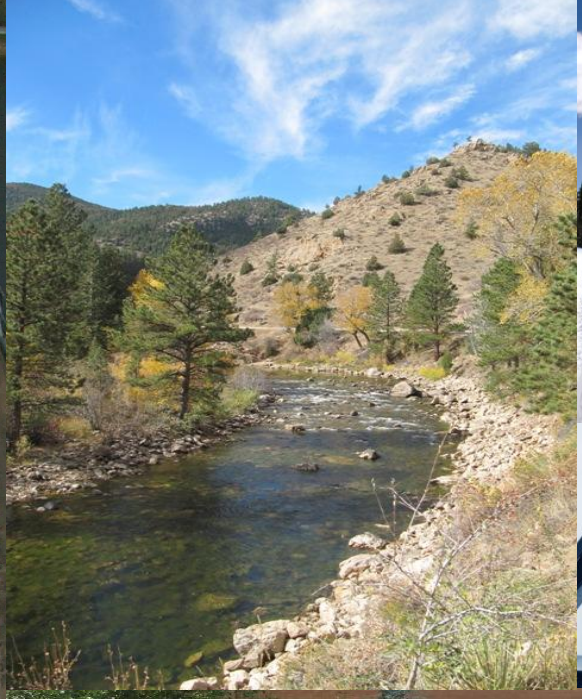

Fort Collins Water Supply and Demand Management Policy Revision Report

April 2014

City of Fort Collins Utilities

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TABLE OF CONTENTS

LIST OF TABLES

TABLE OF FIGURES

APPENDICES

1.0 Executive Summary

The City of Fort Collins (City) Water Utility has periodically updated its Water Supply and Demand Management Policy (Policy) since the original Water Supply Policy was adopted in 1988 with the last update completed in 2003. This 2012 Update addresses the following core issues:

- Continued reductions in per capita water use
- The amount of storage necessary to meet the Water Utility's needs
- The potential effects of climate change
- The use of surplus raw water to support local agriculture and help provide instream flows
- The need for greater regional cooperation
- Triple Bottom Line focus in the Utilities' decision-making process

The Policy Update process integrated technical analyses with community input. Following stakeholder interviews, Utilities staff and consultants facilitated a Community Working Group as a forum for thoughtful discussion on refinements to the former 2003 Water Supply and Demand Management Policy. Feedback from this process was incorporated into the updated Policy and presented to the Water Board and City Council for final approval. Other outreach methods included the project website, a survey on landscape preferences and presentations to organizations.

The Fort Collins Water Supply and Demand Management Policy Report provides the context for the updated Policy, highlights relevant historical data and events as well as future trends and projections, and explains the Policy elements and suggested Water Utility strategies for implementation. The main objective of the 2012 Water Demand and Supply Management Policy is to provide a sustainable and integrated approach to 1) ensuring an adequate, safe and reliable supply of water for the beneficial use by customers and the community and 2) managing the level of demand and the efficient use of a scarce and valuable resource consistent with the preferences of Water Utility customers and in recognition of the region's semi-arid climate. The Policy reflects the City's larger planning vision defined in the City's 2010 Plan Fort Collins and provides a foundational framework for demand management and water supply planning decisions.

To provide a foundational framework for water supply planning and demand management decisions, the 2012 Update focuses on the following five core elements:

- Water use efficiency and demand management
- Water supply reliability
- Treated and raw water quality
- Use of surplus water
- Regional cooperation

Water Use Efficiency and Demand Management – The water efficiency program is an important proactive response to variability in water supplies and the uncertainties inherent in climate change. The water efficiency program fosters a conservation ethic and commitment to sustainability, provides water for multiple uses and can reduce the need for capital expansion projects. The 2012 Policy incorporates the 2009 Water Conservation Plan's goal of reducing future treated water use to 140 gallons per capita per day (gpcd) and defers to the Water Conservation Plan for guidance on specific water conservation activities. The Policy also requires stable transparent water rate structures that provide an economic incentive to use water efficiently.

Water Supply Reliability – The Water Utility is responsible for providing an adequate and reliable supply of water to its customers. The 2012 Policy specifies planning criteria for water supply reliability, defining the conditions under which customers can expect the Water Utility to provide a reliable supply. The planning criteria describe the water demand that can be reliably served under specified drought conditions and the margin of safety the Water Utility should have in place to address unforeseen circumstances. The 2012 Policy specifies a planning demand level of 150 gpcd, reflecting recent water usage which should be met during at least a 1-in-50 year drought. A 1-in-50 drought corresponds to a dry period that is likely to occur, on average, once every 50 years. A 20% storage reserve factor is included in the water supply planning criteria as an additional layer of protection for emergency situations (i.e., pipeline failure) and droughts that exceed the 1-in-50 year limit. These criteria are conservative in order to account for climate change and other factors that might impact water supplies. The Water Utility will closely monitor climate change and other developments and update the Policy, if necessary, at a later date.

Other Policy elements addressing water supply reliability include a Water Supply Shortage Response Plan for periods of unusual drought or other causes of supply shortages, raw water requirements for future development within the Water Utility's service area, provisions for acquiring and sharing agricultural water rights, and provisions for acquiring and developing new water rights and facilities necessary to meet growing demands.

Treated and Raw Water Quality - The Water Utility is also responsible for providing water that meets drinking water standards and using water treatment practices and procedures that provide the highest level of realistic health protection to its customers. The Policy not only emphasizes this responsibility, but also addresses the quality of the Water Utility's source water within the watershed. The City will take an active role in watershed protection and protecting the quality of water within the watershed.

Use of Surplus Water - The Water Utility aims to first meet the water needs of its treated water customers, followed by the needs of its raw water customers which include City parks, golf courses, cemeteries, greenbelt areas and other raw water obligations established through various

agreements. Surplus supplies not needed for these purposes may be leased to agricultural users, used to improve flows in the Poudre River, and used for other beneficial purposes. The 2012 Policy formally establishes the Water Utility's commitment to the use of its surplus supplies for these non-municipal purposes. The Water Utility will explore long-term rental and sharing arrangements with irrigators and will take a leadership role in working with local and regional groups and agencies to quantify and provide instream flows on the Poudre River that are adequate from ecological, recreational and aesthetic perspectives. The Water Utility will also consider and participate in other surplus water supply arrangements that provide mutual benefits and support the region.

Regional Cooperation – Fort Collins' future is increasingly intertwined with other water agencies and organizations. The 2012 Policy emphasizes the importance of regional collaboration and states that the Water Utility will strive to be a leader in demonstrating how water supply can be developed and provided in a manner that respects the interests of others. The Water Utility will work with other water suppliers throughout northern Colorado in studying, developing and sharing infrastructure where there are mutual benefits. The Water Utility will also continue to cooperate with local irrigation companies, local, state and federal agencies, civic organizations, environmental groups and other non-governmental organization on common goals that can benefit the Water Utility, City and the region.

2.0 Introduction

Since the Fort Collins Water Utility's origin in the 1880s, the City has been focused on providing a high quality and reliable water supply to its customers. The original water supply and demand management policies were adopted by the Fort Collins' City Council in 1988 and 1992, respectively. Following the adoption of these policies, the City continued to grow and acquire additional supplies, while the per capita water use dropped by over 15%. To address these changes, the City developed a comprehensive policy addressing both water supply and demand in 2003. The 2003 Policy provided a sustainable and integrated approach to developing and maintaining an adequate and reliable supply of water for beneficial uses by customers and the community while managing the level of demand and the efficient use of water. The City continued to grow and per capita use continued to decrease following the adoption of the 2003 Policy, largely in response to changes that occurred in response to the 2002 drought.

Utilities staff initiated this update in 2011 to address the following issues related to the Water Utility's water supplies and demands:

- Continued reductions in per capita water use
- The amount of storage necessary to meet the Water Utility's needs
- The potential effects of climate change
- The use of surplus raw water to support local agriculture and help provide instream flows
- The need for greater regional cooperation
- Triple Bottom Line focus in the Water Utility's decision making process

2.1 Scope of Policy

The updated Policy also continues the objectives of providing a sustainable and integrated approach to ensuring an adequate, safe and reliable supply of water for the beneficial use by customers and the community, while managing the level of demand and the efficient use of a scarce and valuable resource considering the preferences of Water Utility customers and in recognition of the region's semi-arid climate. It provides direction to the Water Utility on key water supply and demand management decisions as well as general guidance on day-to-day operations and management. General criteria are provided for decisions regarding demand management, water supply modeling, water supply and storage projects, acquisition of water rights, use of surplus water, and local and regional collaboration with other entities.

2.2 Purpose

The purpose of this report is to provide documentation supporting the 2012 update of the City's Water Supply and Demand Management Policy. The report provides information on the Water Utility's historical and current water demand and supplies; background on how future demands are projected and the planning criteria used to determine the amount of future water supply

necessary to meet the needs of the community; and a detailed discussion on each policy element. The report will be used as a reference by Utilities staff and others.

2.3 Policy Development Process

The update process involved integrating technical analysis and stakeholder input to address the following core questions:

- What is the appropriate level of water use in Fort Collins during non-drought years?
- How does the Water Utility best plan for severe drought?
- What sources of supply are needed?
- Recognizing the limits of what Fort Collins can do alone, how can we best address the community's desire for increased flows in the Poudre River through the City?

In 2010, consultants were hired to aid in the process of gathering relevant information, facilitating stakeholder discussions and documenting the Policy background presented in this report. The consultant team included AMEC, Inc. (AMEC) and Catalyst, Inc. (Catalyst). AMEC provided its expertise on municipal water supply and demand management planning while Catalyst led the stakeholder outreach process and facilitated the stakeholder meetings.

The Water Board served as stewards for the process by receiving regular updates on the Policy development and making recommendations to City Council. Following a series of 27 interviews conducted between November 2010 and February 2011 that focused on gathering data for designing the process for updating the Water Supply and Demand Management Policy, a Community Working Group (CWG) was formed to bring together different perspectives for a thoughtful discussion of potential refinements to the existing Policy. Three Water Board members participated on the CWG along with sixteen additional members with different interests including: agriculture, environmental protection, civic organizations, business, homeowners, university, and State of Colorado. The CWG process began with a meeting focused on launching the effort, which involved introducing participants and understanding issues and concerns. Four subsequent meetings addressed the following key topics in the Policy: non-drought water use, severe drought preparedness, additional supplies and facilities, and non-municipal water use. Following these meetings, a draft Policy update was developed and circulated to the CWG for comments. This draft was updated and discussed at the final CWG meeting, where CWG members had the opportunity to provide final comments.[1]

Utilities staff presented the revised draft Policy and memorandum to the Water Board on November 17, 2011. In addition to the work with the CWG and Water Board, public outreach

[1] CWG comments and the Water Utility's responses are documented in a CWG Memo which also outlines the details of the CWG process in more detail and identifies areas where there was agreement within the CWG on their findings and where CWG members disagreed and why. The CWG reached consensus on the memorandum as a fair and accurate summary of its discussions and input to the Update.

and information included posting Policy update information on the City's website, conducting a landscape preference survey with a Utilities customer online survey panel (See attachment C), and conducting presentations for 12 other City boards and interested organizations. These are listed below.

- Economic Advisory Commission
- Fort Collins Area Chamber of Commerce
- Larimer County Agriculture Advisory Board
- Natural Resources Advisory Board
- Foothills Rotary Club
- Eyeopeners Kiwanis
- Planning and Zoning Board
- Parks and Recreation Board
- Fort Collins Board of Realtors
- Land Conservation and Stewardship Board
- Associated Landscape Contractors of Colorado, Northern Chapter
- Downtown Development Authority

Opportunities were provided in all these efforts for individuals to provide comments on the Policy update.

The Policy update was first presented to City Council in a working session on January 10, 2012. The outcome of the discussion was that the Policy update needed more explanation and was not ready for adoption. Changes were made to the Policy update given the City Council's input. It was presented again to the Water Board on July 19, 2012. The Water Board's recommendations were presented to the City Council during a regular meeting of the City Council on October 30, 2012. Council members requested some minor language adjustments to the updated Policy and officially adopted the revised Policy update with those adjustments on November 20, 2012.

3.0 Historical Background

3.1 Historic Review of City Water Supply

From the Water Utility's origin in the 1880s until the early 1960s, the City depended primarily on its direct flow rights on the Cache la Poudre River (Poudre River) to satisfy its water demands. The first water right was obtained in 1889 when the City Council purchased a direct flow water right of 4.0 cubic feet per second (cfs). In 1904 another 2.65 cfs was purchased and the right was moved by decree to the present diversion dam near the former Poudre Canyon Water Treatment Plant. Three other senior direct flow rights were subsequently obtained in the early 1900s. These five direct flow decrees served the City well for many years and still entitle the Water Utility to divert an average of about 11,300 acre-feet of water annually.

In the late 1950s the City acquired 6,000 units of Colorado-Big Thompson (CBT) water, which had been made available by the completion of the CBT Project. CBT water is diverted from the upper Colorado River and stored in Lake Granby, Carter Lake and Horsetooth Reservoir. This project is managed by Northern Water (formerly known as the Northern Colorado Water Conservancy District), which has a key role in providing supplemental water supplies to Colorado's northern Front Range.

During the dry years of the 1950s, enough growth had occurred that the City began to experience water shortages. The Water Utility attempted to purchase substantial amounts of water from existing irrigation ditches, but it failed to adequately consider the legal limitations, which would constrain the use of such water. The result was an historic legal battle that reached the Colorado Supreme Court, and Fort Collins was denied the ability to implement these plans because they were ruled to be injurious to other water users of the basin. An additional detriment was the ill feelings that were generated between the residents of the City and the rural community. As a result of the frustration that occurred in the 1950s, Mr. Harvey Johnson (then mayor) suggested in 1963 that a Water Board be established to recommend solutions to the City's water supply problems. The Board contained a cross section of water professionals who were knowledgeable about the Poudre River Basin water system and its operation. Cooperation and harmony among all water users in the basin – municipal and agricultural – was recognized as crucial. To that end, the Board conferred with the Cache la Poudre Water Users Association on every action that could impact others before making a recommendation to the City Council. Problems related to the withdrawal of water acquired in mutual irrigation companies were resolved through negotiated agreements with the irrigation companies. Potential conflicts were resolved in that process to the extent that litigation was essentially eliminated. The Board also adopted the practice that water would not be sought from agricultural water rights owners except when the land was being developed or it was offered for sale as excess to the owner's irrigation needs. This was intended to avoid disruption in the agricultural economy of the basin. These policies

for water right acquisition by the City laid the foundation for several decades of basin water user cooperation.

Shortly after the Water Board was formed, the City began an active water acquisition program. From 1963 to 1972, the City acquired shares of stock in several local irrigation companies. During this period, approximately 840 shares of the North Poudre Irrigation Company (NPIC) were purchased as well as 60 shares of the Pleasant Valley and Lake Canal Company and about 4,000 more units of CBT water. In 1972, the City purchased 9.917 shares of the Water Supply and Storage Company (WSSC). These purchases resulted in an increased average annual yield of about 11,000 acre-feet per year above the yield from the historic direct flow rights.

During this same period of water purchases, the Water Board and City Council established a policy that required developers to turn over water to the City prior to receiving water service. Initially there was a requirement of 2 acre-feet per acre but this was changed to 3 acre-feet per acre in the early 1970s. This requirement remained until 1984 when the raw water requirements were revised to reflect more closely the actual amount of water used by various classes of customers. The present requirements for residential development are based on a formula that considers both area and number of dwelling units. Non-residential requirements are based on tap size, or for large water users, are negotiated based on estimated water use. The water rights transferred to the City under these requirements include CBT units and shares of several irrigation companies that have historically irrigated in the Fort Collins area.

In the mid 1970s, the City decided to enlarge Joe Wright Reservoir and improve the Michigan Ditch, both located near Cameron Pass on Highway 14. The City had obtained both of these facilities in an exchange with the NPIC in 1971. The enlarged reservoir, with a usable capacity of 6,500 acre-feet, was completed in late 1979. The rebuilding of Joe Wright Reservoir prompted several other related projects. The enlarged reservoir and the ability to divert trans-basin waters from the Michigan River (part of the North Platte River Basin) resulted in reusable waters being brought into the Poudre River Basin. Reusable water refers to imported or newly developed water that may be totally consumed through a succession of identified uses by its owner. In 1978, the City entered into an agreement with Platte River Power Authority (PRPA) and the WSSC to jointly participate in a "Reuse Plan." Under the plan, PRPA takes reusable effluent resulting from the City's and WSSC's reusable sources. PRPA repays the City and WSSC with other water. This joint Reuse Plan results in an additional 2,300 acre-feet available to Fort Collins. Also related to the Joe Wright and Michigan Ditch facilities is the 1,200 acre-feet of storage capacity acquired in 1983 in Meadow Creek Reservoir. The City purchased this capacity in the Michigan River Basin in order to provide replacement water for senior appropriators in that basin. This allows the City to divert more water through the Michigan Ditch during times of high irrigation demand. The average annual yield of Joe Wright Reservoir, Michigan Ditch and Meadow Creek Reservoir is estimated to be 5,500 acre-feet per year.

From 1985 through 1988, the City purchased about 5,500 acre-feet of water, primarily CBT units and NPIC shares. These purchases were primarily because of a decline in the price of water rights in this area and because of concerns related to the purchase of almost half of the shares in the WSSC by the City of Thornton.

After a thorough review of the City's policies concerning water supply in 1987, the Water Supply Policy (Resolution 88-205) was established in 1988. This Policy required that the Water Utility maintain a water supply sufficient to meet the treated water demands of the Water Utility during at least a 1-in-50 year drought. To accomplish this goal for the long term, the City purchased another 7,400 acre-feet of water during 1989-1991. Also, the raw water requirements were increased by 20% to ensure that developers were turning in enough water to meet the long-term goals.

During the 1990s, the Water Utility took significant actions to help ensure the long-term reliability of the City's supply system. In 1992, the City filed a major application with the Water Court to transfer shares of its "Southside Ditches" from agricultural use to municipal use. The shares involved in this transfer included those from the Arthur, Larimer No. 2, New Mercer and Warren Lake irrigation companies. After several years of study, negotiations and Water Court hearings, the City obtained a decree in 1996 that allows the City to use much of this water in its system. More recently, the City entered the court process of converting additional Southside Ditch shares in 2005 and converting its shares in the Water Supply and Storage Company in late 2011.

In 1993, the City entered into an option agreement with NPIC to acquire and enlarge its existing Halligan Reservoir. In November 2003, the City Council approved the exercise of the NPIC option agreement, which transferred the reservoir ownership and enlargement decree to the City. The enlargement of Halligan Reservoir could provide the City with carryover storage which would provide additional drought protection. Since 2006, the City has been going through a National Environmental Policy Act (NEPA) process to obtain a Section 404 Permit for the enlargement of Halligan Reservoir. This process is designed to collect the best available information, examine other practical alternatives, involve the public and disclose impacts of the proposed project and alternatives so that the decision makers can be best informed when making the final decision.

3.2 Historic Review of City Water Demand Management

Demand management measures include actions aimed at controlling or influencing the demand for water. Some measures are used to respond to short-term water supply shortages caused by drought or water supply crises. Other measures are used for long-term water conservation, which help to reduce overall demands and aid in the planning for supply system acquisitions and improvements.

Early Fort Collins settlers realized how precious water was to this semi-arid land. They hauled water in buckets and there was no need to convince them to not be wasteful. But as indoor plumbing became standard in Fort Collins, the perceived need for conservation dwindled. It wasn't until the 1960s, when Fort Collins began to acquire additional water supplies in anticipation of future growth, that an awareness of conservation began to emerge. At that time, two ordinances were enacted. One of the ordinances prohibited wasting water while irrigating lawns and the other gave Council the authority to impose water restrictions when necessary.

The City's conservation efforts began in earnest when Fort Collins was faced with a drought in 1977. During that drought, water restrictions were imposed and a part-time water conservation officer was hired. This position was charged with enforcing the water restrictions, talking to groups and schools about conservation, and working with the media to publicize the restrictions and ways to conserve. The restrictions were only in effect for just over a month because of an abundance of late summer rain.

For a number of years, the idea of installing water meters in homes was often studied, discussed and voted down. The first step was taken in 1977 when Council passed an ordinance that required a meter yoke be installed in all newly-built homes. Yokes ease installation of a meter at a later date. City Council eventually moved to require meters in response to the Colorado Water Metering Act of 1990. Although the State law required that all water taps be metered by January 2009, City Council moved the deadline to December 2005. The program began as voluntary, but became mandatory in 1999. By the summer of 2003, all City water taps had been metered. Studies have shown that metered households use about 20% less water annually than those without meters. Installing meters in Fort Collins homes has played an important role in lowering water demand. It should be noted that the City's commercial, industrial and multi-family customers have been metered for many years.

Low water use plumbing fixtures have helped reduce indoor water use. In 1978, a City ordinance was adopted that required plumbing fixtures to meet flow requirements of 3.5 gallons per flush for toilets, 3 gallons per minute for showerheads and 2 gallons per minute for faucets. When the Federal Energy Policy Act of 1992 became effective, requirements for new plumbing fixtures were further reduced to 1.6 gallons per flush for toilets, 2.5 gallons per minute for showerheads and 2 gallons per minute for faucets. While some existing plumbing fixtures in Fort Collins do not meet these standards, it is expected that ongoing replacements of fixtures will eventually result in attainment of these standards.

Approximately 40% of the City's treated water supply is used for keeping landscapes green. With this in mind, the City initiated several programs to reduce outdoor water use. Beginning in 1982, the Utilities published a daily lawn watering guide in the Coloradoan based on evapotranspiration (ET) data. The guide shows how much water a lawn might need if it hasn't been watered for three, five or seven days. Professor ET, a cartoon character, provided outdoor

water conservation tips to the public. In 1986, a Xeriscape Demonstration Garden was opened in front of City Hall to show customers that landscapes that use less water can be attractive.

In 1989, the Utilities hired a full-time water conservation specialist, and conservation projects and education efforts were expanded. An initial duty of this position was to participate in the development of a water conservation policy for the City. A committee was formed to develop this policy, including members of City Council, the Water Board and Utilities staff. After almost two years of analyzing various measures, City Council passed the Water Demand Management Policy (Resolution 92-63) in 1992 (see Appendix B). Since then, the policy's 12 demand management measures have been the foundation of the City's water conservation program. The 1992 and 2003 policies also set two goals for lowering overall water consumption and peak day demand.

Due to severe drought conditions in 2002, additional water use reductions were required to avoid potential water supply shortages in 2003. In July 2002, mandatory restrictions were put in place allowing customers to water their lawns two days per week. In the fall of 2002, revised restrictions allowed just one day per week. Water savings from the restrictions and other water conservation efforts were carried over for use in 2003. As 2003 began, drought conditions continued, raising concerns of a significant water shortage. A historic blizzard in March and a wet, cool spring quickly changed the situation. Uncertain what the future would bring, Council adopted the Water Supply Shortage Response Plan (Ordinance No. 048, 2003, included as Appendix C) with four levels of measures to address various water shortages. In April 2003, Level 1 water restrictions were put in place to meet a projected 1-10% water shortage. These restrictions remained in place until September 2003, when demands were lower and supply projections had improved. The 2002 drought significantly impacted the City's average historical water demand levels. Since 2002 the City's water use has generally decreased. This is discussed in further detail in Section 4.1.1 which addresses the City's current water use trends.

As the City's population continues to grow and with drought cycles inevitable, it becomes increasingly challenging to meet future water needs. Over the years, the demand management policy and other conservation efforts have lowered the per capita consumption and contributed to the City being able to meet its water demands. The City's current Water Conservation Plan, completed in 2009, includes a goal of reducing treated water use to 140 gpcd by 2020.

The 2009 Water Conservation Plan is a State approved plan, developed according to the State's standards and recommendations. The City's current water conservation program includes a diverse range of activities targeted at all water demand sectors in the service area. These activities are outlined in the 2009 Water Conservation Plan. Demand management tools include educational programs, incentive programs, regulatory and operational measures and conservation-oriented tiered and seasonal water rate structures designed to encourage efficient use. The Water Utility currently monitors conservation by tracking water demand regularly, measuring program impacts and

determining progress toward the water use goal. According to State recommendations, the Water Conservation Plan will be updated every seven years.

3.3 Summary of Previous Water Supply and Demand Management Policies

During the first 130 years of public water supply service in Fort Collins, water supply policies have focused on meeting the residential, commercial and industrial water supply needs of the citizens served by the Water Utility. These policies have evolved over the years to meet the changing needs and desires of the City's residents. A study in 1985 defined the effects of prolonged droughts on the City's water supply system and was an important factor in the development of the 1988 Water Supply Policy.

The 1988 Water Supply Policy included seven general policy elements, which were intended to guide the City as it considered issues regarding water supply and provided the guidance to obtain a diverse array of water rights for at least a 1-in-50 year drought. These seven policies addressed cooperation with the agricultural community, reliability of supply, timing of water acquisitions, the process of acquiring water rights and storage, raw water requirements for new development, regional participation/cooperation and demand management. Efforts were made following the policy adoption to cooperate with the agricultural community and with other water providers in the area.

In 1992, City Council adopted a Water Demand Management Policy to "initiate and intensify activities that demonstrate a commitment to the efficient and wise use of water." The policy included five demand management policy elements addressing a conservation ethic, public education, and deferment of water treatment expansion, future water supply permitting compliance, and maintaining the attractive appearance of landscape. The policy also established four conservation goals addressing City leadership, reducing per capita peak demand and average annual per capita consumption and the development of annual progress reports. Finally the policy also called for twelve individual conservation measures to implement and save water.

Since the adoption of the 1988 Water Supply Policy and 1992 Water Demand Management Policy, the City grew rapidly and its future became increasingly intertwined with other water agencies and organization. In 2003, City Council adopted a Water Supply and Demand Management Policy which consolidated the two policies into a single updated policy that addressed the City's new challenges and opportunities. The 2003 Water Supply and Demand Management Policy updated the demand management goals, provided direction for the conservation program, addressed the leak detection program and recycling of backwash, maintained the 1-in-50 drought criterion, addressed raw water requirements, established the priority of use for existing water supplies and maintenance of a Water Supply Shortage Response Plan and addressed the use of raw water supplies, transfers from agriculture to municipal, working with others, raw water quality, stream flow protection for ecosystem protection, aesthetics and recreation. The three policies discussed above are included in Appendix D.

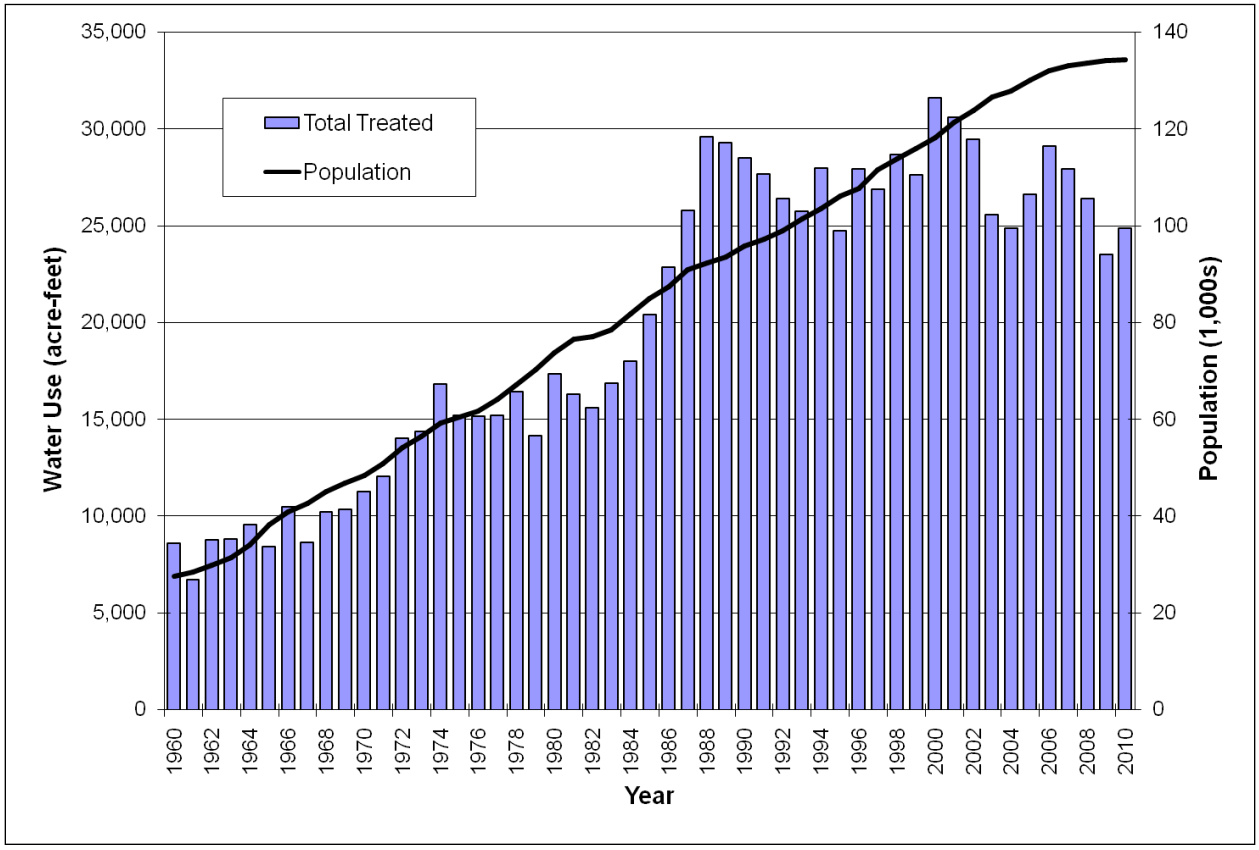
4.0 Historical and Future Water Demands and Supply

4.1 Historical Water Demands and Supply

4.1.1 Historical Water Demands

The Water Utility currently delivers about 26,000 acre-feet per year of treated water and 4,000 acre-feet per year of raw water (which irrigates the City's parks, golf courses, etc.). From 1990 to 2000 the Water Utility service area population increased almost 25% while the total treated water use increased only about 10%. This was largely due to the installation of meters in the majority of single family homes during this period. As a group, single family homes reduced their use by an average of about 25% per home during this period. Despite these savings, water use tended to increase as the population continued to increase in Fort Collins. Following 2000, significant declines in total demands occurred, as reflected in Figure 1. This is largely attributed to the drought in the early 2000s which resulted in a significant reduction in per capita water use throughout Front Range municipalities.

Figure 1 Historical Treated Water Use (1960 – 2010)



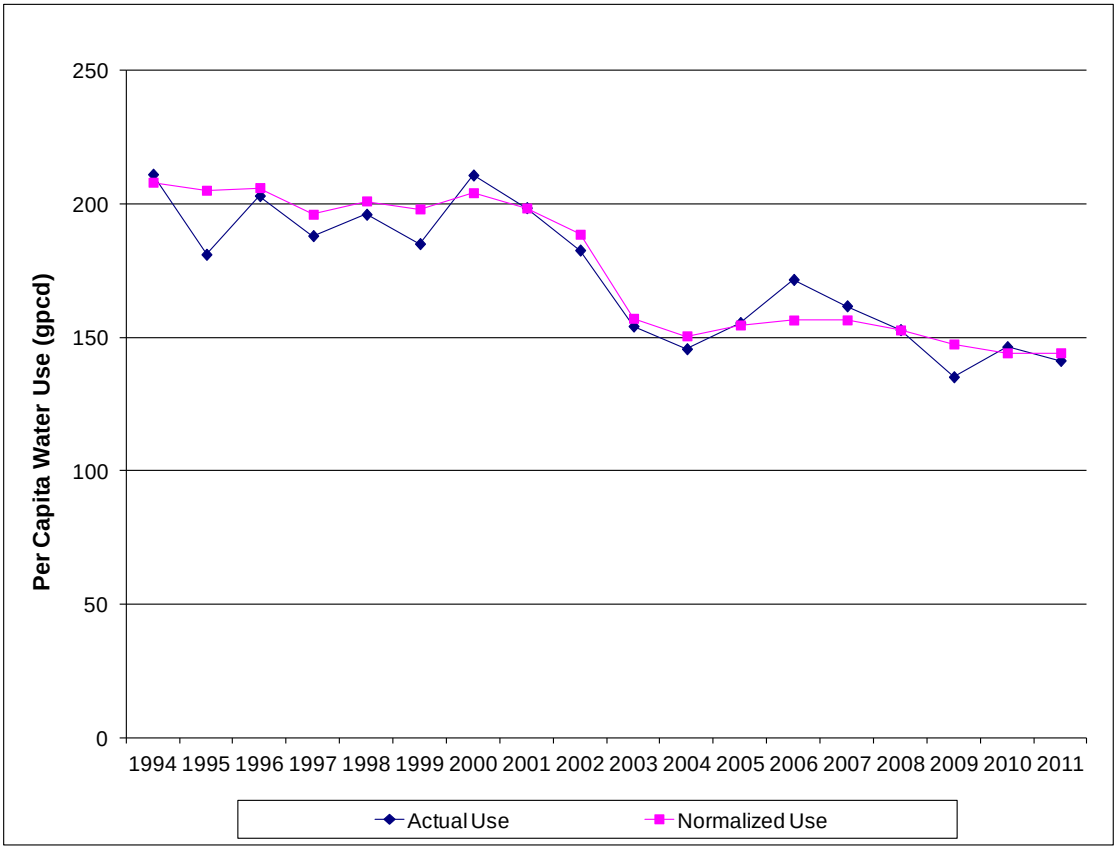
Several factors cause actual demands to vary from year to year. The primary factor that affects variation in demand is the weather. Water demands for the City's municipal customers can vary by up to about 10% annually from average use, depending on whether it is a relatively wet or dry year. Other factors that can affect long term average water use per person include changes in water use characteristics, conservation and education programs, changes in plumbing fixtures, distribution system leakage, changes in development density, and relative change in industrial/commercial versus residential growth.

Municipal water use is often gauged by daily per person use, measured in gallons per capita per day (gpcd). This is calculated as total treated water use (including residential, commercial, etc.) divided by service area population for the Water Utility and 365 days (per year). It should be noted that these calculations are adjusted for large contractual customers and other sales or exchange arrangements in order to estimate per capita use in a manner that is comparable to other municipalities.

Demand levels have declined significantly over the last few decades from around 230 gpcd in the early 1990s to about 200 gpcd before the drought year of 2002. The average use over the last several years (2006-2011 normalized use) has been about 150 gpcd,[2] indicating a 25% reduction in per capita water use from before 2002. This is shown in Figure 2. The 150 gpcd is significantly below the 1992 Water Demand Management Policy target of 195 gpcd by 2010 and the 2003 Water Supply Demand Management Policy of 185 gpcd by 2010.

[2] The per capita water use has been normalized to adjust for fluctuations associated with seasonal weather patterns. Actual per capita water use, shown as the dark blue line in Figure 2, is the measured per capita water use is not adjusted for seasonal weather patterns. The actual per capita water use is generally higher in dry years and lower in wet years when compared to the normalized per capita water use.

Figure 2 Historical Per Capita Water Use



Note: The per capita water use values above do not include large contractual water use.

Analysis by Customer Category

Figures 3 and 4 illustrate the treated water use for 2001 and 2008, respectively, showing the breakdown of use by different customer categories as well as by indoor and outdoor water use. The year 2001 was an average year for the City in terms of weather conditions and water use prior to the 2002 drought, and 2008 is representative of average weather conditions following the 2002 drought. These figures show that the 2001 total water use of 9,934 million gallons was much higher than the total use in 2008 of 8,352 million gallons. The majority of water use reductions have come from the City's residential customers. This is shown in Figures 3 and 4 where single-family/duplex customers were the highest users in 2001 comprising 43% of the total water use. This percentage decreased to 40% in 2008 where commercial/industrial/city government customers comprised the largest user at 42%. These residential reductions are also illustrated in Figure 5, which compares average indoor and outdoor water use from the pre-drought 1998-2001 period and post-drought 2004-2010 period. Such reductions are a combined result of the City being fully metered and adopting tiered and seasonal rate structures by 2003, the City's water conservation program and water conservation efforts by customers. Table 1 provides the annual water use by customer category for the same pre- and post-drought periods.

Figure 3 2001 Treated Water Use By Customer Type

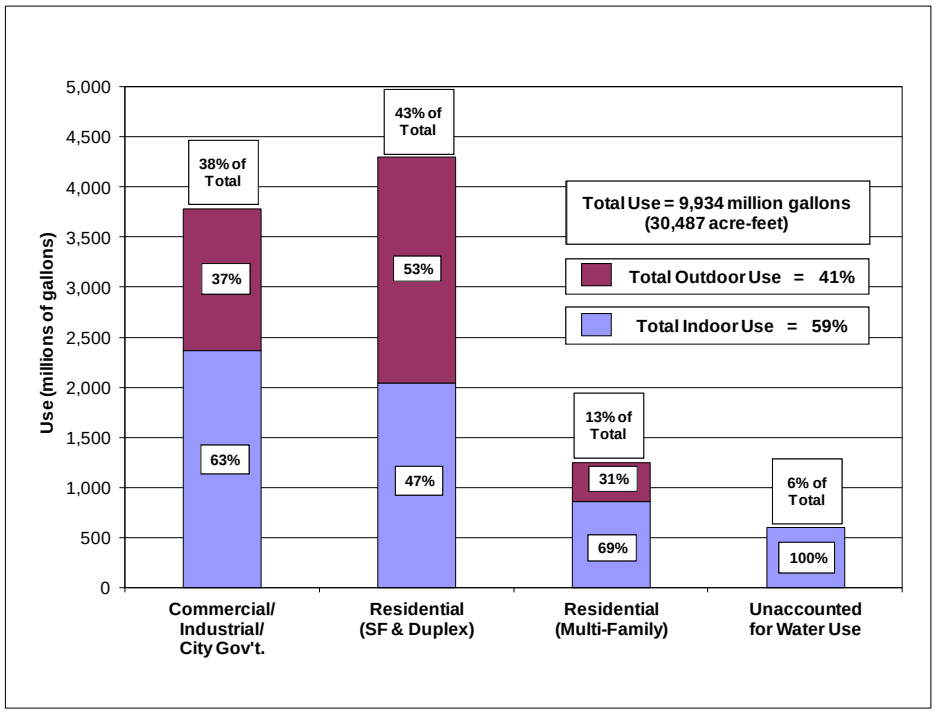


Figure 4 2008 Treated Water Use by Customer Type

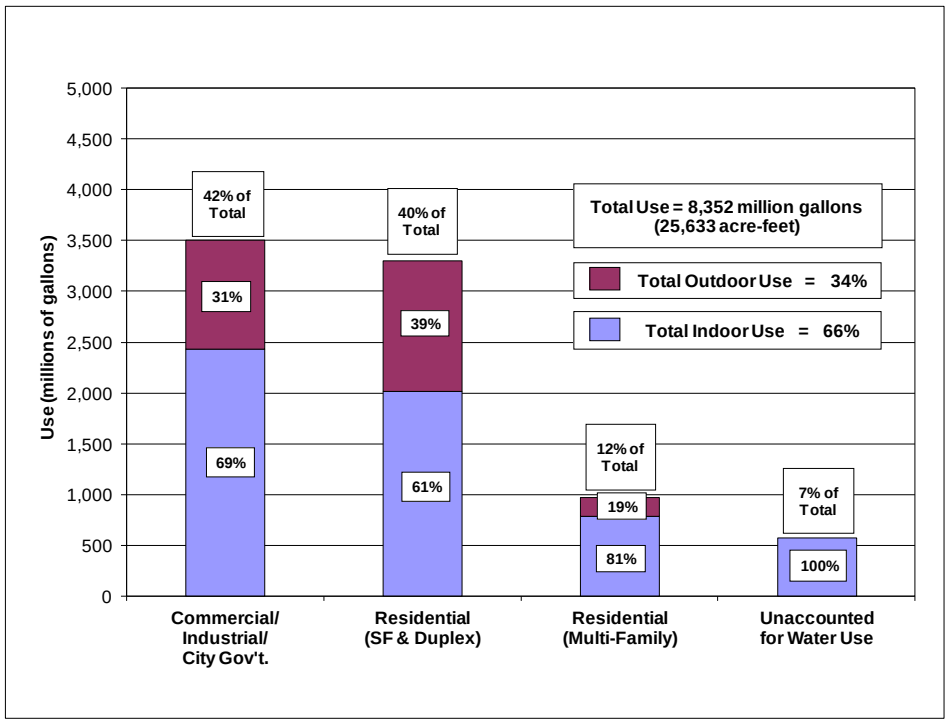


Figure 5 Treated Water Use – Comparison of Period Averages

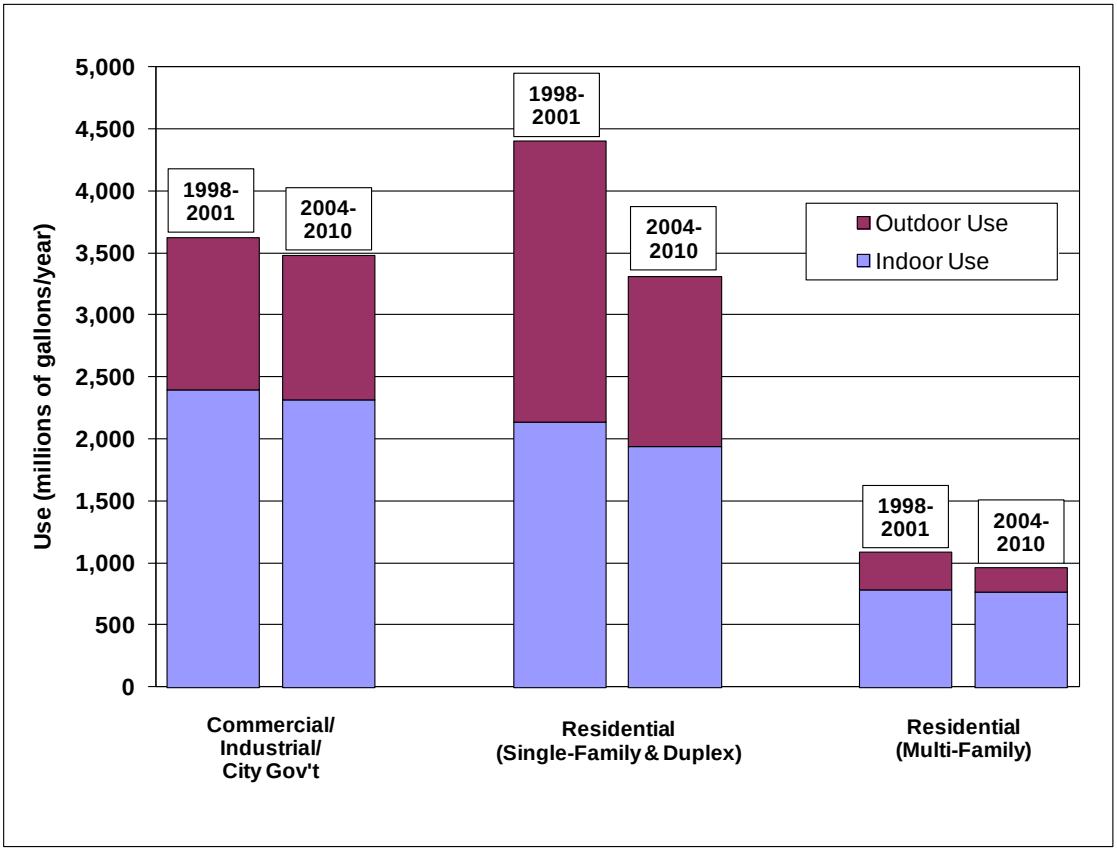


Table 1. Indoor and Outdoor Water Use by Customer Category in Million Gallons (1998 – 2010)

Year	Single Family & Duplex			Multi-Family			Commercial, City Govt, Industrial		
	Indoor	Outdoor	Total	Indoor	Outdoor	Total	Indoor	Outdoor	Total
Average 1998 to 2001	2,136	2,270	4,406	782	309	1,090	2,395	1,229	3,623
Average 2004-2010	1,941	1,365	3,306	765	197	961	2,318	1,160	3,478
% Reduction	9%	40%	25%	2%	36%	12%	3%	6%	4%

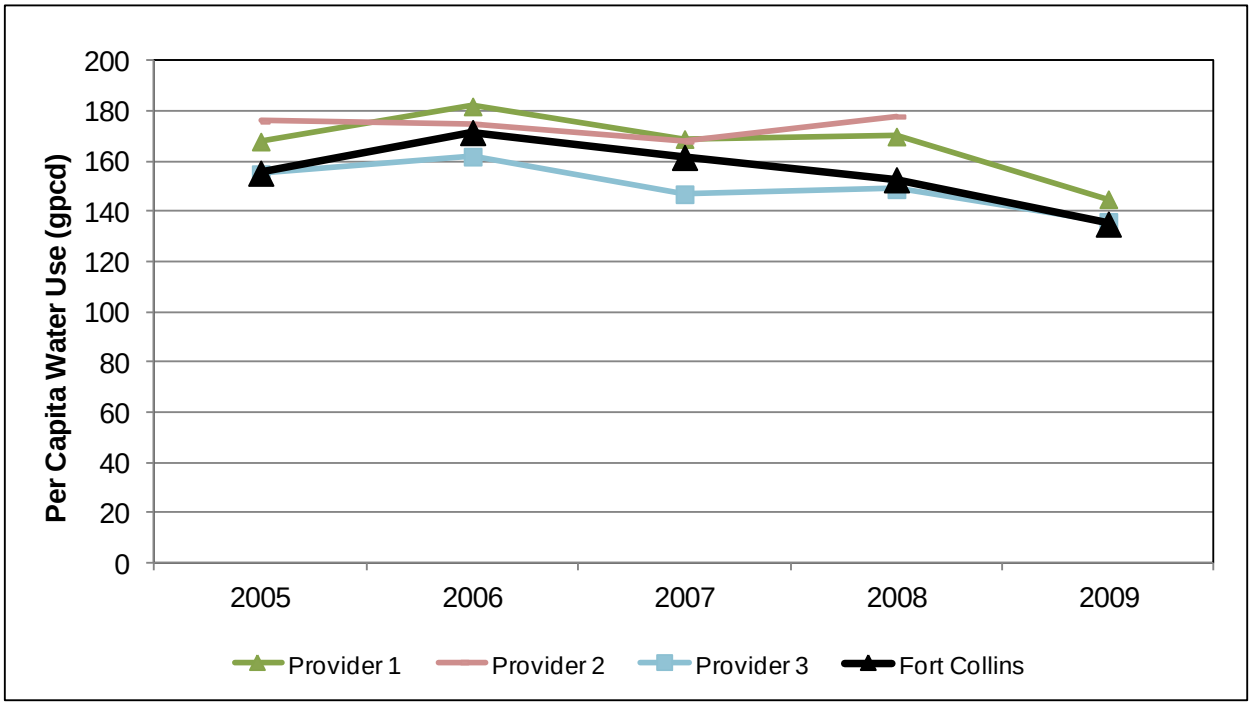
Comparison of Per Capita Water Use with Other Municipalities on the Front Range

To compare water use in Fort Collins with other municipal water use in the region, AMEC conducted a survey of seven water providers along the Front Range acquiring information on their water demand. The providers surveyed included Aurora Water, Denver Water, Thornton, Westminster, Greeley, Colorado Springs and Boulder. Providers used the following two approaches to estimate per capita water use:

- Water treatment plant production divided by service area population
- Sum of total end uses at the meter divided by service area population (this method does not include distribution losses and other unaccounted for losses)

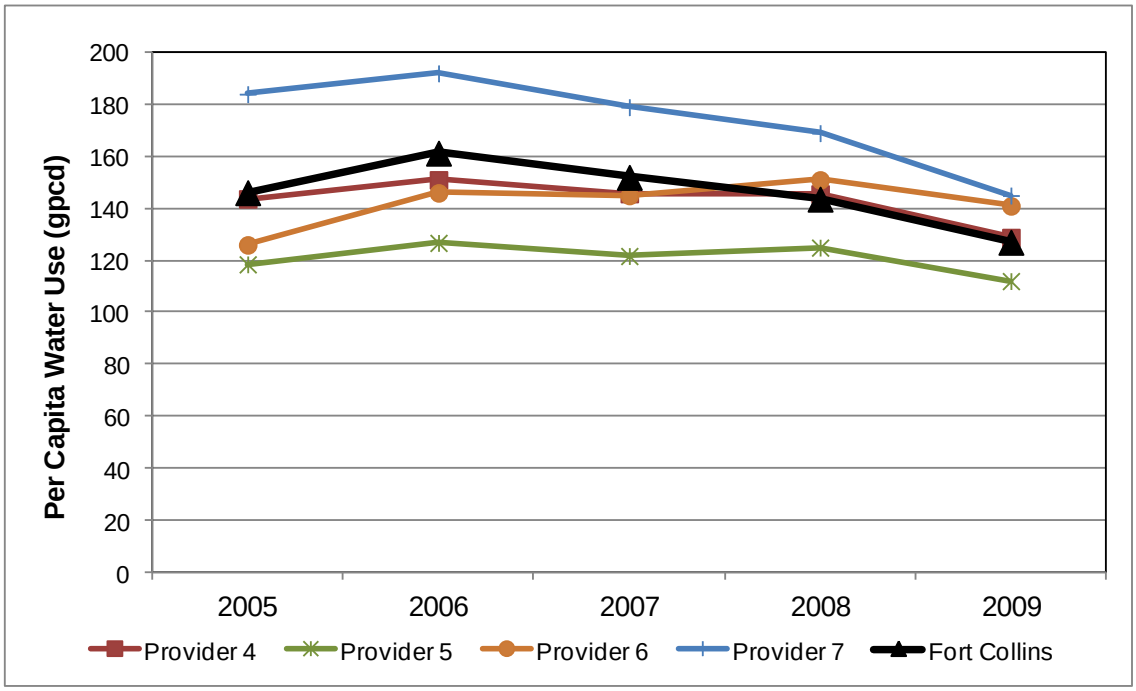
The results shown in Figure 6 indicate that per capita water use in the Fort Collins Water Utility service area was among the lowest from 2005 to 2009 when compared to providers that estimate per capita use using the first method (water treatment plant production divided by service area population). Fort Collins is in the mid range among providers that estimate per capita use using the second method (sum of end use at the meter divided by service area population) as shown in Figure 7. Figure 8 shows that the City's single-family residential per capita use is within the lower range when compared to other providers surveyed.

