

4.23 CUMULATIVE IMPACTS

Summary

Land within the United States Highway 36 (US 36) project area has undergone rapid development over the past 50 years due to the desirable living environment within the US 36 corridor and access to employment and developable real estate. The transition of this area from rural to urban has reduced ecosystem diversity and this is expected to continue under the Denver Regional Council of Government's (DRCOG) approved *2035 Metro Vision Regional Transportation Plan (2035 MVRTP)*, as amended (DRCOG 2009), growth allocations. The continued growth is expected with or without implementation of a build alternative in the US 36 cumulative study area (CSA).

The analysis concludes that:

- Planned population growth of 169,210 people, requiring approximately 16,900 acres of new development by 2035 in the CSA, would occur with or without implementation of any of the build packages being considered. Some small changes in the distribution of growth within the CSA would result from the effects of transit-oriented development (TOD) near transit stations.
- The changes in land use resulting from development to accommodate the population growth by 2035 would dominate future impacts to water quality, wetlands, floodplains, and biological resources as opposed to changes in the US 36 footprint. Air quality would be similar under Package 1 (No Action) and the build packages, and would be improved slightly over existing conditions due to implementation of FasTracks and cleaner operating vehicles.
- Much of the higher-density development planned around transit stations may be realized in Package 1 (No Action). However, the improvements to the park-n-Rides for all the build packages, including the bus rapid transit (BRT) stations, improved bus service, and the highway improvements, would likely further promote some amount of transit-supportive development or TOD at the McCaslin Station and 116th Avenue Station that is slightly higher than under Package 1. These differences are anticipated to be minor from a cumulative land use standpoint.
- The implementation of any of the build packages would increase the amount of impervious surfaces in the corridor, increasing storm runoff in the vicinity of the highway. In all cases, the Colorado Department of Transportation's (CDOT) Municipal Separate Storm Sewer System (MS4) Program would result in the collection, detention, and treatment of stormwater runoff from the highway for the protection of water quality.

Guidance for the Cumulative Impact Assessment

This analysis was conducted to evaluate the secondary and cumulative environmental impacts associated with the implementation of any of the packages under consideration. Guidance for this analysis was derived from the following:

- Workshops attended by representatives of the US 36 Mobility Partnership, the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), U.S. Environmental Protection Agency (USEPA), DRCOG, local municipalities, and environmental interest groups, to determine the appropriate approach for this cumulative impact analysis.
- The Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500-1508) implementing the procedural provisions of the National Environmental Policy Act of 1969 (NEPA) as amended (42 United States Code 4321 et seq.).

- The CEQ 1997 guidelines, *Considering Cumulative Effects under the National Environmental Policy Act*.
- FHWA Position Paper: “Secondary and Cumulative Impact Assessment in the Highway Project Development Process,” April 1992.
- CEQ Guidance on the Consideration of Past Actions in Cumulative Effects Analysis, June 2005.

The CEQ regulations for implementing NEPA define cumulative impacts as: “... the impact on the environment that results from the incremental impact of the 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 impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).”

Indirect effects are caused by the proposed action and appear later in time, or are farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR 1508.8).

Methodology

The cumulative analysis methodology was developed during the Draft Environmental Impact Statement (DEIS) through a series of workshops with CDOT, Regional Transportation District (RTD), FHWA, FTA, USEPA, DRCOG, local municipalities, and environmental interest groups. The methodology is predicated on the direct relationship among future land use changes, induced growth, and environmental quality.

The methodology consists of the following elements:

1. Process and expert panel.
2. Establish areas of influence for induced growth.
3. Timeframe for the analysis.
4. Past, present, and reasonably foreseeable future projects.
5. Resource areas evaluated.
6. Impact analysis.

Each element of the cumulative analysis is presented in the following discussion.

Element No. 1: Process and Expert Panel

The development of the methodology included three workshops and the involvement of an expert panel. The expert panel was comprised of representatives from the local municipalities, DRCOG, and local developers. The methodology was further reviewed in meetings with USEPA, DRCOG, FHWA, FTA, and environmental interest groups. Individual meetings were held with the affected municipalities to discuss development constraints, likely transit station area scenarios and densities, and current land use policies that protect sensitive environments.

Element No. 2: Establish Areas of Influence for Induced Growth

Table 4.23-1, Areas of Influence Based on Type of Transportation Improvement, presents the areas of influence developed for the cumulative analysis.

Table 4.23-1: Areas of Influence Based on Type of Transportation Improvement

Type of Transportation Improvement	Area of Influence for Induced Growth
New Highway	N/A
New Interchange	N/A
Transit Stations	1 mile (most effects within 0.25 and 0.5 mile)
Boulder Transit Village	7 miles
Widened Highway	1 mile on either side
BRT on US 36	1 mile on either side
Modified Interchange	Up to 1 mile (most effects within 0.5 mile)
Bike and Pedestrian Trails	0 mile (not expected to induce growth)

Source: US 36 Mobility Partnership, 2006.

Notes:

- BRT = bus rapid transit
- N/A = not applicable
- US 36 = United States Highway 36

As a result of separating the BNSF Railway transit corridor and the US 36 corridor into separate studies, as explained in Chapter 2, Alternatives Considered, of this Final Environmental Impact Statement (FEIS), the RTD FasTracks transit project elements consisting of commuter rail, park-n-Ride improvements, and bus service enhancements are now considered part of Package 1 because each is now a planned and funded improvement. The BNSF Railway transit corridor is being addressed in ongoing environmental studies for the Northwest Rail Corridor Project being prepared by RTD and the U.S. Army Corps of Engineers (USACE).

Improvements under consideration for US 36 in the three build packages include the addition of general-purpose lanes, high-occupancy vehicle (HOV) lanes, managed lanes, and BRT. The managed lanes would allow HOV and BRT vehicles at no charge; the excess roadway capacity would be sold through dynamic pricing of single-occupant vehicles.

Local municipalities in the corridor also have planned improvements along US 36 to be implemented prior to 2035. Staging of these improvements is planned in the short- to mid-term. The major projects are listed below.

120th Avenue Extension and park-n-Ride Relocation – The City and County of Broomfield and CDOT received a Finding of No Significant Impact in 2005 for the *120th Avenue Connection Environmental Assessment* (CDOT 2005). With the extension of 120th Avenue west across US 36 to link with State Highway (SH) 128 at Wadsworth Parkway, the existing park-n-Ride would be relocated to the south into the Arista development project. Construction is anticipated to begin in 2009.

Boulder Transit Village – The City of Boulder has prepared a mixed-use redevelopment plan for the Boulder Transit Village with an inter-modal transit center serving rail, BRT, bus, bicycle, and pedestrian traffic. Provisions for bus and rail transit service and park-n-Ride functions have been included in the site plan.

Denver Union Station (DUS) Master Plan and Environmental Impact Statement (EIS) – DUS is currently serving as the railroad terminal for passenger services such as Amtrak in the Denver metropolitan area. A Record of Decision for improvements to DUS was signed by FTA in 2008. The US 36 packages consider DUS as the terminal for a portion of the BRT service to downtown Denver. With the DUS improvements, buses would no longer need to serve the Market Street Transfer Station, but would still serve the Civic Center Transfer Station to and from US 36 on 19th Street and 20th Street.

The State of Colorado recently passed legislation repealing the Colorado Tolling Enterprise and establishing a High Performance Transportation Enterprise to examine innovative financing strategies, including public-private partnerships and user-fee financing. Other than the currently existing Northwest Parkway and E-470, this FEIS assumes that no other managed toll lanes or facilities would be in place in 2035. This is consistent with the 2035 MVRTP, as amended (DRCOG 2009).

For the FEIS, the CSA extends 7 miles past the Boulder Transit Village at 30th Street and Pearl Street. Extending the CSA represented a conservative approach to the cumulative analysis and was based on experience with RTD's travel demand model.

Consideration of corridor limits required the addition of a seventh segment to the CSA; this segment is titled Longmont. The CSA extends from Longmont on the north to the DUS on the south. Where appropriate, the CSA varied according to the needs of specific resources. As discussed in more detail below, most of the growth-inducing effects would occur within 1 mile of a project component; however, to provide a more conservative analysis, the CSA extends up to 3 miles on either side of the highway. One exception is air quality, which is assumed to have a regional area of influence. In addition, bike and pedestrian facilities are not envisioned to induce growth.

Element No. 3: Timeframe for the Analysis

The methodology included an analysis of historic land use and density changes from 1950 to 2003 within the CSA. Past land use trends were evaluated using historic demographic data and aerial photography as described below, under the Affected Environment subsection. The present and reasonably foreseeable future projects and associated land use changes were evaluated using DRCOG projects most closely associated with the 2008-2013 Transportation Improvement Program (TIP) (DRCOG 2008), with the 2035 MVRTP, as amended (*Fiscally-constrained Element*) (DRCOG 2009), and with information collected from local jurisdictions.

Element No. 4: Past, Present, and Reasonably Foreseeable Future Projects

Consistent with regulatory guidance for a cumulative impact analysis, projects that were considered included those that were past, present, and reasonably foreseeable.

- **Past projects** were included in the analysis through the study of historic aerial photography, and historic population trends that relate directly to past transportation projects. Public infrastructure projects, such as the original US 36 toll facility, and water and wastewater treatment plant modifications for the cities of Westminster, Broomfield, Superior, Louisville, and Boulder assisted with development in the CSA. A range of other public infrastructures has also accommodated rapid urbanization in the CSA.
- **Present projects** were analyzed by investigating current CSA demographics, through projects funded near term (projects in the TIP and Capital Improvement Program), and by review of the aerial photography from 2003.
- **Reasonably foreseeable future projects** were considered to be reasonably foreseeable if they were included in the 2035 MVRTP, as amended (DRCOG 2009), or if the projects are under study. Development projects are expected to have the greatest influence on environmental conditions in the CSA. However, since these projects generally require less than 2 years for entitlements, a long-term listing of developments was not possible.

As shown in Table 4.23-2, Past, Present, and Future Projects in the US 36 Cumulative Study Area, the greatest influence on the CSA has been the rapid development over the past 30 years. The impact of past development on land use is discussed in more detail under the subsection, Historic Development Trends.

