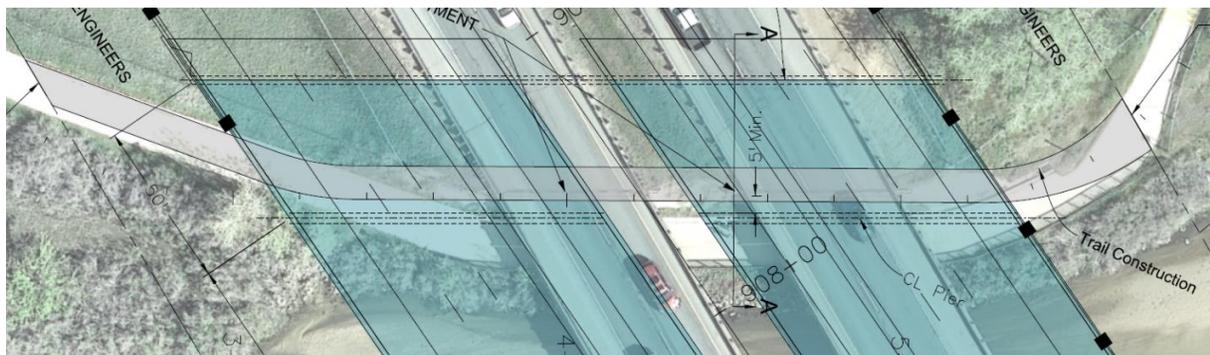
Due to the extensive work needed at this location, closures of this trail are likely to be longer in duration than the closures of the other two trails discussed below. Trail users would be inconvenienced by having to use a detour route during the closure.

Temporary closure of the High Line Canal Trail - The High Line Canal Trail crosses under C-470 in a concrete box culvert that will be lengthened to accommodate additional C-470 lanes. For the safety of trail users, temporary trail closures would occur during culvert extension. Trail users would be

**Table 4-7
Proposed Action Impacts to Park and Recreation Resources**

Facility	Operator	Direct Impact of Proposed Action (other than noise or visual)
Deer Creek Golf Club	Private firm	None
Deer Creek Park and Pool	FHPRD	None
Wingate South Park	FHPRD	None
Chatfield State Park	Colorado Parks and Wildlife	None
Columbine Trail	FHPRD	None
South Platte Park	SSPRD	None
Mary Carter Greenway Trail	SSPRD	Temporary closure and detour during trail reconstruction and bridge replacement
East Trail/ South Platte Park	SSPRD	During construction, fencing may be installed to keep users of this dead-end trail from continuing southward onto CDOT's easement from USACE. There will be no impact to the park itself.
Johnny's Pond	HRMD	None
Fly'n B Park	HRMD	None
Mission Viejo Buffer/High Line Canal Trailhead	SSPRD	None
High Line Canal Trail	HRMD	Temporary closure and detour during culvert widening
David A. Lorenz Regional Park	SSPRD	None
The Links Golf Course	Private firm	None
Willow Creek Trail	SSPRD	Temporary closure and detour during culvert widening

**Figure 4-8
Existing and Proposed Alignment of Mary Carter Greenway Trail under C-470**



inconvenienced by having to use a detour route during the closure.

Temporary closure of Willow Creek Trail -

The Willow Creek Trail crosses under C-470 in a concrete box culvert that will be lengthened to accommodate additional C-470 lanes. For the safety of trail users, temporary trail closures would occur during culvert extension. Trail users would be inconvenienced by having to use a detour route during the closure.

Detour routes have not been finalized, pending further coordination with trail agencies, but for each trail closure a potential detour has been identified. These are discussed in **Section 4.5, Section 4(f)** Impacts. One of the three potential detour routes is shown here as an example, in **Figure 4-9**.

The Proposed Action would increase traffic noise levels for all recreational facilities adjacent to C-470, and result in increased

visual intrusion for some facilities. Noise impacts are discussed In **Section 4.3.1** of this Revised EA.

Many park and recreation facilities are located close to C-470. The addition of Express Lanes, auxiliary lanes in some locations, and new structures for signage and toll collection would make the highway more visually apparent from these facilities.

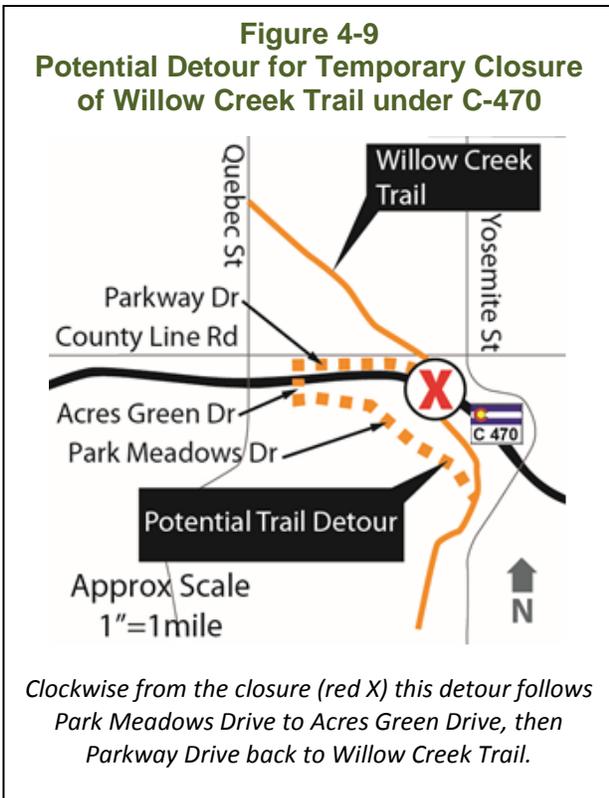
Mitigation for Proposed Action Impacts to Parks and Recreation Areas: CDOT will continue to work closely with the owners of any affected trails, as well as with bicycle groups and other interested parties to minimize any disruption of trail systems due to the Proposed Action. Feasible detour routes for the three trails facing temporary closures have been identified. CDOT will provide detour signage indicating not only the temporary routes but the approximate duration of the detour timeframe. CDOT will provide a minimum two-week advance notice to SSPRD and HRMD prior to any temporary trail closure.

The contractor will also be required to obtain SSPRD’s schedule of major bicycle events scheduled for the Mary Carter Greenway Trail, with the goal of minimizing any construction conflicts with planned major events.

4.2.7 Land and Water Conservation Fund Assisted Properties

Pursuant to Section 6(f) of the Land and Water Conservation Fund Act (LWCF) Act (Public Law 88-578, as amended), property purchased or improved with LWCF grant funds must remain in “continuing recreation use”. If some portion of LWCF-protected property is acquired for other use, replacement property of equivalent or greater value must be provided in compensation.

In Colorado, the U.S. Department of the Interior (National Parks Service) administers the LWCF grant program through CPW.



The Colorado LWCF grants database was reviewed and two assisted properties within the C-470 project area were identified:

- South Platte Park
- Chatfield State Park

No land from any of these Section 6(f) resources would be needed for the No-Action Alternative or the Proposed Action. Thus, there would be no Section 6(f) impacts and no mitigation is necessary.

4.3 PHYSICAL ENVIRONMENT

The physical environment of the C-470 project area includes the non-living features of the environment that can be affected by transportation projects. Effects to the physical environment evaluated in this Revised EA include:

- 4.3.1 Highway noise
- 4.3.2 Air quality
- 4.3.3 Greenhouse gases
- 4.3.4 Water quality
- 4.3.5 Hydrology and hydraulics
- 4.3.6 Floodplains
- 4.3.7 Historic resources
- 4.3.8 Archaeological resources
- 4.3.9 Native American consultation
- 4.3.10 Paleontological resources
- 4.3.11 Geology and soils
- 4.3.12 Hazardous materials
- 4.3.13 Visual character
- 4.3.14 Utilities

4.3.1 Highway Noise

This discussion about highway noise reviews key points and findings from the more detailed *Traffic Noise Technical Report* that is included in **Appendix E**.

The C-470 Proposed Action would use FHWA funding and thus is subject to the requirements contained in Part 772 of Title 23 of the Code of Federal Regulations (23 CFR 772). These regulations describe the methods that must be followed in the evaluation and

abatement of traffic noise in Federal-aid and Federal action highway projects.

Federal regulations require each state highway agency to prepare and adopt written guidelines specific to that state which must demonstrate compliance with 23 CFR 772. CDOT's Noise Analysis and Abatement Guidelines dated January 15, 2015 describe CDOT policy and program to implement 23 CFR 772. These guidelines specify impact criteria, design and cost requirements for noise mitigation (CDOT, 2015).

Noise Basics: Noise levels are measured in decibels (dB). For most highway noise analyses, the measured levels are filtered such that they more accurately represent what the human ear hears. This process is known as A-weighting. A-weighted decibels are abbreviated dB(A).

A change of 3 dB(A) in traffic noise levels is barely noticeable. A 5 dB(A) change is typically always noticed, and if a 10 dB(A) change occurs, most perceive the noise to be doubled (or cut in half).

The main components of highway traffic noise are due to vehicle engines, vehicle exhaust, and tire/pavement interaction. Engine braking by heavy trucks can also be a noise contributor, but is not included in the noise model. Trucks and motorcycles are typically much louder than automobiles.

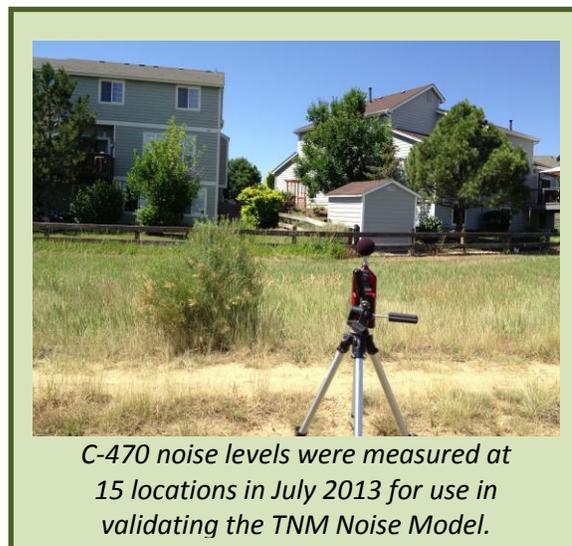
How highway noise affects a nearby residence or other receptor depends on the distance and the path the noise must travel. If terrain or some type of solid barrier blocks the direct noise path to the receptor, this level is generally reduced by at least 5 dB(A). Receptors that are outside of the study zone of 500 feet around the extents of work for the individual project are generally not considered for analysis, unless there is a reasonable expectation that noise impacts would extend beyond that boundary.

Travel speeds affect noise levels. Traffic volumes on C-470 currently exceed highway capacity during the morning and evening rush hours, which reduces travel speeds and therefore reduces noise levels. Traffic noise is loudest when heavy amounts of traffic travel at relatively high speeds. These conditions typically occur just before and after periods of congestion, not during peak traffic hours.

Noise-sensitive land uses are identified as receptor types. CDOT defines the noise impacts for all types of receptors in its Noise Analysis and Abatement Guidelines. A key threshold for residential noise impact analysis is 66 dB(A). This is comparable to the sound of two people six feet away from each other holding a normal conversation. Noise levels at this level or above would interfere with such a conversation. Traffic noise levels of 66 dB(A) or more at an active outdoor use area such as a residential back yard or a public park would constitute a noise impact. The place affected by that impact is called a noise receptor. The impact criterion for outdoor activity areas at a business (e.g., outdoor seating at a restaurant) is 71 dB(A).

Receptors with noise that would exceed CDOT's Noise Abatement Criteria are analyzed to determine whether or not mitigation would be both feasible and reasonable. Noise mitigation is provided only if it would meet all of these criteria and a majority of the benefitted property owners desire it.

Existing Noise Levels: Consistent with CDOT noise analysis guidelines, sampling of C-470 noise levels was conducted at 15 locations in July 2013. These measurements were taken at different distances from the roadway, at different times of day. They were not intended to monitor worst-hour noise hours, but locations were selected to include likely impacted receptor areas. The purpose of the noise monitoring was to generate enough data to calibrate and validate a noise model that would predict corridor-wide noise levels within FHWA-required levels of modeling accuracy.



While noise levels were being collected, C-470 traffic was counted, consistent with CDOT noise analysis guidelines. Vehicles were classified as heavy trucks, medium trucks, light-duty vehicles, buses, recreational vehicles or motorcycles, since the model has different noise emission factors for each of these vehicle types.

C-470 Noise Modeling: A computer model of noise conditions along C-470 was developed using the TNM noise modeling software, version 2.5, as required by FHWA regulations. Consistent with CDOT noise analysis guidelines, this model was run to yield theoretical loudest-hour noise levels for the existing roadway configuration, assuming the maximum possible vehicles that can travel at free-flow speeds.

The current roadway configuration would be unchanged under the No-Action Alternative, so the predicted theoretical loudest-hour noise levels would be the same for both cases. The model was used in the same way to predict theoretical loudest-hour noise for the Proposed Action Alternative, with more lanes full of vehicles at free-flow speeds.

Consideration of Potential Noise Mitigation: By CDOT policy, no noise mitigation is provided in the No-Action Alternative.

Mitigation by CDOT can be provided only in conjunction with a construction project.

To be funded by FHWA or CDOT, a proposed noise mitigation measure must first be found to be both feasible and reasonable. Feasibility issues include:

- Can a 5dB(A) noise reduction be achieved by constructing a noise barrier or berm?
- Are there any fatal flaw drainage, terrain, safety, or maintenance issues involving the proposed noise barrier or berm?
- Can a barrier less than 20 feet tall provide effective noise reduction?

Reasonableness issues include:

- Has the design goal of 7 dB(A) noise reduction for abatement measure been met for at least one impacted receptor?
- Is the Cost Benefit Index below \$6,800 per receptor per dB(A)?
- Are more than 50 percent of benefitted resident/owners in favor of the recommended noise abatement measure?

The most common way to mitigate highway noise is to use noise walls or earthen berms. Alternative mitigation measures include shifting the highway (vertical and horizontal), restricting trucks, reducing speed limits, or acquiring buffer lands. The alternative strategies are not considered practical for this project.

No-Action Alternative Noise Impacts:

Increased congestion by 2035 could lengthen the duration of the peak period, shifting the loudest traffic hours to new times of the day, compared with current conditions. Fourteen residential areas along the corridor would have one or more impacted receptors, and the total number of impacted receptors would be 235 residences, as indicated in **Table 4-7**.

Proposed Action Noise Impacts: Noise levels from C-470 would increase with the Proposed Action due to changes in traffic volume and speed, and also due to widening that will add traffic on new pavement located closer to nearby receptors. **Table 4-8** indicates that 469 residences in 16 residential areas would experience loudest-hour noise levels of 66 dB(A) or more.

Noise impact findings and abatement determinations are presented in **Table 4-9**.

**Table 4-8
Predicted Loudest-Hour Noise Levels
Affecting Residences**

Neighborhood	Receptors with 66.0 dB(A) or more	
	No-Action	Proposed Action
Redstone Ranch	0	0
Chatfield Bluffs	8	24
Meadowbrook	4	13
Chatfield Ave.	2	14
Columbine Hills	4	10
Wolhurst	0*	0
Littleton Commons	19	27
Villas at Verona	49	59
Bluffs Apartments	19	28
Township at Highlands Ranch	0	12
Highlands Ranch Dad Clark, west	7	17
Highlands Ranch, Dad Clark, east	1	27
Highlands Ranch, Venneford Ranch	3	6
Three Complexes	70	100
Shadow Canyon	32	41
Gleneagles Village	0	7
Palomino Park	4	8
Crest	13	76
Totals	235	469

**Table 4-9
Results of Noise Impact and Abatement Analysis**

Location	Exceeds Noise Criterion		Potential Mitigation		
	No-Action	Proposed Action	Feasible	Reasonable	Recommended
RESIDENTIAL AREAS (west to east) – for locations, see Figure 4-10					
Redstone Ranch	No	No	n/a	n/a	No
Chatfield Bluffs	Yes	Yes	Yes	No	No
Meadowbrook	Yes	Yes	Yes	No	No
Chatfield Avenue	Yes	Yes	Yes	Yes	YES
Columbine Hills	Yes	Yes	Yes	No	No
Wolhurst	No	No	n/a	n/a	REPLACE
Littleton Commons	Yes	Yes	Yes	Yes	YES
Villas at Verona	Yes	Yes	Yes	Yes	YES
Bluffs Apartments	Yes	Yes	Yes	Yes	YES
Township at Highlands Ranch	No	Yes	No	n/a	No
Highlands Ranch Dad Clark	Yes	Yes	Yes	No	No
Highlands Ranch, Venneford Ranch	Yes	Yes	Yes	No	No
Three Complexes* (listed below)	Yes	Yes	Yes	Yes	YES
Shadow Canyon	Yes	Yes	Yes	Yes	YES
Gleneagles Village	No	Yes	Yes	No	No
Palomino Park	Yes	Yes	Yes	No	No
Crest	Yes	Yes	Yes	Yes	YES
PARKS AND RECREATION AREAS – for locations, see Figure 4-7					
Deer Creek Golf Club*	Yes	Yes	Yes	No	No
Deer Creek Park and Pool	Yes	Yes	Yes	No	No
Wingate South Park	No	No	n/a	n/a	No
Columbine Trail	Yes	Yes	Yes	No	No
Chatfield State Park, C-470 Trail	No	Yes	Yes	No	No
S. Platte Park, MC Greenway Trail	Yes	Yes	Yes	No	No
Johnny's Pond*	Yes	Yes	No	n/a	No
Fly'n B Park	No	No	n/a	n/a	No
High Line Canal Trail	Yes	No**	n/a	n/a	No
Mission Viejo Open Space	No	No	n/a	n/a	No
D. Lorenz Regional Park fields	Yes	Yes	No	n/a	No
D. Lorenz Regional Park disc golf	Yes	Yes	Yes	No	No
The Links Golf Course	Yes	Yes	Yes	No	No
Athletic fields – HR Christian School	Yes	Yes	Yes	No	No
Athletic field – Skyview Charter Ac.	Yes	Yes	Yes	No	No
Willow Creek Trail	Yes	Yes	No	n/a	No
HISTORIC RESOURCES – for locations, see Figure 4-13					
Hildebrand Ranch Historic District	No	No	n/a	n/a	No
Selzell Ditch	No	No	n/a	n/a	No
City Ditch	Yes	Yes	No frequent human use		No
Littleton Large Animal Clinic/Barn	No	No	n/a	n/a	No
Denver & Rio Grande Railroad	Yes	Yes	No frequent human use		No
ATSF Railroad	Yes	Yes	No frequent human use		No
High Line Canal	Yes	Yes	No frequent human use		No
COMMERCIAL OUTDOOR AREAS – for locations, See Appendix D					
On the Border, LODO, and Brothers	No	Yes	Yes	No	No

* Autumn Chase, Copper Canyon and Copper Ranch apartments

** Proposed Action changes roadway and blocks noise to receptor

Please see additional information regarding abatement analysis in **Appendix D**, which provides a short summary of the mitigation analysis. As noted at the outset of this section, the full *Traffic Noise Technical Report* is included in **Appendix E**.

In **Table 4-9**, the Chatfield State Park modeled receptor was along the C-470 Trail, north of the South Platte River. The C-470 Trail is located between C-470 and many of the residential resources shown in the table, and thus would typically have higher noise levels than the receptors listed in the table.

Many portions of the C-470 Trail are located adjacent to the freeway, so there is no expectation of quiet conditions there. Much of the trail is subjected to noise impacts today (i.e., 66 decibels or more) and these noise levels are expected to increase with the Proposed Action.

Several bar-and-grill restaurants located near the C-470/Quebec Street interchange have outdoor seating areas where traffic noise would exceed the commercial business threshold (Noise Abatement Criteria Category E) of 71 decibels with implementation of the Proposed Action.

Recommended noise mitigation locations are listed in **Table 4-10** and shown in **Figure 4-10**. New noise mitigation is recommended at seven residential locations. One of these recommended noise barriers would benefit three adjacent apartment communities.

It was seen in **Table 4-8** that no residences in the Wolhurst community would be impacted by noise with the Proposed Action. That is because a pair of overlapping CDOT noise barriers totaling approximately 1,675 linear feet currently exist adjacent to Wolhurst, providing noise reduction. Due to the design of westbound on-ramp for the C-470/Santa Fe Drive interchange, it will be necessary to remove the existing noise barriers and construct a replacement wall closer to the residences. Preliminary noise modeling indicates that a single, continuous wall approximately 1,500 feet long and 15.5 feet tall would be needed to replace the existing pair of overlapping walls at Wolhurst.

Current mitigation recommendations are based on preliminary analysis. For example, no utility conflicts were investigated as part of this analysis. This noise mitigation analysis will be revisited during final design when more information is available, to verify that the current recommendations would still be valid.

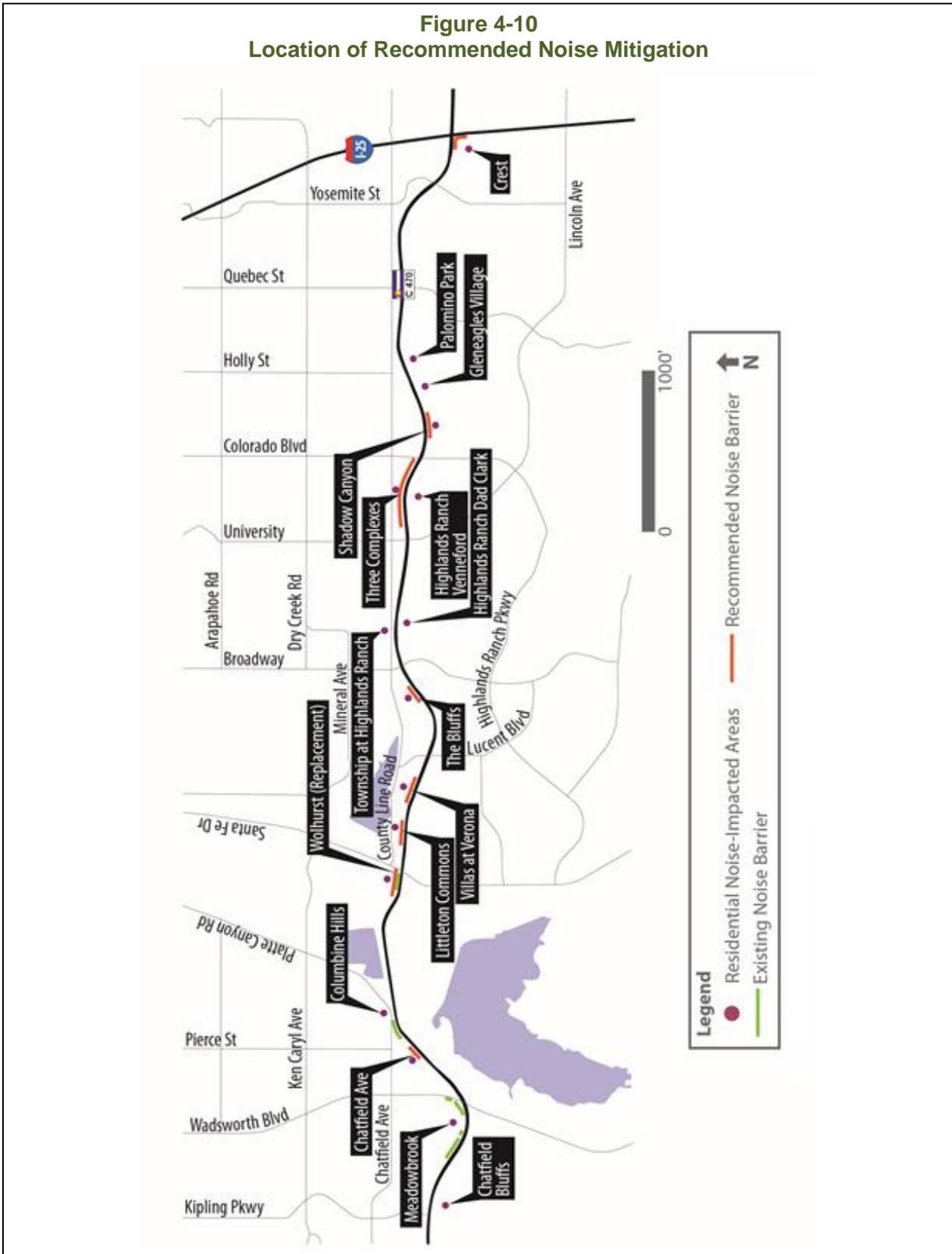
Table 4-10
Recommended Noise Mitigation

Neighborhood	Approximate Wall Height (feet)	Approximate Wall Length (feet)	Approximate Cost (millions)	Number of Benefitted Receivers
Chatfield Ave.	13.5	900	\$0.5	14
Wolhurst	15.5	1,500	\$1.0	n/a*
Littleton Commons	7	2,200	\$0.7	36
Villas at Verona	18.5	2,720	\$1.4	74
Bluffs Apartments	17.7	1,200	\$1.0	28
Three Complexes**	Wall #1: 15.7 Wall #2: 8	Wall #1: 4,300 Wall #2: 390	\$3.2	87
Shadow Canyon	18.7	1,700	\$1.4	39
Crest	18.2	2,300	\$1.9	82
Total for new walls	N/A	17,210	\$11.1 million	360 households

* New Wall at Wolhurst would replace existing wall, not newly benefitting additional receptors

** Autumn Chase, Copper Canyon, and Canyon Ranch

Figure 4-10
Location of Recommended Noise Mitigation



All noise mitigation recommendations noted in **Table 4-10** will be reviewed during final design to ensure their constructability. All proposed wall heights shown are the maximum height of the potential wall. Actual constructed heights will depend on re-analysis during final design and input to be solicited from benefitted property owners and residents. In final design, the actual lengths and locations of the recommended mitigation may vary for reasons such as terrain, utilities, property owner desires or easements.