Figure 6 Comparison of Total Per Capita Water Use (WTP production /Population)



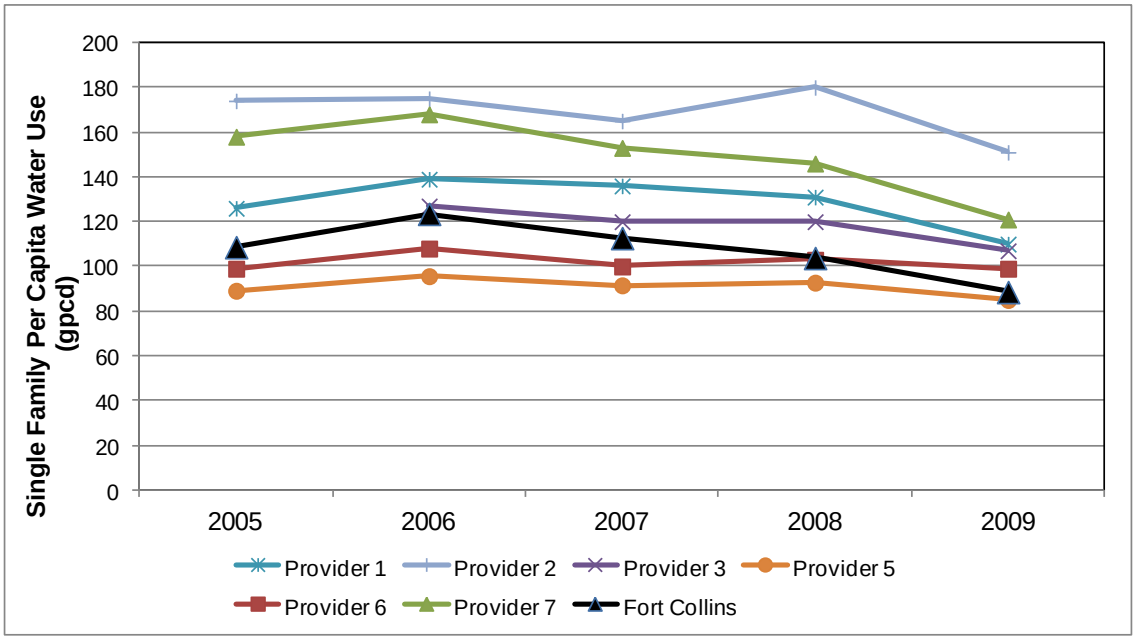
Note: The providers shown above include Fort Collins, Denver Water, Colorado Spring Utilities and Boulder. During the survey process, several providers requested that their per capita water use not be directly compared with other providers. Consequently, the names of the individual providers are not shown in order to prevent such a direct comparison.

Figure 7 Comparison of Total Per Capita Water Use (Metered End Use/Population)



Note: The providers shown above include Fort Collins, Aurora Water, Thornton and Greeley. During the survey process, several providers requested that their per capita water use not be directly compared with other providers. Consequently, the names of the individual providers are not shown in order to prevent such a direct comparison.

Figure 8 Comparison of Single-Family Water Use

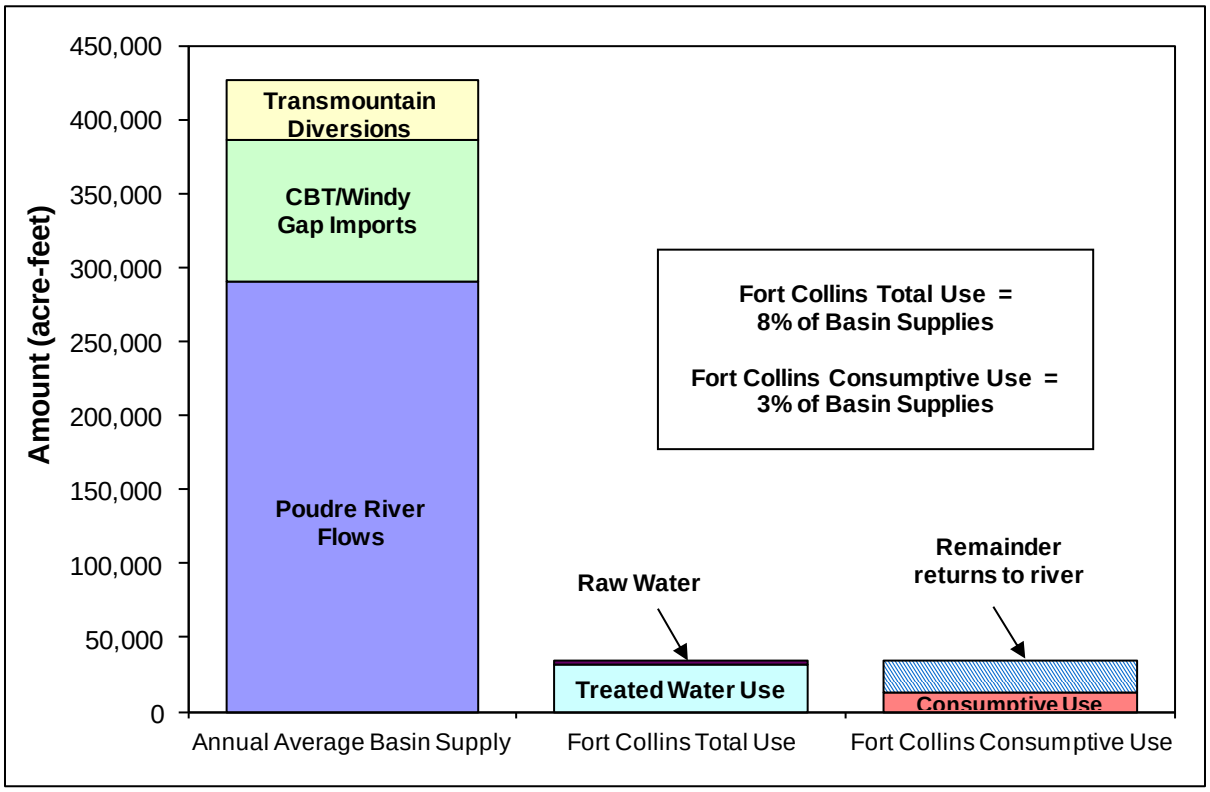


Note: The providers shown above include Fort Collins, Boulder, Thornton, Westminster, Greeley, Denver Water and Colorado Springs. During the survey process, several providers requested that their per capita water use not be directly compared with other providers. Consequently, the names of the individual providers are not shown in order to prevent such a direct comparison.

4.1.2 Fort Collins Treated Water Use Compared to Poudre River Basin Supplies

Figure 9 shows the City's water use compared to the Poudre River Basin supplies. This graph illustrates that the City uses a relatively small percentage of the water in the basin. Total basin supplies average around 425,000 acre-feet annually and include Poudre River native flows, CBT and Windy Gap Project imports from the West Slope, and other transmountain diversions (such as the Michigan Ditch). In comparison, the City's current water use is only around 26,000 acre-feet of treated water annually and around 3,000 acre-feet of raw water annually. The total City use is only about 8% of the total basin supplies. Around 65% of the water used by the City returns to the river through wastewater treatment effluent and some surface and ground water return flows. The City's amount of consumptive use (water used that does not return to the river) is only around 3% of the total basin supplies.

Figure 9 City Water Use vs. Poudre River Basin Supplies



Note: This figure was derived in the May 2004 Water Supply and Demand Management Report.

The majority of flows diverted from the Poudre River are by other agricultural water users. This is demonstrated in Figures 10 through 12 which illustrate representative flows in the Poudre River in January, June and August, respectively.[3] These figures visually portray that the City's

[3] These flows were developed using the monthly average stream flows and diversions for water year 2008 available through the Colorado Decision Support System database, along with estimates of wastewater discharges provided by the City.

diversions are significantly less than its neighboring agricultural users throughout the irrigation season. Figures 10 - 12 show that flows through the City limits are significantly reduced by upstream agricultural diverters during spring runoff (June) and summer (August). Winter season flows (January) are also significantly lower within the City, due to municipal diversions by the City and by Greeley, and storage diversions by the Larimer and Weld Canal.

Figure 10 Conceptual Flow Diagram of Poudre River in January

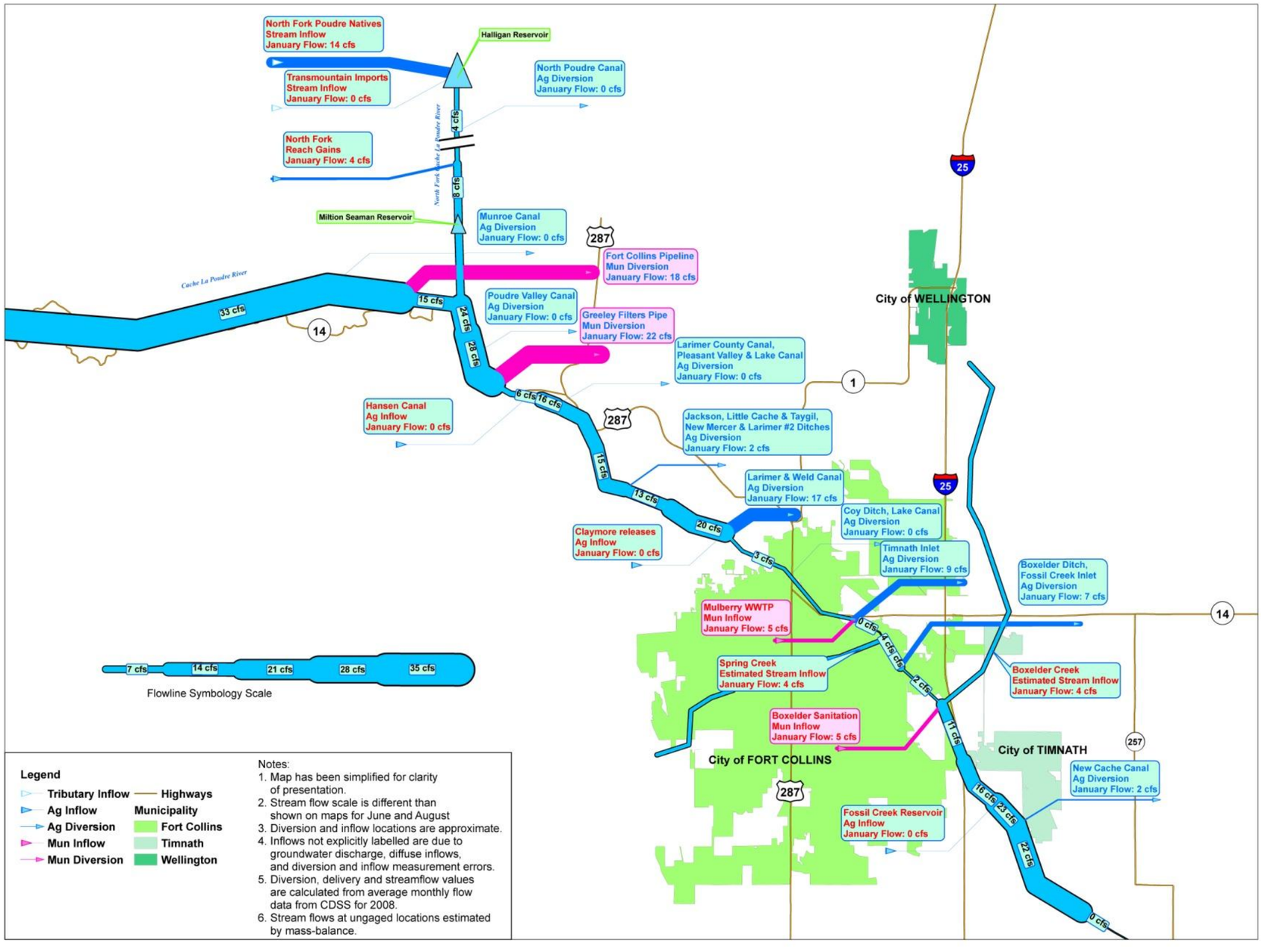


Figure 11 Conceptual Flow Diagram of Poudre River in June

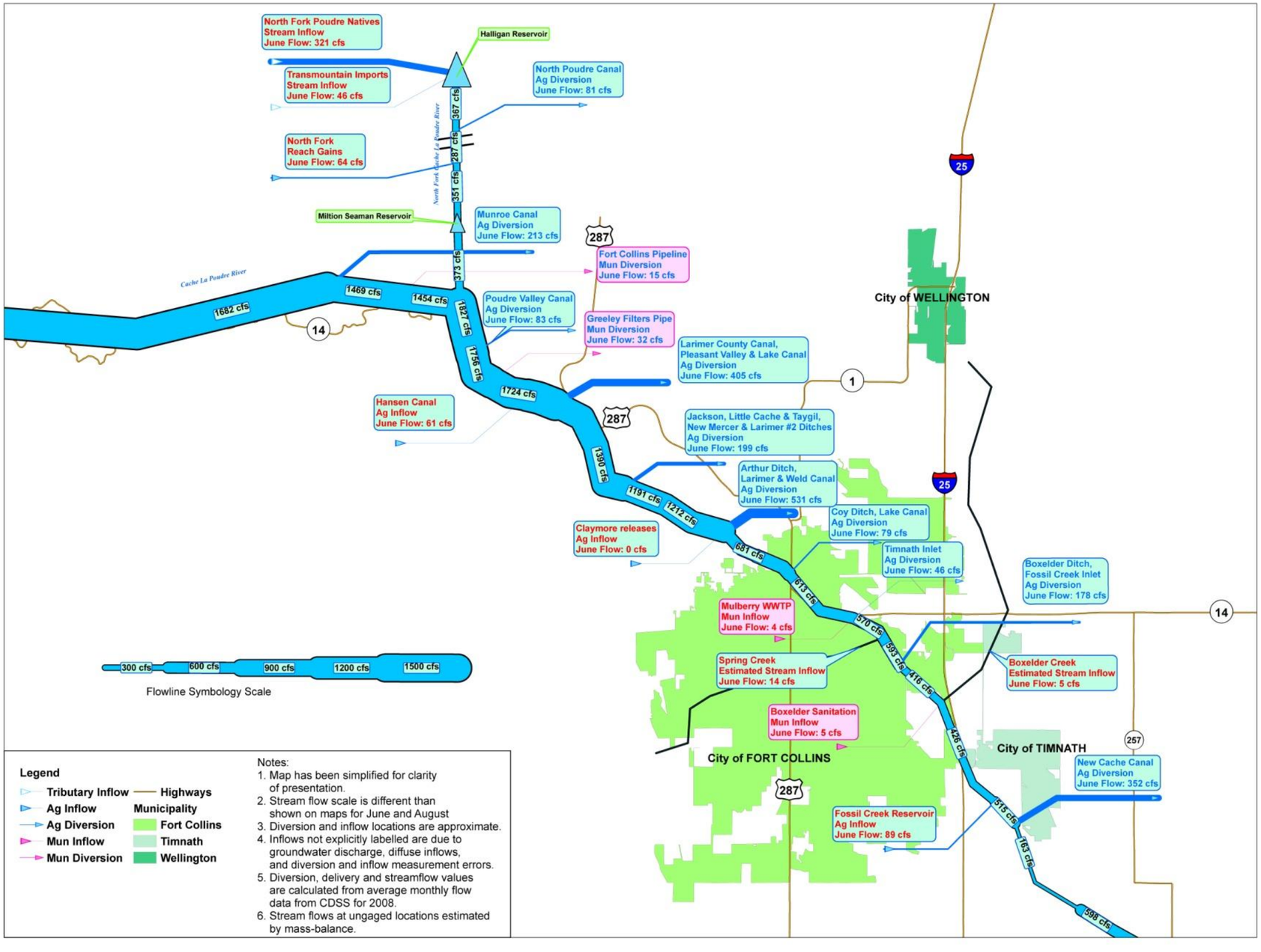
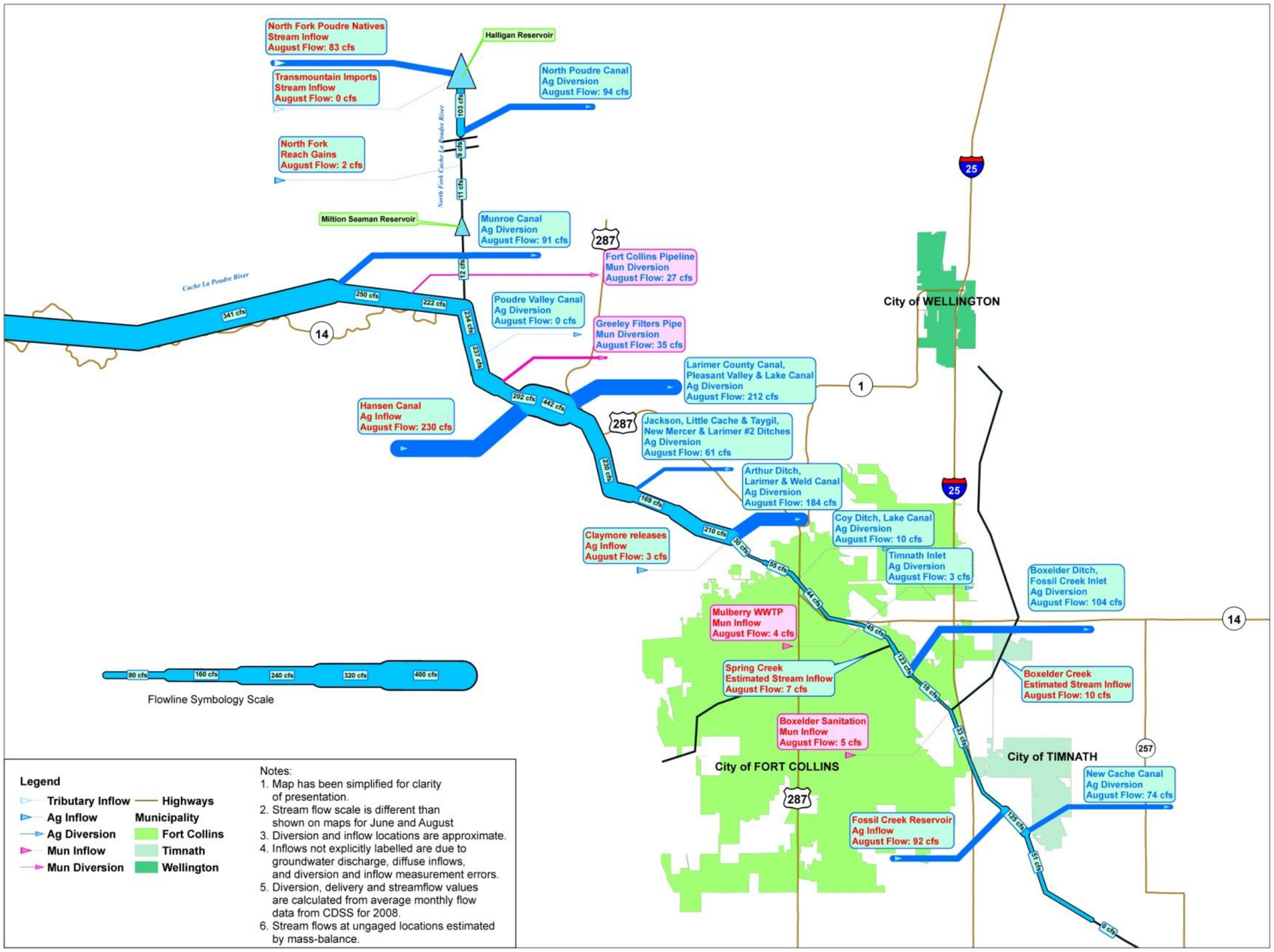


Figure 12 Conceptual Flow Diagram of Poudre River in August

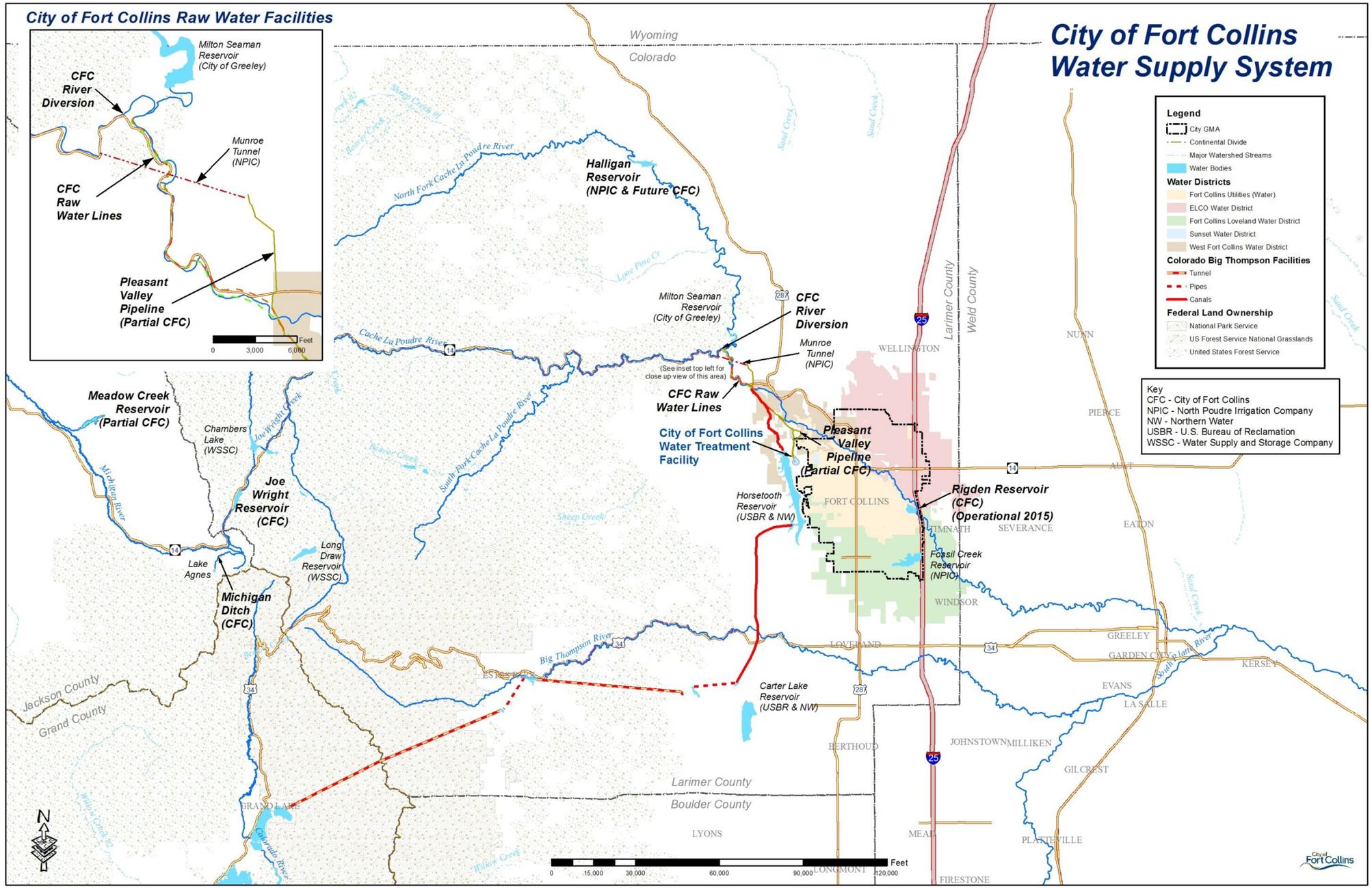


4.1.3 Water Supply

The City's water supply comes from the Poudre River Basin, the North Platte River Basin or the Colorado-Big Thompson (CBT) Project, which includes Horsetooth Reservoir. The City's supplies include direct flow rights, converted agricultural rights, CBT units, supplies from the Michigan Ditch and storage in Joe Wright Reservoir. Figure 13 shows the location of some of the City's key facilities related to delivering water from these sources. These facilities include two diversion locations and pipelines that deliver Poudre River water, Joe Wright Reservoir, Michigan Ditch and the water treatment facility. Also shown are Horsetooth Reservoir and Halligan Reservoir operated by Northern Water and NPIC, respectively.

The City used to divert its Poudre River flows to the water treatment plant through a pipeline located on the mainstem of the river, just above its confluence with the North Fork of the Poudre River. With completion of the Pleasant Valley Pipeline (PVP) in 2004, the City increased the amount of water it diverts off the Poudre River during the summer months (April through October) by 60 MGD. The PVP delivers additional direct flows from the Poudre River consisting of the City's irrigation rights that have been converted from agricultural use to municipal use. The PVP is critical in meeting the future needs of the City by allowing use of converted irrigation water and providing reliability to the City's raw water delivery system.

Figure 13 City of Fort Collins Water Supply System



Over the last 60 years, the City has obtained a wide variety of water rights for use by its customers. The Water Utility currently delivers an average of approximately 26,000 acre-feet per year to its treated water customers. Raw water (untreated) is used in addition to treated water to irrigate many areas in the City. Approximately 3,000 to 4,000 acre-feet is used to irrigate City parks, golf courses, a cemetery, greenbelt areas and some school grounds. In addition to these demands, the City has contractual raw water delivery obligations of approximately 3,500 acre-feet per year.

The City has a policy of acquiring and maintaining a water supply sufficient to meet or exceed its demands during a drought that would occur with an average frequency of once every 50 years. The City owns water rights that yield an average over 74,000 acre-feet per year if they were fully usable. However, because of various legal and capacity constraints, the present yield available for municipal use is much less. The City's water rights are estimated to be worth around $1 billion. The following sections describe the sources that make up the primary supplies available to the City.

Sources Available from the Poudre River

The following sources are generally available for diversion from the Poudre River. Although these sources are available to the City for treated water needs, the amount of usable water is dependent on a number of factors including water demands, dry-year yields, exchange potential, etc. The values listed in the following descriptions state a range of available flows from each source using the City's water supply modeling. However, they represent only the potential yields available and not the usable or firm yield of each source. Further discussion on firm yield is in Section 4.2.2

Senior Direct Flow Rights. The City has five senior direct flow rights on the Poudre River that allow the City to take 19.93 cfs (12.88 MGD) from April 15 through October 15 and 15.00 cfs (9.70 MGD) from October 16 through April 14. These water rights are diverted into the City's original pipeline. Because these rights are very senior, they are available to the City most of the time. In very severe dry periods, diversions may be limited to approximately 10,400 acre-feet per year. In average and wet years these water rights have the potential to yield about 12,600 acre-feet per year.

Junior Direct Flow Rights. These rights (1955 appropriation date) allow the City to take an additional 12.54 cfs (8.11 MGD) from April 15 through October 15 and 17.47 cfs (11.29 MGD) from October 16 through April 14 at the City's existing pipeline. These rights, along with the above senior rights, allow a total diversion of 32.47 cfs (20.99 MGD), which is the capacity of the original pipeline. These junior rights, however, are typically in priority only during peak runoff periods when most of the other water rights on the Poudre and South Platte Rivers have been satisfied. In dry years, the City may not be able to divert anything under these rights. In average to wet years, the City may be able to divert up to 12.54 cfs (8.11 MGD) for about one

month during peak runoff. The annual yield could range from zero in most years to as high as 5,400 acre-feet per in very wet years.

Pleasant Valley and Lake Canal (PVLC) Shares. The City owns about 75% of the shares in this mutual irrigation company. A change of use granted in Water Court Case No. 80CW193 in the early 1980s allows the City to take its pro rata share of water from the Poudre River for municipal purposes. The amount of water the City is entitled to divert to meet treated water demands depends on the number of shares the City designates for such use and which priorities owned by the irrigation company are in priority during the season. Under present ownership, the potential annual yields from this source range from 1,700 acre-feet to 5,500 acre-feet.

Southside Ditches (SSD). The City owns shares of stock in the Arthur, Larimer No. 2, New Mercer and Warren Lake irrigation companies, often referred to as the Southside Ditches. A change of use from agricultural to municipal was granted in Water Court Case No. 92CW129 making diversions possible from the Poudre River for treated water use. These diversions can be made under 13 separate priorities and the yields vary considerably from year to year. Much of the yield comes from a couple of large junior rights and therefore normally occurs during the month of June. Under present ownership, the potential annual yields from this source range from 1,200 acre-feet to 6,500 acre-feet. Most of the water from these water rights can be diverted into the City's portion of the Pleasant Valley Pipeline.

Michigan Ditch and Joe Wright Reservoir System. This system consists of a ditch that diverts water from the Michigan River drainage of the North Platte River Basin across the divide into the Poudre River Basin, Joe Wright Reservoir located high in the Poudre River Basin, and storage capacity in Meadow Creek Reservoir located in the Michigan River Basin. Joe Wright Reservoir, which includes about 6,500 acre-feet of active storage and is the only storage facility owned by the City, can store Michigan Ditch diversions and water from Joe Wright Creek. This mostly reusable water is part of the Reuse Plan that requires delivery of specified quantities of water during the year. To the extent this water can be stored in the reservoir; the time of use is more flexible than the direct flow sources listed above. However, there are usually periods during the peak runoff season in which the reservoir is full and Michigan Ditch water is available if it can be taken directly to meet demands. The City also has rights to 1,200 acre-feet of storage capacity in Meadow Creek Reservoir, which is used to release water to downstream senior rights on the Michigan River in order to increase the City's Michigan Ditch diversions. It should be noted that Joe Wright Reservoir is used primarily to regulate the annual Michigan Ditch flows to help meet the City's obligations under the Reuse Plan and has a limited amount of carryover capacity to provide drought protection for the City. The potential annual yield from this system ranges from about 1,400 acre-feet to 9,600 acre-feet.

Water Supply and Storage Company Shares. The City owns about 27 shares in this irrigation company. Since the City-owned shares are not presently decreed for municipal use, this water is usually rented back for agricultural use. A change of these rights for municipal use is pending. The potential annual yields from this source range from 1,000 acre-feet to 2,500 acre-feet.

During the last 60 years, the City has obtained shares in several local irrigation companies. These have been primarily turned over to the City by developers to satisfy the City's raw water requirements. Table 2 shows how many shares and the percentage ownership for each of the irrigation companies and CBT project water, in addition to the number of shares that would have to be changed from agricultural to municipal beneficial use through water court in order for the City to use the shares as municipal treated water.

Table 2. Shares Owned In Local Irrigation Companies (as of December 2011)

Company/ District	Shares Owned by City	Total Shares in Company	Percent Ownership by City	Shares Already Converted	Shares Being Converted
Arthur Irrigation Co.	607	1,207	50.3%	391.36	154.68
Larimer County Canal No. 2	100	146	68.5%	67.56	27.61
Northern Water (CBT)	18,855	310,000	6.1%	NA	NA
New Mercer Ditch Co.	74	141	52.6%	44.82	27.61
North Poudre Irrigation Co.	3,565	10,000	35.6%	0	0
Pleasant Valley & Lake Canal Co.	192	255	73.0%	186.18	NA
Warren Lake Reservoir Co.	167	225	73.2%	83.19	41.34
Water Supply & Storage Co.	27	600	4.4%	0	26.67

Note: The City owns shares in several other companies. Most of these shares are owned and/or used by other City departments and are not planned to be converted for municipal water use.

Sources Available from Horsetooth Reservoir

The following sources are available for use out of Horsetooth Reservoir, which is a part of the CBT Project.

CBT Water. The City presently owns about 18,855 units of CBT water. Deliveries depend on the annual "quota" set by Northern Water each year. With annual quotas ranging from 50% to 100%, the annual yields range from about 9,400 acre-feet to 18,800 acre-feet. For the most part, this water is the most flexible source that the City owns and can be used to fill gaps from other sources. Part of this water, however, needs to be used at designated times to meet exchange requirements of the Reuse Plan and to meet other contractual obligations. This water can be delivered to the City's water treatment facility just below Soldier Canyon Dam or be released from Horsetooth Reservoir to the Poudre River where it can be delivered or exchanged to various points of diversion on the river. Although the CBT project includes a large amount of storage, including Horsetooth Reservoir, the City has a limited ability to carry over water in CBT reservoirs for drought protection. Currently, the Northern Water allows a 20% carryover

allowance for CBT shareholders, which can only be CBT project water (as opposed to the excess Poudre River water). However, as the certainty of this carryover allowance is questionable, it has not been factored into future use.

Windy Gap Water and the Reuse Plan. The Windy Gap Project was developed by the Municipal Subdistrict of the Northern Water and Windy Gap water is delivered through the CBT system. Unlike CBT water, Windy Gap water is legally reusable to extinction. The Reuse Plan involves the City, PRPA, and the Water Supply and Storage Company (WSSC). The City annually receives 4,200 acre-feet of Windy Gap water from Platte River Power Authority (PRPA) as payment for 4,200 acre-feet of reusable effluent made available to PRPA by the City. The City uses and treats 6,000 – 8,000 acre-feet of reusable water from Water Supply and Storage Company (WSSC) and the City's Michigan Ditch/Joe Wright Reservoir to produce 4,200 acre-feet of reusable effluent. That effluent is used and consumed by Platte River Power Authority (PRPA) at their Rawhide Energy Station. In turn, PRPA repays the city with 4,200 acre-feet of Windy Gap water, which is mostly used at Anheuser-Busch (A-B). A-B requires a reusable supply because their effluent is reused via land application. In addition the City repays WSSC with 1,890 acre-feet of CBT for use of the transmountain WSSC water. The City's overall net benefit, as a result of the Reuse Plan, is about 2,300 acre-feet per year.

North Poudre Irrigation Company (NPIC) Shares. The City currently owns 3,564 shares of NPIC. Each share consists of native water supply (which is primarily decreed for agricultural use) and 4 units of CBT water. The total annual yield per share varies from about 3.0 acre-feet to 6.0 acre-feet. However, until the agricultural portions of the shares are changed for municipal purposes, the City can only use the CBT portion of the shares to meet treated water demands. Based on the CBT portion of each share (on which NPIC usually assesses a 20 percent shrink), the City's annual yield presently ranges from about 5,700 acre-feet to 11,400 acre-feet.

West Fort Collins Water District (WFCWD) Water. Through an agreement with the WFCWD, the City provides treated water to their customers and in return, gets reimbursed with an equivalent amount of CBT water. In recent years, the amount transferred to the City has been about 600 acre-feet each year. The Water Utility's service area population and water use estimates include the WFCWD.

The CBT water and part of the NPIC water provide the most flexible water supplies since they are available in Horsetooth Reservoir where they can be stored until needed to meet demands. Because of this, in most years it is desirable to use other sources to meet City demands prior to using the CBT and NPIC supplies. If the water from these sources is in excess of the current year City demands, they can usually be leased out for agricultural use in the area.

4.1.4 Raw Water Requirements

When new development occurs within the Water Utility service area, developers are assessed a raw water requirement (RWR). This practice began in the 1960s when two acre-feet per acre of land developed was required. In the early 1970s this was changed to three acre-feet per acre.

Because water use varied considerably depending on the type of use, the City did a study was in 1983-84 to develop another method of assessing the RWRs. The resulting system, still in use, attempts to more closely assess the requirements based on actual use.

For residential development, the City adopted a formula that considers the density of residential development. Water use is estimated by considering both indoor and outdoor use. The RWR is calculated by multiplying the water use estimate by a "water supply factor" that is used to reflect the variability in annual supply and demand and other unaccounted-for water use. The equation presently used to determine the residential RWR is:

RWR = 1.92 x ((.18 x Number of Dwelling Units) + (1.2 x Net Acres))

The City originally set the water supply factor at 1.6; however, following adoption of the 1988 Water Supply Policy, the water supply factor was increased by 20% to 1.92. Non-residential requirements are based on tap size. Water use was analyzed for all non-residential customers for a given tap size and the requirements were based on those results. Since there is much variability within each tap size, a raw water surcharge is assessed for any annual use exceeding an annual allotment. Requirements vary from 0.90 acre-feet for a 3/4 inch meter to 14.40 acre-feet for a 3 inch meter. For larger meters, the RWR is based on a customer-specific estimate of water use.

Developers and builders may satisfy the RWR by turning over water rights acceptable to the City or paying cash in lieu of the water rights. The City uses in-lieu payments to purchase additional water rights or implement other means of increasing the City's water supply, such as developing storage capacity. The in-lieu cash fee has been periodically adjusted to reflect the price of water rights on the market.

4.1.5 Colorado Water Law Considerations

Water in Colorado is a limited and highly variable resource. Early settlers faced prodigious challenges in building the dams and ditches that allowed them to divert water from a stream to irrigate lands and grow crops. These challenges were compounded by the threat that another party, arriving later, could divert water from the same stream at an upstream location and thereby deprive the previous settlers of their hard-won supplies during times of inadequate stream flow. To address this and other problems inherent in a semi-arid region, Colorado adopted a series of water laws that protect the security of water supplies while encouraging maximum utilization of water. This section briefly explains some of the basics of Colorado water law.

The Colorado Doctrine, defined in Article 16 of the Colorado constitution (1876), is a set of laws regarding water use and land ownership that have been used since the 1860s. The doctrine defines four principals of Colorado water law. First, all surface and ground water in Colorado is a public resource for beneficial use by individuals, public agencies or corporations. Second, a water right is a right to use a portion of the public's water resources. Third, water rights owners may build facilities on the lands of others to move water to its place of use. And fourth, water rights owners may use streams and aquifers for the transportation and storage of water.

Another important component of Colorado water law is the "prior appropriation" system. The prior appropriation system dictates that in times of short supply, water users with earlier (or "senior") water rights can fully meet their needs before later (or "junior") water rights can divert any water, often described as "first in time, first in right." Water rights can only be appropriated under a plan to divert the water to a specific beneficial use without waste. Water rights owners must continue to use their water beneficially or risk losing their right, coining the term "use it or lose it". A water right can be changed to other uses without losing its priority date by (1) obtaining a court decree approving the change, (2) measuring the water right's historical beneficial consumptive use in location, time and quantity, and (3) imposing terms and conditions to prevent enlargement of the water right or injury to other water rights. These requirements are important to the City when transferring its agricultural water rights to municipal use.

Occasionally, the water rights acquired by the City through its raw water requirements or other means must be changed from agricultural to municipal use in order to allow the City to treat those waters for its use. This process requires obtaining a decree from Colorado Water Court that states its legality and typically involves detailed analysis of the historic water use. For example, in 1996 the City obtained a decree to use its Southside Ditches (SSD), which includes the Arthur Ditch, Larimer No. 2 Canal and New Mercer Canal water rights owned by the City. The court required the City to show that historic return flow patterns and diversion limitations were met. This process was designed to show that the City would not take more water than had historically been taken when the water rights were used agriculturally, thereby preventing injury to other water rights. Currently, the City is in the process of converting additional SSD shares and its shares in the Water Supply and Storage Company.

4.2 Drought and Water Supply Reliability

Fort Collins is located in a semi-arid region of the west, which is more prone to droughts than other parts of the United States. The highly variable nature of precipitation in this area makes long-term planning essential if the Water Utility is to provide an adequate and reliable water supply to its customers. Dictionaries define drought as an "absence of moisture" or "prolonged shortage of water". Drought can be considered a period with below average precipitation, when the demand for water exceeds the available supply, or when there are projected shortages of water. Since a large portion of the water supplies available to the City comes from the Poudre River, the City defines a drought as one or more years of below average annual runoff on the river.

The Poudre River is certainly subject to droughts as shown in Figure 14, which illustrates the variability of annual flows on the river. The individual bars on the graph show the virgin (or natural) annual flows from 1884 through 2012. The straight line on the graph denotes the long-term average for these flows. According to the City's drought definition, droughts can be identified on the graph as one or more years during which the flow is continuously below the average line. Storage and annual water yields in the CBT system are also highly variable. This

is illustrated in Figure 15 which shows monthly active storage levels in three key CBT reservoirs. Storage significantly declined in these reservoirs during the drought in the 2000s.

Figure 14 Poudre River Annual Virgin Flows at the Mouth of the Canyon

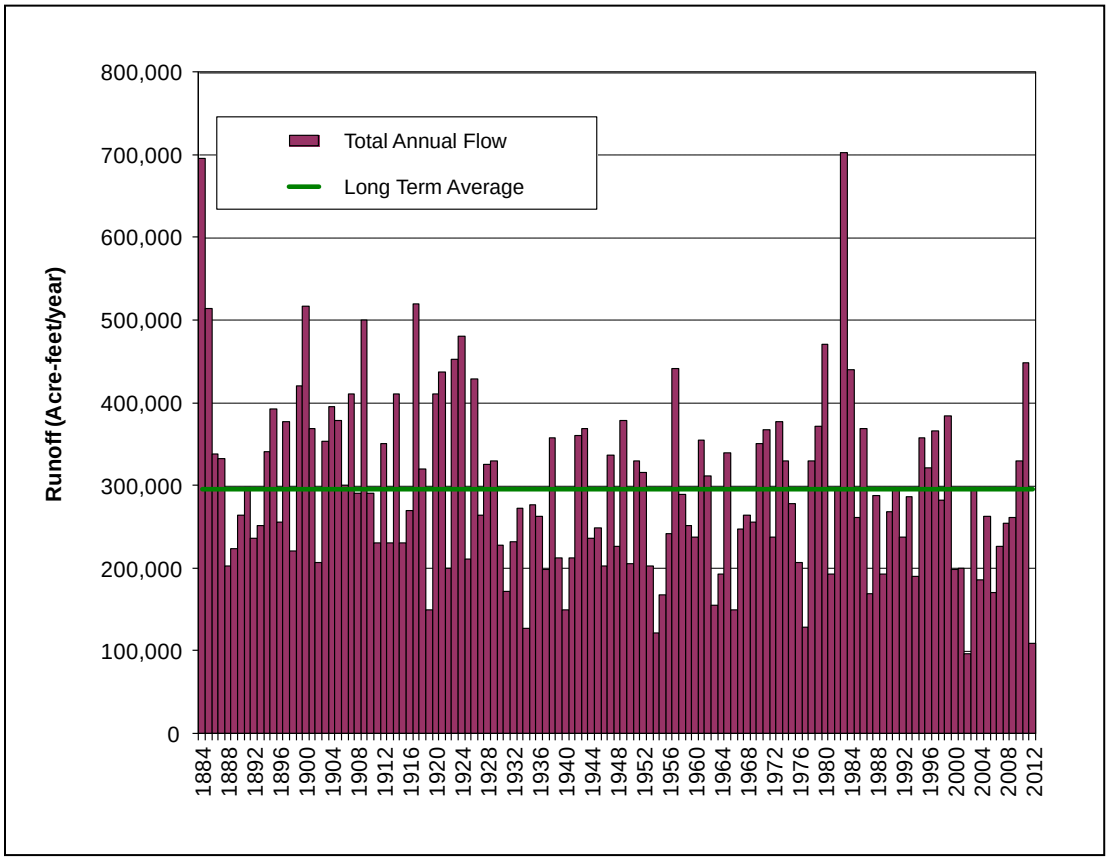
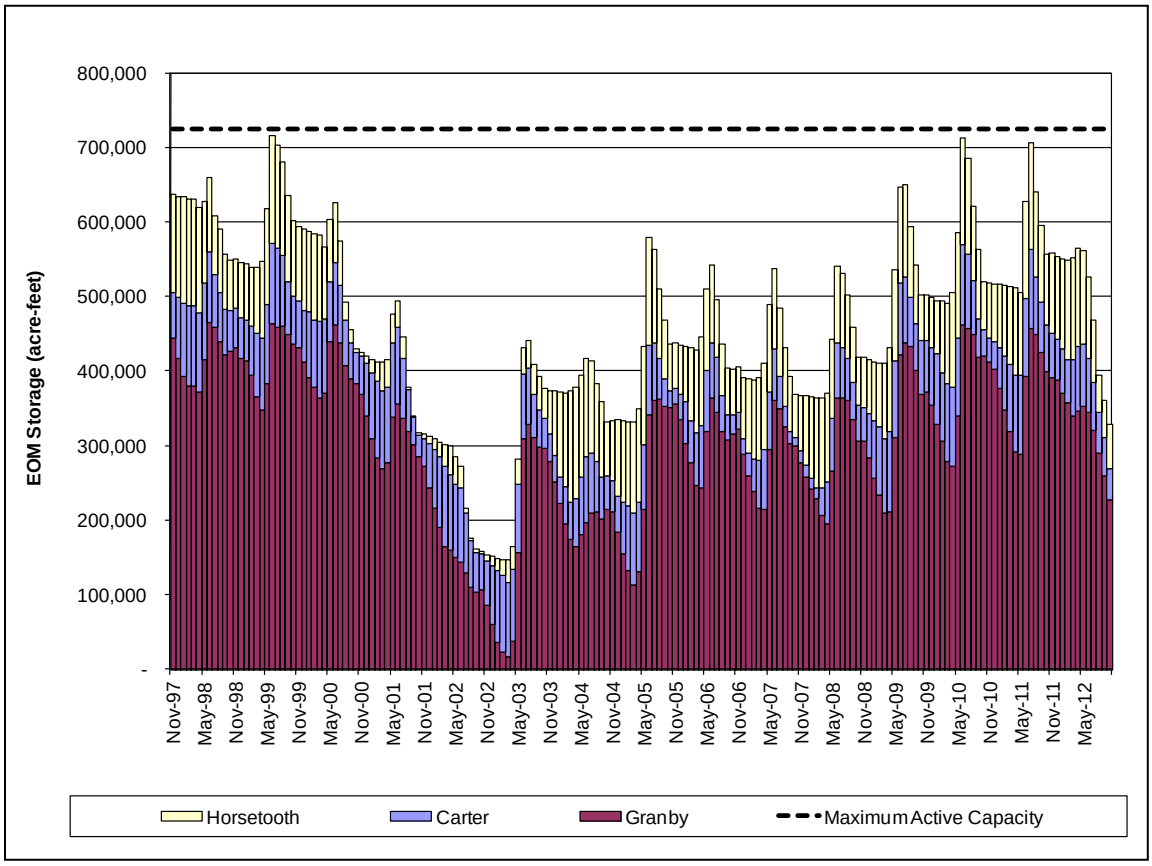


Figure 15 CBT Project End of Month Active Storage Levels (Granby, Carter, Horsetooth)



4.2.1 Recent Drought Conditions

Based on the City's definition of drought and the fact that runoff on the Poudre River has been below average for most of the last thirteen years, the City has generally been experiencing drought conditions since 2000, as shown in Figure 14. In 2002, the drought became very prominent, as water supplies in the Poudre River Basin were severely reduced due to the lowest flow on the river in recorded history. Water year 2003 was very nearly an average runoff year and is questionable as a drought year when defined by runoff. However, the severe conditions in 2002 greatly depleted water sources in the Poudre River Basin for 2003. Based on a potential supply shortage in 2003, the City implemented watering restrictions to reduce demands and carry over as much water as possible into 2003. The improved runoff conditions in 2003, along with the diligent conservation efforts of Water Utility customers and the watering restrictions that remained through most of 2003, helped the City to recover its water supplies for 2004. Lessons learned during this period have resulted in consistent lower water use.

The City recently experienced the two-year sequence of 2011, which was nearly the wettest year on record, followed by 2012, which was nearly the driest year on record. The 2012 drought

significantly depleted the storage reserves available to the City (mostly through the CBT system) and the dry conditions contributed to the High Park wildlife fire, which is the second largest wildfire on record in Colorado. A total of 87,250 acres were burned, causing significant sediment loading to the Poudre River. As a result, the City's ability to use its Poudre River supplies was significantly compromised in 2013 due to problems associated with treating sediment-impaired Poudre River water and increased the City's reliance on CBT supplies. This limitation, combined with the dry winter in 2013, required the City to mandate Response Level 1 water restrictions on April 1, 2013. The City was fortunate to get additional CBT supplies, mostly due to snow storms in late April and early May. These additional CBT supplies allowed the City to meet remaining demands and maximize CBT carryover storage for use in 2014. Since the City lacked additional capacity to store water savings, the restrictions were lifted on June 1, 2013.

4.2.2 Firm Yield Concept

As discussed above, the yield from the City's supply sources varies considerably from year to year. A meaningful assessment of the reliability of the City's water supply system cannot be done by comparing the City's annual demand to the City's average annual supplies. Instead, it is necessary to compare the City's supplies and demands during a series of drought years. This concept, often referred to as "firm yield", is used by many entities to measure the ability of their water supply system to meet water demands through a series of drought years.

Firm yield is commonly determined by calculating the maximum constant annual demand that can be met with the available supply during a specified multi-year hydrologic period. For this determination, it is assumed that both the demand contributors (population, irrigated acres, etc.) and the supply owned (storage capacity, water rights, shares of stock, etc.) are held constant during each trial model run of the hydrologic study period. This procedure results in a firm yield or safe average annual demand (SAAD) that can be met with the current supply system over the specified drought sequence. Once this is determined, one can compare the present average annual demand with the firm yield to determine the margin of safety or reserve supply.

Table 3 shows that the City's current average annual yield is approximately 74,000 acre-feet, which represents the amount available at the original headgates of the various sources of water. This average annual yield has increased over the years as the City has acquired additional supplies. It is important to note that the actual treatable average annual yield is 55,000 acre-feet per year. The reduced amount of annual treatable water right yield is attributable to legal constraints such as agricultural rights that have not been converted for municipal use, ditch losses (typically about 20%), water right volumetric limitations and return flow obligations.

The City's modeling has shown that the firm yield of its system assuming a 1-in-50 year drought is approximately 31,000 acre-feet per year which is significantly less than the average annual yield of 74,000 acre-feet. Both the raw water yield and treatable yield are reduced in dry years, requiring more storage water to meet demands.

Table 3. Historical Average Annual Yield of Raw Water

Source	Conversion Factor (Acre-feet per Share)	Average Annual Yield (Acre-feet per Year)					
		1960	1970	1980	1990	2000	2010
Poudre River Direct Flow		11,300	11,300	11,300	11,300	11,300	11,300
Joe Wright-Michigan Ditch		0	0	4,800	5,500	5,500	5,500
Reuse Plan (PRPA)		0	0	0	2,300	2,300	2,300
Northern Water (CBT)	0.76	4,600	7,000	8,000	13,600	14,300	14,300
N. Poudre Irrigation Co.	5.57	0	2,800	4,700	14,600	19,800	19,800
Arthur Irrigation Co.	3.44	0	400	400	1,300	1,500	2,100
Larimer County Canal No. 2	42.69	200	300	1,600	2,700	3,500	4,300
New Mercer Ditch Co.	30.23	300	300	500	1,300	1,800	2,200
Pleasant Valley & Lake	39.74	200	1,800	4,500	6,300	7,000	7,400
Warren Lake Reservoir Co.	10.00	0	100	400	800	1,000	1,600
Water Supply & Storage Co.	84.00	0	0	1,400	1,900	2,200	2,200
Miscellaneous		0	0	200	700	1,200	1,000
Total		**16,600**	**24,000**	**37,800**	**62,300**	**71,400**	**74,000**

Note: Yields are the approximate average annual yields of the water rights and do not reflect weather variations

The issue that often comes up in discussions about firm yield is whether the representative hydrologic study period contains the type of drought for which protection is desired. Many entities simply take a recent historic period and assume that if they can make it through any droughts contained in that period, their supply is adequate. Without knowing something about the severity of the drought in a historical period, the use of such a period may not be adequate. A Fort Collins "Drought Study", completed in 1985, was done primarily to study the effects of prolonged droughts and to define them in terms of the probability of their occurrence. In the 1985 Drought Study, synthetic hydrologic traces were produced based on statistical parameters of the historic data available. This allowed analysis of numerous artificial drought periods and a determination of representative droughts with calculated return frequencies. Once this was determined, a computer model was used to determine the demand that could be met for each drought type.