Table 4.23-2: Past, Present, and Future Projects in the US 36 Cumulative Study Area

Project Name	Location	Project Type	Description	Data Source
Past Projects (with Environmental Influence)				
US 36	Adams County to Boulder	Federal primary highway	Originally constructed in the early 1950s as a toll road between I-25 and Boulder	Internet
I-76	Adams County	Interstate highway	Interstate highway connecting I-70 to I-25 and eventually connecting to I-80 in Nebraska	Internet
Jefferson County Airport	Broomfield	General aviation airport	General aviation airport with approximately 190,000 aircraft operations (2005) located between Denver and Boulder	Internet
Northwest Parkway	City and County of Broomfield, City of Lafayette, and Weld County	New toll road and beltway	Toll road connecting E-470 to I-25 at 157 th Avenue, extending west and south to 96 th Street and south to US 36	Internet
University of Colorado	Boulder	Higher education; major employer	University	Internet
Valmont Power Plant	Boulder	Power plant	Coal-fired 226-megawatt power plant constructed in 1924	Internet
Broadway	Boulder	Transportation facility: interchange	Intersection and bridge improvements	Internet
Broomfield Event Center	Broomfield	Major event destination	Event center seating 6,000 for sports events, and 7,500 for concerts and special events	Internet
Flatiron Crossing	Broomfield	Shopping center/mall: major employer	1.5 million square foot shopping mall	Internet
Interlocken Business Park	Broomfield	Business park; major employer	Business park consisting of office, technology, and hotel uses	Internet
I-25	Denver	Interstate highway	Constructed from 1948 to 1958, this highway conveys traffic along the Front Range near the eastern boundary of the CSA	Internet
I-70	Denver	Interstate highway	Constructed in 1962, this highway conveys east to west traffic through north Denver at the southern extreme of the CSA	Internet
Denver Pacific Railroad	Denver	Freight railroad	Constructed in 1870 to convey gold and silver to smelters in north Denver neighborhoods	Internet
Omaha-Grant; Argo and Globe Smelting Plants	North Denver	Smelters that refined gold, copper, lead, and zinc	Became the ASARCO Globe Superfund Site and added to the National Priorities List in 1993	Internet
Ramp Industries	North Denver	Radioactive waste storage site	Site was cleaned up from 1994 to 1997, including drum removal and out-of-state disposal of liquid wastes	Internet
Cherokee Power Plant	North Denver	Power plant	Coal-fired power plant went into service in 1957	Internet
Westminster Mall	Westminster	Shopping center/mall: major employer	1.5 million-square-foot shopping mall constructed in 1977	Internet
Standley Lake	Westminster	Major potable water supply	42,000 acre-feet of potable water supply for the cities of Westminster, Northglenn, and Thornton; constructed in 1909 and enlarged in 1963	Internet

Table 4.23-2: Past, Present, and Future Projects in the US 36 Cumulative Study Area

Project Name	Location	Project Type	Description	Data Source
Westminster Promenade	Westminster	Major employer	A "gathering place" for the North Metro community centrally located at US 36 and Church Ranch Boulevard; development includes restaurants, entertainment, and the Westin Westminster Hotel and Conference center	Internet
Myananda	Westminster	Mixed residential	Lifestyle community located adjacent to the Westin Westminster Hotel and Conference center; project includes 27 primary residential units and 41 hotel condo/second residence units in addition to a 24,000-square-foot wellness center	Internet
General Development 1973 to 2003	Corridor-wide	All forms of commercial, industrial, and residential development	Between 1973 and 2003, the greatest environmental change has been associated with the development of 30,080 acres in the CSA	US 36 Mobility Partnership, 2004
Present Projects (Development Projects)				
University of Colorado	Boulder	Ongoing and planned development of student housing	Student housing complex east of US 36 and northeast of Bear Creek Apartments, between Bear Canyon Creek and Apache Court	Internet; Personal Communication
University of Colorado	Boulder	Campus development	50-year master plan to assist in defining the goals for the development of the University of Colorado campus south of Foothills Parkway	Internet; Personal Communication
29 th Street Retail District	Boulder	Mixed retail; transit	16 blocks; retail core is three city blocks with 75 tenants including cinema, grocery, department stores, three parking structures, and on-grade parking	Internet
Broomfield Residential/Mixed Use Development	Broomfield	Mixed retail and multi-family residential	1.5-million square-foot commercial uses; 1,042 apartment units; northwest corner of Sheridan Boulevard and SH 7	City of Broomfield
Conoco Phillips Property (formerly Sun Microsystems)	Louisville	Vacant industrial development	Development plans for the 400-acre site have not been finalized	Internet; Personal Communication
Superior Marketplace	Superior	Mixed retail; TOD	"Big box" retail development on 100-acre site; including 650,000-square-foot large and small format retail, grocery, entertainment establishments, and public art program; 171-unit housing development within walking distance	Town of Superior
Shops at Walnut Creek	Westminster	Mixed retail; office, and transit	"Big box" retail, office, restaurant, and TOD (anchored by Super Target and 365,000 square feet of ancillary retail) on 65-acre site	City of Westminster
Village at Walnut Creek	Westminster	Retail and commercial	Retail and commercial development	Internet
Church Ranch Boulevard Filing 9	Westminster	Hotel	Hotel	Internet
Hyland Village Single Family	Westminster	Traditional mixed-use neighborhood development	Mixed use development with retail, commercial, 426 units of single-family, and 144 units of multi-family residential development	Internet
Northwest Business Park (Axis)	Westminster	Mixed retail; office, single- and multi-family residential	725 units for commercial use; 180 residential units and 24,000 square feet of retail in Phase 1; 570 residential units in Phase 2	Internet

Table 4.23-2: Past, Present, and Future Projects in the US 36 Cumulative Study Area

Project Name	Location	Project Type	Description	Data Source
Westfield Residential Planned Unit Development	Westminster	Single-family residential	100 units of single-family detached residential development	Internet
The Business Park at Mandalay	Westminster	Office/flex	Business park with office and flex uses	Internet
Circle Point Corporate Center	Westminster	Mixed retail and office	New commercial and employment uses on 60-acre site	Internet
Present Projects (Transportation Facility Projects)				
FastTracks	Regional	Transit	Regional multi-modal transit and facility improvements; central corridor extension upgrades; East Corridor; Gold Line Corridor; I-225 Corridor; North Metro Corridor; Southeast Corridor extension and upgrades; Northwest Rail Corridor; maintenance facilities; other items funded through FasTracks; cost of \$7 billion	2035 MVRTP
RTD Bus System Expansion	Regional	Bus routes and park-n-Rides	Improvements and expansion of system; cost of \$80 million	2035 MVRTP
Pecos Street Railroad Grade Separation	Adams County	Roadway	Widen Pecos Street from I-76 to 52 nd Avenue and add railroad overpass; cost of \$9.7 million	2009 Adams County Budget
US 36 at Cherryvale Road and South 88 th Street	Boulder	Roadway	TIP ID #1997-006; Cherryvale Road bridge; southbound climbing lane; bike lanes; cost of \$10.2 million	2008-2013 STIP
Cherryvale Road Shoulders and Overlay – Baseline Road to Arapahoe Road	Boulder	Roadway	Addition of 4-foot paved shoulders with possible realignment	Boulder CIP
Boulder Transit Village Infrastructure Enhancements	Boulder	Enhancements/upgrades	Phased development to enhance the transit village area; cost of \$600,000	Boulder CIP
28 th Street	Boulder	Roadway	Improvements to 28 th Street from Baseline Road to Iris Avenue; cost of \$2.8 million	Boulder CIP
30 th Street Access Improvements: Bluff to Walnut	Boulder	Transit: roadway	Access improvements for the Boulder Transit Village bus station and FasTracks BRT and rail; improvements include pedestrian crossing, two transit super stops, access from the Goose Creek path, and a bicycle/pedestrian underpass; cost of \$900,000	Boulder CIP
Broadway – Euclid Multi-modal Improvements	Boulder	Enhancements/upgrades	Construction of pedestrian/bicycle underpass under Broadway and Euclid Street; installation of bicycle racks; realignment of multi-use path on east side of Broadway, expansion of the southbound RTD bus stop, and relocation of the northbound RTD bust stop; cost of \$5.8 million	Boulder CIP
Arapahoe Multi-Use Path	Boulder	Multi-use paths	Complete multi-use paths on both sides of Arapahoe Road between Folsom Street and 30 th Street; cost of \$1.2 million	Boulder CIP
Broomfield park-n-Ride	Broomfield	park-n-Ride	Broomfield park-n-Ride relocation and slip-ramp access; cost of \$3.2 million	RTD TDP

Table 4.23-2: Past, Present, and Future Projects in the US 36 Cumulative Study Area

Project Name	Location	Project Type	Description	Data Source
SH 128/120 th Avenue Extension	Broomfield	Roadway	Extension of 120 th Avenue from Wadsworth Parkway to US 287; cost of \$53 million	2008-2013 TIP
Dillon Road and South 120 th Street Improvements	Broomfield	Roadway	Roadway improvements	Broomfield 2009 Proposed Design Projects
Lowell Boulevard Improvements	Broomfield/ Westminster	Roadway	Improvements to Lowell Boulevard between West 120 th Avenue and West 136 th Avenue	Broomfield 2009 Proposed Design Projects and Westminster CIP
West 136 th Avenue and Aspen Street Improvements	Broomfield	Roadway	Street improvements	Broomfield Projects Currently in Progress
West Midway Boulevard Extension	Broomfield	Roadway	Roadway extension	Broomfield Projects Currently in Progress
Denver Union Station	Denver	Transit	Improvements to DUS; cost of \$500 million	2035 MVRTP
Dillon Road	Louisville	Roadway	Improvements to Dillon Road between 96 th Street and 104 th Avenue; cost of \$3.4 million	Louisville CIP
SH 42 and South Boulder Road	Louisville	Roadway	Increase capacity of SH 42 and South Boulder Road intersection by constructing dual left-turn lanes in each direction on both South Boulder Road and SH 42; cost of \$2.7 million	Louisville CIP
Street Improvement Project	Superior	Roadway	Maintaining streets and other major infrastructure; cost of \$13.4 million	Superior CIP
Superior/Louisville park-n-Ride	Superior/Louisville	park-n-Ride	400-space park-n-Ride relocation and expansion with pedestrian bridge; cost of \$11.7 million	Internet
McCaslin Boulevard Interchange	Superior/Louisville	Interchange	New loop-ramps and reconstruction of McCaslin Boulevard; cost of \$10 million	Louisville CIP and Superior CIP
Sheridan Boulevard	Westminster	Roadway	Westside, 98 th Avenue to 104 th Avenue; cost of \$315,000	Westminster CIP
Church Ranch Boulevard park-n-Ride	Westminster	park-n-Ride	park-n-Ride expansion and slip-ramp access; cost of \$1.9 million	RTD TDP
112 th Avenue	Westminster	Roadway	Improvements to 112 th Avenue between Navajo Street and Huron Street; cost of \$700,000	Westminster CIP

Table 4.23-2: Past, Present, and Future Projects in the US 36 Cumulative Study Area

Project Name	Location	Project Type	Description	Data Source
Future Projects (Major Transportation Projects Under Study)				
SH 7	Boulder, Lafayette, Erie, and Boulder County	Transportation study	Study and Environmental Assessment of major transportation improvements	Current Study
Northwest Rail Corridor	Broomfield	Transportation study	Corridor study; extends from the freeway systems in the vicinity of US 36 in the City and County of Broomfield, to the freeway systems in the vicinity of SH 58, I-70, and C-470 to the south	Current Study
Sheridan Boulevard	Broomfield	Transportation study	9 th Avenue to 136 th Street - widen from two to four lanes	Current Study
I-25 North	Denver	Transportation study	Multi-modal corridor study and EIS	Current Study
Valley Highway	Denver	Transportation study	Corridor study and EIS for improvements to I-25 through Denver; cost of \$130 million (Phase 1 and Phase 2)	Record of Decision
I-70 East Corridor AA/DEIS	Denver and Aurora	Transportation study	Multi-modal corridor study and EIS	Current Study
Gold Line Corridor AA/DEIS	Denver, Adams County, Arvada, and Wheat Ridge	Transportation study	Multi-modal corridor study and EIS	Current Study
Existing or Proposed TOD Plans				
Boulder Transit Village	Boulder	Mixed use; TOD	Mixed-use 11-acre redevelopment planned with an inter-modal transit center serving rail, BRT, bus, bicycle, and pedestrian traffic	US 36 TMO
Arista – Broomfield Urban Transit Village	Broomfield	Mixed use; TOD	“Big box” shopping center, park-n-Ride, Broomfield Event Center, 400,000 to 600,000 square feet of retail, 400,000 square feet of office, and 1,500 residential units on 209-acre site	US 36 DEIS
Original Broomfield Neighborhood Plan	Broomfield	Mixed use; TOD	Redevelopment of 31.6 acres at BRT/rail transit station at 116 th Avenue (adopted as part of neighborhood revitalization plan)	City and County of Broomfield
DUS Master Plan	Denver	Mixed use; TOD	Inter-modal transportation center and up to 1.5 million square feet of TOD including retail, office, residential, and entertainment uses on 19.5 acres (adopted as part of Blueprint Denver - An Integrated Land Use and Transportation Plan (2002) [City and County of Denver 2002])	City and County of Denver
Commons Planned Unit Development	Denver	Mixed use; TOD	Adjacent to DUS; 5.75 million square feet of office/commercial; 2,000 residential units; 50 acres	Internet
East-West Partners Development	Denver	Mixed use; TOD	Adjacent to DUS; 3,000 residential units; 37 acres	Internet
Highway 42 Revitalization Plan	Louisville	Mixed use; TOD	Mixed-use development including retail, office, higher density residential uses, and a transit station (adopted as amendment to comprehensive plan) on 60-acre site	City of Louisville

Table 4.23-2: Past, Present, and Future Projects in the US 36 Cumulative Study Area

Project Name	Location	Project Type	Description	Data Source
Superior Town Center	Superior	Mixed use; TOD	Mixed use including retail, office, services, and residential (adopted as part of comprehensive plan) on 180-acre site	Town of Superior
Westminster Center TOD	Westminster	Mixed use; TOD	TOD associated with a planned FasTracks commuter rail station at the existing Westminster Mall site; cost of \$1 million	Westminster CIP
South Westminster Revitalization Project	Westminster	Mixed use; TOD	Revitalization of south Westminster neighborhood; cost of \$201,000	Westminster CIP
South Westminster Town Center	Westminster	Mixed use; TOD	1,300 medium-density residential units and 500,000 square feet of commercial/office (includes 93,000 square feet of existing industrial) on 130-acre site	City of Westminster

Source: CDOT, 2008; CDOT, 2009; DRCOG, 2007; RTD, 2004; Adams County, 2006; Boulder County, 2009; City and County of Denver, 2006.; City of Louisville, 2009; Town of Superior, 2008; City and County of Denver, 2004; and City of Westminster, 2009.

