Section II: Documentation of Area Characteristics

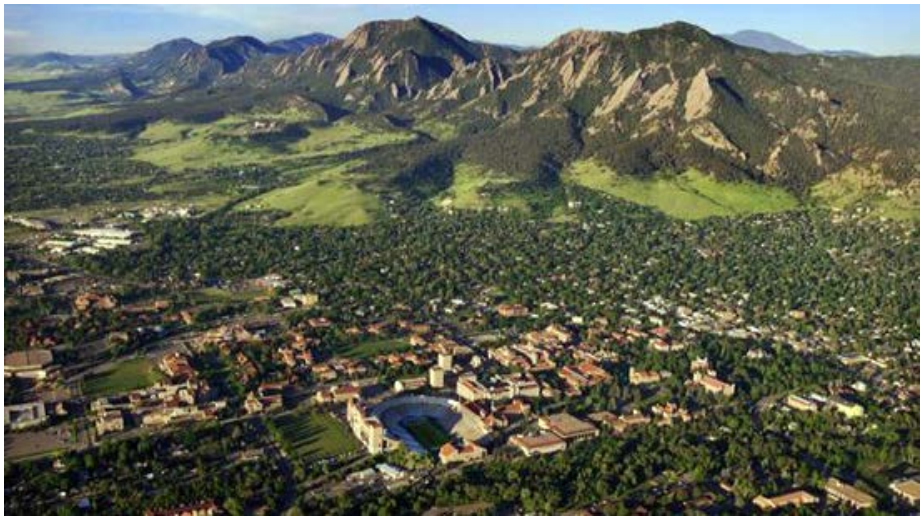


Image 4. City of Boulder aerial view

The City of Boulder is home to the University of Colorado, the National Institute of Standards and Technology (NIST), the National Oceanic and Atmospheric Administration (NOAA), as well as many other science and technology-based companies. It is also the home training base for hundreds of world-class athletes.
The city is located along Boulder Creek at the base of the foothills of the Rocky Mountains, roughly 18.5 miles east of the continental divide and 35 miles northwest of Denver. Canyons create steep, rugged terrain along the western edge of the city along the transition from the foothills to the plains. The canyons also serve as a funnel for strong winds into the city which have caused damage to homes and infrastructure due to their role in fueling the wildfire potential.

Topography

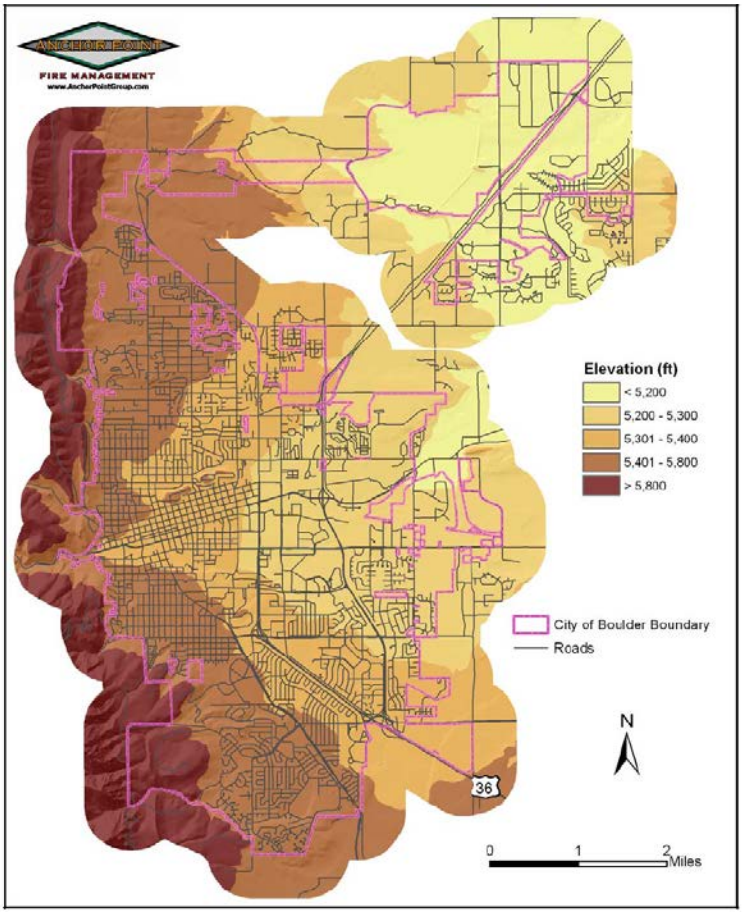
The City of Boulder covers an area of 25.8 square miles. Positioned in Boulder Valley where the Rocky Mountains meet the Great Plains, the city is surrounded by over 45,000 acres of land that has been preserved and protected. Wildlife habitat, unique geologic features, greenways and 145 miles of hiking trails are all managed by the city's Open Space and Mountain Parks. West of the city are slabs of sedimentary stone tilted up on the foothills, known as the Flatirons. The Flatirons are a widely recognized symbol of Boulder.

A variety of fuel types are present in and around Boulder caused by elevation differences. Typically, the lower elevations are dominated by grasslands, tall grass prairie remnants and riparian vegetation (including cattails, cottonwoods and other riparian hardwoods and shrubs) growing along water courses and in drainages. This fuel type exhibits the most aggressive burning, even at night. Above 7500', Ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*) become more prevalent primarily on north facing slopes. There are also dense riparian shrub corridors and open canopy woodlands broken by large grassy meadows in this area. Fire occurrence here is lower and fire behavior is reduced[9].

[9] Colorado Natural Heritage Program,2009

Image 5. Boulder Flatirons

At 8500', Lodgepole Pine becomes common. Fire occurrence here is rare and does not usually present control problems unless drought and wind are involved. Elevations above 9500' are predominantly short-needle conifers or a spruce-fir fuel type. At approximately 11,500' is the tree line and the tundra begins. Fire occurrence here is very rare (Colorado Natural Heritage Program, 2009) . The primary water flow through the city is Boulder Creek. The creek was named well ahead of the city's founding for the large granite boulders that have cascaded into the creek over time. It is from Boulder Creek that the city is believed to have taken its name. Boulder Creek has significant water flow, derived primarily from snow melt and minor springs west of the city. The creek is a tributary of the South Platte River.



Map 8. Boulder's elevation in feet

Development Within the Service Area

Boulder has a diverse economy. Industries with a significant presence in the area include aerospace, bioscience, data storage, light manufacturing, natural and organic products, outdoor recreation, photonics, professional and scientific services, renewable energy and energy research, software, and tourism.

While most of the city's employers are small businesses, several major corporations,

including Amgen, Ball, Cisco, Emerson, Google, IBM, Lockheed Martin, Microsoft, and Northrop Grumman, have a presence in Boulder.

Research institutions include the University of Colorado Boulder and more than a dozen federally funded research laboratories including the National Center for Atmospheric Research (NCAR), National Oceanic and Atmospheric Administration (NOAA), and National Institute of Standards and Technology (NIST). This diversity buffers the effects of economic downturns and contributes to the area's economic vitality.

Responding to the loss of several important historic buildings in the 1960s and early 1970s, Historic Boulder, Inc. drafted a historic preservation ordinance, which City Council unanimously adopted in 1974. The ordinance established an official municipal process to preserve and protect the historic, architectural, and environmental assets that contribute to Boulder's unique sense of place.

With the adoption of the ordinance in 1974, Boulder became one of the first cities in Colorado with the authority to designate and prevent the demolition or destruction of historic, architectural, and cultural resources considered valuable to the community. Today, more than 30 communities in Colorado have similar historic preservation ordinances, many of which are based on Boulder's model.

Protecting significant buildings and neighborhoods helps maintain a connection between Boulder's past, present and future generations. Community interest in preservation has resulted in more than 1,300 designated historic properties in Boulder, including 162 individual landmarks and 10 historic districts.

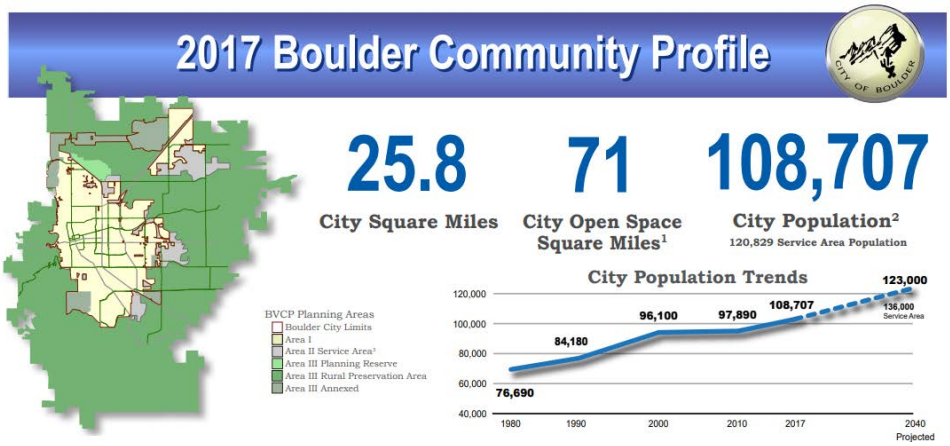


Figure 1. 2017 Boulder Community Profile

Demographics

BFR serves citizens within and around the city limits of Boulder. The city is classified as a highly developed urban based population community surrounded by undeveloped wilderness and open space areas. The city had an estimated total population of 107,349 as of 2015, according to the US Census. This figure includes University of Colorado (CU) students who live in Boulder. CU Boulder students represent approximately 22% of Boulder's population. The University's presence has a significant effect on the demographic characteristics of Boulder residents, evidenced by a higher than average percentage of residents in the 18 to 24 age group, high rate of

renter-occupied housing, relatively high percentage of residents with annual household incomes under $25,000, and significantly higher levels of educational attainment.

Census data on the next page illustrates the city, county, state, and national population in 2010. After a period of dramatic increase in population from 1950 to 1970 (averaging nearly 12% a year), Boulder took steps to slow growth and the city's population grew an average annual rate of 1.6% from 1970 to 2000. Since 2000, Boulder's population has remained relatively stable. By 2035, Boulder's population is projected to increase to approximately 119,370, or .8% per year, through that period, according to the 2010 US Census.

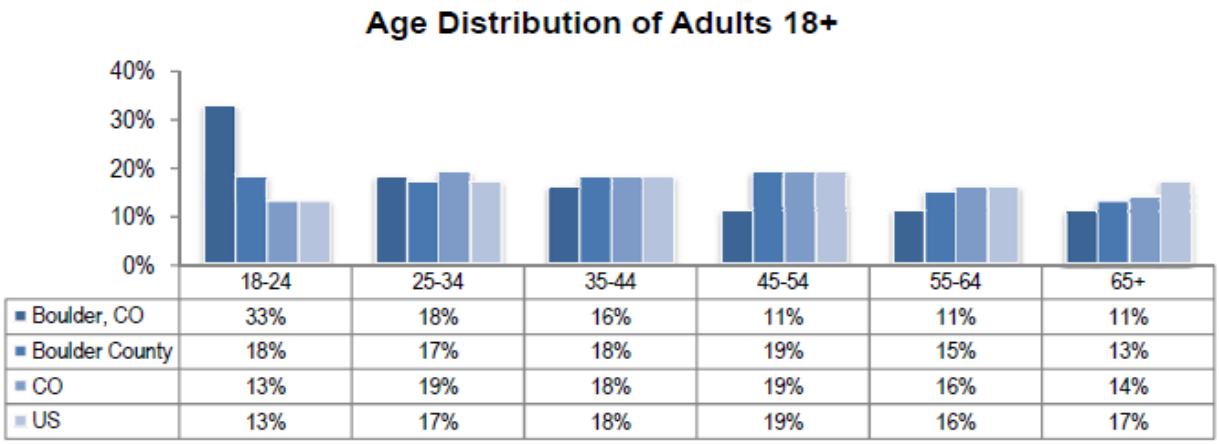
The median age of Boulder's population is 28.8 compared to the national median age of 37.2 years. One third of the city's adult population is between 18 and 24, reflecting the influence of the university on the area's demographic profile. By comparison, 13% of U.S. adults are 18 to 24.