4.3 Projected Municipal Supply and Demand

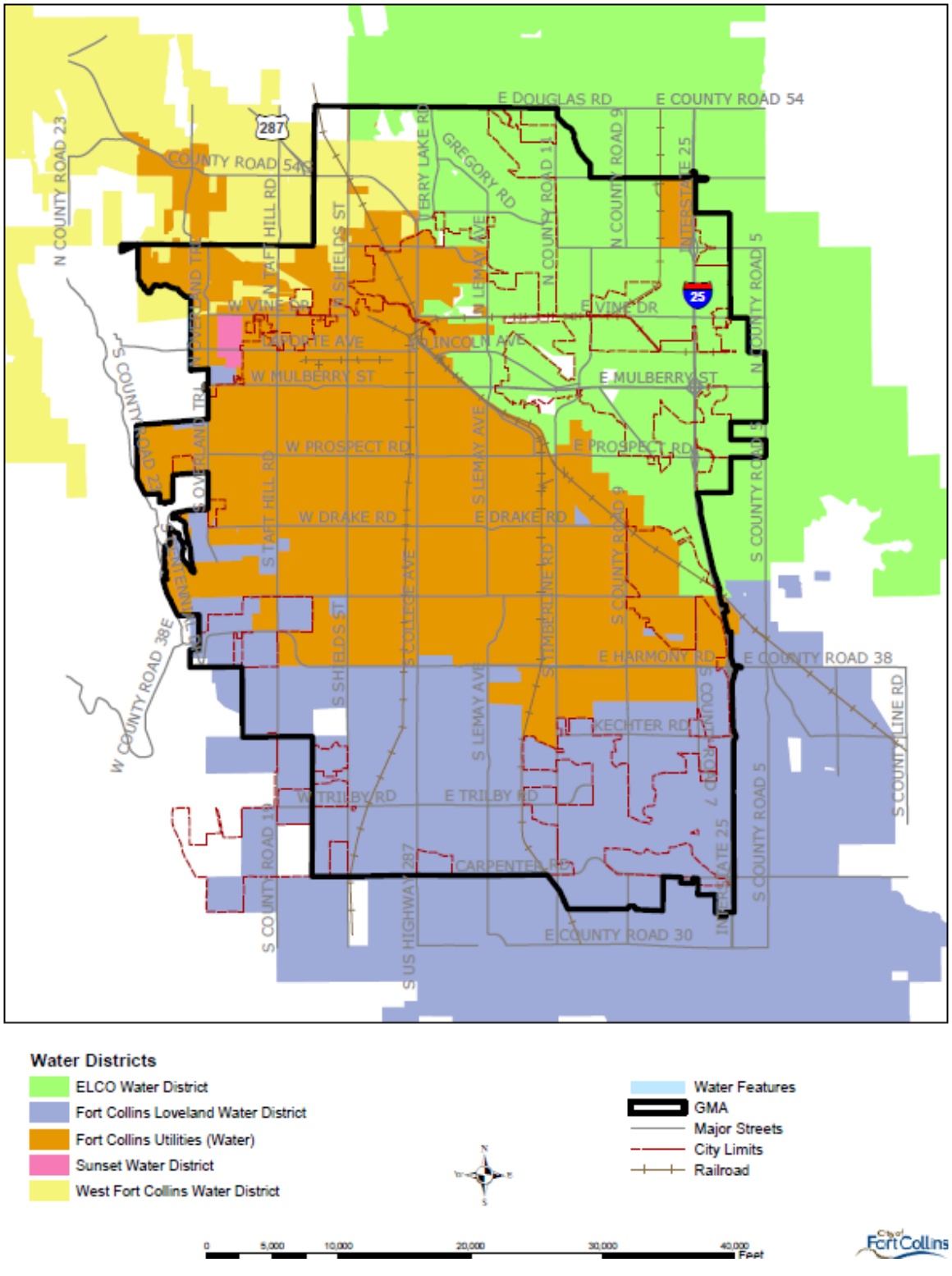
4.3.1 Water Demand Projections

Acquiring water supplies takes many years. In order to ensure a reliable water supply for customers in the future, the City must plan for future growth and water needs. The City's future municipal water demand is largely dependent on population growth and the rate of commercial and industrial development. This section addresses the process used to develop population projections and how these projections are used to develop future water demand projections.

Population Projections

The rate and pattern of population growth is often influenced by the future economy of the area, land use policies, development incentives and other factors. Estimating the future population to be served by the City of Fort Collins Water Utility is challenging since its service area boundary does not coincide with the City limits. This is further complicated by the fact that the boundaries vary for other Fort Collins Utility services (electric, wastewater, stormwater). To make this distinction, this report usually refers to the "Water Utility" when referring to the water service area served by Fort Collins Utilities. Fort Collins-Loveland Water District (FCLWD) and East Larimer County Water District (ELCO) provide water to some areas in the city and will most likely serve additional city residents in the future. The Water Utility also serves some areas outside the Fort Collins city limits, primarily to the northwest, including the water provided to the West Fort Collins Water District (WFCWD). All of these factors were considered in estimating the population for the Water Utility's service area. Figure 16 shows the different service areas with respect to the Fort Collins Urban Growth Area (UGA).

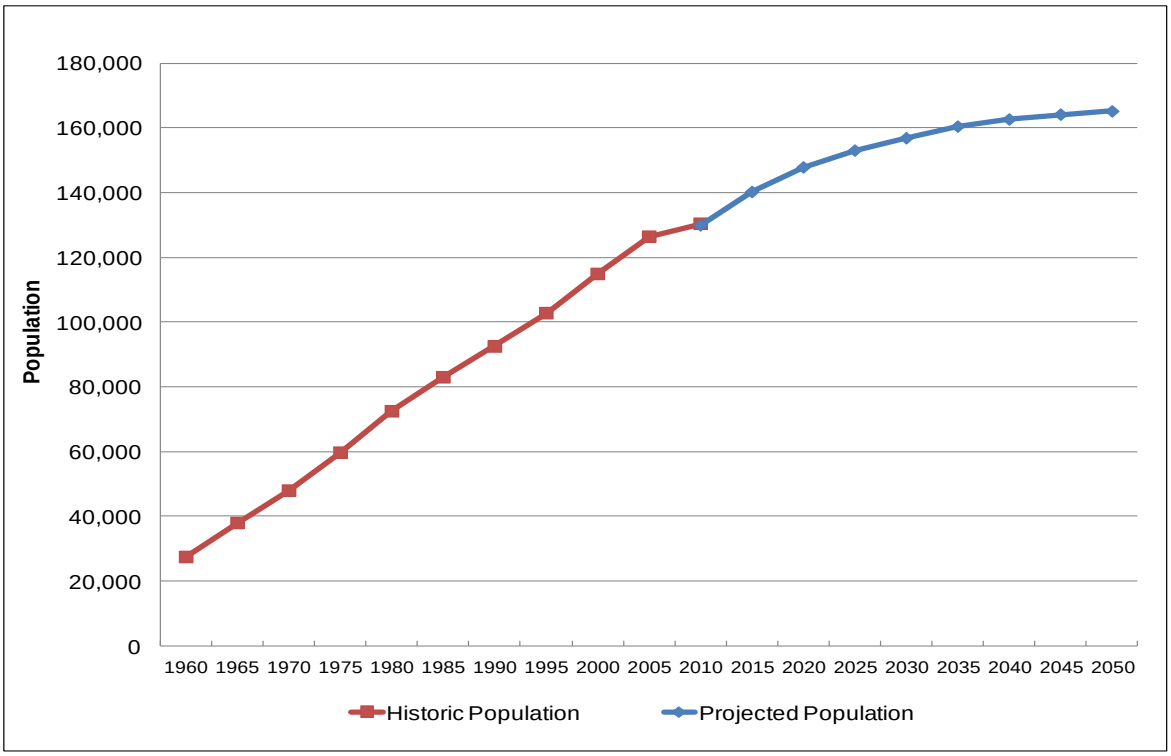
Figure 16 City of Fort Collins Treated Water Service Areas



The projected population estimates for the Water Utility are based on the Traffic Analysis Zone (TAZ) information developed for the City of Fort Collins and Larimer County. The TAZ information is based on selected zones in and around the City that correlate with the City and County zoning designations, which dictate the type of development and their densities. The population within the Water Utility's service area is obtained by cross-referencing the service area with the TAZs. Future population projections are based on projected in-fill for each of the TAZs and assume that the rate of growth will be similar to past patterns. Projections have been made through the year 2050 to provide a long-term look at the effects of growth. Although the projections will not match the actual growth precisely, it is believed that these projections will provide a reasonable basis for the planning needed to project future water supplies and demands.

The City's Planning Department anticipates that by 2035 there will be an increase in population density (more multi-family development); however, this is not anticipated to be significantly different from the current density. Although the Water Utility's service area is limited by the surrounding water districts, the City currently has water sale and exchange agreements to supply some water to these water districts. Figure 17 shows the projected population for the anticipated Water Utility service area, which includes the water sales and exchange agreements with the other water districts. The anticipated population to be served by the Water Utility in 2050 is around 165,000 people.

Figure 17 Water Utility Historic and Projected Service Area Population



Treated Water Demands

In addition to population related growth, the Water Utility also has contractual obligations to provide water for current and future uses by large industrial water users. Since large contractual use can significantly skew the per capita demand rates calculated for the Water Utility's water use, it is not used in the gpcd method of calculating future water needs. Instead, Large Contractual Use (LCU) is calculated on an individual basis and added to the overall current and future water demands. LCU is currently about 4,000 acre-feet per year of reusable water, which includes some raw water obligations. The Water Utility is currently obligated to provide up to 5,510 acre-feet per year of reusable water that the LCU have not yet grown into using. The future (2050) LCU is estimated to be about 8,500 acre-feet per year and includes a mix of single use and reusable water sources.

Besides population and LCU, the other critical factor in projecting future treated water demands is the planning demand level. This is the amount of demand the water supply system should be developed to meet and is measured in gpcd. Future water demands are determined by multiplying the projected population by the planning level demand (gpcd) and adding projected large contractual use. The water demands are ultimately used to determine the additional water supplies to acquire and additional necessary facilities.

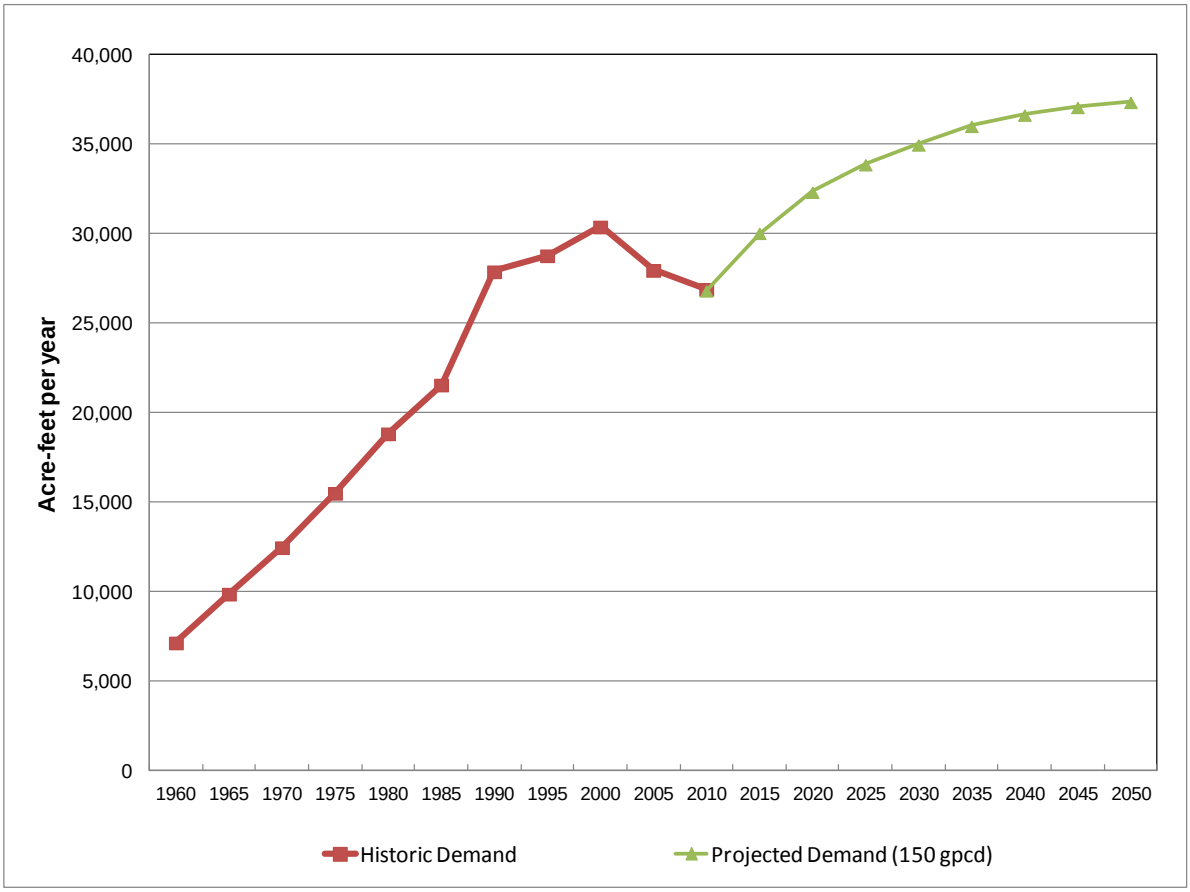
Section 3.1.1 discusses the City's historical per capita water use and relatively recent reductions following the 2002 drought. As previous discussed, this is largely attributed to widespread customer response to the drought of 2002, which includes installation of water-efficient fixtures and appliances, reductions in overwatering outdoors, implementing tiered and seasonal rate structures and other changes in water use habits. Figure 18 compares the historical per capita water demands and planning level demands used in the City's past policies. The 2003 Water Supply and Demand Management Policy used a water demand planning level of 185 gpcd which was lower than past levels. Around 2006, a planning level of 162 gpcd was identified for the Halligan Reservoir enlargement permitting process. Per capita water use since then has decreased with an average of 153 gpcd from 2006 to 2010. In 2009, a targeted per capita water use of 140 gpcd by 2020 was established for water conservation efforts. While this target value is reasonable for conservation planning purposes, it is not guaranteed that this target will be achieved. It is important to note that many municipalities adopt higher planning levels for water demand and supply purposes to account for inherent uncertainties and to provide a higher level of water supply reliability.

A planning level of 150 gpcd was selected through the CWG, Water Board and City Council review processes. The 150 gpcd planning level coupled with the other supply planning criteria should provide sufficient water supply reliability in the future while also adequately representing future water demand levels. Details regarding this decision-making process are provided in Section 5.3.1.

Figure 18 Historical Per Capita Water Use and Planning Level Comparisons

Figure 19 shows the projected demand through 2050 for the anticipated service area. This assumes an 8% treatment and transmission loss and the planning level per capita water use of 150 gpcd. Water demands in 2050 are projected to be about 37,400 acre-feet.

Figure 19 Historical and Projected Water Demands



Raw Water Demand Projections

The City has various water demands that are met with available raw (or untreated) water supplies. These demands include raw water for irrigation of parks, golf courses, a cemetery, school grounds and various other greenbelt areas. The current raw water demands range from about 3,000 to 4,000 acre-feet per year and are in addition to the supplies needed to meet treated water demands. There are also several raw water obligations totaling approximately 4,000 acre-feet per year that need to be met because of various exchanges and agreements. Although it is anticipated that the demand for raw water will increase in the future, these demands will probably be met with water rights provided to the City (in addition to the projected water rights acquisitions through the raw water requirements that will meet treated water demands).

4.3.2 Water Supply Projections

The amount of water available for use is primarily a function of two things. The first is the potential yield of the water rights owned by the City. The second is the facilities that divert, convey and store these water rights.

Water Rights Portfolio and Future Acquisitions

The City currently owns a plentiful portfolio of water rights, thanks to the foresight and action of past Water Boards, City Councils, Utilities staff and citizens of Fort Collins. The system of obtaining additional water rights through development requirements worked well in the past and should continue to help meet the water needs of the City. Developers have the option to meet the raw water requirements by turning in water rights acceptable to the City or by paying cash in-lieu-of water stock. The City uses the cash to purchase additional water rights when desirable or to develop projects that will increase the yield of the water rights owned by the City.

The amount of water rights actually turned over to the City in any given year will vary depending on such factors as the local economy and rate of growth, the availability of water rights on the market and the cash in-lieu-of price set by the City. Although the City anticipates getting additional water rights over the next few decades as it continues growing over previously irrigated lands, the City will get little additional firm yield from those rights without additional storage capacity to manage them, as converted irrigation rights generally have a negative net yield during the non-irrigation months due to the requirement that the City meet return flow obligations that resulted from the historical use of the irrigation rights and which typically occurred in all months of the year.

Water Supply System Constraints

The full use of the City's water rights in a given year can be reduced by several constraints. Generally, these can be divided into physical constraints and legal constraints. Physical constraints are primarily related to the lack of storage capacity to manage and regulate the water rights owned by the City. The Water Utility needs additional water storage capacity to better utilize its water rights and increase the yield and reliability of its water supply system. Short-term storage is needed for operational flexibility and to meet return flow obligations inherent with converted irrigation shares. Long-term carryover storage is needed to capture increased water yields occurring in wetter years for use during drier years. Both types of storage are needed to increase the reliability and redundancy desired to meet the growing water demands of the Water Utility's customers. This is discussed in further detail in Section 4.3.3.

Legal constraints on the full use of the City's water rights are related primarily to Colorado water laws and the associated administration of water rights. Agricultural water rights must be changed to municipal use by applying to the Division 1 Water Court. Depending on the complexity of the change and who the objectors are, a change of water right can be quite costly and take several years to accomplish. In order to protect other water users on the river and

maintain historical river conditions, strict accounting procedures are required. Since historical irrigation results in flows that return to the stream system throughout the year, releases from storage during the winter are often required. At any given time, many of the water rights owned by the City may not be available for municipal use depending on the status of a change case.

4.3.3 Need for Additional Storage

Operational Storage

Operational storage is necessary to meet the return flow requirements of the City's existing water rights the City has changed to date. In the process of changing irrigation rights obtained by the City to municipal use, it is necessary to meet certain return flow obligations. The historical use of irrigation water includes directly applying the water to agricultural fields, part of which is consumed by the crops through evapotranspiration, part of which returns to the river quickly via direct surface flows and part of which returns to the river slowly via groundwater conveyance. When irrigation rights are changed to municipal use, only the water consumptively used by the crops is allowed to be fully used to extinction by a municipality. The amount of irrigation water that historically flowed back to the river must continue to flow back to river at or upstream of the historical location or return flow, at the same rate and within the same period to prevent injury to other water users on the river. Since a portion of the flow returns via groundwater to the river in the winter months when the changed irrigation rights cannot be diverted, there must be a method of meeting these winter return flow obligations. The use of a storage reservoir is necessary to meet these obligations by allowing the winter return flows to be released back to the river at the appropriate time.

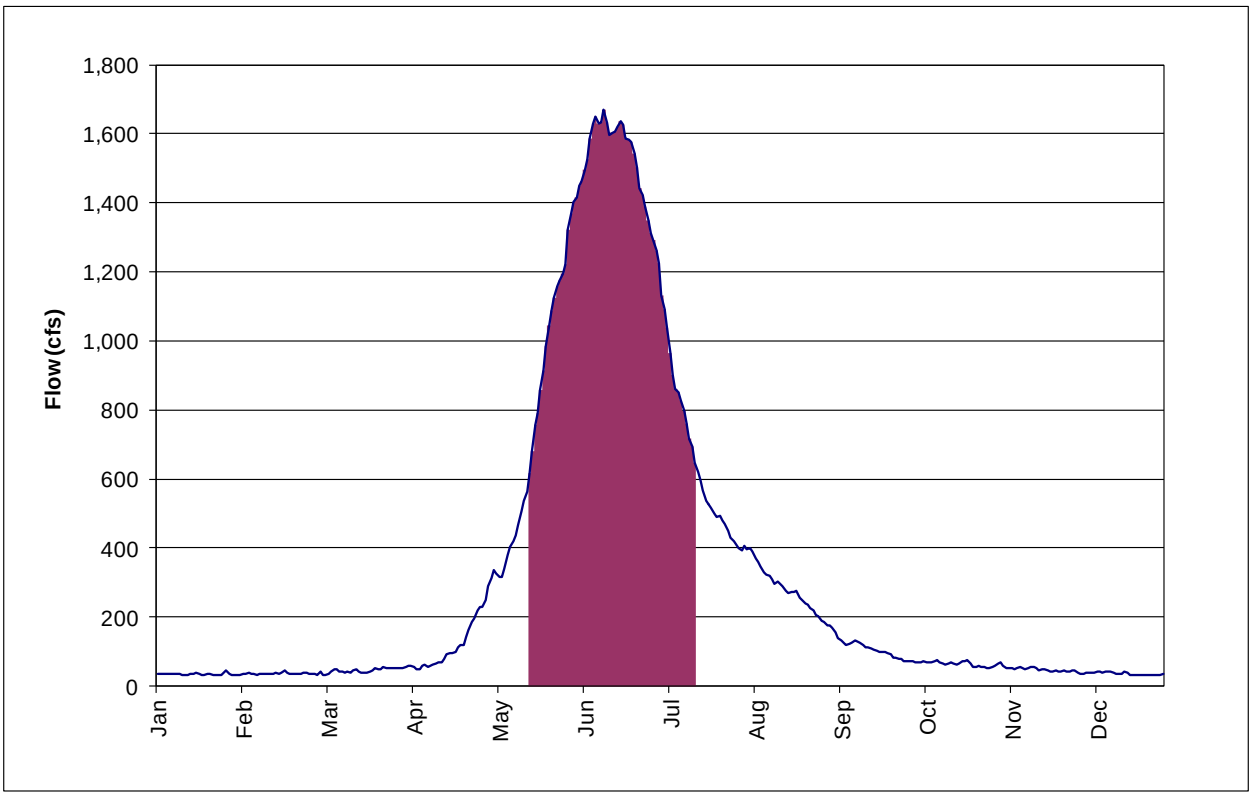
Ditch water rights generally do not come with storage, however, when the City purchased these water rights they were assuming they would have storage in the future to make the rights usable. The firm yield of a municipal's supply depends upon storage to meet return flow requirements. Past modeling efforts have indicated that the City is in need of up to 2,000 acre-feet of operational storage capacity. This will become increasingly true as water demands increase and as the City begins to use more of its changed irrigation company shares for municipal use.

Long-Term Carryover Storage

The City's water supply portfolio contains enough sources to meet demands in most years; however, the yields of many of these sources are greatly diminished in dry years, and the yields are typically greater in wet years when the City's demands can already bet fully met with other supplies. In addition, the yield from many of the City's water rights comes during the peak runoff period, usually in May and June. Previous modeling efforts have shown that the effect of increasing the ownership of water rights is relatively small compared to the effect of increasing storage capacity. Figure 20 shows the pattern of the runoff from the Poudre River where two thirds of the runoff occurs within two months in the spring. Because of the difference in timing between supply availability from the river and demands by City customers, some storage capacity is needed to shift water from high-flow months to low-flow months and from wet years

to dry years. By doing this, the City's existing supplies can be more fully utilized and a higher level of demand can be met.

Figure 20 Poudre River at the Mouth of Canyon Gage Daily Average Flow for 1950-2008



This concept is further illustrated in Figures 21 and 22, which show what the availability of the City's current portfolio of Poudre River direct flow rights would yield today if there was a repeat runoff like the wet year of 1986 or the dry year of and 2002, respectively, relative to the City's 2008 actual water demands and storage water necessary to meet such demands. In the 1986 scenario, the flows in the Poudre were 130% of average and the water rights available to the City were in excess of the City's demands from early April to early July. Figure 22 shows that the yield of the City's exact same Poudre River direct flow water rights was significantly less during the 2002 scenario, requiring significantly more storage reserves to meet demands. In addition, there were still some direct flow rights available in the 2002 scenario that could potentially have been useful with storage.

Figure 21 1986 Poudre River Flows, Storage and the City's 2008 Water Demands

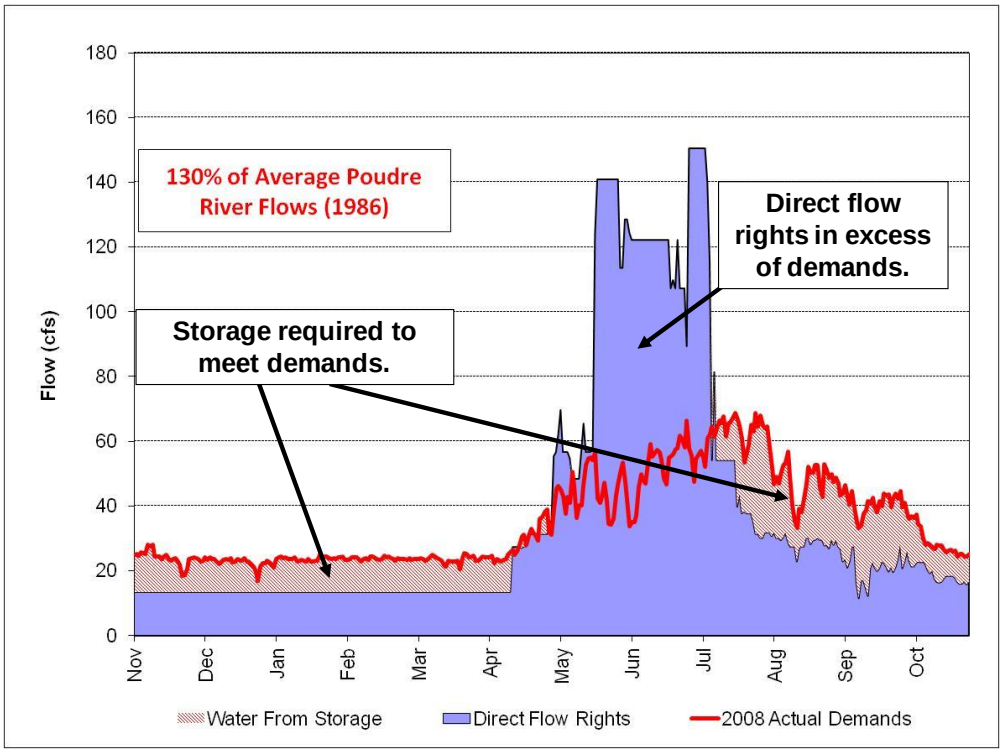
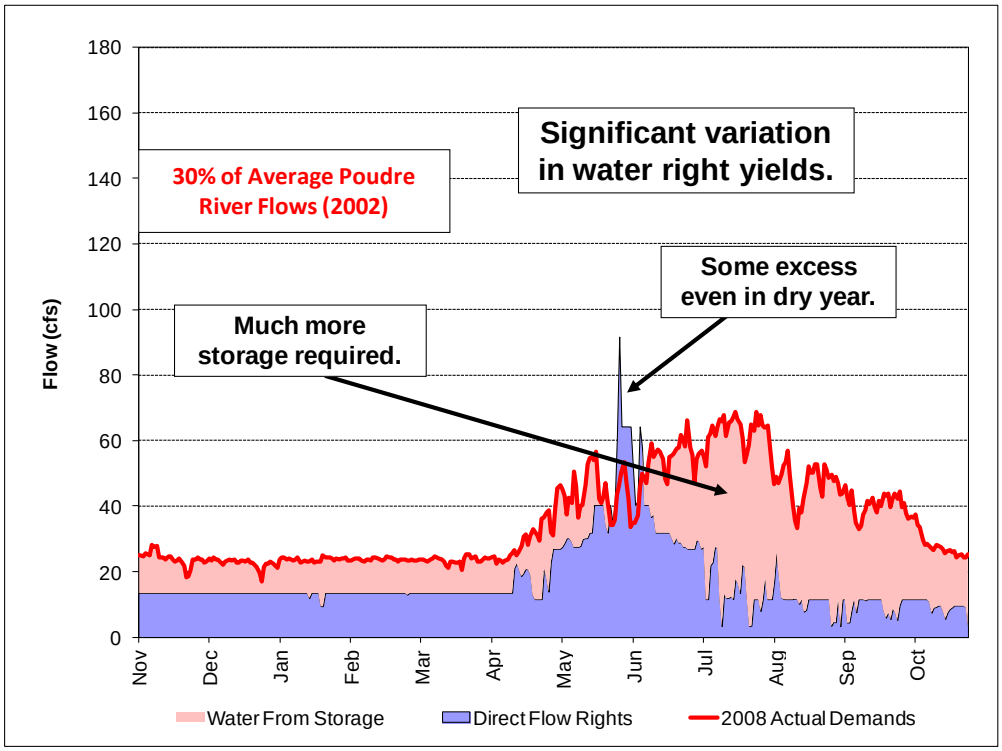
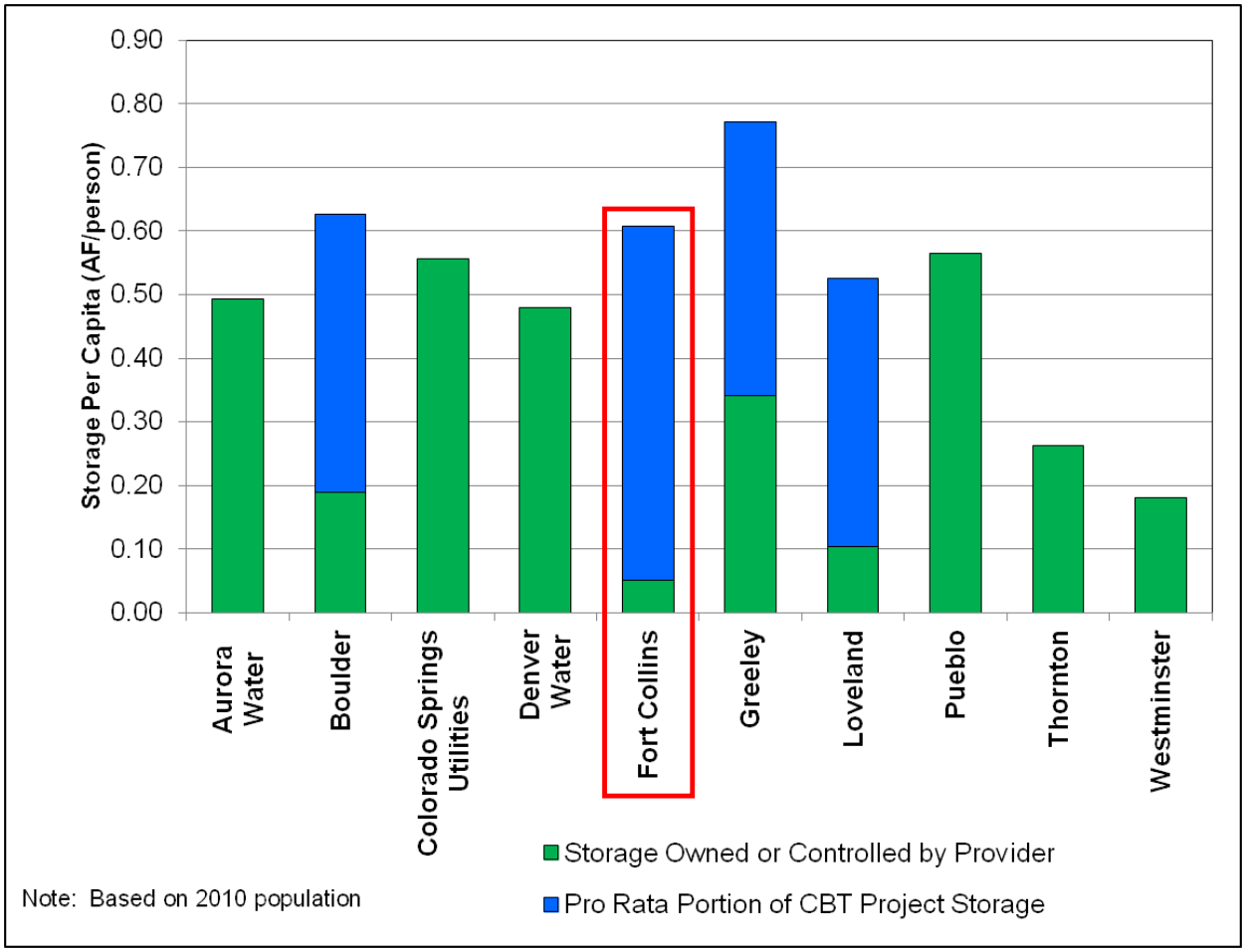


Figure 22 2002 Poudre River Flows, Storage and the City's 2008 Water Demands



Based on a survey conducted during the 2012 Water Supply and Demand Management Policy update, Fort Collins' storage per capita (storage divided by 2010 population) is the lowest among all the surveyed providers when comparing storage directly owned or operated by each provider, as shown in Figure 23. While Fort Collins has the third highest storage per capita compared to Boulder, Greeley and Loveland when including the pro rata portions of CBT project storage attributable to CBT shares owned by each provider, it is important to note that CBT storage is not equivalent to storage directly owned and operated an individual provider. CBT storage is subject to Federal regulations, to Northern Water's policies and rules, and to a potential Colorado River curtailment. Also, the amount of CBT storage that can be carried over from year to year is very limited and providers do not have control over the annual CBT quota. In addition, if the CBT supplies become unavailable for any reason, Fort Collins has very little storage in the Poudre River basin to respond to such an emergency.

Figure 23 Storage Per Capita



Halligan Reservoir, located on the North Fork of the Poudre River approximately 25 miles northwest of Fort Collins, was identified by the City and others (see Cache la Poudre Basin Study, 1987) as a viable location for additional storage in the Poudre River Basin. The City has

been pursuing an enlargement of Halligan Reservoir since the mid-1980s and has conducted feasibility studies for its enlargement in 1989 and again in 2002. These studies have indicated the site could be expanded up to 40,000 acre-feet at a relatively low cost. Subtracting the reservoir's existing 6,400 acre-foot storage capacity, a fully expanded Halligan would provide up to 33,600 acre-feet of additional storage. In 1993, the City entered into an agreement with Halligan's owner at the time, the North Poudre Irrigation Company (NPIC), to reserve the option of acquiring and enlarging the existing reservoir. On November 4, 2003, City Council approved Resolution 2003-121, which allowed the City to exercise the NPIC option agreement and to proceed with development of Halligan Reservoir. The City is currently undergoing the NEPA permitting process for the enlargement of Halligan Reservoir, which involves the analysis of potential environmental impacts associated with multiple water supply and storage options in addition to the costs and benefits.

4.3.4 Key Parameters for Water Supply and Demand Modeling

Because of the complexity of the City's water rights and supply system, a computer model was developed and used to evaluate future scenarios involving numerous water rights and increasing demands and supplies. This section describes the model used, some of the criteria and assumptions, and the results of the modeling.

Computer Simulation Model

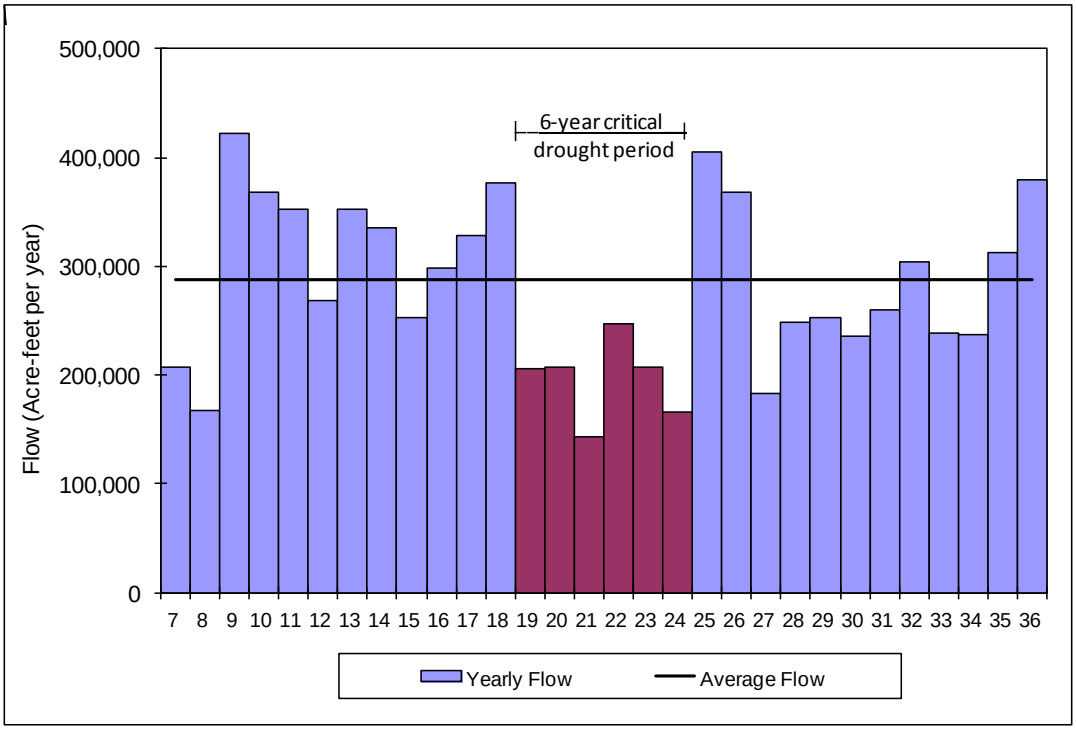
Modeling of the City's water supply system was done primarily with the "MODSIM" computer simulation model, developed by Dr. John Labadie and others at Colorado State University (CSU). MODSIM is a versatile, general-purpose river and reservoir operations model that uses cost minimization principles to simulate the prior appropriation water rights system used in Colorado and other western states. The Water Utility has used MODSIM since the mid-1980s to evaluate various water supply scenarios for the Poudre River Basin. MODSIM is operated by loading numerous parameters into the model that allow it to simulate various future alternative supply systems. These parameters include demand amounts, reservoir volumes, inflow amounts, capacities, link costs and many others, all of which direct the program to allocate the water in the desired manner. Two of the major modeling parameters addressed below are the drought criterion and storage reserve factor.

Modeling and the 1-in-50 Year Drought Criterion

As set forth in the recently adopted 2012 Water Supply and Demand Management Policy update "*The reliability and capacity of the City's water supply system should be maintained to meet the planning level demand during at least a l-in-50 year drought event in the Cache la Poudre River Basin*." Put simply, a drought is a period of below average runoff that can last one or more years and is often measured by its duration, average annual shortage and cumulative deficit below the average. A 1-in-50 drought corresponds to a dry period that is likely to occur, on average, once every 50 years. Although the Poudre River Basin has several drought periods in its recorded history, it is difficult to assess whether any of these droughts were equal in magnitude to a 1-in-

50 drought. In 1985, the Water Utility worked with a consultant and CSU professor, Dr. José Salas, to conduct a study using historic Poudre River virgin flow data to statistically define a 1-in-50 drought[4]. A series of hydrologic traces were produced using the statistics from the historic record on the Poudre River and a 30-year period of annual runoff volumes was selected that included a representative 1-in-50 drought. This drought period is six years long and has a cumulative deficit of 550,000 acre-feet, which represents annual river volumes that are about 70% of the long-term average for the Poudre River. Figure 24 illustrates the selected 30-year synthetic Poudre River volumes that include the 6-year, 1-in-50 drought period.

Figure 24 Poudre River Virgin Flow at the Mouth of the Canyon for Synthetic Data (1-in-50 Drought)



The synthetic virgin flow data was then used as a statistical base to estimate yields of the various ditches and other supplies owned by the City. Most of the City's water rights are on the Poudre River and are affected by the available flows. However, one of the primary components of the City's raw water supply comes from the CBT system. The quota that Northern Water sets each year significantly affects the supply available in a given year. Because of this, the 1985 Drought Study reviewed the potential quota setting for the synthetic drought and developed a set of probable quotas for the 30-year period. The study determined a 50% quota for the critical year of the drought (i.e., the final and second driest year of the 6-year drought) would be likely.

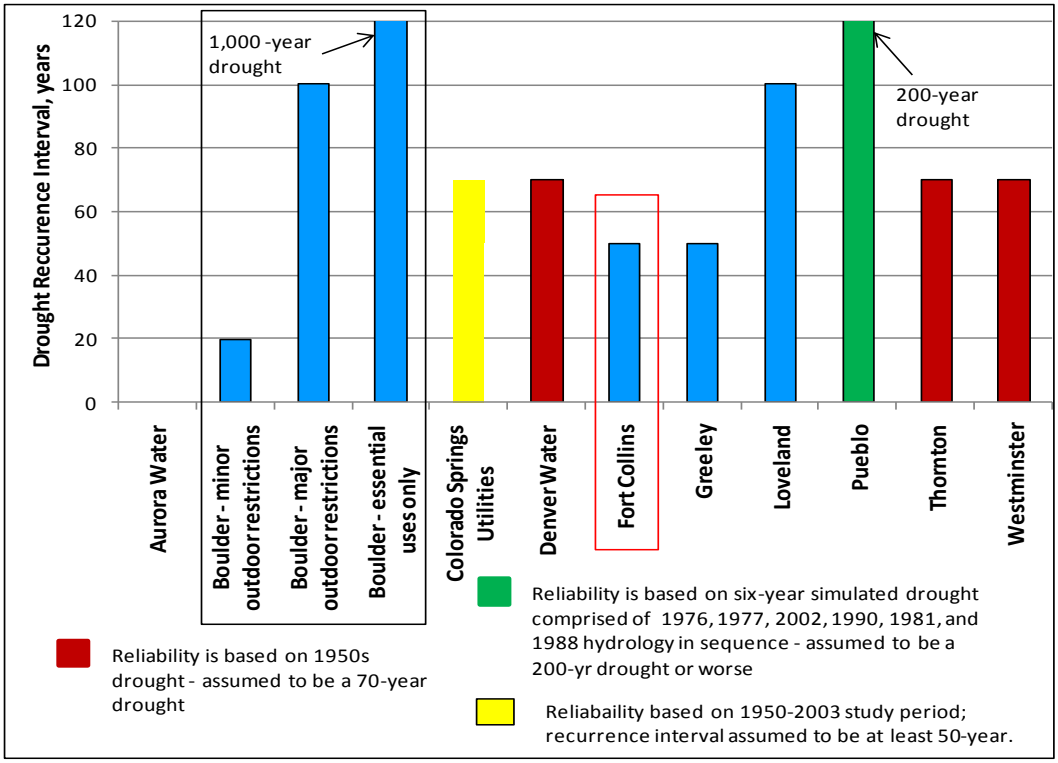
[4] 50,000 years of synthetic flows were developed for 1911 – 1983 Poudre virgin flow data. The virgin flow data are also highly correlated with 400 years of tree-ring data.

In addition to the 1-in-50 year drought, the 1985 study developed statistics for the following drought types: 1-in-20, 1-in-100 and 1-in-500. These alternative drought types were considered at the time the City Council established the 1988 Water Supply Policy (Resolution 88-205). The original recommendation was to adopt a 1-in-100 standard for meeting a drought. After much deliberation, the City Council decided that meeting at least the 1-in-50 drought with no restrictions would provide adequate protection from drought. It was believed that droughts of higher severity could be met with restrictions and/or other conservation measures.

This criterion has provided a reliable supply system to date, although with some issues during the early 2000s drought. During this policy update, the criterion was revisited by the CWG, Water Board and City Council and concluded that the 1-in-50 drought criterion is still a reasonable planning level that is used by other municipalities and has worked well for the City for the last few decades.

A survey was conducted during the 2012 Water Supply and Demand Management Update to assess the drought recurrence intervals used for water supply planning among Front Range municipalities. Figure 25 summarizes the results showing that Fort Collins 1:50 year drought criterion is on the lower range compared to many of the other municipalities.

Figure 25 Drought Recurrence Intervals for Municipal Water Supply Planning



Note: The municipalities in blue express their drought planning parameter directly as a drought recurrence interval (i.e. 1-in-50 year drought) whereas the municipalities in other colors express their planning criteria in alternative ways. AMEC changed these "alternative criteria" into a drought reoccurrence level based on historical hydrology data and professional expertise. In contrast to the other municipalities, Boulder has three drought criteria based on three levels of drought restrictions that are directly incorporated into their water supply modeling. Aurora Water is blank because the municipality did not provide any data on this topic.

Modeling conducted during the 2012 Water Supply and Demand Management Update indicated that if no new facilities or supplies were acquired, the City would still be able to meet their demands in most years. However, shortages would still occur during more severe droughts and the City could not meet its 20% storage reserve factor. Modeling was done with existing facilities and supplies and future water demands through the 1-in-50 year and 1-in-100 year droughts. Results for the 1-in-50 drought (which is 6 years long and has a 50% CBT quota) showed shortages in two years and a maximum shortage of around 1,200 acre-feet. Results for the 1-in-100 drought (which is 8 years long and has a 40% quota) showed shortages in 5 years and a maximum shortage of around 5,600 acre-feet. Both scenarios showed very little to no water remaining in storage at Joe Wright Reservoir through most of the drought years. The potential impacts to customers if no additional facilities and supplies were acquired would include lawn watering restrictions, bans, potential rate adjustments and potential stress and loss of existing landscapes in the 1-in-50 drought. The potential impacts in the 1-in-100 drought would include many more restrictions on all uses, definite rate adjustments and higher losses of existing landscapes.

Modeling and the Storage Reserve Factor

The City's use of a storage reserve factor (SRF) in its modeling is common to municipal water supply planning.[5] This criterion adds an additional layer of protection by requiring a certain percentage of annual demand in storage through the modeled design drought. A safety factor is commonly incorporated into municipalities' planning either on the demand-side or supply-side. Municipalities that incorporate this factor into the demand-side typically increase their modeled annual demand by the margin of safety. It should be noted that those municipalities already have considerable amounts of storage in their water supply systems. The Water Utility uses the SRF on the supply-side where a percentage of storage reserve, equivalent to the percentage of the City's annual demands, is set into a "storage reserve" which cannot be violated during the modeling. Given that Fort Collins has relatively little water storage capacity, it is more appropriate to address these dimensions of risk in terms of storage reserve rather than by increasing the City's modeled annual demand by a margin of safety.

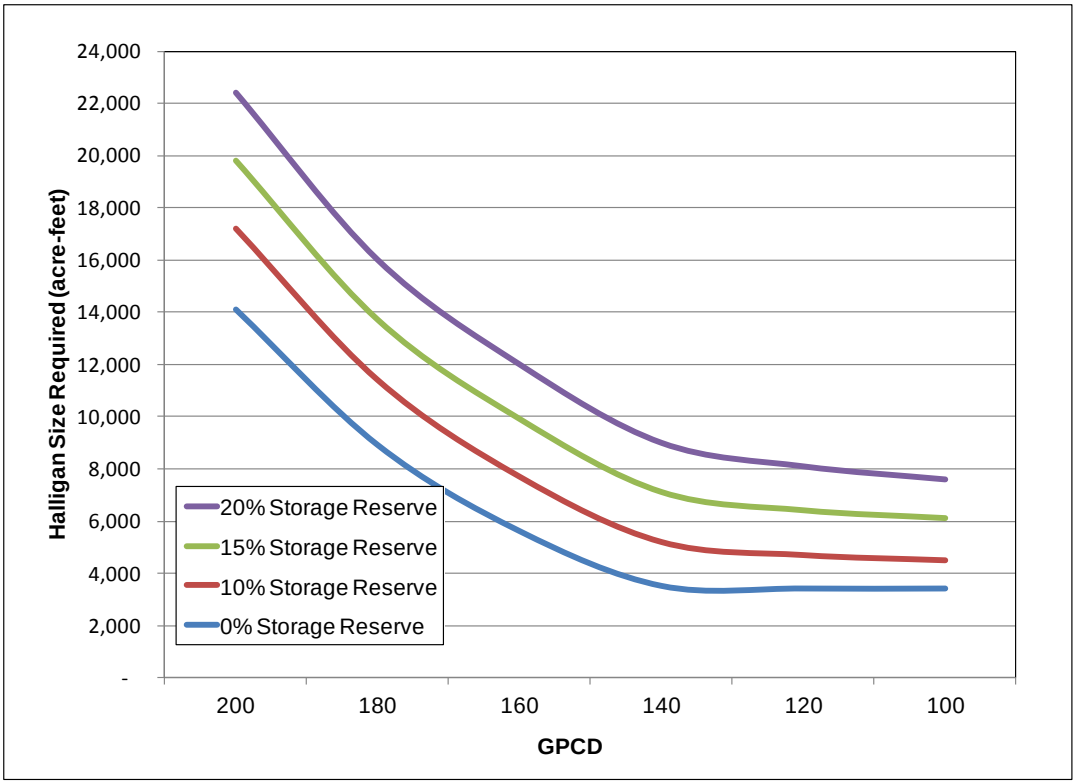
The 2012 Water Supply and Demand Management Update increased the City's SRF from 15% (as used in the 2003 policy material) to 20%, where 20% of annual demands are to be carried over in the most critical year of the modeled 1-in-50 drought. Utilities staff met with the Water Board's Water Supply Committee on April 16, 2012 and the full Water Board on July 19, 2012 to discuss potential options for changing the water supply planning criteria. Changes to these criteria focused mainly on revising the planning demand level (in gpcd) and the SRF. Several options for changing these criteria were modeled and presented by staff, including the following:

[5] During the 2012 Water Supply and Demand Management Update, a survey was conducted to determine how common a SRF or equivalent was to municipal water supply planning on the Front Range. Of the nine municipalities that responded, six incorporated some level of SRF or equivalent in their water supply system modeling. Three of the surveyed providers incorporate an additional storage reserve as a safety factor (Fort Collins, Pueblo and Aurora) whereas the remaining providers apply a safety factor by increasing their demands (Greeley, Boulder, Thornton and Westminster).