The benefitted receptor preference survey process is detailed in the *2015 CDOT Noise Analysis and Abatement Guidelines*, which are an attachment to the *Traffic Noise Technical Report* for this Revised EA (See **Appendix E**). Once final design of the project and the re-evaluated abatement analyses are completed, a public involvement process shall be utilized to solicit the views of current residential occupants and property owners on whether to build noise abatement or not.

Temporary Construction-Related Noise and Vibration: The use of heavy equipment operation and earth moving machinery during construction of the Proposed Action would create noise and vibration. Accordingly, CDOT will require its design-build contractor to prepare a mitigation plan addressing noise and vibration. The plan shall consider options including but not limited to the following:

- If practicable, construct noise barriers in early construction phases, so the barriers block construction noise
- Avoid weekend work, with the exception of activities best suited for off-peak hours
- Combine noisy operations to occur in the same time period
- Use noise blankets or other muffling devices on equipment and quiet-use generators
- Use well-maintained equipment, especially with respect to mufflers
- Use alternative construction methods, such as sonic or vibratory pile driving, in sensitive areas

4.3.2 Air Quality

Federal transportation and air quality conformity regulations were developed during the 1990s to ensure that transportation plans, programs, and projects would not jeopardize attainment of National Ambient Air Quality Standards (NAAQS). Conformity requirements apply to transportation plans and programs that are developed by Metropolitan Planning Organizations (MPO) and also to regionally significant transportation projects, regardless of funding source. The designated MPO for the Denver metro area is DRCOG.

As part of this Revised EA, air quality analysis was performed to determine the differences between the air quality effects of the alternatives under consideration, and to determine whether or not localized hotspot concentrations at worst-case intersections would be likely to cause or contribute to a violation of a standard. For more detailed information, please see the *Air Quality Technical Report* in **Appendix E**. That report includes a letter of concurrence regarding CDOT's air quality analysis methodology from the Air Pollution Control Division (APCD) of the Colorado Department of Public Health and Environment.

Current Regional Air Quality Status and Outlook: C-470 is within the Denver Metropolitan Air Quality Control Region. This airshed includes the entire City and County of Denver, those portions of Adams and Arapahoe Counties west of Kiowa Creek, Douglas and Jefferson Counties, and all of Boulder County except Rocky Mountain National Park.

The region has had ongoing violations of the national standard for ozone pollution, but no violations for other pollutants for approximately two decades. Colorado's 2008 8-Hour Ozone Attainment plan was deemed adequate for conformity budget purposes by EPA effective March 2010. The 2005 CO Maintenance Plan was approved by EPA effective October 2007, and the 2005 PM₁₀

Maintenance Plan was approved by EPA effective January 2008.

The prospects for continued maintenance of air quality standards (except for ozone) and continued emission reductions are good. In February 2015, DRCOG adopted its *Metro Vision 2040 Regional Transportation Plan*. DRCOG's analysis demonstrated that emissions from on-road motor vehicles will remain within the applicable conformity budgets through 2040 even as the region's population grows by 1.2 million residents and daily vehicle miles increase by 37 million (35 percent) between 2015 and 2040.

The DRCOG 2016-2021 Transportation Improvement Program (TIP), the 2040 RTP, and their respective conformity analyses include the Proposed Action. The TIP includes \$100 million in RAMP funding as part of the \$269 million needed to build the Interim configuration. CDOT will borrow funds as needed through the sale of bonds that will be repaid using toll revenues. The RTP includes additional funding for completion of the Ultimate configuration (i.e. the Proposed Action).

In November 2014, the EPA formally proposed a tightening of the national ozone standard (EPA, 2014). A Final Rule could be promulgated in 2015. Since the Denver region does not meet the current standard, a tougher standard would likely require addition of further control strategies in Colorado's air quality State Implementation Plan.

Mobile Source Air Toxics: In addition to the pollutants discussed above, for which national ambient air quality standards (NAAQS) have been established, EPA also identifies some mobile source pollutants for which NAAQS have not been established. These include various mobile source air toxics (MSATs), discussed below.

MSATs are compounds emitted from highway vehicles and non-road equipment which are

known or suspected to cause cancer or other serious health and environmental effects. Mobile sources are responsible for direct emissions of air toxics and contribute to precursor emissions which react to form secondary pollutants. Examples of mobile source air toxics include benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, polycyclic organic matter (POM), and diesel particulate matter.

Quantitative assessment of MSAT emissions is normally required for capacity improvements on roadways expected to carry 140,000 vehicles per day or more. The busiest portions of C-470 would carry this amount of traffic by 2035 if the Proposed Action is built. Therefore, MSAT emissions were calculated for this project.

Carbon Monoxide Hotspot Analysis:

Microscale or "hotspot" analysis is conducted to determine whether or not a project is likely to cause or contribute to a localized exceedance of the national air quality standards for CO. For the Revised EA, hotspot analysis was conducted for the most congested signalized intersection at a C-470 interchange ramp of at the next closest signalized intersection. This was the Quebec Street/County Line Road intersection, which was also modeled in the 2006 EA (and met all air quality requirements in that analysis).

The 2015 CO hotspot analysis was conducted using worst-case (2035) traffic volumes and worst-case (2015) CO emission rates. If there would be no CO hotspot violation at this most congested intersection using these rigorous assumptions, then there would be little probability of any violation elsewhere in the project area under actual future conditions. This approach was approved by APCD for this project.

The results of the microscale CO analysis, presented in **Table 4-11**, suggest that no localized CO violation would be expected in the project area over the next two decades

Table 4-11
Predicted Worst Case CO Concentrations*(parts per million)

	8-hour average		1-hour average	
	No-Action Alternative	Proposed Action	No-Action Alternative	Proposed Action
Background Concentration	0.7	0.7	2.1	2.1
Total Concentration	4.1	4.5	8.0	8.8
National standard	9.0	9.0	35.0	35.0
Meets the standard	Yes	Yes	Yes	Yes

* Worst-case future (2035) traffic with worst-case 2015 emission rates at the corridor's most congested, signalized intersection. Actual future concentrations would be lower.

with either the No-Action Alternative or the Proposed Action. The predicted worst-case 1-hour average concentrations (8.0 ppm for No-Action, 8.8 ppm for Proposed Action) are well below the NAAQS of 35.0 ppm, and the corresponding predictions (4.1 ppm, 4.5 ppm) are well below the 8-hour average NAAQS of 9.0 ppm. Thus, worst-case analysis shows that concentrations would be below the NAAQS, are not expected to cause or contribute to violations of the CO NAAQS in the project corridor, and are not expected to interfere with the region's CO Maintenance Plan or its goals. Accordingly, no mitigation is required for CO.

Consideration of PM₁₀ Hotspot Modeling:

Federal air quality conformity requirements call for microscale modeling of PM₁₀ concentrations in cases where a high number of diesel vehicles are likely to be operating in a given location, such as at bus terminals or intermodal transfer facilities with large numbers of diesel trucks, or locations where there would be a significant increase in diesel vehicles.

Conditions that would require PM₁₀ hotspot modeling are not present along the C-470 Corridor. C-470 carries no RTD transit buses, has no DRCOG-identified intermodal transfer facilities and no truck stops. C-470 has essentially the lowest heavy truck percentage (1.2 percent) of any freeway or major highway in the Denver metro area. The Proposed Action would not induce increased concentration of diesel vehicles. The proposed tolling structure would discourage

heavy truck use of the express lanes. Based on these facts, CDOT determined and APCD concurred that PM₁₀ hotspot analysis is not required for this project.

No-Action Alternative Air Quality Impacts:

Under the No-Action Alternative, traffic would continue to build on C-470 and surrounding arterial streets due to planned growth within the project area. Projected daily emissions for the No-Action Alternative are provided in **Table 4-12**. On the network links that were modeled with MOVES, corridor-wide daily VMT would increase by 22 percent (constrained by the fact that C-470 demand would exceed capacity). However, pollutant emission rates per mile continue to decline due to cleaner vehicle technology. Therefore despite increased traffic and increased congestion, tailpipe emissions generated in the corridor in 2035 would be less than in 2025 and less than today. However, road dust is not subject to technology improvement and therefore would increase in conjunction with increased VMT.

Projected MSAT emissions for the No-Action Alternative are provided in **Table 4-13**. Despite traffic growth, emissions in 2025 and 2035 would be lower than current emissions due to Federally-mandated cleaner vehicle technology (e.g., higher fuel efficiency standards).

Proposed Action Air Quality Impacts:

Project-level emissions analysis is prepared to compare the expected emissions of criteria pollutants for the No-Action Alternative and

Table 4-12
Projected C-470 Criteria Pollutant Vehicle Emissions (tons per day)

Pollutant	Month	2025		2035	
		No-Action	Interim Project	No-Action	Proposed Action
Carbon Monoxide	Feb	4.0	4.7	2.6	3.3
Volatile Organic Compounds (VOC)	Jul	0.13	0.15	0.07	0.11
Oxides of Nitrogen (NO _x)		0.42	0.48	0.23	0.26
Particulate Matter (PM _{2.5}) exhaust	Feb	0.02	0.02	0.01	0.02
Particulate Matter (PM ₁₀) exhaust		0.08	0.08	0.03	0.14
PM _{2.5} road dust	Ann.	0.17	0.19	0.21	0.23
PM ₁₀ road dust	Avg.	0.69	0.78	0.80	0.94

Table 4-13
Estimated Emissions of MSATs on C-470 (pounds per day)

Pollutant	2025		2035	
	No-Action	Interim Project	No-Action	Proposed Action
Benzene	5.9	6.9	3.0	4.8
Formaldehyde	2.5	2.9	1.5	2.7
1,3-Butadiene	0.2	0.2	<0.1	<0.1
Acrolein	0.1	0.2	0.1	0.1
Naphthalene	0.3	0.3	0.2	0.3
Polycyclic organic matter (POM)	0.1	0.2	0.1	0.1
Diesel particulate matter	4.1	4.8	1.9	3.0

Proposed Action. **Table 4-12** shows the results of this analysis. The numbers in the table are daily total emissions on C-470, its connecting north-south arterials, and nearby east-west alternative routes, incorporating the effects of potential shifts to alternative routes due to C-470 congestion levels.

For all pollutants other than particulate matter, future emissions with the Proposed Action would continue to decline over time, due to vehicle technology improvements. For example, No-Action Alternative CO emissions decline from 4.0 tons daily in 2025 to 2.6 tons daily in 2035, a reduction of 35 percent, despite increased traffic. The continuing emission reductions will result in improved air quality.

For particulate matter (PM_{2.5} and PM₁₀), DRCOG forecasts prepared for RTP conformity analysis indicate that regional

emissions budgets will not be exceeded. Additionally, there are no locations along the C-470 corridor where PM hotspots would be expected.

During construction of the Proposed Action, the use of heavy equipment operation and earth moving machinery would create exhaust emissions and fugitive dust. Fugitive dust also may result from disturbed surfaces and material storage piles.

No-Action Alternative Mitigation for Air Quality Impacts: No mitigation would be required for changes in vehicle-generated emissions resulting from the No-Action Alternative.

Proposed Action Mitigation for Air Quality Impacts: During construction, CDOT would require contractor implementation of dust control practices in accordance with *Colorado Air Quality Control Commission Regulation No. 1* on fugitive emissions. The contractor

would also be required to minimize airborne dust during construction through construction phasing to prevent exposing bare dirt on the whole site at once; stabilize soils through seeding and mulching; and suppressing dust suppression through regular watering.

No mitigation would be required for changes in vehicle-generated emissions resulting from the Proposed Action.

4.3.3 Greenhouse Gases

Climate change is an important national and global concern. While the earth has gone through many natural changes in climate in its history, there is general agreement that the earth's climate is currently changing at an accelerated rate and will continue to do so for the foreseeable future. Anthropogenic (human-caused) greenhouse gas (GHG) emissions contribute to this rapid change. Carbon dioxide (CO₂) makes up the largest component of these GHG emissions. Other prominent transportation GHGs include methane (CH₄) and nitrous oxide (N₂O).

Many GHGs occur naturally. Water vapor is the most abundant GHG and makes up approximately two thirds of the natural greenhouse effect. However, the burning of fossil fuels and other human activities are adding to the concentration of GHGs in the atmosphere. Many GHGs remain in the atmosphere for time periods ranging from decades to centuries. GHGs trap heat in the earth's atmosphere. Because atmospheric concentration of GHGs continues to climb, our planet will continue to experience climate-related phenomena. For example, warmer global temperatures can cause changes in precipitation and sea levels.

To date, no national standards have been established regarding GHGs, nor has EPA established criteria or thresholds for ambient GHG emissions pursuant to its authority to establish motor vehicle emission standards for CO₂ under the Clean Air Act. However,

there is a considerable body of scientific literature addressing the sources of GHG emissions and their adverse effects on climate, including reports from the Intergovernmental Panel on Climate Change, the U.S. National Academy of Sciences, and EPA and other Federal agencies.

GHGs are different from other air pollutants evaluated in Federal environmental reviews because their impacts are not localized or regional due to their rapid dispersion into the global atmosphere, which is characteristic of these gases.

The *affected environment* for CO₂ and other GHG emissions is the entire planet. In addition, from a quantitative perspective, global climate change is the cumulative result of numerous and varied emissions sources (in terms of both absolute numbers and types), each of which makes a relatively small addition to global atmospheric GHG concentrations.

In contrast to broad scale actions such as actions involving an entire industry sector or very large geographic areas, it is difficult to isolate and understand the GHG emissions impacts for a particular transportation project. Furthermore, presently there is no scientific methodology for attributing specific climatological changes to a particular transportation project's emissions.

Under NEPA, detailed environmental analysis should be focused on issues that are significant and meaningful to decision-making.¹ FHWA has concluded, based on the nature of GHG emissions and the exceedingly small potential GHG impacts of the proposed action, as discussed below and shown in **Table 4-14**, that the GHG emissions from the Proposed Action will not result in "reasonably foreseeable significant adverse impacts on the human environment" (40 CFR 1502.22(b)).

¹ See 40 CFR 1500.1(b), 1500.2(b), 1500.4(g), and 1501.7

The GHG emissions from the Proposed Action will be insignificant. More detailed information on GHG emissions “is not essential to a reasoned choice among reasonable alternatives” (40 CFR 1502.22(a)) or to making a decision in the best overall public interest based on a balanced consideration of transportation, economic, social, and environmental needs and impacts (23 CFR 771.105(b)). For these reasons, no alternative-level GHG analysis has been performed for this project.

The context in which the emissions from the proposed project will occur, together with the expected GHG emissions contribution from the project, illustrate why the project’s GHG emissions will not be significant and will not be a substantial factor in the decision-making. The transportation sector is the second largest source of total GHG emissions in the U.S., behind electricity generation.

The transportation sector was responsible for approximately 27 percent of all anthropogenic

(human caused) GHG emissions in the U.S. in 2010.²

The majority of transportation GHG emissions are the result of fossil fuel combustion. CO₂ makes up the largest component of these GHG emissions. U.S. CO₂ emissions from the consumption of energy accounted for about 18 percent of worldwide energy consumption CO₂ emissions in 2010.³

U.S. transportation CO₂ emissions accounted for about six percent of worldwide CO₂ emissions.⁴

While the contribution of GHGs from transportation in the U.S. as a whole is a large component of U.S. GHG emissions, as the scale of analysis is reduced the GHG contributions become quite small. Using CO₂ because of its predominant role in GHG emissions, **Table 4-14** presents the relationship between current and projected Colorado highway CO₂ emissions and total global CO₂ emissions, as well as information on the scale of the project relative to statewide travel activity.

Table 4-14
Statewide and Project Emissions Potential, Relative to Global Totals

Year	Global CO ₂ emissions, MMT ^{a,b}	Colorado motor vehicle CO ₂ emissions, MMT ^c	Colorado motor vehicle emissions, percent of global total	Project area VMT as a percentage of statewide VMT	Percent change in statewide VMT with Proposed Action
2010	29,570	10.3	0.0348%	1.66%	none
2040	45,500	11.9	0.0261%	2.18%	0.008%

^a MMT = million miles of travel.

^b These estimates are from the EIA’s International Energy Outlook 2010, and are considered the best-available projections of emissions from fossil fuel combustion. These totals do not include other sources of emissions, such as cement production, deforestation, or natural sources; however, reliable future projections for these emissions sources are not available.

^c MOVES projections suggest that Colorado motor vehicle CO₂ emissions may increase by 15.5% between 2010 and 2040; more stringent fuel economy/GHG emissions standards will not be sufficient to offset projected growth in VMT.

² Calculated from data in U.S. Environmental Protection Agency, Inventory of Greenhouse Gas Emissions and Sinks, 1990-2010.

³ Calculated from data in U.S. Energy Information Administration International Energy Statistics, Total Carbon Dioxide Emissions from the Consumption of Energy, <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=90&pid=44&aid=8>, accessed 2/25/13.

⁴ Calculated from data in EIA figure 104: <http://www.eia.gov/forecasts/archive/ieo10/emissions.html> and EPA table ES-3: <http://epa.gov/climatechange/emissions/downloads11/US-GHG-Inventory-2011-Executive-Summary.pdf>

Based on emissions estimates from EPA's MOVES model⁵, and global CO₂ estimates and projections from the Energy Information Administration, CO₂ emissions from motor vehicles in the entire state of Colorado contributed less than one tenth of one percent of global emissions in 2010 (0.0348 percent). These emissions are projected to contribute an even smaller fraction (0.0261 percent) in 2040.⁶

Vehicle miles traveled (VMT) in the project area represents 1.66 percent of total Colorado State Highway travel; and the project itself would increase statewide VMT by 0.8 percent. For this analysis, only travel on the C-470 mainline and ramps was included.

As a result, FHWA estimates that the Proposed Action could result in a potential increase in global CO₂ emissions in 2040 of 0.02 percent (two hundredths of one percent), and a corresponding increase in Colorado's share of global emissions in 2040 of 0.0002 percent. This very small change in global emissions is well within the range of uncertainty associated with future emissions estimates.^{7, 8}

Mitigation for Global GHG Emissions:

To help address the global issue of climate change, USDOT is committed to reducing GHG

emissions from vehicles traveling on our nation's highways. USDOT and EPA are working together to reduce these emissions by substantially improving vehicle efficiency and shifting toward lower carbon intensive fuels. The agencies have jointly established new, more stringent fuel economy and first ever GHG emissions standards for model year 2012-2025 cars and light trucks, with an ultimate fuel economy standard of 54.5 miles per gallon for cars and light trucks by model year 2025. Further, on September 15, 2011, the agencies jointly published the first ever fuel economy and GHG emissions standards for heavy-duty trucks and buses.⁹

Increasing use of technological innovations that can improve fuel economy, such as gasoline- and diesel-electric hybrid vehicles, will improve air quality and reduce CO₂ emissions future years.

Consistent with its view that broad-scale efforts hold the greatest promise for meaningfully addressing the global climate change problem, FHWA is engaged in developing strategies to reduce transportation's contribution to GHGs—particularly CO₂ emissions—and to assess the risks to transportation systems and services from climate change.

⁵ <http://www.epa.gov/otaq/models/moves/index.htm>. EPA's MOVES model can be used to estimate vehicle exhaust emissions of carbon dioxide (CO₂) and other GHGs. CO₂ is frequently used as an indicator of overall transportation GHG emissions because the quantity of these emissions is much larger than that of all other transportation GHGs combined, and because CO₂ accounts for 90 to 95 percent of the overall climate impact from transportation sources. MOVES includes estimates of both emissions rates and VMT, and these were used to estimate the Colorado statewide highway emissions in **Table 4-14**.

⁶ Colorado emissions represent a smaller share of global emissions in 2040 because global emissions increase at a faster rate.

⁷ For example, Figure 114 of the Energy Information Administration's *International Energy Outlook 2010* shows that future emissions projections can vary by almost 20 percent, depending on which scenario for future economic growth proves to be most accurate.

⁸ When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency is required make clear that such information is lacking (40 CFR 1502.22). The methodologies for forecasting GHG emissions from transportation projects continue to evolve and the data provided should be considered in light of the constraints affecting the currently available methodologies. As previously stated, tools such as EPA's MOVES model can be used to estimate vehicle exhaust emissions of carbon dioxide (CO₂) and other GHGs. However, only rudimentary information is available regarding the GHG emissions impacts of highway construction and maintenance.

Estimation of GHG emissions from vehicle exhaust is subject to the same types of uncertainty affecting other types of air quality analysis, including imprecise information about current and future estimates of vehicle miles traveled, vehicle travel speeds, and the effectiveness of vehicle emissions control technology. Finally, there presently is no scientific methodology that can identify causal connections between individual source emissions and specific climate impacts at a particular location.

⁹ For more information on fuel economy proposals and standards, see the National Highway Traffic Safety Administration's Corporate Average Fuel Economy website: <http://www.nhtsa.gov/fuel-economy/>.

In an effort to assist States and MPOs in performing GHG analyses, FHWA has developed a *Handbook for Estimating Transportation GHG Emissions for Integration into the Planning Process*. The Handbook presents methodologies reflecting good practices for the evaluation of GHG emissions at the transportation program level, and will demonstrate how such evaluation may be integrated into the transportation planning process. FHWA has also developed a tool for use at the statewide level to model a large number of GHG reduction scenarios and alternatives for use in transportation planning, climate action plans, scenario planning exercises, and in meeting state GHG reduction targets and goals. To assist states and MPOs in assessing climate change vulnerabilities to their transportation networks, FHWA has developed a draft vulnerability and risk assessment conceptual model and has piloted it in several locations.

At the state level, there are also several programs underway in Colorado to address transportation GHGs. The Governor's Climate Action Plan, adopted in November 2007, includes measures to adopt vehicle CO₂ emissions standards and to reduce vehicle travel through transit, flex time, telecommuting, ridesharing, and broadband communications. CDOT issued a Policy Directive on Air Quality in May 2009. This Policy Directive was developed with input from a number of agencies, including the State of Colorado's Department of Public Health and Environment, EPA, FHWA, the Federal Transit Administration, the Denver Regional Transportation District and the Denver Regional Air Quality Council.

This Policy Directive and implementation document, the CDOT Air Quality Action Plan address unregulated MSATs and GHGs produced from Colorado's state highways, interstates, and construction activities. As a part of CDOT's commitment to addressing MSATs and GHGs, some of CDOT's program wide activities include:

- Researching pavement durability opportunities with the goal of reducing the frequency of resurfacing and/or reconstruction projects.
- Developing air quality educational materials, specific to transportation issues, for citizens, elected officials, and schools, including development of vehicle idling reduction programs for schools and communities.
- Offering outreach to communities to integrate land use and transportation decisions to reduce growth in VMT, such as smart growth techniques, buffer zones, transit-oriented development, walkable communities, access management plans, etc.
- Committing to research additional concrete additives that would reduce the demand for cement.
- Expanding Transportation Demand Management efforts statewide to better utilize the existing transportation mobility network.
- Continuing to diversify the CDOT fleet by retrofitting diesel vehicles, specifying the types of vehicles and equipment contractors may use, purchasing low-emission vehicles, such as hybrids, and purchasing cleaner burning fuels through bidding incentives where feasible. Exploring congestion and/or right-lane only restrictions for motor carriers.
- Funding truck parking electrification Researching additional ways to improve freight movement and efficiency statewide.
- Committed to use of ultra-low sulfur diesel for non-road equipment statewide.
- Developing a low-VOC emitting tree landscaping specification.

Even though project-level mitigation measures will not have a substantial impact on global GHG emissions because of the exceedingly small amount of GHG emissions involved, the above-identified activities are part of a program-wide effort by FHWA and CDOT to adopt practical means to avoid and minimize environmental impacts in accordance with 40 CFR 1505.2(c).

Summary: This document does not incorporate an analysis of the GHG emissions or climate change effects of each of the alternatives because the potential change in GHG emissions is very small in the context of the affected environment. Because of the insignificance of the GHG impacts, those impacts will not be meaningful to a decision on the environmentally preferable alternative or to a choice among alternatives. As outlined above, FHWA is working to develop strategies to reduce transportation's contribution to GHGs—particularly CO₂ emissions—and to assess the risks to transportation systems and services from climate change. FHWA will continue to pursue these efforts as productive steps to address this important issue. Finally, the construction best practices described above represent practicable project-level measures that, while not substantially reducing global GHG emissions, may help reduce GHG emissions on an incremental basis and could contribute in the long term to meaningful cumulative reduction when considered across the Federal-aid highway program.

4.3.4 Water Quality

Stormwater that drains off of highways (and other land uses) finds its way into various drainages, some of which eventually discharge into streams or rivers that may be classified as waters of the United States. In the C-470 project area, the South Platte Rivers and other drainages have this classification. Under Federal and state regulations pursuant to the Clean Water Act, all facilities that discharge pollutants from any point source into waters of the U.S. are required to obtain a permit under the National Pollutant Discharge Elimination System (NPDES) permit program. In Colorado, NPDES requirements are implemented through Colorado Regulation 61, Colorado Discharge Permit System Regulations.

MS4 Permit Requirements: Colorado Regulation 61 identifies CDOT as a regulated Municipal Separate Storm Sewer System (MS4). By definition, a separate storm sewer

system includes not only a storm drainage system but also ditches, gutters, or other similar means of collecting and conveying stormwater runoff that do not connect with a wastewater collection system or wastewater treatment facility.

CDPHE most recently issued CDOT a Phase 1 MS4 permit on December 2006 that applies to state and interstate highways and their rights-of-ways within “urbanized areas,” as defined by the CDPHE. The CDOT MS4 permit area covers nearly all of the C-470 project area. That permit expired at the end of January 2012, but has remained in effect pending issuance of a new permit.

