



Water Conservation Plan

January 2010

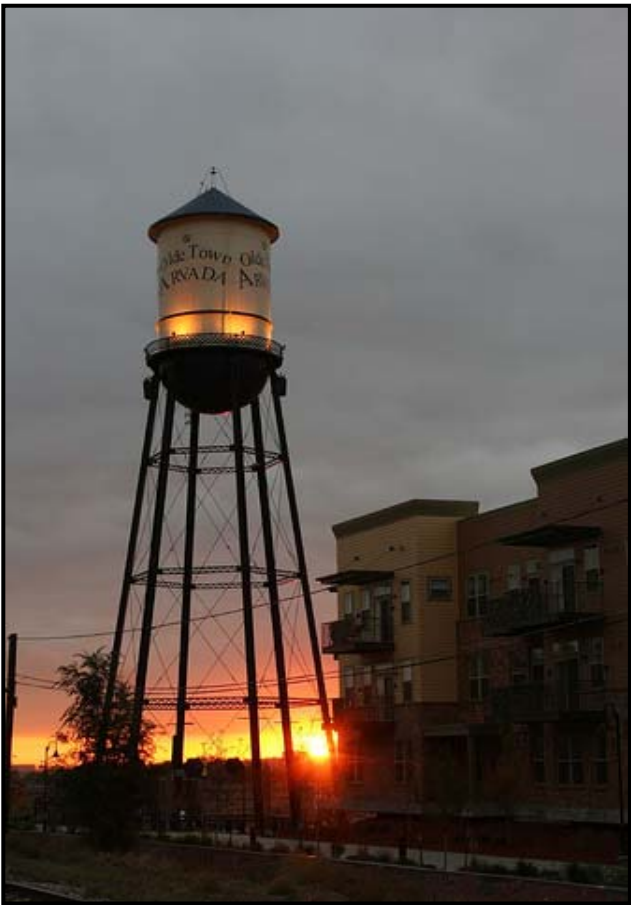


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Introduction

Arvada's History

Arvada's history began in June of 1850 with the first recorded discovery of gold in Colorado by Lewis Ralston. The first irrigation ditch was dug in 1860 and a maze of irrigation ditches followed, many of which still exist today. The ditches alone could not provide enough reliable, quality water, and the first well was dug in 1870.



When the Town of Arvada was incorporated in 1904, it was an agricultural community known as the “Celery Capital of the World”. The town had a population of 600. Water was either drawn from individual wells or from buckets filled in the irrigation ditches.

As Arvada's early pioneers settled into their daily routines, the demands for water grew along with the population. Farmers needed water to grow crops and miners required water for milling operations. The local blacksmith and the barber needed water for their daily operations as well.

A primary responsibility of any municipality is the provision of water. In 1910, the Arvada Water Tank was completed, providing artesian water that promised to end all water problems. However, it didn't take long for a growing population to stress the existing water system.

Throughout the years that followed, more wells were dug and dug deeper again. Pumps were installed and more water storage was added. By 1955 the population had grown to over 10,000. Residents were using 160 million gallons of water on an annual basis, and the well system was strained to the breaking point.

In 1957, a small water treatment plant was built which utilized water from the Clear Creek basin water rights the City had acquired.

In 1960, a contract was signed between Arvada and the Denver Water Board for 19,000 acre feet of water per year. The contract secures three-fourths of Arvada's current annual water needs. This water is collected from the Fraser River and South Boulder Creek Basins and transported first to Gross Reservoir and then to Ralston Reservoir. The water is treated in the City's Ralston Water Treatment Plant, which operates year-round.

The remaining one-fourth of the City's water supply comes from the City's Clear Creek basin water rights. These agricultural rights have been converted into municipal use. This water is stored in the Arvada Reservoir and treated in the Arvada water treatment plant facility, a peaking plant generally used in the summer months.

Today, Arvada is a bustling city combining suburban residential comfort with an eclectic mix of lively businesses. The City's population has grown to over 107,000, spread out over Arvada's nearly 23,000 acres of land.

Throughout Colorado the competition and expense for water supplies is increasing while the availability of local water supply sources are decreasing. Water conservation is becoming an increasingly important staple in water management strategies across the Front Range.

Fortunately, the City of Arvada has been a longtime advocate of water conservation. The City adopted universal metering prior to 1950. In 1974 a billing structure was developed with increasing block rates according to customer usage. In 1979 a City code was adopted requiring that all plumbing fixtures be low-flow and all exterior hoses have automatic shut-off valves. And in 1989, a comprehensive Water Conservation Master Plan was created and adopted by Resolution 89-152.