- previous 162 gpcd and 15% SRF
- 150 gpcd and 15% SRF
- 140 gpcd and 20% SRF

These options are illustrated in relation to the amount of Halligan Reservoir storage enlargement necessary to meet the planning demands in Figure 26. After some discussion, the Water Board voted unanimously to revise the updated Policy to include the planning criteria suggested by the Water Supply Committee of 150 gpcd and 20% SRF.

Figure 26 Per Capita Use and the Storage Reserve Factor Compared



This provision recognizes the likelihood that in the critical year of a 1-in-50 drought, supplies would not be depleted at the end of the year, but rather some carryover would be desired for the following year in anticipation of the drought continuing. The 20% SRF is equivalent to about three and a half months of average winter demand and about one and a half months of average July demand. It assumes that the City cannot rely on the existing temporary CBT carryover program, which currently allows each CBT unit holder to carry over up to 20% of its CBT units in CBT reservoirs for use in the following year. The SRF also addresses dimensions of risk outside of the reliability criteria including emergency situations (i.e., pipeline failure) and droughts that exceed the planning level (greater than 1-in-50 year drought).

4.3.5 Climate Change Impacts on Demands and Supplies

Climate change may have significant impacts on both water demands and water supplies. Numerous studies on climate change and the general impacts that are expected in the field of water supply and demand have been produced by reputable scientific organizations such as the Intergovernmental Panel on Climate Change, National Center for Atmospheric Research, American Water Works Association Research Foundation, the Association of Metropolitan Water Agencies and the American Society of Civil Engineers.

Although additional research is still needed to determine the extent of local impacts, there is general consensus that climate change in the Mountain West will likely include the following changes:

- Increased evapotranspiration rates, increasing the water required to maintain landscaping
- Longer growing season
- Changes in seasonal snow pack
- Earlier spring snowmelt and runoff
- Lower summer and fall season stream flows
- Changes in the distribution of precipitation over the year
- Reservoirs may show increased use; their pool levels will fluctuate more
- Droughts may also become longer and more intense

These changes are expected to accelerate over the decades ahead and impacts may depend largely on factors such as population growth, economic growth and technological changes. The Water Utility will likely face significant challenges in the years ahead managing both water demands and water supplies.

In the area along the Front Range of northern Colorado, it is particularly difficult to project future trends, particularly regarding future precipitation. One such attempt that averages the results of several Global Climate Models (GCM) and greenhouse gas emission scenarios that were used in the Colorado Water Availability Study results in a range of potential scenarios for this area. These models (which result in 112 simulations) suggest that temperatures could increase an average of about 2 degrees Fahrenheit by 2040 and 4 degrees by 2070. This is reflected in Figure 27, which shows the 112 simulations with the dark black line representing the median of these simulations. All of the Global Climate Change models used for this analysis agree that temperature will be increasing. In contrast, precipitation may or may not increase over time. This is reflected in Figure 28 which shows that half of the model simulations show a decrease in precipitation while the other half show an increase.

Figure 27 Annual 30-Year Running Average Temperature for with Climate Change

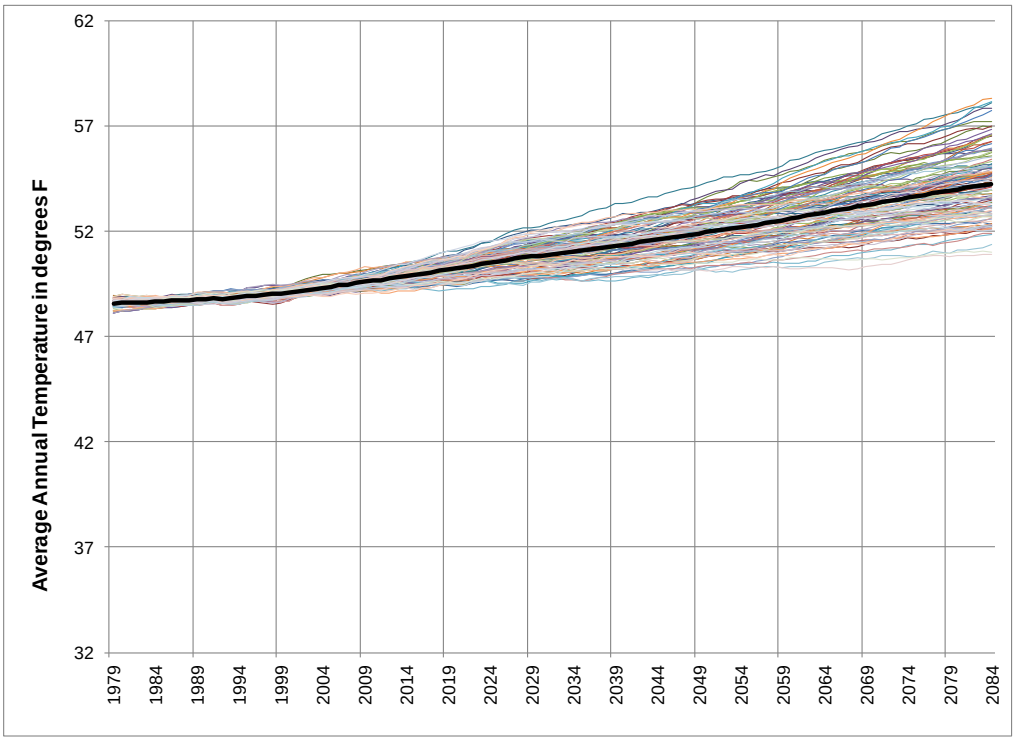
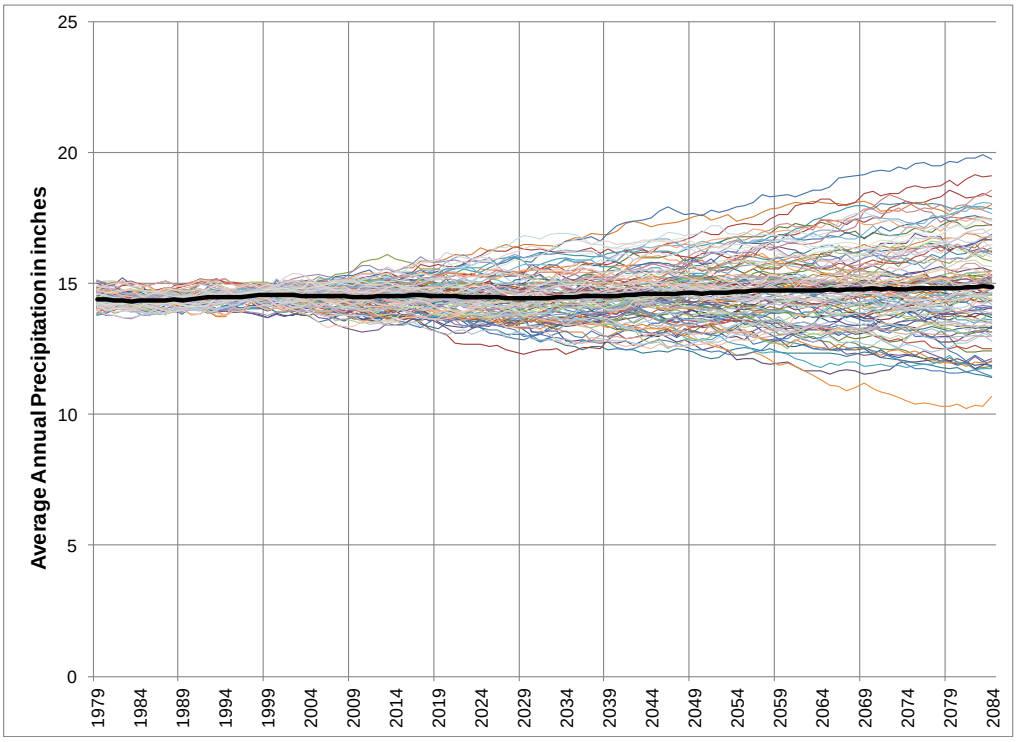


Figure 28 Annual 30-Year Running Average Precipitation with Climate Change

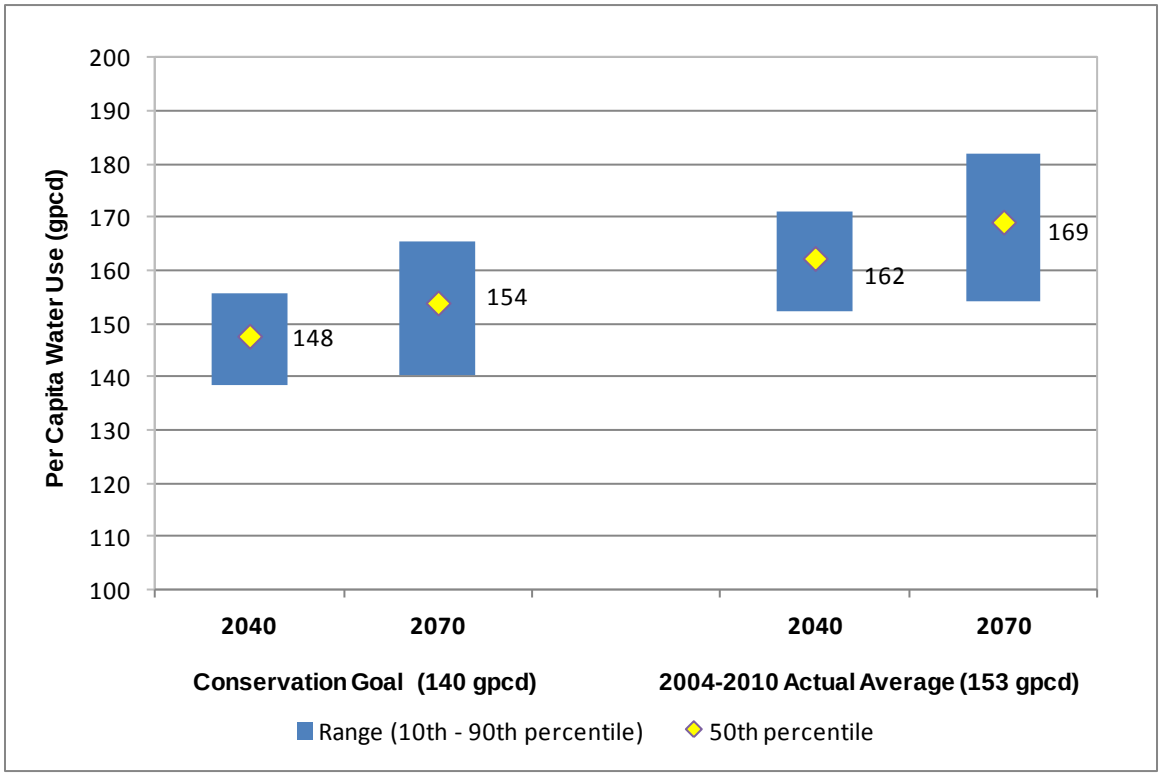


Climate Change and Demands

From a water demand perspective, warmer conditions during the growing season would result in an increase in evapotranspiration of vegetation increasing outdoor water demand. This could have a significant effect on the City's total water demands since approximately one-third of the demand is outdoor water use in the summer. Increases in outdoor demand could further be exacerbated if precipitation decreases, although an increase in precipitation could temper an increase or even decrease overall water demands.

The GCM models coupled with a hydrology model were used to estimate changes in the consumptive irrigation requirement (CIR) within the City. The percentage change in CIR was applied to the outdoor portion (about 30%) of "baseline" per capita water use values of 140 gpcd (representative of the 2009 Water Conservation Plan goal) and 153 gpcd (representative of the actual per capita water use from 2004 to 2010)[6] to estimate the change in total water demands under various climate change scenarios. Figure 29 shows the per capita water use values for the various climate change scenario within the 10th and 90th percentile for both baseline cases in 2040 and in 2070.

Figure 29 Climate Change and Potential Per Capita Water Use



[6] More specifically, the 10th and 90th percentiles of the 112 simulations for percentage changes to consumptive irrigation requirement were determined. These percentages were applied to the outdoor portion (approximately one-third) of the baseline per capita water use to determine a total per capita water use. This was done for modeling simulations developed for 2040 and for 2070.

These results indicate that the City's water demands (represented as gpcd) could change as a result of climate change by 2040 and 2070. Approximately 90% of projected futures lead to increases in existing outdoor water use. Without conservation and/or significant changes in landscaping choices, outdoor water use will likely increase over the coming decades as customers strive to maintain their landscapes in a hotter and longer growing season. However, it is important to note that these estimates cover a range of possible future conditions, and there is no good objective guidance regarding which of these alternative futures is closest to the true future condition.

Climate Change and Supplies

Climate change will likely impact the City's future water supplies; however, there is a great deal of uncertainty on exactly how the Poudre Basin and City's water supply system will be affected.

As discussed above, the GCM climate change models indicate that temperature in the Fort Collins area will increase, yet models disagree on whether precipitation will increase or decrease and by how much. Hydrologic modeling results suggest that runoff in the Poudre Basin could decrease (based on the mean trend); however, there is a great deal of uncertainty.

It is currently difficult to predict how climate change will alter the quantity and timing of runoff. Many models suggest that there will be less runoff in the spring and early summer from snowmelt. Models also suggest that the variability and duration of wet periods and droughts will be more severe. The yield of the City's current water rights portfolio could vary more from year to year, resulting in an increase of water "short" years. This in turn would make meeting demands more challenging. There may also be some years that are wetter than what has been experienced in the past.

With many uncertainties regarding both water supply and demand, it is prudent to prepare for a wide range of conditions in the future. Additional reductions in water use through thoughtful conservation measures are a prudent and sensible approach to begin confronting this uncertainty. Planning for adequate reservoir capacity to help balance the swing in supplies available between wet and dry periods is also a prudent and sensible approach. Fort Collins seeks to combine these efforts to provide for a sustainable water future in the face of great challenges and uncertainty.

Climate change is currently not incorporated into the City's water supply modeling. However, the City has participated in regional studies, most recently the Joint Front Range Climate Change Vulnerability Study, and continues to remain updated on the latest climate change research. This is typical of many municipalities along the Front Range. Among the ten Front Range cities surveyed during the policy update, only four of the cities had directly or are planning to incorporate climate change into their water supply planning within the near future. The remaining six municipalities are either not considering climate change or are following the latest research and will consider incorporating it directly into their planning at a later date.

4.4 New Water Supplies and Storage Options

The strengths of the City's water supply system include senior water rights that provide base flows, converted agricultural rights that yield well in most years and the CBT system that provides stored water to help meet winter demands. Weaknesses of the system include a high reliance on the CBT quota, no effective way to use surplus water rights and no place to store conserved water. These weaknesses indicate a need to focus on diversification of supplies. Additionally some of Fort Collins' water rights, in order to be fully utilized, will require additional operational storage to meet return flow requirements.[7]

4.4.1 Factors to Consider for Selection of Supply and Storage Options

In order to be effective, new supplies need to be deliverable to the treatment plant, deliverable during the critical portions of drought (when current supplies are inadequate), and provide some additional reusable water. The following factors play a significant role when evaluating the types of future supply and storage options available to the City.

- Water rights must be changed in water court according to State law. This requires that the changed amounts are limited to the quantifiable lawful historical use while maintaining historical return flows and that no injury is caused to other water right holders. The City will need to change the point of diversion for many of its water rights to the City's points of diversion, which are upstream. The yield of these rights could be significantly reduced as a result of the limited exchange potential on the Poudre River.
- Supply-side water development may require diversion, storage and release facilities which require land and right of ways. Construction in urban settings is usually expensive and difficult. Also, municipal use generally requires higher levels of raw water facilities maintenance and operational reliability than agricultural use. Construction near riparian ecosystems also often entails extensive permitting.
- Source water quality is affected by upstream human activities and natural processes. Water quality in the higher elevations of the mountains is generally better and easier to treat than lower elevations where there are more human activities. For instance, water quality of lower elevation reservoirs more strongly affected by nutrient loading and increased temperatures (higher trophic status). These lower elevation supplies are more expensive to treat.
- Environmental impacts associated with water development include: construction and/or operations impacts, riparian impacts, agricultural "sharing" requires some dry-up of irrigated lands and energy consumption for pumping water or increased treatment.
- Supply-side alternatives that involve agreements between the cities and farmers must: 1) meet the needs of all willing parties; 2) be specified in contracts so that they can be interpreted by others in the future; 3) be essentially permanent in order to be reliable as municipal supplies; 4) comply with bylaws of the ditch companies, not just the two primary users; and 5) often require land use agreements/limitations (i.e. farmers may have to agree to not irrigate the land and the land must remain in agricultural use for the future).

[7] These water rights are already counted in the City's existing yield.

- Monetary costs associated with water development will affect ratepayers. Costs may include the acquisition of water rights, construction and ongoing O&M, costs to change the diversion location to where the City needs to divert, mitigation, land acquisition and right-of-way, water treatment, and energy costs (i.e. pumping of supplies).

4.4.2 Water Supply and Storage Options

The City may pursue a variety of water supply and storage options. The benefits and challenges associated with developing and operating these options are discussed below.

Storage

Section 4.3.3 addresses the City's need for additional storage and the City's current efforts to obtain a permit to enlarge Halligan Reservoir. Although the City has been actively pursuing Halligan Reservoir as a means of acquiring carryover storage, it should be noted that other similar storage facilities might be able to fulfill the need for drought protection. Alternatives to Halligan Reservoir as long-term carryover storage can be found in other storage projects. One alternative storage project that is currently in the works is Northern Water's Northern Integrated Supply Project (NISP), which would provide new water yield and long-term carryover storage for numerous entities along the northern Front Range. NISP would store unappropriated waters and water diverted by exchange from the Poudre River in a reservoir near the mouth of the Poudre River canyon. Other storage alternatives include using local gravel pits or existing local irrigation reservoirs for storage. The major locations for gravel pit storage would be downstream of where the City diverts its treated water supplies. Gravel pit storage could be used to meet downstream return flow requirements but would not be capable of directly increasing the City's treated water supply without new pumping and pipeline facilities and possibly new water treatment facilities. The gravel pits would need to be lined and could be susceptible to extreme flood events.

Agricultural Supplies

Although the City has an abundance of converted agricultural rights that yield more than needed in most years, these rights yield very little in dry years. These rights do not provide a sufficient yield during the shoulder months (See Figures 21 and 22) nor increase firm yield.

The City could utilize agricultural water supplies and storage. However, most of the irrigation supplies/storage are downstream of the City's intakes and are supplied at least in part by municipal effluent. Change of those water rights for use upstream is limited by low intervening streamflows except during runoff. These supplies could be delivered by pumping, but would require expensive new facilities to convey supplies up gradient to the Water Utility service area. Since the water quality downstream of Fort Collins is also not as good, this option would require increased treatment costs. Also, the City needs water in dry years when yields from downstream agricultural rights are relatively limited. There is little exchange potential during dryer parts of the year to use rights further downstream. The three major "upstream" agricultural companies

that the City could purchase water from are Water Supply and Storage Company (WSSC), North Poudre Irrigation Company (NPIC) and Larimer & Weld Irrigation Company.[8] Other upstream sources are available, yet additional storage would be necessary for firming yields.

Another supply alternative is to forego long-term storage and only acquire water rights with sufficient yield in critical dry years to meet future demands. These water rights would probably come from the agricultural community. The City would need to purchase numerous shares of these agricultural rights in order to yield enough water during the dry years to meet the City's 1-in-50 drought criteria. This would be costly and would result in the City purchasing water from large tracks of productive agricultural lands. It should be noted that many of the irrigation rights owned by agricultural water users in the Poudre basin are not sufficiently senior to yield significant amounts of water during critical drought years; those users rely primarily on storage to supply their needs during droughts.

The City may also enter interruptible supply contracts with agricultural users. However, there are many difficulties related to these operational agreements, such as timing. For instance, a farmer may need to know if the City will have rental water available in March; however the Water Utility may not know available water supplies until April or May. Few long-term municipal/agricultural arrangements have been successfully negotiated in the United States. Large irrigation companies have successfully made arrangements with large municipal water providers in California, and Denver and Boulder have some very small arrangements.

Groundwater Supplies

Groundwater supplies could be developed or acquired by the City for use as a drought year supply and as an alternative to additional surface storage. However, the major aquifers in the South Platte Basin and the lower reaches of the Poudre Basin are located significant distances to the east and south of the City, and there is very little groundwater physically available in the vicinity of Fort Collins. Groundwater pumped from alluvial aquifers causes delayed depletions to the flows of nearby surface streams and such depletions typically persist continuously for several years after pumping. Under Colorado water law, delayed depletions from well pumping must be replaced in order to avoid injury to other water rights. The costs and facilities that would be needed for the City to develop groundwater supplies of sufficient magnitude to serve as an alternative to additional surface storage would likely be prohibitive.

[8] **WSSC water** - WSSC has some reusable sources but cannot release water in the winter from their primary high mountain reservoir (Long Draw). This problem could be fixed but it would require expensive renovations. Sixty percent of the company is already owned by municipalities (Fort Collins owns about 4%); remainder is highly sought after and would command a high price. Fort Collins needs WSSC to continue to use water agriculturally due to the Reuse Plan.
NPIC water - NPIC has fairly junior direct flow rights. Over 70% is already owned by municipalities (Fort Collins owns about 36%). A large part of their supply relies on exchanges because the Munroe Canal as junior water rights. The north part of their system cannot be supplied by the Munroe Canal and is reliant on storage water from Halligan and Park Creek reservoirs. A large portion of their yield is already useable by municipalities because every NPIC share comes with 4 CBT units.
Larimer & Weld water - Larimer & Weld owns Wilson Supply Canal and Worster Reservoir. Worster is controlled by the Fort Collins-Loveland Water District. There is some potential for exchange with this reservoir.

Recycling and Reuse

Recycling and reuse requires a legally reusable supply that is not already committed. Changed irrigation water that was historically consumed by crops can be used to extinction and is therefore termed "reusable" water. This type of water is very valuable for a number of reasons. Reusable water can be used to replenish losses associated with evaporation from storage facilities, for groundwater well augmentation and for other similar uses. It can also be treated and the effluent exchanged upstream with other water in the river to a City pipeline to be treated again, until it is fully consumed to extinction. The water from the SSD will probably be needed to meet these kinds of reusable demands. However, some operational storage capacity is needed to meet all the requirements of the applicable Water Court decrees. The most efficient location for this kind of storage is near Fort Collins, close to the original diversion points of the SSD and the areas where return flows historically occurred. Local gravel pits or other nearby reservoirs would meet annual operational storage needs.

Additionally, it is relatively difficult to find reasonable cost opportunities for the reuse of reclaimed water in already-developed areas because of the high cost of building a dual distribution system necessary to distribute non-potable reclaimed supplies. However this is much easier with new development. For example Denver developed the Denver International Airport annexation corridor with dual use plumbing in anticipation of doing non-potable reuse. Direct potable reuse is expensive and difficult to implement from a public acceptability standpoint. No municipalities in the United States have used direct potable reuse water from their wastewater treatment plant.

Demand Management

Reducing the demand for water through conservation is another alternative. If demands are reduced, the water that is saved can go towards meeting future water demands, instead of having to obtain additional supplies. However, using conserved water to meet future demands without increasing water supplies would essentially make the City's water supply system less resilient, since it would be more difficult to cut back water use during extreme droughts events (i.e., greater than the 1-in-50 year drought). The 2012 Water Demand Management and Supply Policy incorporates the 2009 Water Conservation Plan water conservation goal of 140 gpcd, while continuing to develop supplies to meet demands at 150 gpcd (planning demand level). This combined effort supports reducing indoor and outdoor demands to improve system reliability and resiliency to supply variability on a year-round basis, while preparing for the potential effects of climate change.

Utilities conducted a landscape preference survey with an online survey panel to gage customer's desire for changing landscapes in Fort Collins as it relates to the potential for additional water conservation and its potential impact on existing landscapes. Results of the survey indicated general satisfaction with current landscapes in Fort Collins (especially trees) and support for additional xeriscape. Results indicated no strong opinion regarding additional water

conservation, which coincides with recent general Utilities surveys that indicate the majority of customers believe water conservation efforts are at the correct level.

4.5 Surplus Water

The City uses its water supplies to meet its customers treated water demands, as well as the City's raw water needs and other obligations. Raw water needs mostly include irrigation of City parks, golf courses and other greenbelt areas. Other raw water obligations include primarily water delivered to other entities because of agreements or exchanges made to manage the City's water supply system more effectively. Water not needed for the above purposes is referred to as surplus raw water.

4.5.1 Source and Availability

Since the City's water supplies were acquired to be able to meet demands during a 1-in-50 drought, in most wet and average years the water supplies are greater than is needed to meet demands. The City's surplus water supplies include direct flow rights from the Poudre River and Colorado-Big Thompson Project (CBT) supplies delivered from Horsetooth Reservoir. The City may have surplus water from one or both of these sources depending on the available flows in the Poudre River or the CBT quota, and the level of the City's water demands. Although some of the City's (senior) direct flow rights are available throughout the entire year and during most years (including drought years), the majority of the City's direct flow rights are converted agricultural rights that are only available during the high runoff months (typically May, June and July). In wet and even average years, these converted rights can produce a large amount of surplus raw water.

Each year, the City assesses its projected supplies to best balance supplies with demands. In general, this includes any water stored (or carried over) in Joe Wright Reservoir or in the CBT project (via Horsetooth Reservoir), projected or actual CBT quota and projected yields from Poudre River water rights (which is based mostly on snowpack). Determining these supplies is more certain in early April, when the CBT quota is declared and the snowpack is near its peak amount. The City also looks at projected maximum demands for the year, since demands are higher in hot, dry years. Surplus raw water is estimated as projected total supplies minus projected maximum demands.

There are legal constraints on the City's use of its supplies that affect the amount of its surplus raw water. These constraints include water rights that have not yet been changed to municipal use and the lack of exchange potential in the river to be able to divert the supplies at the City's pipelines. However, much of the City's surplus raw water is from supplies that cannot be used due to lack of demand when they are available.

The lack of storage capacity means that very little of the City's surplus supplies can be saved for later use. Much of the City's surplus raw water comes from changed agricultural rights that yield mostly during high runoff months. The City's only fully owned storage, Joe Wright

Reservoir, does not allow for significant carryover capacity since it is mostly used to capture reusable Michigan Ditch supplies and regulate them for the Reuse Plan and is physically limited due to icing conditions in the winter. Although the City's CBT units come from Horsetooth Reservoir, District policy only allows 20% of the City's units to be carried over each year (currently about 3,800 acre feet) which must be used in the following year. The CBT project facilities cannot be used to store the City's surplus direct flow rights. There is very limited ability for the City to store its surplus supplies in other existing reservoirs in the Poudre River basin, since they are not owned or controlled by the City and are typically full when the City has surplus supplies.

Some of the City's surplus supplies are easier to quantify than others. More easily quantified supplies include CBT supplies, from CBT quota and the multiple-use portion of the City's shares of the NPIC, and unchanged agricultural rights that have been rented in past years. Less easily quantified supplies include direct flow water rights that could have either been treated but lacked sufficient demand or are not legally treatable and had no rental market. Table 4 shows the approximate average amounts of surplus raw water from these sources from 2006 to 2010. It should be noted that the amount of surplus supplies would be much less during drought conditions. Also, the amount of surplus supplies will decrease as the City continues to increase its demands with additional growth.

Table 4. Estimated Surplus Raw Water Supplies (2006-2010 Averages)

Source of City's Supplies	Acre-feet per year
CBT Supplies (quota and NPIC multiple-use)	8,700
NPIC (agricultural portion only)	7,100
Water Supply and Storage Company	2,400
Miscellaneous (small) Irrigation Companies	900
Southside Ditches (Arthur, New Mercer, Larimer No. 2)	5,200
Pleasant Valley and Lake Canal	1,200
Total	**25,500**

4.5.2 Use of Surplus Water

The City's surplus raw water is the primary source for non-municipal uses. Non-municipal uses include the use of the City's water supplies for purposes other than to meet the customers' treated, non-potable or other necessary water needs. These uses may include rentals, instream flows or other uses that benefit the City or our region.

If there is a rental market for these supplies, the City typically tries to rent them to offset the cost associated with owning them. Otherwise, these supplies would be left in the river to be diverted by the next appropriator on the river that is in priority to use the water. In some limited instances, the City has been able to use these rights to benefit the Poudre River. However, using

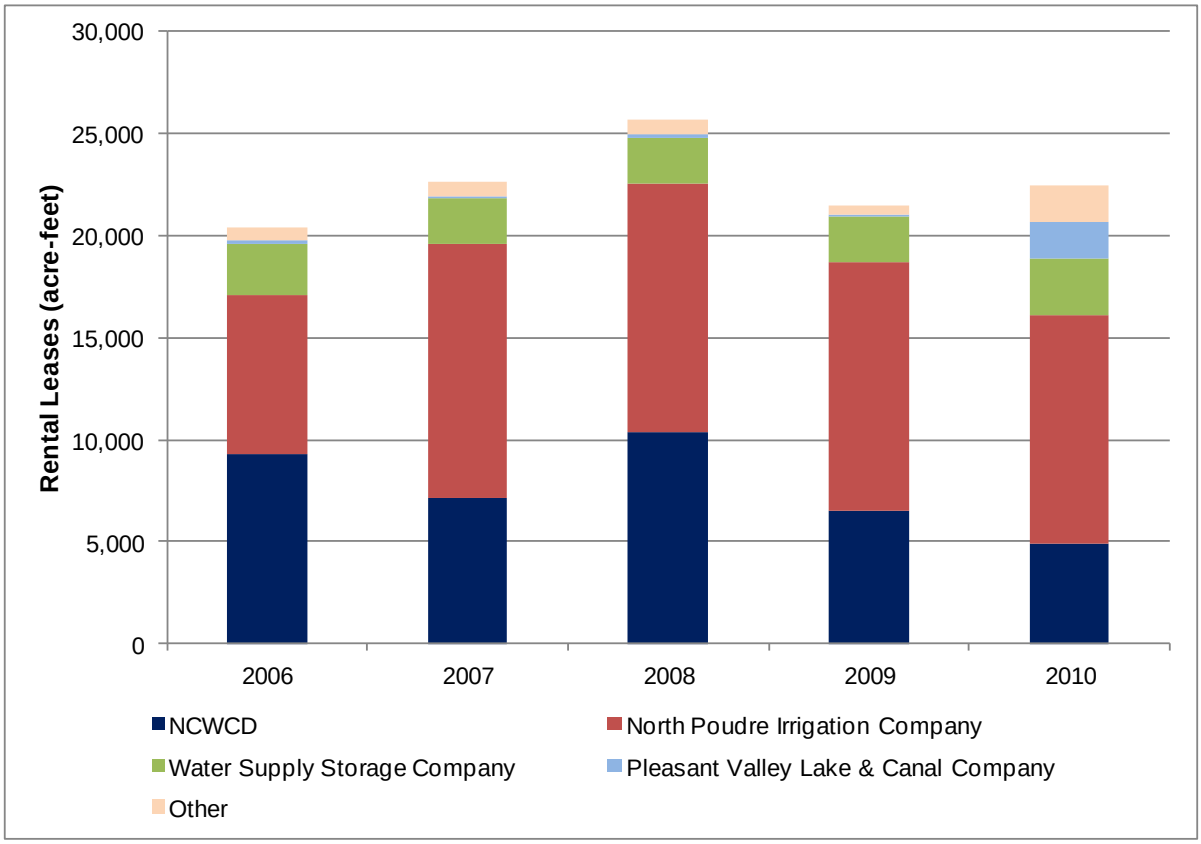
surplus supplies for more consistent instream flows has several legal and physical limitations that are discussed below.

Agricultural Rentals

Most of the City's surplus water is used for agricultural irrigation and rentals have helped maintain viable agriculture in the region. The revenue from renting much of the City's surplus supplies helps to offset expenses associated with owning those water rights and providing water to customers, thus reducing monthly charges to water customers.

Prior to the irrigation season, and periodically thereafter, the Water Utility determines the amount of surplus supplies it has and makes it available to interested parties that are eligible to use the water and are willing to pay the adopted rental rate. The rental is for use of the surplus water for that year only and is not a long-term arrangement. Figure 30 shows the amount of water the City leased to various entities from 2006 to 2010.

Figure 30 Agricultural Leases



Rental prices are generally based on fair market value. The rental market price is mostly influenced by the amount irrigators are willing to pay for water. The rental prices are typically set to be similar to other entities that rent the same (or similar) water rights that the City owns.

Each year, the City's rental rates are recommended by the Water Board and approved by City Council. Table 5, from the Utilities' annual report, provides a summary of rentals from 2005 to 2010.

Table 5. Rental Water And Water Assessment Summary

	2006	2007	2008	2009	2010
Northern Water (CBT)					
Assessments Paid	$331,744	$390,964	$424,972	$382,361	$361,700
Rental Revenue	$245,695	$181,010	$327,130	$227,920	$98,604
Ac-ft Rented	9,260	7,117	10,368	6,512	4,880
North Poudre Irrigation Company					
Assessments Paid	$337,511	$301,984	$319,748	$364,956	$356,475
Rental Revenue	$219,632	$373,039	$424,520	$426,015	$393,037
Ac-ft Rented	7,844	12,435	12,130	12,172	11,231
Water Supply Storage Company					
Assessments Paid	$62,301	$56,001	$61,334	$61,334	$66,668
Rental Revenue	$110,858	$116,617	$121,232	$123,171	$122,276
Ac-ft Rented	2,490	2,237	2,237	2,237	2,759
Pleasant Valley Lake & Canal Co.					
Assessments Paid	$28,319	$28,387	$33,118	$33,107	$33,107
Rental Revenue	$2,447	$1,947	$2,765	$1,459	$8,460
Ac-ft Rented	205	165	210	115	1,747
Others					
Assessments Paid	$204,200	$212,691	$124,220	$207,894	$189,331
Rental Revenue	$15,307	$12,709	$107,300	$16,410	$52,024
Ac-ft Rented	552	635	770	470	1,873
Total					
Assessments Paid	$964,075	$990,026	$963,391	$1,049,652	$1,007,280
Rental Revenue	$593,939	$685,322	$982,947	$794,975	$674,401
Ac-ft Rented	20,351	22,588	25,714	21,505	22,491

Surplus CBT supplies can only be rented within Northern Water boundaries and may be subject to other Northern Water policies. Water from specific irrigation companies cannot typically be rented for use within another irrigation company system without a change of water rights. Therefore, for most irrigation systems, the rental market is limited to individuals under each system and the rental price is largely dependent upon the supply and demand within that system. This results in considerable variation in prices per acre-foot among the various supply sources.

Any CBT supplies that the City does not treat, rent or carryover remain in the CBT system for reallocation to all CBT unit holders in a subsequent year. Unrented City supplies that come from a designated irrigation system may still be diverted into that system under the irrigation

company's water rights and distributed to other company shareholders. Otherwise, most other unrented surplus supplies to the City may be diverted by the next appropriator on the river that is in priority to use the water. Also, during times when there is no call on the Poudre River (all water right holders are satisfied), the water may not be diverted until it reaches the South Platte River or beyond.

There are generally two methods the City uses to allocate limited surplus rentals. The first method is providing a prorated amount to renters, which is used when the difference between the surplus and rental requests are relatively small and renters would receive a reasonable amount of water. The second method is using a lottery system where all requests are randomly assigned a priority and those with higher priority get their requested amount until the City's available surplus supplies are gone. This method is used by the City when there is much less to rent than there are requests, since using the prorated method would allocate very little to any of the renters.

The City does not currently have any long-term agreements with renters. However, rentals have been done year-to-year to help maintain maximum flexibility in how surplus supplies are used. Rentals to NPIC irrigators have many of the characteristics of what is commonly referred to as "interruptible supplies" except that the City owns the shares instead of the irrigators. In most years, the City is able to rent much of the water back to the irrigators under that system to keep it viable. During dry years, the City is able to use much of the supplies purchased from NPIC for its use. Because the water rights purchased from NPIC come from a unique mix of native water and CBT water, rental of these rights provides the potential for a continued partnership between the company and the City to provide mutual benefits to the respective parties.

Instream Flows

There may be ways of using the City's surplus raw water to benefit instream flows in the Poudre River; however, the options available to the City for using these supplies in this manner are limited and complex. Furthermore, the majority of flows diverted from the Poudre River are from other agricultural water users. This is demonstrated in Figures 11 through 13 which illustrate representative flows in the Poudre River in January, June and August, respectively.

Historically, the City has taken advantage of opportunities to improve flows on the Poudre River. The City, along with Greeley and the Water Supply and Storage Company, provide increased flows in the upper reaches of the Poudre River in the winter months as part of a cooperative agreement known as the Joint Operations Plan (JOP). The JOP provides 10 cfs from November through March using Joe Wright, Barnes Meadow and Chambers Reservoirs to make releases to the Fort Collins and Greeley diversions near the mouth of the Poudre River canyon.

On occasion, and given certain water supply and river conditions, the City has been able to coordinate the release of some surplus CBT supplies at the end of the water year to local irrigation companies, which has improved flows in the river. By providing water to store in their reservoirs, the companies were able to reduce their diversions from the river during the winter

which provided some winter-time flows that would not have otherwise been available. This type of operation depends on:

- The City having surplus CBT supplies at the end of the year
- The irrigation company's ability and willingness to participate
- Making a late October delivery of the CBT water to the irrigation company's reservoir prior to the storage season.

In the early 1990's the City obtained Colorado's first "in-channel diversion" water right. The City's decree, finalized after a Colorado Supreme Court decision in 1992, cited flow rates for the Power Plant Dam (boat chute) and the Nature Center Dam. The Supreme Court decision established the right of municipalities to apply for in-channel diversions and is a basis upon which water rights filings for kayak parks are made. The City's historic, precedent-setting decree will provide some protection for the flows through town from future projects on the Poudre River. However, these in-channel diversions are junior decrees and cannot prevent senior appropriators from exercising their rights.

Other Surplus Raw Water Uses

In addition to supporting local agriculture or improving stream flows, there may be other situations in the future where the City's surplus water supplies could be used to benefit the City as a whole or the region around the City. One example would be to provide surplus water supplies to other local providers when mutually beneficial. The 2012 updated Water Supply and Demand Management Policy provides some flexibility to allow future uses of surplus raw water that have yet to be identified or defined.

4.6 Conclusions

The following conclusions can be made regarding projected water demands and measures that are needed to maintain a reliable municipal water supply system:

- Water demands are expected to increase about 35% between the years 2000 and 2050.
- The four main planning criteria specified in the 2012 Water Supply and Demand Management Policy are the water demand planning level, the drought reliability level, the storage reserve factor and the Water Supply Shortage Response Plan. These criteria are key to planning for future water supplies and maintaining a reliable supply for Water Utility customers.
- Around 2,000 acre-feet of "operational storage" is needed to adequately manage and meet return flow obligations related to the conversion of irrigation company shares from agricultural use to municipal use.
- Long-term carryover storage is needed to significantly increase the City's ability to meet water demands during at least a 1-in-50 drought.
- The City's senior water rights, primarily consisting of the City's own direct flow rights and numerous converted agricultural flows, provide reliable base flows in most years. The CBT

system also provides stored water that helps meet winter demands when river yields are low. However, the City's high reliance on the CBT quota with little owned and controlled storage to manage their existing water rights decreases the City's ability to use stored surplus water (in normal and wet years) for alternative uses and presents risk and vulnerability in its water supply system.

- There are water supply options that could be beneficial for Fort Collins yet all have trade-offs:
  - Water sharing with agriculture has promise, but would involve significant land use decisions and may be more expensive than other alternatives.
  - Acquiring more irrigation rights may help meet Fort Collins' needs, but the effectiveness of this option would be limited without additional storage.
  - Some additional storage will be needed in order to Fort Collins to fully utilize portions of its existing water rights portfolio.
  - Enlargement of existing storage has some advantages over construction of new storage.
  - The City will be able to meet some future needs with conversion of existing agricultural water rights. The raw water requirements specified in the 2012 Water Supply and Demand Management Policy will bring in additional water rights or cash.
  - Demand management is a component to improving system reliability and resiliency to supply variability on a year-round basis.
- In order to maintain supplies that will meet dry year demands, the City has obtained water supplies in excess of average demands, producing surplus water in most years. After meeting the needs of City customers, the surplus water is currently made available to entities or individuals at a fair market price that helps offset the City's ownership costs. There are many competitors for the rental of this water, including agricultural users, municipal entities and other users of raw water. There may be other ways in which the City may use this water, including the enhancement of instream flows.

5.0 Description of Policy Elements

This section provides a detailed discussion of the 2012 Water Supply and Demand Management Policy update. The policy is divided into elements for discussion purposes. Each policy element is provided in italics, followed by relevant background information and strategies that the Water Utility is currently implementing or planning to pursue in the near future.

5.1 Policy Introduction

Policy Element

The City of Fort Collins' Water Supply and Demand Management Policy provides a foundational framework for water supply and demand management decisions concerning the City's water supply system. Operational and management actions and decisions by the Water Utility will be consistent with the provisions of this policy.

Objective

To provide a sustainable and integrated approach to 1) ensuring an adequate, safe and reliable supply of water for the beneficial use by customers and the community and 2) managing the level of demand and the efficient use of a scarce and valuable resource consistent with the preferences of Water Utility customers and in recognition of the region's semi-arid climate.

This objective aligns with the 2010 Plan Fort Collins that provides a comprehensive 25-year vision for the future development of Fort Collins. Policy ENV 21.2 of Plan Fort Collins states, "Abide by Water Supply and Demand Management Policy: Provide for an integrated approach to providing a reliable water supply to meet the beneficial needs of customers and the community while promoting the efficient and wise use of water."

This Water Supply and Demand Management Policy calls for a "sustainable and integrated approach" to water demand and water resources management. Sustainability is defined within the context of the triple-bottom-line decision making in Plan Fort Collins as, "To systematically, creatively, and thoughtfully utilize environmental, human, and economic resources to meet our present needs and those of future generations without compromising the ecosystems upon which we depend." Aligning with Plan Fort Collins, the Water Utility will take a leadership role by incorporating the triple-bottom-line in its management of water supply and demand. When this core value is applied to the use and development of our valuable water resources, the Utility will strive to:

- *Avoid, minimize or offset impacts to our environment*
- *Consider the social benefits and impacts of having a reliable and high quality water supply*
- *Analyze the economic cost to provide such supplies, while also considering the effects it has to our local and regional economies*

The Utility will continue to provide a culture of innovation that finds proactive and creative solutions in managing its water supplies and demands, which is a dynamic process that evolves

along with changes in data management and technology, legal and political environments, economic development and water innovation, and as the State's population continues to increase. Given these factors, it is important to maintain an up-to-date effective policy that is based on current data. The policy's terms and conditions should be reviewed and updated by 2020, or sooner if desired by the City Council or the Utilities Executive Director.

Background

The introduction of the updated policy provides a general overview of how the policy update will guide the Water Utility's decision making when managing the City's water supply and demands and how these decisions are reflective of the City's overall vision. The policy aligns the Water Utility with the City's broader vision of sustainability, which integrates a triple-bottom-line approach to decision making. One of the main functions of the Water Utility is to provide an adequate supply of water to meet customer needs. Principle ENV 21 of Plan Fort Collins's states: "Drinking water treated by the City's Water Utility and will meet or exceed customer expectations for quality, quantity, and reliability."

In Fort Collins, water is needed for public health and safety, landscaping and environmental enhancements, comfort and recreation, and growth and economic output. These needs apply to all customers including residential, commercial, industrial and governmental. Indoor water use includes drinking, cleaning, cooking, waste removal and industrial processes. Outdoor water use includes washing, recreation and landscape irrigation. Providing adequate supplies to meet these needs is defined by the quantity of water necessary to provide the desired benefits, the efficiency of the use of the water, and the reliability and flexibility of the supply system. The updated policy is geared towards providing supplies that can meet all the needs of Water Utility customers while also factoring in the limitations associated with the scarcity of water in the region's semi-arid climate.

While this policy reflects current conditions and up-to-date management strategies, it builds on the foundation of former policies, which are explained in Section 3.3. This 2012 policy will be updated by 2020 or earlier if necessary, to ensure that the Water Utility's approach to water supply and demand management is reflective of the current needs of the community and consistent with the City's management initiatives.

5.2 Water Use Efficiency and Demand Management (Policy Section 1.0)

Policy Element

The City views its water use efficiency program as an important proactive response to supply variability and climate change. Elements of the City's conservation program include reducing indoor demand through improved technology, leak reduction and behavior change and reducing outdoor demand through improved irrigation efficiency and reasonable changes in landscaping. The City believes water use efficiency is of vital importance for many reasons, including to:

- *Foster a conservation ethic and eliminate waste*

- *Demonstrate a commitment to sustainability*
- *Provide water for multiple beneficial purposes*
- *Reduce the need for capital expansion projects and certain operational costs*
- *Encourage and promote innovation in water demand management*
- *Prepare for potential impacts of climate change*

Background

The efficient use of water not only fosters sustainability but is also a critical component to the City's future vision of water supply and demand management efforts. Principle ENV 21 of Plan Fort Collins's emphasizes that "water conservation will be strongly encouraged." The City's 2009 Water Conservation Plan[9] states:

> The City views the water conservation program as an important proactive response to supply variability and climate change. Reducing indoor demand through improved technology, leak reduction and behavior change (all elements of the City's conservation program) will improve system reliability and resilience to supply variability year round. Reducing outdoor demand through improved irrigation efficiency and landscape transformation (key elements of the City's conservation program) improves reliability during summer months when demand peaks, providing additional water availability for storage and environmental flows.

The Water Utility seeks to promote water conservation to a level that provides sufficient benefits while also maintaining the quality of life that its customers desire. The following discussion elaborates on each of the bulleted policy items provided above.

Foster a conservation ethic and eliminate waste -The City adopted a water waste ordinance in 1964 where water wasting complaints are investigated and used as an education tool. Enforcement by ticketing is also an option. The City has a long history of water conservation activities starting with the drought in 1977. Since the success of the City's water conservation program depends on the cooperation of its customers, instilling a conservation ethic is an important first step to changing habits and attitudes toward water use.

Demonstrate a commitment to sustainability – The City believes it is important to conserve water because it is good stewardship; it is the responsible way to manage a vital resource. Sustainability means not only conserving water, but also efficiently managing our water supply portfolio in a manner that is environmentally responsible and will best serve our community's residents. Plan Fort Collins states: "Today, the City's sustainability efforts are more focused and address a broad range of topics including energy use, solid waste, water conservation, and other considerations." Water conservation not only saves water, it meets other sustainability objectives including reductions in energy use and chemicals used for water treatment.

[9] The 2009 Water Conservation Plan in provided in Appendix B.

Provide water for multiple beneficial purposes – The City owns a portfolio of water rights that produces a plentiful supply of water in most years, however, the yield of these water rights varies considerably. One reason for an aggressive water conservation program is to be able to provide more water for beneficial uses beyond normal municipal purposes. For example, the area around Fort Collins continues to be a productive agricultural area that produces many crops that provide a local food source an additional economic activity to the area. These remaining agricultural areas also provide significant open space outside of Fort Collins that is desired by many residents. Making some of the City's surplus water available for these purposes also provides supplemental revenue for the Water Utility and its customers. The potential environmental benefits of conserved water are also important. Providing additional flow for the local stream systems, in-stream flow programs, improvements in water quality, improvements in aquatic and riparian ecosystems, enhanced recreational opportunities, and aesthetics are all potential benefits of water conservation in Fort Collins.

Reduce the need for capital expansion projects and certain operational costs – There are costs associated with varying levels of water use in Fort Collins including water rights acquisitions, enhanced or expanded treatment, distribution and storage facilities, environmental and agricultural impacts and legal issues, which are often passed on to customers. Ongoing variable charges related to the level of use are typically for items such as energy for pumping and chemicals for treatment. Lowering the Water Utility's water demands can reduce energy needs and use of chemicals for treatment as well as the need for capital expansion projects. The Water Utility seeks to minimize both direct and indirect costs to citizens while providing all of the benefits of the efficient use of water.

Prepare for potential impacts of climate change – Climate change may have significant impacts on both water demands and water supplies. Reputable scientific organizations have produced numerous studies on climate change and the general impacts that are expected on water demands and supplies. As discussed in Section 4.3.5 climate change will likely result in increased temperature which, depending on precipitation trends, could increase outdoor water demand. While it is currently difficult to predict how climate change will alter the quantity and timing of runoff, many models suggest that there will be less runoff in the spring and early summer from snowmelt. Models also suggest that the variability and duration of wet periods and droughts will be more severe.

Water Utility Strategies

Recommended strategies for addressing water use efficiency and demand management include:

- Enforce the waste ordinance among customers
- Eliminate waste and conserve water within the context of daily operations (i.e. ensure efficient irrigation on all City owned property)

- Promote and manage programs specified in the 2009 Water Conservation Plan and future updates to this plan. Examples of such program include incentives, rebates, educational campaigns and regulatory measures such as the water wasting ordinance[10].

5.2.1 Water Use Efficiency Goals for Treated Water Use (Policy Section 1.1)

Policy Element

The City's 2009 Water Conservation Plan[11] established a goal of reducing the City's treated water use to 140 gallons per capita per day (gpcd)[12] by the year 2020[13]. The City will utilize water use efficiency measures and programs with the aim of reducing its water use to an average of 140 gpcd, subject to 1) continuing study of the water requirements of the City's urban landscaping, 2) impacts on water demand due to changes in land use policies, building codes and housing trends, 3) additional studies on climate change, and 4) changes in the water use goal as may be adjusted by any subsequent water conservation plans. This water use goal is subject to change as discussed above and is intended as a goal that can be met while sustaining reasonable indoor and outdoor values of the City.

The per capita peak daily demand[14] will be reduced or maintained to be no more than 350 gpcd by the year 2020, but may be adjusted by any subsequent water conservation plans.

Background

In September 2003, the Fort Collins City Council adopted the *Water Supply and Demand Management Policy*. The objective of the Policy was, "to provide a sustainable and integrated approach to (1) providing an adequate and reliable supply of water for the beneficial use by customers and the community and (2) managing the level of demand and the efficient use of a scarce and valuable resource." The Policy set a goal of 185 gpcd by 2010. This goal made sense at the time; however per capita water use has been significantly lower since 2002.