In 2014, CDPHE modified CDOT's New Development & Redevelopment (NDRD) Program significantly, in response to a modification requested by CDOT on April 17, 2014. The request was approved with conditions issued on April 22, 2014 (CDPHE, 2014b) and May 22, 2014 (CDPHE, 2014c). The result is the 2014 CDOT NDRD Interim Guidance dated September 18, 2014 (CDOT, 2014). The initial conditional approvals and the Interim Guide were further modified by a CDPHE letter to CDOT dated January 8, 2015 (CDPHE, 2015b).

To simplify contracting and administration of the requirements, the requirements of the 2014 CDOT Interim NDRD Program will be applied to the entire project area.

The 2014 Interim NDRD Program includes a change of terminology from “Best Management Practices (BMPs) to “Control Measures (CMs)” for Permanent Water Quality facilities. However, since the new MS4 permit has not been received and the terminology could change again at that time, this Technical Report will continue to refer to permanent water quality facilities and activities as “BMPs”.

CDOT has extensive experience in implementing permanent BMPs for post-construction mitigation as well as temporary

BMPs addressing potential water quality degradation during construction.

Water Quality in the Project Area: Section 303(d) of the Clean Water Act requires states to identify waters that do not or are not expected to meet applicable water quality standards with technology-based controls alone. This identification of water quality-limited waters is presented in Colorado's 303(d) list, updated every two years maintained by CDPHE.

The most recent Colorado 303(d) list indicates that several receiving waters in the C-470 Corridor are impaired, as follows:

- South Platte River – high priority impairment for arsenic
- Four drainages – low priority impairment for selenium (Dad Clark Gulch, Lee Gulch, Big Dry Creek, and Willow Creek)

Arsenic and selenium are elements naturally found in the soils in the project area. If they get into receiving waters in sufficiently high concentrations, they can impair the waters' beneficial uses. Controlling construction-related and long-term erosion along highways may be helpful with regard to these issues and is a top CDOT MS4 permit priority.

Surface Waters: Surface waters within the project area are shown in **Figure 4-11**. Color variations on the highway line indicate to which receiving water each C-470 segment drains.

The largest water body in the area is Chatfield Reservoir, owned and operated by the USACE. It was built as a flood control reservoir on the South Platte in response to major regional flooding in 1965. Denver Water and other entities use their water rights to fill and maintain water in this reservoir. A 2013 Environmental Impact Statement by USACE detailed plans to greatly increase the amount of water stored there (USACE, 2014).

McClellan Reservoir is a man-made water storage facility located north of C-470

between Santa Fe Drive and Broadway. The reservoir acts as a drinking water supply for the City of Englewood and Highlands Ranch. The City of Englewood and Centennial Water and Sanitation District pump water directly from McClellan Reservoir to supply water to Highlands Ranch.

Regarding domestic drinking water, the Centennial Water and Sanitation District provides water to most of the C-470 project area. The water is supplied through a conjunctive system (both surface and groundwater). Water supplies in the northern portion of the project area are provided by both Denver and Aurora Water, which primarily gain water through surface waters located outside of the project area. No water from the South Platte River below Chatfield Reservoir is used for drinking water supply.

Interagency Cooperation: The cities and counties along C-470 also are subject to MS4 requirements and they have developed their own water quality ponds and other BMPs needed for compliance. These systems are not static but change as needed to address new development and redevelopment needs. Interagency cooperation among MS4 permittees offers opportunities for shared mitigation that can avoid unnecessarily expensive and redundant systems. For this reason, CDOT contacted many of the adjacent jurisdictions to explore cooperative approaches. A number of the water quality features proposed for the Proposed Action involve cooperative solutions.

Meetings to discuss opportunities for cooperation, stormwater management issues and planned improvements were held with:

- City of Englewood (Englewood McClellan Reservoir District)
- Highlands Ranch Metropolitan District
- City of Lone Tree
- Arapahoe County
- Douglas County
- Jefferson County

Additionally, drainage reports were collected from the various agencies with water quality jurisdiction along the corridor.

Water quality impacts associated with the No-Action Alternative and Proposed Action are summarized below. Additional details are provided in the Water Quality Technical Report in **Appendix E**.

No-Action Alternative Water Quality Impacts:

The No-Action Alternative would neither improve nor degrade current water quality conditions in the C-470 project area. Current streams and their courses would not be altered. The amount of impervious surface would remain unchanged for the 13.75 miles of C-470 and its ramps.

Proposed Action Water Quality Impacts:

Impervious surface area would increase from 204.9 acres for the existing condition and No-Action condition to 324.7 acres with the Proposed Action. The increase in impervious surface from the highway widening would cause greater volumes of water to runoff into receiving waters. Average daily traffic on C-470 will increase with the Proposed Action from an existing range of 61,000 to 106,000 to about 93,000 to 161,000 in 2035.

Chemical pollutants resulting from increased impervious surface and traffic would flow into roadside drainage systems. However, water quality facilities constructed as part of the Proposed Action would be effective in preventing chemicals from entering the receiving waters within the project area.

Water quality in the project area's receiving waters should benefit from the Proposed Action since more runoff from C-470 would be treated than is treated today. Permanent water quality BMPs constructed with the Proposed Action would treat runoff from an area of roadway surface equal to or greater than 90 percent of the increased roadway surface added due to the Proposed Action.

Because the South Platte River segment receiving runoff from the project is listed for

arsenic, one of the seven pollutants specified in the 2014 NDRD Interim Program requirements, 90 percent of the increased roadway surface area within this specific drainage basin will be treated by facilities within the basin.

The increase in impervious area due to the Proposed Action is 119.8 acres. About 4.4 acres of the new impervious area will be treated by existing facilities at Santa Fe Drive. According to the 2014 Interim NDRD Program, runoff from 90 percent of this area, or 107.8 acres, must be treated. The Proposed Action would provide water quality treatment for runoff from an additional 185.1 impervious acres, or about 172 percent of the required area. By treating more than the minimum required area, CDOT is committing not only to preserve stormwater quality in the corridor, but to improve it.

Temporary Impacts during construction are expected to include working within and adjacent to some of the identified receiving waters. For example, the Proposed Action would remove and replace the two parallel C-470 bridges over the South Platte River. Implementation of temporary BMPs will be required to prevent the transport of sediment from exposed, erodible soils into the receiving waters.

The management and handling of materials and equipment during the construction phase would be conducted in accordance with pertinent sections of the CDOT Standard Specifications for Road and Bridge Construction and the CDOT Erosion Control and Stormwater Quality Guide, in compliance with a CDPS Construction Stormwater Permit.

Mitigation of Proposed Action Impacts on Water Quality: A Stormwater Management Plan (SWMP) detailing how and where temporary BMPs will be used before, during and after construction will be developed for the Proposed Action. This document will evolve as the construction progresses to meet the changing needs of the project.

Work on the project shall conform to the requirements of the CDOT Standard Specifications for Road and Bridge Construction and the CDOT Erosion Control and Stormwater Quality Guide. A Stormwater Construction Permit issued by CDPHE will be required for the project. Work on the project will be monitored by CDOT through its “Construction Sites Program”.

Numerous temporary BMPs will be required during the construction phase of the project. Temporary BMPs are described in the CDOT Erosion Control and Stormwater Quality Guide. The SWMP will include, but not be limited to, the following general measures:

- Erosion Control Measures including minimizing soil disturbances and adequately stabilizing disturbed areas as soon as possible to prevent erosion;
- Sediment Control Measures including using adequate BMPs to collect and remove pollutants from runoff before it is discharged from areas under construction;
- Using adequate measures to prevent materials from being tracked by vehicles or carried by wind and deposited off-site; and
- Proper spill prevention, management and control measures.

Permanent BMPs proposed for implementation with the Proposed Action will dominantly consist of, but not be limited to extended detention basins. Design will maximize ease of safe access, and will include input from Maintenance staff to accommodate available maintenance equipment. Depending on site conditions, local agency requirements, and space available, CDOT will also consider the use of ecology embankments/media filter drains, and pre-manufactured mechanical treatment devices.

4.3.5 Hydrology and Hydraulics

Hydrologic and hydraulic analysis for the study consisted of two elements: regional hydrology and cross culverts carrying regional drainages under C-470, and roadway

drainage carrying storm runoff from the roadway itself.

The regional assessment was conducted to check bridges and cross culverts for adequate hydraulic capacity and, in some cases, for other considerations such as roadway profile changes, trail underpasses, and wildlife passage. The roadway storm drainage system was designed at a conceptual level to locate and size the collection system and to locate and size detention storage and water quality ponds.

The major streams and drainages in the project area include Massey Draw, South Platte River, Dad Clark Gulch, Big Dry Creek, and Willow Creek, as shown previously in **Figure 4-11**.

Massey Draw flows through a double box culvert under C-470 between Wadsworth Boulevard and Santa Fe Drive. The existing bridge at the South Platte River is a three-span bridge. Dad Clark Gulch crosses C-470 through an existing water quality detention outlet structure. A bridge carries C-470 over Big Dry Creek. Willow Creek crosses under C-470 in an existing triple box culvert. Existing culverts and bridges are described in **Table 4-14**. Details on potential floodplain impacts are discussed in the *Hydraulics Study* in **Appendix E**.

Flows to the cross drainages were determined using master plans and drainage studies that cover the project area and by delineating basins that contribute runoff to culverts that are 48 inches in diameter and larger. Basins were analyzed further if no published information was available on the basin and/or culvert crossing.

One crossing of hydraulic importance is the South Platte River bridges, just west of Santa Fe Drive. This crossing is downstream of the Chatfield Reservoir dam and spillway. The Chatfield Dam outlet permits a maximum flow of 8,000 cubic feet per second (cfs), but the actual discharge permitted is currently limited to 5,000 cfs by state statute.

The USACE recently completed a storage reallocation study for Chatfield Reservoir to evaluate its storage capacity and operation (USACE, 2014). That study considered a possible increase in the maximum allowable discharge rate, but the study's selected alternative calls for no change to the existing operation (i.e., 5,000 cfs). Therefore, the regulated release rate of 5,000 cfs is being used for the 100 and 500-year design flows at the South Platte River crossing.

Currently, median and roadside ditches handle all existing roadway storm drainage. Therefore, no storm sewers are present, except at low points that require outlets to the roadside ditches or receiving watercourses.

No-Action Alternative Hydrology Impacts: No changes to the existing hydrology or hydraulics would result from the No-Action Alternative.

Proposed Action Hydrology Impacts: Many culverts that cross C-470 would be extended to accommodate the wider typical section. Culvert headwater depths have been calculated to determine if the culverts along C-470 have adequate capacity to pass the 100-year storm event and meet CDOT criteria for this project.

Almost all of the culverts crossing C-470 are adequately sized to pass the 100-year design flow based on allowable headwater criteria. However, the existing 72-inch culvert east of Spring Creek (1,200 feet west of Quebec St.) is undersized and cannot pass the 100-year storm. It can only pass 336 cfs at a headwater to diameter ratio of 1.5, but needs to pass 490 cfs for the 100-year storm.

Based on this assessment, no existing buildings would be impacted by any changes in headwater elevations at the culvert crossings.

The box culvert carrying Willow Creek under C-470 would be extended on the south side to accommodate the wider highway. Lengthening the culvert and raising the

inverted would cause a minor rise in the 100-year floodplain, but the property adjacent to the floodplain is publicly owned and not available for development.

The existing bridges over the South Platte River would be replaced to improve the horizontal and vertical geometry of the crossing. This replacement would not modify the main 100-foot wide river channel. The bridge opening would be widened and raised to provide improved trail clearances and sight distances for the regional Mary Carter Greenway trail. The revised section also provides a wildlife corridor. The design passes the 5,000 cfs maximum hourly discharge from the Chatfield Dam without significant adverse impacts to the floodplain.

A preliminary analysis of the floodplain, using the standard step method provided in the USACE HEC-RAS software, showed that widening the bridges can cause a small rise in the 100-year floodplain at the downstream face of the bridges, however, the longer bridge span will widen the floodplain under the bridges and cause a small decrease in the 100-year water surface upstream of the crossing. A more detailed analysis of this crossing will be required to determine if a FEMA map revision will be required.

The bridges over Big Dry Creek would be widened to adjust to the wider roadway section, but no changes would be made to the channel. The bridge at Big Dry Creek was evaluated for capacity using Manning's equation. Widening of the bridge abutments may cause some minor encroachment into the adjacent floodplain.

The total impervious area for 13.75 miles of C-470 and its ramps would change from 204.9 acres to 324.7 acres, an increase of 119.8 acres. This will increase stormwater runoff, both in volume and peak flow rates.

The storm drainage collection system was analyzed to locate and size inlets, pipelines and outfalls to the drainageways. Detention storage and water quality ponds were also

located and sized to strategically address increases in runoff and to comply with CDOT's MS4 permit requirements.

At some locations, increases in flow rates will be discharged to drainageways without peak flow reduction. At these locations the increase is not large relative to the flows expected in the receiving waters. These increases in flow could result in erosion along ditches, and downstream drainageways and could impact water quality.

A more detailed discussion of the hydraulic capacity of crossings and potential impacts on receiving waters and floodplains is provided in the *C-470 Hydraulic Study* in **Appendix E**.

Mitigation of Hydrology Impacts: Most of the proposed culvert extensions would still be within the existing ROW, but in cases where they would not fit, additional ROW would be acquired as part of the alternative.

To correct the potential flooding at the culvert east of Spring Creek, the culvert would be replaced with an 84-inch-diameter reinforced concrete pipe culvert to allow for adequate passage of the estimated 100-year frequency design flows.

The longer bridges over the South Platte River will not affect the capacity of the crossing, but a more detailed analysis of the crossing will be necessary to determine if a FEMA map revision process is required.

The construction of detention storage ponds with water quality features will reduce runoff from the project to pre-project peak flow rates where it was feasible to place these facilities. Erosion mitigation measures will be provided to address the potential impact from increased runoff where detention storage facilities were not feasible.

Water quality ponds are included in the alternative as permanent BMPs to improve water quality of storm runoff, as discussed in **Section 4.3.4, Water Quality**. A more detailed discussion of the Proposed Action

water quality impacts and mitigation measures is provided in the *Water Quality Technical Report* (April 2015).

4.3.6 Floodplains

Executive Order 11988, Floodplain Management, requires federal agencies to avoid direct or indirect support of floodplain development whenever a practicable alternative exists. The base flood (100-year flood) is the regulatory standard used by federal agencies and most states to administer floodplain management programs. Flood insurance rate maps (FIRM) from the Federal Emergency Management Agency (FEMA) were used to identify drainages with 100-year floodplains within the C-470 project area. Locations of the floodplains are shown in relation to C-470 in **Figure 4-12**.

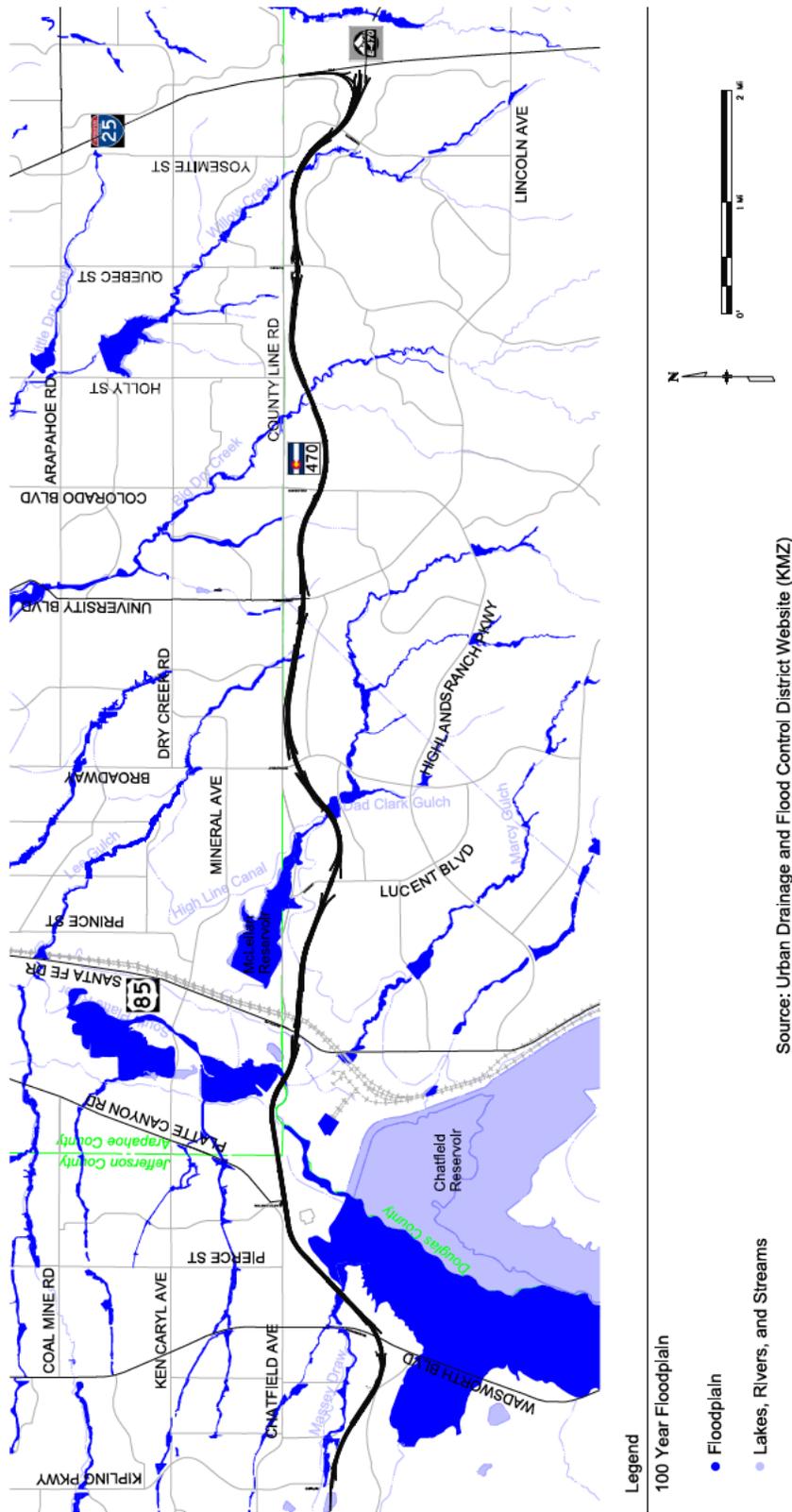
C-470 intersects five drainages with 100-year floodplains including; Massey Draw, the South Platte River, Dad Clark Gulch, Big Dry Creek, and Willow Creek. Flood Hazard Area Delineations (FHAD), Master Plans, and Outfall Planning Studies are available for these drainages and their tributaries through the Urban Drainage and Flood Control District (UDFCD). The South Platte River and Big Dry Creek floodplains have regulated floodwater elevations (base flood elevations, Zone AE) and Massey Draw, Dad Clark Gulch and Willow Creek have approximate floodplains without base flood elevations (Zone A).

Flooding in the C-470 project area is typically due to short-duration, high-intensity events from May to September. Since Chatfield Reservoir is upstream of C-470 on the South Platte River, flow rates passing under the parallel C-470 bridges are controlled by the Chatfield Dam outlet works.

Further discussion of floodplains and potential project impacts is provided in the *C-470 Hydraulic Study* presented in **Appendix E**. Floodplain findings from that study are summarized below.

No-Action Alternative Impacts on Floodplains: The No-Action Alternative would result in no

**Figure 4-12
FEMA Floodplains in the C-470 Corridor**



Source: Urban Drainage and Flood Control District Website (KMZ)

effects to the regulated 100-year floodplains within the project area.

Proposed Action Impacts on Floodplains:

Project improvements have been planned to eliminate or limit and mitigate potential adverse impacts to floodplains.

Culvert crossings at Massey Draw and Dad Clark Gulch will not be lengthened due to the construction of retaining walls that will constrain the wider roadway embankment. Therefore, there is no potential impact to the adjacent floodplains at these locations.

Potential impacts to the South Platte River floodplain may occur due to the longer and wider bridge spans of the replacement bridges. The longer bridge spans provide improved clearances and sight distances for the regional Mary Carter Greenway Trail and a wildlife corridor. No widening of the main river channel is required, but the longer bridge span allows flood flows to expand westerly adjacent to the proposed bridge abutment.

A preliminary analysis shows that potential adverse impacts to the floodplain water surface elevation will be limited to the C-470 easement through USACE land. All of the land adjacent to the bridge crossing is publicly owned and not available for development. Therefore no increased risk to developed property is expected. Potential impacts will need to be assessed in more detail to determine if a FEMA map revision is required.

Widening of the C-470 bridges over Big Dry Creek will extend bridge abutments upstream and downstream parallel to the existing floodplain. However, no modifications to the channel section are planned. Therefore, impacts to the floodplain are expected to be minimal.

Extension of the south entrance to the existing culvert at Willow Creek, and the corresponding rise in the culvert invert, may cause a minor increase in the floodplain water surface elevation. However, a preliminary analysis showed that the rise would be within

the allowable one-foot increase for approximate floodplains. The area adjacent to the floodplain is public land and is not available for development. Therefore, no additional risk to adjacent developed property is expected.

4.3.7 Historic Resources

Consistent with requirements of Section 106 of the National Historic Preservation Act of 1966, historic resources were inventoried and evaluated within the C-470 project's Area of Potential Effect (APE), as defined by the FHWA and CDOT with concurrence from the State Historic Preservation Officer (SHPO) in May 2004. The APE was defined as approximately 150 feet on either side of the existing C-470 centerline from Kipling Parkway to I-25, with additional width identified at interchanges, and locations where historic resource property boundaries were known to occur within the project area.

Complete details regarding the study of historic resources for this Revised EA are provided in the *Historic Resources Survey* in **Appendix E**.

Only one resource in the project area, Hildebrand Ranch (5JF188), is listed in the National Register of Historic Places (NRHP). Research conducted for the 2006 EA identified additional resources that were found to be eligible for NRHP listing. All of these resources are located west of Broadway. No historic resources were identified in the eastern half of the C-470 project area.

A new survey in 2013 identified and recorded two additional resources that were determined *eligible* to the NRHP. These are:

- the Chatfield Dam (Jefferson County portion 5JF5142 and Douglas County portion 5DA3091) and
- the Columbine Hills neighborhood (5JF5143), a post World War II subdivision located north and west of Platte Canyon Road.

The *Historic Resource Survey: C-470 Kipling Parkway to I-25* (June 2013) contains details regarding the historic context and all historic resources within the project area (Please see **Appendix E, Technical Reports**). This report summarizes the NRHP determinations of eligibility for resources within the APE and contains findings of Section 106 effect (36 CFR 800.5). Effect determinations under Section 106 (36 CFR 800.5) may be:

- *no historic properties affected,*
- *no adverse effect, or*
- *adverse effect*

The Proposed Action results in findings of *no historic properties affected* or *no adverse effect* with regard to the resources in the APE. The project does not result in *adverse effects* to historic properties.

CDOT's assessment of eligibility and effects for C-470 was submitted to the SHPO in formal Section 106 consultation. The SHPO provided written concurrence with these determinations of eligibility and effects on September 6, 2013 for all but one resource, and concurrence for the final resource on October 16, 2013. The consultation process also included the following parties:

- City of Littleton Historic Preservation Board
- Arapahoe County Commissioners
- Jefferson County Historical Commission
- C-470 Corridor Coalition
- Douglas County Historic Preservation Board

All correspondence from the consultation process is provided in **Appendix A**.

Figure 4-13 shows the locations of the properties identified as officially eligible or on the NRHP. **Table 4-15** lists them and indicates the effect determination for each due to the Proposed Action.

No-Action Alternative Impacts on Historic Properties: The No-Action Alternative would not impact historic resources.

Proposed Action Impacts on Historic Properties: The resources listed in **Table 4-16** with a finding of *no adverse effect* are discussed below. These are:

- Chatfield Dam
- Columbine Hills neighborhood
- City Ditch
- High Line Canal

Chatfield Dam (5JF5142 and 5DA3091)

The USACE built the Chatfield Dam, reservoir, and associated recreational areas over a ten year period between 1967 and 1977, after a devastating flood in 1965 in the South Platte River Valley. Chatfield Dam is historically significant under NRHP Criterion A for its association with the USACE and their role as dam builders. The rolled-earth dam is significant under NRHP Criterion C for its embodiment of the distinctive characteristics and method of construction for a Rolled Earth-Fill Dam used by the USACE. The distinctive construction began in 1967, which is 48 years ago. When assessing potentially historic properties, CDOT considers sites that are 45 or more years old, approaching the 50-year age normally needed (together with other factors) for historic eligibility.

The Proposed Action would result in no direct effects to Chatfield Dam. Indirect effects would include increased noise and visual intrusion. The C-470 expanded pavement would be visible only from the top of the west embankment overlook. At the top of the embankment, ranging from 1,000 to 3,000 feet from the highway, the potential effect of increased noise is minimal. Because the project would not diminish the significant features of the resource, it results in a finding of *no adverse effect* to the Chatfield Dam.

Columbine Hills (5JF5143)

The Columbine Hills subdivision is a good example of a multiple filing subdivision based on a Master Plan that includes amenities, such as shopping, schools, churches, and parks constructed between 1959 and 1977.