Notes:

= number
 2035 MVRTP = 2035 Metro Vision Regional Transportation Plan, as amended
 AA = Alternatives Analysis
 ASARCO = American Smelting and Refining Company
 BRT = bus rapid transit
 CIP = Capital Improvement Program
 CSA = cumulative study area
 DEIS = Draft Environmental Impact Statement
 DUS = Denver Union Station
 EIS = Environmental Impact Statement
 I-# = Interstate #
 ID = identification
 RTD = Regional Transportation District
 SH = State Highway
 STIP = State Transportation Improvement Program
 TDP = Transportation Development Plan
 TIP = Transportation Improvement Program
 TMO = Transportation Mobility Organization
 TOD = transit-oriented development
 US # = United States Highway #

Element No. 5: Resource Areas Evaluated

The cumulative impacts analysis evaluated the combined incremental effects of human activities, the impacts over time, and the total effects on the resource ecosystem or community. The analysis focuses on the resources especially vulnerable to incremental effects. The cumulative analysis is tied directly to changes in future land use because of the close relationship among land use, transportation, and the environment.

As described by the CEQ handbook *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997), the analysis should address the sustainability of resources, ecosystems, human communities, and resources that may be especially vulnerable to incremental effects. The cumulative impact analysis for this FEIS focuses on the following resource areas considered to be barometers of the sustainability of our surroundings:

- Land Use
- Air Quality
- Biological Habitats and Wildlife
- Water Quality
- Wetlands

Table 4.23-3, Methodology Used for Cumulative Impact Analysis, displays the methodology, time frame, and data sources used for the impact analysis of the resources listed above.

Table 4.23-3: Methodology Used for Cumulative Impact Analysis

Resource Area	Time Frame	Data Source	Methodology
Land Use	Aerial Photography: 1973, 1980, 1990, and 2003 Demographic Data: 1950 to 2000	<ul style="list-style-type: none"> • Historic aerial photography • Historic demographic data: U.S. Census 2000 as analyzed by the State of Colorado, DOLA • Transit station area plans from adopted planning documents and consultation with local planning agencies 	<ul style="list-style-type: none"> • GIS analysis of aerial photography estimating acres of developed and undeveloped land • Estimate of historic and future densities and population • Estimate of land required for development based on assumptions of densities within and outside of transit station areas (see Section 4.2, Land Use) • Identification of plausible locations for future development based on availability, zoning, future land use plans, market forces, local knowledge, land use constraints, and infrastructure availability • Mapping of future land use availability to serve as basis for assessing impacts
Air Quality	2035	<ul style="list-style-type: none"> • Regional model output from DRCOG 2035 Travel Demand Model • 2035 Model runs completed for this study • 2035 Model runs completed for FasTracks SB 208 process • USEPA MOBILE 6.2 Air Quality Modeling • Air Pollution Control Division, 2009 Air Quality Standards 	<ul style="list-style-type: none"> • Comparisons made between vehicle miles traveled and various emissions from the model runs completed for this project and model runs assuming a full build-out of the transit system in the region

Table 4.23-3: Methodology Used for Cumulative Impact Analysis

Resource Area	Time Frame	Data Source	Methodology
Biological Habitats and Wildlife	2035	<ul style="list-style-type: none"> • Colorado Division of Wildlife, 2004 • United States Fish and Wildlife Service 2003 • National Diversity Information Source, 2004 • City of Boulder • Boulder County Open Space • Colorado Natural Heritage Program, 2004 • Field work completed for this study • Mapping from the affected environment analysis completed for this study • Mapping of riparian and upland vegetation from CDOW and Colorado Gap Analysis Land Cover Map 	<ul style="list-style-type: none"> • Existing habitat mapped • GIS analysis of project land use information as compared to habitat mapping • GIS analysis of land available for development compared to habitat mapping • Acres of habitat potentially affected was estimated assuming vacant or agricultural land is superior habitat to developed land use • Qualitative estimate of impacts to wildlife due to habitat loss • Analysis of existing local land use controls to protect sensitive environments
Water Quality	2035	<ul style="list-style-type: none"> • CDPHE, 2002 • CDPHE 303(d) List • Big Dry Creek Watershed Association • United States Geological Survey, 2000 • Colorado Groundwater Association, 2000 • FHWA Driscoll Model output to determine pollutant mass loadings for this study • Information from the affected environment analysis completed for this study 	<ul style="list-style-type: none"> • Streams identified with known water quality problems from the CDPHE 303(d) List • Estimate of the increases in impervious surfaces by package (See Section 4.20, Water Resources: Water Quality and Floodplains) • Analysis of existing regulations and controls in place to protect water quality
Wetlands	2035	<ul style="list-style-type: none"> • Field work completed for this study • Mapping of existing wetlands from the affected environment analysis completed for this study • Mapping of riparian and wetlands from CDOW 	<ul style="list-style-type: none"> • Existing wetlands mapped • GIS analysis of land available for development compared to wetlands mapping • Potential changes in wetlands resulting from additional development were qualitatively identified • Analysis of existing regulations in place to protect wetlands

Source: US 36 Mobility Partnership, 2006; Colorado Division of Wildlife, 1998; and NDIS, 2007.

Notes:

- CDOW = Colorado Division of Wildlife
- CDPHE = Colorado Department of Public Health and Environment
- DOLA = Department of Local Affairs
- DRCOG = Denver Regional Council of Governments
- FHWA = Federal Highway Administration
- GIS = geographic information system
- SB = State Bill
- USEPA = United States Environmental Protection Agency

Element No. 6: Impact Analysis

The impacts of Package 1 were compared to each of the build packages for each of the resource areas evaluated. The impact of Package 1 was based on the 16,900 acres of development required to accommodate the 2035 DRCOG population projections at historic densities (DRCOG 2007). The impact of this planned population growth on land use, air quality, wildlife habitat, water quality, and wetlands was then compared to the differences in impact resulting with the implementation of the build packages.

Quantitative Impact Analysis Used for Wildlife and Wetlands

A quantitative assessment of potential impacts of population growth to wildlife habitats and wetlands was conducted using geographic information system overlays of several sets of data, including land available for development, vegetation types, prairie dog colonies, and wetland and riparian habitats. The estimate of land potentially available for development included all undeveloped lands that were not open space or parks as of 2003, a total of about 38,500 acres. At least half of this total includes lands that are designated as Rural Preservation Area and/or lands that are outside of DRCOG urban growth boundaries, so that development is likely to be limited within the next 20 years. The 38,500 acres of potentially developable land was used as a worst-case analysis of impacts to biological resources. Data on distribution of vegetation types, prairie dogs, and wetland and riparian habitats were obtained from the Natural Diversity Information Source (NDIS) (NDIS 2007), and the Colorado Division of Wildlife (CDOW) (CDOW 1998). The vegetation and habitat data were overlaid with each of the potentially developable parcels of land, and acres of potentially affected habitats were generated and aggregated by type.

As used in this analysis, wetlands included all of the riparian shrub and riparian herb (except upland grass) mapping categories in the CDOW wetland and riparian data, while cottonwood woodlands and other riparian woodlands were identified as riparian and not wetland. The other vegetation mapping categories were derived from the NDIS gap data, and included urban/developed areas, dry land and irrigated cropland, native prairie (tall grass, mid-grass, and foothill grassland), foothills shrub, and ponderosa pine. Areas of wetland and riparian habitats were subtracted from the upland habitats so that there were no overlapping areas.

Wildlife habitats were categorized as high, moderate, or low quality, generally following the same criteria as the Chapter 4, Affected Environment and Environmental Consequences, impact analysis. High quality wildlife habitat consists of riparian, wetland, and foothills habitats, and prairie dog colonies; moderate quality habitat consists of native prairie/grassland and other undeveloped areas; and low quality habitat consists of developed and urban areas, and isolated patches of undeveloped land. This section does not address in detail the cumulative impact considerations of Package 1 outside of the CSA because the elements of Package 1 are being evaluated (or have been evaluated) through other environmental documents; consequently, NEPA requirements have been fulfilled for Package 1. Analysis of the impacts of Package 1 in the US 36 Corridor FEIS within the CSA is included for comparison to the build packages and does not include extensive analysis of the individual elements. In all cases, the impact of accommodating the 2035 population projection and the supporting development far outweighs the impact of the three build packages.

Affected Environment

Key to understanding the cumulative impacts of a build package in the CSA is knowledge of the development trends that have shaped the past, present, and reasonably foreseeable actions planned for the CSA. The affected environment for the US 36 cumulative analysis includes:

- Historic population trends
- Estimates of the CSA Population Growth from 1950 to 2000
- Historic development trends
- Estimate of future population and densities
- Land use policies in place to protect sensitive environments
- Cumulative impact results

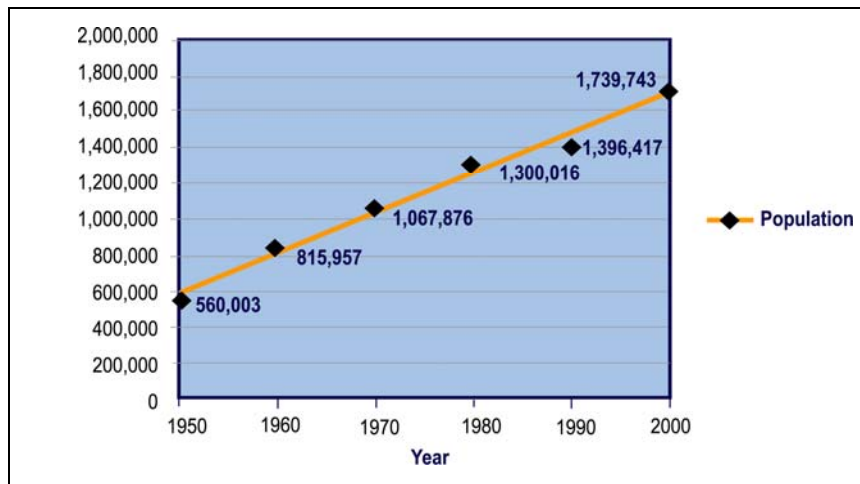
Historic Population Trends

Since the CSA is not defined by jurisdictional boundaries, it was necessary to develop customized population estimates for the area. Analysis of population trends from 1950 to 2000 for the surrounding counties and cities served as the basis for developing these estimates. Historic population information was obtained from the Colorado Department of Local Affairs (DOLA).