Table 4. 2010 Demographic Snapshot

2010 Demographic Snapshot

Population Characteristics	City of Boulder	Boulder County	Colorado	US
Total Population	97,948	295,487	4,302,086	281,424,600
Number of Households	39,893	119,774	196,585	114,567,419
Average Household Size	2.18	2.37	2.52	2.63
Average Family Size	2.79	2.95	3.12	3.23
% Family Households (families)	45.5%	59.1%	64.2%	66.4%
% Households with children under 18	21.0%	27.6%	30.0%	29.7%
Male	50.2%	50.0%	50.1%	49.2%
Female	49.8%	50.0%	49.9%	50.8%
Age				
Median age	28.8 years	35.9 years	36.0 years	37.2 years
Under 5 years old	4.4%	5.6%	6.8%	6.5%
18 years or older	85.1%	78.8%	75.7%	76.0%
65 years or older	9.6%	10.0%	10.9%	13.1%
Education (Population 25 or older)				
High school graduate or higher	94.1%	94.1%	89.7%	85.6%
Bachelor's degree or higher	67.2%	57.5%	36.4%	28.2%
Graduate or professional degree	34.8%	24.5%	13.0%	10.4%
% of population in workforce (16 or older)	66.1%	70.5%	69.4%	64.4%
Civilian labor force (16 or older)	55,855	168,798	2,714,224	155,917,013
Occupation				
Management, business, science, arts	60.9%	53.7%	39.7%	35.9%
Sales and office	18.5%	20.3%	24.8%	25.0%
Service	15.7%	15.6%	17.1%	18.0%
Natural resources, Construction, maintenance	2.2%	4.4%	9.4%	9.1%
Production, transportation, material moving	2.8%	6.1%	9.1%	11.9%
Mean travel time to work	18.8 minutes	22.0 minutes	24.1 minutes	25.3 minutes
Drive alone to work	51.5%	65.5%	75.5%	76.6%
Use alternative transportation	35.7%	23.6%	18.1%	19.1%
Work at home	12.8%	10.9%	6.4%	4.3%
Income				
Median household income	$52,618	$61,859	$54,046	$50,046
Median family income	$92,540	$86,145	$67,800	$60,609
Median non-family income	$47,056	$35,834	$33,148	$30,440
Per capita income	$33,981	$35,988	$28,723	$26,059
Housing				
1-unit detached housing (single family)	43.2%	61.0%	62.4%	61.4%
Built 2000 or later	10.3%	13.6%	18.6%	14.9%
Owner-occupied housing units	46.9%	62.3%	65.9%	65.4%
Renter-occupied housing units	53.1%	37.7%	34.1%	34.6%
Vacant housing units	6.1%	5.8%	11.5%	13.1%
Median value owner-occupied homes	$529,300	$352,800	$236,600	$179,900
Average Rent	$1,082	$996	$863	$855

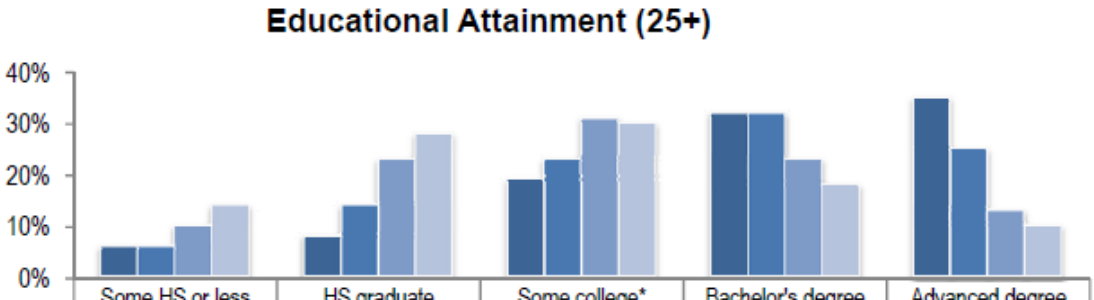
US Census, 2010 American Community Survey; Colorado State Demography Office
*Less than 0.5%



	18-24	25-34	35-44	45-54	55-64	65+
Boulder, CO	33%	18%	16%	11%	11%	11%
Boulder County	18%	17%	18%	19%	15%	13%
CO	13%	19%	18%	19%	16%	14%
US	13%	17%	18%	19%	16%	17%

Chart 1. Age Distribution of Adults 18+ US Census, 2010 American Community Survey

Boulder's population is highly educated, the Boulder Metropolitan Statistical Area has the nation's highest percentage of residents with a bachelor's degree or higher). Ninety-four percent of city residents 25 or older have a high school diploma and 67% have earned a bachelor's or advanced degree, more than twice the U.S. average of 28%. Many factors influence the high number of area residents with college degrees, including the presence of the university, research labs, and a heavy concentration of business in advanced technology.



	Some HS or less	HS graduate	Some college*	Bachelor's degree	Advanced degree
Boulder, CO	6%	8%	19%	32%	35%
Boulder County	6%	14%	23%	32%	25%
CO	10%	23%	31%	23%	13%
US	14%	28%	30%	18%	10%

Chart 2. Educational Attainment of Adults (25+) US Census, 2010 American Community Survey

Most working residents of Boulder are employed in white collar occupations. Over 60% of the city's civilian workforce is employed in managerial, professional, or related occupations compared to 36% of the nation's workers.

Data from the Bureau of Labor Statistics Occupational Employment Survey illustrates the Boulder area's high concentration of employment in computer, mathematical, science, and engineering occupations. Boulder has a high concentration of computer software engineers (5 times the national average), physicists, hydrologists, chemists and environmental scientists (3 to 6 times the national average), computer hardware engineers (8 times the national average), and aerospace, electronics and materials engineers (4 to 5 times the national average). According to the Census data in the table below, the Boulder area also has a higher than average percentage of residents employed in the educational services, health care, and social assistance, professional, scientific, management, and administrative industries (2A.7).

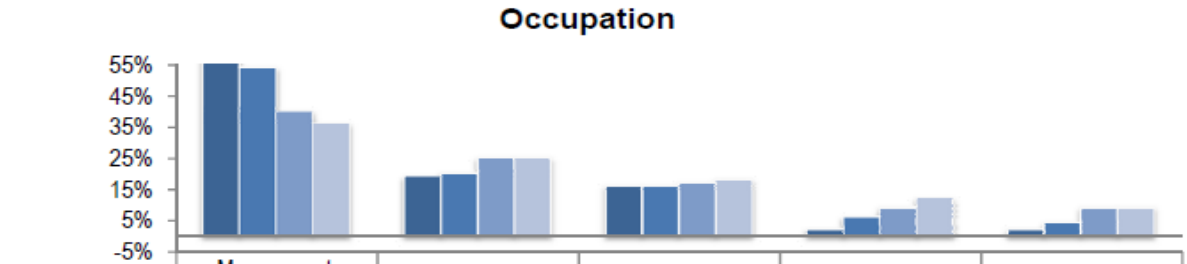
Industries where residents are employed	City of Boulder	Boulder County	Colorado	US
Educational services; health care and social assistance*	29.6%	23.8%	20.4%	23.2%
Professional, scientific; management; administrative	17.7%	17.7%	13.1%	10.6%
Arts, entertainment, recreation; accommodation, food services	12.8%	11.2%	10.7%	9.2%
Manufacturing	7.5%	12.3%	7.4%	10.4%
Retail Trade	9.6%	8.9%	11.4%	11.7%
Other services	6.1%	5.1%	5.0%	5.0%
Construction	2.4%	4.5%	7.6%	6.2%
Finance, insurance; real estate, leasing	5.1%	4.9%	7.2%	6.7%
Public administration	2.2%	2.8%	5.0%	5.2%
Wholesale Trade	2.1%	2.4%	2.6%	2.8%
Information	2.0%	3.1%	3.0%	2.2%
Transportation and warehousing; utilities	2.6%	2.5%	4.5%	4.9%
Agriculture, forestry, and fishing; mining	.3%	.8%	2.2%	1.9%

Table 5. Employment Industries US Census, 2010 American

The impact of University of Colorado students can be seen when comparing the median household income and median family income for city residents. While the median household income in City of Boulder is less than the state, the median family income is significantly higher.

High education levels in the city contribute to a higher than average percentage of residents with household and family incomes over $100,000 (27%). In contrast, the city's student population influences a higher than average percentage of households with incomes under $25,000 (30%).

Annual Income	City of Boulder	Boulder County	Colorado	US
Median Household	$52,618	$61,859	$54,046	$50,046



	Management, Professional	Sales and Office	Service	Production	Construction
Boulder, CO	61%	19%	16%	2%	2%
Boulder County	54%	20%	16%	6%	4%
CO	40%	25%	17%	9%	9%
US	36%	25%	18%	12%	9%

Chart 3. Occupation Distribution US Census, 2010 American Community

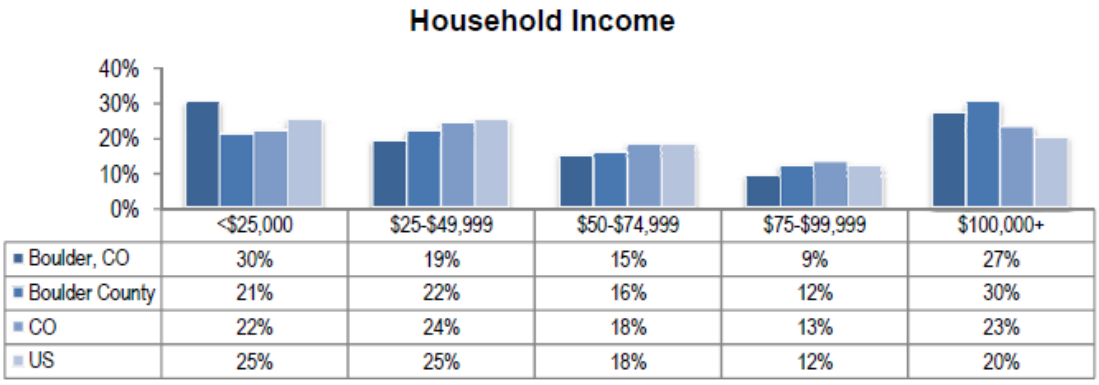
Housing	City of Boulder	Boulder County	Colorado	US
Overall occupancy rate	93.9%	94.2%	88.5%	86.9%
Owner-occupied	46.9%	62.3%	65.9%	65.4%
Avg household size	2.42	2.55	2.59	2.70
Median value	$529,300	$352,800	$236,600	$179,900
Vacancy rate	2.6%	1.6%	2.5%	2.5%
Renter-occupied	53.1%	37.7%	34.1%	34.6%
Avg household size	1.97	2.07	2.38	2.50
Median gross rent	$1,082	$996	$863	$855
Vacancy rate	1.7%	2.4%	6.7%	8.2%
Housing Units built:				
2000 or later	10.3%	13.6%	18.6%	14.9%
1980 – 1999	25.8%	37.1%	32.1%	27.9%
1960 – 1979	42.6%	34.6%	29.7%	30.0%
1940 – 1959	12.8%	6.9%	11.1%	16.4%
1939 or earlier	8.6%	7.8%	8.4%	13.7%
Moved into housing unit:				
2005 or later	63.1%	52.9%	51.3%	44.8%
2000 to 2004	13.6%	17.6%	18.2%	17.7%
1990 to 1999	13.0%	18.5%	17.3%	18.5%
1989 or earlier	10.3%	11.1%	13.2%	19.0%