In 2007, the City set a goal of reducing water use to 140 gpcd[15] by 2020 as part of the process of developing the 2009 Water Conservation Plan[16]. This goal represents realistic and achievable

[10] Specific programs and measures are provided in Table 16 of the 2009 Water Conservation Program.
[11] State guidelines are changing the terminology of Water Conservation Plans to Water Use Efficiency Plans, and likewise conservation is being changed to water use efficiency. For purposes of this policy, water use efficiency is referred to as water conservation; however, the terminology may be used interchangeably.
[12] Gallon per capita per day (gpcd) calculations are based on the total treated water produced at the Water Treatment Facility for use by Water Utility customers (minus large contractual customers and other sales or exchange arrangements) divided by the estimated population of the Water Utility's service area.
[13] This goal represents an 8.5% reduction in water use compared to Fort Collins' 2006-2010 average daily water use of 153 gpcd. It represents a 29% reduction in water use compared to Fort Collins' pre-drought (1992-2001) average daily water use of 197 gpcd.
[14] The peak daily demand is 2.5 times the average daily use water conservation goal and is based on historic ratios of average to peak daily use.
[15] This is goal is normalized by adjusting it for weather conditions so it is representative of a year with average precipitation and temperatures.
[16] However, page 25 of the 2009 Water Conservation Plan cautions: "Even though the water conservation goal of 140 gpcd is believed to be obtainable, there are many uncertainties regarding the future reliability of the City's water supply. Future issues, such as climate change, make it important to continue to plan for a slightly higher water demand for purposes of developing the City's supply system."

demand reductions in all customer sectors in Fort Collins, and includes projected savings from all conservation activities included in the Water Utility's 2009 Water Conservation Plan. Achieving this goal in the planning period will provide an additional measure of reliability to the water supply system to ensure high quality service to customers in case of future drought, climate change and unforeseen shortages.

The per capita peak daily demand was decreased from the previous target of 475 gpcd in the 2003 Policy to 350 gpcd. The peak daily demand is 2.5 times the average daily use water conservation goal and is based on historic ratios of average to peak daily use. These new demand levels are obtainable without affecting the beneficial uses of water enjoyed by existing and future customers, simply by reducing unnecessary water use. The reduction in peak demand can reduce the stress on water treatment during the peak production period in the summer.

Water Utility Strategies

Recommended strategies for addressing water use efficiency goals for treated water use:

- Use the 2009 Water Conservation Plan (or update to the 2009 Plan) for guidance in achieving the water conservation goal.
- Monitor the public's feedback on an appropriate level of water conservation
- Continue studying the following:
  - Water requirements of the city's urban landscaping
  - Impacts on water demand due to changes in land use policies
  - Building codes and housing trends
  - Additional studies on climate change
- Use the information above to assess whether changes should be made in the water conservation goal subsequent water conservation plan updates

5.2.2 Water Use Efficiency Program (Policy Section 1.2)

Policy Element

Policy ENV 21.2 of Plan Fort Collins states, "Conservation measures should be implemented in accordance with the Water Conservation Plan and periodically adjusted to reflect new and effective conservation measures." The City will optimize water use efficiency through the programs and measures specified in its Water Conservation Plan. These programs and measures include educational programs, incentive programs, regulatory measures and operational measures. Specific measures and programs are outlined in the Water Conservation Plan.

The overall effectiveness of these measures and programs will be evaluated on a regular basis and if necessary, modifications will be made to increase effectiveness or to modify the City's water use goal. An annual water conservation report will be prepared to describe the status and results of the various measures and programs. The Water Conservation Plan will be updated at a minimum of every seven years, as currently required by the State of Colorado.

Background

The Water Utility's water conservation program offers a diverse range of activities targeted at all water demand sectors in the service area. These activities focus on 1) education and public outreach through the distribution of educational materials and giveaways, adult and school education programs, business and environmental programs; 2) a tiered increasing block rate structure in addition to a seasonal block rate structure for commercial and multi-family customers; 3) indoor residential fixtures and appliances rebates; 4) outdoor landscape and irrigation such as rebates, sprinkler system audits and xeriscape demonstration gardens; 5) indoor fixtures and appliances for commercial, industrial and institutional customers such as facility audits, rebates and distribution of conservation materials at hotels and restaurants; 6) regulatory measures such as the wasting water ordinance, landscape and irrigation plan review for new developments and soil amendment ordinance; 7) distribution loss program; and 8) water reuse.

Utilities will monitor implementation and impacts of the Water Conservation Plan on a regular basis. Regular demand monitoring will provide information on water use and progress toward to the stated conservation goals. Utilities staff will continue to produce an annual report on the conservation program that includes a detailed description of plan implementation as well as the measured impacts on usage. Additional information on the conservation activities is provided in the 2009 Water Conservation Plan.

Water Utility Strategies

Recommended strategies for addressing the water use efficiency program:

- Implement the water conservation measures and programs specified in the Water Conservation Plan
- Regularly evaluate the effectiveness of the measures and programs
- Continue to develop an annual water conservation report describing status and results of various measures and programs
- Remain at the forefront of water conservation by being knowledgeable of what other municipal water providers are doing both at a local and global level and using this information to improve the program
- Update the Water Conservation Plan at a minimum every seven years

5.2.3 Water Rate Structures (Policy Section 1.3)

Policy Element

The City will have stable water rate structures with transparent accountability for all classes of customers. The water rate structures will provide an economic incentive to use water efficiently while also providing sufficient revenue for operational and maintenance purposes. Examples of structures that may be utilized include 1) tiered rates with increasing prices as water use increases, 2) seasonal blocks with higher rates during the irrigation season, and 3) water budget approaches based on appropriate targets for individual customers.

The City will annually review the effectiveness of its water rate structures as part of its financial analyses regarding Water Utility revenue, expenses and rates. Specific studies or changes to the rate structure may be made upon identification of the need to revise it. Any changes to the rate structure will require City Council approval.

Background

All of the Water Utility's customers are metered. Historically, residential customers paid a set rate per 1,000 gallons regardless of water use. Since January 2003, single-family and duplex water rates are tiered. For many years, commercial customers have had a two-tier water rate. Beginning in 2003, commercial and multi-family customers are billed seasonal rates–with higher rates from May through September. Commercial rates still have a second tier for higher water use. The seasonal and tiered rates structures are designed to charge an incrementally higher amount for higher water use, encouraging water users to use less water.

The policy above states that the City will review the water rate structure as a component of its annual financial analysis. Water saving benefits in addition to expenditures, revenues and equitable distribution among its customers will be taken into consideration.

Water Utility Strategies

Recommended strategies for addressing water rate structures:

- Conduct annual review of water rate structures
- Initiate studies on any necessary changes to the water rate structures

5.2.4 Population Growth (Policy Section 1.4)

Policy Element

Population growth is an important factor in determining the City's water supply needs, since increases in population generally increase the need for additional supplies. Population growth projections and associated water demand are mostly a function of land use planning, development densities, annexation and other growth related issues that can be affected by City Council decisions. The Water Utility will continue to work closely with the Current Planning Department, which provides population projections that may be effected by changes in City policies related to growth.

Background

In addition to the issues regarding the water supply planning criteria, Council members wanted the updated Policy to include more focus on economic development and water innovation as well as a discussion on the relationship of population growth to water supply and demand planning. The updated Policy now includes these changes, along with the revised water supply planning criteria recommended by Water Board.

Water Utility Strategies

Recommended strategies for addressing population growth include:

- The Water Utility will continue to work closely with the Current Planning Department on obtaining up-to-date population projections
- The Water Utility will stay informed on any changes that the Current Planning Department makes to their approach in developing population projections

5.3 Water Supply Reliability (Policy Section 2.0)

Policy Element

The City needs to meet future water demands in an efficient and reliable manner. Policy ENV 21.2 of Plan Fort Collins states, "Water supply reliability criteria will take into consideration potential effects of climate change and other vulnerabilities. Water supplies and related facilities shall be acquired or developed after careful consideration of social, economic and environmental factors." One of the Water Utility's primary objectives is to provide an adequate and reliable supply of water to its customers and other water users. Key principles that need to be considered when addressing water supply for municipal use include:

- *Providing water supply system reliability and flexibility*
- *Considering a broad portfolio of resources that do not overly depend on any one source*
- *Maintaining a water storage reserve for unforeseen circumstances*
- *Maintaining water supply infrastructure and system security*
- *Being a steward of the City's water resources, which includes watershed management*
- *Collaboration with the City's regional water providers and users*
- *Maintaining awareness of state, national and worldwide trends and adapting as needed to meet our customer needs*
- *Promoting education, awareness and a culture of innovation among the Water Utility and others to enable creative responses to future water supply uncertainties*

Background

As Fort Collins continues to grow, so will the Water Utility's water demands. Although some of the future water needs can be reduced through conservation, the City will still need to acquire additional water supplies and other facilities that enhance the flexibility and reliability of the City's supply system. The Water Utility will incorporate the principles listed above in their decision making process and management of the City's water supply. These principles capture the social, economic and social aspects of water supply management and decision making, remaining consistent with Plan Fort Collins triple-bottom-line in addition to fostering local and regional collaboration.

5.3.1 Water Supply Planning Criteria (Policy Section 2.1)

Water supply planning is a long-term process with many uncertainties. The water supply planning criteria specified in this policy seek to balance the benefits and risks of developing a reliable water supply with the associated costs and impacts of doing so while being somewhat conservative to account for uncertainties in water supply planning. These criteria determine the amount of supplies and/or facilities needed, but it is the City's water use that mostly impacts the river system (except for construction and inundation impacts to the river). Planning for higher water use levels could provide the City more flexibility to use supplies for other benefits such as supporting local agriculture, if the City continues to reduce water use (e.g., meets the water conservation goal).

Planning Demand Level (Policy Section 2.1.1)

Policy Element

The reliability of the City's water supply should be maintained to meet an average per capita demand level of 150 gpcd[17,18]*. This planning level provides a value that is higher than the water use goal to address uncertainties inherent in water supply planning.*

It is important to have a planning number that can be used for development of long-range water supply facilities. Because water supply system infrastructure may take many years to permit and construct, it is desirable to use conservative assumptions to size facilities that may be needed for the long-term. A planning demand level should be larger than the water use goal, primarily because of the uncertainties related to projected water demands, yields from specific water rights, climate change and other unanticipated effects.

Background

The planning demand level is the amount of demand the water supply system should be developed to meet. Since acquiring water supplies takes many years, projecting future demands is required to determine which supplies and/or facilities need to be acquired. The planning demand level is measured in gpcd and is used along with projected population and large contractual use needs to determine future demand levels (and thus water supplies and/or facilities to acquire). The per capita water demand has significantly declined as water efficient technologies have improved and customers are using less water following the 2002 drought. The average normalized[19] per capita demand from 20006-2010 was 151 gpcd. The planning demand level can be higher than current use or water conservation goals to account for uncertainties in water supply planning that might reduce the yield of the City's water supplies. The City's

[17] The 150 gpcd value is based upon the normalized 2006-2011 average daily use.

[18] The average per capita demand planning level is used for facility planning purposes. Gallons per capita per day (gpcd) calculations are based on the total treated water produced at the Water Treatment Facility for use by Water Utility customers (minus large contractual customers and other sales or exchange arrangements) divided by the estimated population of the Water Utility's service area. This number is multiplied by population projections developed by the City's Planning Department to calculate future water demands.

[19] Per capita demands have been normalized to represent average expected use for 1930-1995 weather conditions.

current average water use is 150 gpcd and the 2009 Water Conservation Plan has a goal to reduce use to 140 gpcd by the year 2020.

The water supply planning criteria values initially presented in the updated draft 2012 Policy were those being used by the Corps in the permitting process for the Water Utility's proposed enlargement of Halligan Reservoir, which has been ongoing for several years. These criteria included the 1-in-50 year drought criterion, a planning demand level of 162 gpcd (2002-2007 average use), and a 15% storage reserve factor (SRF). Although there were some divergent views from CWG members on these planning criteria, the majority of CWG members felt that the water supply planning criteria (used in the Halligan permitting process) were set at reasonable levels. The Water Board also discussed and considered changes to these criteria during their November 2011 meeting, but decided they should remain the same to avoid potential delay to the Halligan permitting process.

At the January 2012 work session, some Council members expressed concern with having a planning demand level that is above our current water use level (150 gpcd) and water conservation goal (140 gpcd), and wanted a clearer explanation of the planning criteria and how they relate to City water supply needs, the size of Halligan Reservoir and the City's water use and conservation efforts. As a result, they did not feel the policy was ready for adoption. A summary of their feedback during the work session is attached, along with staff responses to their issues.

Following the City Council work session, Utilities staff contacted the Corps to ask how changes to the planning criteria in the Policy would affect the Halligan Reservoir permitting process. Their input was that the Corps conducts an independent study of the City's water supply needs and that the planning criteria values being used in the process seemed reasonable. Prior to issuance of a permit, the Corps will revisit these values and make adjustments as necessary. This input allowed for some flexibility in the planning criteria values used in the updated Policy.

Utilities staff met with the Water Board's Water Supply Committee on April 16, 2012 and the full Water Board on July 19, 2012 to discuss potential options for changing the water supply planning criteria. Changes to these criteria focused mainly on revising the planning demand level (in gpcd) and the SRF. Several options for changing these criteria were presented by staff, including the previous 162 gpcd and 15% SRF, 150 gpcd and 15% SRF and 140 gpcd and 20% SRF. After some discussion, the Water Board voted unanimously to revise the updated Policy to include the planning criteria suggested by the Water Supply Committee of 150 gpcd and 20% SRF. City Council also approved the 20% SRF by adopting the updated Policy on November 20, 2012.

Water Utility Strategies

Recommended strategies for addressing water supply planning criteria include:

- Plan to provide water supplies for demands at 150 gpcd

- Reevaluate the 150 gpcd demand planning level in the future revision of the policy in 2020

Drought Criterion (Policy Section 2.1.2)

Policy Element

The reliability and capacity of the City's water supply system should be maintained to meet the planning level demand during at least a l-in-50 year drought event in the Cache la Poudre River Basin. Water rights should be acquired and facilities (including storage capacity) should be planned and constructed sufficiently ahead of the time to maintain the 1-in-50 year drought criterion, considering the time required to obtain water court decrees and permit and construct diversion, conveyance and/or storage facilities. In using this criterion, the City seeks to provide a balance among water supply reliability, the financial investment necessary to secure such reliability and the environmental impacts associated with water storage and diversions.

Background

Once the planning demand level discussed above is determined, the amount of water supply necessary to meet the demand level is modeled using a drought criterion. The drought criterion defines the level of reliability for the City's water supply system. In general, water supply systems yield less in more severe droughts. For example, a water supply system that can provide 30,000 acre-feet of water through a 1-in-50 year drought might only be able to provide 20,000 acre-feet during a 1-in-100 year drought. The City's criterion of a 1-in-50 year drought requires having sufficient water to meet the planning levels demands during a drought that typically occurs once every 50 years.

The City has used a 1-in-50 year drought criterion since the 1988 Water Supply Policy. As discussed in Section 4.3.4, alternative drought criteria were carefully considered at the time the City Council established the 1988 Water Supply Policy (Resolution 88-205). The 1985 Drought Study considered droughts with return frequencies of 1-in-20, 1-in-50, 1-in-100 and 1-in-500. The original recommendation was to adopt a 1-in-100 standard for meeting a drought. After much deliberation, the City Council decided that meeting at least the 1-in-50 drought with no restrictions would provide adequate protection from drought. It was believed that droughts of higher severity could be met with restrictions and/or other conservation measures.

This criterion has provided a reliable supply system to date, although with some issues during the early 2000s drought. During this policy update, the criterion was revisited by the CWG, Water Board and City Council and concluded that the 1-in-50 drought criterion is still a reasonable planning level that is used by other municipalities and has worked well for the City for the last few decades. It provides sufficient reliability, enabling the City to supply water to its customers in an efficient manner while having the flexibility to handle different operating scenarios. Having several different sources of water and a few ways to deliver it to the treatment plant has provided the City this reliability in the past.

Water Utility Strategies

Recommended strategies for addressing the drought criterion include:

- Continue to use the 1-in-50 year drought reliability criterion for planning purposes.
- Closely monitor climate change studies and evaluate potential impacts to the City's water supply. If warranted, future changes may be made to the drought criterion to address climate change.

Storage Reserve Factor (Policy Section 2.1.3)

Policy Element

The City's water supply planning criteria will include a storage reserve factor that equates to 20% of annual demand in storage through a 1-in-50 year drought[20,21]*. This factor provides an additional layer of protection intended to address dimensions of risk outside of the other reliability criteria, including emergency situations (i.e. pipeline failure) and droughts that exceed a 1-in-50 year drought.*

Background

The SRF provides an additional "layer of protection" built into a provider's quantitative water supply planning process (modeling) to address dimensions of risk not addressed by the reliability criterion. The factor is a certain percent of annual demand in storage through the design drought criterion (1-in-50 year drought). The SRF can be equated to the number of months of demand that can be met as shown in Table 6:

Table 6. Storage Reserve Factor

Storage Reserve Factor	# of Winter Month Demands	# of Summer (July) Month Demands
0%	0.0	0.0
5%	0.9	0.4
10%	1.8	0.7
15%	2.8	1.1
20%	3.7	1.5
25%	4.6	1.8

This storage reserve provides a short-term supply to address emergency situations, such as pipeline shutdowns (which can and have occurred during drought conditions), water source

[20] For the Water Utility, 20% of annual demand is equivalent to around 3.7 months of average winter demand and about 1.5 months of average July demand.

[21] In meeting this factor, it is assumed that the City cannot rely on the existing Colorado-Big Thompson Project (CBT) carryover program. This program currently allows each CBT unit holder to carry over up to 20% of its CBT unit ownership in CBT reservoirs for use in the following year. However, this program has varied over the years and there is no guarantee that it will be continued in the future.

contamination, infrastructure failure, droughts worse than reliability criteria and other emergency events and uncertainties. Acquiring storage in the Poudre Basin for meeting the storage reserve would help diversify the City's water supply system, which is highly reliant on CBT storage.

The SRF was increased from 15% in the 2003 policy to 20% in this update. Following considerable discussion, Water Board and City Council agreed that a 20% SRF was necessary to ensure adequate water supplies while maintaining a 1-in-50 drought criterion in conjunction with a 150 gpcd planning demand level.

Water Utility Strategies

Recommended strategies for addressing the SRF include:

- Use the 20% SRF in the water supply modeling.
- Closely monitor climate change studies and potential impacts to the City's water supply. If warranted, future changes may be made to the SRF to address climate change.

5.3.2 Climate Change (Policy Section 2.0)

Policy Element

Climate change could significantly impact the reliability of the City's supplies and/or the amount of water required to maintain existing landscapes[22]*; however, there is a great deal of uncertainty related to current climate change projections along the Colorado Front Range and its impact on municipal demands and water supply systems. The City's planning criteria and assumptions are conservative in part to account for climate change based on the information to date. The City will continue to monitor climate change information and, if necessary, will revise its water supply planning criteria and assumptions to ensure future water supply reliability.*

Background

Climate change may have significant impacts on both water demands and water supplies. Numerous studies on climate change and the general impacts that are expected in the field of water supply and demand have been produced by reputable scientific organizations including the Joint Front Range Climate Change Vulnerability Study. Although additional research is still needed to determine the extent of local impacts, there is general consensus that climate change in the Mountain West will likely include the following changes:

- Increased evapotranspiration rates, increasing the amount of water required to maintain a given level of landscaping.
- More frequent dry spells and a longer growing season.
- Changes in seasonal snow pack.

[22] Current research indicates that changes in precipitation in this area are uncertain but that temperatures will increase and therefore it is likely that runoff will come earlier and in a shorter amount of time, precipitation may more often come as rain, and higher temperatures will increase outdoor demands and change growing seasons for existing landscapes.

- Earlier spring snowmelt and runoff.
- Significantly reduced stream flows during the summer and fall.
- Changes in the distribution of precipitation over the year.

These changes are expected to accelerate over the decades ahead and impacts may depend largely on factors such as population growth, economic growth and technological changes. The Water Utility will likely face significant challenges in the years ahead managing both water demands and water supplies.

In the area along the Front Range of northern Colorado, while temperature trends are relatively clear, it is particularly difficult to project future precipitation trends. One such attempt that averages the results of several Global Climate Models (GCM) results in several potential scenarios for this area. These models suggest that temperatures could increase an average of about 2 degrees Celsius by 2040 and 3 degrees by 2070. The change in precipitation shows an average annual increase of about 1% by 2040 and 2% by 2070. The precipitation distribution over the year is expected to change and it is expected to be wetter during the winter months and drier during the spring and summer months. Conclusions from the Joint Front Range Climate Change Vulnerability Study conducted in 2012 recommend the following:

- Expect runoff to occur earlier.
- Consider contingency plans for both increases and decreases in average annual runoff.
- Monitor evolving indicators of climate change at both global and regional scales to identify trends and evaluate the relative merits of existing and future climate change models.
- Broaden the scope of selected climate change models to use in hydrologic simulation to more fully explore the range and distribution of outcomes.
- Be prepared to incorporate updated climate change model outputs in planning processes based on forthcoming advances in climate science.
- Encourage advances in climate science that will facilitate accurate hydrologic assessment.

From a water demand perspective, hotter and drier conditions during the growing season will result in more evapotranspiration and water use for trees, lawns and other vegetation. In Fort Collins, outdoor water use is about one-third of total use on an annual basis. Based on current use patterns and conditions, a 10% increase in outdoor water use could result in an increase of about 7 gpcd. A 20% increase in outdoor water use translates to an increase of 14 gpcd. Without conservation and/or significant changes in landscaping choices, outdoor water use will likely increase over the coming decades as customers strive to maintain their landscapes in a hotter and longer growing season. Outdoor water conservation efforts can help counter-balance this increase by lowering demand through activities such as efficient irrigation practices, xeriscaping and other best management practices including the proper preparation of soils and use of mulch to retain moisture in the soil.

Water Utility Strategies

Recommended strategies for addressing climate change include:

- Continue to remain at the forefront of climate change by participating and staying updated on local, regional and global studies and closely assessing water supply and demand trends relative to weather and climate patterns within Fort Collin's water supply system.
- Continue to add a certain level of conservatism in water supply reliability planning efforts to account for the uncertainty of climate change.
- Consider incorporating climate change into water supply reliability planning effort if considered valuable at a future date.

5.3.3 Water Supply Shortage Response Plan (Policy Section 2.3)

Policy Element

The City will maintain a plan for responding to situations where there are projected water supply shortages, either because of severe drought conditions (i.e., greater than a 1-in-50 year drought) or because of disruptions in the raw water delivery system. When needed, the Water Supply Shortage Response Plan will be activated based on the projected water supply shortage.

This plan will include measures to temporarily reduce water use through media campaigns, regulations, restrictions, rate adjustments and other measures. The plan may also include provisions to temporarily supplement the supply through interruptible water supply contracts, leases, exchanges and operational measures. Reducing the City's water use during supply short situations may lessen adverse impacts to irrigated agriculture and flows in the Poudre River. The plan will be reviewed periodically and, if necessary, updated to reflect changes in the City's water use and its water supply system.

Background

Prior to the early 2000s drought (2000-2003), the City did not have a written plan for responding to water supply shortages. In response to the severe drought year 2002 and in anticipation of continuing drought conditions, the City developed the Water Supply Shortage Response Plan, adopted by the City Council in April 2003 (Ordinance No. 48, 2003). The plan dictates the steps to be taken when there are water supply shortages and contains four different response levels based on the severity of the shortage. Although the Water Utility's main objective is to provide customers with an adequate and reliable water supply, there will be times when the City's water supply is projected to be less than anticipated demands. A response plan enables the City to quickly make the necessary adjustments in order to reduce water demands to a level that matches supply. It is anticipated that this plan will be reviewed periodically and may be changed in the future to match the City's changing water supplies, facilities and operations.

Water Utility Strategies

Recommended strategies for addressing the Water Shortage Response Plan include:

- Periodically review and maintain a Water Supply Shortage Response Plan to proactively respond to supply shortages

- Consider adding voluntary water restrictions to the Water Supply Shortage Response Plan.

5.3.4 Additional Supplies and Facilities (Policy Section 2.4)

Policy Element

In order to meet projected growth within the Water Utility's service area, as well as maintain system reliability and operational flexibility, the City will need to increase the firm yield of its current water supply system. The following policy elements address ways of meeting these needs.

Background

The Water Utility's current treated water firm yield is approximately 31,000 AF, based on the City's existing water right portfolio and infrastructure. This was determined by modeling the base demand that can be met assuming a 1-in-50 year drought, while maintaining a storage reserve. Additional information on the firm yield concept is provided in Section 4.2.2. It is anticipated that the population within the Water Utility's service area will continue to grow, requiring additional supplies to meet the future demand.[23] The new supplies will increase the firm yield of the water supply system, enabling the Water Utility to meet a higher demand in periods that are stressed by drought.

Raw Water Requirements for New Development (Policy Section 2.4.1)

Policy Element

The City shall require developers to turn over water rights as approved by the City, or cash in-lieu-of water rights, such that supplies can be made available to meet or exceed the demands of the Water Utility's treated water customers during a l-in-50 year drought.

Cash collected shall be used to increase the firm yield and long-term reliability of the City's supply system. Potential uses of cash include acquiring additional water rights, entering into water sharing arrangements with agricultural entities, purchasing or developing storage facilities and pursuing other actions toward developing a reliable water supply system. Consideration will be given to providing a diversified system that can withstand the annual variability inherent in both water demands and supplies. The balance between water rights being turned over and cash received by developers should be monitored and adjusted as needed to develop a reliable and effective system.

Background

When new development occurs within the current Water Utility service area, developers are assessed a raw water requirement. This practice originally began in the 1960s and has been modified throughout the years. The current method is based on a 1983-84 study which developed a method to calculate the raw water requirements accounting for different types of use and acreage size. This method is described in further detail in Section 4.1.4.

[23] Section 4.3.1 provides a detailed discussion on how population projections are developed.

Developers and builders may satisfy the raw water requirements by turning over water rights acceptable to the City or paying cash in-lieu-of the water rights. Cash in-lieu-of payments can be used to purchase additional water rights when appropriate or acquire other means of increasing the City's water supply, such as developing storage capacity. The cash fee has been periodically adjusted over the years to reflect the price of water rights on the market. Additional information on this program is provided in Section 4.1.4.

This approach enables the Water Utility to acquire additional supplies necessary to meet the demands of the new development, while also providing flexibility to both the Water Utility and developers in arranging a payment that meets the mutual needs of both entities.

Water Utility Strategies

Recommended strategies for addressing raw water requirements for new development include:

- Continue to assess raw water requirements for new development and acquire adequate water rights for future growth.
- Adjust the cash in-lieu-of rate as needed to obtain an appropriate mix of water rights and cash to achieve an adequate and reliable raw water supply system.
- Acquire sufficient reusable sources to meet future demands requiring such water.

Acquisition and/or Sharing of Agricultural Water Supplies (Policy Section 2.4.2)

Policy Element

The City currently owns and will acquire additional water rights that are decreed only for agricultural use. The City will periodically need to change these water rights from agricultural use to municipal use to meet its water supply needs. The City will change those rights that come from areas upon which the City is growing, or from areas where the irrigation has ceased, when needed. For water rights that were derived from irrigated agricultural lands that remain in viable agricultural areas, the City will refrain from converting agricultural decrees to municipal use as long as other water supply options are available or other factors make it prudent to do so. The City will also work towards water sharing arrangements that provide water for municipal uses when critically needed and that allow for continued agricultural use of water at other times, in a manner that preserves irrigated agricultural lands over the long-term.

Background

Many of the water rights that the City owns are in the form of irrigation company shares. Most of these shares must be changed through Water Court in order to use them for municipal purposes. Some of these shares come from areas where the City is growing or from shares where the irrigation of such lands has ceased. However, some of the shares obtained are from irrigated agricultural lands that remain in production. Due to population growth in the area and subsequent rises in water prices, more and more irrigation share owners desire to sell their water rights and remain in business by renting the water needed for their operations. Although these

water users lose the certainty of receiving water via ownership, those who sell their shares can often receive high prices and then rent water for a relatively low cost. Changing irrigation shares to municipal use may reduce the amount of water available for rental and potentially drive some agricultural renters out of business.

In order to follow the Water Utility's objective of providing water for the needs of its primary customers, the City will need to periodically change its water rights from agricultural use to municipal use. Shares are generally changed from areas where the City is growing or from shares where irrigation has ceased and such a change does not appear to be detrimental to the agricultural community. Additionally, most of the water rights the City acquires are from ditches that use to service areas not developed or going to be developed by the City. This sustainable approach helps to preserve the agricultural lands that are not zoned for development and are projected to remain in agricultural production for the long-term.

Water Utility Strategies

Recommended strategies for addressing acquisition and/or sharing of agricultural water supplies include:

- Closely monitor the City's growth and when necessary change agricultural water rights to municipal use. Reserve these changes for water rights that irrigate lands zoned for urban development or have been taken out of agricultural production
- Consider future water right change cases that provide the ability to lease back water for agricultural use.

Facilities (Policy Section 2.4.3)

Policy Element

The City will pursue the acquisition or development of facilities that are needed to manage the City's water rights in an efficient and effective manner and enhance the City's ability to meet demands through at least a 1-in-50 year drought. These facilities may include storage capacity, diversion structures, pipelines or other conveyances, pumping equipment, or other facilities that increase the firm yield of the City's supply system.

Additional storage will be acquired or constructed considering 1) the City's return flow obligations incurred from changes of water rights, 2) the City's need to carryover water from wet years to dry years in order to meet its drought criteria, 3) operational flexibility, redundancy and reliability of the City's water supply system, and 4) potential multiple-use benefits (i.e., environmental flows, recreational uses, etc.). The City will analyze the potential environmental impacts of developing storage along with other associated costs and benefits, and will develop that storage in a manner that avoids, minimizes or offsets the effects to the environment. Storage capacity options include the enlargement of Halligan Reservoir, the development of local gravel pits into storage ponds, the acquisition of storage capacity in new or existing reservoirs, the development of aquifer storage, or some combination of the above.

Background

As reflected in the objective of this policy, it is the Water Utility's responsibility to provide an adequate, safe and reliable supply of water to its customers. While the City currently has sufficient water rights to meet a 1-in-50 year drought, the majority of its water rights provide yield during the high run-off period. Additional storage, in combination with conservation and other management tools, is necessary to meet future demands during dry-periods. The City currently owns and controls only 6,500 acre-feet of active storage capacity in Joe Wright Reservoir. This is inadequate to effectively regulate the wide variety of water rights the City owns. Computer modeling results show that additional storage capacity is needed to more effectively manage the variety of water rights that the City currently owns. This is discussed in further detail in Section 4.3.4.

As City demands grow and the City transfers more of its water rights from agricultural use to municipal use, the need for storage increases. New storage capacity is needed to (1) help meet year-round return flow obligations incurred from transfers of water rights from agricultural use to municipal use, (2) provide carryover water from wet years to dry years and (3) provide operational flexibility and reliability. Storage options that are being studied and discussed include the enlargement of Halligan Reservoir, the development of local gravel pits into storage ponds and the acquisition of storage capacity in new or existing reservoirs. Additional storage would result in a more reliable system that better utilizes the City's existing and future portfolio of water rights. Although less effective than managing existing water rights with additional storage, other non-infrastructure water supply options that could be used in combination with storage include water right acquisitions, change of the City's existing agricultural water rights to municipal use and water conservation.

It is important to note that one of the key principles the Water Utility adheres to when addressing water supply is being a steward of the City's water resources, which includes watershed management. The City is currently undergoing the NEPA permitting process for the enlargement of Halligan Reservoir, which involves the analysis of potential environmental impacts associated with multiple water supply and storage options in addition to the costs and benefits. This corresponds with the City's triple-bottom-line and is intended to minimize environmental impacts.

Water Utility Strategies

Recommended strategies for addressing facilities include:

- Continue to pursue additional storage options that increase the firm yield or reliability of the City's water supply system. This may include the enlargement of Halligan Reservoir, the development of local gravel pits into storage ponds and/or the acquisition of storage capacity in new or existing reservoirs.
- Develop operational plan that optimizes the use of storage to meet demands while also providing other benefits such as instream flows, agricultural leases, recreational uses, etc.

- Work with regional entities to evaluate and possibly participate in regional water supply and storage projects.

5.4 Treated Raw Water Quality (Policy Section 3.0)

Policy Element

Policy ENV 21.1 of Plan Fort Collins states, "Develop and adhere to drinking water quality standards, treatment practices, and procedures that provide the highest level of health protection that can be realistically achieved." In addition, the City will take an active role in protecting the quality of water in the various watersheds from which the City's raw water is derived and maintaining the taste and quality of the City's treated water. This may include mixing of the City's source waters to maintain high water quality and require collaboration with private, county, state and federal land owners and managers. The acquisition, development, and management of the City's raw and treated water will be consistent with the City's Drinking Water Quality Policy and other applicable policies related to watershed protection and water treatment.

Background

Utilities has a long standing commitment to providing customers with high quality water. Due to Fort Collins' proximity to the mountains, where the majority of the water supply originates, the quality of the raw water is relatively high and there are many businesses within City limits the rely on the high quality of water for production purposes. The quality of treated water produced by the City is addressed in the City's current Drinking Water Quality Policy (Resolution 93-144).

The quality of the City's water supply sources and watershed is also of great importance. Water quality is a component of the environmental health vision for Plan Fort Collins which advocates for: "meeting or exceeding standards for stream water quality, drinking water quality and water reclamation." The City is active in promoting actions to protect the quality of raw water in local rivers and streams. The Water Utility collaborates with other drinking water providers to monitor and assess water quality in the upper Poudre River watershed. They are a member of the Big Thompson Watershed Forum and partner with a variety of organizations to monitor and analyze water quality in the CBT watershed. Monitoring data are used to determine if activities in the watershed are causing water quality to change over time.

Water Utility Strategies

Recommended strategies for addressing treated raw water quality include:

- Continue to provide a high quality treatment of water according to the City's Drinking Water Quality Policy.
- Operate the Water Utility's water supply system to maximize water quality benefits.

- Continue to consider water quality an important factor in the decision-making process for acquiring and developing new water supplies.
- Actively participate in and promote protection of water quality in the respective watersheds from which the City receives its supplies.

5.5 Use of Surplus Water (Policy Section 4.0)

Policy Element

The City will use its existing supplies to meet municipal obligations with the following priorities: 1) to meet water demands by the City's treated water customers, and 2) to meet the City's raw water needs as well as other City raw water obligations. Raw water needs include use for such purposes as irrigation of City parks, golf courses, cemeteries and other greenbelt areas. Additional raw water obligations include primarily water transfers to other entities because of agreements or exchanges made to manage the water supply system more effectively.

Water not needed for the above purposes is referred to as surplus water and may be made available to others in accordance with decrees and other applicable policies. Since the City plans its water supply system using a 1-in-50 year drought criterion, it typically has significant quantities of surplus raw water in many years. This surplus water may be available on a year-to-year basis or through multi-year arrangements that do not significantly impair the City's ability to meet municipal demands. The City will continue to rent its surplus supplies at a fair market price that helps offset the cost of owning such supplies and benefits the Water Utility ratepayers.

Background

In order to maintain supplies that will meet dry year demands, the City has obtained water supplies in excess of average demands, producing surplus water in most years. After meeting the needs of City customers, the surplus water is currently made available to entities or individuals at a fair market price that helps offset the City's ownership costs. There are many competitors for the rental of this water, including agricultural users, municipal entities and other users of raw water.

The City of Fort Collins for many years has made its surplus raw water available to irrigators around Fort Collins and within the Northern Water boundaries. The amount available varies considerably from year-to -year because of the City's demand, the annual variability in water yield and the demand from the agricultural community. The variability in both supply and demand are primarily affected by the precipitation throughout the year, both in the mountains and on the plains. The annual quota set by Northern Water for the CBT project water has a major effect on the total supply available to Fort Collins. Additional information on the City's surplus water supply and rental program is available in Section 4.5.2.

Water Utility Strategies

Recommended strategies for addressing use of surface surplus supply include:

- Continue to meet the primary treated water needs of municipal customers prior to providing raw water.
- Once the treated and raw water demands are met, lease surplus supplies to irrigators and others within the Poudre River Basin or the Northern Water boundaries on a year-to-year basis.
- When surplus supplies are short, allocate water in a manner that will not encourage renters to depend on City water.

5.5.1 Commitment to Beneficial Purposes (Policy Section 4.1)

Policy Element

Acknowledging that the City's use of its valuable water resources has impacts to the environment and the region, the City will commit to using its surplus supplies for other beneficial purposes such as supporting irrigated agriculture, supplementing flows in the Poudre River or providing other regional benefits. The City's surplus supplies come from a variety of sources, each of which has unique characteristics. These sources include CBT water and shares in several irrigation companies. Some sources are more suitable and available than others to meet beneficial purposes. Whether the surplus raw water can be used for these other purposes is dependent upon a number of factors, including the type of water, place of use and other decree limitations. Any potential use of these supplies should consider, and will likely require coordination with, other water users, state agencies and other groups. Some uses of the surplus supplies, such as maintaining an instream flow according to the State's Instream Flow Program, may require a change of water rights through the water court process. The City will engage in a thorough evaluation of these issues as part of assessing the use of its surplus supplies for these beneficial purposes.

Utilities will evaluate implementing a program to allow voluntary contributions from its ratepayers (i.e., Utility bill "check-off box") for programs that are designed to support the following purposes: preserving local agriculture, supplementing flows in the Poudre River, or meeting other beneficial purposes that our community may desire.

Background

The preservation of rural lands and health of the Poudre River are important to the City's future vision. Principle LIV 42 of Plan Fort Collins states: "Rural Lands and agricultural uses will be a valuable component of Fort Collins' economy, culture, and heritage..." while Principle ENV24 supports instream flows within the Poudre River stating: "The City will support a healthy and resilient Poudre River ecosystem, and protect, enhance and restore the ecological values of the River."

The Water Utility's commitment to using surplus water supplies for agricultural and environmental purposes was also strongly supported by the CWG throughout the policy update process. The CWG expressed that one of the strengths of this policy update was emphasizing agricultural preservation and water sharing as well as the protection of instream flows.

During the CWG policy update process, the concept was developed of using voluntary contributions from ratepayers to support programs that are designed to benefit agriculture, instream flows or other identified options. This program will be evaluated by the Water Utility and if proven to be effective, will be implemented on an appropriate scale to raise funds for such programs.

Water Utility Strategies

Recommended strategies for addressing beneficial purposes include:

- Continue to rent surplus supplies to the surrounding agricultural community.
- Explore opportunities and work with others to use surplus supplies for other beneficial purposes.
- Evaluate implementing a program to allow voluntary contributions from its ratepayers (i.e., Utility bill "check-off box") for programs that are designed to support beneficial purposes that our community may desire.

Agriculture and Open Space (Policy Section 4.1.1)

Policy SW 3.2 of Plan Fort Collins states, "Participate in and follow the Northern Colorado Regional Food System Assessment project and other Larimer County agricultural efforts, and implement their recommendations at a local level, if appropriate." In addition, Policy LIV 44.1 of Plan Fort Collins states, "Maintain a system of publicly-owned open lands to protect the integrity of wildlife habitat and conservation sites, protect corridors between natural areas, conserve outstanding examples of Fort Collins' diverse natural heritage, and provide a broad range of opportunities for educational, interpretive, and recreational programs to meet community needs." To the extent that surplus water is available, the City will continue to support the local agricultural economy and help preserve the associated open spaces by renting surplus agricultural water back to irrigators under the respective irrigation companies.

The City will explore long-term rental and sharing arrangements with irrigators[24] *in order to support the regional food system, encourage agricultural open space and other benefits provided by irrigated agriculture, as well as benefit the Water Utility ratepayers.*

Background

The majority of the surplus raw water in the past has been rented to help offset the City's cost of owning such supplies while supporting local irrigators. This has proven to be a successful program and in both generating additional revenue and supporting local agriculture. Since the City needs a varying amount of water from year to year, it is desirable to have a rental system that does not encourage dependency on City water. It is also desirable to maintain considerable flexibility in order to effectively deal with the variability associated with the City's surplus rental

[24] The City's largest irrigation company ownership interest is in the North Poudre Irrigation Company, which still has substantial lands in irrigated agricultural production and has a unique mix of native water and CBT water that lends itself to these types of partnership arrangements.

water. Detailed information on the City's agricultural rental program is provided in Section 4.5.2.

There have been a few recent meetings of the Water Supply Committee of the Water Board with representatives of the Larimer County Agricultural Advisory Board to discuss ways of sharing supplies between the City and local irrigators. Some of the reasons for this approach is to help stabilize the viability and benefits of local irrigated agriculture while providing other amenities that are appreciated by City residents (such as open space, wetlands and wildlife). These types of long-term agreements will take additional studies, legal analysis, discussion and negotiations that are beyond the development of this policy.

Water Utility Strategies

Recommended strategies for addressing agriculture and open space include:

- Explore long-term rental and sharing arrangements with irrigators in order to support the regional food system, encourage agricultural open space and other benefits provided by irrigated agriculture, as well as benefit the Water Utility ratepayers.

Instream Flows (Policy Section 4.1.2)

Policy ENV 24.5 of Plan Fort Collins states, "Work to quantify and provide adequate instream flows to maintain the ecological functionality, and recreational and scenic values of the Cache la Poudre River through Fort Collins." Recognizing that its water use depletes natural streamflows, the City will seek innovative opportunities to improve, beyond any associated minimum regulatory requirements, the ecological function of the streams and rivers affected by its diversions. The Water Utility will take a leadership role in working with other City departments, local and regional groups and agencies towards the following objectives in accordance with Colorado water law and the administration of water rights in Colorado: 1) encourage flows in local streams to protect the ecosystem, 2) pursue the operation of its water supplies and facilities in a manner that avoids, minimizes or offsets the effects to the environment while meeting customer demands, and 3) explore projects or measures that would provide flows in streams and water in reservoirs for recreational and aesthetic purposes.

Background

The City has demonstrated a strong desire to improve instream flows in the Poudre River. Plan Fort Collins contains a Poudre River Corridor section with a specific policy (ENV 24.5) stating "Coordinate to Provide Adequate Instream Flows." The Water Board has made a recommendation to City Council to support an "Instream Flow Feasibility Study and Action Plan" and the Natural Resources Department has City Council support to develop an ecological model that will predict future conditions of the lower Poudre River ecosystem based on likely and feasible changes to the system for the purpose of selecting a vision for the river. This project coincides with efforts of the newly developed Health of the Poudre River Subcommittee of the

Natural Resources Advisory Board. Although they are in the beginning stages, it is anticipated that the Water Utility will participate in these efforts.

The Water Utility could provide a supporting role in this effort with staff's expertise and the potential use of the surplus supplies. However, there needs to be considerable review and study to address the following questions:

- Where, how much and when are flow increases needed?
- Can these flow increases be reasonably achieved?
- What types of water rights or river operations can help meet these flow increases?
- What legal (Colorado water rights administration) factors need to be considered?
- How much will it cost to study, legalize, engineer and achieve these flow increases? Who will pay for these costs?

In order to use the City's existing water rights (surplus or not), there will also need to be considerable study and legal analysis to address the following questions:

- Can the City use its water rights for instream flows (or other uses) if it reduces the yields available to its treated and raw water customers in a manner that would violate the City's drought criteria?
- Can the City use its water rights for instream flows to the extent that such instream flow use comes from reduced municipal use through additional water conservation, thereby avoiding a violation of the City's drought criteria?
- What risks would be incurred if the City were to change some of its water rights to include instream flow as an alternate use?
- What are the implications of potentially reducing rental revenues?

Some of the limitations the City must consider in using its surplus raw water to benefit the river include:

- Most of the City's water rights are not decreed for instream flow purposes.
- Measuring devices (flow gages) may be needed to get flows past certain diversion points in the river.
- Modifications may need to be made (at the City's expense) to other entities' diversion structures to allow for controlled bypass of instream flows.
- CBT water cannot be put in the river only for increasing flows – it must have a delivery location on the river and a legitimate beneficial use at that location.
- Unconverted water rights cannot be taken anywhere other than the original ditch company's river diversion.
- Water rented to downstream users is typically subject to their desired delivery method (if you make it too difficult, they may not want to rent it).

Although there are many complexities involved, there are several ideas that have been considered for providing benefits to the Poudre River. The following are some of these ideas, which would require additional study and analysis to assess their potential viability:

- The most likely of the City's surplus supplies that could be used in the CWCB Instream Flow Program are excess yields of its converted agricultural rights that no longer support irrigated agriculture and are available during high runoff months (May, June and July) in wet to average years. Storage capacity may be needed to regulate these supplies in order to provide consistent flows throughout the year and during dryer years.
- Renting the City's surplus supplies to users downstream of Fort Collins.
- Having the City purchase water rights and/or facilities for the sole purpose of improving flow conditions.
- Running water past irrigation company diversions that are upstream of Fort Collins, diverting it downstream of the City and pumping it back up to the original irrigation company ditch.
- Working with all new water supply projects in the Poudre Basin that require permitting to help maintain and/or improve flows conditions.
- Inviting Poudre Basin water users and the Poudre River Commissioner to review basin operations and potential ways of improving flow conditions.

Water Utility Strategies

Recommended strategies for addressing instream flows include:

- Seek opportunities to improve the ecological, recreational and aesthetic function of the streams, rivers and reservoirs.
- Support and encourage instream flows in local streams.
- Conduct operations in a manner that customer demands while avoiding, offsetting and/or minimizing environmental impacts.
- Assume a leadership role in working with City departments and other groups and agencies in achieving the items listed above.

Other Arrangements (Policy Section 4.1.3)

The City will consider and participate in other surplus water supply arrangements with other entities that provide mutual benefits and support the region. These may include other rental agreements, augmentation plans and other cooperative arrangements with regional partners. These types of arrangements should be limited to unique opportunities that are mutually beneficial to the parties and provide significant social, economic or environmental benefits to the region.

Background

A variety of new opportunities may develop as water users and others with a vested interested in the Poudre River watershed collaborate to benefit the region. The City will be an active

participant and where appropriate, lead such initiatives. This may include new rental/leasing agreements with irrigators, augmentation plans and other collaborative partnerships.

Water Utility Strategies

Recommended strategies for addressing other arrangements include:

- Seek out other surplus water supply arrangements with other entities that provide mutual benefits and support the region. These may include other rental agreements, augmentation plans and other cooperative arrangements with regional partners.

5.6 Regional Cooperation (Policy Section 5.0)

Policy Element

The City recognizes the importance in maintaining good relationships with regional entities and coordinating efforts to achieve mutual goals. The City also recognizes that growing Colorado municipalities are currently struggling to define a way to meet future water supply needs in a manner that minimizes negative impacts to agricultural economies and river ecosystems. The Water Utility will endeavor to be a leader in demonstrating how water supply can be provided in a manner that respects other interests and provides a culture of innovation.

Background

As the population continues to grow along the Front Range, the municipal demand for water continues to increase, stressing a scarce water supply. Furthermore the physical, legal, economic and environmental dynamics are becoming more complex and interrelated. In order to preserve the diverse interests of the water users in the region, along with the recreational benefits and environmental needs, it is crucial that the City maintain good working relationships with local and regional entities and where appropriate, for the City to play a leadership role.

5.6.1 Working With Other Municipal Providers (Policy Section 5.1)

Policy Element

The City will continue to work with the water suppliers throughout the northern Colorado Front Range to assure that adequate supplies are maintained in the region. When benefits are identified, the City will cooperate with area entities in studying, building, sharing capacity and operating water transmission lines, distribution systems and storage reservoirs for greater mutual benefit. The City has common interests and the potential to cooperate with regional entities including the water districts around Fort Collins, the City of Greeley and the Northern Colorado Water Conservancy District, as well as other Colorado water providers. In particular, the City should work closely with water districts that serve Fort Collins residents to encourage similar policies regarding drought protection, conservation and to provide mutual assistance during emergencies.

Background

As growth continues in Fort Collins and the surrounding area, it is increasingly difficult to adopt policies or build projects without affecting one or more neighboring entity. Several water districts serve water inside the City boundaries. Policies made by the respective entities are compared with one another. Water rights are obtained from the same sources – either the Poudre River or the CBT Project. Facilities needed by different entities are side by side. Expertise and capabilities vary with each entity. There are opportunities to share facilities and knowledge, thereby reducing the cost to Water Utility customers.

The Tri-Districts (Fort Collins-Loveland, East Larimer County and North Weld County), which operate the Soldier Canyon Filter Plant, have much in common with the Fort Collins Water Utility and their systems are closely interrelated. Figure 16 shows the boundary of their service areas. Both treat water from Horsetooth Reservoir and have a need to develop additional sources from the Poudre River. Their transmission lines traverse through the City adjacent to many of Fort Collins Water Utility's pipelines.

West Fort Collins Water District (WFCWD) presently turns over raw water to the Water Utility, where it is treated and then returned to WFCWD for distribution. The City of Greeley diverts water from the Poudre River and has several storage reservoirs in the Poudre River Basin. Northern Water provides CBT water to all the local water users and has a leadership role in many water planning and management issues. Several groups such as the Larimer-Weld Water Issues Group (LWWIG) have been formed in the past to share information and pursue common goals.

The relationship between the City and other municipal water providers becomes increasingly important as growth in the Poudre River Basin increases and during drought periods when a consistent message to the public concerning the drought can be very beneficial. Sharing facilities, supplies and/or public outreach campaign messages with these entities may provide regional benefits and cost savings for all customers.

Water Utility Strategies

Recommended strategies for addressing working with other municipal providers include:

- Work closely with water districts that serve Fort Collins residents to encourage similar policies regarding drought protection, water conservation and mutual assistance during emergency situations.
- Continue to cooperate with the Tri-Districts regarding the sharing of treated water and conveyance through common facilities.
- Work toward more uniform policies regarding raw water requirements among the Water Utility and local water district that serve residents of the City of Fort Collins.
- Continue to work closely with Greeley, Northern Water and the Tri-District on Poudre River Basin modeling efforts.

- Monitor, provide input and/or be involved as necessary in regional supply projects.
- Continue participation in regional groups for information exchange and to identify opportunities for cooperation.

5.6.2 Working With Local Irrigation Companies (Policy Section 5.2)

Policy Element

The City will continue to cooperate with local irrigation companies regarding the use, exchange and transfer of water in the Cache la Poudre River Basin. As a major shareholder in many of the local irrigation companies, it is necessary and desirable that the City work closely with these companies. Much of the water supply available to the City is through the ownership of shares in local irrigation companies.