The following is an updated version of Arvada's existing water conservation plan pursuant to the requirements of the Office of Water Conservation and Drought Planning §37-60-126. The statute states that all entities which serve more than 2,000 acre-feet of water per year must file a Conservation Plan with the Colorado Water Conservation Board, and that the plan be updated at least every seven years.

Definition of Terms

Acre-Foot (AF):	The amount of water it would take to cover one acre of land to a depth of one foot; 325,851 gallons.
GPF:	Gallons per flush.
GPM:	Gallons per minute.
GPD:	Gallons per day.
GPY:	Gallons per year.
Maximum Day:	The largest amount of water used in a single day.
MGD:	Million gallons per day.
MGH:	Million gallons per hour.
Peak Hour:	The largest amount of water used in a single hour.
Potable Use:	Water that is treated to drinking water standards for municipal use.
Non-Potable Use:	Water that is not treated and is either used for irrigation or other non-potable uses.
Return Flows:	A portion of a water right that was historically used for irrigation that was not consumed by crops and made its way back to the river system as surface water and groundwater.
SFE:	Single Family Equivalent- the amount of water used in a typical single-family home in one year.
ULV:	Ultra-Low Volume- low-flow toilets that use 1.6 gallons of water or less per flush.

Profile of Existing Water System

Water Sources and Delivery

The City of Arvada covers 35.56 square miles of land, has a current population of approximately 107,700 residents, and maintains 549 miles of distribution mains. The City operates two water treatment plants: Ralston Water Treatment Plant, with a capacity of 36 mgd, and Arvada Water Treatment Plant, with a capacity of 16 mgd. The City of Arvada has emergency interconnects with the City of Westminster and North Table Mountain Water and Sanitation District.

The City has two perpetual firm yield contracts with the Denver Water Board, representing up to 19,531 AF of raw water annually.¹ In addition, Arvada also owns various surface rights in the Clear Creek watershed with an average annual yield of 6,200 AF. Arvada is not currently utilizing its decreed non-tributary groundwater in its domestic water supply.

Arvada Reservoir is the City's main water storage facility with a capacity of 6,373 AF.

Combining the two water treatment plants, Arvada has a total supply capacity of 52 mgd. Maximum water production capacity is 2.17 mgh.

¹ Storage facilities for contractual water are owned and operated by Denver Water.

The City's water accounts are fully metered. 2008² service connections and water consumption are broken down as follows:

Table 1: Accounts

TYPE	ACCOUNTS
Single Family	31,264
Multi-Family*	1,389
Commercial	1,008
Irrigation	314
Parks	147
Other**	153
TOTAL:	34,275

*Multi-Family Taps = 1,389 Multi-Family Units = 12,862

**Other Accounts = 153 Other Taps = 3

Table 2: Total Water Consumption (in Acre Feet)

Residential	12,626
Non-Residential	4,014
Non-account Authorized Water	136
TOTAL:	16,776

² 2009 was an abnormally wet year. To better represent a normal water year for the City of Arvada, 2008 is referenced throughout the Plan.

**Table 3: Water Consumption and Population by Sector
(2003 to 2008)**

Total Water Consumption by Sector (in acre-feet)	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>
Single Family	9,900	8,685	9,939	11,061	10,265	10,502
Multi-Family	2,053	1,933	2,053	2,122	2,101	2,124
Commercial	1,508	1,451	1,635	1,736	1,663	1,917
Parks, Irrigation, & Other	1,535	1,378	1,918	2,309	2,170	2,233
Total:	14,997	13,446	15,544	17,228	16,198	16,776
Number of Taps by Sector	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>
Single Family	29,899	30,178	30,424	30,934	31,087	31,264
Multi-Family	1,261	1,282	1,347	1,369	1,377	1,389
Commercial	899	916	923	931	932	1,008
Parks, Irrigation, & Other	414	451	468	502	509	464
Total:	32,473	32,827	33,162	33,736	33,905	34,125
Estimate of Population Served by Sector	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>
Single Family	73,818	73,035	73,594	74,483	75,492	76,468
Multi-Family	28,707	29,831	30,059	30,423	30,835	31,234
Total Population	102,525	102,866	103,653	104,906	106,327	107,702
Commercial*	27,108	27,127	27,172	27,243	27,323	27,319

*Based on average number of jobs in Arvada

Water Billing and Rate Structure

The City of Arvada has a three-tiered bimonthly billing system. For in-city residential accounts, consumption up to 30,000 gallons is billed at the first tier rate. As of January 2010, the first tier rate is \$2.92 per 1000 gallons. Usage between 30,001 and 60,000 gallons is billed at the second tier rate of \$3.64 per 1000 gallons. Anything over 60,000 gallons is billed at the third tier rate, \$7.30 per 1000 gallons. Out-of-city customers pay double the in-city rates following the same tier structure; \$5.84 per 1000 gallons for the first tier, \$7.30 for the second tier, and \$14.60 for the third tier.