Table 6. Boulder Housing US Census, 2010 American Community Survey

Median Family	$92,540	$86,145	$67,800	$60,609
Per Capita Income	$33,981	$35,988	$28,723	$26,059

Table 7. Annual Incomes US Census, 2010 American Community Survey

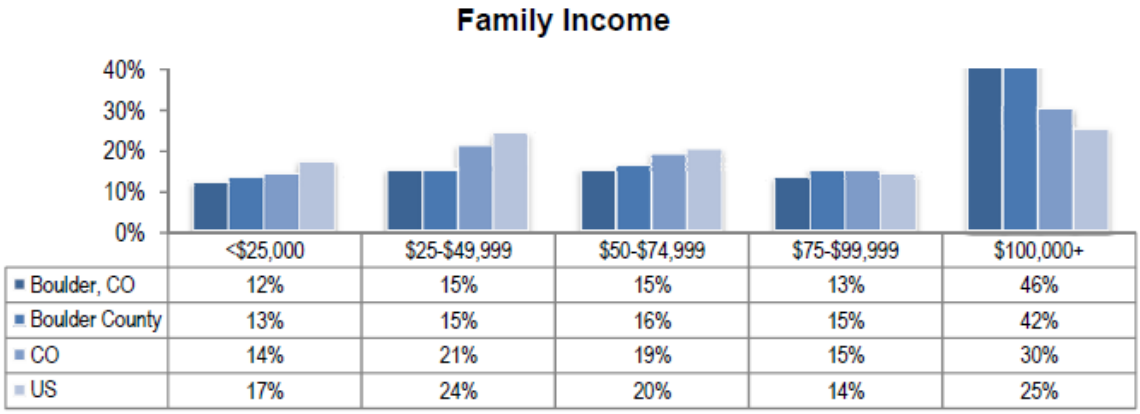
Boulder's comparatively high real estate values and percentage of renter-occupied housing are influenced by the presence of the University of Colorado and the city's desirable location and amenities. Census data indicates 94% of the city's housing units were occupied when the survey was conducted in 2010. Owner-occupied housing represented 47% of occupied housing in the city and the median value of a home was $529,300. Renter-occupied housing represented 53% of occupied housing units. The median rent in the city was $1,082 per month. Almost two-thirds of the city's residents moved into their current homes in 2005 or later, demonstrating major change in the last decade.



	<$25,000	$25-$49,999	$50-$74,999	$75-$99,999	$100,000+
Boulder, CO	30%	19%	15%	9%	27%
Boulder County	21%	22%	16%	12%	30%
CO	22%	24%	18%	13%	23%
US	25%	25%	18%	12%	20%

Chart 4. Household Incomes US Census, 2010 American Community Survey

According to the American Community Survey (2010), 90% of people are Caucasian. This compares to the national percentage of 76%. Regarding diversity, the state of Colorado lacks some of the diversity from both Black or African American and Hispanic or Latino populations as compared to national percentages.



	<$25,000	$25-$49,999	$50-$74,999	$75-$99,999	$100,000+
Boulder, CO	12%	15%	15%	13%	46%
Boulder County	13%	15%	16%	15%	42%
CO	14%	21%	19%	15%	30%
US	17%	24%	20%	14%	25%

Chart 5. Family Incomes US Census, 2010 American Community Survey

Additionally, the City of Boulder has similar representation in percent of foreign born citizens as compared to national statistics.

Population

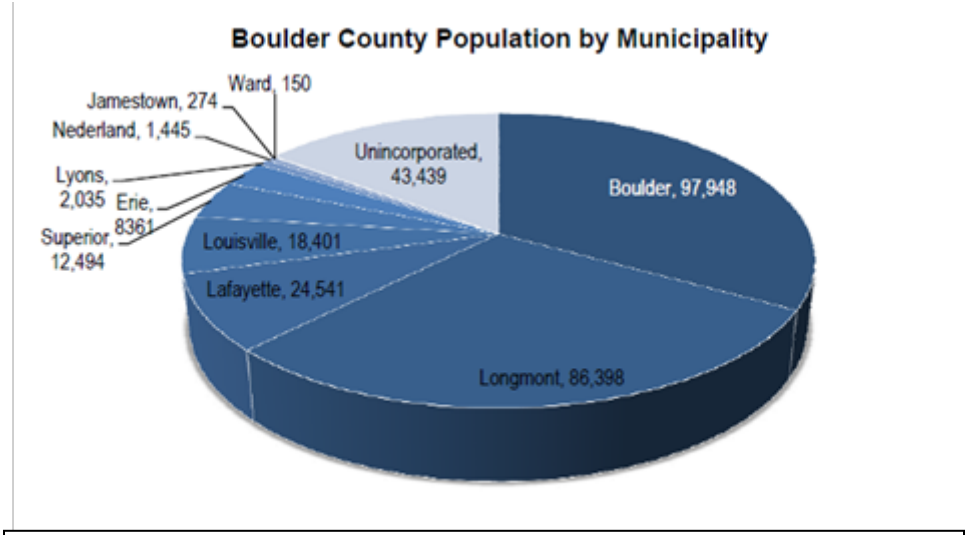
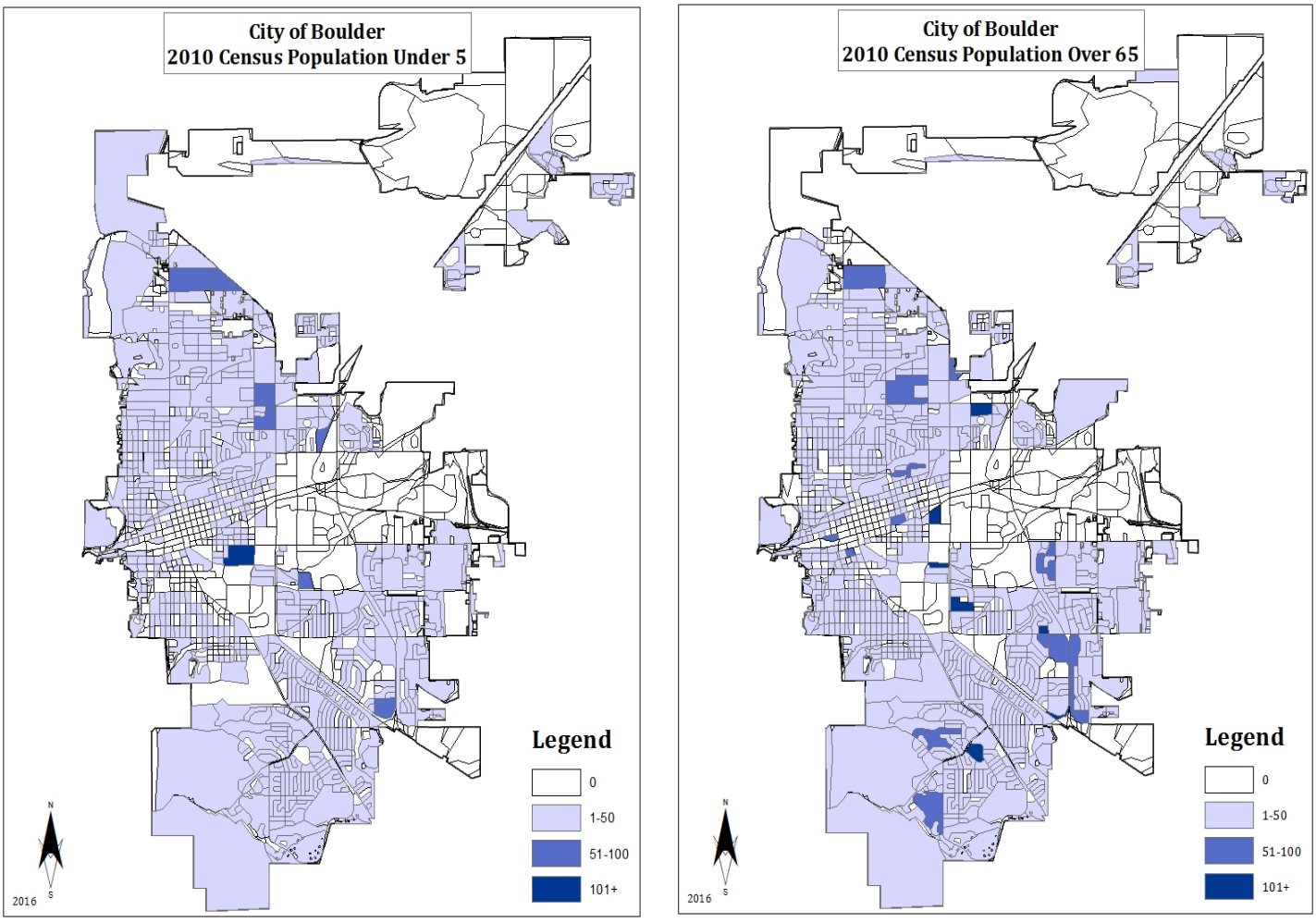


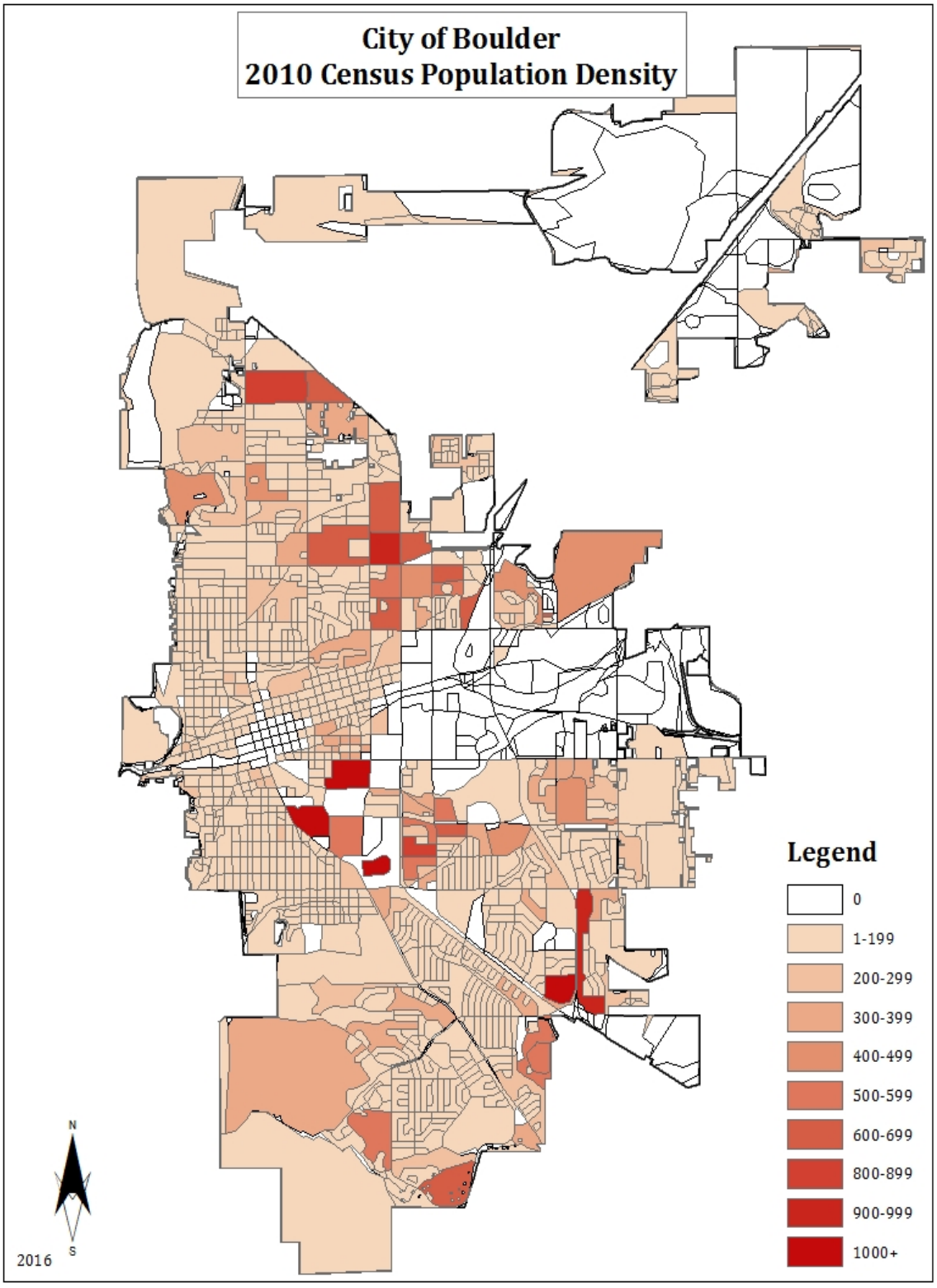
Chart 6. Boulder County Population by Municipality

Boulder County has an estimated 292,487 residents. Between 1970 and 2000, the county's population increased from 131,889 to 291,288 or an average of 4% annually. From 2000 to 2010, the county's population grew by 0.7%.