Background

The Water Utility currently owns a significant number of shares in several local irrigation companies, including NPIC, Pleasant Valley and Lake Canal Company, Arthur Irrigation Company, Larimer County Canal No. 2 Irrigation Company, New Mercer Ditch Company and WSSC, among others. Besides owning shares of these companies, the City regularly cooperates to maximize the efficient use of Poudre River Basin water by participating in exchanges and transfers. The manner in which the City uses shares can significantly affect the operations of these companies, especially when the water is changed from agricultural to municipal use. City staff members serve on the board of directors for some of these companies, helping to make important decisions regarding the operation of the companies.

Maintaining a good relationship between the City and the local irrigation companies is important in managing the supplies in the Poudre River Basin. Continued cooperation with these companies provides benefits to the City, the agricultural community and the Poudre River Basin as a whole.

Water Utility Strategies

Recommended strategies for addressing working with local irrigation companies include:

- Continue to cooperate with local irrigation companies regarding the transfer, exchange and use of water in the Poudre River Basin.
- Continue to participate as board members and/or shareholders in local irrigation companies.

5.6.3 Working with Others (Policy Section 5.3)

Policy Element

City Departments will work together and also cooperate with local, state and federal agencies, civic organizations, environmental groups and other non-governmental organizations when common goals would benefit City residents and the surrounding community. Examples of goals

that may involve City water supplies and be worthy of collaborative efforts include support for existing and development of new local food sources, promoting open space, improving river flows and supporting the local economy. Such efforts should identify appropriate entities and sources of revenue for specific goals or projects.

Background

The City's future is increasingly intertwined with other water agencies and organizations, which creates new challenges and opportunities. City planning efforts routinely engage stakeholders and public outreach efforts to ensure that the community's needs and regional interests are being represented to the decision makers and incorporated into the City's planning efforts. Water is integral to the quality and economic vibrancy of the Fort Collins community. When planning decisions concerning water are being made, it is crucial to engage stakeholders in the process and collaborate with regional agencies and groups. Stakeholders often represent a diversity of interests including business, recreational, agricultural, other municipalities and water users in the region and the environment.

Water Utility Strategies

Recommended strategies for addressing working with others include:

- Continue public outreach efforts.
- Seek input from stakeholders and where appropriate from the general public during future planning efforts (i.e. water conservation plan?)

Appendix A 2012 Water Supply and Demand Management Policy

RESOLUTION 2012-099
OF THE COUNCIL OF THE CITY OF FORT COLLINS
ADOPTING A WATER SUPPLY AND DEMAND
MANAGEMENT POLICY

WHEREAS, a Water Supply Policy was adopted by the City Council in December 1988 to help direct the acquisition, development, and management of the City's water supplies since that time; and

WHEREAS, a Water Demand Management Policy was adopted by the City Council in April 1992, which set water use goals and provided for measures to help meet those goals; and

WHEREAS, in 2003, the City Council approved Resolution 2003-104, adopting a Water Supply and Demand Management Policy to provide guidance regarding the future development and use of the City's water supplies; and

WHEREAS, since that time, there have been significant reductions in the City's water use; and

WHEREAS, it is a high priority of the City to provide an adequate, safe and reliable supply of water for our community, while considering the potential effects of climate change on those supplies; and

WHEREAS, managing water use in Fort Collins to reduce impacts to the environments from which the City's supplies come is an important community value; and

WHEREAS, in light of the foregoing, and following discussions with interested citizens, stakeholder groups, the Water Board and City Council, City staff has developed a proposed Fort Collins Water Supply and Demand Management Policy, dated October 2, 2012, a copy of which is attached hereto as Exhibit "A" and incorporated herein by this reference (the "Policy"); and

WHEREAS, the concepts and principles to be incorporated into the Policy and a draft of the Policy were presented to, and discussed with, the City Council at a work session on January 10, 2012, and at the City Council's October 2, 2012, regular meeting; and

WHEREAS, a draft of the Policy was also presented to, and discussed with, the Water Board at the Board's July 19, 2012, meeting, and the Board's recommendations have been incorporated into the Policy attached hereto; and

WHEREAS, it is the desire of the City Council to formally adopt and approve the Policy.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF FORT COLLINS that the City Council hereby adopts the Fort Collins Water Supply and Demand Management Policy, to provide general criteria for City decision making regarding water supply

projects, acquisition of water rights, demand management measures, and other water supply and demand related issues.

Passed and adopted at a regular meeting of the Council of the City of Fort Collins this 20th day of November A.D. 2012.

Mayor Pro Tem

ATTEST:

City Clerk

CITY OF FORT COLLINS SEAL COLORADO

City of Fort Collins

Water Supply and Demand Management Policy

The City of Fort Collins' Water Supply and Demand Management Policy provides a foundational framework for water supply and demand management decisions concerning the City's water supply system. Operational and management actions and decisions by the Water Utility will be consistent with the provisions of this policy.

Objective
To provide a sustainable and integrated approach to 1) ensuring an adequate, safe and reliable supply of water for the beneficial use by customers and the community and 2) managing the level of demand and the efficient use of a scarce and valuable resource consistent with the preferences of Water Utility customers and in recognition of the region's semi-arid climate.

This objective aligns with the 2010 Plan Fort Collins that provides a comprehensive 25-year vision for the future development of Fort Collins. Policy ENV 21.2 of Plan Fort Collins states, "Abide by Water Supply and Demand Management Policy: Provide for an integrated approach to providing a reliable water supply to meet the beneficial needs of customers and the community while promoting the efficient and wise use of water."

This Water Supply and Demand Management Policy calls for a "sustainable and integrated approach" to water demand and water resources management. Sustainability is defined within the context of the triple-bottom-line decision making in Plan Fort Collins as, "To systematically, creatively, and thoughtfully utilize environmental, human, and economic resources to meet our present needs and those of future generations without compromising the ecosystems upon which we depend." Aligning with Plan Fort Collins, the Water Utility will take a leadership role by incorporating the triple-bottom-line in its management of water supply and demand. When this core value is applied to the use and development of our valuable water resources, the Utility will strive to:

- Avoid, minimize or offset impacts to our environment
- Consider the social benefits and impacts of having a reliable and high quality water supply
- Analyze the economic cost to provide such supplies, while also considering the effects it has to our local and regional economies

The Utility will continue to provide a culture of innovation that finds proactive and creative solutions in managing its water supplies and demands, which is a dynamic process that evolves along with changes in data management and technology, legal and political environments, economic development and water innovation, and as the State's population continues to increase. Given these factors, it is important to maintain an up-to-date effective policy that is based on current data. The policy's terms and conditions should be reviewed and updated by 2020, or sooner if desired by the City Council or the Utilities Executive Director.

1.0 WATER USE EFFICIENCY AND DEMAND MANAGEMENT

The City views its water use efficiency program as an important proactive response to supply variability and climate change. Elements of the City's conservation program include reducing indoor demand through improved technology, leak reduction and behavior change and reducing outdoor demand through improved irrigation efficiency and reasonable changes in landscaping. The City believes water use efficiency is of vital importance for many reasons, including to:

- Foster a conservation ethic and eliminate waste
- Demonstrate a commitment to sustainability
- Provide water for multiple beneficial purposes
- Reduce the need for capital expansion projects and certain operational costs
- Encourage and promote innovation in water demand management
- Prepare for potential impacts of climate change

1.1 Water Use Efficiency Goals for Treated Water Use

The City's 2009 Water Conservation Plan[1] established a goal of reducing the City's treated water use to 140 gallons per capita per day (gpcd)[2] by the year 2020[3]. The City will utilize water use efficiency measures and programs with the aim of reducing its water use to an average of 140 gpcd, subject to 1) continuing study of the water requirements of the City's urban landscaping, 2) impacts on water demand due to changes in land use policies, building codes and housing trends, 3) additional studies on climate change, and 4) changes in the water use goal as may be adjusted by any subsequent water conservation plans. This water use goal is subject to change as discussed above and is intended as a goal that can be met while sustaining reasonable indoor and outdoor values of the City.

The per capita peak daily demand[4] will be reduced or maintained to be no more than 350 gpcd by the year 2020, but may be adjusted by any subsequent water conservation plans.

1.2 Water Use Efficiency Program

Policy ENV 21.2 of Plan Fort Collins states, "Conservation measures should be implemented in accordance with the Water Conservation Plan and periodically adjusted to reflect new and effective conservation measures." The City will optimize water use efficiency through the programs and measures specified in its Water Conservation Plan. These programs and measures include educational programs, incentive programs, regulatory measures and operational

[1] State guidelines are changing the terminology of Water Conservation Plans to Water Use Efficiency Plans, and likewise conservation is being changed to water use efficiency. For purposes of this policy, water use efficiency is referred to as water conservation; however, the terminology may be used interchangeably.
[2] Gallon per capita per day (gpcd) calculations are based on the total treated water produced at the Water Treatment Facility for use by Water Utility customers (minus large contractual customers and other sales or exchange arrangements) divided by the estimated population of the Water Utility's service area.
[3] This goal represents an 8.5% reduction in water use compared to Fort Collins' 2006-2010 average daily water use of 153 gpcd. It represents a 29% reduction in water use compared to Fort Collins' pre-drought (1992-2001) average daily water use of 197 gpcd.
[4] The peak daily demand is 2.5 times the average daily use water conservation goal and is based on historic ratios of average to peak daily use.

measures. Specific measures and programs are outlined in the Water Conservation Plan. The overall effectiveness of these measures and programs will be evaluated on a regular basis and if necessary, modifications will be made to increase effectiveness or to modify the City's water use goal. An annual water conservation report will be prepared to describe the status and results of the various measures and programs. The Water Conservation Plan will be updated at a minimum of every seven years, as currently required by the State of Colorado.

1.3 Water Rate Structures

The City will have stable water rate structures with transparent accountability for all classes of customers. The water rate structures will provide an economic incentive to use water efficiently while also providing sufficient revenue for operational and maintenance purposes. Examples of structures that may be utilized include 1) tiered rates with increasing prices as water use increases, 2) seasonal blocks with higher rates during the irrigation season, and 3) water budget approaches based on appropriate targets for individual customers.

The City will annually review the effectiveness of its water rate structures as part of its financial analyses regarding Water Utility revenue, expenses and rates. Specific studies or changes to the rate structure may be made upon identification of the need to revise it. Any changes to the rate structure will require City Council approval.

1.4 Population Growth

Population growth is an important factor in determining the City's water supply needs, since increases in population generally increase the need for additional supplies. Population growth projections and associated water demand are mostly a function of land use planning, development densities, annexation and other growth related issues that can be affected by City Council decisions. The Water Utility will continue to work closely with the Current Planning Department, which provides population projections that may be effected by changes in City policies related to growth.

2.0 Water Supply Reliability

The City needs to meet future water demands in an efficient and reliable manner. Policy ENV 21.2 of Plan Fort Collins states, "Water supply reliability criteria will take into consideration potential effects of climate change and other vulnerabilities. Water supplies and related facilities shall be acquired or developed after careful consideration of social, economic and environmental factors." One of the Water Utility's primary objectives is to provide an adequate and reliable supply of water to its customers and other water users. Key principles that need to be considered when addressing water supply for municipal use include:

- Providing water supply system reliability and flexibility
- Considering a broad portfolio of resources that do not overly depend on any one source
- Maintaining a water storage reserve for unforeseen circumstances
- Maintaining water supply infrastructure and system security
- Being a steward of the City's water resources, which includes watershed management
- Collaboration with the City's regional water providers and users

- Maintaining awareness of state, national and worldwide trends and adapting as needed to meet our customer needs
- Promoting education, awareness and a culture of innovation among the Water Utility and others to enable creative responses to future water supply uncertainties

2.1 Water Supply Planning Criteria

An integral component of the City's water supply planning efforts is to maintain computer models that estimate the yield of its existing and future water supplies. The following water supply planning criteria are key parameters used in these models that provide a foundation for planning future supplies.

2.1.1 Planning Demand Level

The reliability of the City's water supply should be maintained to meet an average per capita demand level of 150 gpcd[5,6]. This planning level provides a value that is higher than the water use goal to address uncertainties inherent in water supply planning.

It is important to have a planning number that can be used for development of long-range water supply facilities. Because water supply system infrastructure may take many years to permit and construct, it is desirable to use conservative assumptions to size facilities that may be needed for the long-term. A planning demand level should be larger than the water use goal, primarily because of the uncertainties related to projected water demands, yields from specific water rights, climate change and other unanticipated effects.

2.1.2 Drought Criterion

The reliability and capacity of the City's water supply system should be maintained to meet the planning level demand during at least a l-in-50 year drought event in the Cache la Poudre River Basin. Water rights should be acquired and facilities (including storage capacity) should be planned and constructed sufficiently ahead of the time to maintain the 1-in-50 year drought criterion, considering the time required to obtain water court decrees and permit and construct diversion, conveyance and/or storage facilities. In using this criterion, the City seeks to provide a balance among water supply reliability, the financial investment necessary to secure such reliability and the environmental impacts associated with water storage and diversions.

2.1.3 Storage Reserve Factor

The City's water supply planning criteria will include a storage reserve factor that equates to 20% of annual demand in storage through a 1-in-50 year drought[7,8]. This factor provides an

[5] The 150 gpcd value is based upon the normalized 2006-2011 average daily use.
[6] The average per capita demand planning level is used for facility planning purposes. Gallons per capita per day (gpcd) calculations are based on the total treated water produced at the Water Treatment Facility for use by Water Utility customers (minus large contractual customers and other sales or exchange arrangements) divided by the estimated population of the Water Utility's service area. This number is multiplied by population projections developed by the City's Planning Department to calculate future water demands.
[7] For the Water Utility, 20% of annual demand is equivalent to around 3.7 months of average winter demand and about 1.5 months of average July demand.

additional layer of protection intended to address dimensions of risk outside of the other reliability criteria, including emergency situations (i.e. pipeline failure) and droughts that exceed a 1-in-50 year drought.

2.2 Climate Change

Climate change could significantly impact the reliability of the City's supplies and/or the amount of water required to maintain existing landscapes[9]; however, there is a great deal of uncertainty related to current climate change projections along the Colorado Front Range and its impact on municipal demands and water supply systems. The City's planning criteria and assumptions are conservative in part to account for climate change based on the information to date. The City will continue to monitor climate change information and, if necessary, will revise its water supply planning criteria and assumptions to ensure future water supply reliability.

2.3 Water Supply Shortage Response Plan

The City will maintain a plan for responding to situations where there are projected water supply shortages, either because of severe drought conditions (i.e., greater than a 1-in-50 year drought) or because of disruptions in the raw water delivery system. When needed, the Water Supply Shortage Response Plan will be activated based on the projected water supply shortage.

This plan will include measures to temporarily reduce water use through media campaigns, regulations, restrictions, rate adjustments and other measures. The plan may also include provisions to temporarily supplement the supply through interruptible water supply contracts, leases, exchanges and operational measures. Reducing the City's water use during supply short situations may lessen adverse impacts to irrigated agriculture and flows in the Poudre River. The plan will be reviewed periodically and, if necessary, updated to reflect changes in the City's water use and its water supply system.

2.4 Additional Supplies and Facilities

In order to meet projected growth within the Water Utility's service area, as well as maintain system reliability and operational flexibility, the City will need to increase the firm yield of its current water supply system. The following policy elements address ways of meeting these needs.

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[8] In meeting this factor, it is assumed that the City cannot rely on the existing Colorado-Big Thompson Project (CBT) carryover program. This program currently allows each CBT unit holder to carry over up to 20% of its CBT unit ownership in CBT reservoirs for use in the following year. However, this program has varied over the years and there is no guarantee that it will be continued in the future.

[9] Current research indicates that changes in precipitation in this area are uncertain but that temperatures will increase and therefore it is likely that runoff will come earlier and in a shorter amount of time, precipitation may more often come as rain, and higher temperatures will increase outdoor demands and change growing seasons for existing landscapes.

2.4.1 Raw Water Requirements for New Development

The City shall require developers to turn over water rights as approved by the City, or cash in-lieu-of water rights, such that supplies can be made available to meet or exceed the demands of the Water Utility's treated water customers during a l-in-50 year drought.

Cash collected shall be used to increase the firm yield and long-term reliability of the City's supply system. Potential uses of cash include acquiring additional water rights, entering into water sharing arrangements with agricultural entities, purchasing or developing storage facilities and pursuing other actions toward developing a reliable water supply system. Consideration will be given to providing a diversified system that can withstand the annual variability inherent in both water demands and supplies. The balance between water rights being turned over and cash received by developers should be monitored and adjusted as needed to develop a reliable and effective system.

2.4.2 Acquisition and/or Sharing of Agricultural Water Supplies

The City currently owns and will acquire additional water rights that are decreed only for agricultural use. The City will periodically need to change these water rights from agricultural use to municipal use to meet its water supply needs. The City will change those rights that come from areas upon which the City is growing, or from areas where the irrigation has ceased, when needed. For water rights that were derived from irrigated agricultural lands that remain in viable agricultural areas, the City will refrain from converting agricultural decrees to municipal use as long as other water supply options are available or other factors make it prudent to do so. The City will also work towards water sharing arrangements that provide water for municipal uses when critically needed and that allow for continued agricultural use of water at other times, in a manner that preserves irrigated agricultural lands over the long-term.

2.4.3 Facilities

The City will pursue the acquisition or development of facilities that are needed to manage the City's water rights in an efficient and effective manner and enhance the City's ability to meet demands through at least a 1-in-50 year drought. These facilities may include storage capacity, diversion structures, pipelines or other conveyances, pumping equipment, or other facilities that increase the firm yield of the City's supply system.

Additional storage will be acquired or constructed considering 1) the City's return flow obligations incurred from changes of water rights, 2) the City's need to carryover water from wet years to dry years in order to meet its drought criteria, 3) operational flexibility, redundancy and reliability of the City's water supply system, and 4) potential multiple-use benefits (i.e., environmental flows, recreational uses, etc.). The City will analyze the potential environmental impacts of developing storage along with other associated costs and benefits, and will develop that storage in a manner that avoids, minimizes or offsets the effects to the environment. Storage capacity options include the enlargement of Halligan Reservoir, the development of local gravel pits into storage ponds, the acquisition of storage capacity in new or existing reservoirs, the development of aquifer storage, or some combination of the above.

3.0 TREATED AND RAW WATER QUALITY

Policy ENV 21.1 of Plan Fort Collins states, "Develop and adhere to drinking water quality standards, treatment practices, and procedures that provide the highest level of health protection that can be realistically achieved." In addition, the City will take an active role in protecting the quality of water in the various watersheds from which the City's raw water is derived and maintaining the taste and quality of the City's treated water. This may include mixing of the City's source waters to maintain high water quality and require collaboration with private, county, state and federal land owners and managers. The acquisition, development, and management of the City's raw and treated water will be consistent with the City's Drinking Water Quality Policy and other applicable policies related to watershed protection and water treatment.

4.0 USE OF SURPLUS RAW WATER

The City will use its existing supplies to meet municipal obligations with the following priorities: 1) to meet water demands by the City's treated water customers, and 2) to meet the City's raw water needs as well as other City raw water obligations. Raw water needs include use for such purposes as irrigation of City parks, golf courses, cemeteries and other greenbelt areas. Additional raw water obligations include primarily water transfers to other entities because of agreements or exchanges made to manage the water supply system more effectively.

Water not needed for the above purposes is referred to as surplus water and may be made available to others in accordance with decrees and other applicable policies. Since the City plans its water supply system using a 1-in-50 year drought criterion, it typically has significant quantities of surplus raw water in many years. This surplus water may be available on a year-to-year basis or through multi-year arrangements that do not significantly impair the City's ability to meet municipal demands. The City will continue to rent its surplus supplies at a fair market price that helps offset the cost of owning such supplies and benefits the Water Utility ratepayers.

4.1 Commitment to Other Beneficial Purposes

Acknowledging that the City's use of its valuable water resources has impacts to the environment and the region, the City will commit to using its surplus supplies for other beneficial purposes such as supporting irrigated agriculture, supplementing flows in the Poudre River or providing other regional benefits. The City's surplus supplies come from a variety of sources, each of which has unique characteristics. These sources include CBT water and shares in several irrigation companies. Some sources are more suitable and available than others to meet beneficial purposes. Whether the surplus raw water can be used for these other purposes is dependent upon a number of factors, including the type of water, place of use and other decree limitations. Any potential use of these supplies should consider, and will likely require coordination with, other water users, state agencies and other groups. Some uses of the surplus supplies, such as maintaining an instream flow according to the State's Instream Flow Program, may require a change of water rights through the water court process. The City will engage in a thorough evaluation of these issues as part of assessing the use of its surplus supplies for these beneficial purposes.

Utilities will evaluate implementing a program to allow voluntary contributions from its ratepayers (i.e., Utility bill "check-off box") for programs that are designed to support the following purposes: preserving local agriculture, supplementing flows in the Poudre River, or meeting other beneficial purposes that our community may desire.

4.1.1 Agriculture and Open Space

Policy SW 3.2 of Plan Fort Collins states, "Participate in and follow the Northern Colorado Regional Food System Assessment project and other Larimer County agricultural efforts, and implement their recommendations at a local level, if appropriate." In addition, Policy LIV 44.1 of Plan Fort Collins states, "Maintain a system of publicly-owned open lands to protect the integrity of wildlife habitat and conservation sites, protect corridors between natural areas, conserve outstanding examples of Fort Collins' diverse natural heritage, and provide a broad range of opportunities for educational, interpretive, and recreational programs to meet community needs." To the extent that surplus water is available, the City will continue to support the local agricultural economy and help preserve the associated open spaces by renting surplus agricultural water back to irrigators under the respective irrigation companies.

The City will explore long-term rental and sharing arrangements with irrigators[10] in order to support the regional food system, encourage agricultural open space and other benefits provided by irrigated agriculture, as well as benefit the Water Utility ratepayers.

4.1.2 Instream Flows

Policy ENV 24.5 of Plan Fort Collins states, "Work to quantify and provide adequate instream flows to maintain the ecological functionality, and recreational and scenic values of the Cache la Poudre River through Fort Collins." Recognizing that its water use depletes natural streamflows, the City will seek innovative opportunities to improve, beyond any associated minimum regulatory requirements, the ecological function of the streams and rivers affected by its diversions. The Water Utility will take a leadership role in working with other City departments, local and regional groups and agencies towards the following objectives in accordance with Colorado water law and the administration of water rights in Colorado: 1) encourage flows in local streams to protect the ecosystem, 2) pursue the operation of its water supplies and facilities in a manner that avoids, minimizes or offsets the effects to the environment while meeting customer demands, and 3) explore projects or measures that would provide flows in streams and water in reservoirs for recreational and aesthetic purposes.

4.1.3 Other Arrangements

The City will consider and participate in other surplus water supply arrangements with other entities that provide mutual benefits and support the region. These may include other rental agreements, augmentation plans and other cooperative arrangements with regional partners. These types of arrangements should be limited to unique opportunities that are mutually

[10] The City's largest irrigation company ownership interest is in the North Poudre Irrigation Company, which still has substantial lands in irrigated agricultural production and has a unique mix of native water and CBT water that lends itself to these types of partnership arrangements.

beneficial to the parties and provide significant social, economic or environmental benefits to the region.

5.0 REGIONAL COOPERATION

The City recognizes the importance in maintaining good relationships with regional entities and coordinating efforts to achieve mutual goals. The City also recognizes that growing Colorado municipalities are currently struggling to define a way to meet future water supply needs in a manner that minimizes negative impacts to agricultural economies and river ecosystems. The Water Utility will endeavor to be a leader in demonstrating how water supply can be provided in a manner that respects other interests and provides a culture of innovation.

5.1 Working with Other Municipal Providers

The City will continue to work with the water suppliers throughout the northern Colorado Front Range to assure that adequate supplies are maintained in the region. When benefits are identified, the City will cooperate with area entities in studying, building, sharing capacity and operating water transmission lines, distribution systems and storage reservoirs for greater mutual benefit. The City has common interests and the potential to cooperate with regional entities including the water districts around Fort Collins, the City of Greeley and the Northern Colorado Water Conservancy District, as well as other Colorado water providers. In particular, the City should work closely with water districts that serve Fort Collins residents to encourage similar policies regarding drought protection, conservation and to provide mutual assistance during emergencies.

5.2 Working with Local Irrigation Companies

The City will continue to cooperate with local irrigation companies regarding the use, exchange and transfer of water in the Cache la Poudre River Basin. As a major shareholder in many of the local irrigation companies, it is necessary and desirable that the City work closely with these companies. Much of the water supply available to the City is through the ownership of shares in local irrigation companies.

5.3 Working with Others

City Departments will work together and also cooperate with local, state and federal agencies, civic organizations, environmental groups and other non-governmental organizations when common goals would benefit City residents and the surrounding community. Examples of goals that may involve City water supplies and be worthy of collaborative efforts include support for existing and development of new local food sources, promoting open space, improving river flows and supporting the local economy. Such efforts should identify appropriate entities and sources of revenue for specific goals or projects.

Appendix B Former Water Supply and Demand Management Policies

RESOLUTION 88-205
OF THE COUNCIL OF THE CITY OF FORT COLLINS
ADOPTING A WATER SUPPLY POLICY

WHEREAS, the City's population and water demands are expected to continue to grow during the next several decades; and

WHEREAS, increased competition and speculation for water resources is anticipated along the Northern Colorado Front Range; and

WHEREAS, during the past two years the City Staff and Water Board have extensively studied the City's present and future water supply needs and have proposed changes regarding the City's water supply policy; and

WHEREAS, the Water Board, after considerable study and debate, has made a recommendation to adopt a water supply policy which can be used for future planning and water acquisition programs; and

WHEREAS, a joint City Council and Water Board Committee was appointed in February 1988 to examine a number of key issues related to the City's proposed water supply policy; and,

WHEREAS, the joint Council/Water Board Committee, after much deliberation, made several recommendations regarding water supply reliability, acquisition, and financing; and

WHEREAS, the Water Board has suggested that the Committee's recommendations be adopted by City Council; and

WHEREAS, the Council finds that this water supply policy and subsequent actions will result in a more reliable water supply and will result in significant long-term benefits to the citizens of the City.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF FORT COLLINS as follows:

Section 1. That the following water supply policies be adopted:

1. Cooperation with Agricultural Community. The City should continue to be sensitive to the effects that City acquisition policies have on the agricultural community.

2. Reliability of Supply. The reliability of the Fort Collins water supply should be maintained to meet at least the 1 in 50 drought event.

3. Timing of Acquisitions. Water supplies that help balance the City's present raw water system should be acquired ahead of the time it is needed to meet the 1-in-50 reliability criteria.

4. Process of Acquiring Water Rights and Storage. The City should evaluate opportunities as they arise and obtain the most desirable sources of water. These opportunities may include acquisition of water stock or CBT water, lease arrangements, and the development or rehabilitation of reservoirs.

5. Raw Water Requirements for New Development. The raw water requirements (RWR) for new development should be set such that with other water acquisitions, the total water supply available is adequate to meet or exceed a 1-in-50 drought over the long term.

6. Regional Participation/Cooperation. The City should continue to work with the water suppliers throughout the Northern Colorado Front Range region to assure that adequate supplies are maintained in the region and that maximum use is obtained from supplies and available infrastructure (treatment capacity and transmission lines).

7. Demand Management. Water conservation education programs should be continued and enhanced so as to encourage efficient water use. Plans should be made to provide adequate treatment plant capacity to meet projected peak day demands without imposing restrictions.

Section 2. That Water Board and City Staff shall use the foregoing policies as general criteria when considering water supply projects, acquisition of water rights, and other measures related to the City's water supply.

Section 3. That Staff be directed to present to City Council appropriate resolutions and ordinances, and take other measures as necessary, to implement the following actions as recommended by the joint City Council and Water Board Committee:

1. Increase the raw water requirements for new development by approximately 20%.

2. Purchase 7,400 acre feet of water over the next five years with funds generated from general water service fees.

3. Increase water service fees by 3% in 1989, 3% in 1990, and 2% in 1991 to finance the purchase of 7,400 acre feet of water.

4. Take steps necessary to optimize existing water treatment plant capacity and plan for future water treatment plant expansions that will meet projected demands without imposing restrictions.

Passed and adopted at a regular meeting of the Council of the City of Fort Collins held this 20th day of December, 1988.

Mayor

ATTEST:

City Clerk

RESOLUTION 92-63
OF THE COUNCIL OF THE CITY OF FORT COLLINS
ADOPTING A WATER DEMAND MANAGEMENT POLICY

WHEREAS, the Council of the City of Fort Collins has previously determined that it is in the best interest of the City that a Water Demand Management Committee review the current policies and practices of the City regarding water demand management and to make recommendations regarding any suggested changes; and

WHEREAS, the Council created said committee with Resolution 90-24, dated February 20, 1990; and

WHEREAS, the Water Demand Management Committee, after extensive review and discussion, has made a recommendation to augment the water supply policy, created by Resolution 88-205, dated December 20, 1988, with the adoption of this water demand management policy; and

WHEREAS, the proper use of the resource of water is essential in maintaining the public health, safety and welfare; and

WHEREAS, the City of Fort Collins has historically placed primary emphasis on water supply and has previously adopted a policy to maintain a supply sufficient to meet the demand during a 1 in 50 year type drought; and

WHEREAS, water is a limited and vital resource which must be used efficiently and wisely; and

WHEREAS, water conservation should be an integral part of a long-term water supply and demand management program; and

WHEREAS, the implementation of additional conservation practices will benefit the City of Fort Collins by helping to assure continued reliable short and long term supplies of high quality, reasonably-priced water.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF FORT COLLINS as follows:

Section 1. That the following water demand management policies be adopted:

1. Project a water conservation "ethic". The City should initiate and intensify activities that demonstrate a commitment to the efficient and wise use of water.

2. Public education. The community's awareness of the importance of using water efficiently should be reinforced and strengthened.

3. Defer water treatment plant expansion. Deferring expansion of the water treatment plant--without jeopardizing future needs--should be a goal of water demand management.

4. Permitting compliance. Water use efficiency within the city should be improved in order to ensure compliance with anticipated federal

and state permitting requirements for water-use efficiency, applicable to future supply expansion projects.

5. Appearance of landscaping. The attractive appearance of the community's public and private landscapes should be maintained and encouraged.

Section 2. That the following water demand management goals be adopted:

1. Improve, document, and publicize the City government's water use efficiency, such that we can encourage the public through positive leadership.

2. Lower the adjusted per capita peak daily demand from the current 605 gpc to 575 gpc by the year 1996 (5% reduction), 545 gpc by the year 2000 (10% reduction), and 502 gpc by the year 2010 (17% reduction).

3. Lower the adjusted per capita annual consumption from the current 235 gpcd to 223 gpcd by the year 1996 (5% reduction), 211 gpcd by the year 2000 (10% reduction), and 195 gpcd by the year 2010 (17% reduction).

4. Review progress in meeting goals and objectives on an annual basis, and make adjustments as necessary.

Section 3. That, in order to meet the above-stated goals, staff is hereby directed to implement the following measures, as recommended by the Water Demand Management Committee, and take such other actions as may be reasonably necessary to accomplish such goals:

1. Implement an ongoing leak detection program.

2. Perform an audit of indoor water use at City-owned facilities, and install more water-efficient plumbing fixtures, where determined to be cost-effective.

3. By the end of 1994, install meters on all City department water taps, and assess 100% of the associated water and wastewater service charges. Additionally, assess City departments that rent water at 100% of the current rental rate.

4. Institute a more aggressive, comprehensive and visible public education campaign on water conservation.

5. Research all irrigated City-owned landscapes for the possibility of converting from potable to raw water, and implement where it is determined to be economically justified.

6. Provide an annual training program on efficient watering for all City employees and contract laborers that are involved with irrigation of City-owned landscapes.

7. Institute a voluntary certification program for sprinkler contractors, with the qualification being the satisfactory completion of a test on water-efficient irrigation design.

8. Amend the residential and non-residential Point Charts within the Land Development Guidance System to include water-conserving actions in the awarding of points.

9. Develop minimum water conservation standards for irrigation systems associated with landscape plans for all development which is subject to City review and approval. This does not include the irrigation systems of single family residences.

10. Where determined to be financially justified for individual City departments, implement central irrigation control for irrigated City-owned landscaping.

11. Develop guidelines for the design of City-owned landscaping, with a high priority being placed on water conservation and Xeriscape landscaping.

12. Develop a zero-interest loan program for the installation of qualified water conservation measures, as specified by Water Utility Staff and Water Board.

Passed and adopted at a regular meeting of the Council of the City of Fort Collins held this 7th day of April, A.D. 1992.

Susan Kirkpatrick
Mayor

ATTEST:

Wanda M. Krajicek
City Clerk

RESOLUTION 2003-104
OF THE COUNCIL OF THE CITY OF FORT COLLINS
ADOPTING A WATER SUPPLY AND DEMAND
MANAGEMENT POLICY

WHEREAS, a Water Supply Policy was adopted by the City Council in December 1988 to help direct the acquisition, development, and management of the City's water supplies since that time; and

WHEREAS, a Water Demand Management Policy was adopted by the City Council in April 1992, which set water use goals and provided for measures to help meet those goals; and

WHEREAS, there is a need to update the water supply and demand management policies to provide guidance regarding the future development and use of the City's water supplies; and

WHEREAS, the Council has requested that staff develop an integrated water supply and demand management policy; and

WHEREAS, the Fort Collins Water Supply and Demand Management Policy attached hereto as Exhibit "A" and incorporated herein by this reference has been developed over the last several years through discussions with interested citizens, groups, the Water Board and City Council.

NOW THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF FORT COLLINS that the City Council hereby adopts the Fort Collins Water Supply and Demand Management Policy attached hereto, to provide general criteria for City decision making regarding water supply projects, acquisition of water rights, and demand management measures.

Passed and adopted at a regular meeting of the Council of the City of Fort Collins held this 16th day of September, A.D. 2003.

Mayor

ATTEST:

City Clerk

EXHIBIT "A"

Fort Collins Water Supply and Demand Management Policy
September 16, 2003

Policy Objective: To provide a sustainable and integrated approach to (1) providing an adequate and reliable supply of water for the beneficial use by customers and the community and (2) managing the level of demand and the efficient use of a scarce and valuable resource.

1. Demand Management

a. Water Use Goals. The City will implement the necessary water conservation practices and programs to reduce its water use to an average of 185 gallons per capita per day (gpcd) by the year 2010. In addition, the per capita peak daily demand will be reduced to 475 gpcd by the year 2010. These calculations are based on the total treated water produced for use by City customers (adjusted for large contractual customers and other sales or exchange arrangements) divided by the estimated population of the City's water service area.

b. Educational Programs. The City will have a continuous, comprehensive and visible public education program that helps citizens and businesses use water appropriately and efficiently. Examples of such programs include (1) working with the schools to provide water conservation education, (2) promoting the use of xeriscape landscaping for public facilities, businesses, homeowners, and others, (3) helping the public to understand and utilize evapo-transpiration information in determining their irrigation applications, and (4) educating water users on the operation of sprinkler system controllers.

c. Rate Structures. The City will have water rate structures for all classes of customers that provide an economic incentive to use water efficiently. Examples of structures that may be utilized include (1) tiered structures with increasing prices as water use increases, (2) seasonal blocks with higher rates during the irrigation season, (3) water budget approaches based on appropriate targets for individual customers, and (4) flat rate structures.

d. Incentive Programs. When determined to be cost effective, the City will implement incentive programs that will assist customers in replacing outdated plumbing fixtures or landscape features that use excessive amounts of water. Examples for reducing indoor use are rebates for replacing showerheads, toilets and clothes washers with water conserving models. Examples for reducing outdoor use include rebates for expenses related to irrigation scheduling equipment and converting landscape to xeriscape.

e. Regulatory Measures. The City will maintain and/or adopt regulations that promote water efficiency and reduction of water waste while recognizing the benefits of adequate water to maintain an attractive and pleasant environment in the City. Examples include regulations that require the amendment of soils with organic materials and prohibition of homeowner associations banning the use of xeriscape. The City will also review its Land Use Code for potential revisions which would limit bluegrass turf on new landscapes and prohibit landscaping that requires irrigation in certain areas such as medians, thin strips, and other small areas.

f. Operational Measures. The City will establish practices and procedures to deliver and use water in its facilities without excessive losses. Examples of such practices are the leak detection program to reduce losses through the Utility's water distribution system and the recycling of backwash water at the Water Treatment Facility.

2. Water Supply for Municipal Use

a. Drought Criteria. The reliability of the Fort Collins water supply should be maintained to meet at least the 1-in-50 year drought event in the Cache la Poudre River Basin. Water rights and storage capacity should be acquired ahead of the time it is needed to meet at least the 1-in-50 year drought criteria, so as to provide enough time to seek and obtain water court decrees and diversion or storage facilities, if needed, to use such water.

b. Raw Water Requirements (RWR). The City shall require developers to turn over water rights, or cash in-lieu-of water rights, such that the total water supply available for municipal purposes is adequate to meet or exceed a 1-in-50 year drought over the long term. Cash collected shall be used to purchase additional water rights, acquire or develop additional storage capacity, or enter into other arrangements that will increase the long-term reliability of the City's supply system.

c. Storage Capacity. The City will pursue the acquisition or development of storage capacity which is needed to manage the City's water rights in an efficient and effective manner and which will enhance the City's ability to get through at least a 1-in-50 year drought. New storage capacity in the range of 12,500 to 14,000 acre-feet shall be pursued to (1) help meet return flow obligations incurred from transfers of water rights from agricultural use to municipal use, (2) provide carryover water from wet years to dry years, and (3) provide operational flexibility, some redundancy and reliability. Storage options include the enlargement of Halligan Reservoir, the development of local gravel pits into storage ponds, the acquisition of storage capacity in new or existing reservoirs, or some combination of the above.

d. Use of Existing Supplies. The City will use its existing supplies to meet municipal obligations with the following priorities: (1) to meet water demands by the City's treated water customers, and (2) to meet raw water needs in the City and to meet other obligations of the City. Raw water needs include use for such purposes as irrigation of City parks, golf courses, cemeteries, and other greenbelt areas. Other raw water obligations include primarily water transfers to other entities because of agreements or exchanges made to manage the water supply system more effectively. Water not needed for the above purposes is referred to as surplus water and may be made available to others in accordance with decrees and other policies that may apply.

3. Water Supply Shortage Response Plan

The City will maintain a plan for responding to situations where there are projected water supply shortages, either because of severe drought conditions or because of disruptions in the raw water delivery system. This plan may include measures to temporarily reduce water use through media campaigns, various regulations, restrictions, rate adjustments and others. The plan may also include provisions to temporarily supplement the supply through interruptible water supply contracts, leases, exchanges and operational measures.

4. Use of Surplus Raw Water

To the extent the City has surplus raw water available after meeting the needs of its treated water customers and meeting other raw water obligations, it will make water available to entities or individuals at a fair rental market price that helps offset the City's cost of owning such supplies. Other objectives or uses of the surplus water include, in no particular order, providing irrigation water to farmers to provide for the continued production of agricultural crops in the Cache la Poudre River Basin and the Northern Colorado Water Conservancy District, helping maintain open space and natural areas supported by Fort Collins, and providing for other uses as opportunities arise.

5. Regional Cooperation

a. Working with Other Municipal Providers. The City will continue to work with the water suppliers throughout the Northern Colorado Front Range to assure that adequate supplies are maintained in the region. When benefits are identified, the City will cooperate with area entities in studying, building, and sharing capacity of water transmission lines, distribution systems, and storage reservoirs. Entities in this area that have many common interests with the City and which the City has the potential to cooperate with include the Soldier Canyon Filter Plant and the associated water districts, the City of Greeley and the Northern Colorado Water Conservancy District. In particular, the City should work closely with water districts that serve Fort Collins residents to encourage similar policies regarding drought protection and to provide mutual assistance during emergency situations.

b. Working with Local Irrigation Companies. The City will continue to cooperate with local irrigation companies regarding the transfer, exchange and use of water in the Cache la Poudre River Basin. As a major shareholder in many of the local irrigation companies, it is necessary and desirable that the City work closely with these companies.

c. Transferring Water Rights from Agricultural to Municipal Use. The City will periodically transfer its water rights from agricultural use to municipal use on those shares that come from areas upon which the City is growing, or from shares where the irrigation of such lands has ceased. For water rights that were derived from irrigated agricultural lands that remain in viable agricultural areas, the City may transfer these water rights to municipal use when a need is identified or other factors make it prudent to do so. To the extent that this water remains surplus to the City's need, the City will continue to support the local agricultural economy by renting this surplus agricultural water back to irrigators under the respective irrigation companies.

6. Raw Water Quality

The City will take a proactive role in protecting the quality of water in the various watersheds from which the City's raw water is derived. The acquisition, development, and management of the City's raw water will be consistent with the City's Drinking Water Quality Policy and other applicable policies related to watershed protection.

7. Stream Flow and Ecosystem Protection

To the extent the City's use of its water rights and water resources are not adversely affected, the City will cooperate with other local groups or agencies to encourage flows in local streams to protect the ecosystem, in accordance with Colorado water law and the administration of water rights in Colorado.

8. Recreational/Aesthetic Flows

To the extent the City's use of its water rights and water resources are not adversely affected, the City will cooperate with other local groups or agencies to explore projects or measures that would provide flows in streams and water in reservoirs for recreational and aesthetic purposes, in accordance with Colorado water law and the administration of water rights in Colorado.

Appendix C Water Conservation Plan

Water Conservation Plan

February 12, 2009

Prepared by:

Peter Mayer, Aquacraft, Inc.

Laurie D'Audney & Dennis Bode, Fort Collins Utilities

City of Fort Collins Utilities

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The city of Fort Collins is located 65 miles north of Denver in Larimer County, nestled against the foothills of the Rocky Mountains. The Poudre River winds its way through north Fort Collins before reaching the South Platte River to the east. Fort Collins is home to over 131,000 residents and 25,000 students enrolled at Colorado State University.

The City of Fort Collins Utilities provides water, wastewater, stormwater and electric services to the Fort Collins community. In 2007, the Utilities served 8.8 billion gallons of water to approximately 128,000 people. Because the service area boundary does not coincide with the city limits, the Utilities serves water to some customers outside the city limits, and not all those within the city.

Water sources are solely surface supply from a wide variety of water rights. The City's water comes from the Poudre River Basin and the Colorado-Big Thompson (C-BT) Project (which includes Horsetooth Reservoir).

The City views the water conservation program as an important proactive response to supply variability and climate change. Reducing indoor demand through improved technology, leak reduction and behavior change (all elements of the City's conservation program) will improve system reliability and resilience to supply variability year round. Reducing outdoor demand through improved irrigation efficiency and landscape transformation (key elements of the City's conservation program) improves reliability during summer months when demand peaks, providing additional water availability for storage and environmental flows.

Faced with a drought in 1977, the Utilities created a part-time position dedicated to water conservation. Following the position expanding to full-time in 1990, the *1992 Water Demand Management Policy* set out 12 measures and two water use goals. Plans to develop a new document for the conservation program began with the adoption of the *2003 Water Supply and Demand Management Policy*.

The State of Colorado Water Conservation Act of 2004 (HB 1365) requires entities that supply 2,000 acre-feet or more annually to submit a water conservation plan to the Colorado Water Conservation Board (CWCB) before receiving financial assistance from the CWCB or the Colorado Water Resources and Power Development Authority. Although Fort Collins isn't seeking funds from either State agency, this plan was developed based on the CWCB's guidance documents.

Goals and Recommendations

Fort Collins Utilities has established a goal for the conservation program of reducing water use to 140 gallons per capita per day (gpcd) by 2020 (normalized to account for weather conditions). This goal represents realistic and achievable demand reductions in all customer sectors in Fort Collins. Achieving this goal within the planning period will provide an additional measure of reliability to the water supply system to ensure high quality service to customers in case of future drought, climate change and unforeseen shortages.

The conservation program recommended in this plan includes all measures from Fort Collins Utilities' current program. The recommended program represents a significant expansion of the current program and targets residential and commercial customers, and indoor and outdoor water use. The program also includes an effort to reduce water loss from 6 percent down to 5 percent.

Under current climate conditions, this program will save an estimated 2,300 acre-feet if continued at the same level through the planning period to 2020. Table ES.1 presents a summary of the forecast demands and water savings developed for this conservation plan.

Table ES.1: Summary of forecast demand and savings

Forecast	Average Use (Ac-ft/year)	2020 Forecast Demand (Ac-ft/year)	Savings vs. Pre-2002 Use (Ac-ft/year)	Savings vs. Baseline Use (Ac-ft/year)
Pre-2002 (1998-2001)	34,000	39,700	N/A	N/A
Baseline (2003-2007)	27,500	31,800	7,900	N/A
Current Program		30,800	8,900	1,000
Recommended Program		29,500	10,200	2,300

Benefits of Water Conservation

The City of Fort Collins is committed to expanding its conservation efforts. The City believes water conservation is of vital importance for many reasons, including to:

- Foster a conservation ethic and eliminate waste.
- Demonstrate a commitment to sustainability.
- Provide water for multiple beneficial purposes.
- Reduce costs for the Utility and for customers.
- Prepare for forecasted climate change.

Implementation and Monitoring

The new measures introduced in this plan will be implemented over a three year period. Fort Collins Utilities will monitor implementation and impacts of the conservation plan on a regular basis. Regular demand monitoring will provide information on water use and progress toward the stated conservation goals. Adjustments to the program will be made as warranted due to new technology or programs becoming outdated, changes in climate and any other unforeseen circumstances. A complete formal review and revision of the conservation plan will be completed within five years.

Public Review and Adoption

A 60-day public review period of the conservation plan took place from October 8 to December 7, 2007. During the review period, 34 comments were received and the plan was updated in response. The plan will be presented to the Fort Collins City Council for adoption.

KEY UTILITY INFORMATION

The city of Fort Collins is located 65 miles north of Denver in Larimer County, nestled against the foothills of the Rocky Mountains. The Poudre River winds its way through north Fort Collins before reaching the South Platte River to the east. With an average of 300 days of sunshine per year and low humidity, Fort Collins averages 15 inches of precipitation annually.

Fort Collins is home to over 131,000 residents and 25,000 students enrolled at Colorado State University. The city began as a hub for agricultural production, but has shifted its focus to a high-tech economy. Between 1995 and 2005, the population grew an average of three percent annually. As expected, the growth rate has become much slower; it was 1.6 percent for 2006.

WATER SYSTEM PROFILE

This section provides a summary of the physical characteristics of the existing water system, including water sources, system limitations, costs and pricing, policies and planning initiatives and conservation activities.

Physical Characteristics of the Existing Water Supply System

In 2007, Fort Collins Utilities served 8.8 billion gallons of water to approximately 128,000 people. One water treatment facility and 530 miles of water main deliver treated water to customers. Two water reclamation facilities treat wastewater before it's returned to the river.

The Utilities service area boundary does not coincide with the city limits. Some customers outside the city limits are served, but not all those within the city. Fort Collins-Loveland Water District (FCLWD) and East Larimer County Water District (ELCO) provide water to some areas within the city limits and will most likely serve additional city residents in the future.

Fort Collins Utilities serves some areas outside the city limits, primarily to the northwest of Fort Collins, including water provided to West Fort Collins Water District (WFCWD). Figure 1 shows the different service areas with respect to the Fort Collins Urban Growth Area (UGA).

Table 1 summarizes service area characteristics, water production and water demand by customer sector.

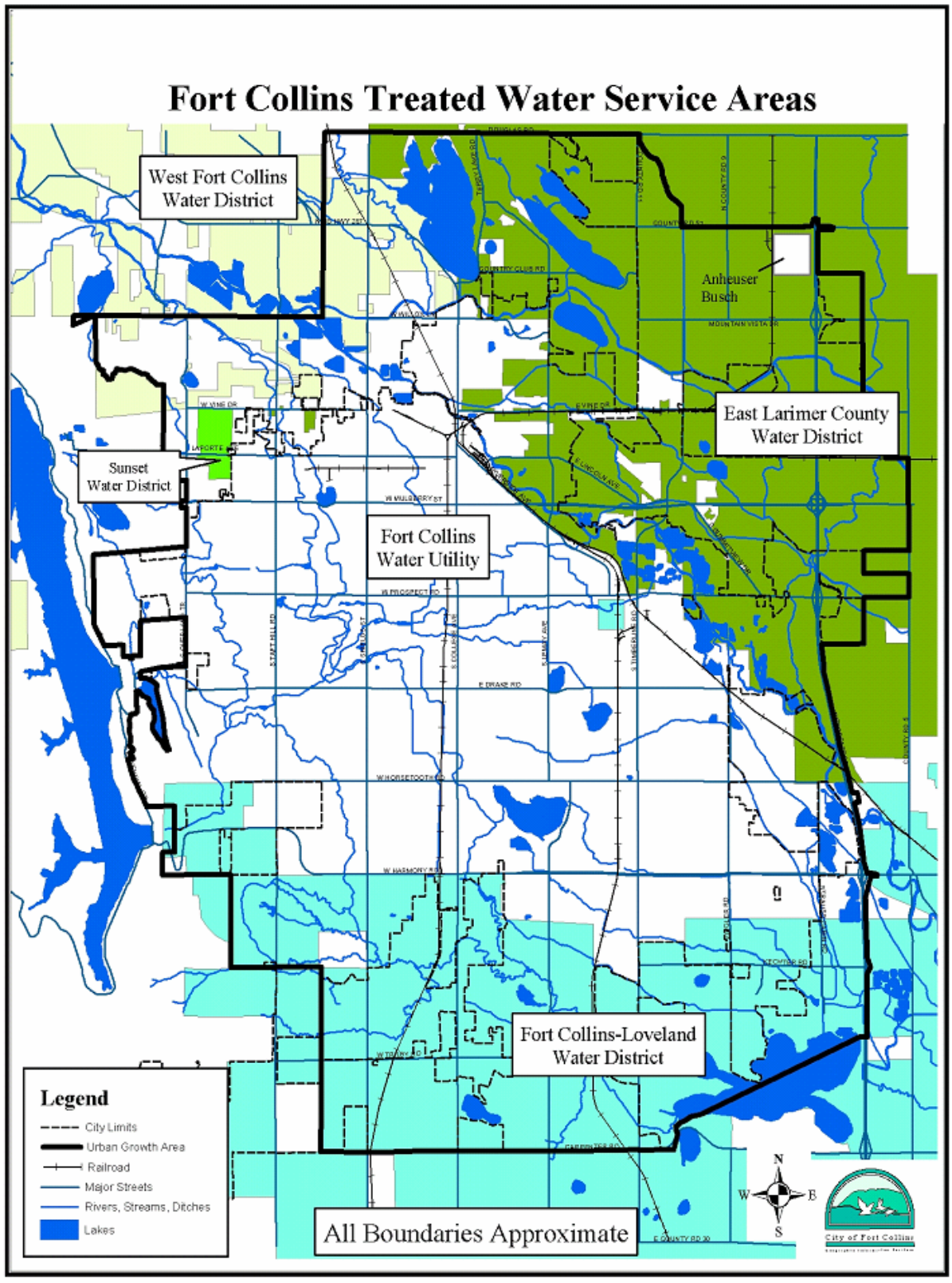

Figure 1: Treated water service area

Table 1: Water system profile, 2007

Service Characteristics	**Number**		
Estimated service population	128,400		
Estimated service area (sq. miles)	35		
Miles of mains	530		
Number of treatment plants	1		
Number of separate water systems	0		
Interconnection with other systems	6		
Annual Water Supply	**Annual volume (MG)**	**Number of intakes or source points**	**Percent metered**
Groundwater	0	0	N/A
Surface water (treated & raw)	23,900	9	100%
Purchases: raw	0	0	N/A
Purchases: treated	0	0	N/A
Total annual water supply	23,900	9	100%
Service Connections	**Connections**	**Water sales (MG)**	**Percent metered**
Residential, single-family	27,720	3,081	100%
Residential, multi-family	2,104	987	100%
Commercial & Industrial	2,103	3,557	100%
City government	199	137	100%
Wholesale	1	164	100%
Outside City customers	1,394	294	100%
Total	33,521	8,220	100%
Treated Water Demand	**Annual volume (MG)**	**Percent of total**	**Per connection (MG)**
Residential	4,232	37	0.14
Nonresidential	3,694	33	1.60
Wholesale	164	1	164
Outside City	294	3	0.21
City Raw water (Parks, etc.)	1,190	10	N/A
Raw water obligations	1,140	10	N/A
Nonaccount water: system losses	640	6	N/A
Total system demand (total use)	11,354	100	N/A
Treated Water Average & Peak Demand	**Volume (MG)**	**Total supply capacity**	**Percent of total capacity**
Average-day demand	24.2	87	28%
Maximum-day demand	47.5	87	55%
Maximum-hour demand	N/A	N/A	N/A
Planning	**Prepared a plan**	**Date**	**Filed with state**
Capital, facility or supply plan	Yes	2003	No
Drought or emergency plan	Yes	2003	No
Water conservation plan	Yes	2008	Not yet

Sources of Water

Water sources are solely surface supply from a wide variety of water rights. The City's water comes from the Poudre River Basin and the Colorado-Big Thompson (C-BT) Project (which includes Horsetooth Reservoir). Figure 2 shows the location of some of the City's key facilities related to delivering water from these sources. These facilities include the diversion structure and pipeline off the Poudre River, Joe Wright Reservoir, Michigan Ditch and the water treatment facility. Also shown are Horsetooth Reservoir and Halligan Reservoir operated by the Northern Colorado Water Conservancy District (NCWCD) and North Poudre Irrigation Company (NPIC), respectively.