**Figure 4-13
Historic Resources**

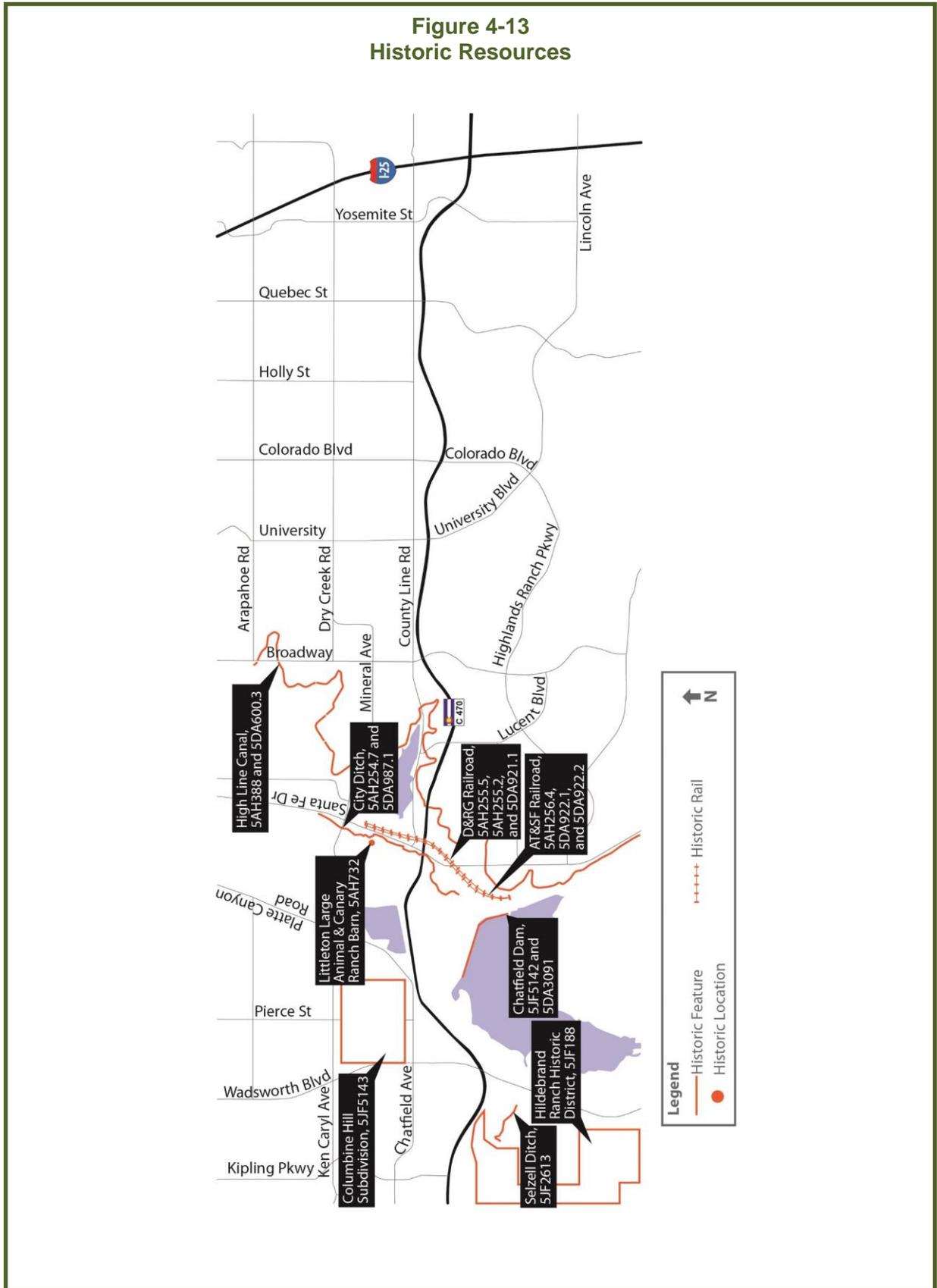


Table 4-15
Officially Eligible or Listed Historic Properties

Site Number	Resource	Location	Effect
5JF188	Hildebrand Ranch	South of C-470; west of Wadsworth Boulevard	No historic properties affected
5JF2613	Selzell Ditch	South of C-470; west of Wadsworth Boulevard	No historic properties affected
5JF5142 and 5DA3091	Chatfield Dam*	South of C-470; between Wadsworth Boulevard and Santa Fe Drive	No adverse effect
5JF5143	Columbine Hills*	North of C-470; along Platte Canyon Road	No adverse effect
5AH254.7 and 5DA987.1	City Ditch	Crosses under C-470 at the Santa Fe Drive interchange	No adverse effect
5AH732	Littleton Large Animal Clinic and Canary Ranch Barn	North of C-470 on the west side of Santa Fe Drive	No historic properties affected
5AH255.5, 5AH255.2, and 5DA921.1	Denver & Rio Grande Railroad	Crosses over C-470 immediately east of Santa Fe Drive	No historic properties affected
5AH256.4, 5DA922.1, and 5DA922.2	Atchison Topeka & Santa Fe Railroad	Crosses over C-470 immediately east of Santa Fe Drive	No historic properties affected
5AH388 and 5DA600.3	High Line Canal	Crosses C-470 east of Erickson Drive	No adverse effect

* Chatfield Dam and Columbine Hills have newly been determined eligible; they were not assessed in the 2006 EA.

This subdivision is significant under NRHP Criterion A for its association with postwar development in the Denver metropolitan region to meet growing demand for housing for young professionals who worked in the region's expanding industrial and technological markets.

Under NRHP Criterion C, the Columbine Hills subdivision is representative of patterns of the metro area's postwar community planning and development that utilized a master plan to create a cohesive, individual community for its residents.

The C-470 Proposed Action would not encroach on the historic boundaries of the Columbine Hills subdivision, and thus would have no direct effects on this resource. However, it would result increased traffic noise levels for the subdivision. Noise analysis conducted for this Revised EA concluded that the eight southernmost homes in this 1,300-home subdivision would experience noise levels of 66 decibels or

more in the year 2035. This level of noise would interfere with ordinary outdoor conversation. These homes on West Alder Avenue receive noise not only from C-470, but also from Chatfield Avenue, which is even closer to them, right behind their back yards.

Nearby Columbine Hills residences are protected by an existing CDOT noise barrier. Extension of that barrier to protect eight more homes is considered unlikely, as it would not meet the current FHWA and CDOT standard for reasonable cost-effectiveness. However, if the noise barrier on CDOT right-of-way were to be extended, the same homes would experience a visual impact instead of a noise impact. The assessment of effects evaluated both possibilities for indirect effects to the resource, stemming from increases in noise or the visual impact of a new noise wall. As neither option would diminish the historic integrity of the resource, the project results in a finding of *no adverse effect* with regard to Columbine Hills.

City Ditch (5AH254.7 and 5DA987.1)

The entire City Ditch was determined officially eligible to the NRHP under Criterion A for its historic significance in engineering and irrigation on the Plains and its association with Early High Plains Irrigation and Farming to 1900. This ditch crosses the APE just once but has two Smithsonian identification numbers (one indicating Arapahoe County and one indicating Douglas County) because it crosses the county line.

The two City Ditch segments intersecting the APE have each been determined non-supporting of the overall eligibility of the City Ditch. These segments demonstrate diminished historic integrity due to realignment and routing the historic ditch into pipes during the construction of C-470 between 1985 and 1990.

As part of the Proposed Action, the portion of City Ditch located under C-470 in the vicinity of the Santa Fe Drive interchange would be re-aligned and re-constructed.

The City Ditch in this area lacks historical integrity because during the initial construction of this section of C-470 between 1982 and 1985, these sections of City Ditch were significantly altered. Specifically, they were re-aligned and put into pipes south of C-470, under the highway, and north of the highway along Santa Fe Drive. Because the subject segments lack integrity, reconstruction of the ditch pipeline at each segment will not alter or diminish historic features of the resource, and the proposed action results in a finding of *no adverse effect* with regard to the City Ditch, including the subject segments.

High Line Canal (5AH388 and 5DA600.3)

The High Line Canal was determined officially NRHP-eligible under Criterion A for its association with Colorado's early agricultural development. The segment evaluated within the APE has historic integrity. It has two Smithsonian identification numbers (one indicating Arapahoe County and one indicating Douglas County) because it crosses the county line. In 1880 plans were

completed for the canal, and construction crews began work on the High Line Canal. It would ultimately extend for 70 miles with several laterals. It was completed in 1883. The canal was used extensively by farmers and ranchers in northern Douglas County. In 1924, it became the property of Denver. The High Line Canal is still in use today, now flanked by a major regional recreation trail. During the initial construction of C-470 in the 1980s, the section of the High Line Canal within the APE was put in a low, concrete-box culvert to allow the highway to cross over the ditch and not interrupt the flow of water.

Despite the widening of the highway, there would be no need to extend the existing box culvert. Instead, a concrete retaining wall would be extended from the edge of the pavement down the slope to within 15 feet of the box culvert on both the north and south sides. The concrete wall would stabilize the earthen slope protecting the High Line Canal from erosion associated with the highway. An earthen slope would continue from the edge of the wall down to the head wall of the box culvert. Because the proposed work would not diminish the characteristics of the resource qualifying it for inclusion on the NRHP, the project will result in a finding of *no adverse effect* with regard to the Highline Canal, including segments 5AH388 and 5DA600.3.

Mitigation of Proposed Action Impacts on Historic Properties: No mitigation measures for historic resources are required because the project does not result in adverse effects under Section 106 for any historic resources present in the APE.

4.3.8 Archaeological Resources

In July and August 2004, CDOT archaeologists completed archival research for the project area. This research involved investigating the site and study files housed at the Colorado Office of Archaeology and Historic Preservation and reviewing CDOT records. The entire length of C-470 between I-25 and I-70 was initially inventoried for archaeological resources by the Colorado

Department of Highways in 1976, as part of the Section 106 compliance process that preceded highway construction (*The Archaeological Survey of I-470 – Southwest Circumferential. Highway Salvage Report No. 14, 1976*).

The parcel within the current project area located east of I-25, along the E-470 alignment, was surveyed under the auspices of the E-470 Authority in 1987 (*Final Report of Cultural Resource Inventory for the Proposed E-470 Corridor, Douglas, Arapahoe and Adams Counties, Colorado, 1988*).

From the late 1970s to early 2000s, a number of additional cultural resource studies included portions of C-470, some of which were transportation-related, while others were undertaken as a result of ancillary developments. No additional field survey to identify archaeological sites was necessary for the current study.

The file search identified eight prehistoric sites located completely or partially within the 1,000-foot wide APE established for the archaeological resources assessment (500-feet on either side of the highway centerline). All eight sites were documented during the mid- to late 1970s, well before C-470 was constructed. However, official determinations of National Register eligibility were never completed for many of these resources, a task ultimately undertaken by CDOT for the 2006 C-470 EA.

The eight sites have been entirely or partially destroyed by transportation, residential, or commercial construction activities such that they no longer retain physical integrity and/or exhibit the potential to contain significant buried cultural deposits.

In September 2004, the SHPO concurred with the FHWA and CDOT evaluations of not eligible for listing on the NRHP for all archaeological sites within the project area. Records of agency correspondence are located in **Appendix B**.

No archaeological sites listed on or eligible for the NRHP are located within the project area. As such, the No-Action and Proposed Action would have no effect on this type of historic properties. In the event archaeological remains are exposed during any phase of construction associated with the study, the CDOT Senior Staff Archaeologist will be contacted to evaluate the discovery and coordinate appropriate Section 106 compliance actions with the SHPO and other agencies or entities, as necessary.

Mitigation for Impacts to Archaeological Resources: If archaeological remains are exposed during any phase of construction associated with the study, the CDOT Senior Staff Archaeologist will be contacted to evaluate the discovery and coordinate appropriate Section 106 compliance actions with the SHPO and other agencies or entities, as necessary.

4.3.9 Native American Consultation

Section 106 of the National Historic Preservation Act (as amended) and the Advisory Council on Historic Preservation regulations (36 CFR 800.2[c][2][ii]) mandate that federal agencies coordinate with interested Native American tribes in the planning and environmental process for federal undertakings.

Consultation with Native American tribes recognizes the government-to-government relationship between the United States government and sovereign tribal groups, and federal agencies must be sensitive to the fact that historic properties of religious and cultural significance to one or more tribes may be located on ancestral, aboriginal, or ceded lands beyond modern reservation boundaries.

Consulting tribes are offered the opportunity to identify concerns about cultural resources and comment on how the project might affect them. If it is found that the project would impact cultural resources that are eligible for inclusion on the NRHP and are of religious or cultural significance to one or more consulting

tribes, their role in the consultation process could also include participation in resolving how best to avoid, minimize, or mitigate those effects.

By describing the proposed undertaking and the nature of known cultural sites, and consulting with the interested Native American community, the FHWA and CDOT strive to effectively protect areas important to American Indian people.

The USACE administers several linear miles of land within the project area, where C-470 is located on an easement from that agency. For the C-470 project, the USACE delegated consultation responsibilities to the FHWA, the lead agency, but in so doing did not relinquish its obligations, as mandated by federal statute. The USACE maintains an ongoing role in the consultation process.

Tribes Contacted: Tribes were initially contacted for the 2006 EA and those that expressed interest in the project were contacted again as the project transitioned into the Revised EA. In March 2004, FHWA contacted 15 federally recognized tribes with an established interest in Arapahoe, Douglas and Jefferson Counties, and invited them to participate as consulting parties. These parties are:

- Ute Mountain Ute Tribe (CO),
- Southern Ute Indian Tribe (CO),
- Ute Tribe of the Uintah and Ouray Agency (“Northern” Ute) (UT),
- White Mesa Ute Tribe (UT),
- Cheyenne River Sioux Tribe (SD), Crow Creek Sioux Tribe (SD), Oglala Sioux Tribe (SD),
- Rosebud Sioux Tribe (SD), Standing Rock Sioux Tribe (ND), Cheyenne and Arapaho Tribes of Oklahoma (OK): two tribes administered by a unified tribal government,
- Pawnee Nation of Oklahoma (OK),
- Comanche Nation of Oklahoma (OK),
- Kiowa Tribe of Oklahoma (OK), Northern Arapaho Tribe (WY), and
- Northern Cheyenne Tribe (MT).

Four tribes responded to the invitation in writing (Northern Arapaho, Southern Ute, Pawnee Nation, and Standing Rock Sioux), of which two (Northern Arapaho and Southern Ute) expressed the desire to be consulting parties for the study. Neither of the two consulting tribes raised specific issues of concern regarding the C-470 project.

CDOT contacted the Northern Arapaho and Southern Ute tribes in September 2013 to renew consultation for this Revised EA. An October 2013 response from the Southern Ute Indian Tribe indicated their conclusion that the project would have no effect on resources of cultural or religious significance to that tribe. This correspondence is located in **Appendix A, Agency Correspondence**.

Each consulting tribe will continue to receive information about the study as it becomes available, to facilitate their involvement in the planning and environmental process. In so doing, the FHWA and CDOT will have fulfilled their legal obligations for tribal consultation under federal law.

4.3.10 Paleontological Resources

Paleontological resource compliance is mandated by the Colorado Historical, Prehistorical, and Archaeological Resources Act of 1973. In September 2004, the CDOT paleontologist completed archival research for the project area. A literature survey was conducted to evaluate the potential for scientifically substantial paleontological resources within the geologic units of the project area.

Because of heavy residential and commercial development along C-470 in recent years, there are no potentially fossil-bearing bedrock exposures within the project area that merit on-site reconnaissance for paleontological resources. Thus, no additional field survey was necessary for this Revised EA.

No-Action Alternative Impacts to Paleontological Resources: The No-Action Alternative would have no effect on paleontological resources.

Proposed Action Impacts to Paleontological Resources: Construction activity at or above the present ground surface will have no effect on scientifically important paleontological resources. However, potentially fossil-bearing units found in pre-Holocene and Pleistocene, Late Cretaceous and Paleocene formations mapped within the C-470 project area have produced scientifically important fossils within a few miles of the highway. These units are not, for the most part, well-exposed naturally, but could be encountered during excavation associated with roadway depression or highway widening within the existing ROW.

Subsurface excavation during project construction could affect scientifically important paleontological resources, but it is impossible at this time to determine which potentially fossil-bearing deposits, if any, would be affected. Most of the known fossil localities in the project area were uncovered during earth-moving activities associated with sand and gravel mining, housing and commercial development, and highway and railroad construction.

Mitigation for Proposed Action Impacts to Paleontological Resources: CDOT will ensure that a qualified paleontologist is on site during major construction excavation to monitor for buried paleontological resources where known fossil-bearing deposits are mapped, but not currently exposed at the ground surface. If any potential fossils are unearthed during construction, work will be halted until the paleontologist can assess the significance of the find and make recommendations regarding resource protection.

4.3.11 Geology and Soils

Geologic conditions present within the C-470 project area were identified using information from geologic maps, topographic maps, USGS reports, Colorado Geological Survey

publications, United States Department of Agriculture soil survey reports, and geotechnical reports. This information was supplemented with field reconnaissance and communications with local engineering and planning personnel. Evaluation of existing geologic conditions was based on proximity to the corridor, history of occurrence, and effect of occurrence on transportation and mobility. Additional details regarding geotechnical analysis can be found in the *Geology Technical Report* in **Appendix E**.

Existing Conditions: The geologic units along the C-470 Corridor range from recent unconsolidated river deposits to sedimentary bedrock between 55 and 70 million years old and are directly related to the formation of the Rocky Mountains located west of the highway. Much of the mountainous terrain associated with the Rocky Mountains began during a mountain building event known as the Laramide Orogeny, which began near the end of the Cretaceous Period about 72 million years ago.

Bedrock along the C-470 Corridor typically consists of hard sedimentary rock, exposed at or near the surface at the western end of the corridor. These rock formations are the oldest at the western end of the corridor, with the younger formations exposed progressively to the east.

Overlying the bedrock formations are deposits of surficial material. These surficial deposits are the result of geomorphic activity that has shaped the present landforms and vary considerably in depth. This activity is primarily related to processes involving wind and water including former and modern streams and rivers. The surficial deposits are younger than the bedrock and are unconsolidated and loose by comparison.

Artificial fill is also found at various locations along the corridor ranging from zero to 15 feet above ground and is used for highway and other road fills, flood control, canal embankments, trash dumps, and sanitary landfills. This material is composed of various

amounts of clay, silt, sand, gravel, concrete, brick, and trash. For construction purposes, it is assumed that this material is not suitable unless it can be removed and re-compacted to specified CDOT standards.

No-Action Alternative Geologic Impacts:

The No-Action Alternative would not disturb existing soils and geological conditions. Therefore, no effects to the existing roadway from geologic and soil conditions are anticipated.

Proposed Action Geologic Impacts: Geologic conditions and soils in the C-470 project area would need to be considered during design and construction. However, none of these geologic conditions would be sufficient to alter the location of the Proposed Action. These conditions include:

- expansive soils and bedrock
- corrosive soils
- steeply dipping bedrock
- collapsible soils
- unstable slopes

The Proposed Action would result in excavation, soil disturbance, and exposure of previously buried and stable geological and soil units to precipitation, air, and weathering. Expansive soils and bedrock and corrosive soils may cause increasing damage to transportation system components over a period of years. Differential movement in steeply dipping bedrock has damaged local pavement and transportation structures. Collapsible soils could also damage the highway infrastructure by either large settlement areas or differential settlement. Unstable slopes could also cause failure at cut and fill areas.

Mitigation of Proposed Action Geologic Impacts: Mitigation of geological and soil conditions for the Proposed Action is described in terms of engineering design solutions. These engineering details are not of general interest and therefore are not detailed here. However, some of the engineering solutions are of interest due to

the additional environmental issues related to them. Pile driving and pier drilling needed in response to expansive or collapsible soils would result in increased construction noise and vibration. Over-excavation, re-compaction and importation of structural fill would result in additional dust emissions, noise, vibration, and construction truck traffic.

4.3.12 Hazardous Materials

Hazardous materials are any product that is flammable, corrosive, or toxic. Hazardous material sites are found in association with a variety of industrial, mining, and municipal land uses. Hazardous material sites located adjacent to the highway ROW could result in project delays and increased cost if contaminated soils or groundwater are exposed during construction activity, particularly if they have not been identified prior to construction. Advance knowledge of contaminated conditions can reduce health hazards for construction workers and the general public.

Some types of contamination commonly found along an urban highway include:

- Soil and groundwater pollution due to fuel leaking from an underground storage tank (e.g., commercial gasoline station)
- Soil and groundwater contamination due to landfills, chemical or material spills, dry cleaners or industrial operations
- Asbestos found in nearby structures that are acquired for highway ROW and in soil where building debris has been buried
- Lead paint found on highway bridge structures or in buildings acquired for ROW.

Additionally, C-470 is a CDOT-designated route for hazardous material transport, not including nuclear materials. However, north-south nuclear material transport is permitted on I-25, at the eastern end of the C-470 project area. Despite extensive safety regulations for hazardous cargos, there is always some potential for hazardous material spillage on these routes, especially in case of a major collision. The database research

described below includes research regarding hazardous spills along highways.

Database Searches: A hazardous material database search was conducted in 2013 for this Revised EA. This search included data available from the EPA, CDPHE, Tri-County Health Department, and the Colorado Department of Labor and Employment Division of Oil and Public Safety. The results are documented in the Phase I Environmental Site Assessment (ESA) provided in **Appendix E**.

A second database search was completed in early 2015 to bring the findings up to date. It found no new hazmat concerns in the project area.

A total of 11 sites were identified as having “recognized environmental conditions”. These sites are listed in **Table 4-16** and the locations are shown in **Figure 4-14**.

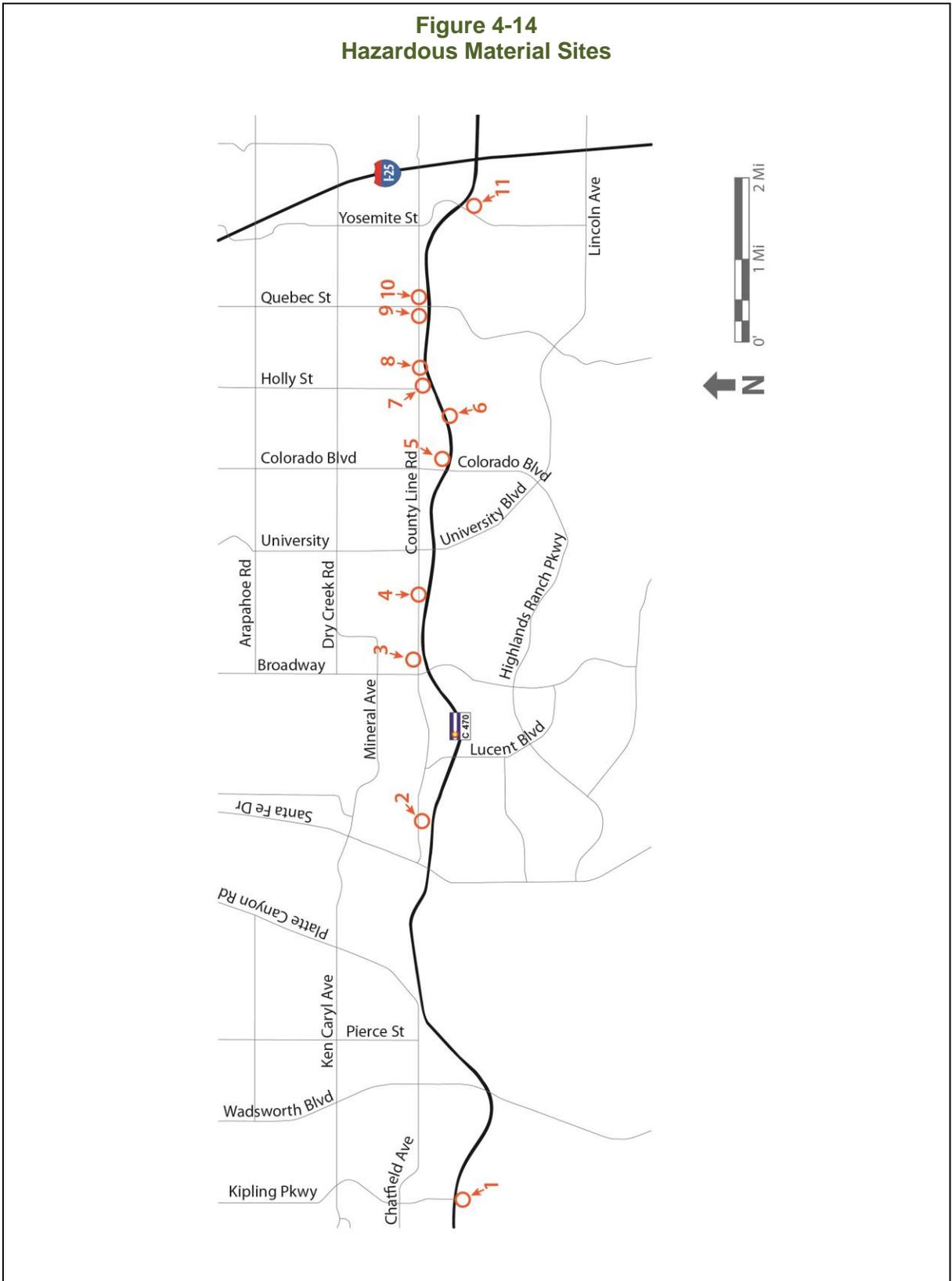
No-Action Alternative Hazardous Material Impacts: The No-Action Alternative would not affect any hazardous material sites identified along C-470.

Proposed Action Hazardous Material Impacts: Four hazardous material sites were ranked with a high potential for concern within the C-470 project area. Potential impacts from these sites resulting from the Proposed Action are detailed in **Table 4-16**.