The American Community Survey estimates that in 2015, the City of Boulder population increased to 107,349 people. In 2016, the University of Colorado (CU) 2016 student enrollment was 32,270. The presence of the university has a significant effect on the demographic characteristics of the city's residents, evidenced by a higher than average percentage of residents in the 18 to 24 age group, high rate of renter-occupied housing, and a relatively high percentage of residents with annual household incomes under $25,000. Additionally, the university has an influence on high educational levels of Boulder residents. Boulder is the largest city in Boulder County and approximately one-third of the county's residents live in within city limits. Population estimates for cities within the Boulder County are listed in Chart 9, according to the 2010 Census. Map 10 shows the City of Boulder's vulnerable populations. Results from the 2010 Census show that 4.1% of people are under 5 years of age. Regarding individuals 65 and older, 8.9% of residents fall into this category of vulnerable population.



Map 9. City of Boulder vulnerable populations



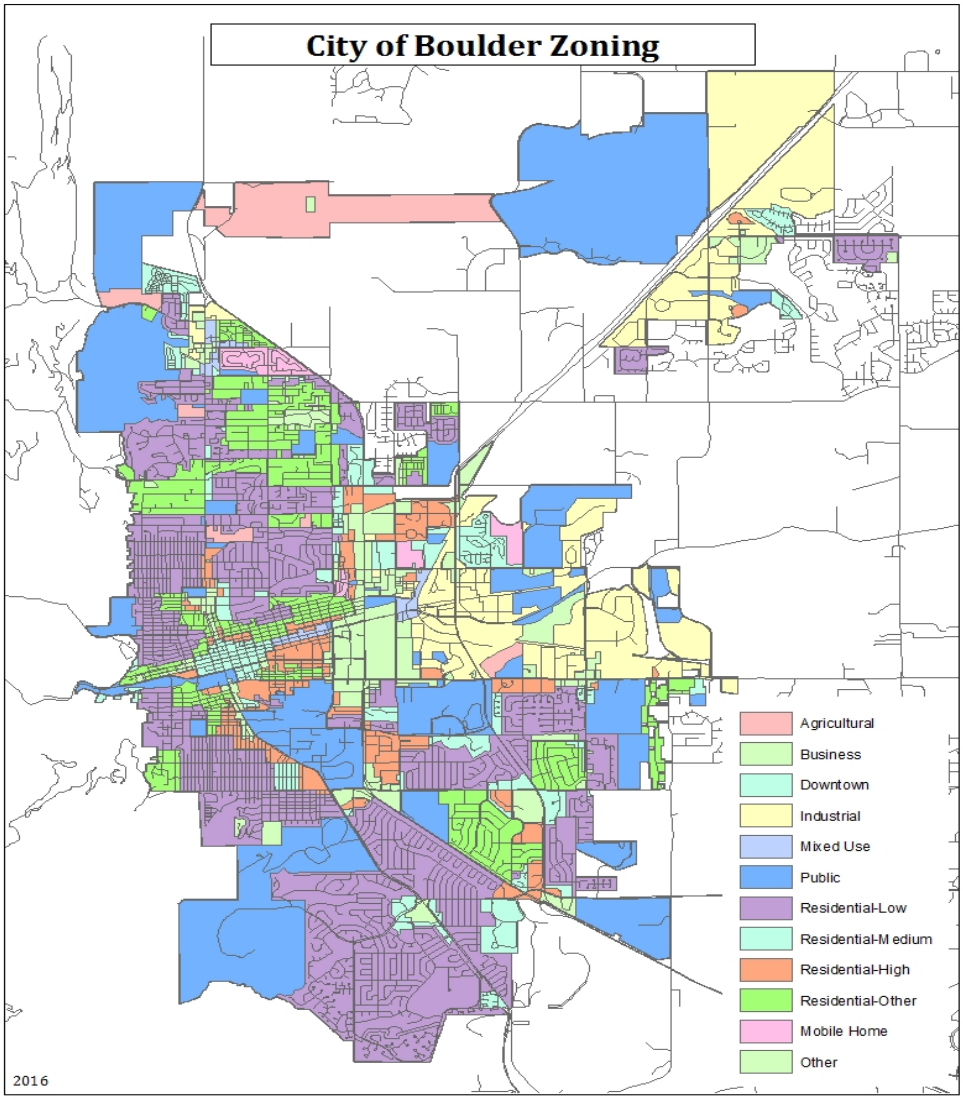
Map 10. City of Boulder population density

City Planning Areas

While the City of Boulder has many zoning areas including residential, commercial, and mixed-use zoning, the city also plans using a variety of other strategies. For example, the City of Boulder also looks to neighborhoods, business districts, historical zones, and critical infrastructure before major planning efforts are initiated. Officially, Boulder has 99 neighborhoods, 8 historic districts, and 4 business districts.

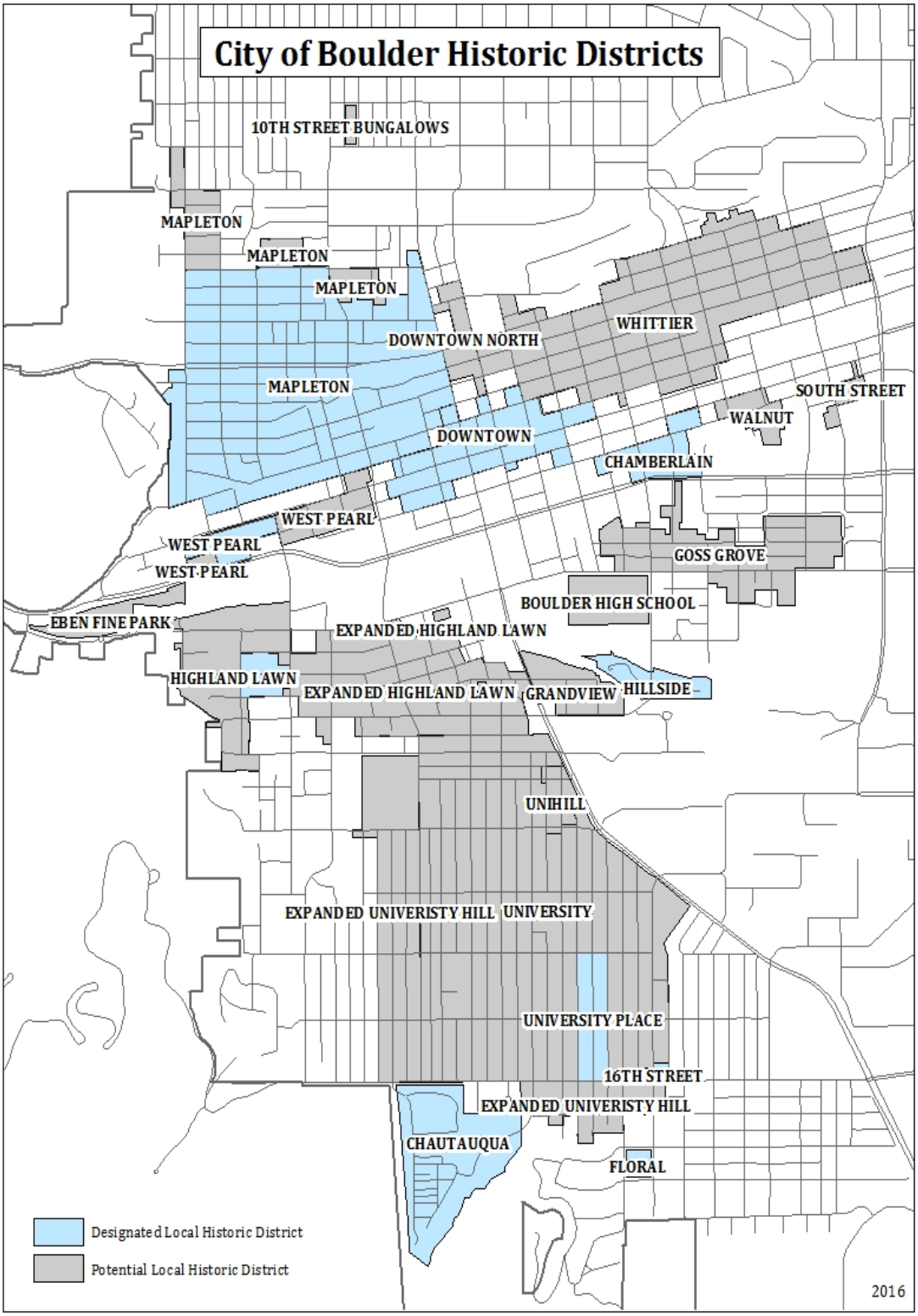
Community Land Use and Zoning

As mentioned previously in the Community Planning Areas/Zones section of this document, the City of Boulder has several areas considered for planning efforts. Land use and zoning can be broken down into the following categories: agricultural, business, downtown, industrial, mixed use, public, residential, mobile home, and "other" types of zoning. Most of green space surrounds the city (see Boulder Parks, Open Space, and Blue Line map) and therefore is not located within city limits.As demonstrated in the City of Boulder Zoning map below, the various types of zoning are not particularly concentrated in any one area. Boulder's significant amount of Open Space has stayed open because of the Blue Line — an unofficial north-south boundary on the city's west