County Trends

The counties that comprise the US 36 project area include Adams, Boulder, Broomfield, Denver, and Jefferson. The historic analysis of population for the demographic analysis only included Broomfield in accounting for city population since Broomfield was not a county at the time of the collection of these data. The population of the counties in the project area was 560,003 in 1950 and increased to 1,739,743 in 2000. This represents an increase of 1,179,740 or 211 percent. Figure 4.23-1, Cumulative Study Area County Population Trends, displays the population in the four counties from 1950 to 2000.

Figure 4.23-1: Cumulative Study Area County Population Trends



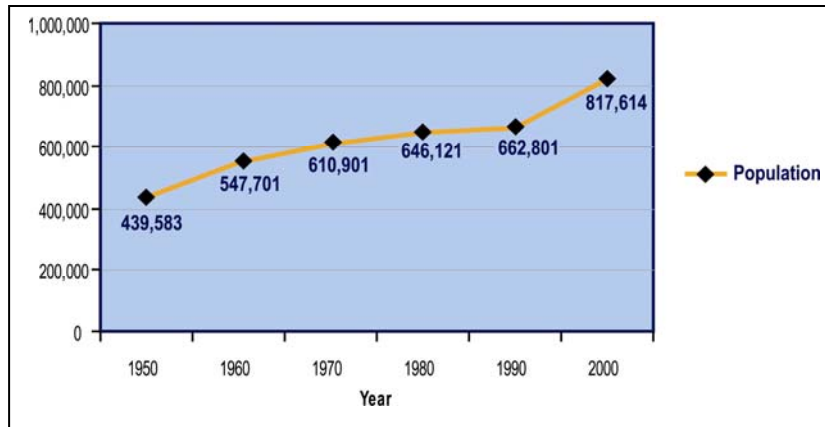
Source: U.S. Census 2000 data analyzed by the Colorado DOLA; downloaded 2004.

The counties within the CSA gained approximately a quarter million people every decade (by county estimates) from 1950 to 2000, with the exception of the years from 1980 to 1990, which was a decade that saw an increase of only 96,400 persons. The decade from 1980 to 1990 was a time of general economic downturn in the Denver metropolitan area.

City and Town Trends

The US 36 project area comprises the cities of Boulder, Broomfield, Denver, Louisville, and Westminster and the Town of Superior. The population trends of these communities from 1950 to 2000 are displayed in Figure 4.23-2, City and Town Population Trends.

Figure 4.23-2: City and Town Population Trends*



* Includes the population for Boulder, Broomfield, Denver, Louisville, Superior, and Westminster.

Source: U.S. Census 2000 data analyzed by the Colorado DOLA; downloaded 2004.

The population of the six communities in the CSA was 439,583 in 1950, and increased to 817,614 in 2000, an increase of 86 percent. The period from 1990 to 2000 was the decade of the highest absolute population increases for the cities and the counties in the CSA. The US 36 toll facility was built in the early 1950s. With the advent of the toll facility, the cities of Boulder and Westminster grew substantially in the 20 years from 1950 to 1970. The cities of Broomfield, Louisville, and Westminster experienced substantial growth in the decade from 1970 to 1980. The City of Louisville continued to grow at a fast pace up until 2000. The Town of Superior had the highest decade of growth from 1990 to 2000. The City and County of Denver had major growth from 1950 to 1960, and also from 1990 to 2000, while the interim decades were relatively flat or the city lost population.

Estimates of the Cumulative Study Area Population Growth from 1970 to 2000

Estimates of the population for the CSA, based on the historic population trends discussed above, were required to calculate historic densities in the CSA. Estimates were required because:

- Historic densities were important for this analysis and these could not be calculated without both historic population trends, and historic development trends.
- The CSA does not encompass clear geographic boundaries that coincide with cities, counties, or census geography; therefore, the direct reporting of data from traditional sources was not feasible.

Population trends were considered with aerial photography that shows areas of development in the CSA in order to calculate historic densities. Aerial photography of the area was first available in 1973; therefore, population estimates from 1970 and later were developed to consider with the aerial photography.

The methodology for estimating population trends in the CSA was based on using known population trends in the counties. Historic population trends for the CSA were assumed to follow the same trends as the historic trends in the counties. This assumption was based on the analysis that historic county trends follow a linear trend. Population estimates, along with digitized acres of development using historic aerial photography, were used to calculate historic land use densities.

Historic Development Trends

The analysis of the historic aerial photography, which measured areas of development in the CSA, resulted in an estimate of acres that were developed and undeveloped for the years 1973, 1990, and 2003. The population estimates and acres of developed land were then used to estimate the historic densities in the CSA for those same years. The results of this analysis are shown in Table 4.23-4, Amount of Land in Development and Historic Densities in the Cumulative Study Area, and Figure 4.23-3, Cumulative Study Area Historic Development Trends (1973-2003).

Table 4.23-4: Amount of Land in Development and Historic Densities in the Cumulative Study Area

Type of Land	1973 (acres)	1980 (acres)	1990 (acres)	2003 (acres)
Undeveloped	119,680	112,000	105,600	89,600
Developed	67,840	75,520	81,920	97,920
Total Land Area	187,520	187,520	187,520	187,520
Population Estimates of CSA	305,790	460,800	615,800	770,815
Estimated Densities (Persons per Acre)	4.5	6.1	7.5	7.9

Source: US 36 Mobility Partnership, 2006.

Note:

CSA = cumulative study area

Development Constraints Considered

To account for additional constraints to development (in addition to land that was already committed to development), the amount of underdeveloped land was decreased by land that has been preserved as open space and/or parks. This resulted in the area of “developable” land of 38,950 acres in 2003.

In consultation with the expert panel, the total acreage available for development was then decreased by an additional 450 acres to account for a variety of other development constraints, including:

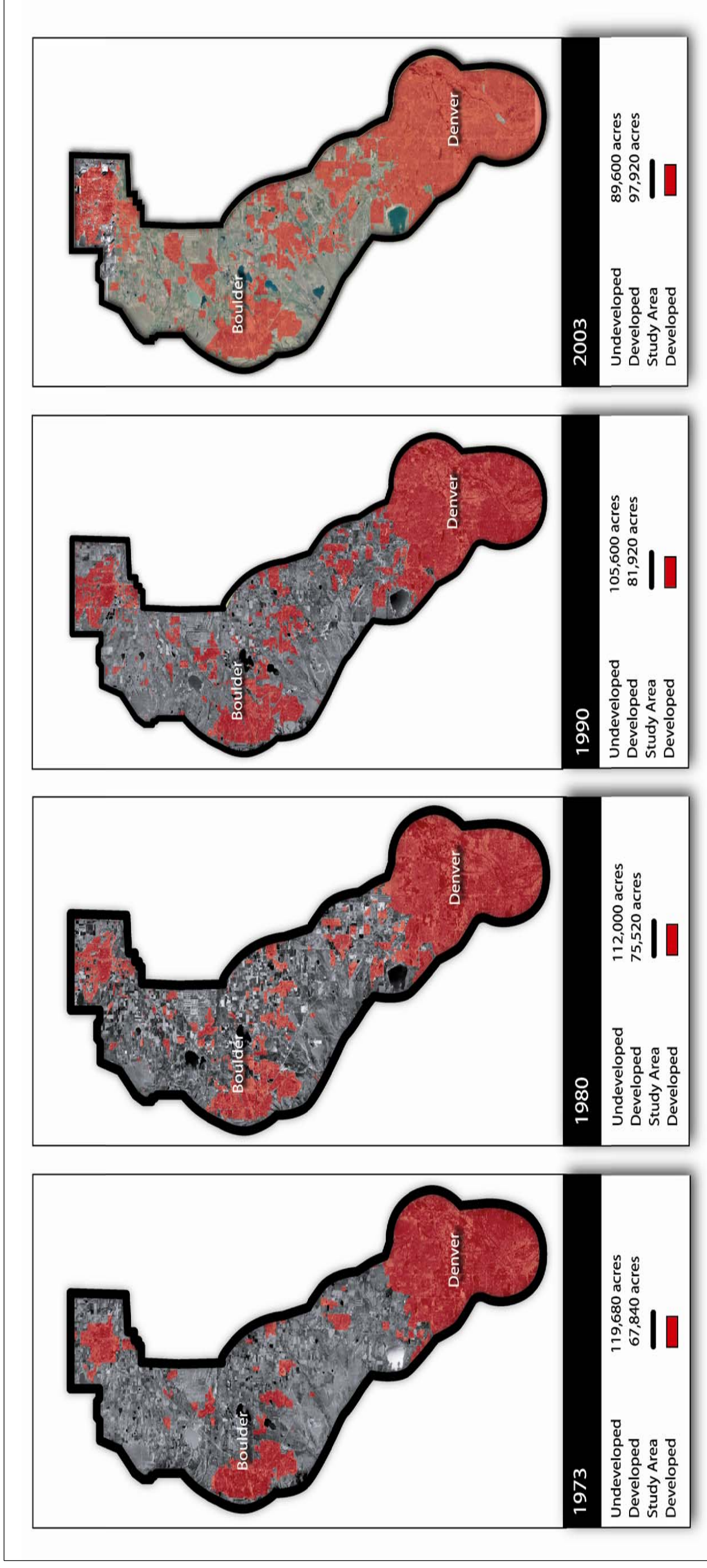
- open space and parklands not accounted for on previous mapping; and
- minor mapping errors.

The land classified as “remaining for development” was then analyzed to account for two other regional development constraints, as listed below.

- Whether the land was within “Rural Preservation Areas (RPA).”
- Whether the land was within DRCOG’s “Urban Growth Boundaries (UGB).”

Rural Preservation Areas have been designated by a number of jurisdictions within the study area and are enforced by an Intergovernmental Agreement (IGA) that notes that these lands are not subject to annexation for 20 years. After 20 years, annexation would require the mutual agreement of the jurisdictions that are parties to the IGA. These areas, for purposes of this analysis, are deemed to be not developable for the 20-year planning horizon of this study. Therefore, the land designated as “available for development” (38,500 acres) was reduced by approximately 10,850 acres based on the analysis of the amount of land in RPAs. This resulted in the final estimate of the availability of land for development in the CSA, which was 27,650 acres.

Figure 4.23-3: Cumulative Study Area Historic Development Trends (1973-2003)



Source: US 36 Mobility Partnership, 2006.

DRCOG UGBs, are based on regional cooperation and are not enforceable by regulation of law. As such, while the boundaries are regionally quite significant, they are subject to change and expansion. If the developable areas outside of UGBs (which eliminates roughly 12,250 acres, as there is some overlap with the RPAs), are subtracted from the total inventory of land, the remaining land for development is 15,400 acres. Since this is less than the amount of land needed to accommodate the 2035 DRCOG planned population growth, it is assumed that the UGBs may be extended as needed to accommodate new population. If the UGBs are not adjusted, the amount of redevelopment would need to increase, or densities would increase, or development would have to occur outside of the CSA.

Table 4.23-5, Land Available for Development in the Cumulative Study Area (2003), displays the development constraints that were accounted for in the final estimate of 27,500 acres of land available for development in the CSA, and the final estimate of 15,400 acres of land available for development within the UGBs in the CSA.

Table 4.23-5: Land Available for Development in the Cumulative Study Area (2003)

Development Constraint	Decrease in Acreage	Resultant Acreage
Total Land Area of 187,520 Acres in CSA Reduced by Developed Acreage	-97,920	89,600
Reduction Due to Land in Open Space and Parks	-50,650	38,950
Mapping Corrections Obtained from Coordination with Local Planning Agencies	-450	38,500
Land Preserved in RPAs	-10,850	27,650
Land Preserved in RPAs and UGBs	-23,100	15,400

Source: US 36 Mobility Partnership, 2004.