Table 4-16
Hazardous Material Recognized Environmental Conditions

Map ID	Location	Entity	Finding
1	9509 W. Ute Ave. Littleton	Jeffco Road and Bridge	Improper oil disposal in 1996.
2	3220 W. County Line Rd. Littleton	Bowen Farms	Site of gasoline leak from underground storage tank in 2006.
3	201 E. County Line Rd. Littleton	Chevron (now Waffle House)	Gasoline leak from underground storage tank in 1990.
4	1650 E. County Line Rd. Highlands Ranch	Jiffy Lube	Oil and other contaminants possibly drained to storm sewer
5	8422 S. Colorado Blvd. Littleton	County Line Disposal	Landfill closed in 1987 has methane and contaminated groundwater. Now covered by David A. Lorenz Regional Park.
6	8606 Canongate Ln. Littleton	Centennial Water and Sanitation	Lift station is site of reported waste-water spills in 2003 and 2005.
7	6086 E. County Line Rd. Littleton	Dry Cleaning Station	Tetrachloroethylene solvent is used on site. No known spills.
8	6028 E. County Line Rd. Littleton	AAMCO	Leak from underground storage tank reported in 2001.
9	7132 E. County Line Rd. Littleton	Heritage Cleaners	Tetrachloroethylene solvent is used on site. No known spills.
10	7130 E. County Line Rd. Littleton	K & G Stores	Confirmed gasoline leak from an underground storage tank in 2002.
11	8750 S Yosemite St. Lone Tree	7-Eleven	Leaking underground (gasoline) storage tanks were closed in 2003 and 2010.

**Figure 4-14
Hazardous Material Sites**



Mitigation of Proposed Action Hazardous Material Impacts: Because contaminated soil and groundwater may be encountered along C-470, mitigation measures would include development of a site-specific Materials Handling Plan, in accordance with CDOT's *Standard Specifications for Road and Bridge Construction*.

During final design, soil and groundwater testing would be conducted, if necessary, for hazardous material sites that would be directly impacted by construction. In cases where total avoidance of contaminated materials is not possible, measures would be developed to protect workers during construction, in compliance with environmental regulations.

Prior to alteration or demolition of bridges (e.g., over South Platte River), guardrails or sign structures, an asbestos hazardous materials survey and a lead paint survey would be conducted per CDOT's *Standard Specifications for Road and Bridge Construction* and other relevant Occupational Safety and Health Administration, state, and federal regulatory requirements.

4.3.13 Visual and Aesthetic Character

C-470 was constructed as the Centennial Parkway and is generally a visually appealing corridor with abundant open space and parks nearby. Adjacent land uses include commercial development at the eastern end of the project area, residential areas in the central portion and western end. There is minimal adjacent development with unattractive industrial uses.

A viewshed analysis conducted for the 2006 EA identified five viewsheds visible from the highway. Three of these are views towards mountains or bodies of water, and two are views towards distant concentrations of buildings (Denver Tech Center and downtown Denver Skyline). For more information about viewshed analysis, please see the *Visual Character and Aesthetics Technical Report*, found in **Appendix E**.

Generally the eastern portion of the project area near I-25 and the Park Meadows regional mall has a busier, more urban feel than the rest of the corridor. At the project's eastern terminus, the C-470/I-25 freeway-to-freeway interchange is a busy network of on-ramps, off-ramps and directional signage.

Corridor landscaping along C-470 consists of native grasses, not irrigated plantings. Nearly two dozen prairie dog colonies are located within CDOT ROW, with their mounds distinctively interrupting the grasses.

Planted trees are very common in nearby developments including neighborhoods and commercial areas. Within highway ROW (typically a total of 300 feet), trees may pose a safety hazard if they are too close to the highway. Due to available water, trees occur along the drainages that cross the highway, including the South Platte River. Generally, no rock outcroppings are visible within CDOT ROW. The concrete C-470 Trail is often visible the highway.

The existing grassy median helps to instill a rural or suburban character to the roadway, although the median is not necessarily picturesque. Due to the severity of past head-on crashes, the median includes a cable barrier for safety. Signs in the median are fairly rare, and roadway lighting is found primarily at interchanges, not along the mainline in-between them.

Figure 4-15 shows the existing typical four-lane highway with a grassy median and the C-470 Trail at right. Visual clutter at this location includes the cable barrier, guardrail protecting a lighted median sign, a radio antenna pole, and a massive cell phone tower in the distance (at Colorado Boulevard). Snow-capped mountains are visible on the (western) horizon, behind the radio antenna.

C-470 crosses over a number of arterial cross-streets, but passes under bridges structures at Quebec Street, Colorado Boulevard and Santa Fe Drive (and railroad bridges also at Santa Fe Drive).

Figure 4-15
Representative View along the C-470 Corridor



Figure 4-16 shows the southbound to eastbound flyover ramp at the Santa Fe interchange, which is the most notable roadway feature along the corridor. The flyover ramp was originally included as part of the Preferred Alternative in the 2006 C-470 EA, but was funded and built separately as a safety improvement project, so it is not part of the 2015 Proposed Action.

C-470 was constructed years prior to the development of CDOT's current design

standards, as described in CDOT's *Urban Design for Region 6* (note: now reorganized into CDOT Region 1). For this reason, there are many highway design inconsistencies along the corridor.

Several jurisdictions have expressed interest in incorporating interchanges within the project area into gateways to their respective communities. As such, they have requested some flexibility in the design treatments for

Figure 4-16
Santa Fe Flyover Ramps and Freight Railroad Bridges over C-470



these interchanges to achieve their community goals. Both Lone Tree and Highlands Ranch (Douglas County) use the Quebec Street interchange as gateways to their communities.

Looking at the roadway from nearby areas such as the Wolhurst Community or Chatfield State Park, the existing view includes a four lane highway, with a large grassy median, as seen in the typical section presented earlier in **Figure 2-3**.

Near C-470 interchanges, a moderate amount of signage is present, mostly directional overhead signs.

No-Action Alternative Visual Effects: The No-Action Alternative would result in no visual effects along C-470. This alternative would retain current aesthetic design inconsistencies.

Proposed Action Visual Effects: Adding two express lanes in each direction on most of the corridor and auxiliary lanes in many locations would change the visual character of C-470 from rural to more urban. Other major changes would be the elimination of the grassy median between I-25 and Broadway, and the addition of overhead toll collection gantries plus a large number of new roadway signs instructing motorists as to where they can enter or exit the express lanes and how much it would cost to use them. Because the toll collection gantries and added signage would require vertical structures, they would be visible from some nearby parks, trails and neighborhoods.

The Proposed Action would alter the character of the C-470 Corridor with regard to the following elements:

- Grassy median elimination
- Larger highway and interchange footprints
- Longer ramps
- Larger abutments
- More lighting
- More noise barriers
- More retaining walls

- More water detention ponds
- Tolling surveillance equipment
- Express lane signage
- C-470/I-25 direct-connect ramps
- New bridges over South Platte River

Clearly, the result of all of these changes would be a corridor than is more urban in character than the existing highway. C-470 would still traverse a suburban landscape with plentiful open space and parks, but the roadway itself would be more visually imposing. This will affect views of and to the roadway, but will only minimally affect motorists' views from the roadway.

The discussion of historic resources in this Revised EA separately notes the ways in which nearby historic resources are or are not affected by visual impacts under the Proposed Action. The C-470 project's visual impacts would not adversely affect the qualities that make those resources eligible for their historic status.

Mitigation of Proposed Action Impacts on Visual Resources: CDOT has developed a set of corridor-wide standard architectural treatments that would be used to create a more consistent appearance of the corridor, both when looking out from the roadway, and when looking in towards the roadway from nearby. After discussions with adjacent jurisdictions along C-470, design standards were created using existing features and unifying elements. This work was documented in the 2006 C-470 EA technical report on Visual and Aesthetic Character. That 241-page report is incorporated by reference. Common themes would order to provide a uniform suburban corridor look. Color would be added where practical, and subtle changes would be made to existing features to avoid reconstruction of the many architectural treatments on the existing highway.

New structures would incorporate existing colors on C-470 for bridges, lights, sign structures, sound barriers, retaining walls, and concrete railings. To add more interest, an accent pin stripe would be added to the

exterior sides of the new bridge rails and the tops of sound barriers and retaining walls.

Generally, retaining walls necessary for this project would be constructed with forms and textures consistent with CDOT design standards and existing features along the C-470 Corridor. Retaining walls constructed near Chatfield State Park would be textured and colored to match the existing native grasses in the area to create a more natural appearance for trail users and park users looking towards the highway. The largest retaining wall near the Chatfield dam would be tiered to provide a visual break in the height of the wall. CDOT will continue to work with Chatfield State Park during final design to develop the exact details for retaining walls in this area.

For the Proposed Action, overhead toll collection devices and signing would follow a region-wide standard for consistent viewing and driver expectancy/recognition, to be set by the High-Performance Toll Enterprise (HPTE) at a later date. These standards would remain flexible to comply with statewide unifying elements for other HPTE toll facilities, as they are developed.

If an adjacent jurisdiction such as Douglas County, Lone Tree, Highlands Ranch, and Littleton wishes to upgrade a particular interchange or other architectural feature beyond the established corridor standards at their expense, CDOT will coordinate with them to ensure that such upgrades would be compatible. To maintain a consistent appearance, an aesthetic treatment plan or menu of design features has been set by CDOT from which upgrades could be selected. As examples, upgrades could include textured sound walls, landscaping, and bridge identification markings.

4.3.14 Utilities

The location of utility lines is an important factor to consider during roadway construction. Minor utility lines are simple to relocate, but major utility lines are more

problematic, potentially affecting project design. Major utilities in the project area include water mains 60 inches or greater in diameter; electrical transmission lines; fiber optic lines, including backbone, trunk lines, and fiber considered critical to national security; and large sanitary sewer lines 60 inches or greater in diameter. All major utilities in the project area were inventoried and included in the utility impact analysis.

The results of this effort are presented in the *Utilities Technical Report* in **Appendix E**. **Table 4-17** indicates that CDOT and three private owners account for more than half of the utility lines in the project area.

Table 4-17
Potential Utility Conflicts along C-470

Resource Type and Operator	Number of Resources		
	Total	%	Major
Electric: Xcel Energy	28	15%	3
Fiber Optic: CDOT ITS	25	14%	4
Water: Denver Water	21	11%	5
Natural gas: Xcel Energy	15	8%	7
Fiber Optic: Comcast	12	7%	9
All others, including two railroads	83	45%	17
TOTALS	184	100%	45

Most utility infrastructure is privately owned by corporations providing telephone, communication, electrical, and gas service to communities in the C-470 project area. Local government typically provides public water and sanitary service to its respective jurisdictions. Above ground and overhead infrastructure is present throughout the project area, located within and outside the existing ROW.

No-Action Alternative Utility Impacts: No effects to utilities would occur under the No-Action Alternative. Therefore, no mitigation would be needed.

Proposed Action Utility Impacts: The Proposed Action would require a number of utility relocations. Exact details would be determined during final design. In some locations, the existence of major utility lines

parallel to C-470 creates potential design conflicts that would preclude various other project mitigation features, such as creation of a water detention pond or a noise berm. These issues have been considered in the conceptual design of the Proposed Action to identify solutions that best balance any conflicting needs.

Mitigation for Proposed Action Utility Impacts:

Where ROW acquisition is required, or when a publicly held utility must be relocated to accommodate a highway project, it is generally the project's responsibility to fund the related construction for relocation. Utility relocation requirements would be defined during final design.

4.4 BIOLOGICAL ENVIRONMENT

The biological environment for the project area consists of the natural resources within one mile of C-470. The following resources are assessed in this section:

- 4.4.1 Common Wildlife
- 4.4.2 Threatened and Endangered Species
- 4.4.3 Wetlands and Waters of the United States
- 4.4.4 Prime and Unique Farmlands
- 4.4.5 Vegetation, including Noxious Weeds

4.4.1 Common Wildlife

Although much of the project area is highly developed, a large number of wildlife species make use of riparian habitat and undeveloped or protected areas. Most species in the project area are well adapted to human disturbance. Common mammals in the area include:

- mule deer
- elk
- coyote
- red fox
- raccoon
- cottontail rabbit
- striped skunk
- deer mouse

A *Biological Resources Technical Report* prepared for this Revised EA is provided in **Appendix E**. Key findings from that report are presented in this section. In addition to consumption or disturbance of wildlife habitat, a key issue for a highway project is the

subject of wildlife movement across or under the roadway.

Figure 4-17 indicates the location of known wildlife habitat along the project area. Most of the stream crossings along C-470 serve as wildlife corridors under the highway. The most significant wildlife corridors are along the South Platte River and Big Dry Creek, where highway bridges allow for wildlife passage.

Other wildlife crossings include Willow Creek, Dad Clark Gulch, and the High Line Canal, where box culverts allow for some wildlife movement. Fifteen culverts have been inventoried along C-470 between Kipling Parkway and Broadway, with an additional eight culverts east of Broadway. The smallest of these is 36 inches in diameter. These culverts often serve as small mammal crossings.

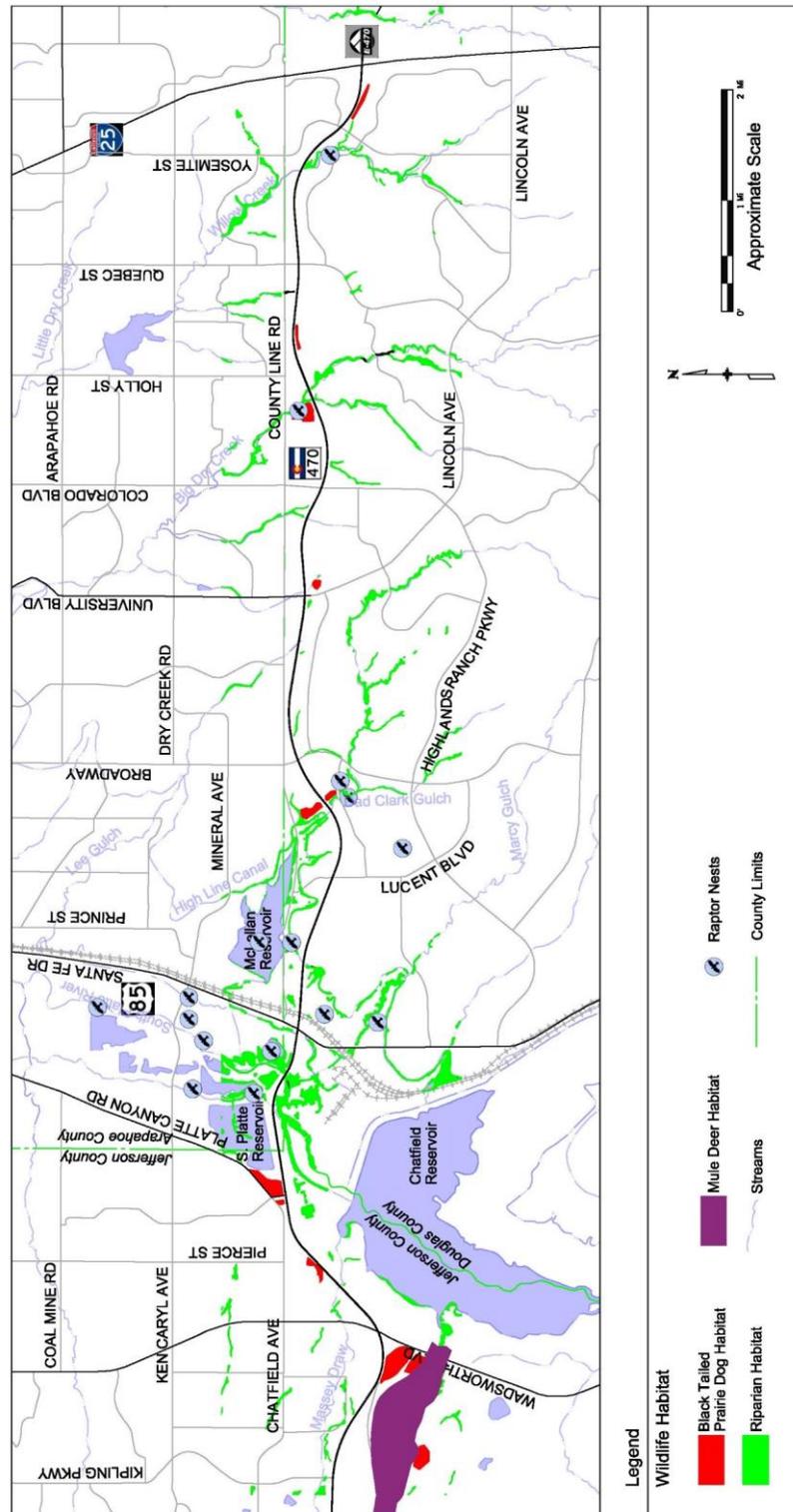
C-470 poses a substantial barrier to movement for these large animals. Mule deer are likely to use the South Platte River and Big Dry Creek bridges as movement corridors. Although the South Platte River is a major movement corridor, the existing C-470 bridges provide little room for wildlife movement along the river banks due to the existing trail and riprap. An existing chain link fence extending east and west from the South Platte River currently serves as deer fence.

An average of about six vehicle-wildlife collisions per year have been reported on C-470 in the project area. Most of these crashes involved deer and occurred at night. The highest localized concentration of vehicle-wildlife collisions along C-470 in the project area was in the vicinity of the South Platte River (eight crashes over five years).

No-Action Alternative Wildlife Impacts:

The No-Action Alternative would have no direct effect on wildlife resources in the project area. Indirect effects could result as traffic volumes increase, making movement across the highway even more difficult. Any adverse effects on aquatic resources from

**Figure 4-17
Wildlife Habitat**



stormwater runoff would continue at historical levels.

Proposed Action Wildlife Impacts: Impacts to various types of wildlife are summarized in **Table 4-18**. The table specifically addresses impacts to mule deer and elk, birds, and aquatic species. The black-tailed prairie dog, a well-known inhabitant of the C-470 Corridor, is discussed in the following section, regarding threatened and endangered species. It is neither threatened or endangered, but is considered a Colorado Species of Special Concern.

In general, adding travel lanes in the Proposed Action would increase the difficulty of wildlife movement across the highway, but would not appreciably change wildlife movement. While the Proposed Action would result in lengthening existing culverts and bridges, it would not eliminate any existing wildlife crossings. The reconstruction of the existing bridges over the South Platte River would benefit a variety of wildlife species, as noted below. During construction, birds and

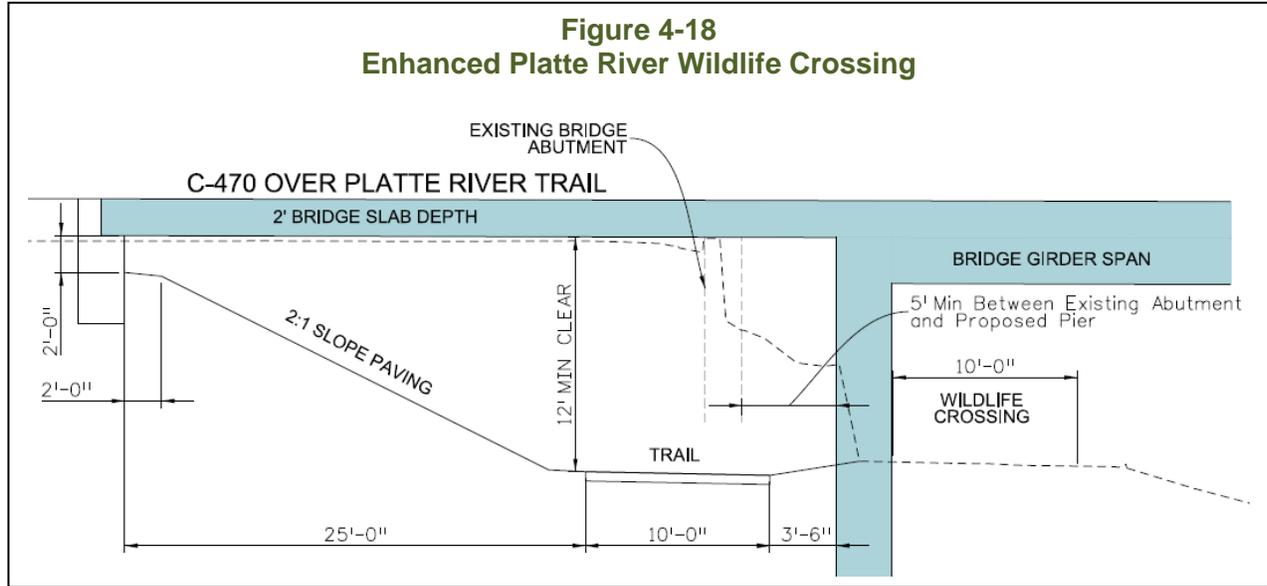
other wildlife may be disturbed by intrusion of human activity, noise and lights.

Mitigation of Proposed Action Impacts to Common Wildlife: The Proposed Action would remove and replace the parallel C-470 bridges over the South Platte River. The new bridges would be wider and taller than the existing bridge and would better accommodate wildlife movement between Chatfield State Park and South Platte Park. It would also provide more distance between the trail and the wildlife movement space. This design is shown in **Figure 4-18**.

After construction, re-vegetation near the bridge would include native riparian shrubs such as skunk brush and willow in attempt to attract deer to cross under C-470. The existing chain link fence that extends from the South Platte River along the north and south side of C-470 would also be replaced to serve as deer fence, directing large mammals to safely cross under C-470 at the South Platte River.

**Table 4-18
Potential Project Impacts to Wildlife**

Wildlife Type	Existing Conditions	Potential Project Impacts
Mule deer and elk	These mammals are common in the vicinity of the South Platte River and to the west. Most reported vehicle-wildlife crashes involve deer and occur at night.	Minor loss of roadside habitat. Adding more lanes would make C-470 more difficult to cross.
Birds	<ul style="list-style-type: none"> A large variety of birds visit Chatfield Reservoir and South Platte Park, on either side of C-470 along the South Platte River. Swallow nests exist on the C-470 bridges over the South Platte, Willow Creek and Erickson Boulevard. Active Red-Tailed Hawk nests are found within 1/3 mile of C-470. Other raptors, including Bald Eagles, may be found along the South Platte River. 	<p>Land-clearing and bridge construction activities have potential to disturb the nests of birds protected under the Migratory Bird Treaty Act.</p> <p>Construction noise and activity during nesting season could disturb raptor breeding and foraging. Loss of prairie dog colonies would slightly reduce available raptor prey.</p>
Aquatic species	Water flow in the South Platte River depends on release from the Chatfield Dam. The river has a major drop structure immediately north (downstream) of the C-470 bridges.	Downstream turbidity (suspended sediment) would be increased during construction involving bridges or culverts. This could affect downstream fish and invertebrates.



In response to SSPRD input requesting an improved wildlife crossing, CDOT developed a bridge design that moves the western bridge abutments farther to the west. The new design reduces the curvature of the trail under the bridge, increases the vertical clearance for bicyclists and pedestrians, and provides a wider buffer space between the trail and the river for use by wildlife. This wildlife use area will have a natural substrate and is expected to offer approximately eight feet of vertical clearance.

Any culverts replaced as part of this project would be maintained at current size or upgraded, subject to drainage restrictions, to maintain connectivity across C-470 for small and medium sized mammals.

Implementing water quality BMPs along the C-470 Corridor would improve wildlife habitat in riparian and aquatic areas by discharging cleaner stormwater runoff to receiving waters.

Although this wildlife corridor would be disrupted during construction, the post-construction condition would be an improved crossing that would improve wildlife movement through this area.

Regarding **raptors**, a survey for nesting raptors within one-third mile of C-470 would be performed to ensure that nesting raptors would not be disturbed by construction.

For the Red-Tailed Hawk, Colorado Parks and Wildlife (CPW) recommends no surface occupancy from February 15 to July 15 within a one-third mile radius of nest sites and associated alternate nests. The CDOW has developed recommended buffer zones and seasonal restrictions for new surface occupancy within certain distances of nest sites of several raptor species, including the Red-Tailed Hawk. Surface occupancy is defined as human-occupied buildings and other structures such as oil and gas wells, roads, railroad tracks, and trails.

If restricting construction within nest buffers during the breeding season is not practicable, prior to construction CDOT would coordinate with USFWS and CPW to develop a mitigation strategy to offset potential lost productivity.

Regarding **other bird nests**, prior to construction, CDOT would survey areas out to 50 feet beyond limits proposed for disturbance for the presence of migratory bird nests. If nests are present, CDOT would avoid

disturbing active nests by removing trees and shrubs during the non-nesting season and timing construction activity to avoid active nests during the nesting season. Bird nests found under existing bridge structures would be removed after August 31, but prior to April 1 in compliance with the Migratory Bird Treaty Act (MBTA) of 1918. Work outside the buffer area would be conducted in compliance with CDOT Standard Specification 240.

To prevent new nests from being constructed, netting would be installed under bridges and culverts during the non-breeding season or new nests under construction would be visited every three to four days to prevent new nests from being completed, unless project construction activity is continuous on a daily basis during active nesting season.

4.4.2 Threatened and Endangered Species

Federally threatened and endangered species are protected under the Endangered Species Act (ESA) of 1973 as amended. **Table 4-19** lists federal threatened and endangered species that could occur in the C-470 project area, as provided by USFWS. As part of this Revised EA, study biologists assessed the project area for the presence of habitat for listed species. The *Biological Resources Technical Report* in **Appendix E** documents these study efforts and findings.

The list begins with a group of five species that are included in the South Platte River Water Related Activities Program (SPWRAP). Actions undertaken in Colorado have the potential to affect these species many miles downstream, in Nebraska and other states. In consultation for the 2006 EA, USFWS concurred that the Preferred Alternative would not affect these species. The Proposed Action in this Revised EA is also additional of express lanes and would not affect these species.