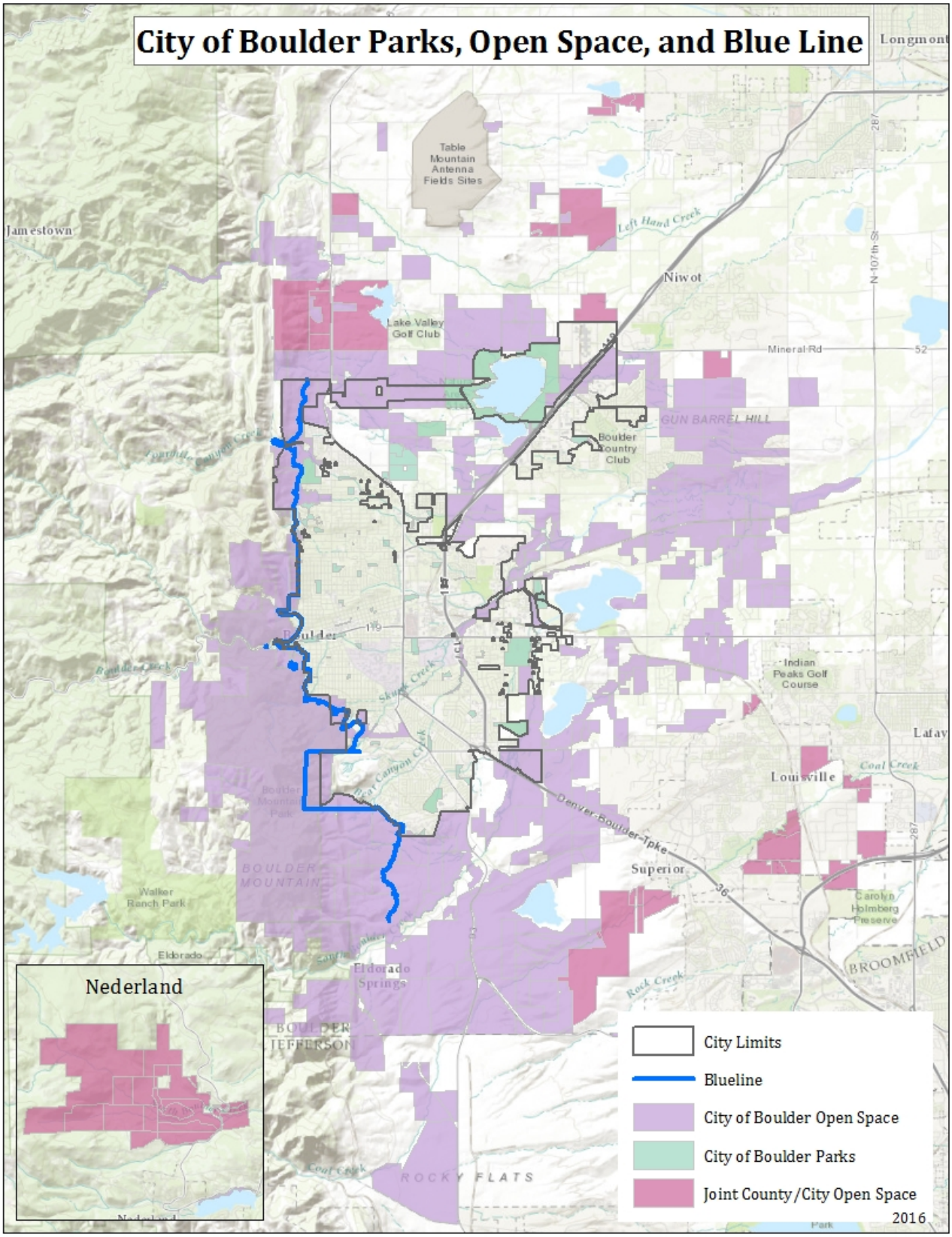
Map 11. City of Boulder Zoning Map

side, which in 1959 determined the elevation above which Boulder could not provide water service and launched the city's modern environment movement in the process.



Map 12. Boulder Historic Districts

Parks and Open Space



Map 13. Map of Boulder Parks, Open Space, and Blue Line

Infrastructure

Critical infrastructure are systems or assists needed to maintain minimum services for operation of a community. Critical infrastructure includes transportation, communications, water, power, and healthcare.

Transportation

Since Boulder has operated under residential growth control ordinances since 1976, the growth of employment in the city has far outstripped population growth. Considerable road traffic enters the city each morning and leaves each evening, since many employees live in surrounding communities. Boulder is served by US 36 and a variety of state highways. Parking regulations in the city have been explicitly designed to discourage parking by commuters and to encourage the use of mass transit.

The City of Boulder Transportation Division identifies roads, improvements, closures, and access points. According to the Transportation Master Plan (TMP) update in 2016, Boulder's street system is classified by road type with local streets comprising 71 percent, collector streets comprising 12 percent and arterial streets comprising 17 percent of the city's street system. Currently roughly half of the city's streets have an OCI rating in Very Good and Excellent ranges. Nearly 80 percent of the street system is rated "Good" or better.

New jobs in Boulder and residential growth throughout the region increase demand on the regional transportation system. Boulder continues to work with regional partners to improve travel options and the person-carrying capacity of all the major corridors connecting Boulder to surrounding communities. These partnerships seek solutions that improve regional travel for everyone, including people who use autos and transit.

"The City of Boulder's annual traffic study found that approximately 49,000 vehicles enter Boulder during the morning rush, which is from 6 to 10 a.m. That is an increase of 2 percent compared to 48,000 vehicles in 2014, but it remains below the peak year of 2004, when about 51,000 vehicles entered the city during the morning rush. The 2015 traffic study also found that about 20,000 vehicles leave the city each day during the morning rush hour[10]."

Over the years, Boulder has made significant investments in the multi-modal network. The city is now well known for its grade-separated bicycle and pedestrian paths, which are integrated into a network of bicycle lanes, cycle-tracks, and on-street bicycle routes. Boulder also provides an innovative community transit network that connects downtown, the University of Colorado campuses, and local shopping amenities. While the city has no rail transit, local and regional shuttle busses are funded by a variety of sources and emphasize minimal headways, enhanced route identity, easy fare payment, and community input in design. Due in part to these investments in pedestrian, bicycle, and transit infrastructure, Boulder has been recognized both nationally and internationally for its transportation system.

Boulder has an extensive bus system operated by the Regional Transportation District (RTD). The HOP, SKIP, JUMP, Bound, DASH and Stampede routes run throughout the city and connect to nearby communities. Regional routes, traveling between nearby cities such as Longmont, Golden, Fort Collins, and Denver, as well as Denver

[10] City of Boulder Annual Boulder Valley Count Program

Image 6. Lakewood Reservoir

International Airport, are also available. There are over 100 scheduled daily bus trips on seven routes that run between Boulder and Denver on weekdays.

Long-term transit plans call for a 41-mile RTD commuter rail route called the *Northwest Rail Line* proposed to run from Denver through Boulder to Longmont, with stops in major communities along the way. These future transit plans, as well as the current Flatiron Flyer Bus Rapid Transit route, are part of FasTracks, an RTD transit improvement plan funded by a 0.4% increase in the sales tax throughout the Denver metro area.

Boulder, well known for its bicycle culture, boasts three hundred miles of bicycle-pedestrian paths, lanes, and routes that interconnect to create a renowned network of bikeways usable year-round. Boulder has 74 bike and pedestrian underpasses that facilitate safer and uninterrupted travel throughout much of the city. The city offers a route-finding website that allows users to map personalized bike routes around the city. Furthermore, in May 2011, B-cycle bike-sharing opened in Boulder with 100 red bikes and 12 stations.

Image 7. Public Transportation in Boulder

Vision Zero

Boulder has joined leading-edge cities from around the U.S. in setting a goal of zero traffic-related fatalities and serious injuries. The Transportation Division has formed the Vision Zero Community Partnership Committee to foster on-going implementation of the city's safety strategies in collaboration with the broader Boulder community. This committee brings together community stakeholders to foster partnerships and broad-based leadership on mitigation strategies to achieve Boulder's Vision Zero safety goals. The committee includes representation from the Transportation Advisory Board (TAB) as well as local, regional, and state-wide agency partners and is charged with providing input and offering feedback regarding the Safe Streets Boulder action plan and co-developing and disseminating VZ safety education and awareness messaging for the greater Boulder Valley community.

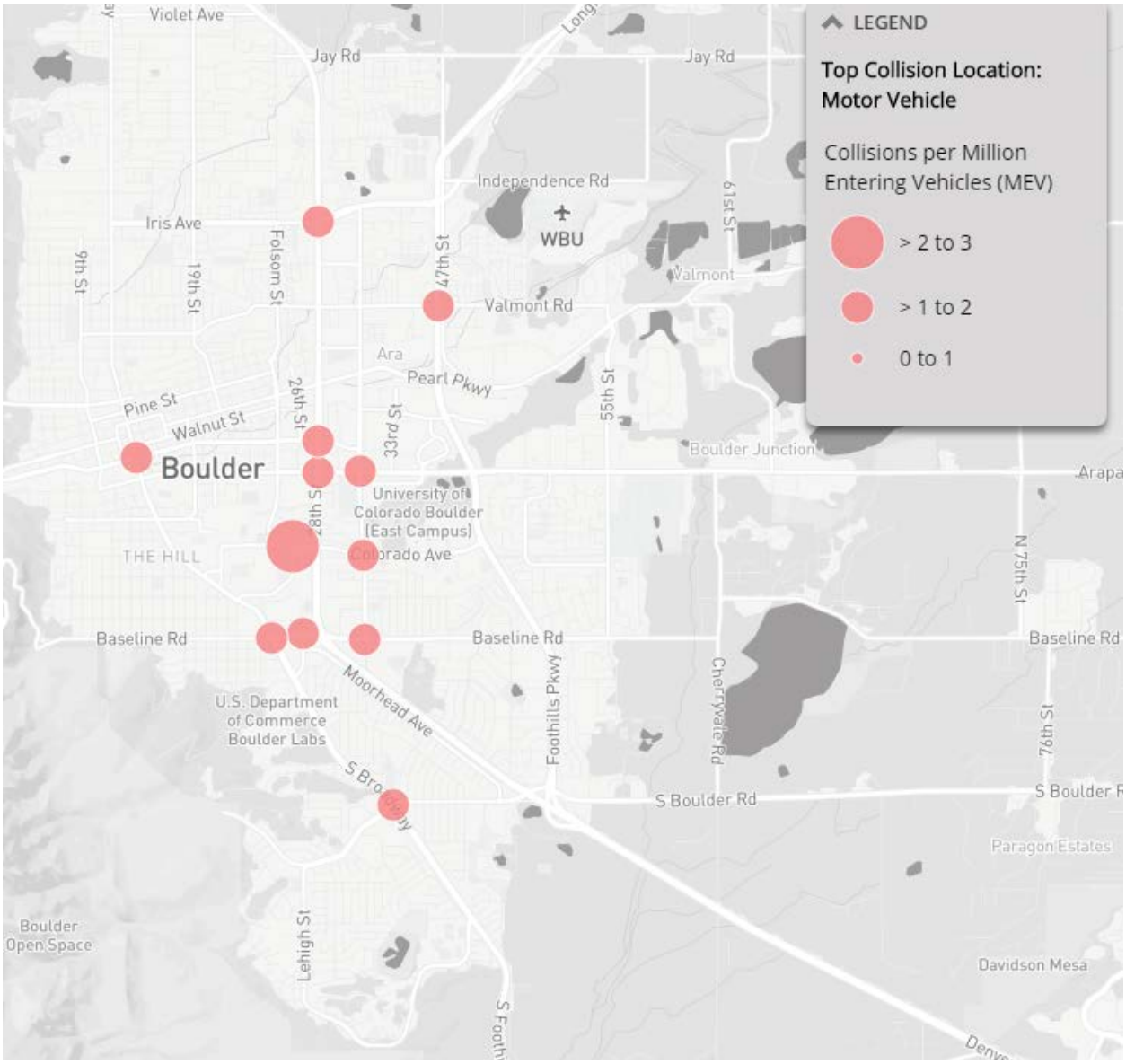
Progress Snapshot

Since 2009, an average of 3,275 collisions per year were reported within the City of Boulder. The percentage of collisions that resulted in a serious injury or fatality has been relatively flat at 2 percent of all collisions over this six-year span. The City of Boulder has fewer fatal collisions per capita than similar Colorado cities. While only 8 percent of all traffic collisions in the city involve a bicyclist or pedestrian, they account for approximately 60 percent of serious injuries and fatalities sustained in traffic collisions.

Image 7. Vision Zero Philosophy

Boulder Top Collision Locations Map & Vision Zero Strategies

An interactive map of Boulder is available on-line. The map highlights top collisions that involve motor vehicles, bicyclists, and pedestrians from 2012-2014. The website features Vision Zero strategies of engineering, education, and enforcement to reducing serious injuries and fatalities. A new map of close calls is also featured in this interactive map to pinpoint any trends and identify possible mitigation measures.



Map 14. Map of Boulder Parks, Open Space, and Blue Line[11]

Rail

One railroad travels through the City of Boulder. The Burlington Northern and Santa Fe Railroad (BNSF) and the Union Pacific Railroad (UP). The city of Boulder has declared “quiet zones” at-grade railroad crossing. These

[11] http://boulder.maps.arcgis.com/apps/MapSeries/index.html?appid=907a7532db3f41fc9ca94bc22b6ae804

crossing include physical infrastructure and warning systems so that train engineers are not required to sound the train horn at the crossing. While this infrastructure is in place to reduce the noise of passing trains, these safety measures also ensure citizens are aware of the crossings reducing risk.