Commercial customers have separate tiers based on the size of the meter, as shown below.

Table 4: Non-Residential Water Use Charges- Within City

Meter Size	<i>Quantity (in 1,000 gallons) at a rate of \$2.92 per 1,000 gallons</i>	<i>Quantity (in 1,000 gallons) at a rate of \$3.64 per 1,000 gallons</i>	<i>Quantity (in 1,000 gallons) at a rate of \$7.30 per 1,000 gallons</i>
5/8" x 3/4"	0 to 170	170 to 340	All over 340
3/4"	0 to 170	170 to 340	All over 340
1"	0 to 280	280 to 560	All over 560
1 1/4"	0 to 400	400 to 800	All over 800
1 1/2"	0 to 600	600 to 1,200	All over 1,200
2"	0 to 900	900 to 1,800	All over 1,800
3"	0 to 2,000	2,000 to 4,000	All over 4,000
4"	0 to 3,400	3,400 to 6,800	All over 6,800

Table 5: Non-Residential Water Use Charges- Outside City

Meter Size	<i>Quantity (in 1,000 gallons) at a rate of \$5.84 per 1,000 gallons</i>	<i>Quantity (in 1,000 gallons) at a rate of \$7.30 per 1,000 gallons</i>	<i>Quantity (in 1,000 gallons) at a rate of \$14.60 per 1,000 gallons</i>
5/8" x 3/4"	0 to 170	170 to 340	All over 340
3/4"	0 to 170	170 to 340	All over 340
1"	0 to 280	280 to 560	All over 560
1 1/4"	0 to 400	400 to 800	All over 800
1 1/2"	0 to 600	600 to 1,200	All over 1,200
2"	0 to 900	900 to 1,800	All over 1,800
3"	0 to 2,000	2,000 to 4,000	All over 4,000
4"	0 to 3,400	3,400 to 6,800	All over 6,800

Current Water Conservation Efforts

The City of Arvada has a comprehensive water conservation program in place with current emphasis on increasing the level of customer participation. The City is required by contract to follow any emergency water restrictions imposed by the Denver Water Board. Current water-reduction guidelines in place pertain to the summer watering season, between May 1 and October 1, and state that customers should avoid watering between 10 am and 6 pm, not allow water to spray or pool on non-landscape areas, and avoid using spray irrigation during rain or strong winds.

City Efforts

In 1991, the City amended its low-flow plumbing fixtures ordinances to require the installation of ultra low-volume (ULV) toilets for new construction or when remodeling includes changes to the existing plumbing system. The City also has an ongoing Xeriscape program which includes demonstration gardens, public education, and reduced tap fees for water-conserving landscaping.

The system-wide leak detection program dictates that 25% of the water system be surveyed for leaks annually. The City uses Permalog leak survey sensors. Evident and non-evident leaks are pinpointed, and suspected leaks are verified. Additionally, at the customer's request about 75 customer service lines are surveyed for leaks each year.

Public Education

The City of Arvada takes advantage of the many types of media available for relaying water conservation information to the citizens of Arvada.

- Weekly water-saving tips are posted both on the City's public website at www.arvada.org and on the City of Arvada's Facebook and Twitter pages.
- Water conservation inserts are included with the water bill mailings annually, at a cost of \$1,750.
- The Arvada Report, which is a bi-monthly newsletter sent out to Arvada residents and businesses, periodically contains water conservation information.

- The City's Nature Center staff educates both adults and children with their hands-on water demonstrations at the Majestic View Nature Center. In addition, they have water education booths at the Arvada Trails Event each June, and put together an annual water conservation contest for elementary students, detailed below.

City Facilities

The Majestic View Nature Center is a 3,000 square-foot public facility located in Arvada that features hands-on nature and environmental displays, Xeriscape gardens, wildlife exhibits, classrooms, and a children's area. Led by the Nature Center's environmental education specialist, the staff has held an annual school program since 2004 called WaterWise! Water Conservation School Program and Contest. The contest is open to Arvada 5th graders and educates and challenges them to conserve water in their own homes. The students are provided with shower timers to promote shorter shower times, toilet tablets to check for leaks in the toilet tank, toilet tank banks to reduce the amount of water used with each flush, and information on finding leaks in the home. Since the program's inception in 2004, over 2,460 students have participated, completing nearly 64,000 water conservation tasks. 90% of the participants installed shower timers, and 87% took 5-minute showers during the contest, saving 369 hours of shower time. In addition, 298 leaks have been fixed as a result of the contest.