Based on species-specific habitat requirements and the known conditions in the C-470 project area, ESA Section 7 consultation was conducted with regard to

three Federally-listed threatened or endangered species listed in **Table 4-19**:

- Preble's meadow jumping mouse
- Ute ladies'-tresses orchid
- Colorado butterfly plant

Based on documentation submitted to USFWS for this Revised EA, the USFWS provided a letter of concurrence dated June 15, 2015 indicating that results from the Proposed Action are not likely to adversely affect these species. This letter is included with the *Biological Resources Technical Report* in **Appendix E**.

State Listed Threatened and Endangered Species: The State of Colorado has developed a list of wildlife species that it considers to be threatened or endangered within Colorado. Some Federally listed species occur in Colorado and are on the state's list. Due to this overlap, **Table 4-19** includes all species on either list.

Of the state-listed terrestrial species shown in the table, based on habitat requirements and current distribution, the Burrowing Owl is the only terrestrial species likely to occur in the area. A state Threatened species, this small migratory owl occupies sparsely vegetated areas on the plains (typically prairie dog towns in eastern Colorado) during the summer breeding season. Twenty black-tailed prairie dog colonies covering a total of about 90 acres were observed within the project area. These colonies provide potential habitat for the Burrowing Owl and may support active nests during the breeding season. However, no Burrowing Owls were observed in the project area during site visits undertaken for the 2006 EA or this Revised EA.

Two State-listed fish species, the northern redbelly dace and the common shiner, could potentially occur in the South Platte River, Big Dry Creek and Willow Creek. However, based on available information, it is unlikely that these species are present in the C-470 project area. Therefore, the Proposed Action is unlikely to affect them.

Table 4-19
Potential of Threatened and Endangered Species to Occur in the C-470 Project Area

Species	Status Federal/State	Habitat Considerations	C-470 Project Area Potential
South Platte River SPWRAP Federally-listed Species			
Interior Least Tern <i>Sternula antillarum</i>	Endangered/ Not State listed	Inhabits reservoirs, lakes, and rivers with sandy shorelines or islands.	No suitable habitat
Pallid Sturgeon <i>Scaphirhynchus albus</i>	Endangered/ Not State listed	The closest documented occurrence of this species is in Nebraska.	Not known to occur in Colorado
Piping Plover <i>Charadrius melodus</i>	Endangered/ Not State listed	Inhabits reservoirs, lakes, and river habitat with bare, non-vegetated shorelines.	No suitable habitat
Whooping Crane <i>Grus Americana</i>	Endangered/ Not State listed	Uses wetlands, meadows, reservoirs, and river sandbars during migration.	No suitable habitat
Western prairie fringed orchid <i>Platanthera praeclara</i>	Threatened/ Not State listed	Occurs in Nebraska and several other states.	Not known to occur in Colorado
Federally Listed Non-SPWRAP Species (some are also State-Listed)			
Canada lynx <i>Lynx Canadensis</i>	Threatened/ Endangered	Could occur in Jefferson County high-elevation conifer forests.	No suitable habitat
Preble's meadow jumping mouse <i>Zapus hudsonius preblei</i>	Threatened/ Threatened	Occurs upstream of Chatfield Dam. C-470 is southern boundary of block clearance zone.	Potential habitat between C-470 and Chatfield Dam, but this area is isolated from known populations
Mexican Spotted Owl <i>Strix occidentalis lucida</i>	Threatened/ Threatened	Prefers mature conifer forests in the montane vegetation community.	No suitable habitat
Greenback Cutthroat trout <i>Oncorhynchus clarki ssp. stomias</i>	Threatened/ Not State listed	Could occur in Jefferson County cold water streams	No suitable habitat
Pawnee montane skipper <i>Hesperia leonardus montana</i>	Threatened/ Not State listed	The species prefers dry, open, ponderosa pine woodlands.	No suitable habitat
Ute ladies'-tresses orchid <i>Spiranthes diluvialis</i>	Threatened/ Not State listed	C-470 is the southern boundary of a USFWS-approved block clearance zone.	Unlikely to occur along project area streams due to dense vegetation present in riparian zones
Colorado butterfly plant <i>Gaura neomexicana var. coloradensis</i>	Threatened/ Not State listed	C-470 is the southern boundary of a USFWS approved block clearance zone.	Unlikely to occur along project area streams due to dense vegetation present in riparian zones
Colorado-Listed Species that are not Federally Listed			
Common shiner <i>Luxilus cornutus</i>	NA/ Endangered	Found in South Platte River and tributaries, including West Plum Creek.	Has potential to occur in the project area
Northern redbelly dace <i>Phoxinus eos</i>	NA/ Threatened	The fish requires slow moving streams and cold water temperatures.	Has potential to occur in the project area
Burrowing Owl <i>Athene cunicularia</i>	NA/ Threatened	Uses prairie dog towns for nesting and hunting.	Has potential to occur in C-470 prairie dog towns
Plains Sharp-tailed Grouse <i>Tympanuchus phasianellus jamesii</i>	NA/ Threatened	Could occur in Douglas County shrublands	No suitable habitat

Colorado Species of Special Concern: Colorado also lists Species of Special Concern, shown in **Table 4-20**. These species do not have statutory protection but are considered important to ecosystem health.

Four species of special concern are potentially present in Arapahoe, Douglas or Jefferson County. Two of these are birds for which there is no suitable nesting habitat in the C-470 project area. The other two species are small mammals. The black-tailed prairie dog is known to occur in the project area, with 20 active colonies using about 90 acres of land within CDOT ROW. The Northern pocket gopher could inhabit some of the open grasslands in the project area.

No-Action Alternative Impacts on Threatened and Endangered Species: The No-Action Alternative would not involve activity that would have a direct or indirect effect on any federally listed threatened, endangered, or candidate species.

Proposed Action Impacts on Threatened and Endangered Species: No adverse effects to Federally-listed threatened or endangered species are anticipated. Habitat for the State Threatened Burrowing Owl would be reduced with the loss of about 14 acres of black-tailed prairie dog colonies. Due to the abundance of habitat available along the Colorado Front Range, this loss of habitat would have only a minor effect on the Burrowing Owl and the

black-tailed prairie dog. Any impact to the northern pocket gopher would be minimal, as roadside land to be converted to highway use is already highly disturbed and therefore not good quality habitat. Their habitat consists usually of good soil in meadows or along streams.

Mitigation of Proposed Action Impacts on Threatened and Endangered Species:

Black-tailed prairie dogs are the only sensitive species for which specific mitigation would be provided. Prior to construction, colonies in the areas that would be impacted by the Proposed Action would be re-surveyed for any changes in activity. Construction would be phased to avoid and minimize direct effects to occupied prairie dog colonies. In areas where avoidance is not possible, CDOT would follow the 2009 *CDOT Impacted Black-tailed Prairie Dog Policy*. This policy consists of a series of steps which include avoiding and minimizing effects, relocating affected individuals if possible, and coordinating with CPW on approved removal methods if relocation is not feasible.

For colonies that would be only partially affected, prior to construction a visual barrier would be installed between the burrows that would be impacted and undisturbed portions of the colony. Following barrier installation, burrow openings in the construction area would be collapsed. The visual barrier and collapsed burrows encourage abandonment of burrows that would be affected, which

Table 4-20
Colorado Species of Special Concern Potentially Present in Arapahoe, Douglas or Jefferson County

Species	Habitat Considerations	C-470 Project Area Potential
Black-tailed prairie dog <i>Cynomys leucurus</i>	Uses grassland habitat.	Known to occur within C-470 ROW: 20 active colonies on 90 acres
American Peregrine Falcon <i>Falco peregrinus anatum</i>	Requires rocky outcrops for nesting.	No suitable nesting habitat; may use project area during migration
Mountain Plover <i>Charadrius montanus</i>	Requires open grassland for nesting.	No suitable nesting habitat; may use project area during migration
Northern pocket gopher <i>Thomomys talpoides macrotis</i>	Occupies a wide variety of habitats.	Has potential to occur in the project area

would reduce the likelihood of direct effects to individual prairie dogs.

4.4.3 Wetlands and Waters of the U.S.

In recognition of the ecological value of wetlands and open water, two major Federal mandates protect these resources. These are the Clean Water Act passed by Congress in 1972 and an Executive Order issued in 1977.

The Clean Water Act gives the USACE regulatory authority over the discharge of dredged or fill material into regulated surface water and any associated wetlands. The USACE's jurisdiction applies only to wetlands that have a surface connection to regulated surface water. Effects to all wetlands and waters of the U.S. must be avoided or minimized to the best extent possible, and unavoidable effects must be mitigated.

Executive Order 11990, Protection of Wetlands, protects isolated wetlands (those not connected to a regulated water of the U.S.) by directing the lead agency (in this case the FHWA) to avoid direct or indirect effects to wetlands wherever there is a practicable alternative for projects with federal funding or oversight. Executive Order 11990 and Department of Transportation Order 5660.1A, Preservation of the Nation's Wetlands (1978), require FHWA to mitigate for impacts to non-jurisdictional wetlands. For additional information on wetland delineation, see the *Wetland Delineation Report* (April 2013).

In accordance with the USACE delineation manual, *U.S. Army Corps of Engineers Wetlands Delineation Manual* (1987), wetlands were identified and mapped on the basis of three environmental characteristics including the prevalence of wetland vegetation, wetland hydrology, and hydric soils.

Using National Wetland Inventory maps and Natural Resource Conservation Service soil maps, the biologists initially identified locations where wetlands were likely to occur within the project area. These areas were

then field verified based on the presence of vegetation, hydrology, and soils as outlined in the USACE delineation manual.

Existing Conditions: During the summer of 2013, the project biologist surveyed wetlands within the project area in accordance with current CDOT and USACE wetland delineation requirements. This effort focused on just the wetlands that would be affected by the Proposed Action. Follow-up field work was performed in 2015.

The majority of the wetlands in the project area are adjacent to perennial streams that are tributary to the South Platte River. The principal streams and rivers within the C-470 project area include Massey Draw, the South Platte River, Dad Clark Gulch, Lee Gulch, Big Dry Creek, and Willow Creek.

Other wetlands are associated with hillside seeps or with drainage ditches along roads and do not have a surface connection to a regulated water of the United States. These are considered to be non-jurisdictional, meaning not within USACE regulatory jurisdiction.

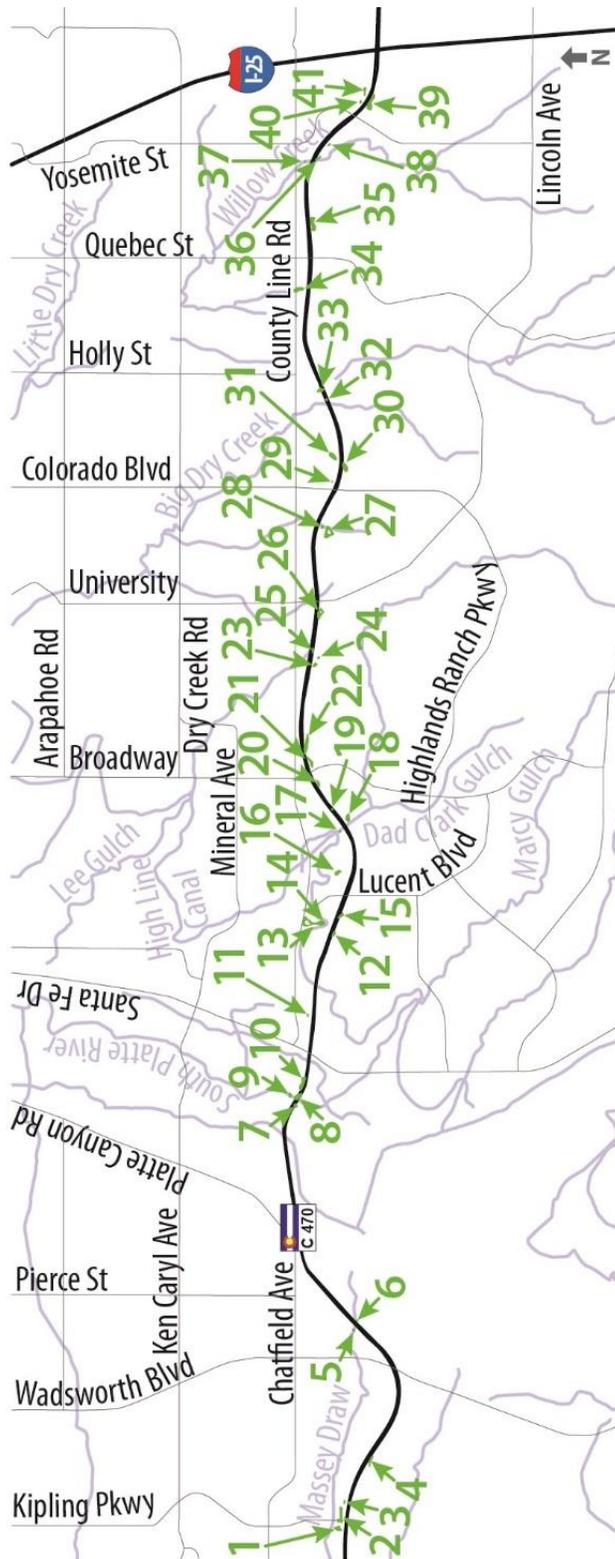
The wetlands identified in the study are shown in **Figure 4-19**. Wetland numbers are identified in Table 1 of the Wetland Finding located in **Appendix C**.

Wetlands with no surface connection to a stream or open water are typically located in roadside drainage swales along C-470 or in small depressions in the highway ROW.

In addition to natural streams, portions of two irrigation waterways, the High Line Canal and City Ditch, pass through the project area. The High Line Canal passes through the project area approximately one mile east of the South Platte River, and again as it crosses Dad Clark Gulch.

All wetlands do not perform all of their potential functions equally. CDOT uses a system called Functional Assessment of Wetlands (FACWet) to assess wetland

Figure 4-19
Location of Anticipated Wetland Impacts



functions and values. FACWet analysis was performed for four groups of wetlands along the C-470 Corridor, with the following results:

- South Platte River wetlands scored 0.78 (high end of functioning)
- Big Dry Creek wetlands scored 0.75 (high end of functioning)
- Willow Creek wetlands scored 0.71 (low end of functioning)
- Non-jurisdictional wetlands scored 0.60 (low end/impaired)

Every potentially affected wetland within the C-470 project corridor is represented by the groupings listed above.

Avoidance and Minimization of Wetland Impacts: During the development and design of proposed alternatives, effects to wetlands and waters of the U.S. were avoided and minimized to the extent practicable. Because wetland locations within the project area were identified early in the study process, and delineated prior to the completion of quantitative screening, measures were taken to avoid wetland effects by varying widths in sensitive areas and using retaining walls to limit encroachment into wetlands where total avoidance was not possible.

No-Action Alternative Wetland Impacts: The No-Action Alternative would not result in any direct effects to wetlands or waters of the U.S., although indirect effects such as water quality degradation due to untreated stormwater runoff would continue at historical levels.

Proposed Action Wetland Impacts: The Proposed Action would result in about 0.7 acre of permanent impacts and 1.3 acres of and temporary wetland effects, as indicated in **Table 4-21**.

A formal USACE determination of jurisdiction has not been requested by CDOT for the various wetlands that would be affected, but wetlands along streams are likely jurisdictional and isolated roadside ditches likely are not. New national policy on determining jurisdiction was promulgated jointly by USACE and EPA in June 2015, effective August 28, 2015 (EPA).

Indirect effects to wetlands, such as changing drainage patterns, increasing runoff volumes, changing wetland hydrology, and increasing delivery of non-point source pollution (such as sediment, de-icer, and petroleum products) could result from increasing the impervious surface area of the roadway. These effects will be avoided and minimized by implementing construction and post-construction BMPs as described in **Section 4.3.4** on water quality. For more information on wetland effects and mitigation, see the Wetland Finding, provided in **Appendix C**.

Mitigation for Proposed Action Wetland Impacts: Despite making every effort during alternative development and conceptual design to avoid and minimize impacts to all wetlands and open waters, previously described unavoidable impacts would result from implementing the Proposed Action.

**Table 4-21
Wetlands Affected by the Proposed Action**

Impact Type	Potentially Jurisdictional*	Potentially Non-Jurisdictional	Total
Wetland Impacts, Permanent	0.10	0.60	0.70
Wetland Impacts, Temporary	0.30	1.00	1.30

*Jurisdiction is based on USACE determination, subject to future consultation.

Section 404 of the CWA requires compensatory mitigation for permanent, direct impacts to waters of the U.S., including wetlands. Additionally, at the direction of Executive Order 11990, Protection of Wetlands (1977), and Department of Transportation Order 5660.1A, Preservation of the Nation's Wetlands (1978), the FHWA and CDOT also mitigate for impacts to non-jurisdictional wetlands.

In general, locally-important functions and values are present along existing stream banks, and the reliability of existing stream flows support adequate hydrology resulting in a high likelihood for long-term wetland sustainability. Therefore, on-site mitigation will be considered (but not required) for impacts to wetlands along existing stream banks. As an alternative, CDOT will consider purchasing mitigation bank credits instead, which is the expected mitigation for impacts to low-functioning non-streamside wetlands such as a roadside ditch.

4.4.4 Prime and Unique Farmlands

Prime and unique farmlands are protected under the Farmland Protection Policy Act of 1981. Prime farmlands are those considered to be of national importance and have been defined as land with the best combination of physical and chemical characteristics for producing feed, forage, fiber, and oilseed crops, and are available for these uses. Unique farmland is land other than prime farmland that is used for the production of specific, high-value crops.

According to Federal regulations at 7 CFR 658.2, "farmland" does not include land already in or committed to urban development," which includes lands identified as being within an urban area. Since all of the C-470 project area is included within the metro Denver urbanized area, no Federally-protected farmland is present. Accordingly, there would be no direct or indirect effects to this resource with the No-Action Alternative or the Proposed Action.

4.4.5 Vegetation, Including Noxious Weeds

The term vegetation refers to the collective plant cover present in an area. Vegetation communities are classified as distinct grouping of individual species that recur in areas with similar physical environmental characteristics (e.g., climate, moisture availability, and soils). They are also defined by the presence of a few dominant species and their physical appearance.

The C-470 project area is located in the westernmost edge of the plains shortgrass ecosystem. Historically, this ecosystem has been dominated by blue grama and buffalo grass. However, because of the high level of human development within the project area, little of this ecosystem remains. Most of the area is a mixture of commercial and residential uses with parks and open space scattered throughout, especially in the western third of the project area. Humans have influenced the vegetation to one degree or another, from the highly disturbed commercial areas to the woody riparian banks of the South Platte River.

Grasslands: Portions of the project area, primarily in Chatfield State Park and in undeveloped uplands along drainages, support disturbed native grasslands. Most of the disturbed native grasslands in the project area have been altered by the combined effects of past agricultural practices and urban development.

Commercial and residential areas, primarily between I-25 and Lucent Boulevard, consist of maintained, irrigated landscape including Kentucky bluegrass and planted ornamental trees and shrubs around the buildings.

Riparian Areas: Of all the vegetation types present within the C-470 project area, riparian vegetation has the highest ecological value. Riparian vegetation is found along most of the principal streams and in drainage ditches, ponds, and other water sources. Riparian areas generally consist of woody vegetation with an understory of grasses and forbs. Dominant

vegetation typically includes various species of trees and shrubs including plains cottonwood (*Populus deltoides*), willow (*Salix* spp.), chokecherry (*Prunus virginiana*), three-leaf sumac (*Rhus trilobata*), and Russian olive (*Elaeagnus angustifolia*) (a non-native weed species).

Listed as rare by the Colorado Natural Heritage Program, the American currant (*Ribes americanum*) shrub occurs in drainages with dense woody vegetation. Most of the riparian areas in the C-470 project area, including the South Platte River, provide potential habitat for this species. American currant populations are known to occur in South Platte Park, located on the north side of C470, just west of Santa Fe Drive interchange, in the South Platte River floodplain.

The Colorado Legislature passed Senate Bill 40 (SB 40) in order to protect and preserve fish, fishing waters, and all wildlife resources, including riparian vegetation associated with the streams of Colorado. SB 40 gives CPW jurisdiction over impacts to riparian areas and their associated streams resulting from state agency projects.

Noxious Weeds: Noxious weeds are non-native plant species that have been introduced into an environment with few, if any, natural biological controls. This gives them a competitive advantage in dominating and crowding out native plant species and can threaten the integrity of native plant communities. Because of the adverse environmental effects of weeds, both the federal and state governments have issued regulations regarding noxious weeds.

Executive Order 13112 directs federal agencies (including FHWA) to prevent the introduction of invasive species, control and monitor invasive species, and restore native species and habitats that have been invaded. Additionally, in 1990 the State of Colorado passed the Colorado Noxious Weed Act. As amended in 2003, the Act

requires land managers (in this case CDOT), to control certain species of noxious weeds.

CDOT mapped the noxious weeds and prepared a Noxious Weed Control Plan for the 2006 EA, but that plan is now outdated. More recently, CDOT statewide weed mapping efforts have included C-470, and field visits were made in 2013 to document weed-infested areas for this Revised EA.

No-Action Alternative Impacts on Vegetation: The No-Action Alternative would have no effect on vegetation in the project area.

Proposed Action Impacts on Vegetation: Direct effects to vegetation resulting from the Proposed Action would include construction activities associated with roadway widening, and bridge construction. In addition to herbaceous vegetation, hundreds of trees and shrubs likely would be removed during construction. Temporary and permanent impacts totaling up to 2.77 acres of riparian habitat are anticipated at eight sites in four drainages: Massey Draw (4 sites), Willow Creek (2), Big Dry Creek, and the South Platte River.

Indirect effects to vegetation include the introduction or spread of noxious weeds. Most of the disturbance associated with the Proposed Action would be to areas mapped as maintained uplands, which includes the ROW.

Mitigation of Proposed Action Impacts on Vegetation: To minimize the adverse effects of disturbance to all the vegetation types resulting from the Proposed Action, CDOT's revegetation practices will be followed. Areas temporarily disturbed during construction would be reseeded after construction with a native seed mix reviewed and approved by a CDOT landscape architect. Seeding would occur during appropriate seasonal timeframes to ensure that seeds take root and germinate. If out of season, the earth would be

protected from erosion with mulch and mulch tackifier.

Permanent seeding would occur throughout the project, and disturbed areas would be completely revegetated as soon as practicable. Trees adjacent to the project area that would not be removed would be protected by erecting plastic barricade fencing to avoid unintentional damage. Removed native trees greater than 2 inches in diameter at breast height will be replaced on at least a one to one basis.

The Colorado Department of Natural Resources and CDOT entered into a memorandum of agreement in 2005 that requires Colorado Parks and Wildlife to review plans submitted by state agencies proposing actions with adverse impacts to streams protected under SB 40 and grants SB 40 Certification for actions that include appropriate measures to eliminate or diminish adverse effects to such streams or their banks or tributaries.

In compliance with the memorandum of agreement, CDOT would apply to CPW for SB 40 Certification at least 60 days prior to construction.

Prior to construction, CDOT will update its weed mapping of the project area and prepare a current Integrated Noxious Weed Management Plan. The plan will include a variety of species-specific control methods based on the size of the weed populations and the surrounding landscape. Some of these methods include cutting and removing the noxious weeds, mowing vegetation in the ROW, and using carefully selected herbicides targeted for the particular species and growth stage.

Following construction, the site would be monitored for the need for follow-up weed control at least twice over the first growing season.

4.5 SECTION 4(f) IMPACTS

Under Section 4(f) of the USDOT Act of 1966, FHWA (and other USDOT agencies) cannot approve the use of land from historic sites, publicly owned parks, recreation areas, or wildlife refuges unless there is no feasible and prudent alternative to the use and the action includes all possible planning to minimize harm to the property, or if the use will have a *de minimis* impact to the property. (See text box, next page).

The Proposed Action would not require land from any protected property identified in **Section 4.2.6, Parks and Recreation**, or **Section 4.3.7, Historic Resources**. However, it would affect the following four Section 4(f) resources in ways that necessitate consultation with affected parties:

- City Ditch (historic)
- Mary Carter Greenway Trail (recreation)
- High Line Canal Trail (recreation)
- Willow Creek Trail (recreation)

These Section 4(f) resources are discussed below.

The C-470 Trail was not listed in **Section 4.2.6, Parks and Recreation**, but instead was described in **Section 3.2.11, Bicycle and Pedestrian Facilities**. As noted there, CDOT owns this paved, multiuse trail that parallels C-470 for its entire length. The C-470 Trail serves the important transportation purpose of providing east-west mobility and offering cyclists a safe route that is not on the busy, high-speed freeway. As a CDOT-owned transportation facility, it is not considered a Section 4(f) recreation resource.

4.5.1 *De Minimis* Finding for City Ditch

The City Ditch (5AH254.7 and 5DA987.1) was described previously as an historic resource in **Section 4.7**. Past actions including C-470 original construction in 1982 to 1985 caused much of the

historically open-channel City Ditch to be piped underground, resulting in a loss of historic integrity for this short segment of the overall multi-mile historic ditch. The segment affected by the C-470 Proposed Action has been determined non-supporting of the overall eligibility of this resource.

Although no easement or right-of-way acquisition is needed at the Ditch's C-470 crossing, the project will require realignment and reconstruction of the ditch to accommodate highway construction. This constitutes a "use" under Section 4(f) because it requires the permanent incorporation of a small area of land associated with the resource to be incorporated into the transportation infrastructure.

In August 2013, CDOT contacted with the State Historic Preservation Office (SHPO), as the Official with Jurisdiction over historic resources, as well as five Section 106 (36 CFR 800) Consulting Parties regarding recommended findings of eligibility and Section 106 effect for the City Ditch resource.