Notes:

- = decrease
- CSA = cumulative study area
- RPA = rural preservation area
- UGB = urban growth boundary

Estimate of Future Population and Densities

The next step in the analysis included the use of future population forecasts and estimations of densities for each package. This step was necessary to estimate the land use absorption rates for the impact analysis.

Future Population Projections

The 2035 *MVRTP*, as amended (DRCOG 2009) population estimates (hereafter referred to as “planned population growth”) were used for this analysis. This provides for consistency between the travel demand forecasts completed for this study and the cumulative analysis. Since the CSA is larger than the study area for the rest of the environmental analysis, the population forecast for this analysis is greater than that reported in Chapter 1, Purpose and Need. Estimates of the 2035 population in the CSA are 940,025. This is an increase of 169,210 persons in the CSA, representing a 22 percent increase over 2003.

Estimation of Future Densities (Package 1)

Population densities have been historically increasing in the CSA over the past 30 years. As densities increase, the amount of land needed for new development decreases proportionately. Increases in density have resulted from an increase in the cost of land, planning policy, and increasing shortage of vacant land in the CSA as population has increased.

Based on projections and the total acres of existing development, the average population density for the CSA in 2035 is estimated at 10 persons per acre (DRCOG 2007). This compares to about 7.9 persons per acre in 2003, 7.5 persons per acre in 1990, and 4.5 persons per acre in 1973 (see Table 4.23-4, Amount of Land in Development and Historic Densities in the Cumulative Study Area).

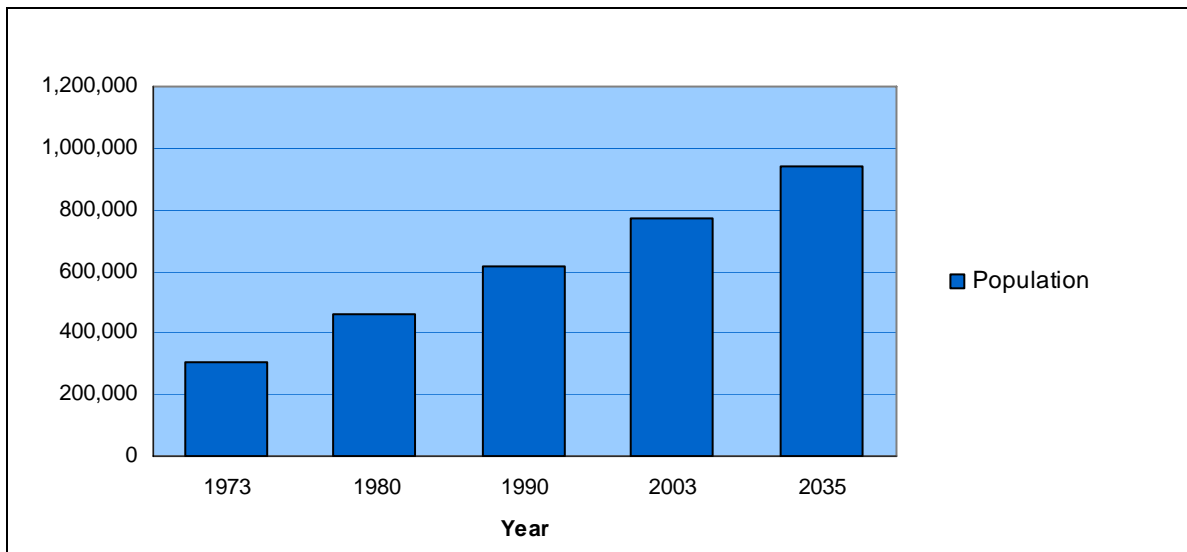
Estimation of Future Densities (Build Packages)

Under existing planning initiatives, land use densities are planned to increase around future transit and BRT stations. (See Table 4.23-2, Past, Present, and Future Projects in the US 36 Cumulative Study Area, and Section 4.2, Land Use, for additional information on TOD plans.) Because of this, the build packages assumed densities that intensified at BRT station areas. These density assumptions were derived from:

- Local land use plans
- Estimates of a reasonable increase over Package 1
- Consultation with the project team, including RTD

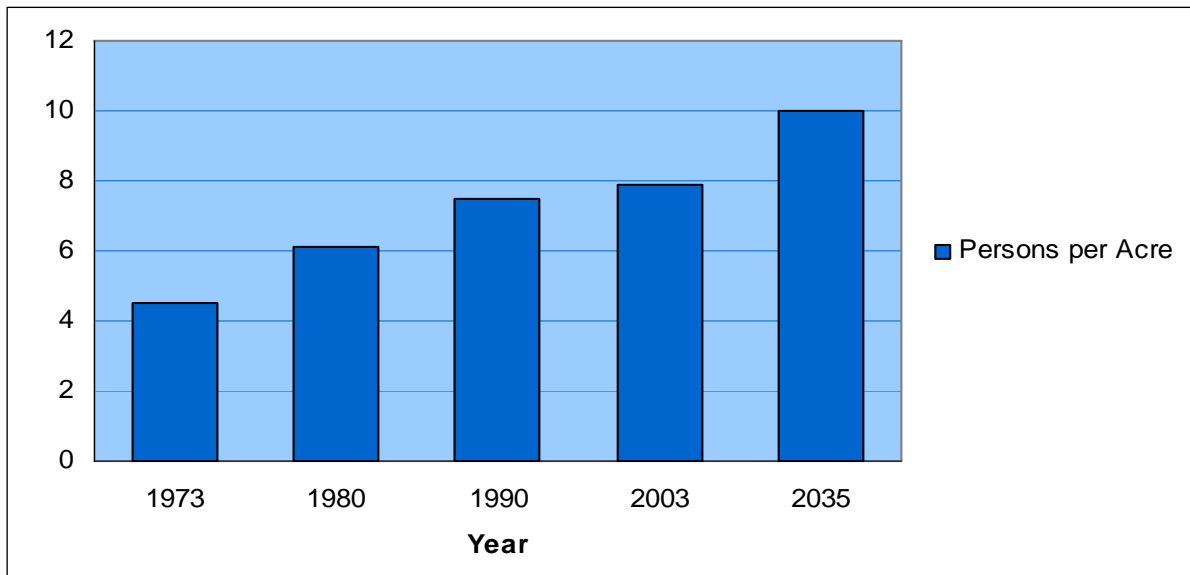
Figure 4.23-4, Cumulative Study Area — Historic and Future Populations, and Figure 4.23-5, Cumulative Study Area — Historic and Future Densities, display historic and future population and density trends.

Figure 4.23-4: Cumulative Study Area — Historic and Future Populations



Source: US 36 Mobility Partnership, 2009.

Figure 4.23-5: Cumulative Study Area — Historic and Future Densities



Source: US 36 Mobility Partnership, 2009.

Land Use Policies in Place to Protect Sensitive Environments

Several land use policies are intended to protect sensitive natural environments and manage growth in the US 36 project area. In addition to DRCOG UGBs, and the regional planning associations in the project area, municipalities that make up the CSA also have a number of preservation policies in place. These policies and regulations would reduce the impact of future development on sensitive environments.

The land use policies for protection of sensitive environments include:

- Open space purchases
- Transfer of Development Rights programs
- Conservation easements
- Floodplain permitting and protection
- Wetlands protection and permitting requirements
- Zoning
- Riparian protection in the cities of Boulder and Broomfield, and the Town of Superior

Cumulative Impact Results

The results of the cumulative impact evaluation are included below by package for each of the resources identified in the cumulative impact methodology:

- Land use
- Water quality, wetlands, and floodplains
- Biological resources
- Air quality

Resource evaluations are generally presented under two headings:

- Effects of planned population growth
- Effects of present and future infrastructure projects

Package 1: No Action

Land Use

Effects of Planned Population Growth

Under Package 1, the CSA would continue to urbanize until near build-out in 2035, based on existing comprehensive plans. Moreover, land use absorption rates are expected to continue into the future based on densities as calculated from DRCOG 2035 data (DRCOG 2007), resulting in approximately 169,210 additional persons moving into the CSA by 2035 at an average density of 10 persons per acre. This would require 16,900 acres of new development to support these individuals. Additionally, Denver is encouraging the transition of land in the northern portion of the city (Five Points, Globeville, Sunnyside, and Highlands neighborhoods) from industrial to mixed use and TOD, especially in locations that would likely be affected by future transit stations. This transition of land use is dependent on Denver changing its current zoning to reflect the vision created by *Blueprint Denver - An Integrated Land Use and Transportation Plan (2002)* (City and County of Denver 2002), and the final location of transit stations. Urbanization as a result of DRCOG's planned population growth would have greater environmental

consequences than present or planned infrastructure projects. All infrastructure systems included generally require from 20 to 25 percent of total land development.

Location of Development. The ultimate location of new development would be a function of local policy and land availability. Due to the fact that the CSA is expected to be near full build-out by 2035, the development pressure on available land would likely become extreme, especially in the eastern portions of the CSA. The largest amount of developable land is in the Boulder and Longmont segments that have the greatest amount of flexibility to direct the location of new development. The Boulder Segment would likely be built-out by 2035, while the Longmont Segment is not expected to be completely built-out by 2035.

Effects of Present and Future Infrastructure Projects

As discussed above, accommodating future population growth and supporting development of the CSA in Package 1, as predicted by DRCOG, would result in the most dramatic environmental change. Serving this development, the most important transportation projects being studied are those already in local plans or those that are imminent in the CSA:

- Northwest Parkway, completed in 2003
- Northwest Rail, under study with development of an Environmental Evaluation and Environmental Assessment
- Expansion at DUS, approved by FTA in 2008
- Other FasTracks Program projects

As previously shown in Table 4.23-2, Past, Present, and Future Projects in the US 36 Cumulative Study Area, there are numerous projects that are committed to serve projected development. The effects of these projects are included in the estimates of future land development (estimated at approximately 16,900 acres) to accommodate the 2035 population.

The Northwest Parkway (completed in 2003) and the Northwest Rail Corridor Project (under study) represent transportation projects that would cumulatively affect land uses in the CSA. The Northwest Parkway is a toll road that opened in November 2003 and connects E-470 and Interstate 25 (I-25) at 157th Avenue. The parkway travels west and south to 96th Street and then turns into a four-lane arterial allowing access to US 36. The Northwest Parkway is comprised of three jurisdictions: the City and County of Broomfield, the City of Lafayette, and Weld County. The fact that most of the land adjoining the Northwest Parkway, as it traverses the CSA east of US 36, is dedicated as open space, has reduced the effect of the parkway on land use.

The Northwest Rail Corridor Project is a proposed 38.1-mile commuter rail corridor from DUS to Longmont via Boulder, passing through Westminster, Broomfield, Louisville, Boulder, Niwot, and Longmont. As part of the voter-approved FasTracks Program, the Northwest Rail Environmental Evaluation/Environmental Assessment will be conducted under NEPA to identify the best way to provide high-quality, reliable transit service to the area, while improving travel times and enhancing access to jobs, recreation, and entertainment. Funding was secured for the Northwest Rail Corridor Project through the passage of FasTracks in November 2004, and the project is currently estimated to open in 2015. The effort will incorporate the analysis of the rail corridor from Denver to Boulder and on to Longmont, Colorado. Much of the remaining land in the CSA that would be affected by the Northwest Rail Corridor Project is outside of the existing urban growth boundary and therefore would not be developed until after 2035.