Airport

Image 8. Aerial view of Boulder Municipal Airport

In addition to multi-modal ground transportation, Boulder Municipal Airport is located 3 miles (4.8 km) from central Boulder. It is owned by the City of Boulder and is used exclusively for general aviation, with most traffic consisting of single-engine airplanes and glider aircraft[12]. Boulder Municipal Airport is a general aviation airport, providing business, private, recreational and emergency aviation services to the City of Boulder and surrounding communities. Boulder Municipal Airport does not offer commercial airline service.[13]

Water Supply

The Water Department is charged with the upkeep and maintenance of the water system to include hydrants, and water mains, as well as to identify system issues which includes outages and improvements. Boulder's water supply system includes storage, conveyance, hydroelectric and treatment facilities. The city owns approximately 7,200 acre-feet of reservoir storage space in the North Boulder Creek watershed, 11,700 acre-feet of storage in Barker Reservoir on Middle Boulder Creek and has up to 8,500 acre-feet of storage space in Boulder Reservoir.

[12] Henao,2015
[13] Airport Master Plan – https://bouldercolorado.gov/airport/airport-master-plan

Boulder's two water treatment facilities are the Betasso Water Treatment Facility (WTF), with approximately 45 million gallons per day (MGD) of treatment capacity and the Boulder Reservoir WTF at about 16 MGD. The city operates eight hydroelectric plants located within the municipal water supply system and sells the electricity to Xcel Energy. Four of these hydro plants are located on raw water pipelines and four are on treated water transmission pipeline. Operation of the city's water system involves intricate relationships between water rights, water quality, laws and legal agreements, streamflow's, reservoir storage operations, transmission pipeline operations, treatment capacity, hydropower production, and water demand.

The availability of sufficient water supplies to meet the city's needs is only assured by balancing and managing these factors. The city's Middle Boulder Creek and North Boulder Creek water rights are fed by watersheds on the eastern slope just below the continental divide. Boulder also owns rights to the delivery of water from the Colorado-Big Thompson Project (CBT) and the Windy Gap Project. Both projects divert water from the western slope and deliver it through the CBT facilities, which are operated by the Northern Colorado Water Conservancy District (NCWCD). Like most western communities, Boulder depends on stored water most of the year. High streamflow from melting snowpack occur for only a few spring and summer months. Natural streamflow in late summer and the winter are not sufficient to meet customer demands and must be supplemented with previously stored water supplies. The amount of water available also changes from year to year depending on how much snow falls in the mountains. Therefore, Boulder must store water in reservoirs during wetter years to carry over for use in drier years. The city owns seven reservoirs and several natural lakes in the headwaters of the North Boulder Creek basin within the Silver Lake Watershed. In addition, the city owns Boulder Reservoir northeast of Boulder and the Barker Reservoir facilities on Middle Boulder Creek.

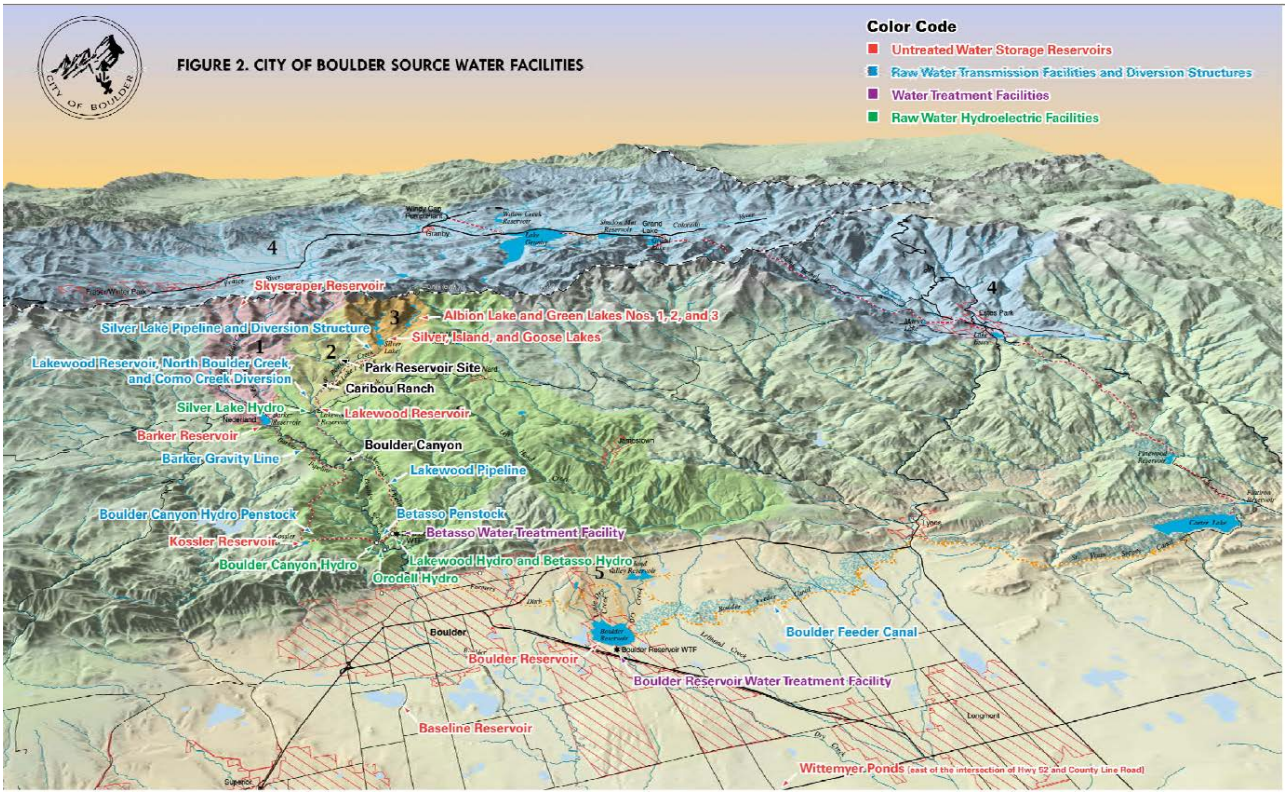


Image 9. City of Boulder Water Source Facilities, Water Source Master Plan, 2009.

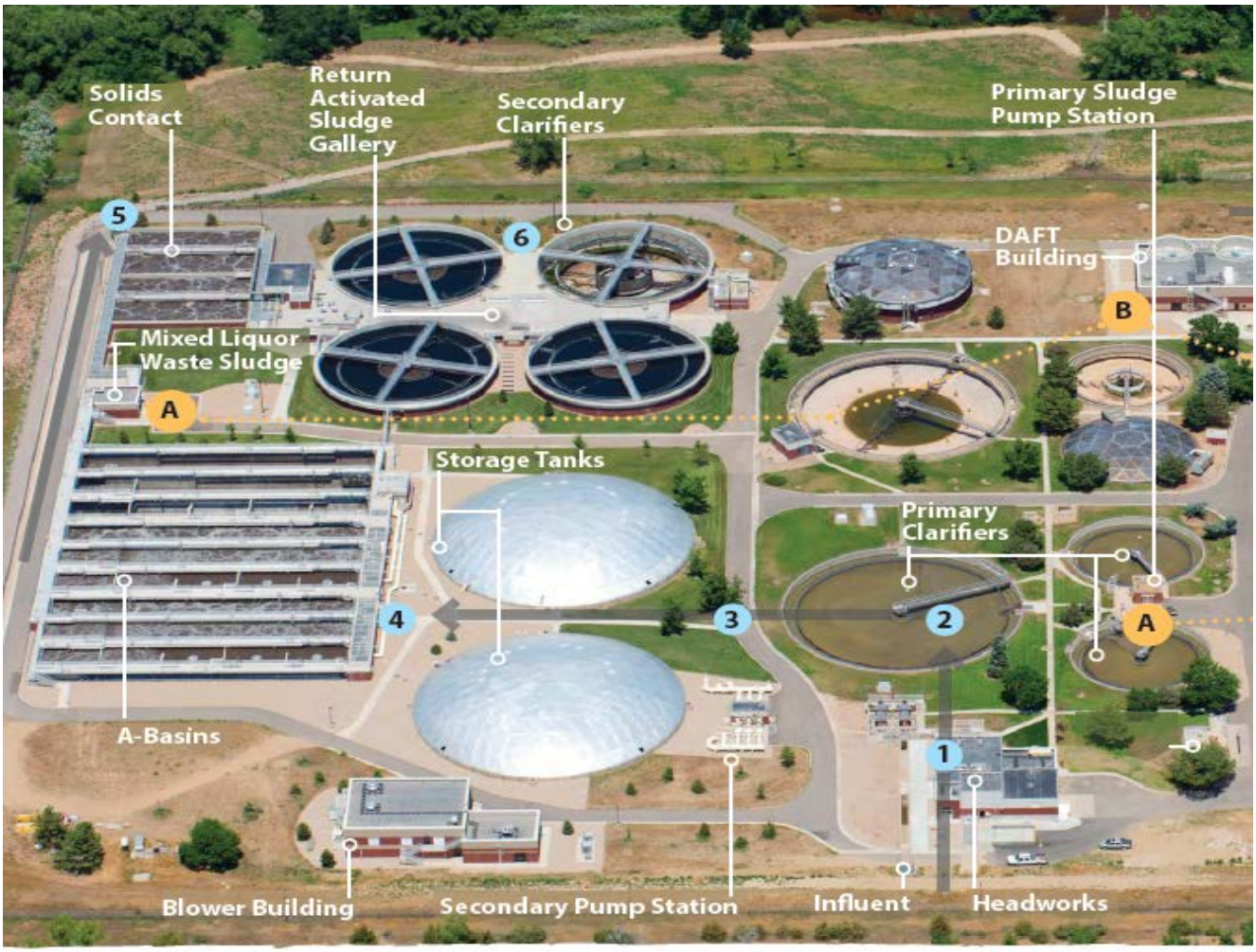
Water Distribution

Boulder receives drinking water from three sources: Arapahoe Glacier and Silver Lake Reservoir (40%), Barker Reservoir (40%) and the Colorado River (20%) via the Colorado-Big Thompson Transbasin Diversion Project. Water from Arapahoe Glacier and Barker Reservoir is piped to the Betasso Water Plant. Water from the Colorado River is piped to Boulder Reservoir through the Boulder Feeder Canal. It is treated at the 63rd Street Water Treatment Plant. The water goes through a series of treatment steps including: coagulation, sedimentation, filtration. It is then piped to homes through an extensive distribution system[14].

Water Treatment

Boulder's wastewater collection system, also known as the sanitary sewer system, consists of underground pipes that utilize gravity to transport untreated wastewater from residential, commercial and industrial properties to the city's Waste Water Treatment Facility (WWTF), located on 75th Street near Boulder Creek. Wastewater collected from smaller pipes throughout the city flows downhill into larger pipes known as "interceptors." Several large-diameter pipes convey the city's wastewater to a primary interceptor that delivers the flow to the WWTF. Once the collected wastewater is delivered to the WWTF, it is sent through a 12 to 24 hour, multi-stage treatment process to disinfect potentially harmful bacteria, viruses and protozoa. Boulder's WWTF utilizes physical/mechanical, microbiological and ultraviolet light to treat waste water.

[14] Boulder Area Sustainability Information Network



Wastewater Treatment Process (Liquid Pathway)

1. Influent goes to the headworks;
2. Moves to the primary clarifiers;
3. Is pushed by secondary pumps;
4. Enters the A-Basins;
5. Goes through solids contact;
6. Enters the secondary clarifiers;
7. Enters the ultraviolet (UV) light disinfection;
8. The treated effluent goes to Boulder Creek;

Image 10. Wastewater Treatment Process (liquid pathway)

Biosolids/Dewatering Process (Solids Pathway)

A. Solids are removed from the wastewater.

B. The solids are concentrated either by settling materials out in the gravity thickeners or by using dissolved air flotation thickeners (DAFT).