Through this Section 106 consultation process, it was determined that the C-470 Proposed Action would result in *no adverse effect* to the City Ditch (resource 5AH254/5DA987, including segment 5AM254.7/5DA987.1). In accordance with 23 CFR 774.17 a finding of *no adverse effect* means that effects to this Section 4(f) resource would be *de minimis*.

In accordance with the coordination requirements of 23 CFR 774.5(b)(1), notification of *de minimis* findings for this

23 CFR 774.17, Definitions

De minimis impact.

(1) For historic sites, *de minimis* impact means that the Administration has determined, in accordance with 36 CFR part 800 that no historic property is affected by the project or that the project will have "no adverse effect" on the historic property in question.

resource was sent to SHPO and the consulting parties by letters dated November 26, 2013. CDOT provided full documentation of this process to FHWA in a letter dated January 21, 2014, and FHWA provided written concurrence with this *de minimis* finding on March 21, 2014.

In summary, all applicable Section 4(f) requirements have been satisfied for the Proposed Action's impacts to the City Ditch. Documentation regarding this finding is found in **Appendix A, Agency Correspondence**.

4.5.2 Section 4(f) Determination for Trail Impacts

For the three trail crossings that would be temporarily closed to construct the Proposed Action, USACE owns the land at one site (Mary Carter Greenway Trail) and CDOT owns the land for the other two (High Line Canal Trail and Willow Creek Trails), although in each case the trail is maintained by a separate recreational district.

Mary Carter Greenway Trail: The Mary Carter Greenway Trail begins inside Chatfield State Park at its junction with the C-470 Trail and extends northward for many miles, first crossing under C-470 and then traversing South Platte Park. Like C-470 itself, The Mary Carter Greenway Trail is located on an easement granted by USACE. The trail was built and is maintained by the South Suburban Parks and Recreation District (SSPRD).

CDOT plans to reconstruct and improve this trail in conjunction with replacement of the two parallel C-470 bridges that cross over the South Platte River and the trail located on its west bank. The existing crossing is depicted in **Figure 4-20**.

CDOT met twice with SSPRD staff in developing of the conceptual design for the South Platte River bridges, including the Mary Carter Greenway Trail. The first meeting was held to learn SSPRD's concerns about the existing trail crossing.

Figure 4-20
Mary Carter Greenway Trail Crossing
under C-470 (view southward)



SSPRD indicated its strong desire that horizontal and vertical clearances under C-470 should be improved, and that the new bridges should offer an improved wildlife crossing under C-470.

The second meeting was held to review the conceptual design, shown previously in **Figure 4-18**. The second meeting also included a review of potential detours for use during temporary trail closures, as shown in **Figure 4-21**.

The conceptual design for the new C-470 bridges includes a trail and wildlife crossing that meet SSPRD's desires and represent a substantial enhancement over the existing trail crossing. Accordingly, this trail impact will be cleared using FHWA's transportation enhancement exception. It is anticipated that written agreement from SSPRD will be received in July or August 2015.

Section 4(f)
Transportation Enhancement Exception

The proposed impacts to the Mary Carter Greenway Trail meet the requirements of 23 CFR 774.13(g), the exception allowed for transportation enhancement projects because:

- (1) The use of the Section 4(f) property is solely for the purpose of preserving or enhancing an activity, feature, or attribute that qualifies the property for Section 4(f) protection; and
- (2) The official(s) with jurisdiction over the Section 4(f) resource (i.e., SSPRD) agrees in writing to the statement above.

Figure 4-21
Potential Temporary Detours for Mary Carter Greenway Trail



Two detours are available to link the Mary Carter Greenway Trail north of C-470 to the C-470 Trail south of the highway.

Western detour: From the west, follow the Columbine Trail along Chatfield Avenue and Platte Canyon Road. Then take the Mineral Trail along Mineral Avenue to Mary Carter Greenway Trail.

Eastern detour: From the east, follow the High Line Canal Trail to the Mineral Trail. After crossing Santa Fe Drive, continue on the Railroad Spur Trail to Mary Carter Greenway Trail.

High Line Canal Trail: The High Line Canal Trail closely parallels another historic irrigation feature, the High Line Canal, which has historic use taking water from the South Platte River south of C-470 downstream to the Denver metro area. The trail and the canal are conveyed under C-470 through separate culverts just east of Erickson Boulevard, which is east of the C-470/ Santa Fe intersection. **Figure 4-21** presents an aerial view of this crossing.

This portion of the trail is maintained by the Highlands Ranch Metro District (HRMD). This crossing also is part of CDOT's C-470 commuter trail that parallels the highway. Impacts at this crossing will be temporary closures with signed detours for the safety of trail users during construction of the C-470 improvements passing over it. No reconstruction of this trail is needed.

Denver Water has a permanent easement allowing its staff to use this trail for inspection of the canal. After receiving documentation of the proposed impacts from CDOT, Denver Water staff indicated in June 2015 that they have no issues with the project but request at least a two-week advance notice before any closure.

Since the trail is maintained by HRMD under an agreement with HRMD and CDOT, CDOT will also coordinate closures and detours with HRMD staff when the project gets underway. CDOT anticipates receiving documentation from HRMD pursuant to 23 CFR 774.14(d)(5) in July or August 2015.

CDOT has identified a potential detour route to mitigate the temporary trail closure, as

The temporary closure of the High Line Canal Trail meets the requirements for Section 4(f) temporary occupancy, pursuant to 23 CFR 774.13(d), because:

- (1) The duration of any trail closures will be limited and much shorter than the duration of the entire project, and there would be no change in the ownership of the land.
- (2) The scope of the work must be minor, not changing the trail.
- (3) There are no anticipated permanent adverse physical impacts, nor will there be interference with the protected activities, features, or attributes of the property, on either a temporary or permanent basis; a detour route is available to convey non-motorized traffic across C-470 at a nearby location.
- (4) The land being used (if any) would be returned to a condition which is at least as good as that which existed prior to the project.
- (5) Documented agreement regarding the above conditions will be obtained from the official(s) with jurisdiction (i.e., HRMD) over the High Line Canal Trail.

shown in **Figure 4-22**. This route is subject to change during ongoing coordination with HRMD and CDOT's design-build contractor.

Figure 4-22
High Line Canal Trail Crossing under C-470

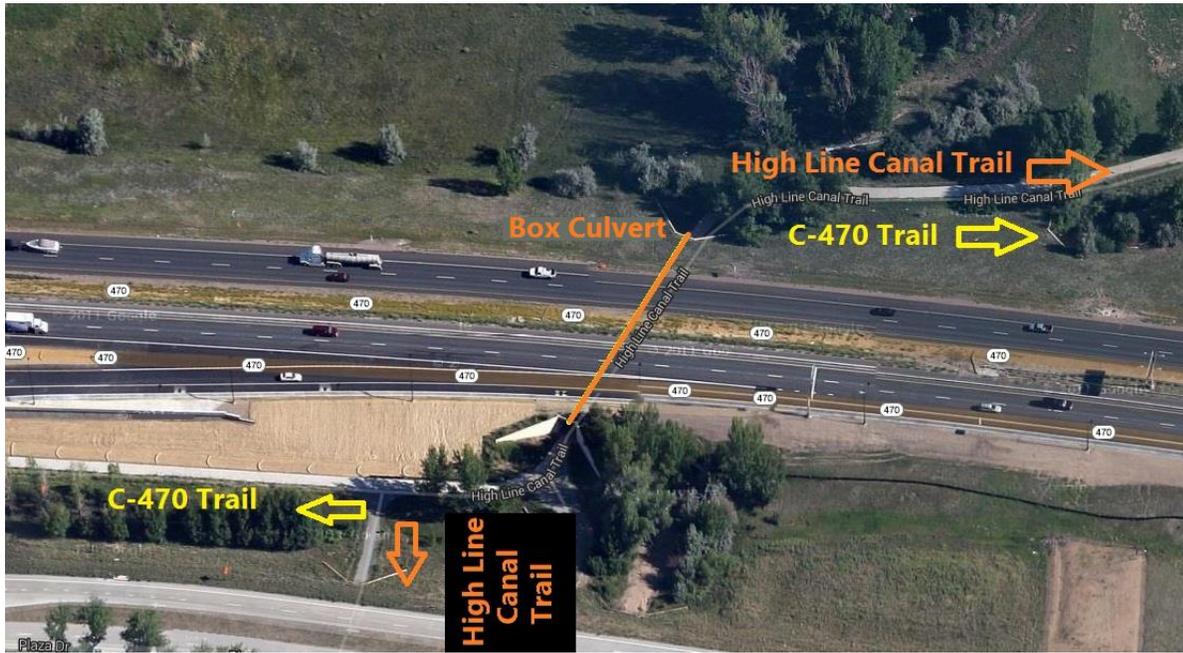
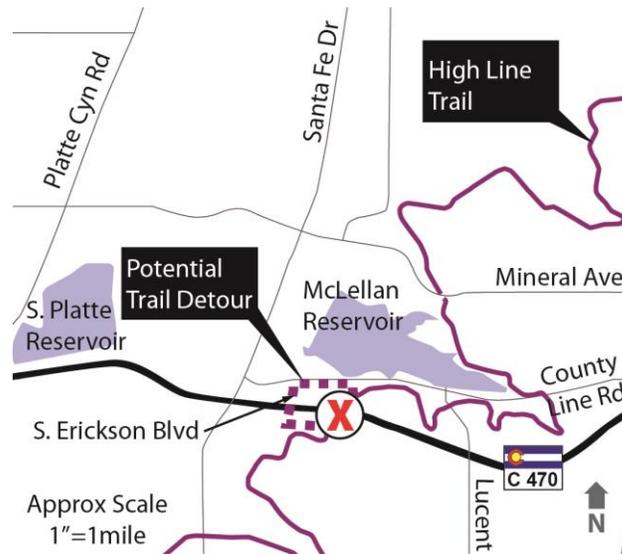


Figure 4-23
Potential Detour for Temporary Closure of High Line Canal Trail



Clockwise from the closure (red X), this detour uses the C-470 Trail to Erickson Boulevard, then County Line Road to Primo Road, back to the High Line Canal Trail.

Willow Creek Trail: The Willow Creek Trail is another trail maintained by SSPRD. It crosses C-470 along with its namesake drainage through a double culvert located west of Yosemite Street. An aerial view of the site is provided in **Figure 4-23**.

This trail would be subject to temporary closures for the safety of its users while C-470 reconstruction and widening takes place overhead. No reconstruction of this trail is needed. The trail culvert will be extended slightly to the south. This impact would result in a Section 4(f) temporary occupancy (see text box). CDOT has identified a potential detour as shown in **Figure 4-24**.

CDOT anticipates receiving documentation from SSPRD pursuant to 23 CFR 774.14(d)(5) in July or August 2015.

Figure 4-24
Willow Creek Trail Crossing under C-470



The temporary closure of the Willow Creek Trail meets the requirements for Section 4(f) temporary occupancy, pursuant to 23 CFR 774.13(d), because:

- (1) The duration of any trail closures will be limited and much shorter than the duration of the entire project, and there would be no change in the ownership of the land.
- (2) The scope of the work will be minor, extending one end of the existing culvert under C-470.
- (3) There are no anticipated permanent adverse physical impacts, nor will there be interference with the protected activities, features, or attributes of the property, on either a temporary or permanent basis; a detour route is available to convey non-motorized traffic across C-470 at a nearby location.
- (4) The land being used (owned by CDOT) would be returned to a condition which is at least as good as that which existed prior to the project.
- (5) Documented agreement regarding the above conditions will be obtained from the official(s) with jurisdiction (i.e., SSPRD) over the Willow Creek Trail.

Figure 4-25
Potential Detour for Temporary Closure of Willow Creek Trail



Clockwise from the closure (red X) this detour follows Park Meadows Drive to Acres Green Drive, then Parkway Drive back to Willow Creek Trail.

Mitigation for Temporary Trail Closures:

The mitigation for Section 4(f) trail closures was specified earlier in the discussion of Park and Recreation Resources (EA **Section 4.2.6**) and is as follows:

CDOT will continue to work closely with the owners of any affected trails, as well as with bicycle groups and other interested parties to minimize any disruption of trail systems due to the Proposed Action. Feasible detour routes for the three trails facing temporary closures have been identified. CDOT will provide detour signage indicating not only the temporary routes but the approximate duration of the detour timeframe. CDOT will provide a minimum two-week advance notice to SSPRD and HRMD prior to any temporary trail closure.

Additionally, CDOT's contractor will be required to obtain SSPRD's schedule of major bicycle events scheduled for the Mary Carter Greenway Trail, with the goal of minimizing any construction conflicts with planned major events.

4.6 SUMMARY OF EFFECTS AND MITIGATION

Table 4-22 summarizes the effects for the No-Action Alternative and the Proposed Action,

as discussed in **Sections 4.2** through **4.4** of this chapter. The purpose of this table is to provide a concise, side-by-side comparison of the effects of these two alternatives.

Table 4-22
Summary of Effects

Resource	Effects of No-Action Alternative	Effects of Proposed Action
Transportation, Chapter 3	Limited available capacity on C-470 would constrain traffic getting to/from the adjacent local arterials and lengthen the peak period. Future congestion and delay would worsen from current conditions.	Operations and travel times on mainline would improve along the express lanes while general purpose lanes would operate at the levels comparable to existing conditions, as detailed in Chapter 3 . Approximately 5.8 miles of the C-470 Trail would be relocated/replaced. In affected portions, the trail will be shifted up to 167 feet outward from its existing course, but generally 45-50 feet. During construction, C-470 traffic speeds may be reduced in work zones and by construction-related congestion.
Demographics, page 4-2	Continued population and employment growth is expected along the corridor, even with a congested C-470.	The Proposed Action is not expected to alter expected population and employment growth along the corridor.
Minority and Low Income Populations, page 4-6	No effects to minority or low-income populations	An existing noise wall along the Westbound on-ramp from Santa Fe Drive will be relocated a few feet closer to the adjacent, low-income Wolhurst Mobile Home Community. These effects are not disproportionately high and adverse.
Economic Considerations, page 4-7	Increased cost of travel time due to congestion may affect business location and home rental/purchase decisions	Construction activity would increase temporary employment opportunities. Local construction material purchases would benefit businesses in the region. Motorists, passengers and freight would incur economic cost (value of time) due to C-470 congestion during construction.
Land Use, page 4-11	No change in land use patterns.	Same as No-Action Alternative. The Proposed Action would not add or eliminate local access to the freeway.
Right-of-Way, page 4-14	No right-of-way acquisition	The Proposed Action results in the need to acquire 3.48 acres of right-of-way, 31.14 acres of permanent easement, and 15.42 acres of temporary easement. The 3.48 acres are partial acquisitions from six (larger) parcels that are all privately-owned, non-residential land. No business or residential relocations would be necessary. No change to the USACE easement is needed.
Parks and Recreation, page 4-16	Increased traffic would increase noise levels at adjacent parks and recreation areas; access would become more difficult and time consuming with increased congestion	The Mary Carter Greenway Trail under C-470 would be reconstructed to provide better vertical clearance and sight distance; three trails would experience temporary closures and detours during construction – Mary Carter Greenway Trail, Highline Canal Trail, and Willow Creek Trail. Parks and trails near the freeway would experience increased noise levels. New retaining walls would alter views from inside Chatfield State Park looking north.

Table 4-22 (continued)
Summary of Effects

Resource	Effects of No-Action Alternative	Effects of Proposed Action
Land and Water Conservation Fund Assisted Properties, page 4-18	No LWCF properties affected	No land LWCF property would be acquired.
Highway Noise, page 4-21	Model predictions indicate that 235 households in 14 neighborhoods would exceed CDOT Noise Abatement Criteria, as would parks and trails near the freeway.	Without mitigation, 469 households in 16 neighborhoods would exceed CDOT Noise Abatement Criteria, as would parks and trails near C-470, and outdoor areas at several restaurants. Unlike the No-Action Alternative, the Proposed Action includes new noise barriers recommended for seven affected locations. One of these barriers would benefit three apartment complexes.
Air Quality, page 4-27	Carbon monoxide, ozone, and particulate matter levels would be within EPA-approved emission budgets.	Carbon monoxide, ozone, and particulate matter levels would be within EPA-approved emission budgets. The Proposed Action would not attract increased truck traffic so would have little effect on mobile source air toxics. Fugitive dust emissions and exhaust from heavy machine would be generated during project construction.
Water Quality, page 4-36	Increased traffic due to regional growth will increase pollutant loading in roadway runoff. No change to existing impervious surface area (204.9 acres); limited opportunity to decrease highway runoff into adjacent water sources.	Increased traffic due to regional growth will increase pollutant loading in roadway runoff. Impervious surface would increase to 324.7 acres, adding 119.8 acres to the 2015 existing condition. An estimated 185.1 acres would be addressed with BMPs to improve water quality of highway run-off into adjacent water sources.
Hydrology and Hydraulics, page 4-38	No effects	More impervious surface area would cause increased runoff volume and peak flow rates from highway. The C-470 culvert east of Spring Creek and bridges over South Platte River would be replaced and enlarged; both would provide increased flow capacity.
Floodplains, page 4-41	No effects	Minor changes to flood elevations. A localized increase of less than one foot is expected at the Willow Creek crossing of C-470.
Historic Resources, page 4-42	No effects	Construction effects to City Ditch and the High Line Canal would result in no adverse effects.
Archaeological Resources, page 4-46	No effects	No effects to known archaeological resources; project excavation activity has potential to result in new finds, but this is not expected.
Native American Resources, page 4-47	No effects	No effects to known Native American resources of cultural or religious significance; project excavation activity has potential to result in new finds, but this is not expected.

**Table 4-22 (continued)
Summary of Effects**

Resource	Effects of No-Action Alternative	Effects of Proposed Action
Paleontological Resources, page 4-48	No effects	No effects to known paleontological resources; project excavation activity has potential to result in new finds, but this is not expected.
Geology and Soils, page 4-49	No effects	Geologic and soil conditions that may affect project design and construction include: expansive soils and bedrock, corrosive soils, steeply dipping bedrock, collapsible soils, and unstable slopes.
Hazardous Materials, page 4-50	No effects	During construction activity, especially excavation, contaminated soil or groundwater could be encountered.
Visual and Aesthetic Character, page 4-54	No effects	New visual elements will include added signage, tolling gantries, loss of grassy median, wider typical section, additional retaining walls and noise walls.
Utilities, page 4-55	No effects	Various utility lines would require relocation, most at public expense but some at CDOT expense. Accidental service interruptions, not anticipated, are possible but would be very short in duration.
Common Wildlife, page 4-56	Increased traffic would exacerbate existing disturbance to wildlife near the roadway and make crossing the highway slightly more difficult.	Minor habitat loss for mule deer and elk; additional travel lanes would increase difficulty for wildlife movement across the highway; foraging behaviors for raptors may be temporarily affected; minor reduction to raptor foraging habitat; swallow nests under existing bridges would be disturbed; 14.3 acres of black-tailed prairie dog habitat would be eliminated, reducing availability of prey for raptors including the Bald Eagle; minor, temporary disturbance to aquatic resources during construction; new, improved South Platte River bridges will enhance wildlife movement.
Threatened and Endangered Species, page 4-62	No effects	The Burrowing Owl has the potential to be found in the C-470 project area because of the existence of prairie dog colonies which provide its habitat and prey. Loss of 14.3 acres of prairie dog colonies would reduce the amount of potential Burrowing Owl habitat in the area. There are approximately 90 acres of prairie dog colonies in the CDOT project area and more colonies in other nearby areas.

Table 4-22 (continued)
Summary of Effects

Resource	Effects of No-Action Alternative	Effects of Proposed Action
Wetlands and Waters of the U.S. page 4-65	No effects	0.10 acre permanent effects and 0.30 acre temporary impact to likely jurisdictional wetlands; 0.60 acre permanent effects and 1.00 acre temporary effects to likely non-jurisdictional wetlands; CDOT's policy is to ensure no net loss of wetlands. Use of offsite wetland mitigation banks is anticipated.
Prime and Unique Farmlands, page 4-66	No effects (no resource in project area)	No effects (no resource in project area)
Vegetation, page 4-67	No effects	Up to 2.77 acres riparian habitat would be eliminated at eight locations in four drainages: Massey Draw (4 sites), Willow Creek (2), Big Dry Creek, and South Platte River. Hundreds of existing trees would be removed. Roadside areas would be disturbed during construction, potentially resulting in increased occurrence of noxious weeds.
Section 4(f) Resources, page 4-68	No effects	The Proposed Action effects trails and an historic site (as already noted above) that are protected by Section 4(f) of the U.S. DOT Act of 1966. The portion of the historic City Ditch that is beneath C-470 would be realigned and reconstructed (<i>de minimis</i> finding completed). The Mary Carter Greenway Trail would be reconstructed under C-470 (transportation enhancement exception), resulting in temporary trail closures/detours. The High Line Canal Trail and the Willow Creek Trail (culvert to be extended) that cross under C-470 would experience temporary closures/detours (temporary occupancy exception).

Table 4-23 summarizes the mitigation measures that would be part of the Proposed Action. These potential measures are described in detail in the respective sections of **Chapter 4**.

**Table 4-23
Summary of Mitigation Commitments**

#, Resource	Impact	Mitigation Commitment from Source Document	Responsible Branch	Timing/Phase that Mitigation Will Be Implemented
1. Transportation	C-470 congestion due to construction activity	CDOT will maintain at least two through lanes in each direction open for public travel throughout the construction process.	CDOT Region 1 Project Engineer	Construction
2. Transportation	C-470 temporary closure	Any necessary roadway closures (e.g., possibly for Santa Fe bridge replacement) would be limited to night time and extensive media notice would be provided, with safe detours identified and marked.	CDOT Region 1 Project Engineer	Construction
3. Transportation	Relocation of 5.8 miles of the C-470 Trail	New sections of trail will be constructed prior to closing any portion of the existing C-470 trail, to avoid disruption. However, closure and detour will be unavoidable where the C-470 Trail and High Line Canal Trail cross C-470 through a shared culvert. See commitment #5, Parks and Recreation, below.	CDOT Region 1 Project Engineer	Construction
4. Right-of-Way	CDOT would need to acquire 3.48 acres of right-of-way, 31.14 acres of permanent easement, and 15.42 acres of temporary easement.	All right-of-way transactions will be conducted in accordance with the Uniform Relocation Assistance and Real Property Acquisition Act of 1970, as amended. A CDOT ROW specialist will be assigned to each property owner to provide assistance with the ROW process.	CDOT Right-of-Way Branch	Pre-construction
5. Right-of-Way	Construction activity on temporary easement property may result in damage to that property.	Any temporary easement property disturbed during construction would be restored to its prior condition, or appropriate compensation will be provided.	CDOT Region 1 Project Engineer	Construction
6. Parks and Recreation	Temporary closure of Mary Carter Greenway Trail, High Line Canal Trail, and Willow Creek Trail	A minimum two-week advance notice would be provided to SSPRD and HRMD prior to any temporary trail closure. CDOT has identified available detour routes for each closure and would provide signage for trail users to inform them of the detour routes.	CDOT Region 1 Project Engineer	Construction

Table 4-23 (continued)
Summary of Mitigation Commitments

#, Resource	Impact	Mitigation Commitment from Source Document	Responsible Branch	Timing/Phase that Mitigation Will Be Implemented
7. Parks and Recreation	Temporary closure of the Mary Carter Greenway Trail could conflict with major bicycle events planned by SSPRD.	CDOT's contractor will be required to obtain SSPRD's schedule of major bicycle events scheduled for the Mary Carter Greenway Trail, with the goal of minimizing any construction conflicts with planned major events.	CDOT Region 1 Project Engineer	Construction
8. Highway Noise	A number of neighborhoods would experience noise impacts (> 66 decibels)	Noise barriers will be constructed where they are found to be reasonable and feasible, and where the majority of benefitted households voting on mitigation favor its installation. In final design, the actual lengths and locations of the recommended mitigation may vary for reasons such as terrain, utilities, property owner desires or easements.	CDOT Region 1 Project Engineer	Pre-construction; Construction
9. Highway Noise	Construction activities would result in noise and vibration.	CDOT will require its contractor to prepare a mitigation plan for noise and vibration, to consider a number of options identified in Section 4.3.1 .	CDOT Region 1 Project Engineer	Pre-construction
10. Air Quality	Construction activities would cause fugitive dust emissions	CDOT would require contractor implementation of dust control practices in accordance with Colorado Air Quality Control Commission Regulation No. 1 on fugitive emissions.	CDOT Region 1 Project Engineer	Construction
11. Water Quality	Increased runoff due to 120 acres of additional impervious surface	Permanent water quality features that are incorporated into the project's conceptual design to comply with CDOT's MS4 Permit for water quality treatment.	CDOT Region 1 Project Engineer	Pre-construction, Construction
12. Water Quality	Construction activity poses risks for spills, erosion, and other water quality problems during construction.	CDOT will prepare and implement a Stormwater Management Plan (SWMP) detailing how and where temporary BMPs will be used before, during and after construction, including rigorous compliance monitoring.	CDOT Region 1 Project Engineer	Pre-construction; Construction