The Northwest Rail Corridor EIS, which analyzed construction of a new freeway between Northwest Parkway and C-470 in Jefferson County, was cancelled in 2008 due to budget constraints and lack of consensus among local communities. The Jefferson Parkway Public Highway Authority continues to work toward creating and financing a plan to build a freeway in this area. This project is not in any

funded plans and therefore was not determined to be a reasonably foreseeable future project within the timeframe for this analysis.

Implementation of DUS improvements is key to the success of FasTracks as it serves as the hub for regional rail and bus service. Improvements at DUS are expected to encourage higher density development and result in a more efficient use of land.

RTD's *Programmatic Cumulative Effects Analysis (PCEA)* (RTD 2007) states that the FasTracks Program would reduce the amount of natural land converted to urbanization due to denser development around transit stations associated with TOD.

Water Quality, Wetlands, and Floodplains

This analysis assumes that water quality, wetlands, floodplains, and wildlife habitat are all related components to a diverse ecosystem, and that all would be affected by future development in the CSA. The cumulative effects of planned population growth and present and future projects under Package 1 are discussed below. A strong correlation exists between the ecological health of the US 36 corridor environment and water resources. US 36 intersects four major watercourses. These watercourses provide the most productive wildlife habitat in the project area, and serve as important riparian corridors connecting protected open spaces and allowing wildlife habitat connectivity. In addition, these corridors serve as the backbone for trail systems that provide public recreation.

Water quality has progressively been reduced with increased urbanization as impervious surfaces (i.e., asphalt and concrete) have been added to the landscape and non-point sources of contamination have been introduced to the surface drainage system through increased storm runoff. Historically, water quality protection from storm runoff was not typically provided in new development projects, including highway and street projects. During rain events, pollutants and sediments that accumulated on impervious surfaces were flushed into the receiving stream, causing a detrimental effect on stream water quality. As a result, current federal and state regulations require stormwater detention and treatment for most transportation improvements, including new pavement proposed for the US 36 packages. This is critical to future water quality and flood control, as the amount of impervious surfaces in the project area is predicted to increase from the current 21 percent, to 24 percent in 2035. The water quality analysis indicates that none of the build packages would degrade water quality due to the incorporation of protective measures. In fact, the build packages, due to the inclusion of water quality controls, would result in improved water quality over the existing condition where no controls are currently provided. Likewise, the floodplain and hydraulic analyses indicate that neither of the build packages would impact flood elevations in any of the affected water courses. This is because new bridges would be designed to accommodate a 100-year flood, or would at least match the existing bridge or culvert span across the floodplain.

None of the build packages are expected to degrade water quality due to the incorporation of protective measures.

Water Quality

Effects of Planned Population Growth

In Package 1, the greatest effect of planned population growth on water quality would be the increase in the amount of impervious surfaces that trap pollutants and increase runoff to receiving watercourses. The CSA is projected to change from a current 52 percent developed to 61 percent developed in 2035. Assuming that the average percent imperviousness of existing developed land is 40 percent, the overall percent imperviousness within the CSA is currently 21 percent (40 percent of 52 percent). Based on the land use projections made for this study, the future percent imperviousness would increase to 24 percent (40 percent of 61 percent), or by 3 percent overall. This is anticipated to increase runoff and the volume of contaminants potentially conveyed to streams in the CSA.

Due to development pressure, essentially all of the available developable land in the CSA south of the Longmont Segment is anticipated to become urbanized by 2035. Both in-fill and greenfield development could contribute to water quality problems, because it would further reduce the remaining natural areas in the CSA to filter and infiltrate runoff.

These effects should be alleviated by local and CDOT stormwater detention ordinances requiring that runoff not exceed historic, pre-development levels. Nonetheless, water quality in receiving streams can be expected to degrade somewhat as the result of dissolved contaminants (e.g., chemical oxygen demand, 5-day biological oxygen demand, nutrients, and metals), fecal coliform, *Escherichia coli* (*E. coli*), and petroleum products that are not captured by stormwater detention facilities.

The Denver, Adams, and Boulder segments are expected to have a greater portion for their future development to occur as redevelopment (e.g., urban renewal). The net increase in development in these areas is predicted to be much less, since little vacant, developable land is available and redevelopment would not represent much change over existing conditions.

New development and redevelopment in the study area would not be expected to substantially degrade water quality due to stormwater control ordinances, better riparian protection, and improved public education regarding the use of toxic materials for landscape maintenance. Redevelopment areas would also be retrofitted with stormwater runoff controls, which, in many cases, do not now exist, resulting in small improvements to water quality.

Of the 13 streams that cross the CSA, the six that are most likely to be affected by new development under Package 1 include:

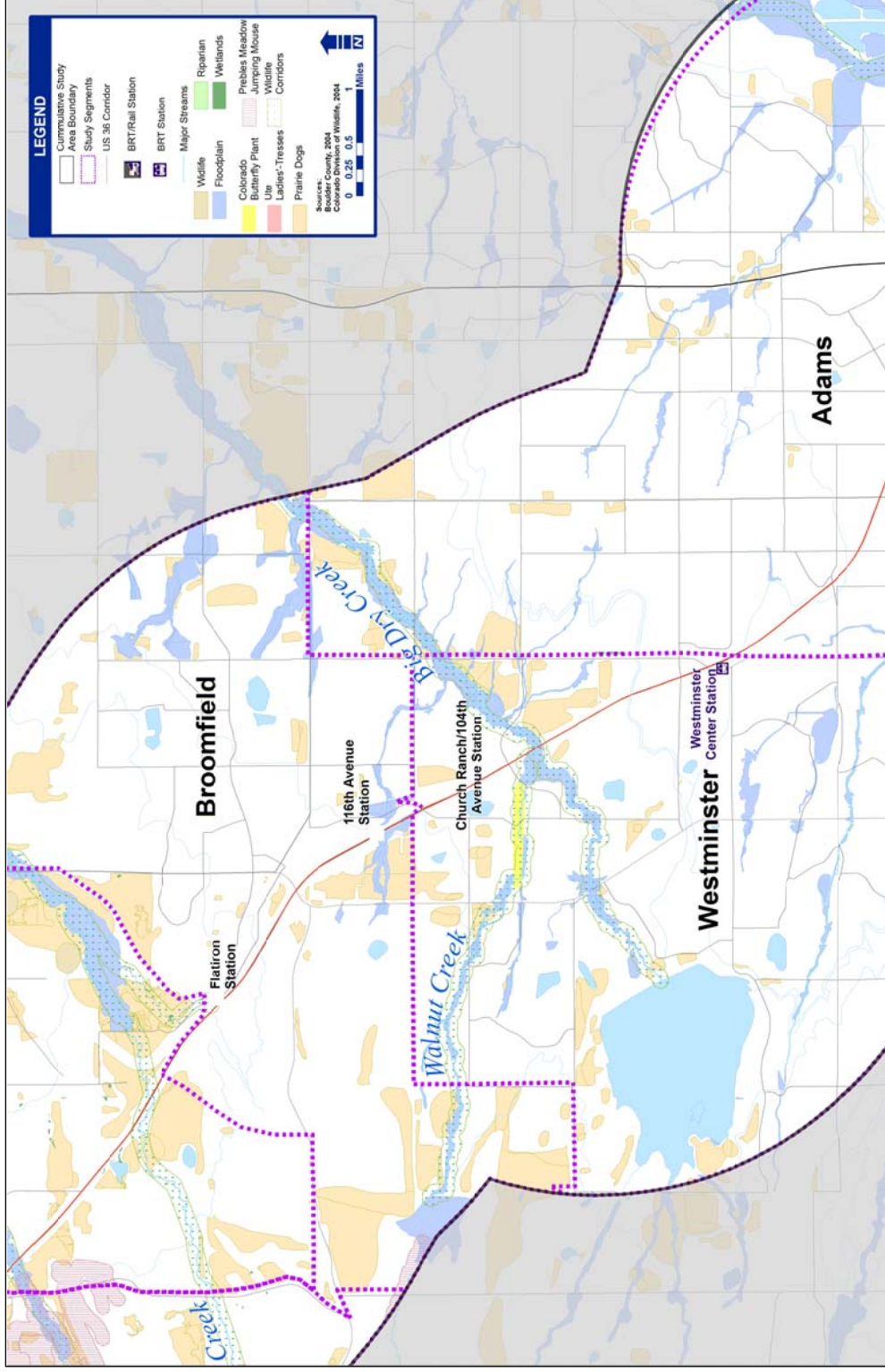
- Big Dry Creek
- Walnut Creek
- Rock Creek
- Coal Creek
- Left Hand Creek
- Saint Vrain Creek

These streams would be affected the most because they cross through areas of unprotected developable land that would most likely be urbanized over the next 25 years. Most of the constraints facing stream ecology in this portion of the CSA are independent of improvements on US 36. They exist as a result of historic development activities, particularly over the past 50 years. As shown in Figure 4.23-6, Big Dry Creek Drainage, parcels of developable land exist north of US 36 on both sides of the creek until it exits the CSA. Developable lands are also located within the Walnut Creek drainage south of US 36. In both cases, these vacant parcels are surrounded by subdivisions, so it is highly probable that all of this land would be developed by 2035.

In the Rock Creek and Coal Creek basins, the majority of the land is either not available for new development or is already developed. However, as shown in Figure 4.23-7, Rock Creek and Coal Creek Drainages, vacant parcels are available both adjacent to US 36 and in the vicinity of the confluence of the two creeks near the eastern boundary of the CSA. These areas would probably be developed by 2035 because of the relative shortage of developable land in this segment.

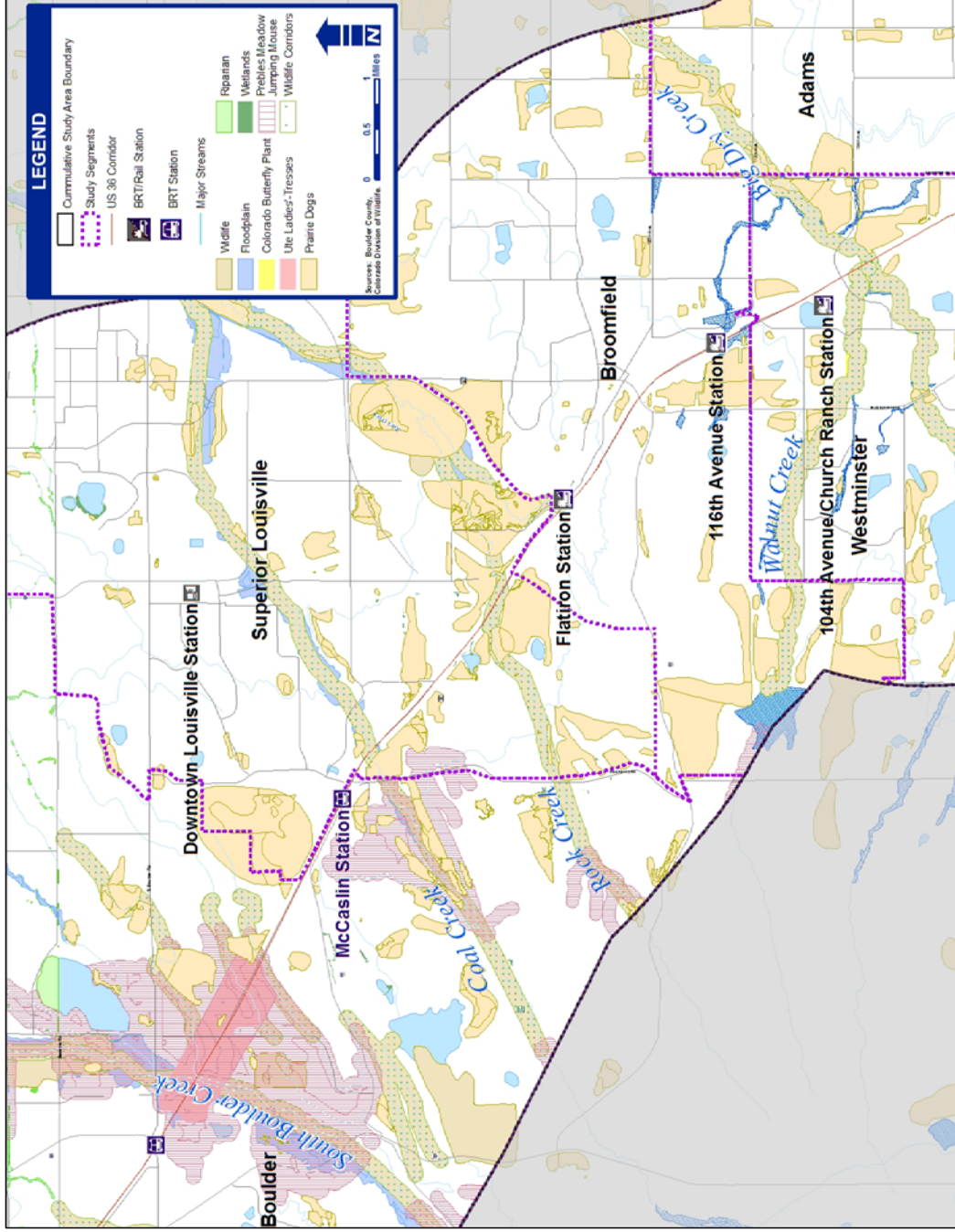
The impact of new development on Left Hand Creek would depend on the degree to which Boulder County expands its development boundaries. With no expansion of the current growth boundaries, the upper portion of Left Hand Creek would be unaffected by new urbanization in 2035. (See Figure 4.23-8, Left Hand, Dry Creek, and Saint Vrain Creek Drainages.)