The program is free to Arvada elementary schools. Total project costs to the City for the 2008 program were \$30,000, which includes salaries and supplies.

Water Use and Forecasted Demands

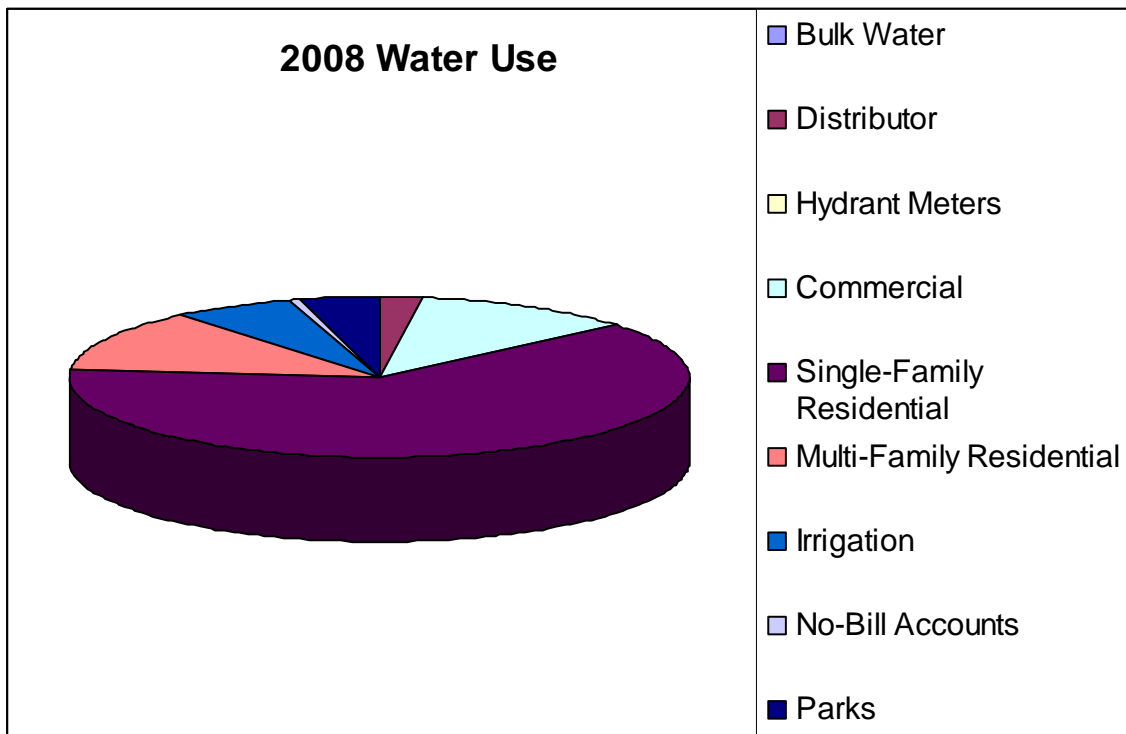
Current Water Use

The City of Arvada supplied 16,776 acre-feet of water to 34,275 accounts in 2008. Accounts are broken down into the following categories:

Table 6: Current Water Use

Category	Acre-Feet
Bulk Water	6
Distributor	360
Hydrant Meters	25
Commercial	1,917
Single-Family Residential	10,502
Multi-Family Residential	2,124
Irrigation	1,039
No-Bill Accounts	105
Parks	699
TOTAL	16,776

Water use by customer can be seen in the following graph:



Demand Forecast

The City of Arvada anticipates an approximate 1% annual population growth over the next twenty years, with a similar trend in job growth. The table below shows an approximate annual water demand of 20,252 acre-feet per year by 2028.