Table 4-23 (continued)
Summary of Mitigation Commitments

#, Resource	Impact	Mitigation Commitment from Source Document	Responsible Branch	Timing/Phase that Mitigation Will Be Implemented
13. Hydrology and Hydraulics	Increased stormwater runoff could increase flows under C-470.	To prevent flooding, CDOT will replace an existing, undersized 72-inch culvert east of Spring Creek with a larger, 84-inch reinforced concrete pipe culvert to safely convey the estimated 100-year frequency design flow.	CDOT Region 1 Project Engineer	Construction
14. Floodplains	Replacing C-470 bridges over South Platte may trigger need for a FEMA map revision.	CDOT will prepare a more detailed analysis to determine if a FEMA map revision is required based on the final design of the new bridges. CDOT will prepare a FEMA map revision if needed.	CDOT Region 1 Engineering Staff	Pre-construction
15. Archaeological Resources	Excavation could unearth archaeological resources	If archaeological remains are exposed during any phase of construction associated with the study, work will be halted and the CDOT Senior Staff Archaeologist will be contacted to evaluate the discovery and coordinate appropriate Section 106 compliance actions with the SHPO and other agencies or entities, as necessary.	CDOT Region 1 Project Engineer, assistance from Staff Archaeologist if needed	Construction
16. Paleontological Resources	Excavation could unearth paleontological resources	CDOT will ensure that a qualified paleontologist is on site during major construction excavation to monitor for buried paleontological resources where known fossil-bearing deposits are mapped, but not currently exposed at the ground surface. If any potential fossils are unearthed during construction, work will be halted until the paleontologist can assess the significance of the find and make recommendations regarding resource protection.	CDOT Region 1 Project Engineer assistance from qualified paleontologist as needed	Construction

Table 4-23 (continued)
Summary of Mitigation Commitments

#, Resource	Impact	Mitigation Commitment from Source Document	Responsible Branch	Timing/Phase that Mitigation Will Be Implemented
17. Geology and Soils	Known conditions along C-470 require consideration in project design.	Geologic and soil conditions will be taken into consideration during final design in accordance with ordinary due diligence in engineering practice. Appropriate design features and construction methods will be used as needed in response to such conditions.	CDOT Region 1 Project Engineer	Pre-construction; construction
18. Hazardous Materials	During construction, especially excavation, contaminated soil or groundwater could be encountered.	CDOT will require its contractor to develop a site-specific Materials Handling Plan, in accordance with CDOT's Standard Specifications for Road and Bridge Construction.	CDOT Region 1 Project Engineer	Pre-construction; construction
19. Hazardous Materials	Demolition of bridges and other structures may result in exposure to asbestos materials or lead paint.	CDOT will require its contractor to conduct an asbestos hazardous materials survey and a lead paint survey prior to alteration or demolition of bridges, guardrails or sign structures. If found, proper handling and disposal of these materials would be required.	CDOT Region 1 Project Engineer	Pre-construction; construction
20. Visual and Aesthetic Character	C-470 visual character will become more urban due to new lanes, signage, noise barriers and toll equipment.	CDOT will design corridor improvements in accordance with Region 1 design standards to improve design consistency. If local governments desire to fund localized upgrades above the corridor standards, CDOT will work with them to pursue these possibilities.	CDOT Region 1 Project Engineer	Pre-construction
21. Utilities	Numerous utility lines under, over or near C-470 would need to be relocated.	The owners of private utility lines within CDOT ROW pay for relocation of their utilities. If utilities are on land newly being acquired for ROW, CDOT pays for the relocation.	CDOT Region 1 Project Engineer	Pre-construction; construction
22. Common Wildlife	Adding lanes would increase the difficulty of wildlife movement across C-470.	At the South Platte River, which is the corridor's most ecologically sensitive location, existing parallel C-470 bridges will be replaced and the new bridges have been designed specifically to enhance wildlife movement, providing a 10-foot wildlife movement corridor separated from the adjacent Mary Carter Greenway Trail.	CDOT Region 1 Project Engineer	Pre-construction; construction

Table 4-23 (continued)
Summary of Mitigation Commitments

#, Resource	Impact	Mitigation Commitment from Source Document	Responsible Branch	Timing/Phase that Mitigation Will Be Implemented
23. Common Wildlife	Adding lanes would increase the difficulty of wildlife movement across C-470.	The existing chain link fence that extends from the South Platte River along the north and south side of C-470 would also be replaced to serve as deer fence, directing large mammals to safely cross under C-470 at the South Platte River.	CDOT Region 1 Project Engineer	Construction
24. Common Wildlife	Adding lanes would increase the difficulty of wildlife movement across C-470.	After construction, re-vegetation near the bridge would include native riparian shrubs such as skunk brush and willow in attempt to attract deer to cross under C-470.	CDOT Region 1 Project Engineer	Post-construction
25. Common Wildlife/ Migratory Bird Treaty Act	Construction would occur within 1/3 mile from active nests of Red-Tailed Hawks and possibly other raptors, disturbing their breeding and foraging behaviors.	Prior to construction, CDOT will conduct additional field surveys to confirm the location of active raptor nests. Seasonal construction restrictions and exclusion areas will be established as necessary to comply with CPW buffer recommendations. If restricting construction within nest buffers during the breeding season is not practicable, prior to construction CDOT would coordinate with USFWS and CPW to develop a mitigation strategy to offset potential lost productivity.	CDOT Region 1 Biologist	Pre-construction; construction
26. Common Wildlife/ Migratory Bird Treaty Act	Nests of MBTA-protected birds may be disturbed during construction	Prior to construction, CDOT would survey areas proposed for disturbance for the presence of migratory bird nests. CDOT would avoid disturbing active nests by removing trees and shrubs during the non-nesting season and timing construction activity to avoid active nests during the nesting season.	CDOT Region 1 Biologist	Pre-construction; construction

Table 4-23 (continued)
Summary of Mitigation Commitments

#, Resource	Impact	Mitigation Commitment from Source Document	Responsible Branch	Timing/Phase that Mitigation Will Be Implemented
27. Common Wildlife/ Migratory Bird Treaty Act	Swallow nests on CDOT bridges and in culverts would be disturbed during construction	Bird nests found under existing bridge structures would be removed after August 31 but prior to April 1 for MBTA compliance. To prevent new nest establishment, netting would be installed under bridges and culverts during the non-breeding season or new nests under construction would be visited every three to four days to prevent new nests from being completed, unless construction activity is continuous on a daily basis during active nesting season.	CDOT Region 1 Biologist	Pre-construction; construction
28. Common Wildlife/ Aquatic Species	Construction activity would increase turbidity downstream from bridges or culverts.	Construction in riparian areas will be minimized and mitigated in accordance with SB 40 requirements and the SB 40 permit to be obtained from CPW when final design is completed. In compliance with the SB 40 memorandum of agreement, CDOT would apply to CPW for SB 40 Certification at least 60 days prior to construction. Water quality temporary BMPs will be implemented during construction, and permanent BMPs will be incorporated in the project design, improving long-term water quality.	CDOT Region 1 Biologist	Pre-construction; construction
29. Threatened/ Endangered Species	The Proposed Action would displace an estimated 14.3 acres of black-tailed prairie dog colonies.	Colonies in the areas that would be impacted by construction would be re-surveyed for any changes in activity. CDOT would follow the 2009 <i>CDOT Impacted Black-tailed Prairie Dog Policy</i> .	CDOT Region 1 Biologist	Pre-construction; construction
30. Threatened/ Endangered Species	The Proposed Action would displace an estimated 14.3 acres of black-tailed prairie dog colonies.	For colonies that would be only partially affected, prior to construction a visual barrier would be installed between the burrows that would be impacted and undisturbed portions of the colony. Following barrier installation, burrow openings in the construction area would be collapsed. The visual barrier and collapsed burrows encourage abandonment of burrows that would be affected, which would reduce the likelihood of direct effects to individual prairie dogs.	CDOT Region 1 Biologist	Pre-construction; construction

Table 4-23 (continued)
Summary of Mitigation Commitments

#, Resource	Impact	Mitigation Commitment from Source Document	Responsible Branch	Timing/Phase that Mitigation Will Be Implemented
31. Wetlands and Waters of the U.S.	0.70 acres of permanent wetland impacts and 1.30 acres of temporary impacts may occur.	CDOT has already minimized wetland impacts in conceptual design and will strive for further minimization during final design. Clean Water Act Section 401 and 404 permits will be obtained as appropriate. All impacts will be mitigated under CDOT's "no net loss" policy. Wetland replacement within the corridor will be considered but most likely an offsite wetland mitigation bank will be used.	CDOT Region1 Biologist	Pre-construction; construction
32. Vegetation – Riparian Area	Temporary and permanent impacts to riparian areas could total up to 2.77 acres.	CDOT will develop mitigation plans and submit them to CPW for SB 40 Certification at least 60 days prior to construction.	CDOT Region1 Biologist	Pre-construction; construction
33. Vegetation – Trees	Loss of hundreds of trees.	Trees not being removed would be protected by erecting plastic barricade fencing to prevent damage. In riparian areas, removed native trees at least two inches in diameter at breast height would be replaced on-site on a one-to-one basis. Trees four or more inches in diameter removed from non-riparian areas would be replaced elsewhere in the project area.	CDOT Region1 Biologist	Construction
34. Vegetation	Construction of the Proposed Action would damage roadside vegetation	Areas temporarily disturbed during construction would be seeded after construction with a native seed mix reviewed and approved by a CDOT landscape architect. Seeding would occur during appropriate seasons to ensure that seeds take root and germinate during the next growing season. If out of season, the earth would be protected from erosion with mulch and mulch tackifier. Permanent seeding would occur throughout the project.	CDOT Region1 Biologist	Construction; post-construction

Table 4-23 (continued)
Summary of Mitigation Commitments

#, Resource	Impact	Mitigation Commitment from Source Document	Responsible Branch	Timing/Phase that Mitigation Will Be Implemented
35. Vegetation – Noxious Weeds	Soil disturbance and importation of construction equipment would enable the spread of noxious weeds, already a problem along C-470.	Prior to construction, CDOT will update its weed mapping of the project area and prepare a current Integrated Noxious Weed Management Plan. The plan will include a variety of species-specific control methods based on the size of the weed populations and the surrounding landscape. The plan will be implemented throughout project construction as appropriate. Following construction, mitigated sites will be monitored at least twice over the first growing season and follow-up weed control will be provided where needed.	CDOT Region1 Biologist; CDOT Maintenance	Pre-construction; construction
36. Section 4(f) Resources	Construction of Proposed Action would involve reconstruction of Mary Carter Greenway Trail (transportation enhancement exception), plus temporary closure (temporary occupancy exceptions) for High Line Canal Trail and Willow Creek Trail.	CDOT will work with its contractor to minimize closure durations. CDOT and the contractor will coordinate with the entities that operate these trails (HRMD and SSPRD) to identify and sign suitable detours. At least two week's advance notice would be given to trail users. The contractor will be required to obtain SSPRD's schedule of major events on the Mary Carter Greenway Trail for use in planning to minimize conflicts.	CDOT Region 1 Project Engineer	Construction

4.7 CUMULATIVE EFFECTS

Regulations implementing NEPA require federal agencies to consider direct, indirect, and cumulative effects of a proposed federal action on the social, physical, and biological environment. Cumulative effects result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over time.

4.7.1 Past, Present and Reasonably Foreseeable Actions

Past, present, and reasonably foreseeable actions affecting the C-470 project area are summarized in **Table 4-23**. The actions show the effects of adding one million new residents to the Denver metro area since 1990 and another one million residents projected between 2015 and 2035. This growth has converted large quantities of grassland to urban development with paved and built surfaces. Each resident consumes land, air, water, food, shelter, energy and transportation services, which can be at the expense of the natural environment.

Urbanization from the Denver metro area has already occurred southward across C-470 into Douglas County between I-25 and US 85, and now is beginning to push southward along US85. In-fill is occurring north of C-470 with redevelopment and increased densities along Santa Fe Drive in Littleton, especially in areas served by light rail transit stations.

The South Platte River corridor including Chatfield State Park, South Platte Park and other parks and trails are increasingly used for public recreation. They are used by urban-adapted wildlife but are increasingly less able to sustain sensitive species. Hence, for example, the USFWS exclusion zone for the threatened Preble's Meadow Jumping Mouse indicates that the species is unlikely to occur north of C-470.

4.7.2 Potential for Cumulative Effects from the C-470 Proposed Action

If an individual study has no direct or indirect effects upon a resource, then it also has no cumulative effects upon that resource. The direct and indirect impacts of the Proposed Action were listed earlier in **Table 4-23**. Some of those findings are already cumulative in nature, such as traffic noise and air quality. Predictions of future noise are loudest-hour levels accounting for existing traffic plus future traffic growth. Carbon monoxide hotspot predictions for future air quality include estimated background concentrations coming into the area from the rest of the region, and emissions estimates for conformity analysis consider all regional vehicular emissions.

An assessment of the potential for cumulative effects to resources directly or indirectly affected by the C-470 Proposed Action is provided in **Table 4-25**.

A study of potential area-wide cumulative effects was prepared for CDOT by University of Colorado researchers in 2008 (Muller et al., 2008). It used C-470 as a case study for exploring cumulative effects relevant data and impact metrics. However, it focused on the western half of C-470 between I-70 and Kipling Parkway. The western half of C-470 has strong similarity to the eastern half in certain ways. The 2008 research study focused on two key metrics: increased impervious surface and loss of habitat for the black-tailed prairie dog. Impervious surface was identified as an indicator of water quality impacts, while prairie dog habitat was an indicator of overall ecological conditions.

These correspond to the largest-acreage impacts of the C-470 Proposed Action, which would add approximately 120 acres of impervious surface area and eliminate about 14 acres of roadside prairie dog habitat.

**Table 4-24
Past, Present and Reasonably Foreseeable Future Actions**

Action	Effects
PAST ACTIONS	
1975 – Chatfield Dam and Lake completed (begun in 1967 after devastating South Platte River flood in 1965). USACE land leased to Colorado State Parks in 1974 and Chatfield State Park opened in 1976.	Altered flow of South Platte River; replaced prairie with lake ecosystem and major attraction for birds; attracted vehicular recreation trips from throughout the region; floodplains downstream along South Platte converted to park and recreation uses
1980 to 1990 - existing C-470 built in stages as a State Highway, after being withdrawn as a planned Interstate Highway 470	Provided main east-west transportation link for high-growth area, replacing prairie habitat and hampering wildlife movement; introduced highway noise to the area; increased vehicle-related air pollution emissions in the area
1980 to 2015 Urban growth along C-470, includes the region's largest shopping mall (Park Meadows opened in 1996) and other retail development; Highlands Ranch residential development (100,000 residents) reached Buildout in 2014	Replaced prairie with urban land uses, displacing wildlife and hampering wildlife movement; increased impervious surface, contributing to water pollution; area increases demand for water supply, leading to South Platte Reservoir and others; major traffic growth increases highway noise
1991 – Toll highway E-470 opened, connected to C-470.	Provided direct route to Denver International Airport, which opened in 1995. Supported increased growth in the southeastern portion of the metro area.
2002 – NEPA Record of Decision for South I-25 Corridor and US 85 Corridor	Provided environmental clearance to widen I-25 from Denver to Castle Rock (done) and US85 from Castle Rock to Littleton (still underway). US85 corridor impacts wildlife movement and black-tailed prairie dogs
2003 – E-470 Extension to I-25 in northern Adams County in 2003 completed 75 percent of a beltway around the Denver region.	Together, C-470, E-470 and the Northwest Parkway total 85 miles. As more of the beltway is completed, likelihood of regional trips on C-470 increases.
2004 – Voters approve \$4.7 billion FasTracks light rail system	Southwest Line ends near Mineral Avenue, along Santa Fe Drive, north of C-470. Southeast Line has stations at Park Meadows Mall and Lincoln Avenue, at eastern end of C-470. Transit plan implemented with strong emphasis on increased density of development near stations.
2006 – Completion on \$1.67 billion T-REX I-25 expansion through Denver, including highway widening and the Southeast Corridor Light Rail Line	The newly added capacity enables more vehicles to get to and from C-470, potentially worsening C-470 congestion.
2006 – Denver's mayor (now Colorado's governor) announced the Mile High Million initiative to plant one million additional trees in Denver by 2025.	Increasing Denver's forest from 2.2 million trees (baseline) to 3.2 million could capture CO2 from the environment and reduce cooling costs thus reducing fossil fuel use. Related studies estimated that Littleton (abutting C-470) had an estimated 316,000 trees and the regional total was 9.6 million.
2011 – South Santa Fe flyover ramp at C-470 opens, to improve safety	Ramp is adjacent to Wolhurst Mobile Home Community, with visual effects, but relieving gridlock in front of the Wolhurst community entrance, improving mobility for residents.

**Table 4-24 (continued)
Past, Present and Reasonably Foreseeable Future Actions**

Action	Effects
PRESENT ACTIONS (2015)	
Developments along C-470 between Lucent and Santa Fe Drive – Children’s Hospital (175,000 square feet), Wind Crest retirement community and 2015 expansion (1,800 living units); Villas at Verona (550 patio homes), Littleton Commons (386 apartments), car dealership and commercial sites	These in-fill developments are rapidly converting grassland to dense development just east of Santa Fe Drive.
Sterling Ranch development (12,000 homes planned) beginning development along US 85 (South Santa Fe Drive), south of Chatfield Reservoir	Construction will attract truck traffic and development will eventually generate increased traffic demand at C-470 Santa Fe intersection; encroaching development will reduce wildlife habitat and access to Chatfield State Park from the south.
USACE Water Reallocation Project – NEPA ROD approved in 2014 allows USACE to increase water storage in Chatfield Lake	Action will raise water levels, inundating existing shoreline and necessitating relocation of various Chatfield Park amenities. Also resulting in loss of 350 acres of trees plus Preble’s Mouse habitat. Will require some construction traffic and may temporarily reduce park visitation.
FUTURE ACTIONS	
US 85 widening south of C-470, pursuant to 2002 NEPA ROD or subsequent decision	Funding recently approved by DRCOG would address immediate traffic needs south of C-470 interchange, but additional interchange improvements are anticipated in the future.
Shea Homes Plum Creek Development along US 85 south of Chatfield State Park, 1,250 additional new homes	Further loss of habitat and further surrounding of Chatfield State Park with development from the southeast.
RTD Light Rail extension to Lucent Boulevard, planned but does not have approval or funding	RTD continues to plan for future extension of the Southwest Line from Mineral Station southward across C-470 then eastward to Lucent Boulevard. Light rail stations attract vehicular traffic to parking lots and promote dense, transit-oriented development.
E-470, immediately east of C-470, will be widening to add two lanes between I-25 and Parker Road, in the 2025-2035 timeframe.	The I-25/C-470 interchange will need to be able to accommodate appropriate connections to the new lanes.
Continued local and regional development – between 2015 and 2035, 33,000 additional residents and 47,000 additional jobs in the C-470 area, and 1 million additional residents in the Denver metro area, using regional transportation facilities	Additional traffic, congestion, impervious surface, water consumption, loss of wildlife habitat can all be expected. However, by increasing density and establishing urban growth boundaries, the region is avoiding additional land consumption that would have resulted from past development practices.

Table 4-25
C-470 Proposed Action Cumulative Effects Potential

Resource	Effects of Proposed Action	Cumulative Effects Potential
Transportation	Proposed Action would provide travel time reliability, potentially enabling RTD to run bus routes on C-470. It would improve mobility in one of the region's key congested corridors as identified by DRCOG.	LOW: Improving mobility in this corridor would address a regional congestion bottleneck, potentially benefitting the entire regional transportation system.
Demographics	By improving mobility, the Proposed Action may provide opportunities for development in the project area to occur more quickly than under the No-Action Alternative.	NONE.
Minority and Low Income Populations	Existing noise wall relocated slightly closer to Wolhurst low-income mobile home community for persons 55 years or older.	LOW: Past flyover construction, current nearby land development, future Santa Fe Drive improvements, and future light rail extension are intensifying the urban surroundings of this community.
Economic Considerations	Short-term increased employment for roadway construction. Long-term mobility enhancement could keep the area more economically viable compared with worse congestion under the No-Action Alternative.	NONE.
Land Use	The Proposed Action would not directly change land use and would not add or eliminate local access to the freeway.	NONE.
Right-of-Way	About 5.5 acres of vacant land to be acquired for right-of-way, requiring no relocation of residences, businesses or other land uses.	NONE.
Parks and Recreation	The project would result in temporary closures for three trails, and increased noise for parks and trails close to the highway. The new C-470 bridges over the South Platte River would provide an improved, safer crossing for the Mary Carter Greenway Trail.	LOW: Apart from the direct impacts of the Proposed Action, no other past, present or reasonably foreseeable actions would adversely affect these facilities.
Visual and Aesthetic Character	Corridor visual character will shift from rural/suburban to more urban with added lanes, additional signage, and loss of grassy median. Use of CDOT Region 1 standards will improve design consistency.	MODERATE: The character of the C-470 Corridor has greatly changed since the highway opened and rapid change has occurred in recent years, with residential build-out of Highlands Ranch recently completed and infill development occurring along C-470 at Erickson Boulevard and along South Santa Fe Drive.

**Table 4-25 (continued)
C-470 Proposed Action Cumulative Effects Potential**

Resource	Effects of Proposed Action	Cumulative Effects Potential
Utilities	Numerous utilities would be relocated.	LOW: Utility relocation is a routine occurrence. Utility service is not ordinarily disrupted. Relocation costs ultimately get passed along to customers through rate increases.
Transportation	Key impact is typical construction-related congestion for up to two years. It is anticipated that there will be a near-term Interim project and a future project to complete the Ultimate configuration.	LOW: Major highway improvement projects have been underway in the Denver region for the past two decades (e.g. TREX project, central I-25, I-25 Douglas County lane balancing).
Common Wildlife	Minor loss of deer habitat; wider roadway more difficult to cross; black-tailed prairie dogs displaced, reducing prey for raptors; temporary disruption to raptors and other birds; key South Platte River wildlife crossing will be improved.	LOW: The C-470 Corridor is largely developed, with large areas of park land and open space. Continued growth region-wide (one million additional residents by 2035) and in northern Douglas County will consume habitat, confining wildlife to parks, open spaces and drainage corridors.
Threatened/ Endangered Species	Loss of 14.3 roadside acres of prairie dog colonies would reduce the amount of potential Burrowing Owl habitat in the area. This State Threatened owl may occur but is not known to occur in CDOT right-of-way along the freeway.	LOW: Prairie dog colonies within the metro area are continually being displaced and more confined to undevelopable lands with lower quality habitat (e.g., adjacent to freeway).
Wetlands and Waters of the U.S.	Permanent impacts of 0.70 acre and will be mitigated on one-to-one basis. No net loss.	LOW: Mitigated C-470 project impact would have negligible effect.
Prime and Unique Farmlands	No resource present in project area	NONE.
Vegetation	Hundreds of existing trees would be removed, but many of them would be replaced: in riparian areas, those over two inches in diameter at breast height would be replaced on-site; for non-riparian areas, those over four inches in diameter would be replaced somewhere within the project area. Up to 2.77 acres of riparian habitat affected (temporary and/or permanent), but impacts will be avoided, minimized and mitigated in accordance with SB 40 requirements.	LOW: These are specific, localized effects to resources generally not impacted by other foreseeable actions.

Impervious Surface Area and Water Quality
Quantitatively, the largest impact of the C-470 Proposed Action would be the creation of new pavement, or impervious surface area.

Impervious surface area would increase from 204.9 acres for the existing condition and No-Action condition to 324.7 acres with the Proposed Action. This is an increase of 119.8

acres over the 13.75-mile Proposed Action. This roughly 120-acre increase is spread out over a number of drainage sub-basins, although eventually they all flow to the South Platte River, a watershed size of over 3,000 square miles.

The 12 drainage sub-basins that receive C-470 runoff conservatively average at least two square miles (1,280 acres) in size, so the roughly 120 acre impervious surface increase from the Proposed Action would equate to less than a 1 percent increase in impervious surface area for sub-basins along the corridor.

In the case of C-470 Proposed Action, the roughly 120-acre increase in impervious surface area is being offset having 185 acres of C-470 ROW will newly addressed with water quality BMPs. The expected result of the Proposed Action is a net water quality improvement.

Black-Tailed Prairie Dog Colonies: It was noted earlier that the C-470 Proposed Action would consume about 14.3 acres of black-tailed prairie dog habitat, out of the 90 acres found within CDOT ROW along the project corridor. This animal is not officially threatened or endangered but is considered a Species of Special Concern by CPW as it offers prey and habitat for other species. In some cases, a colonies would only be partially affected, in terms of the physical area involved, but partial disruption could affect the viability of the entire colony.

The loss of 14 of 90 acres is about a 16 percent reduction (or more, depending on partial colony abandonment). This is consistent with an estimated 18 percent loss regionally that was predicted within the DRCOG Urban Growth Boundary in a 2008 study called *Areawide Coordinated Cumulative Effects Analysis* prepared by University of Colorado researchers (Muller et al., 2008). That study estimated there to be over one million acres of black-tailed prairie dog habitat in the region, and predicted that continuation of prevailing development

patterns would result in the loss of over 180,000 acres by 2030. Thus, the C-470 Proposed Action would contribute a minute fraction of the overall ongoing regional trend.

These animals are found within CDOT ROW in part because they have been displaced by adjacent development, and the highway roadside is what remains available to them. The same problem is encountered elsewhere around the state, which resulted in the need for a statewide policy on how to deal with the issue. Section 4.4.1 noted that for C-470 Corridor impacts, CDOT will follow this *2009 CDOT Impacted Black-tailed Dog Policy*. This policy prioritizes animal relocation as a first option (for colonies two acres or larger), followed by other humane and environmentally responsible options if relocation is not feasible.

4.7.3 Cumulative Effects Conclusion

The C-470 Proposed Action direct effects most likely to have cumulative effects are the water quality impacts of adding 120 acres of impervious surface and the ecological impacts of displacing about 14 acres of prairie dog colonies. However, water quality BMPS being designed as mitigation for the Proposed Action will more than offset direct impacts, resulting in improved water quality. Additionally, the loss of 14 acres of low-quality roadside prairie dog habitat is negligible in the context of ongoing regional development that is making the Denver metropolitan area increasingly incompatible as habitat for this animal and the other grassland species that depend on it for prey.

It is concluded that no cumulative effects mitigation is needed to augment mitigation of direct project impacts.