Figure 4.23-6: Big Dry Creek Drainage



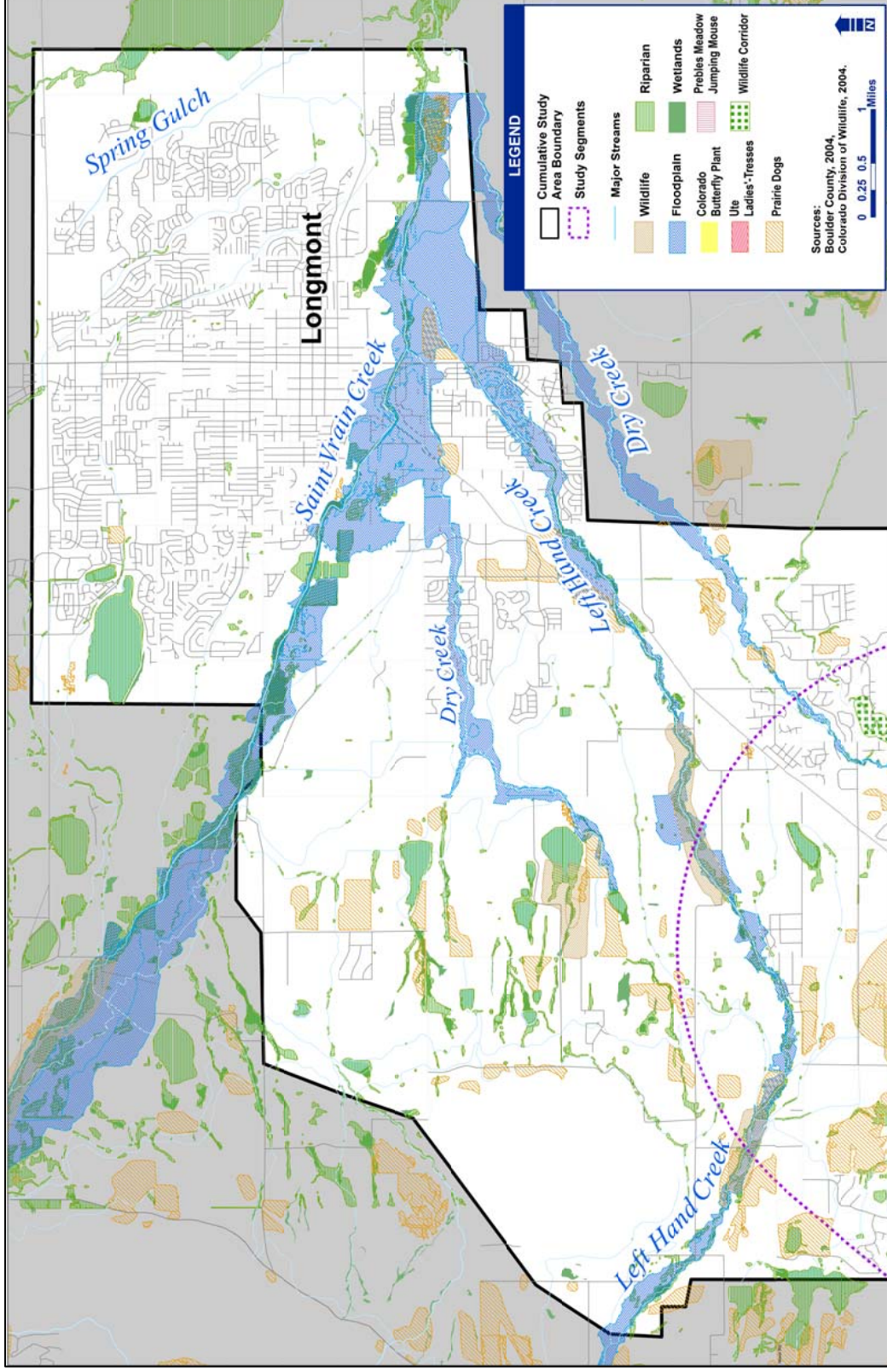
Note: The 116th Avenue Rail Station is not a part of the 2004 FasTracks Program. Additional stations were added in the early planning stages of the US 36 Environmental Impact Statement. Exact rail station locations and additional stations may be reconsidered in the U.S. Army Corps of Engineers/Regional Transportation District Northwest Rail Environmental Assessment/Environmental Evaluation.

Figure 4.23-7: Rock Creek and Coal Creek Drainages



Note: The 116th Avenue Rail Station is not a part of the 2004 FasTracks Program. Additional stations were added in the early planning stages of the US 36 Environmental Impact Statement. Exact rail station locations and additional stations may be reconsidered in the U.S. Army Corps of Engineers/Regional Transportation District Northwest Rail Environmental Assessment/Environmental Evaluation.

Figure 4.23-8: Left Hand, Dry Creek, and Saint Vrain Creek Drainages



The impacts of planned population growth on the Saint Vrain Creek and Dry Creek drainages immediately west of Longmont is also affected by the degree to which the UGB is expanded. The majority of the developable land is located between Dry Creek and Saint Vrain Creek, with additional developable land located immediately south of Dry Creek in this same area (see Figure 4.23-8, Left Hand, Dry Creek, and Saint Vrain Creek Drainages). These remaining lands would probably be developed by 2035 because much of the immediate surrounding area has been subdivided.

In contrast to the above, South Boulder Creek, Boulder Creek, Goose Creek, Wonderland Creek, and Fourmile Canyon Creek in the Boulder Segment are protected from urbanization due to extensive open space preservation in this portion of the CSA. Again, the condition of these streams is established and not anticipated to change by 2035 in Package 1.

Effects of Present and Future Infrastructure Projects

The Northwest Parkway (completed in 2003) may affect water quality in the Rock Creek drainage basin. However, as discussed above, land use changes along Rock Creek to the north of US 36 are expected to be minimal due to the large amount of open space adjacent to the Northwest Parkway alignment. The one exception is the urbanization of land located between SH 287 and the creek immediately north of the SH 287/Northwest Parkway interchange. The Northwest Parkway is not anticipated to indirectly affect water resources in other portions of the CSA.

According to the *PCEA* (RTD 2007), the proposed FasTracks Program is estimated to add 280 acres of new impervious surfaces for regional parking facilities. Runoff from these facilities would be collected and detained per local regulations¹. The higher densities associated with TOD are anticipated to reduce the conversion of natural land to urban land. Overall, regional water quality is considered to be comparable to a future without FasTracks.

Wetlands

Effects of Planned Population Growth

Approximately 2,090 potentially developable acres of wetlands are in the CSA. These wetlands could be reduced or eliminated during development through direct effects (filling), or removal of hydrology, such as canal seepage or return flows. While all of these wetlands could potentially be affected by development, impacts are likely to be much less than the predicted 2,090 acres due to Section 404 permit requirements, and local land use policies. All projects impacting wetlands considered jurisdictional by the USACE would have requirements for permitting, minimization of impacts, and mitigation under the Section 404 permitting program.

Cumulative effects on wetlands would most likely occur proportionately to the amount of developable land available within the CSA. The greatest absolute impact is expected in the Superior/Louisville, Boulder, and Longmont segments. The wetland mapping shows minimal wetlands in the developable lands surrounding Big Dry Creek and Walnut Creek, as shown in Figure 4.23-6, Big Dry Creek Drainage. There is a small area of wetlands on developable land in the Rock Creek drainage north of US 36, shown in Figure 4.23-7, Rock Creek and Coal Creek Drainages. There are numerous small wetlands in the developable land surrounding Louisville. There are also small wetlands located throughout the developable lands of the upper drainage of Left Hand Creek, and the Saint Vrain Creek and Dry Creek drainages in the Longmont Segment, as shown in Figure 4.23-8, Left Hand, Dry Creek, and Saint Vrain Creek Drainages.

Wetlands that are isolated or that are supported by irrigation are likely to be considered non-jurisdictional by the USACE. Loss of non-jurisdictional wetlands is more likely as these wetlands are not as closely regulated. The extent to which non-jurisdictional wetlands are protected will be controlled by the local

¹ The *Programmatic Cumulative Effects Analysis (PCEA)* (RTD 2007) does not analyze water quality impacts due to runoff from track and pervious track ballast.

governments. For example, as mentioned previously, the City of Boulder has a wetland permitting process to protect floodplain and riparian areas. Other political entities in the CSA also have policies for protection of wetlands. In the case of state highways, CDOT policy requires mitigation for all impacted wetlands, including non-jurisdictional wetlands.

Effects of Present and Future Infrastructure Projects

The Northwest Parkway Project involved two crossings of Rock Creek and a single crossing of Goodhue Ditch in the CSA. According to the *Corridor Environmental Review* conducted by the Northwest Parkway Authority in 2001, approximately 1.4 acres of jurisdictional wetlands, and 0.67 acre of non-jurisdictional wetlands were affected.

According to the *PCEA* (RTD 2007), up to 50 acres of wetlands in the Denver metropolitan region could be affected with the implementation of FasTracks. The *PCEA* also notes that some indirect effects are possible due to induced development associated with TOD around stations.

Floodplains

Effects of Planned Population Growth

The implementation of Package 1 would result in an increase in the amount of impervious surfaces in the CSA from 21 to 24 percent, which is anticipated to increase peak runoff, thus possibly increasing streambed scour and bank erosion. These changes are the result of development and the absolute increase in the urban footprint of approximately 16,900 acres. The greatest changes are expected in the Big Dry Creek and the Saint Vrain Creek drainages due to the potential for development in these areas. Hydrologic changes in the Rock Creek and Coal Creek drainages are also anticipated but to a lesser extent as the ratio of developable land to the total drainage area is smaller. Stormwater ordinances limiting runoff to historic, pre-development levels would mitigate these impacts.