Table 7: Preliminary Water Demand Forecast (in acre-feet)

	2008	5-Year Forecast	10-Year Forecast	20-Year Forecast
Residential Demand				
Annual Water Sales- Residential	12,626			
Current Population	107,702			
Residential Sales per Capita	0.117			
Projected Population		112,344	117,899	129,848
Projected Residential Water Demand		13,170	13,822	15,223
Non-Residential Demand				
Annual Non-Residential Sales	4,014			
Current Number of Jobs	27,319			
Water Use per Job	0.147			
Projected Number of Jobs		28,914	30,603	33,305
Projected Non-Residential Water Demand		4,249	4,497	4,894
Non-Account Water				
Current and Forecasted Amount	136	136	136	136
Water System Total Demand				
Current Total Annual Water Demand	16,776			
Projected Total Annual Water Demand		17,555	18,454	20,252
Total Annual Water Demand Forecast	16,776	17,555	18,454	20,252

Based on the above chart, average-day and maximum-day demand can be forecast as follows:

Table 8: Average-Day and Maximum-Day Demand Forecast (in mgd)

	2008	5-Year Forecast	10-Year Forecast	20-Year Forecast
Average-Day Demand	15.0	15.7	16.5	18.1
Maximum-Day Demand	41.2			
Maximum to Average Day Demand Ratio	2.75			
Projected Maximum-Day Demand		43.1	45.3	49.7
Maximum-Day Demand Forecast	41.2	43.1	45.3	49.7
Daily Treatment Capacity	52.0	52.0	52.0	52.0

Proposed Facilities

Moffat Collection System Project

The City of Arvada and Denver Water have entered into a contract that would provide Arvada with 3,000 acre-feet of raw water with storage. This project could include the expansion of Gross Reservoir and is anticipated to be completed by 2018 with an estimated cost to the City of Arvada of \$106 million.

Candelas

The Candelas Development is a 1500-acre urban renewal area located in the northwest quadrant of the City of Arvada. This area is designed for residential, commercial, and industrial development.

Several water storage tanks will be constructed as the development progresses. One 800,000 gallon water storage tank has been completed, costing \$700,000. By 2028, the City anticipates constructing four additional tanks with a total volume of 3.1 million gallons, and costing approximately \$4.7 million.

Conservation Goals

Water Conservation Goals

Water conservation can benefit the citizens of Arvada by preserving water resources, lowering long term water costs, reducing demand on the wastewater system, and extending the life of existing facilities.

The City's average water usage from 2000 to 2002 was 18,104 AF per year. Arvada experienced a five and a half percent increase in population between 2000 and 2008. In spite of this population growth, average annual water usage from 2006 to 2008 was reduced to 16,734. This reduction was due in part to the lingering effects of the 2002-2003 drought and in part to water conservation efforts.

The City of Arvada remains dedicated to water conservation. To supplement the City's current water conservation efforts, the City will be adding three new programs starting in 2013. Partnering with the Center for Resource Conservation, Arvada will be involved with the Garden-In-a-Box Xeriscape Program and the Slow the Flow Colorado Sprinkler Inspection Program. We will also be conducting low-income housing audits, providing water-efficient plumbing fixtures to eligible residents as part of our Residential and Commercial Energy Efficiency Program.

Furthermore, new technology has been integrated into our existing plan making significant positive impacts to our ongoing water conservation efforts. For instance, utilizing social media tools such as Facebook and Twitter to convey water conservation tips and information allows the information to reach a much broader audience than ever before at no extra cost to the City. Additionally, the new leak detection equipment that was put into service at the end of 2009 will increase the efficiency and effectiveness of detecting leaks and reducing water loss.

The City believes these programs along with the trend of decreased water use will result in an additional 700 AF of water savings annually by 2018. This amount was reached by forecasting future water consumption, factoring in future population growth, and estimating a declining rate of savings. The 700 AF is based on combined passive and active conservation efforts and represents an overall decrease of 3.8% of the annual 18,454 AF estimated in our ten-year forecast.

Although Arvada is optimistic about reduced consumption as a result of water conservation, we will continue to plan ahead for future drought and potential water shortages through our planned Moffat Collection System Project.

Identify Water Conservation Measures & Programs

Per the requirements stated in statute 37-60-126, the following water conservation measures and programs have been identified and evaluated for current implementation and future consideration.

Table 9: Water Conservation Measures and Programs

Conservation Measure	Program	Cost	Water Savings in Acre-Feet per year
Water Efficient Fixtures and Appliances/Customer Water Use Audits- Indoors	Low-income housing audit program to begin 2013	50,000.00	15.5
Landscape Efficiency- Customer Incentives	Reduced tap fee program- Currently Implemented	-	9.2
Landscape Efficiency/Customer Water Use Audits- Outdoors	Slow the Flow Sprinkler Audits to begin 2013	24,000.00	5.5
Landscape Efficiency- Xeriscape/Customer Incentives	Garden-In-A-Box Program to begin 2013	12,000.00	0.9
Industrial and Commercial Efficiency	Car Wash Recycle Program- Currently Implemented	-	<1
Distribution System Leak Detection and Repair	Permalog Sensors- Put in service 2010	30,000.00	12.3
Public Education and Information Dissemination	Various Programs- Currently Implemented	31,750.00	
Water Rates Structure and Billing Systems Designed to Encourage Efficiency	3-Tiered Bimonthly Billing System-Currently Implemented	-	
Regulations/Ordinances	Currently Implemented	-	
		147,750.00	43.4