C. Anaerobic digestion breaks down and treats solids, which are further concentrated.

D. Solids are then dewatered to 25 percent solids by weight before being trucked off as biosolids.

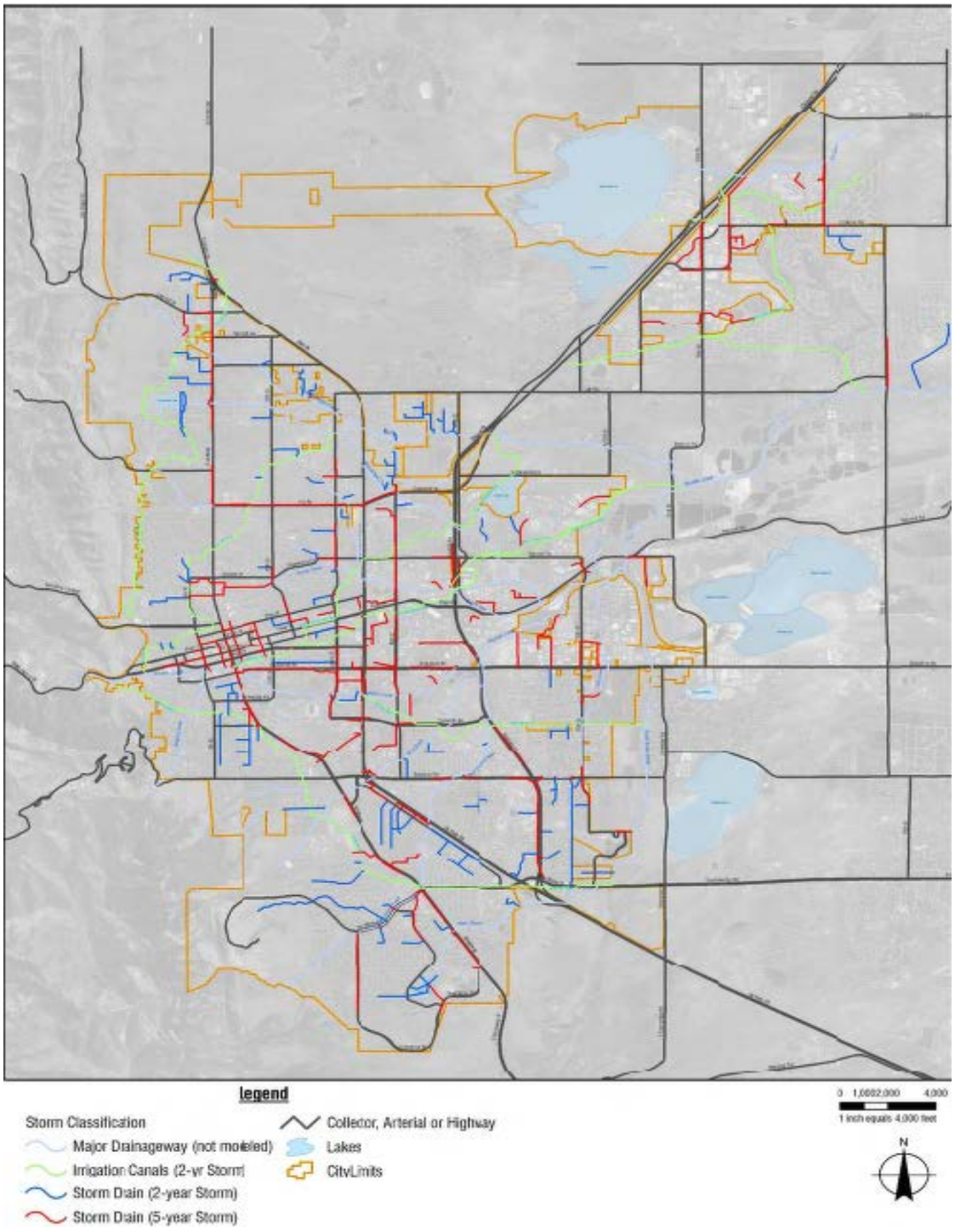
Image 11. Biosolids/Dewatering Process-Solids Process

Stormwater

According to the City of Boulder Comprehensive Flood and Stormwater Utility Master Plan, the Boulder Creek Watershed encompasses roughly 440 square miles and extends from the Continental Divide to the high plains east of Boulder. There are 15 major drainageways (or creeks) in Boulder. Seventeen sub-basins have been delineated and the tributary drainageways all eventually lead to the Boulder Creek.

Regarding drainage, the collection system consists of a variety of storm sewers and open drainage ditches that collect water and divert the water to major drainageways. Irrigation ditches collect stormwater in many places in the City. Depending on the amount of rainfall, stormwater flows may exceed the capacity of the ditch and spill from the ditch in an uncontrolled manner. Rather than purely focusing on a structural solution, Boulder adheres to a series of guiding principles to balance both structural and non-structural solutions. These principles include maintaining and preserving natural draining, managing runoff, and eliminating drainage problems.

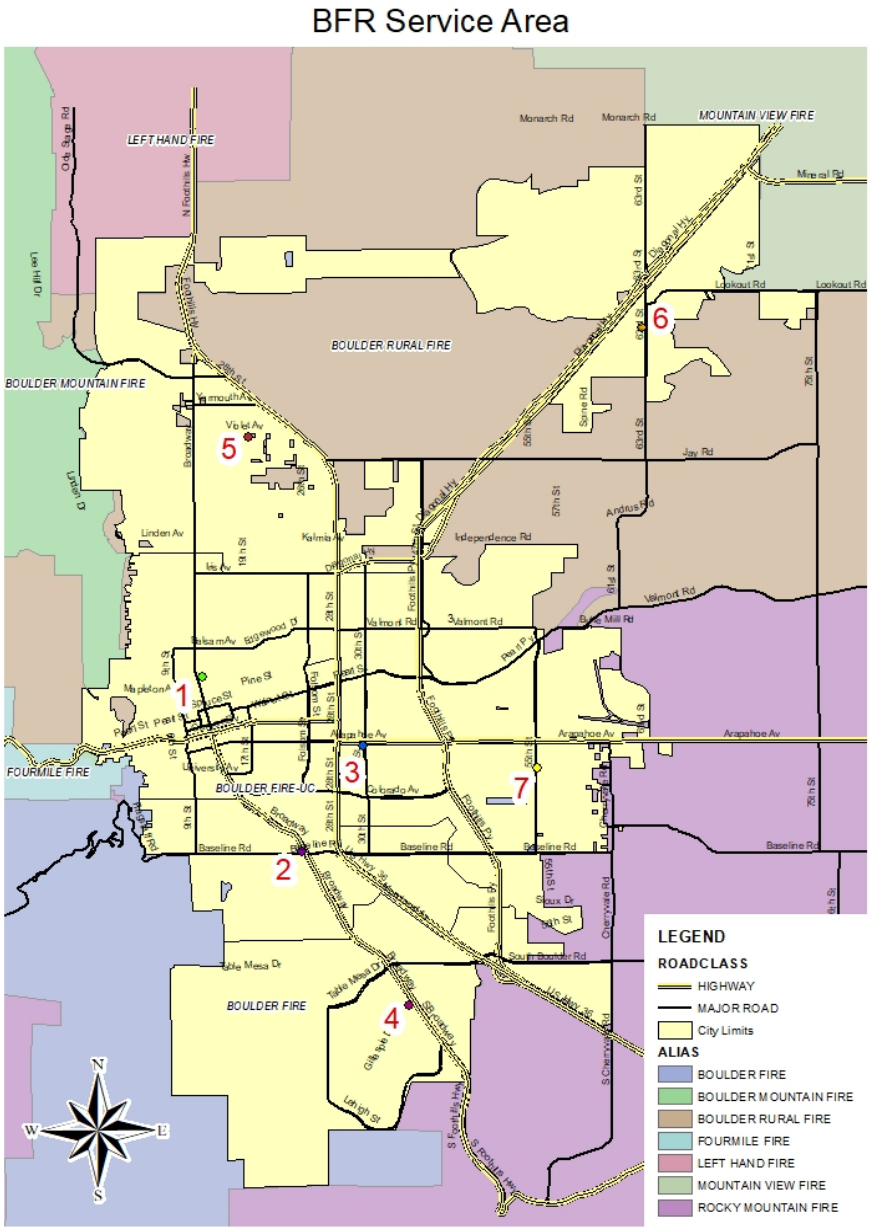
The Stormwater Quality Program manages local activities to preserve, protect, and enhance water quality affecting Boulder's streams and drainages. Elements such as water quality regulation, sub-basin management, and stream enhancement contribute to a comprehensive framework for recognizing trends, philosophies, and standards while ensuring maximum effectiveness, cost efficiency.



Map 15. City of Boulder stormwater Map

Service Area

BFR is the Authority Having Jurisdiction (AHJ) within the City of Boulder, Colorado's geographical boundaries. BFR protects over $21 billion worth of property (2A.5) which encompasses 25.8 square miles of land, and 312 road miles. The city is located within Boulder County and is the county seat. Boulder is the most populous municipality of Boulder County, and the 11th most populous municipality in the state of Colorado[15]. BFR shares several geographical boundaries with neighboring emergency service agencies. This includes Boulder Rural Fire Department, Rocky Mountain Fire Department, and Four Mile Fire Department.