Effects of Present and Future Infrastructure Projects

In combination, the recently completed Northwest Parkway and the anticipated Northwest Rail corridor projects, currently under study, would represent a minor percentage of new impervious area within the CSA. Moreover, these projects would comply with the state's MS 4 Program, which requires the capture and treatment of stormwater resulting from new highway pavements. Other new local developments will need to comply with Urban Drainage and Flood Control District (UDFCD) criteria and local ordinances for new drainage projects, including the control of future runoff from impervious surfaces. Runoff would be mitigated to not exceed historic pre-development levels. A list of programmatic mitigation measures to be implemented by RTD is provided in the *PCEA*, and includes the use of locally accepted and encouraged BMPs for protection of water quality.

Adams County and CDOT have worked together on previous drainage improvements to the area along US 36 between I-25 and Federal Boulevard. Drainage facilities for the build packages would be designed in a cooperative manner with local jurisdictions, including Adams County, for the outfall to Clear Creek. Further work and coordination on this issue will occur during final design.

The City of Boulder has recently completed and adopted an initial study of the South Boulder Creek floodplain. As of the writing of this FEIS, none of the build packages would include removal of US 36 from the 100-year floodplain. Depending upon continued subsequent plans for flood control by the City of Boulder, Boulder County, and the UDFCD, the final elevation of the highway may need to be modified. Further work and coordination on this issue will occur during final design of the US 36 project.

Future project phases would work with the UDFCD and the jurisdictions along the corridor to identify and implement drainage improvements where practical. As stipulated under 23 CFR 650.115(5), encroachment within any of the floodplains along US 36 would be subject to the requirements of the local jurisdictions. However, it is not the obligation of the US 36 project to upgrade existing storm drainage

infrastructure beyond what is required to mitigate any adverse impacts to properties either upstream or downstream of the project improvements. The process that would be followed during design of the project would be guided by CDOT's *Procedural Directive 501.2: Cooperative Storm Drainage System*, (2004).

As mentioned earlier, according to the *PCEA* (RTD 2007), the FasTracks Program is projected to add 280 acres of impervious surface for parking facilities. Like other development projects, runoff would be mitigated to not exceed historic pre-development levels.

Biological Resources

Effects of Planned Population Growth

In Package 1, the conversion of 16,900 acres from undeveloped and agricultural land to urban land would reduce wildlife habitat in the CSA. Approximately 3,850 acres of high-quality habitat and 28,500 acres of moderate-quality wildlife habitat were available for development within the CSA in 2003. This estimate includes areas of wetlands, riparian, cropland, open water, native prairie, and other natural habitats, but does not include residential areas that are used by wildlife adapted to more urbanized environments. The majority of the habitat type considered available for development is irrigated cropland.

Riparian areas in the CSA are generally protected. However, in areas where the adjoining land is anticipated to develop, the productivity of the ecosystem and its biodiversity, would be reduced. The riparian corridors where habitat loss from surrounding uplands is anticipated to include Big Dry Creek, Walnut Creek, Coal Creek, Rock Creek, Left Hand Creek, and Saint Vrain Creek. Figures 4.23-6 through 4.23-8 show the relationship between developable land and important wildlife habitat.

Three listed federally threatened (FT) or federally endangered (FE) species are known to occur in the CSA: Preble's meadow jumping mouse, Ute ladies'-tresses orchid, and Colorado butterfly plant. Three state-threatened species, the bald eagle (*Haliaeetus leucocephalus*), burrowing owl (*Athene cunicularia*), and common shiner (*Luxilus cornutus*), also occur in the CSA.

Future development adjacent to riparian corridors may serve to reduce their value as wildlife habitats for all but the most urban-tolerant species. Species such as deer, coyote, bald eagle, and other raptors would be expected to be displaced from these developed areas. Additionally, the loss of prairie dog colonies on the developable land adjacent to Big Dry, Walnut, Rock and Coal creeks, Big Dry Creek Drainage, and Rock Creek and Coal Creek drainages, would reduce the food source for predator species, as well as reduce the value of these habitats for burrowing owls. With the exception of the burrowing owl, none of the other identified FT and FE species use the riparian areas most likely to be developed. Other FT and FE species, such as Ute ladies'-tresses orchid, have been identified on other open space properties in the Boulder Segment. Bald eagle nests identified in the CSA are found on protected open space properties.

The extent of impact partially depends on the level of habitat fragmentation that occurs in these corridors as the result of future development. This is especially important in the Westminster, Broomfield, and Superior/Louisville segments where open space is especially critical to wildlife. Vacant lands along Rock Creek east of US 36 and Coal Creek adjacent and north of US 36, are prime lands for development. As these areas are developed, this portion of the CSA would become less productive as wildlife habitat.

Land use along the South Platte River and Clear Creek is essentially fixed and its value to wildlife would not change markedly in 2035. Lands along South Boulder Creek, Davidson Ditch, Goodhue Ditch, and South Boulder Ditch are protected as open space and also are not expected to change in 2035.

Effects of Present and Future Infrastructure Projects

Present and future infrastructure projects are anticipated to have a minor impact on wildlife compared to 2035 development projects, which represent over 99 percent of the land converted to urban uses. The Northwest Parkway may indirectly affect wildlife habitat in Rock Creek and Walnut Creek drainages. As discussed above, land use changes along Rock Creek to the north of US 36 are not anticipated due to the large amount of open space adjacent to the Northwest Parkway. However, the parkway has added an additional barrier to wildlife movement in this portion of the CSA.

The *PCEA* (RTD 2007) does not specifically address cumulative effects of the FasTracks Program on biological resources. The study does indicate that the influence of TOD is projected to reduce the amount of natural lands that would be developed in the future. This would have a neutral effect on biological resources.

Air Quality

The component projects of Package 1 meet the transportation conformity requirements by their inclusion in the conforming DRCOG *2008-2013 TIP* (2008) and are consistent with the DRCOG *2035 MVRTP*, as amended (2009).

In Package 1, regional air quality is anticipated to improve slightly over the 25-year planning period. This is due to the implementation of the FasTracks Program, reductions in roadway sanding, more aggressive street sweeping, and cleaner operating motor vehicles. These projects will follow the regulatory structure for air quality planning in Colorado that includes federal, state, regional, and local agencies. These agencies either have regulatory authority or are responsible for the development and implementation of programs and plans designed to reduce air pollution levels, including emissions from transportation sources.

Package 2: Managed Lanes/Bus Rapid Transit; Package 4: General-Purpose Lanes, High-Occupancy Vehicle, and Bus Rapid Transit; and the Combined Alternative Package (Preferred Alternative): Managed Lanes, Auxiliary Lanes, and Bus Rapid Transit

Land Use

Effects of Planned Population Growth

Because the 2035 population of the CSA would be the same with or without a build alternative, the implementation of Packages 2 or 4, or the Combined Alternative Package (Preferred Alternative) would have essentially the same cumulative effect on land use as Package 1.

There may be opportunities for induced growth in the form of additional TOD around the proposed US 36 BRT stations. Local governments have been proactive in planning for future transportation improvements in the US 36 corridor. As a result, many of the land use plans anticipate transit improvements and improvements to the highway. Several of the local plans from the corridor identify transit supportive development and/or TOD around the BRT stations proposed in the build packages. The majority of TOD would likely happen around the existing park-n-Rides in Package 1, especially at the park-n-Ride stations adjacent to commuter rail stations (given the stronger association between rail stations and TOD). This would not result in an increase of population in the CSA, but would cause minor re-distributions of population near transit stations.

The improvement of the park-n-Rides to include median BRT stations, enhanced bus service, and highway improvements in Packages 2 and 4 would likely support and encourage a small amount of additional TOD. However, the ability of the BRT stations provided by the Combined Alternative

Package (Preferred Alternative) to attract TOD would be comparable. Thus, the minor indirect impacts associated with the higher-density development around BRT stations could be generated to comparative levels with any of the three build packages. The transit-supportive development would primarily consist of higher-density residential development within an area comprising a 0.25-mile (or a 5-minute walking) radius around the stations.

Effects of Present and Future Infrastructure Projects

The effect of present and future projects on land use for any of the build packages are the same as discussed above for Package 1.

Water Quality, Wetlands, and Floodplains

Effects of Planned Population Growth

Because the 2035 population of the CSA would be the same with or without a build alternative, the implementation of either Packages 2 or 4, or the Combined Alternative Package (Preferred Alternative) would have essentially the same cumulative effect on water quality, wetlands, and floodplains as Package 1. The cumulative water quality effects of any redistribution of growth associated with BRT station TOD would be negligible when compared to Package 1.

The impacts of Packages 2 and 4, and the Combined Alternative Package (Preferred Alternative) are essentially the same as Package 1 with some minor differences. Minor additional indirect impacts associated with the higher-density development around BRT stations could be generated with the three build packages, resulting in fewer acres of new impervious area. While this would have a beneficial effect on water quality, the differences when compared to Package 1 would be negligible.

Packages 2 and 4 and the Combined Alternative Package (Preferred Alternative) would have no measurable differences in wetland impacts within the CSA over Package 1.

Implementation of any of the three build packages would result in an increase in impervious area, potential runoff, and resulting non-point source pollution over the existing impervious area. Approximately 6,800 acres (typically about 40 percent of new development) of new impervious area is associated with accommodating the 2035 population under Package 1. Packages 2 and 4, and the Combined Alternative Package (Preferred Alternative) would reconstruct US 36 and some adjacent local roads, resulting in a total of 565, 577, and 473 acres of impervious surface, respectively.

In comparison to Package 1, minor improvements to water quality would occur with the three build packages due to the need to comply with the MS4 Program requirements for controlling runoff from US 36. For example, water quality ponds would be constructed to detain and treat stormwater runoff from the highway facility before releasing it to adjacent waterways. Under this requirement, the three build packages would provide the runoff capture and detention to mitigate water quality impacts, whereas under Package 1, runoff control from the existing US 36 pavement would not be provided. This is a positive impact but small by comparison to the amount of runoff generated by existing and projected development within the CSA.

Implementation of any of the three build packages would present the potential for construction-related erosion and sediment related to earthwork, construction of structures, highway widening, and loss of vegetation. These impacts would be mitigated by existing regulations and are comparatively minor compared to the amount of site preparation required to accommodate 16,900 acres of new development needed to support the projected 2035 population.

Since population in the CSA would be the same with the implementation of Package 1 and any of the three build packages, the domestic water supply requirements to serve the population increases would also be equal.

Effects of Present and Future Projects

The cumulative effect of present and future projects, plus implementation of any of the build packages, is comparable to Package 1.

Biological Resources

Effects of Planned Population Growth

Because the 2035 population of the CSA would be the same with or without a build alternative, the implementation of Packages 2 or 4, or the Combined Alternative Package (Preferred Alternative) would have essentially the same cumulative effect on biological resources as Package 1. While the distribution of growth may be slightly different among the alternatives due to TOD surrounding BRT stations, the changes would be minor and not quantifiable compared to Package 1.

Effects of Present and Future Projects

The cumulative effect of present and future projects in combination with any of the build packages on biological resources is comparable to Package 1.

Air Quality

The Denver metropolitan area became a nonattainment area for the federal ozone (O₃) standard in 2007 as a result of violation of the federal 8-hour O₃ standard. The state has developed a detailed plan to reduce O₃; the plan requires future reductions in O₃ levels than were initially required when the O₃ violations first occurred. CDOT is required to ensure that federally-funded projects, like the improvements proposed to US 36, adhere to Colorado's air quality improvement plans and health-based air quality standards. The air quality analysis conducted for each of the build packages determined that each package would be in conformity and would not result in exceedances of the national ambient air quality standards.

The implementation of any of the build packages would have impacts that are comparable to Package 1.

Mitigation

The analysis of cumulative impacts shows that in comparison to Package 1, the difference in impacts between any of the build package is minor. Therefore, no further mitigation for cumulative impacts would be required.

Specific mitigation measures for direct impacts, including measures to avoid, minimize, or rectify adverse environmental impacts with the build packages, are discussed in the individual resource sections of this document.