Evaluation and Selection of Conservation Measures & Programs

Water Efficient Fixtures and Appliances

The City of Arvada has low-flow plumbing ordinances in place that require the installation of ULV toilets on all new construction or when any remodeling includes changes to the existing plumbing system. As specified in the regulations/ordinances section of this Plan, all additions and alterations to existing residential, commercial, and industrial structures issued a building permit must comply with the 1.6 gallons or less per flush for toilets. In addition, all showerheads used for the purpose of bathing, lavatory faucets, and sink faucets shall have a maximum flow capacity of 2.5 gallons per minute. However, due to the increased availability and lower costs of higher-efficiency fixtures and appliances, many builders and homeowners are opting for the newer EPA standard toilets and showerheads that use a maximum of 1.28 gpf and 2.0 gpm, respectively.

In addition, the City of Arvada's Residential and Commercial Energy Efficiency Program will add low-income housing audits beginning in 2013. This program will allow us to evaluate existing plumbing fixtures in our low-income housing areas, and replace outdated fixtures, toilets, and/or shower heads with new, water-efficient ones. The initial plan for 2013 is to audit 200 units, with a \$250 allowance per unit for improvements.

Table 10: Fixture and Appliance Replacement Program

Showerhead Replacement	
Assumptions:	
3	gpm- rated flow
2	gpm- actual flow
5.3	min/day
28.0	gpd per household*
Estimated Water Savings With 2.5 gpm showerhead	
4.7	gpd per household
1,702	gpy savings
340,400	gpy savings- 200 showerheads
Faucet Replacement	
Assumptions:	
2.75	gpm- rated flow
1.8	gpm- actual flow
8.1	min/day
38.5	gpd per household
Estimated Water Savings With 1.5 gpm faucet or aerator	
17.8	gpd per household
6,504	gpy savings
1,300,800	gpy savings- 200 faucets
Toilet Replacement	
Assumptions:	
3.5	gpf
5.1	daily uses per person
47.1	gpd per household
Estimated Water Savings With 1.28 gpf toilet	
16,958	gpy savings
3,391,600	gpy savings- 200 toilets
*Based on 2.64 average persons per household	

Source: *Handbook of Water Use and Conservation* (Amy Vickers, 2001)

If all 200 participants take advantage of the plumbing upgrades provided by the City, we could save approximately 15.45 AF of water per year.

Landscape Efficiency

The City of Arvada's Land Development Code requires water wise landscaping standards. These standards are explained in the Regulations/Ordinances section of this Plan. The City has an ongoing Xeriscape program which includes demonstration gardens and public education. A Xeriscape garden was installed several years ago at the Streets Department facility, and a large interactive demonstration garden will debut in 2010 at the Majestic View Nature Center. In 2004 the City funded a "This Old Yard" DVD to demonstrate ideas on how to retrofit existing yards into more water-efficient landscaping.

Beginning in 2013, Arvada will be participating in the Garden-in-a-Box Xeriscape Program offered through the Center for Resource Conservation. Through this program, the City offers residents "plant-by-number" Xeriscape gardens along with the planting and care instructions. The gardens use half the water of typical landscapes, and will be offered to the residents at a discounted cost of \$100 per garden.

The city will be purchasing 375 gardens in 2013 at a cost of \$12,000. For each garden that replaces turf, the water savings is estimated at 800 gallons per year. This program has proven very popular with the several local municipalities that have participated in recent years.

In addition, reduced tap fees are offered for water-conserving landscaping. Owners and developers who request an irrigation meter are required to supply the City's Utility department with maps and information detailing how much of the landscape/irrigation area will be sod (non-conserving landscape) and how much will be non-sod, such as mulch beds, shrubs, or trees (water-conserving landscape). The plans are reviewed, and the tap fees are then determined based on square footage of sod and non-sod areas.

Current tap fees are 90 cents per square foot for sod, and 45 cents per square foot for non-sod. The reduced tap-fee program is listed in the City's Water Tap Fee schedule which is posted on the City's web page or available at City Hall. Tap fees are determined on a case-by-case basis. To estimate savings, the City of Arvada issued 63 irrigation taps from 2002 to 2006. The non-sod component was 332,220 square feet. Assuming non-sod areas needing 9 gallons per square foot per year and sod needing 18 gallons per square foot per year, the non-sod saved approximately 9.2 AF of water.