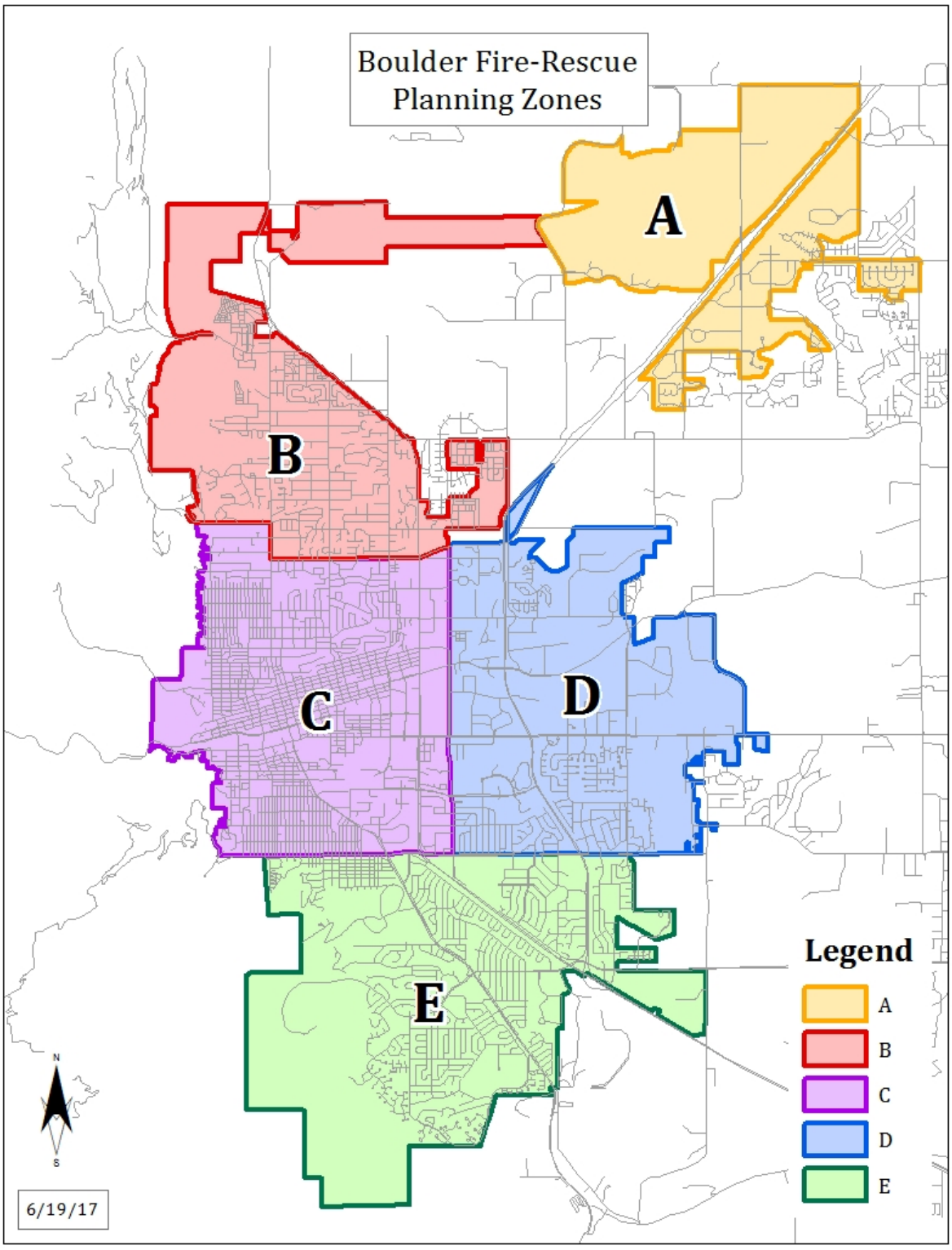
Map 16. BFR service area

[15] Boulder Fire Rescue Department,2012

Planning Areas

The City of Boulder is approximately 26 square miles bounded on all sides with established “city limits” border. The city is classified as a highly developed urban based population community. Much of the land that boarders the city would be considered as undeveloped wilderness and open space areas. To conduct this risk assessment, The Department divided the city into five (5) planning zones. These 5 zones where determined by city limits and major atrial roads within the city (Table XX). Each of the 5 zones was further divided into subzones to gather a manageable set of data beneficial to determine risk in each zone. (Map of the 5-zones and a 2nd map of the sub-zones).

Area	General Description	Area Description	Sub-Area
A	Gunbarrel Area	• Boundary is city limits	01-05
B	North Boulder	• North of Iris/Linden • West of Foothills Hwy (28th St.)	01-04
C	Central Boulder – West	• South of Iris/Linden • North of Baseline • West of 30th	01-08
D	Central Boulder – East	• East of 30th • North of Baseline • City limit boundary to the north and east	01-07
E	South Boulder	• South of Baseline • City limit Boundary to the west, south and east	01-07



Map 17. Station 1st due territories

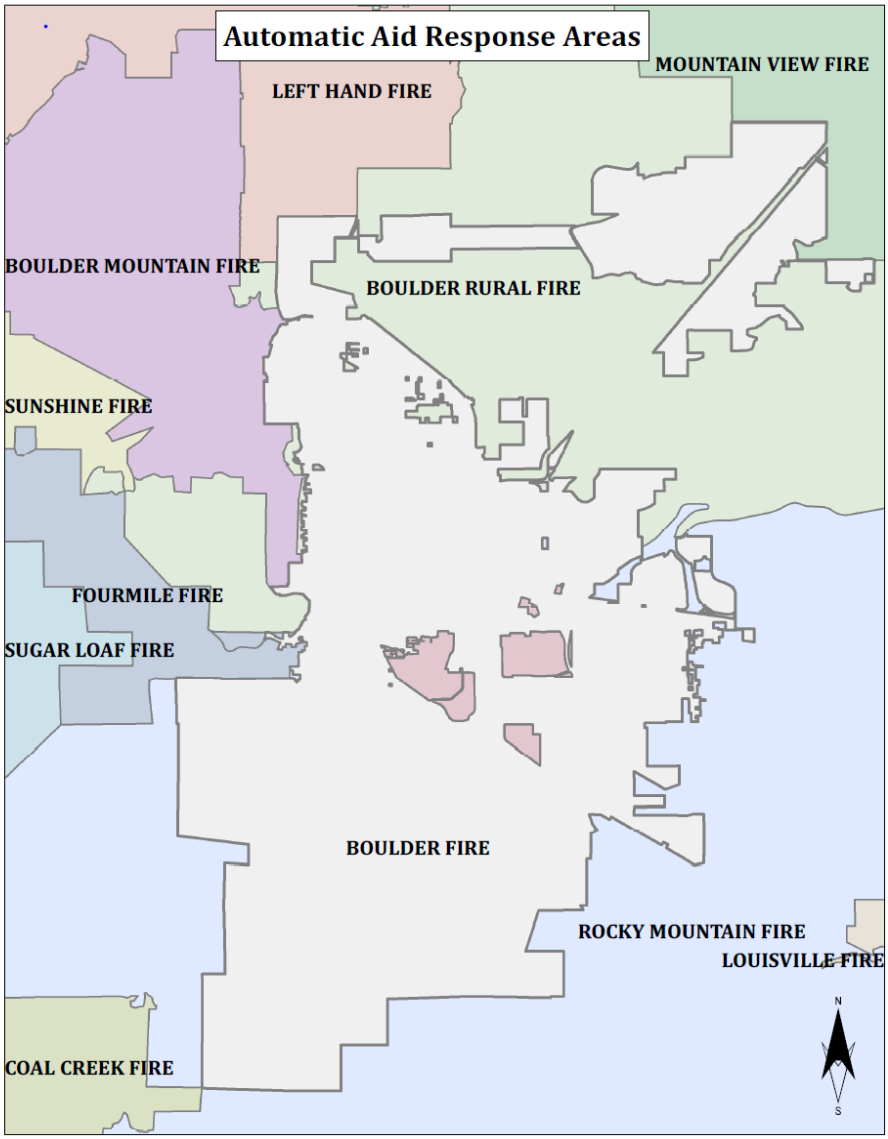
Fire-Rescue Sub-Zones

Map 16. BFR Sub-Zones

The Boulder Rural Fire Department (BRFD) is responsible for providing service to approximately 25 square miles in the northern, eastern, and western portions of unincorporated Boulder County surrounding the City of Boulder. BRFD has 17 full-time career firefighters and is supported by 25 trained volunteer firefighters. BRFD responds to approximately 1000 calls per year.

Rocky Mountain Fire Department (RMFD) protects the properties located in the areas south, southeast, and west of the City of Boulder. RMFD has approximately 40 members and staffs two stations with seven firefighters and one duty chief.

Four Mile Fire Department (FMFD) is a combination fire department located to the west of the city. FMFD responds to approximately 95 calls per year and has 30 members who regularly respond to emergencies.



Map 18. Automatic Aid Response Areas

Boulder County Jurisdictions

Boulder Mountain Fire Protection District (BMFD) is located to the northwest of Boulder, Colorado. This combination fire department responds to structure fires, wildland fires, medical emergencies, motor vehicle accidents and other community disasters. BMFD has 1 full time chief, 3 full time wildland specialists with approximately 50 volunteers operating out of 3 stations[16].

[16] http://www.bouldermountainfire.org

Lefthand Fire Protection District (LFPD) is 52 square miles of rugged ridges, canyons and plains protected by 30 volunteer firefighters. This unique urban interface environment includes five subdivisions and several mountain neighborhoods.

Mountain View Fire Protection District (MVFPD) is in Weld and Boulder counties consisting of 184 square miles and a population of approximately 50,000 people. MVFPD is a full-service fire department providing both fire and emergency medical services. MVFPD serves the communities of Dacono, Erie, Mead, Niwot, and unincorporated areas of Boulder and Weld counties. MVFD operates out of eight stations, six are staffed with approximately 100 firefighters, 10-12 part-time firefighters, and two unstaffed stations[17].

Automatic and Mutual Aid

Aside from the State Level Mutual Aid Agreement, BFR has developed reciprocal mutual aid and cooperative agreements with fire departments in surrounding communities. BFR has automatic aid agreements with both Boulder Rural Fire Department and Rocky Mountain Fire Department. BFR has cooperative agreements throughout the State of Colorado and with the federal government in the event of more widespread emergencies such as a major wildland[18] fires. BFR is also part of the Intergovernmental Agreement for Emergency Management and the Intergovernmental Agreement for Participation in the Boulder County Hazardous Material Response Plan. There are specific mutual aid and automatic aid agreements in the form of letters of understanding (LOU) and contracts with the following districts for various emergency services:

- Contract between city of Boulder and the Hazardous Materials Response Authority
- Contract between city of Boulder and Boulder Emergency Squad
- Contract between city of Boulder and Rocky Mountain Rescue Group, Inc.
- Letter of Understanding between BFR, Boulder Rural, and Rocky Mountain Fire Protection District.
- Letter of Understanding between BFR and Boulder Rural Fire Protection District (BRFPD) (2007)
- Mutual Aid Agreement with Denver Metro

The letters of understanding between BFR, Boulder Rural, and Rocky Mountain Fire Protection District impact operations daily, BFR responds to most of BRFPD's as an automatic aid resource[19].

Boulder County Cooperators

Rocky Mountain Rescue Group

The Boulder Fire Rescue Department is responsible for assisting in the protection 70.8 square miles of city Open Space and Mountain Parks (OSMP) adjacent to the City of Boulder. Each year, over 5 million people visit and utilize the 150 miles of trails stretching throughout the 45,000 acres of open space. In order to provide medical and rescue assistance that is needed within Boulder OSMP, the City of Boulder contracts with Rocky Mountain Rescue Group (RMR).

[17] http://www.mvfpd.org/general/page/about-mvfr
[18] Boulder Fire Rescue,2012
[19] https://www-static.bouldercolorado.gov/docs/Fire_ops_mgmt_assess_June2011-1-201305151223.pdf?_ga=1.184622703.759232242.1487041361

Rocky Mountain Rescue Group is an all-volunteer organization trained and equipped for all weather search and rescue on mountainous terrain. Founded in 1947, RMR is one of the oldest mountain rescue teams in the country. RMR is contracted by the City of Boulder as well as the Boulder County Sheriff's Office as the county's primary mountain rescue agency. Rescue calls are diverse and can involve hikers with sprained ankles, fallen climbers, searches for missing parties, and evacuation of injured persons. Personnel from BFR will assist RMR in these rescues and will provide equipment, personnel, and command structure.
In 2015, RMR responded to 94 calls for service in the Boulder Open Space Mountain Park area. From 2010 to 2015, the average call volume was 68 calls per year.

Boulder Emergency Squad

Boulder Emergency Squad (BES) is a volunteer technical search and rescue team serving Boulder County. BES is the primary dive rescue agency for Boulder County. Staffed by 42 members in 2015, BES is 100% volunteer supported. The primary source of funding for BES is the Boulder County Commissioners. BES works closely with the BFR to provide mutual-aid support for emergency situations by providing air cascade, lighting support and traffic control as well as a variety of technical rescue incident support[20].

Image12. Dive Team

Office of Emergency Management

The mission of the Boulder Office of Emergency Management (Boulder OEM) is to develop, coordinate, and lead a comprehensive emergency management program. Boulder OEM seeks to enable effective preparation for, efficient response to, and effective recovery from emergencies and disasters, to save lives, reduce human suffering, protect resources and develop a more resilient community.

In the event of large-scale natural or technological disasters, the Boulder Fire-Rescue Department works with other agencies and organizations such as the City of Boulder/Boulder County Office of Emergency Management (Boulder OEM). The Boulder OEM coordinates with local, state, and federal partners to facilitate planning and response to emergency situations. Given the importance of emergency response and recovery planning, the city continuously reviews the coordination with Boulder OEM to identify any areas of improvement.

The Boulder Office of Emergency Management has emergency management responsibilities for both the City of Boulder and Boulder County. In addition, Boulder OEM coordinates with state and federal partners, many city and county departments, public safety agencies, municipalities, non-governmental organizations and private businesses throughout Boulder County to facilitate coordinated planning and response to emergency situations.

[20] http://www.boulderrescue.org