Poudre River

The following sources are generally available for diversion from the Poudre River. The City diverts its Poudre River flows to the water treatment plant through two pipelines located on the main stem of the river.

Senior Direct Flow Decrees: The City has five very senior direct flow decrees on the Poudre River that are available to the City most of the time. Only in very severe dry periods are the diversions limited.

Junior Direct Flow Decrees: These junior rights are only in priority during the peak runoff period when most of the other rights on the Poudre River have been satisfied. In dry years, the City may not be able to divert anything under these rights.

Pleasant Valley and Lake Canal Shares: The City of Fort Collins owns about 70% of the shares in this mutual irrigation company. The amount of water the City is entitled to divert to meet treated water demands depends on the number of shares the City designates for such use and which priorities owned by the irrigation company are in priority during the season.

Southside Ditches: The City owns shares of stock in the Arthur, Larimer No. 2, New Mercer and Warren Lake irrigation companies, referred to as the Southside Ditches. With 13 separate priorities, yields vary considerably from year to year. Much of the yield comes from a couple of large junior rights and normally occurs during June.

Michigan Ditch and Joe Wright Reservoir System: This system consists of a ditch that diverts water from the Michigan River drainage across the divide into the Poudre River Basin, Joe Wright Reservoir and storage capacity in Meadow Creek Reservoir. Joe Wright Reservoir includes about 6,500 acre-feet of active storage and is the only storage facility owned by the City. There are usually periods during the peak runoff season in which the reservoir is full and Michigan Ditch water is available if it can be taken directly to meet demands. Joe Wright Reservoir is used primarily to regulate the annual Michigan Ditch flows and has limited carryover capacity to provide drought protection for the City. The City also has storage capacity in Meadow Creek Reservoir, which is used to release water to downstream senior rights on the Michigan River.

Water Supply and Storage Company Shares: The City owns about 26 shares in this irrigation company. Since the City-owned shares are not presently decreed for municipal use, this water is usually rented back for agricultural use. During the last 40 years, the City has obtained shares of several local irrigation company stocks by developers satisfying the City's raw water requirements.

Horsetooth Reservoir

Water from Horsetooth Reservoir, a part of the C-BT Project, can be delivered to the City's water treatment facility or to the Poudre River. Although the C-BT project includes a large amount of storage, including Horsetooth Reservoir, the City currently has a limited ability to carry over water in C-BT reservoirs for drought protection. Currently, the NCWCD allows a 20 percent carryover allowance, which can only be C-BT project water (as opposed to the excess Poudre River water). The following sources are available for use from Horsetooth Reservoir.

Colorado-Big Thompson (C-BT) Water: The City presently owns about 18,850 units of C-BT water. Deliveries depend on the annual "quota" set by NCWCD each year. For the most part, this water is the most flexible source that the City owns and can be used to fill gaps from other sources.

Windy Gap Water: The City receives Windy Gap water from Platte River Power Authority (PRPA) as payment for 4,200 acre-feet of reusable effluent made available to PRPA by the City. The reusable effluent is the result of the Reuse Plan that involves the City, PRPA, and the Water Supply and Storage Company (WSSC). The 4,200 acre-feet of Windy Gap water is dedicated for large contractual use that requires reusable water. As part of the Reuse Plan, the City is required to deliver 1,890 acre-feet of single use water to the WSSC.

North Poudre Irrigation Company (NPIC) Shares: The City currently owns about 3,550 shares of NPIC. Each share consists of native water supply (which is primarily decreed for agricultural use) and 4 units of C-BT water. Until the agricultural portion of each share is changed for municipal purposes, the City can only use the C-BT portion of the shares to meet treated water demands.

West Fort Collins Water District (WFCWD) Water: Through an agreement with the WFCWD, the City provides treated water to their customers and in return, gets reimbursed with an equivalent amount of C-BT water. In recent years, the amount transferred to the City has been about 600 acre-feet each year.

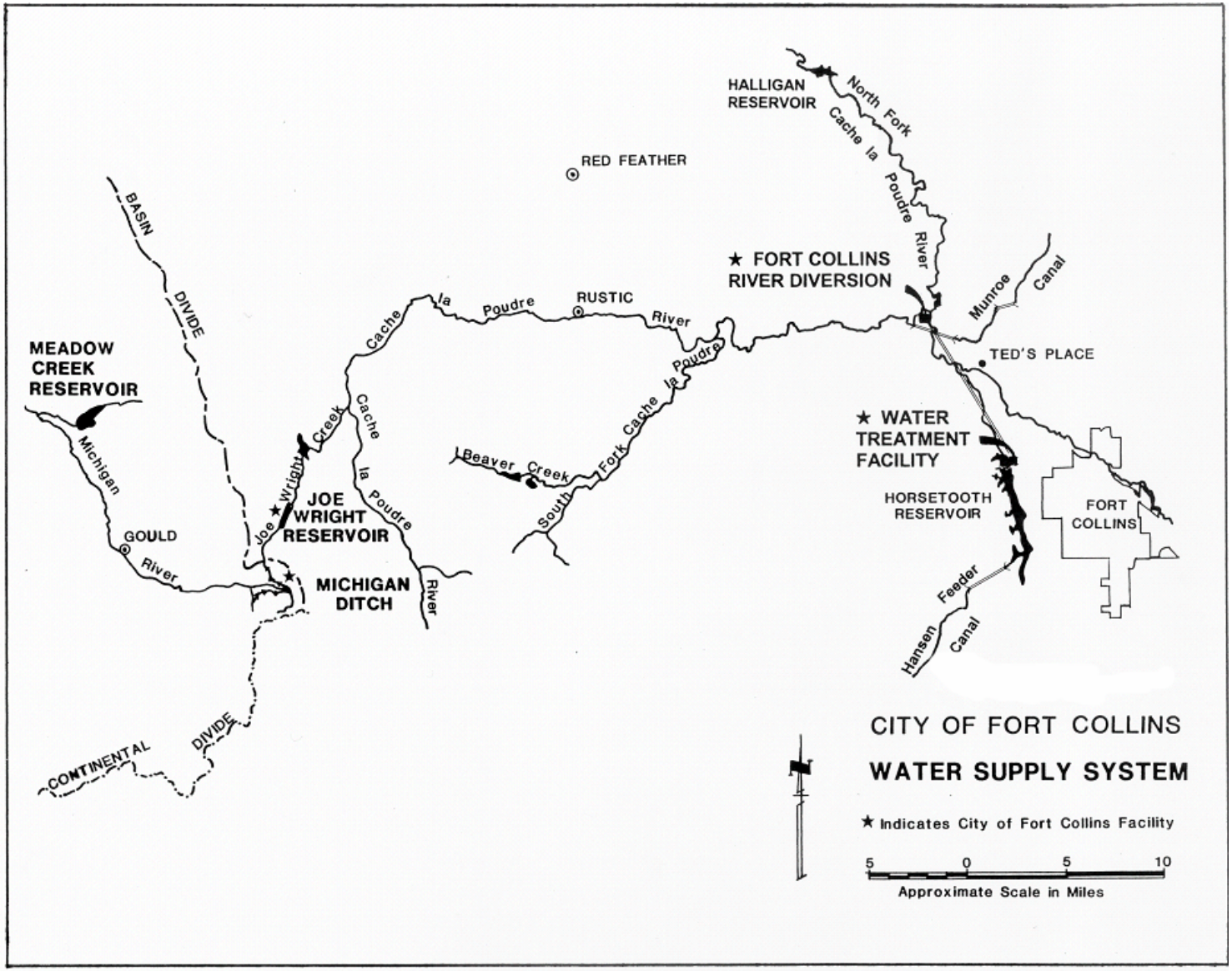

Figure 2: Water supply system

The C-BT water and part of the NPIC water provide the most flexible water supplies since they are available in Horsetooth Reservoir where they can be stored until needed to meet demands. If the water from these sources is in excess of the current year City demands, they can usually be leased for agricultural use in the area. Because of this, in most years it is desirable to use other sources to meet City demands prior to using the C-BT and NPIC supplies.

An important part of the City's water supplies are sources that are reusable. Typically, this is water that is imported from another basin or comes from specific in-basin sources that may be totally consumed through succession of identified uses. For Fort Collins, this includes much of the Michigan Ditch and Joe Wright Reservoir water, Windy Gap water and Southside Ditches water that has been converted from agricultural use to municipal use. Approximately 20 percent of the City's supplies are reusable. Much of this is used as part of a Reuse Plan which involves the City, a local irrigation company and Platte River Power Authority (PRPA). Reusable sources owned by the City and the irrigation company are used through the City and the reusable effluent is used by PRPA. In turn, PRPA provides Windy Gap water to the City where much of it is used by a customer that requires a source of reusable water. The plan results in the efficient use of a good part of the City's reusable supplies.

The City of Fort Collins has a policy of acquiring and maintaining a water supply that is sufficient to meet or exceed the demands during a severe drought that has been defined as a 1-in-50 year drought. The City owns water rights that average over 70,000 acre-feet per year if they were fully usable; however, because of various legal and capacity constraints the present firm yield available for municipal use is about 31,000 acre-feet.

Firm Yield Concept

The yield from the City's supply sources varies considerably from year to year. Because of this, demands cannot easily be compared to the average annual supply yields. Instead, it is necessary to make an analysis of how the supplies and demands compare during a series of critically dry (or drought) years. A concept often referred to as "firm yield" is used by many entities to measure the ability of their water supply system to meet water demands through a series of drought years.

Firm yield is commonly determined by calculating the maximum constant base demand that can be met with the available supply during a representative hydrologic period. For this determination, it is assumed that both the demand contributors (population, irrigated acres, etc.) and the supply owned (storage capacity, water rights, shares of stock, etc.) are held constant during each trial run of the hydrologic study period. This procedure results in a firm yield or safe average annual demand (SAAD) that can be met with the current supply system. Once this is determined, one can compare the present average annual demand with the firm yield to determine the margin of safety or reserve supply.

The issue that often comes up in discussions about firm yield is whether the representative hydrologic study period contains the type of drought for which protection is desired. Many entities simply take a recent 20 or 30 year historic period and assume that if they can make it through any droughts contained in that period, their supply is adequate. Without knowing something about the severity of the drought in a historical period, the use of such a period may not be adequate. The *Fort Collins Drought Study*, completed in 1985, was done primarily to study the effects of prolonged droughts and to define them in terms of the probability of their occurrence. In this study, synthetic hydrologic traces were produced based on statistical

parameters of the historic data available. This allowed analysis of numerous artificial drought periods and a determination of representative droughts with calculated return frequencies. Once this was determined, a computer model was used to determine the SAAD that could be met for each drought type.

Raw Water Requirements

When new development occurs within the current Utility service area, developers are assessed a raw water requirement (RWR). This practice originally began in the 1960s when two acre-feet per acre of land developed was required. In the early 1970s this was changed to three acre-feet per acre. Because water use varied considerably depending on the type of use for any given area, a study was done in 1983-84 to develop another method of assessing the raw water requirements. The resulting system, still in use, attempts to more closely assess the requirements based on actual use.

For residential development, a formula was adopted that considers the density of residential development. Water use is estimated by considering both indoor and outdoor use. The RWR is calculated by multiplying the water use estimate by a "water supply factor" that is used to reflect the variability in supply and demand from year to year as well as other unaccounted for water use. The equation presently used to determine the residential RWR is as follows:

RWR = 1.92 x ((.18 x Number of Dwelling Units) + (1.2 x Net Acres))

The water supply factor was originally set at 1.6; however, following the adoption of the 1988 *Water Supply Policy*, the water supply factor was increased by 20% to 1.92.

Non-residential requirements are based on tap size. Water use was analyzed for all non-residential customers for a given tap size and the requirements were based on those results. Since there is a lot of variability within each tap size, a raw water surcharge is assessed for any annual use exceeding an annual allotment. Requirements vary from .90 acre-feet for a 3/4 inch meter to 14.40 acre-feet for a 3 inch meter. If the water tap is above the 3 inch size, the RWR is based on an estimate of water use.

Developers and builders may satisfy the raw water requirements by turning over water rights acceptable to the City or paying cash in-lieu-of the water rights. Cash in-lieu-of payments can be used to purchase additional water rights when appropriate or acquire other means of increasing the City's water supply, such as developing storage capacity. The cash fee has been periodically adjusted over the years to reflect the price of water rights on the market.

System Limitations

The full use of the City's water rights in a given year can be reduced by several physical and legal constraints. A primary physical constraint is the lack of storage capacity to manage and regulate the water rights owned by the City. Additional water storage capacity is needed to increase the yield and reliability of its water supply system. Short-term storage is needed for operational flexibility and to meet return flow obligations inherent with converted irrigation shares.

Long-term carryover storage is needed to capture water during wetter years for use during drier years. Both types of storage are needed to increase the reliability and redundancy desired to meet the water needs of our customers. In November 2003, City Council approved a resolution to exercise an option to acquire Halligan Reservoir and its enlargement potential. In 2004, the City

signed a cooperative agreement with partners and submitted a letter of intent to pursue the project to the U.S. Army Corps of Engineers (COE). If the project is approved by the COE after an extensive environmental review and preparation of an Environmental Impact Statement, it is expected that the City will have an additional storage capacity of up to 12,000 acre-feet to help make more efficient use of its water supplies and provide a more reliable level of drought protection.

The amount of additional reservoir capacity needed is somewhat dependent on the ultimate demand level that results from water conservation efforts. In general, as demand goes down, the amount of storage capacity needed also decreases. The relationship between water demand level and storage capacity needed will be further developed and refined as part of the evaluation of the proposed storage project. Variability in both water demands and water availability, particularly in light of the uncertainty of climate changes, provides a challenge in projecting needed storage capacity to help meet reliability criteria.

Table 2: Summary of system conditions

Planning Questions	**Yes**	**No**	**Comment**
Is the system in a designated critical water supply area?		X	
Does the system experience frequency shortages or supply emergencies?		X	
Does the system have substantial unaccounted-for and lost water?		X	
Is the system experiencing a high rate of population and/or demand growth?		X	
Is the system planning substantial improvements or additions?	X		See discussion of water storage and Halligan Reservoir project.
Are increases to wastewater system capacity anticipated within the planning horizon?	X		

Water Costs and Pricing

All Fort Collins Utilities water customers are metered. Historically, residential customers paid a set rate per 1,000 gallons regardless of water use. Since January 2003, single-family and duplex water rates are tiered. For many years, commercial customers have had a two-tier water rate. Beginning in 2003, commercial and multi-family customers are billed seasonal rates–with higher rates from May through September. Commercial rates still have a second tier for higher water use. Table 3 presents the 2008 residential water rates and rate structure utilized by Fort Collins.

Table 3: Residential water rates, 2008

		Single-Family	Duplex
	Base Charge	$12.72	$15.51
Tier	**Tier Size**	**$/1,000 gal.**	**$/1,000 gal.**
1	0-7,000 gal	$1.97	
	0-9,000 gal		$1.97
2	7,001-13,000 gal	$2.26	
	9,001-13,000 gal		$2.26
3	Over 13,000 gal	$2.60	$2.60

Current Policies and Planning Initiatives

Water Supply and Demand Management Policy

The City's *1988 Water Supply Policy* and *1992 Water Demand Management Policy* were combined and updated when City Council adopted the *2003 Water Supply and Demand Management Policy*. The 2003 Policy provides general criteria for decisions regarding water supply projects, acquisition of water rights and demand management measures. One key provision of the Policy is a goal of reducing water use from the previous target of 195 gallons per capita per day (gpcd) to 185 gpcd (normalized to account for weather variations). The Policy includes tools to meet this goal through educational programs, rate structures, incentive programs, and regulatory and operational measures. Another key provision in the Policy provides that the City will pursue the acquisition or development of additional storage capacity. Other provisions include maintaining a water supply shortage response plan, use of surplus raw water, fostering regional cooperation, protecting raw water quality and encouraging stream flow and ecosystem protection and recreational/aesthetic flows.

Water Supply Shortage Response Plan

In response to the severe drought year 2002 and in anticipation of continuing drought conditions, the City developed the *Water Supply Shortage Response Plan*, adopted by the City Council in April 2003. The plan dictates the steps to be taken when there are water supply shortages and contains four different response levels based on the severity of the shortage. Although the Utility's main objective is to provide customers with an adequate and reliable water supply, there will be times when the City's water supply is projected to be less than anticipated demands. A response plan enables the City to quickly make the necessary adjustments in order to reduce water demands to a level that matches supply. It is anticipated that this plan will be reviewed periodically and may be changed in the future to match the City's changing water supplies, facilities and operations.

Improving System Reliability in Response to Climate Change and Supply Variability

The City acknowledges the best available scientific information on global climate change predicts changes that could impact the Fort Collins water supply system. These changes could include reduced snow pack, earlier runoff, hotter and drier summers, and an increased recurrence of drought. The City views the water conservation program as an important proactive response to these potential changes. Reducing indoor demand through improved technology, leak reduction,

and behavior change (all elements of the City's conservation program) will improve system reliability and resilience to supply variability year round. Reducing outdoor demand through improved irrigation efficiency and landscape transformation (key elements of the City's conservation program) improves reliability during summer months when demand peaks, providing additional water availability for storage and environmental flows.

A key element to improving system reliability and resiliency in Fort Collins is storage. If conserved water is to be used to help improve reliability, some portion of the conserved water must be stored for use at a later date. Reducing demand by itself may offer some reliability benefits, but during a water shortage such as a drought having water in storage is critical for maintaining essential services. Future water supply planning efforts should carefully examine the beneficial uses of conserved water for Fort Collins.

Historic Water Demand

Water use can vary for many reasons, including changes in weather, population, drought awareness, rates and conservation efforts. Over the last 15 years, low-flow plumbing standards have lowered water use through natural attrition and new construction.

Table 4 shows the history of water demand for the past 20 years. Figure 3 shows the population and annual demand in a graphical format. Annual water use in 2004 was lower than the second lowest use for this period in 1995. Per capita use has been below 185 gpcd since the 2002 drought when only 9.3 inches of precipitation fell and restrictions were in place. Table 5 shows the number of accounts in each customer category from 2002–2007. Fewer than 1,000 new accounts were added during this time indicating the relatively modest rate of growth in the system. Table 6 provides the water use in each customer category from 2002–2007. Overall demand in these recent years has been less than in the previous period even though the number of accounts has increased. Table 7 presents the average per account water use by customer category from 2002–2007.

Table 4: Historic water demand

Year	Service Area Population	Annual Precipitation (inches)	Annual Water Use (MG)	Average Day Use (MGD)	Peak Day Use (MGD)
1989	93,600	12.9	9,548	26.2	60.6
1990	95,900	17.3	9,289	25.5	58.6
1991	97,200	14.1	9,020	24.7	55.9
1992	99,000	20.7	8,604	23.5	45.6
1993	101,400	17.3	8,384	23.0	52.5
1994	103,500	13.4	9,119	25.0	54.4
1995	106,200	20.2	8,069	22.1	55.5
1996	107,800	14.7	9,099	24.9	51.5
1997	111,500	24.8	8,768	24	58.9
1998	113,900	16.5	9,350	25.6	59.3
1999	115,900	20.7	9,000	24.7	53.7
2000	118,300	11.3	10,295	28.2	55.9
2001	121,300	12.3	9,978	27.3	55.8
2002	123,700	9.3	9,599	26.2	51.4
2003	125,500	18.2	8,280	22.6	46.9
2004	125,800	18.1	7,984	21.8	42.3
2005	126,900	16.2	8,497	23.3	50.1
2006	127,800	11.2	9,268	25.4	48.9
2007	128,400	13.7	8,860	24.2	47.5

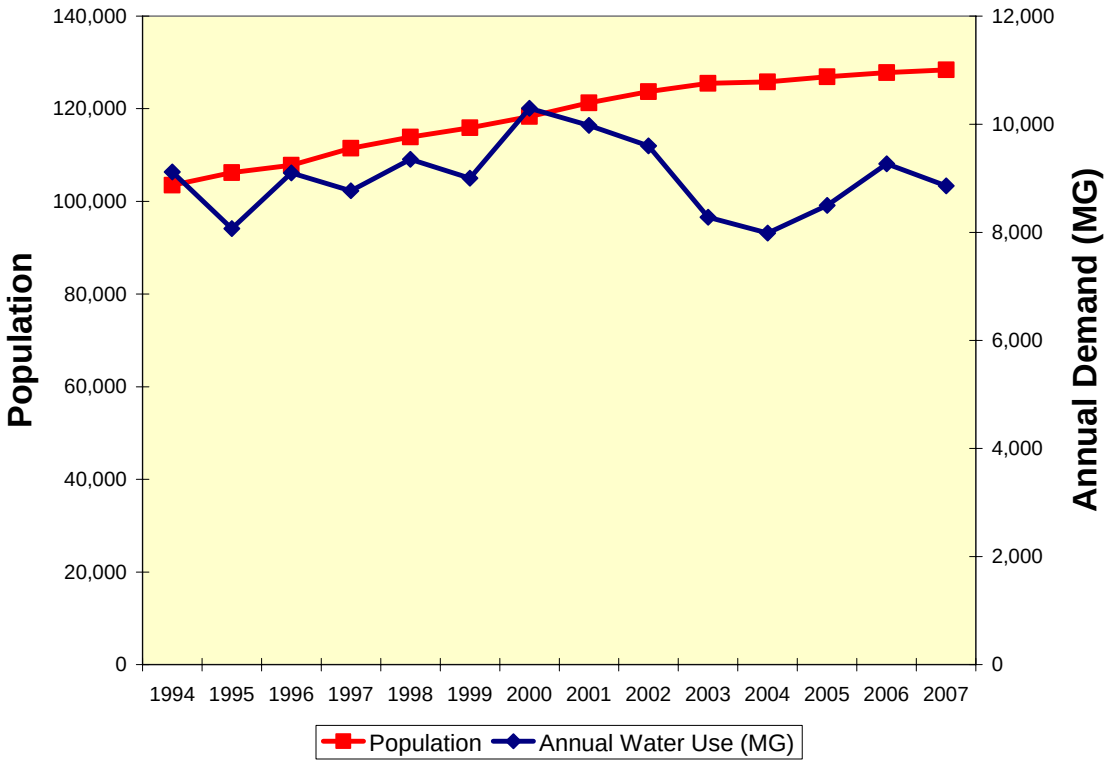

Figure 3: Population and annual water use

Table 5: Number of accounts by customer category

Account Category	2002	2003	2004	2005	2006	2007
Single-Family	26,160	26,091	26,168	26,272	26,413	26,555
Duplex	1,187	1,189	1,178	1,171	1,171	1,165
Multi-Family	1,962	2,013	2,049	2,072	2,094	2,104
Commercial	1,890	1,933	1,978	2,027	2,069	2,103
City Government	178	176	188	186	194	199
West Fort Collins WD	1	1	1	1	1	1
Outside City Customers	1,408	1,323	1,327	1,351	1,370	1,394
Total	32,786	32,726	32,889	33,081	33,312	33,521

Table 6: Water use by customer category

Customer Category	2002 Water Use (MG)	2003 Water Use (MG)	2004 Water Use (MG)	2005 Water Use (MG)	2006 Water Use (MG)	2007 Water Use (MG
Single-Family	3,433	2,886	2,555	2,802	3,204	2,938.
Duplex	167	144	131	137	151	143
Multi-Family	1,027	934	922	937	996	987
Commercial*	3,687	3,229	3,376	3,389	3,648	3,557
City Government	125	122	108	135	165	137
West Fort Collins WD	181	152	145	164	167	164
Outside City Customers	367	286	265	269	303	294
System Losses**	613	527	481	663	635	640
Total	9,599	8,280	7,984	8,497	9,268	8,860

Table 7: Average annual per account water use by customer category

Customer Category	2002 Avg. per acct. use (gal.)	2003 Avg. per acct. use (gal.)	2004 Avg. per acct. use (gal.)	2005 Avg. per acct. use (gal.)	2006 Avg. per acct. use (gal.)	2007 Avg. per acct. use (gal.)
Single-Family	131,223	110,626	97,630	106,660	121,285	110,644
Duplex	141,025	121,182	110,965	116,958	128,908	122,489
Multi-Family	523,265	463,779	449,999	451,987	475,682	469,229
Commercial	1,950,800	1,670,684	1,706,679	1,671,721	1,762,374	1,691,314
City Government	698,833	694,648	577,093	726,493	851,554	686,922
Outside City Customers	260,401	216,004	199,958	199,470	221,041	211,186

Indoor vs. Outdoor Water Use

Precipitation levels and daily temperatures during the watering season cause water use to vary considerably from year to year. For Fort Collins, the chart below shows the percentage of water used indoors versus outdoors per year. Indoor water use remains fairly consistent while outdoor water use fluctuates. Close to 40 percent of the annual water use is for outdoor watering between April and October.

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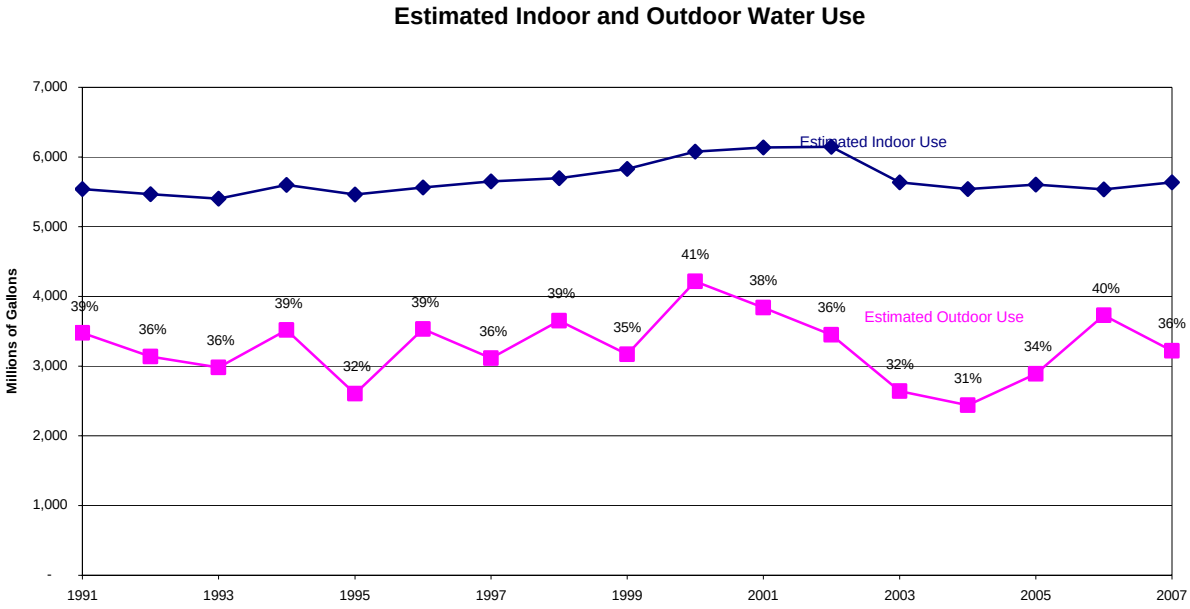

Figure 4: Estimated indoor and outdoor demand, Fort Collins Utilities

Per Capita Water Use

Table 8 shows per capita water use for 1994-2007. Fort Collins has seen a significant decrease in water use over the past 15 years. Per capita use has decreased from around 200 gpcd in the 1990s to below 160 gpcd during the last 5 years, a decrease of about 20 percent. Analyzing how much of that reduction can be attributed to the City's water conservation measures is difficult. Tiered and seasonal water rates, continuing drought awareness, low-flow plumbing standards and metered water taps have also contributed. Water use can vary for many reasons, including changes in weather, seasons, household size and income.

Per capita water use estimates can misrepresent water use trends over time. Population is not the sole determinant of water use. Precipitation levels and daily temperatures during the watering season cause water use to vary considerably from year to year.

Table 8: Per capita water use

Year	Actual Per Capita Use (gpcd)	Normalized Per Capita Use* (gpcd)	Actual Peak Day Demand (gpcd)	1 in 50 Normalized Peak Day Demand** (gpcd)
1994	211	208	491	511
1995	181	205	492	526
1996	203	206	443	527
1997	188	196	496	509
1998	196	201	487	501
1999	185	198	435	473
2000	211	204	440	477
2001	198	198	428	503
2002	183	189	378	411
2003	154	157	346	383
2004	146	150	307	327
2005	155	155	365	363
2006	172	156	353	350
2007	162	156	342	356

Notes:

* Normalized values are adjusted to estimate average expected use based on "normalized" 1930-1995 weather conditions.

** 1 in 50 peak use is expected to occur once in 50 years. Log-Pearson type III distribution applied. Values include all water demands except large contractual use. Since the severe drought year 2002, actual and normalized use values have been significantly lower due to changes in water conservation programs and practices.

Comparison with Other Colorado Utilities

Comparing water use patterns between utilities is a challenging exercise as it is often impossible to compare demands in an “apples to apples” manner. By examining the annualized average per household winter consumption for single-family customers (a reasonable estimate of annual indoor use) it is possible to make a fair comparison. Table 9 presents a comparison of single-family residential per household indoor demands in five Front Range utilities.

Table 9: Comparison of single-family per household indoor demands, 2005-2006

City	Avg. SF Indoor Demand (gal/day)	Annual Indoor (gal)
Boulder	151.5	55,300
Northglenn	153.4	56,000
Fort Collins	157.5	57,500
Denver	174.0	63,500
Aurora	174.5	63,700

During this time period, water use in Fort Collins was toward the lower end of this group. Northglenn and Boulder were approximately 4 gallons per day (gpd) lower and Denver and Aurora approximately 17 gpd higher than Fort Collins. Assuming 2.7 people per household in Fort Collins, this suggests that residents in Fort Collins use approximately 58 gpcd for indoor purposes. The national average (measured in 1999 as part of the AWWA *Residential End Uses of Water* study) was 69.3 gpcd. Subsequent water use studies conducted by Aquacraft have shown

that homes equipped with high efficiency toilets and water conserving clothes washers can reduce their demand to 40 gpcd (EPA Combined Retrofit Studies, 2004). This suggests that while Fort Collins is below the national average for single-family indoor water use, significant indoor conservation potential may exist (approximately 30%).

Current Water Conservation Program

Faced with a drought in 1977, the Utilities created a part-time position dedicated to water conservation. In 1990, the position expanded to full-time and conservation projects and educational efforts increased. The Fort Collins City Council adopted the *Water Demand Management Policy* in 1992, setting two goals for lowering demand and 12 measures for achieving those goals.

The effects of a more recent drought in 2002-2003 greatly impacted water use and the City's water conservation program. As awareness of the drought grew, the City's outreach efforts expanded, restrictions were put in place and regional media coverage affected how customers used water. Water use began declining in 2002 and has remained at a lower level since then. New programs introduced in 2003 included clothes washer rebates, a new water conservation curriculum for youth, a *Water Shortage Response Plan* and various regulatory measures.

During 2003, the *1992 Water Demand Management Policy* was updated and combined with the *1988 Water Supply Policy*. Resolution 2003-104, a *Water Supply and Demand Management Policy*, was adopted by City Council in September 2003. The resolution provides general criteria for decisions regarding water supply projects, acquisition of water rights and demand management measures. Demand management tools include educational programs, rate structures, incentive programs, and regulatory and operational measures.

In 2007, Fort Collins became a partner in the U.S, EPA's WaterSense program, a new national water efficiency effort. WaterSense is a voluntary partnership program sponsored by the EPA with the mission of protecting the future of our nation's water supply by promoting and enhancing the market for water-efficient products and services. As the water counterpart to the EnergyStar program, WaterSense has begun labeling products that offer a 20 percent efficiency improvement to help consumers conserve water when they install new plumbing fixtures and appliances.

Current Goals

As part of this plan, Fort Collins Utilities has established a goal for the conservation program of reducing water use to 140 gallons per capita per day (gpcd) by 2020 (normalized to account for weather conditions). This goal represents realistic and achievable demand reductions in all customer sectors in Fort Collins under existing climate conditions. Achieving this goal within the planning period will provide an additional measure of reliability to the water supply system to ensure high quality service to customers in case of future drought, climate change and unforeseen shortages.

Current Conservation Program

Fort Collins Utilities' water conservation program offers a diverse range of activities targeted at all water demand sectors in the service area. Fort Collins has implemented a conservation oriented increasing tiered water rate structure designed to encourage efficient use. Following descriptions of the current programs, Table 10 summarizes those conservation program activities.

Education and Public Information

Conservation public information campaign - Staff respond to residential and commercial customers with water use or billing questions and requests for water conservation information. Water conservation information is disseminated via a wide range of media; including bill inserts, bus benches and brochures. Displays are set up at various community events; including the Sustainable Living Fair, Thursday Night Music and More, and others. Topics include water-saving tips, technology and techniques, Xeriscape and lawn watering.

Adult education programs - The Utilities provides programs about Xeriscape landscaping, watering techniques and practices and general water conservation. A daily Lawn Watering Guide is published in the *Fort Collins Coloradoan* during the watering season.

Business environmental programs - A series of programs is offered to commercial customers on a variety of environmental topics, including water conservation. Staff provides newsletters, mailings, meetings and seminars on topics of interest to specific businesses, such as restaurants, hotels, car washes, landscapers and large accounts.

School education programs - Presentations and hands-on activities are provided to school classes on water topics, including the history of water in Fort Collins, water use and conservation, water chemistry and watersheds. Dr. WaterWise is a water conservation curriculum introduced in 2003 to classrooms during the drought. Fort Collins Utilities is a co-sponsor of the annual Children's Water Festival.

Conservation giveaways - Water conservation kits with indoor or outdoor water-saving devices are offered periodically free of charge through coupons in utility bills.

Water Rates and Usage Information

Increasing block rate structure – Tiered rates for single-family residential customers are designed to charge an incrementally higher amount for higher water use.

Seasonal rate structure - Commercial and multi-family customers are billed with a seasonal block rate structure with higher rates from May through September. Commercial rates have a second tier for higher water use.

Indoor Fixtures and Appliances - Residential

Residential clothes washer rebates - The Utilities offers a $50 rebate for customers who purchase high-efficiency clothes washers. Rebate costs are split between water and electric utility funds. Some commercial rebates may also be given. Approximately 900 rebates are given each year.

Dishwasher rebates – New in 2007, this program offers a $25 rebate when a qualifying dishwasher is purchased. The cost of the rebates is shared with the electric utility fund.

Zero-interest Loan Program (ZILCH) - Loans are provided at no interest to residential customers for water conservation improvements. Loans are available for water service line replacements and high efficiency clothes washers.

Outdoor Efficiency – Landscape and Irrigation

Sprinkler system audits – Available to homeowners and homeowner associations, Utilities auditors perform a sprinkler system assessment and show sprinkler operators how to water more efficiently. Approximately 250 audits are completed each year.

Xeriscape Demonstration Garden - Staff oversees maintenance of the City's Xeriscape Demonstration Garden and provides tours at organized events and upon request.

Raw water for City irrigation - Raw water is used to irrigate 80% of the City's parks, cemeteries and golf courses.

Indoor Fixtures and Appliances – Commercial, Industrial, Institutional (CII)

CII facility audits - Staff performs facility water audits to assess water use and make recommendations for improved efficiency. Many of these audits are done in conjunction with the Climate Wise program.

Hotel and restaurant conservation material distribution – A three-card set is available for hotels and other lodging establishments to inform guests about importance of water conservation to our area, and encourage the reuse of towels and linens. Tent cards are available for restaurants telling customers that "water is served upon request."

Water Reuse Systems

Large customer reuse - Treated wastewater from the Drake Water Reclamation Facility is pumped to Rawhide Power Plant for landscaping and cooling water.

Backwash water recycling - Backwash water recycling equipment at the water treatment facility treats backwash water and recycles it to the beginning of the treatment process.

Regulatory Measures

Wasting water ordinance - Staff enforces the section of the City Code that prohibits wasting water. Wasting water complaints are investigated. Complaints are used as an education tool, but enforcement by ticketing is also an option.

Restrictive covenants ordinance - City Council adopted Ordinance No. 083, 2003 that prohibits homeowner association's covenants from banning the use of Xeriscape or requiring a percentage of landscape area to be planted with turf.

Soil amendment ordinance - City Council adopted Ordinance No. 084, 2003 that requires builders to amend the soil for new properties.

Water Supply Shortage Response Plan – This plan has a series of measures to be enacted, including water restrictions, for four levels of water shortage.

Landscape and irrigation standards - New development landscape and irrigation plans are reviewed for compliance with the Land Use Code's water conservation standards. As part of these standards, a rain shut-off device is required for commercial sprinkler systems.

Operational Measures

Utility water loss program – All utilities "lose" water to leaks in the distribution system, meter inaccuracy, billing errors, and other normal conditions associated with the standard operation of

a treated water delivery system. System water loss programs generally involve finding and repairing leaks in the water distribution system—often the most easily addressed and economically sensible manner to tackle system loss. The Fort Collins program entails listening for leaks and pinpointing their locations using sonar equipment. It takes crews two years to survey the 500 miles of water mains. The goal is to reduce water wasted from water main leaks. Catching leaks before they have surfaced saves water and costs of excavation and repairs.

Water conservation upgrades at City LEED buildings - The City is committed to building new City buildings to the LEED Gold standard (Silver standard in some cases). Water conservation upgrades are part of this commitment.

Table 10: Current water conservation program measures

Program/Measure	Date of Implementation
Education and Public Information	
Conservation public information campaign	1977
Adult education programs	1977
Business environmental programs	2004
School education programs	1977
Conservation giveaways	1990
Water Rates and Usage Information	
Increasing block rate structure – Res.	2003
Seasonal rate structure – Comm. & MF	2003
Indoor Fixtures and Appliances - Residential	
Residential clothes washer rebates	2003
Dishwasher rebates	2007
Zero-interest loan program	1994
Outdoor Efficiency - Landscapes and Irrigation	
Sprinkler system audits	1999
Xeriscape Demonstration Garden	1986
Raw water for City irrigation	1900
Indoor Fixtures and Appliances - CII	
CII facility audits	2004
Hotel and restaurant conservation materials	2003
Water Reuse Systems	
Large customer reuse	1980
Backwash recycling at water treatment facility	2003
Regulatory Measures	
Wasting water ordinance	1964
Restrictive covenants ordinance	2003
Soil amendment ordinance	2003
Water Shortage Response Plan	2003
Landscape & irrigation standards	1994
Operational Measures	
Utility water loss program	1993
Water conservation upgrades at City LEED buildings	2006

POPULATION AND WATER DEMAND PLANNING PROJECTIONS

Forecasting Method

During the development of the *2003 Water Supply and Demand Management Policy*, considerable effort was made to forecast future population and water demand. This data was updated in 2006 when additional planning information became available. It is this updated data that is reflected in this section of the conservation plan.

Estimating the future population to be served water by Fort Collins Utilities was quite challenging since its service area boundary does not coincide with the city limits. This is further complicated because the boundaries vary for other utility services (electric, wastewater and stormwater). The Fort Collins-Loveland Water District (FCLWD) and the East Larimer County Water District (ELCO) provide water to some areas within the city limits and will most likely serve additional city residents in the future. The Utilities also serves some areas outside the city limits, primarily to the northwest of Fort Collins, including water provided to the West Fort Collins Water District (WFCWD). All of these factors were considered in estimating the population for the Utilities water service area. Figure 1 shows the different service areas with respect to the Fort Collins Urban Growth Area (UGA).

The projected population estimates for the Utilities water service area were based on the Traffic Analysis Zone (TAZ) information developed for the City of Fort Collins and Larimer County. The TAZ information is based on selected zones in and around the city that correlate with the City and County zoning designations, which dictate the type of development and their densities.

The population within the Utilities water service area was obtained by cross-referencing the service area with the TAZs. Future population projections were based on projected in-fill for each of the TAZs and it was assumed that the rate of growth will be similar to past patterns. Projections were made through the year 2035 to provide a long-term look at the effects of growth. Fort Collins anticipates that more of its growth toward build out will occur in the next 15 years (2008–2023) compared with the following years (2024–2035).

Fort Collins planning boundaries are clearly defined and unlikely to change significantly. As time goes on there will be less and less land available for development. The anticipated slowing population growth over time (i.e. decay in the growth rate) is expected to translate into slowing water demand growth at the end of the planning period as well. Demand projections developed for this study reflect this anticipated change in growth rate over time. Although the projections will be updated from time to time and will not match the actual growth precisely, it is believed that these projections provide a reasonable basis for the planning needed to project future water supplies and demands.

Although the Utilities water service area is limited by the surrounding water districts, the City currently has some water sale and exchange agreements to supply water to these water districts. With these agreements in place, and the potential for more in the future, additional population was added for growth within the City but which is outside the current water service area. It is estimated that by 2035 an additional 10,000 people will be served by the Utilities that is within the service area of the water districts. Currently, it is estimated that the Utilities will serve water to a total population of about 157,700 people by the year 2035.

Population was used as the primary factor in determining projected water use. It is expected that most growth in the community will be made up of a similar proportion of residential, commercial and other uses as presently exists. Because of this, treated water demands were forecast based on two main components. The first is what has been referred to as population-based demand, per capita water use multiplied by the population. The second component is an estimated use for large contractual users that the Utilities has an obligation to serve.

Since significant large contractual use can skew the per capita demand rates calculated for the City's water use, it was not used in the gpcd method of calculating future water needs. Instead, large contractual demands were estimated on an individual basis and added to the population related demand. During the treatment process, a small percentage of the water is lost. This is added to the demands to reflect the amount of raw water supply that needs to be delivered to the treatment facility. Based on these assumptions and criteria, treated water demands were calculated as shown in the following section.

Previous Treated Water Demand Projections

Table 11 shows a summary of the Utilities water service area historic use from 1960 and the projected demand through 2035 for the utility projected service area. Two different water demand projections are shown. The first scenario, shown under the heading of 185 gpcd, reflects the projections that were used in the development of the *2003 Water Supply and Demand Management Policy*. The second scenario, shown under the heading of 161 gpcd, reflects the current number that is being considered for purposes of water supply planning. Because of the significant reductions in use for the last several years, it seems prudent to adjust the numbers that are used for planning purposes. Even though the water conservation goal of 140 gpcd is believed to be obtainable, there are many uncertainties regarding the future reliability of the City's water supply. Future issues, such as climate change, make it important to continue to plan for a slightly higher water demand for purposes of developing the City's supply system. Figure 5 presents the same data in graphical format.

Raw Water Demand Projections

In addition to treated water demands, the Utilities has various raw water demands that are met with available supplies. These demands include raw water for irrigation of parks, golf courses, a cemetery, school grounds and various other greenbelt areas. The current raw water demands range from about 3,000 to 4,000 acre-feet per year and are in addition to the supplies needed to meet treated water demands. There are also several raw water obligations totaling approximately 4,000 acre-feet per year that need to be met because of various exchanges and agreements. Although it is anticipated that the demand for raw water will increase in the future, these demands will probably be met with water rights provided to the City (in addition to the projected water rights acquisitions through the raw water requirements that will meet treated water demands).

Table 11: Historic and projected population and treated water demand (1960–2035)

	Historic Service Area[1]		Projected Service Area[1]		
	Population (1,000)	Demand[2,4] (Ac-ft)	Population (1,000)	Demand[3,4]	
				185 GPCD (Ac-ft)	161 GPCD (Ac-ft)
1960	27.5	7,277			
1965	38.2	10,109			
1970	48.4	12,808			
1975	60.4	15,984			
1980	73.7	19,504			
1985	85.0	22,494			
1990	95.9	29,316			
1995	106.2	30,168			
2000	118.0	31,690			
2005	130.3	32,694			
2010			137.4	34,219	30,416
2015			144.4	36,497	32,498
2020			148.5	38,144	34,032
2025			152.4	39,749	35,529
2030			155.1	41,098	36,803
2035			157.7	42,425	38,059

Notes:

1. The Historic Service Area includes the City's current utility service area plus the area served by the West Fort Collins Water District. The 2005-2035 values also include water delivered to the Fort Collins-Loveland Water District special agreement area.
2. Based on 225 gpcd for 1960-1990, 210 gpcd for 1995, 198 gpcd for 2000, and 161 gpcd for 2005; plus large contractual demands ranging from 3,750 ac-ft in 1990 to 4,010 ac-ft in 2005.
3. Based on the stated amount of gpcd for the 2010-2035 planning period; plus large contractual demands increasing from 4,760 ac-ft in 2010 to 8,510 ac-ft in 2035 during the projected period.
4. An additional 5% for 1960-2000 and 3% for 2005-2035 of treated water use is included to process the water. The drop in amounts is due to backwash recycling implemented in 2003.

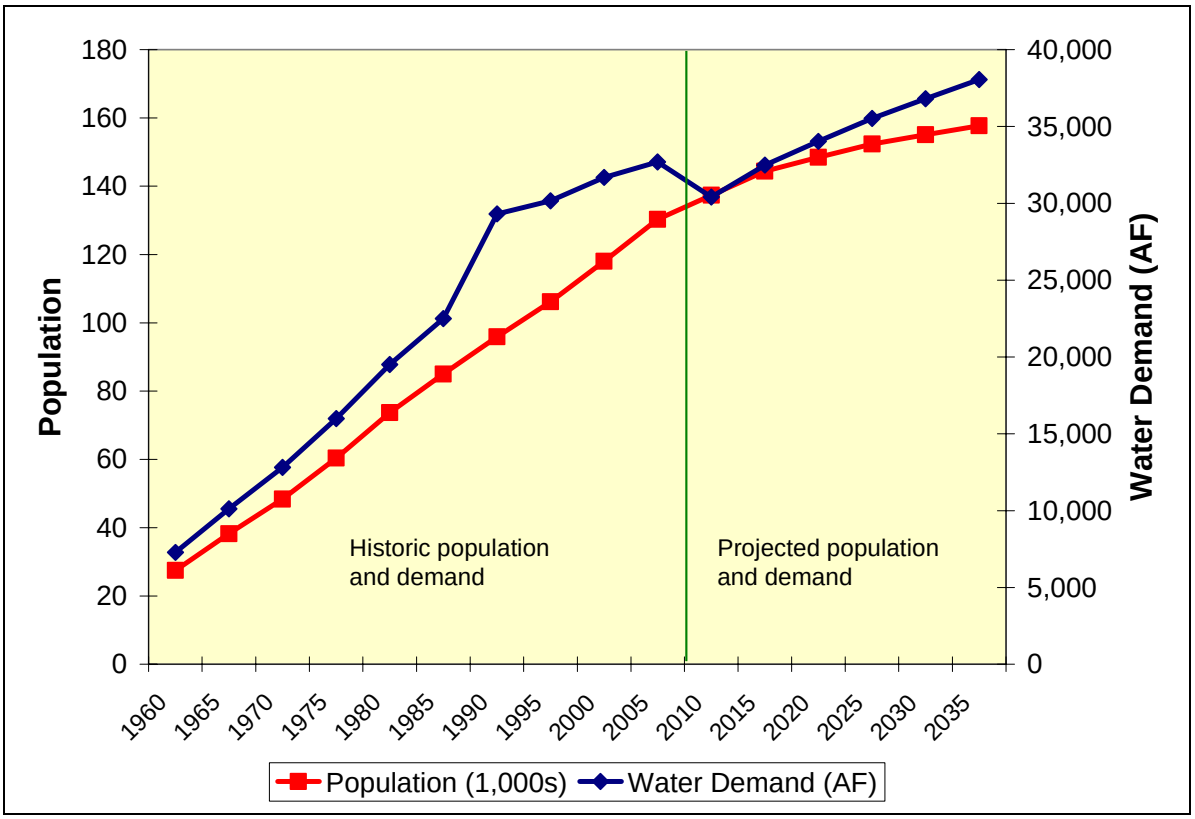

Figure 5: Historic and projected population and treated water demand (from previous studies)

PROPOSED WATER SUPPLY PROJECTS

Integrated Resources Planning in Fort Collins – Water Supply and Demand Management

In planning for a safe, secure, and sustainable water future, the City of Fort Collins employs an integrated resources planning strategy that carefully considers a range of supply and demand management options. In confronting the future water supply uncertainties posed by climate change and the potential for increased and extended droughts, the City has opted for a diversified approach that increases storage capacity (and hence flexibility in system operations) and an expanded water conservation program to reduce demand and improve system reliability and resilience to drought.