Industrial and Commercial Efficiency

All in-bay automatic and conveyor car wash installations that obtain a certificate of occupancy or a temporary certificate of occupancy from and after June 1, 2003 that use water supplied by the city water system shall be required to be equipped with, and shall maintain in operation, a water recycling system that will recycle not less than 50 percent of the water being used by such car wash installation.

Water use at car washes varies greatly due to many factors such as weather, location, and type of car wash. Therefore, estimating water savings as a result of water recycling can be somewhat difficult. However, according to the International Carwash Association, water use by car washes with reclaim systems can reduce water use by more than half.

Total water consumption from 2004 to 2008 for automatic car washes in the City of Arvada that have a water recycling component was 45,630 gallons. If we assume that amount would be double without the recycling component, we can estimate an annual savings of approximately 9,126 gallons.

Water Reuse Systems

By contract, the water obtained from Denver Water cannot be reused. Arvada has a one-time use with this water, and then dominion and control reverts back to Denver Water. The City has a number of water rights that allow for reuse of return flows. The City currently utilizes return flow credits to supplement the raw water supply. Approximately one half of our Clear Creek water is treated at the Metro Wastewater Reclamation District, which we then use to meet our return flow obligations on the South Platte.

Distribution System Leak Detection and Repair

The City utilizes a leak detection system to routinely monitor the system for leaks that have not surfaced. New leak detection equipment was put into service in November 2009 for a cost of approximately \$30,000. The City's Water Transmission and Distribution Department uses Permalog sensors to survey for leaks. The data is collected by a receiver and then downloaded to a computer for analysis. The system is also used to assist homeowners in detecting leaks in the household system. The 46 sensors currently in service survey approximately 30,000 linear feet of pipe per month. The leak

detection program detects and stops approximately 4 million gallons of water loss per year that would have resulted from non-surfacing leaks and hydrant problems.

In addition, the City has an ongoing main line replacement program which will cost approximately \$2.8 million per year to replace the older water mains which are increasingly prone to failure and leakage.

Public Education and Information Dissemination

The City currently utilizes water-bill inserts, newsletters, informational booths at public events, youth education programs, the City website, and social media such as Twitter and Facebook to educate and engage its customers regarding water conservation and water resources management. In addition, a $\frac{3}{4}$ Full Time Equivalent Water Conservation Specialist position was filled at the Majestic View Nature Center. This position was funded to help provide water conservation educational materials to the public, with many of the programs designed for elementary-age children.

According to *Water Conservation for Small- and Medium-Sized Utilities* (Deborah Green, 2010), public information, on its own, is likely to save the least amount of water when compared to other measures. When public information is the only measure offered by a utility, water savings range from 2 to 5 percent during non-crisis periods. It is, however, intended to support and supplement the other measures by providing residents and businesses information about the water-saving programs available to them. Although the direct effects of public education alone cannot be measured, it is a vital part of the overall water conservation plan, encouraging consumer behavioral and lifestyle changes.

Customer Water Use Audits

The City of Arvada conducted a Residential Water Audit Program from 1991 to 1993. The program included retrofitting homes with low-flow showerheads, faucet aerators, and Future Flush toilet retrofit devices. The project also included distributing literature, education, and a review of individual water consumption histories. The three-year cost of the project was \$189,200, with 90.6 AF of water saved.

The City's current water use audits are done through the billing system and are based on monitoring increases in customer water consumption. A large jump in water consumption from one billing cycle to the next triggers an account review. Customers are contacted by City staff to quickly notify them of the increase and to assist in determining the cause of the increase.

High-use customers are notified of a wireless monitoring device they can obtain from the City for a \$20 refundable deposit. This wireless device allows for instantaneous readings from the customer's water meter, allowing them to constantly monitor their water usage.

Bi-monthly reports, which are created through the billing system, flag accounts with possible leaks and list the top 100 water users. The potential leaks are forwarded to the leak detection program administrator for review, and the list of high water users is analyzed by the water resources administrator.

Partnering with the Center for Resource Conservation (CRC), Arvada will be implementing the Slow the Flow Colorado Sprinkler Inspection Program in 2013. This program offers free irrigation audits to residents, providing them with a full sprinkler system inspection and customized watering schedule.

The City is authorizing 240 audits to be completed in 2013, at a cost of \$24,000. The average water savings resulting from these audits is between 5,000 and 10,000 gallons per year per household.