The combination of increased storage and reduced demand through conservation offers the best water management option for meeting future supply challenges. The proposed Halligan Reservoir enlargement will provide increased water storage which is the primary physical constraint the City faces in managing and regulating its water rights portfolio. When combined with the anticipated demand reductions from the City's expanded water conservation program, this integrated strategy will help improve Fort Collins' ability to weather the expected impacts of climate changes during the next few decades and beyond. Emerging global climate models suggest temperatures will rise causing higher water demands and more frequent and intense drought periods. Either water conservation or storage by itself, while beneficial, would not provide the same level of flexibility and drought resilience.

Expanded water conservation offers cost-effective water supply that can be stored for drought, leased for agriculture, or potentially used for beneficial environmental enhancement efforts such as in-stream flow programs. However, water conservation savings must be quantified and proven sustainable if they are to be relied upon for various beneficial uses. Increased storage provides a physical location for conserved water and enables Fort Collins to take full advantage of savings achieved by customers.

Potential Facility Needs

The City of Fort Collins is fortunate in that most of the infrastructure is in place to support the projected level of water use as defined in the *2003 Water Supply and Demand Management Policy*. The peak day capacity of the Water Treatment Facility is 87 million gallons per day, which is higher than the projected peak demand level for build-out in the Utility service area. In addition, there is adequate capacity in the major transmission lines to support projected peak day demands.

The primary water facility needs are related to additional water storage capacity that is required to meet the policy drought criteria. Fort Collins requires both short-term and long-term carryover storage to maximize operational flexibility and system reliability and to take advantage of anticipated conservation savings. Short-term storage is needed for operational flexibility and to meet return flow obligations inherent with converted irrigation company shares. Long-term carryover storage is needed to capture excess water in wetter years and water conserved by Fort Collins citizens. This provides a source of water in drought years to provide the desired level of water system reliability.

WATER CONSERVATION PROGRAMS AND MEASURES

Conservation Goals and Identified Programs and Measures

Water Conservation Goal

In 2007, Fort Collins Utilities set a goal of reducing water use to 140 gallons per capita per day (gpcd) by 2020. This goal represents realistic and achievable demand reductions in all customer sectors in Fort Collins, based on current water demand factors. Achieving this goal in the 12 year planning period will provide an additional measure of reliability to the water supply system to ensure high quality service to customers in case of future drought, climate change and unforeseen shortages. It will be necessary, in particular, to monitor the effects of expected climate change impacts on water use. This is particularly true for the outdoor component of use and may require that some adjustments be made to the goal in the future. Adapting to changes in the supply and demand conditions is a normal element of water conservation planning.

The City will implement the necessary water conservation practices and programs to reduce its water use to reach the 140 gpcd goal by 2020. The gallons per capita calculation is made by dividing total treated water produced for use by City customers (adjusted for large contractual customers and other sales or exchange arrangements) by the estimated population of the City's water service area. It is also "normalized" by adjusting it for weather conditions so it is representative of a year with average precipitation and temperatures.

Benefits of Water Conservation

Water conservation is of vital importance to the City of Fort Collins. Although there are many reasons to implement and expand water conservation efforts, a few key ones include:

To foster a conservation ethic and eliminate waste. The success of the City's water conservation program depends on the cooperation of its customers. Instilling a conservation ethic is an important first step to changing habits and attitudes toward water use. The objective of the 140 gpcd level of use is to provide adequate water to customers, while reducing unnecessary use and waste. Much of indoor water use is for fundamental and public health purposes, such as drinking, flushing and cleaning, not only in homes but also in businesses, schools and industry. Adequate quantities of water are necessary to meet these important functions. Outdoor water use is primarily watering landscapes. Adequate supplies are needed to maintain trees, bushes and other vegetation at a level desired by the community and which provides desirable benefits to the urban environment. Even at 140 gpcd, outdoor water use will continue to constitute about one-third of the total use by Fort Collins' customers.

To demonstrate a commitment to sustainability. The City has an approved *Action Plan for Sustainability* that states, "Being sustainable means considering the environmental, financial and human impacts of all of our decisions. It means recognizing new challenges that result from finite resources. It means considering the long term impacts of our actions." In addition, the Utilities is launching the *21st Century Utilities* project with the purpose of "inspiring community leadership by reducing environmental impact while benefiting customers, the economy and society."

The City believes it's important to conserve water because it's good stewardship; it's the responsible way to manage a vital resource. Sustainability means not only conserving water, but also efficiently managing our water supply portfolio in a manner that is environmentally responsible and will best serve our community's residents.

To provide water for multiple beneficial purposes. The City owns a portfolio of water rights that produces a plentiful supply of water in most years. The yield of these water rights varies considerably and in times of severe drought the supply system may be stressed resulting in the need for extra conservation measures. In most years, however, the City has supplies that are surplus to its normal municipal demands. One reason for an aggressive water conservation program is to be able to provide more water for beneficial uses beyond normal municipal purposes. For example, the area around Fort Collins continues to be a productive agricultural area that produces many crops that provide a local food source and provides additional economic activity to the area. These remaining agricultural areas also provide significant open space outside of Fort Collins that is desired by many residents. Making some of the City's surplus water available for these purposes also provides supplemental revenue for the Utility and its customers. The potential environmental benefits of conserved water are also important. Providing additional flow for the local stream systems, in-stream flow programs, improvements in water quality, improvements in aquatic and riparian ecosystems, enhanced recreational opportunities, and aesthetics are all potential benefits of water conservation in Fort Collins.

To reduce costs. There are costs associated with varying levels of water use in Fort Collins. These include costs for the Utility as a whole and for individual customers. Utility costs, which are also passed on to customers, include any water system infrastructure costs dependent on the level of water use or water flow. These costs may include water rights acquisition, enhanced or

expanded treatment, distribution and storage facilities, environmental and agricultural impacts, and legal issues. Ongoing variable charges related to the level of use are typically for items such as energy for pumping and chemicals for treatment. These costs extend beyond the direct financial impact to the Utility and include the anticipated costs and impacts associated with long-term climate change and the hazards associated with the use of certain chemicals. From the customer perspective, lowering Utility water bills through conservation can reduce other costs indirectly. These savings may come from reductions in the energy required for heating water, reduced use of fertilizer and landscape chemicals, and reduced landscape maintenance costs. Fort Collins seeks to minimize both direct and indirect costs to citizens while providing all of the benefits of the efficient use of water.

To prepare for forecasted climate change. Climate change may have significant impacts on both water demands and water supplies in the time frame of this plan. Numerous studies on climate change and the general impacts that are expected in the field of water supply and demand have been produced by reputable scientific organizations such as the Intergovernmental Panel on Climate Change, National Center for Atmospheric Research, American Water Works Association Research Foundation, the Association of Metropolitan Water Agencies and the American Society of Civil Engineers.

Although additional research is still needed to determine the extent of local impacts, there is general consensus that climate change in the Mountain West will likely include the following changes:

- Increased evapotranspiration rates, increasing the water required to maintain landscaping.
- More frequent dry spells and a longer growing season.
- Changes in seasonal snow pack.
- Earlier spring snowmelt and runoff.
- Changes in the distribution of precipitation over the year.

These changes are expected to accelerate over the decades ahead and impacts may depend largely on factors such as population growth, economic growth and technological changes. Utilities will likely face significant challenges in the years ahead managing both water demands and water supplies.

In the area along the Front Range of northern Colorado, it is particularly difficult to project future temperature and precipitation trends. One such attempt, averaging the results of several Global Climate Models (GCM), results in some potential scenarios for this area. These models suggest that temperatures could increase an average of about 2 degrees Celsius by 2040 and 3 degrees by 2070. The change in precipitation shows an average annual increase of about 1% by 2040 and 2% by 2070. The distribution over the year changes and it is expected to be wetter during the winter months and drier during the spring and summer months.

From a water demand perspective, hotter and drier conditions during the growing season will result in more evapotranspiration and water use for many trees, lawns and other vegetation. In Fort Collins, outdoor water use is about one-third of total use on an annual basis. Based on current use patterns and conditions, a 10% increase in outdoor water use could result in an increase of about 7 gpcd. A 20% increase in outdoor water use translates to an increase of 14 gpcd. Without conservation and/or significant changes in landscaping choices, outdoor water use will likely increase over the coming decades as customers strive to maintain their landscapes in a hotter and longer growing season.

It is currently difficult to predict how climate change will alter the quantity and timing of runoff. Many models suggest that there will be less runoff in the spring and early summer from snowmelt. Models also suggest that the variability and duration of wet periods and droughts will be more severe. The yield of the City's current water rights portfolio could vary more from year to year, resulting in an increase of water "short" years. This in turn would make meeting demands more challenging. There may also be some years that are wetter than what has been experienced in the past.

With many uncertainties regarding both water supply and demand, it is prudent to prepare for a wide range of conditions in the future. Additional reductions in water use through thoughtful conservation measures are a prudent and sensible approach to begin confronting this uncertainty. Planning for adequate reservoir capacity to help balance the swing in supplies available between wet and dry periods is also a prudent and sensible approach. Fort Collins seeks to combine these efforts to provide for a sustainable water future in the face of great challenges and uncertainty.

Document the Goal Development Process

In September 2003, the Fort Collins City Council adopted the *Water Supply and Demand Management Policy*. The objective of the Policy was, "to provide a sustainable and integrated approach to (1) providing an adequate and reliable supply of water for the beneficial use by customers and the community and (2) managing the level of demand and the efficient use of a scarce and valuable resource." The Policy set a goal of 185 gpcd by 2010. This goal made sense at the time; however per capita water use has been significantly lower since 2002. A new water use goal of 140 gpcd by 2020 was established as part of the process of developing this plan

CONSERVATION PROGRAMS AND DEMAND FORECASTS

Demand forecasts were prepared for each of the scenarios described below including the Baseline (no conservation) scenario. The forecasting methodology uses current per capita demand as the basis and then forecasts future demand using Fort Collins population planning projections. The impact of different conservation program measures reduces the per capita demand incrementally by year depending upon the proposed implementation schedule. Care has been taken to properly assign program impacts and to avoid double counting reductions.

Baseline: Demand Forecast Without Conservation Program

The baseline forecast represents a projection without any water conservation program. This forecast provides a way to examine the impacts of the current conservation program and the recommended expanded program against a hypothetical baseline without conservation. The forecast includes anticipated changes in growth rates based on current planning projections. Growth rates are expected to gradually decline over the next couple of decades as the City approaches build-out. The baseline forecast includes the following assumptions (many of which are included in the Level 1 and Level 2 forecasts as well):

- The Projected Service Area includes the City's current utility service area plus some of the new growth in the UGA that is not already served by the surrounding water districts that the City plans to serve.
- The demand forecast is based on 153 gpcd at the beginning of the 13 year planning period (2008-2020); plus large contractual demands increasing from 4,010 ac-ft in 2005 to 6,476 ac-ft in 2020 during the projected period.

- The demand forecast includes the assumption of 6% losses in the treated water system.
- This forecast does not include the impacts of an ongoing water conservation program. This baseline provides a way to show the impact and potential savings of the current program.

Level 1: Current Program

Fort Collins Utilities' current water conservation program is broad-based and designed to reduce demand in most customer sectors. Key elements of the current program include: public education and information, an increasing block rate billing structure and seasonal rates for commercial customers, rebates for efficient residential clothes washers, an innovative zero-interest loan program, irrigation audits, several ordinances, and a utility water loss detection program. A detailed description of the current programs is provided earlier in this report.

The Level 1 current conservation program will save an estimated 1,000 acre-feet if continued at the same level through the planning period to 2020.[1]

Level 2: Recommended New Program

The Level 2 program includes all elements from the current program and the following additional program measures. The Level 2 conservation program will save an estimated 2,300 acre-feet if continued at the same level through the planning period to 2020. See Table 16 for an overview of the recommended program, including current and new measures.

The following new conservation measures are included in the Level 2 program. Program costs and savings estimates are presented in Table 12. These measures are planned to be phased in over three years.

Education and Public Information

Public information campaign expansion – This measure would increase the amount of outreach to customers through print and radio advertising, more bus benches and other venues for increased visibility of water conservation messages. Efforts may include partnerships with home builders, local nurseries, Colorado State University, regional water suppliers and/or others.

Water conservation recognition awards – Residential and commercial customers would be recognized for their water conservation efforts.

Water Rates and Usage Information

Online access to water use history – Customers who have online access to their water bills can track and compare their monthly and seasonal water use. This program will be implemented along with online bill payments.

Online water use calculator – A water use calculator can provide feedback to customers about how efficiently they are using water. Customers will be able to customize the calculator with their household parameters and historic water consumption.

[1] These savings estimates do not include the impact of the Fort Collins increasing block and seasonal water rate structure. Rate structure impacts were not evaluated in the preparation of this plan.

Fixtures and Appliances – Residential

High efficiency toilet rebates – High Efficiency Toilets (HETs) are typically dual flush or pressure assisted models that use an average of 1.28 gallons per flush (gpf) or less. Some HETs use only 1 gallon per flush and have passed tests for effective waste removal. Performance tests for these products are now available and there are many HET models that perform as well or better than standard 1.6 gpf fixtures. This program would offer a $50 rebate for the purchase and installation of an HET toilet.

Low income retrofit program – This program will provide low income single- and multi-family households with toilet, showerhead and faucet aerator retrofits. It is envisioned that all equipment will be provided and installed free of charge to the customer. This program may be administered as part of the City's REACH and LEAP weatherization programs.

Zero-interest loan program expansion – Fort Collins currently offers zero interest loans to customers for replacing aging water service lines and purchasing high-efficiency clothes washers. This would expand the loan program to possibly include high efficiency toilets, smart irrigation controls, Xeriscape and/or other technologies as appropriate.

Research: Water end use study for homes – This measure would include a survey of the City to determine how water is being used in homes, including gallons per flush of toilets. It would also track water usage for irrigating landscapes. This information would help to target programs appropriately to have a greater impact on water use.

Outdoor Efficiency – Landscapes and Irrigation

Xeriscape design clinics – This program would offer homeowners an educational program and one-on-one landscape design assistance from a professional. Customers would pay a fee to participate.

Irrigation technology rebates – One of the most promising new technologies for water conservation with automatic irrigation systems is "smart control". These controllers use prevailing weather conditions or soil moisture measurements to automatically adjust irrigation applications to meet the real-time water needs of the plants. This equipment is more expensive than conventional irrigation control and this program would offer rebates to customers ranging from $50-150 (depending upon the product and number of irrigation zones impacted). The average rebate amount is estimated to be $85.

Large HOA irrigation efficiency grants – This program would offer HOAs with large landscapes a grant averaging $1,300 per customer for the purpose of improving irrigation efficiency through improved distribution uniformity, leak repair, and weather-based scheduling. This program would be tied directly to Fort Collins Utilities' current irrigation audit program. Five large HOA customers per year would be targeted.

Research: Determine irrigated area for lots – This measure would use GIS and other technologies to determine the square feet of irrigated area for each City lot. This information would help in providing water budgets and efficiency reports to customers.

Fixtures and Appliances – Commercial, Industrial, & Institutional

CII facility audit program expansion – This measure would hire contract labor to perform more complex assessments than our current program at industrial facilities.

Commercial clothes washer rebates – This program will offer rebates for the purchase of water (and energy) efficient clothes washers for the commercial, industrial, and institutional (CII) sector. Although commercial customers can currently apply for rebates for residential washers, this program would include coin-operated and other commercial washers.

Commercial high-efficiency toilet and urinal rebates – Similar to the residential HET incentive described earlier, this program expands the rebate offer to commercial customers and also includes efficient urinals. Savings are estimated to be comparable to residential installations.

Financial incentives for commercial water-saving upgrades – This program aims to overcome barriers to implementing water efficiency upgrades in the CII sector (e.g. cooling tower conductivity control, leak detection and repair, fixture replacement, etc.). Customers would submit a proposal for improvements and estimated water savings. Incentives would be based on the amount of documented saved water.

Restaurant pre-rinse spray valve distribution – Restaurants and commercial food service operators use pre-rinse spray valves to rinse trays of dishes prior to washing them in a large commercial dishwasher. Historically these valves have flowed at anywhere from 3 to 10 gallons per minute (gpm). New high-efficiency spray valves use 1.6 gpm or less and utilize venturi valve technology to ensure a high-pressure spray with less water. Distribution programs of pre-rinse spray valves have been a success in numerous water districts in California, Washington, and Colorado. New spray valves cost less than $40 each. Most utilities have simply given these devices away and many have installed them as well to ensure they are utilized. Satisfaction surveys have shown that customers prefer the new valves.

Regulatory Measures

Landscape and irrigation standards update – In 1994, City Council adopted landscape and irrigation standards for water conservation. With revisions to these standards, water efficiency can be improved. An interdepartmental team, along with outside professionals, would review the current documents and consider appropriate revisions. The new standards may include a provision for dedicated irrigation taps for large landscapes, irrigation system efficiency requirements and/or limiting turf in narrow strips, among other measures. These new standards may result in the need to hire an additional FTE for compliance and outreach.

Operational Measures

Utility water loss program enhancement – This measure would change the methodology of the City's current water loss program by implementing the new industry standard, the IWA/AWWA water loss methodology. This new methodology offers a new set of tools for quantifying water loss in a utility. The IWA/AWWA Water Audit Method is effective because it features sound, consistent definitions for the major forms of water consumption and water loss encountered in drinking water utilities. It also has a set of rational performance indicators that evaluate utilities on system-specific features such as the average pressure in the distribution system and miles of water main. Once implemented, this method can be used to track and assess water loss over time and to develop effective tools for reducing real and apparent losses. The goal of this effort will be to reduce what is currently described as unaccounted for water from 6 percent per year to 5 percent per year by 2026. However it should be understood that the results of changing methodologies are uncertain. The impacts for Fort Collins could be larger or smaller than estimated here. Furthermore it is uncertain what budget is required to implement the new

methodology. Fort Collins currently budgets $70,000 per year for leak detection and water loss control. For the purposes of this plan, a one time cost of $200,000 has been allotted for implementing the new IWA/AWWA methodology in the first year. It is anticipated that these costs could go back down to $70,000 after the initial audit is complete, but initial outlay requirements are not fully known.

Water conservation upgrades at City facilities – One of the goals of the City's conservation program is to demonstrate a water conservation effort. This measure would provide upgrades of water-efficient indoor fixtures and sprinkler system equipment at City facilities.

Table 12: Level 2 new measures - estimated costs and water savings

Note: Some staff labor will be absorbed within existing programs. All measures do not have quantified water savings.

Program/Measure	New FTE	Labor Cost	$/ Customer (i.e. rebate)	# of Customers Impacted (or rebates)	Annual program/ measure cost	Total annual cost (labor & program costs)	Anticipated annual water savings in gallons	Annual Savings (AF)	Cost of Saved Water ($/AF)	Implementation Difficulty (1 = easy, 5 = difficult)
Education and Public Information										
Public information campaign expansion	0.1	$10,000	N/A	N/A	$10,000	$20,000	750,000	2.3	$8,689	2
Water conservation recognition awards	0.05	$5,000	N/A	N/A	$1,000	$6,000	Unknown			2
Water Rates and Usage Information										
Online access to water history	0	0	N/A	N/A	N/A	N/A	Unknown			2
Online water use calculator	0	0	N/A	N/A	N/A	N/A	Unknown			1
Indoor Fixtures and Appliances - Residential										
High efficiency toilet rebates	0.1	$10,000	$50	1,000	$50,000	$60,000	9,000,000	27.6	$1,991	2
Low income retrofit program	0.05	$5,000	$400	25	$10,000	$15,000	1,250,000	3.8	$3,910	3
Zero-interest loan program expansion	0	0	N/A	N/A	N/A	N/A	500,000	1.5	$0	2
Research: Water end use study for homes	0.05	$5,000	N/A	N/A	$50,000	$55,000	0	0	0	3
Outdoor Efficiency – Landscapes & Irrigation										
Xeriscape design clinics	0.05	$5,000	$50	75	$3,750	$8,750	750,000	2.3	$3,801	2
Irrigation technology rebates	0.1	$10,000	$85	175	$14,875	$24,875	3,500,000	10.7	$2,316	3
Large HOA irrigation efficiency grants	0.05	$5,000	$1,300	5	$6,500	$11,500	1,250,000	3.8	$2,998	2
Research: Determine irrigated area for lots	0.05	$5,000			$50,000	$55,000	0	0		3
Indoor Fixtures & Appliances – CII										
CII facility audit program expansion	0.4	$40,000	N/A	40	$10,000	$50,000	1,000,000	3.1	$4,887	3
Commercial clothes washer rebates	0	0	$100	10	$1,000	$1,000	90,000	0.3	$3,620	3
Commercial toilet and urinal rebates	0.1	$10,000	$50	1,000	$50,000	$60,000	1,800,000	5.5	$2,715	2
Financial incentives for commercial water-saving upgrades ($ based on savings)	0.15	$15,000	$1,000	25	$25,000	$40,000	2,500,000	7.7	$5,213	3

Program/Measure	New FTE	Labor Cost	$/ Customer (i.e. rebate)	# of Customers Impacted (or rebates)	Annual program/ measure cost	Total annual cost (labor & program costs)	Anticipated annual water savings in gallons	Annual Savings (AF)	Cost of Saved Water ($/AF)	Implementation Difficulty (1 = easy, 5 = difficult)
Restaurant pre-rinse spray valve distribution	0.1	$10,000	$100	50	$5,000	$15,000	650,000	2.0	$7,500	2
Regulatory Measures										
Landscape and irrigation standards update	1	$100,000	N/A	N/A	$10,000	$110,000	5,000,000	15.3	$7,168	3
Operational Measures										
Utility water loss program enhancement	0	0	N/A	N/A	$70,000	$70,000	4,890,000	15	$4,666	4
Water conservation upgrades at City facilities (indoor & outdoor)	0.05	$5,000	N/A	N/A	$40,000	$45,000	1,500,000	4.6	$9,782	2

Demand Forecasts

Demand forecasts were prepared for each of the scenarios described above including the Baseline (no conservation) scenario. Results are shown in Figure 6. Three demand forecasts are included in Figure 6 and the forecasting methodology is discussed below.

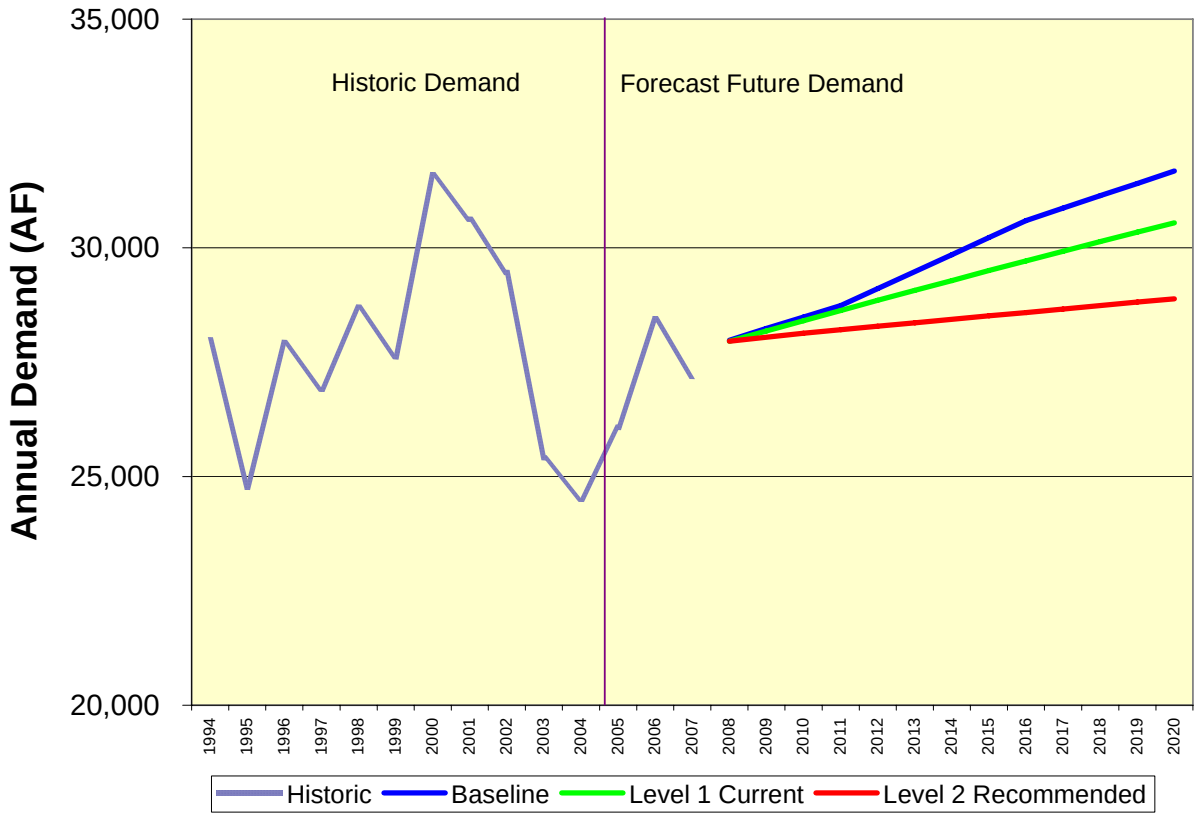

Figure 6: Demand forecasts under different conservation scenarios

Baseline – Without Conservation (blue line)

2020 demand = 31,800 Ac-ft
2020 per capita use = 153 gpcd (not including contractual demands)
Estimated change from 2003-2007 average per capita (155 gpcd) = 1.3% reduction

This forecast represents a baseline projection without any water conservation program. This forecast provides a way to examine the impacts of the current conservation program. The forecast includes anticipated changes in growth rates based on current planning projections. More accelerated growth occurs in the next 10 years and it then slows approaching build out.

This approach assumes that all new customers will essentially have demands that are identical to the existing customer base and it further assumes that no efficiency improvements will be made by the current customer base. This methodology likely over-estimates future demand. The *Energy Policy Act of 1992* requires all toilets sold in the U.S. be 1.6 gallons per flush or less and also sets maximum flow rate standards for showerheads and faucets. New U.S. Department of Energy standards for clothes washers will provide for market transformation to more water efficient machines over the next 10-20 years. These policies essentially assure that new

customers will use less water indoors than existing customers *and* that existing customers will likely become more water efficient over time through the natural replacement of old fixtures and appliances. Barring the widespread adoption of a new water consuming technology that could increase per capita demand or an unexpected population surge, the assumptions of this forecasting methodology could slightly overestimate future demand in Fort Collins given the current conservation program.

Given the recent changes in per capita demand in Fort Collins resulting from the drought of 2002, the assumptions used in this forecast are reasonable. Consequently, the estimated impacts of the conservation programs will be more modest than they would have been had per capita use not changed so dramatically already. It is assumed that sizeable portions of the easy conservation savings have already been achieved. Historic demand is also shown in Figure 6 to illustrate this point.

Level 1 - Current Conservation Program (green line)

Forecast 2020 demand = 30,800 Ac-ft
Forecast water savings in 2020 = 1,000 Ac-ft
Estimated 2020 per capita use = 147 gpcd (not including contractual demands)
Estimated reduction from 2003-2007 average per capita (155 gpcd) = 5.2%

This forecast projects demand in Fort Collins assuming the current conservation program (described earlier in this document) continues at a similar funding level (adjusted for inflation).

Level 2 – Recommended New Program (red line)

Forecast 2020 demand = 29,500 Ac-ft
Forecast water savings in 2,300 = Ac-ft
2020 per capita use = 139 gpcd (not including contractual demands)
Estimated reduction from 2003-2007 average per capita (155 gpcd) = 10.3%

This forecast projects demand in Fort Collins assuming the Level 2 conservation program (described earlier in this document) is fully implemented starting in 2008.

Summary of Forecast Demands

Summaries of the demand forecasts presented above are presented in Table 13 and Table 14. Demand and savings in acre-feet are shown in Table 13. Forecast per capita demands and savings percentages are shown in Table 14. The recommended program will save an estimated 2,300 Ac-ft/year by 2020. Under this scenario, per capita demand will be reduced to 139 gpcd. Table 15 provides the percent of the estimated 2020 attributable to indoor measures, outdoor measures, and utility water loss control.

Table 13: Summary of forecast demand and savings (acre-feet per year)

Forecast	Average Use (Ac-ft/year)	2020 Forecast Demand (Ac-ft/year)	Savings vs. Pre-2002 Use (Ac-ft/year)	Savings vs. Baseline Use (Ac-ft/year)
Pre-2002 (1998-2001)	34,000	39,700	N/A	N/A
Baseline (2003-2007)	27,500	31,800	7,900	N/A
Current Program		30,800	8,900	1,000
Recommended Program		29,500	10,200	2,300

Table 14: Summary of forecast demand and savings (gallons per capita per day)

Forecast	Average Use (gpcd)	2020 Forecast Demand (gpcd)	Savings vs. Pre-2002 Use (%)	Savings vs. Baseline Use (%)
Pre-2002 (1998-2001)	200	200	0%	N/A
Baseline (2003-2007)	155	153	-23.5%	-1.3%
Current Program		147	-26.5%	-5.2%
Recommended Program		139	-30.5%	-10.3%

Table 15: Breakdown of 2020 water savings by category

	Indoor	Outdoor	Water Loss Control	Total
Current Program	55.6%	35.4%	9.0%	100.0%
Recommended Program	50.5%	32.8%	16.7%	100.0%

IMPLEMENTATION PLAN FOR RECOMMENDED CONSERVATION PROGRAM

The recommended conservation program will be implemented over a three year period. Table 16 shows the recommended program, including current and new measures. The table also shows which customer classes will be impacted, whether a measure affects indoor or outdoor use, the type of measure, and if it's an existing or new measure.

Table 16: Conservation measures for recommended program

Measure	Customers				Water Use		Type of Measure		Existing or New	
	RSF	RMF	CII	City	Indoor	Outdoor	Comm	DSM	Exist	New
Education and Public Information										
Conservation public information campaign	X	X	X	X	X	X	X		X	
Public information campaign expansion	X	X	X	X	X	X	X			X
Adult education programs	X	X			X	X	X		X	
Business environmental programs		X	X		X	X	X		X	
School education programs	X	X			X	X	X		X	
Conservation giveaways	X	X			X	X	X		X	
Water conservation awards	X	X	X	X	X	X	X			X
Water Rates and Usage Information										
Increasing block rate – Res.	X				X	X			X	
Seasonal rates – Comm. & MF		X	X	X	X	X			X	
Online access to water history	X	X	X		X	X	X			X
Online water use calculator	X				X	X	X			X
Indoor Fixtures and Appliances - Residential										
Residential clothes washer rebates	X	X			X			X	X	
High efficiency toilet rebates	X	X			X			X		X
Dishwasher rebates	X	X			X			X		X
Low income retrofit program	X				X			X		X
Zero-interest loans for conservation	X				X		X		X	
Zero-interest loan program expansion	X				X	X	X			X
Research: Water end use study	X				X	X	X			X
Outdoor Efficiency - Landscapes and Irrigation										
Sprinkler system audits	X	X					X		X	
Xeriscape Demonstration Garden	X	X	X	X		X	X		X	
Xeriscape design clinics	X	X				X	X			X
Irrigation technology rebates	X	X	X			X		X		X
Large HOA irrigation efficiency grants		X				X		X		X
Raw water for irrigation at parks, cemeteries and golf courses				X		X			X	
Research: Determine irrigated area for lots	X	X	X	X		X	X			X
Indoor Fixtures and Appliances - Comm., Indust., Institutional (CII)										
CII facility audits			X		X	X	X		X	
Facility audit program expansion			X		X	X	X			X
Commercial clothes washer rebates			X		X			X		X
Commercial toilet and urinal rebates			X		X			X		X

Measure	Customers				Water Use		Type of Measure		Existing or New	
	RSF	RMF	CII	City	Indoor	Outdoor	Comm	DSM	Exist	New
Financial incentives for commercial water-saving upgrades			X		X	X		X		X
Hotel and restaurant conservation materials			X		X		X		X	
Restaurant pre-rinse spray valve distribution			X		X			X		X
Water Reuse Systems										
Large customer reuse			X	X	X	X			X	
Backwash recycling at water treatment facility				X				X	X	
Regulatory Measures										
Wasting water ordinance	X	X	X	X	X	X			X	
Restrictive covenants ordinance		X	X			X			X	
Soil amendment ordinance	X	X	X	X		X			X	
Water Shortage Response Plan	X	X	X	X	X	X			X	
Landscape & irrigation standards for new development		X	X	X		X	X		X	
Landscape & irrigation standards update	X	X	X	X		X	X			X
Operational Measures										
Utility water loss program				X				X	X	
Water loss program enhancement				X				X		X
Water conservation upgrades at City LEED buildings				X	X	X	X		X	
Water conservation upgrades at City facilities				X	X	X		X		X

Key:
RSF – Residential Single Family
RMF – Residential Multi-family
CII – Commercial, Industrial, Institutional
City – City government
Indoor – effects indoor water use
Outdoor – effects outdoor water use
Comm – Community water conservation program
DSM – demand-side management measure
Exist – existing measure
New – new measure

Ongoing Monitoring

Fort Collins Utilities will monitor implementation and impacts of the conservation plan on a regular basis. Regular demand monitoring will provide information on water use and progress toward to the stated conservation goals. Utilities staff will continue to produce an annual report on the conservation program that includes a detailed description of plan implementation as well as the measured impacts on usage.

Plan Refinement

Fort Collins Utilities understands that the conservation plan and program will need regular review and refinement to ensure that the goals are met. As has been done since the program's inception in 1977, adjustments to the program will be made as warranted due to new technology or programs becoming outdated. A complete formal review and revision of the conservation plan will be completed five years after adoption.

COMPLIANCE WITH STATE PLANNING REQUIREMENTS

Colorado Statutes Title 37 Water and Irrigation – Colorado Water Conservation Board (CWCB) and Compacts 37-60-126 requires a state approved water conservation plan for covered entities as a condition of seeking financial assistance from the CWCB. Key planning requirements of the statute include the following items:

1. Consideration of specific conservation measures and programs including – (I) fixtures and appliances; (II) water-wise landscapes; (III) CII measures; (IV) water reuse systems; (V) water loss and system leakage; (VI) information and education; (VII) conservation oriented rate structure; (VIII) technical assistance; (IX) regulatory measures; (X) incentives and rebates.
2. Role of conservation in the entity's supply planning.
3. Plan implementation, monitoring, review and revision.
4. Future review of plan within 7 years.
5. Estimated savings from previous conservation efforts as well as estimates from implementation of current plan.
6. A 60-day minimum public comment period.

This section of the plan details Fort Collins' compliance with this statute.

Fort Collins Compliance

Fort Collins Utilities developed this conservation plan to achieve full compliance with the Colorado statute. Each element of compliance is documented below.

1. Consideration of specific conservation measures -

- *Fixture and appliances* – Current program includes residential clothes washer rebates; faucet aerator, and showerhead distribution. Level 2 program includes residential HET toilet incentives, commercial toilet and urinal incentives, restaurant pre-rinse spray valve distribution.
- *Water wise landscape* – Current program includes sprinkler system audits. Recommended program includes expanded audits, Xeriscape design clinics, irrigation

technology rebates. HOA irrigation efficiency grants, and research to measure irrigated areas.

(III) *CII measures* – Current program includes a business program series and facility water audits. Level 2 program includes distribution of pre-rinse rinse spray valves in restaurants, incentives for CII efficiency upgrades, and commercial toilet and urinal rebates.

(IV) *Water reuse systems* – Current program includes reuse water for cooling and irrigation at the local power plant; backwash recycling at the water treatment facility. Additional small scale reuse systems were found either not cost effective for Fort Collins or were not compliant with the Utilities' water rights holdings.

(V) *Water loss and system leakage reduction* – Current program includes a utility water loss reduction program. Fort Collins has included implementation of the IWA/AWWA water loss methodology in Level 2.

(VI) *Information and public education* – Current program includes a local conservation public information campaign; school education program; business environmental series; adult education programs. Level 2 program includes an expanded public information campaign with new partnership efforts.

(VII) *Water rate structure* – Current program includes a three-tier increasing block rate structure for residential; seasonal rates for commercial customers. Level 2 program includes online access to water use history and an online water use calculator.

(VIII) *Regulatory measures* – Current program includes requirement for rain shutoff devices for new commercial development; water waste ordinance; landscape and irrigation standards for new development; restrictive covenants ordinance; soil amendment ordinance for new development. Level 2 program includes required dedication irrigation tap for new large landscapes and an update of the City's landscape and irrigation standards.

(IX) *Incentives* – A broad range of incentive and rebate programs are included in the measures described above.

2. **Role of conservation in Fort Collins supply planning.** Fort Collins takes water conservation seriously and has had a staff position for dedicated to water conservation since 1977. Resolution 2003-104, a *Water Supply and Demand Management Policy*, was adopted by City Council in September 2003. The resolution provides general criteria for decisions regarding water supply projects, acquisition of water rights and demand management measures.
3. **Plan implementation, monitoring, review and revision.** Fort Collins has developed a specific plan implementation program along with monitoring mechanisms and scheduled review and revisions. Details of this effort are described in the preceding section of this document.
4. **Future review of plan within seven years.** Fort Collins Utilities intends to review and update the water conservation every five years. The next review is scheduled to occur in 2012.
5. **Estimated savings from previous conservation efforts and current plan.** The Fort Collins water conservation program has been active since 1977. Since 1994 weather normalized per capita demand has been reduced by 25 percent. Not all of this reduction can be fairly

attributed to the conservation program (the 2002 drought had a measurable impact), but the data show a distinct water savings trend. Savings from the conservation program recommended in this plan are estimated to be an additional 10.3 percent by 2020.

6. **Public comment period.** A public review of the conservation plan took place from October 8 to December 7, 2007. Thirty-four comments were received and revisions were made to the plan in response to the comments.

Appendix D Results of the Landscape Survey

Utilities Online Survey Panel

The City of Fort Collins Utilities formed an online survey panel in 2011 as part of its ongoing market research to gather customer perceptions and insight to help Utilities accomplish its mission and achieve specific goals. The online survey panel was formed by sending email invitations to more than 28,000 Utilities' customers, about 2,000 of whom agreed to participate. Surveys will be administered on an established schedule and follow certain standards and protocols.

2011 Fort Collins Landscape Survey Results

As part of an update to the City's Water Supply and Demand Management Policy, Utilities administered an online survey to the panel in November 2011 to gather customer opinions about landscape preferences in Fort Collins, as well as opinions regarding additional water conservation efforts. More than 1,200 panel respondents completed the survey, the results of which are provided below.

The following email was sent to the online survey panel as an introduction to the survey:

Dear (panel member),

Thank you for your continued participation in our online survey panel. Your opinion is important!

The City of Fort Collins is in the process of updating its Water Supply and Demand Management Policy, which will continue to ensure a reliable supply of water to meet customer's needs and provide an appropriate level of water conservation. This survey is designed to gather opinions on landscaping preferences. Results will help guide decisions we make about additional water conservation.

To participate in our online survey please click on the link below.
http://www.surveymonkey.com/s/NSHS3XY

We expect that this survey will take no more than 8 minutes to complete. Due to the longer than normal survey length, the Utilities will award 10 gift cards rather than the usual 5. All respondents who provide their email address at the end of the survey will be entered into a drawing for a $50 Downtown Bucks gift card, selected at random.

Thank you,
Patty Bigner
Customer & Employee Relations Manager
Fort Collins Utilities

Utilities Survey Panel - Landscaping

SurveyMonkey

1. For each item below, please check the response that best describes your opinion. The reason for residential and commercial landscaping is to:

	Strongly agree	Agree	Neutral/Undecided	Disagree	Strongly disagree	Response Count
Make the property more attractive	**53.4% (646)**	44.2% (535)	2.1% (25)	0.3% (4)	0.0% (0)	1,210
Increase the property value	39.2% (473)	**51.4% (620)**	8.0% (97)	1.2% (15)	0.1% (1)	1,206
Provide a place to play, relax and/or entertain	40.5% (488)	**50.0% (602)**	8.2% (99)	1.3% (16)	0.0% (0)	1,205
Express resident's gardening style	19.4% (232)	**43.3% (518)**	30.3% (362)	6.4% (76)	0.7% (8)	1,196
Be consistent with the neighborhood/community	12.5% (150)	**43.3% (520)**	28.7% (344)	13.0% (156)	2.5% (30)	1,200
Provide energy savings through shade	30.0% (361)	**47.1% (568)**	17.8% (215)	4.3% (52)	0.7% (9)	1,205
Reduce greenhouse gases	26.2% (315)	**36.9% (444)**	25.7% (309)	7.5% (90)	3.7% (44)	1,202
					answered question	**1,211**
					skipped question	**0**

2. The reason for community parks landscaping is to:

	Strongly agree	Agree	Neutral/Undecided	Disagree	Strongly disagree	Response Count
Make the City more attractive	**59.5% (717)**	39.1% (471)	1.2% (15)	0.2% (2)	0.1% (1)	1,206
Provide a place for City residents to play and relax	**70.9% (853)**	27.8% (335)	1.2% (14)	0.1% (1)	0.0% (0)	1,203
Be consistent with the neighborhood/community	25.3% (304)	**45.8% (550)**	21.3% (256)	6.5% (78)	1.1% (13)	1,201
Provide energy savings through shade	28.2% (338)	**35.7% (428)**	25.1% (301)	9.4% (113)	1.7% (20)	1,200
Reduce greenhouse gases	30.9% (371)	**34.3% (411)**	24.5% (294)	7.1% (85)	3.2% (38)	1,199
					answered question	**1,209**
					skipped question	**2**

3. Low water use, or xeric landscaping, is adapted to our semi-arid climate and requires limited watering. Please indicate your level of agreement with each of the following statements about xeriscaping/low water landscaping in our community.

	Strongly agree	Agree	Neutral/undecided	Disagree	Strongly disagree	Response Count
Provides a desirable landscape	31.0% (374)	**42.3% (511)**	18.7% (226)	7.3% (88)	0.7% (8)	1,207
Does not include my favorite plants	4.2% (50)	26.1% (314)	**40.9% (491)**	22.6% (272)	6.2% (74)	1,201
Provides enough green	14.3% (172)	**41.5% (499)**	26.4% (318)	15.9% (191)	1.9% (23)	1,203
Is too expensive	2.8% (33)	9.4% (113)	**46.1% (553)**	30.7% (368)	11.1% (133)	1,200
Requires a lot of maintenance	2.2% (27)	7.4% (89)	31.0% (373)	**42.4% (511)**	17.0% (205)	1,205
Looks attractive	19.5% (234)	**47.0% (564)**	21.6% (259)	9.8% (118)	2.1% (25)	1,200
Provides enough variety in landscape design	20.8% (251)	**43.9% (529)**	24.7% (297)	9.3% (112)	1.2% (15)	1,204
Looks too drab/uninteresting	4.2% (51)	15.9% (192)	23.7% (285)	**40.0% (481)**	16.2% (195)	1,204
				Any other benefits or drawbacks (please specify)?		238

answered question	**1,210**
skipped question	**1**

4. Please indicate your level of agreement with each of the following statements about cool season turf lawns (Kentucky bluegrass, fescue, etc). Cool season turf lawns:

	Strongly agree	Agree	Neutral/undecided	Disagree	Strongly disagree	Response Count
Are familiar	23.2% (278)	**48.2% (577)**	21.2% (253)	5.6% (67)	1.8% (21)	1,196
Are cooling	11.6% (138)	41.3% (492)	**42.5% (506)**	3.9% (47)	0.6% (7)	1,190
Provide a place for recreation for people/children/pets	24.6% (294)	**58.2% (695)**	16.2% (194)	0.9% (11)	0.1% (1)	1,195
Are desirable for landscaping	14.2% (170)	**43.6% (520)**	31.6% (377)	9.0% (107)	1.6% (19)	1,193
Often look unattractive	3.2% (38)	12.1% (144)	**40.9% (488)**	38.4% (458)	5.4% (64)	1,192
Require a lot of maintenance	18.3% (218)	28.8% (343)	**39.2% (466)**	12.2% (145)	1.5% (18)	1,190
Require too much water	21.0% (250)	22.2% (265)	**44.9% (536)**	10.7% (128)	1.2% (14)	1,193
				Any other benefits or drawbacks (please specify)?		120

answered question	**1,199**
skipped question	**12**

5. Please indicate your level of agreement with each of the following statements. Trees in a residential yard:

	Strongly agree	Agree	Neutral/undecided	Disagree	Strongly disagree	Response Count
Make an area more beautiful	**67.3% (812)**	30.5% (368)	1.7% (20)	0.5% (6)	0.1% (1)	1,207
Increase the value of a home	**51.2% (617)**	36.7% (442)	10.5% (126)	1.4% (17)	0.2% (2)	1,204
Create too much litter	2.1% (25)	9.2% (111)	21.6% (260)	**53.4% (644)**	13.8% (166)	1,206
Provide valuable shade	**62.5% (753)**	35.4% (427)	1.3% (16)	0.7% (9)	0.0% (0)	1,205
Produce too much pollen	2.0% (24)	7.1% (86)	33.7% (406)	**45.3% (546)**	11.9% (144)	1,206
Are an important part of the landscape	**55.8% (673)**	39.1% (472)	3.7% (45)	1.1% (13)	0.2% (3)	1,206
Require too much water	1.3% (15)	6.8% (82)	34.8% (418)	**46.9% (563)**	10.2% (122)	1,200
				Any other benefits or drawbacks (please specify)?		122

answered question	**1,209**
skipped question	**2**

6. The amount of xeriscape in our community is:

	Response Percent	Response Count
Not enough	**61.1%**	**729**
About right	37.0%	441
Too much	1.9%	23
	answered question	**1,193**
	skipped question	**18**

7. The amount of cool season turf lawns (bluegrass, fescue, etc.) in our community is:

	Response Percent	Response Count
Not enough	15.3%	180
About right	**54.3%**	**640**
Too much	30.4%	359
	answered question	**1,179**
	skipped question	**32**

8. The number of trees in our community is:

	Response Percent	Response Count
Not enough	26.7%	322
About right	**69.8%**	**841**
Too many	3.5%	42
	answered question	**1,205**
	skipped question	**6**

9. The general look of landscaping in our community is:

	Response Percent	Response Count
Too brown and drab	6.8%	81
About right	**81.5%**	**976**
Too green and lush	11.8%	141
	answered question	**1,198**
	skipped question	**13**

10. Please indicate your level of agreement with the following statements related to water use and conservation in the Fort Collins community.

	Strongly agree	Agree	Neutral/undecided	Disagree	Strongly disagree	Response Count
Current reduced landscape watering levels are resulting in undesirable yards (i.e., dirt/weed lawns).	2.9% (35)	17.2% (208)	32.9% (397)	**39.9% (481)**	7.0% (85)	1,206
Current water use levels seem reasonable.	4.0% (48)	**43.3% (520)**	31.6% (379)	18.0% (216)	3.1% (37)	1,200
Indoor water use should be reduced further.	7.3% (87)	**35.4% (424)**	32.7% (392)	20.9% (251)	3.8% (45)	1,199
Outdoor water use should be reduced further.	14.8% (178)	**38.6% (464)**	29.4% (353)	15.2% (182)	2.0% (24)	1,201
Total water use should be reduced further.	12.8% (154)	**46.5% (558)**	26.2% (314)	11.8% (142)	2.7% (32)	1,200
The City's conservation program should place more emphasis on efficient watering of existing landscapes.	21.9% (263)	**58.9% (707)**	15.6% (187)	3.2% (38)	0.5% (6)	1,201
The City's conservation program should place more emphasis on (but not force) conversion to xeric landscapes.	17.0% (205)	**48.7% (586)**	21.1% (254)	10.0% (121)	3.2% (38)	1,204
The City's conservation program should place more emphasis on the elimination of water intensive landscapes (such as largely turf lawns).	19.8% (238)	**36.7% (442)**	24.2% (291)	15.8% (190)	3.6% (43)	1,204
The City's conservation program should place more emphasis on reducing indoor water use.	10.0% (120)	**39.9% (480)**	32.3% (389)	14.6% (176)	3.2% (39)	1,204
The City's conservation program should place more emphasis on reducing commercial and industrial water use.	27.1% (325)	**44.4% (532)**	21.4% (256)	5.3% (64)	1.8% (21)	1,198
					answered question	**1,208**
					skipped question	**3**

11. Do you water landscaping at your residence?

		Response Percent	Response Count
Yes		**70.8%**	**854**
No, don't water		5.7%	69
No, live in apartment/condo/complex where someone else takes care of outdoor watering		23.5%	284
		answered question	**1,207**
		skipped question	**4**

12. In the future would you consider changing your landscaping to use less water?

		Response Percent	Response Count
Yes		**65.1%**	**557**
No		13.6%	116
Maybe		21.3%	182
		answered question	**855**
		skipped question	**356**

13. Which category below includes your age?

	Response Percent	Response Count
Under 25	7.3%	88
25-39	**37.6%**	**453**
40-54	26.4%	318
55-64	18.9%	228
65 or over	9.1%	110
Prefer not to say	0.7%	8
answered question		**1,205**
skipped question		**6**

14. Do you own or rent your home in Fort Collins?

	Response Percent	Response Count
Own	**70.2%**	**845**
Rent	28.8%	347
Prefer not to say	1.0%	12
answered question		**1,204**
skipped question		**7**

15. Are you a Fort Collins Utilities Water customer?

	Response Percent	Response Count
Yes	**87.2%**	**1,049**
No	9.1%	110
Don't know	3.7%	44
	answered question	**1,203**
	skipped question	**8**

16. What is the zip code at your residence?

	Response Percent	Response Count
80521	18.0%	217
80524	12.2%	147
80525	**33.3%**	**402**
80526	27.3%	330
80528	8.1%	98
80535	0.7%	9
Other	0.3%	4
	answered question	**1,207**
	skipped question	**4**

17. Please provide your email address to be entered in the drawing for a Fort Collins Downtown Bucks gift card.

	Response Count
	1,118
answered question	**1,118**
skipped question	**93**