Water Rates Structure and Billing Systems Designed to Encourage Efficiency

The City's water rates are designed to promote water conservation. The City has a three-tiered bimonthly billing system for its residential customers, with inclining block rates based on usage. Commercial customers have separate tiers based on the size of the meter. See the Water Billing and Rate Structure section of the plan for details.

Regulations/Ordinances

City of Arvada- Land Development Code

Section 6.5.2, Parts G and H

G. Water Wise Landscaping Required. All landscaping plans shall be designed to conserve water to the greatest degree practicable. The regulations of paragraph “H” cover the following types of development:

1. Single-family detached development where landscaping is installed by the developer or builder;
2. Two-family development where landscaping is installed by the developer or builder;
3. Multi-family development;
4. Commercial development;
5. Industrial development;
6. Office development;
7. Any privately-owned common open space; and
8. Landscaping installed within public rights of way as may be required as part of the development approval process or City street templates.

H. Water Wise Landscaping Standards.

1. Plant Selection. All tree, shrub, groundcover, perennial, vine, and grass selections shall come from the City’s recommended list.

Substitutions are only allowed if approved by Community Development Director upon reviewing evidence as to the waterconserving qualities of proposed substitutions.

2. Use of High-Water-Demand Landscapes. High water-demand landscapes (such as irrigated cool season turf grass) are limited to areas of high pedestrian activity, tree lawns, primary entrance features, club-houses, wetland plantings, or in single-family lot front yards. High-water-demand turf shall be minimized to the extent practicable and not exceed 50% of the total landscaped area in residential projects and 35% in commercial, office or industrial projects. High-water-demand turf is specifically prohibited in the following (unless approved by the Community Development Director after reviewing evidence of a water-efficient irrigation system):

- a. Parking lot islands,
- b. Slopes greater than 4:1,
- c. Street medians,
- d. Storm water detention ponds, unless designed for active recreation or needed as part of required wetlands;

e. Any space less than 8 feet wide.

3. Grouping Plants According to Water Needs. All plantings should be grouped according to their water needs to minimize water use.

4. Soil Amendments. Prior to planting, all sites for plantings shall incorporate soil amendments at a rate of 3 cubic yards per 1000 square feet to a minimum depth of 6". A lesser amount shall be allowed if a soil test shows that 3 cubic yards per 1000 square feet is not necessary for water retention and deep rooting of plant materials. If the specified plant material requires less fertile soil, those areas may have less soil amendments installed if approved by the Community Development Director. These areas shall be identified on the landscape plan. Existing topsoil shall be salvaged and stockpiled for use as soil amendments or topsoil. No topsoil shall be removed from the site unless the City approves the transfer of topsoil to a City-owned park or open space area. A note shall be placed on the landscape plan reflecting the above requirements regarding soil amendments and topsoil. Examples of acceptable soil amendments include compost and aged manure. Mountain peat and inorganic materials such as sand, gypsum and lime are prohibited soil amendments. All sites are subject to inspection by the City for compliance with soil amendment requirements.

5. Irrigation. The landscape plan shall label or note the type of irrigation to be applied to each plant hydrozone to ensure that plants receive only the needed water. In addition, the plan shall include:

- a. A rain sensor with automatic shut-off of the system during periods of high moisture;
- b. A drip, sub-surface, bubbler or low volume irrigation system for all planting strips less than 8' wide and all planting beds involving trees, shrubs, perennials and groundcover; and
- c. An irrigation clock which allows programming to meet the differential needs of the specified planting plan.

6. Restrictive Covenants Requiring Sod. Any restrictive covenant that becomes effective after July 15, 2003 shall not prohibit the use of water-wise landscaping or require more than 50% highwater-demand turf. This provision shall not restrict the individual and voluntary use of a greater percentage of high-water-demand turf.

The following ordinances pertaining to water conservation have been adopted by the City of Arvada:

ARVADA, COLORADO CODE OF ORDINANCES
UTILITIES
WATER AND SEWER
DIVISION 4. WATER CONSERVATION

Sec. 102-101. Intent.

- (a) The purpose of this division is to require mandatory provisions for the conservation of the city potable water supply by the utilization of certain plumbing fittings and fixtures and water use practices.
 - (b) These provisions apply to all residential structures, including but not limited to one- and two-family residences, townhomes, condominiums, apartment buildings, hotels and motels that are issued a building permit. Section 102-103(b) applies to commercial and industrial structures issued a building permit.
 - (c) All additions and alterations to existing residential structures issued a building permit will comply with the provisions of this division when the work includes the installation or replacement of plumbing fixtures and fittings governed by this division.
 - (d) All additions and alterations to existing commercial and industrial structures that are issued a building permit will comply with the provisions of subsection (b) of this section when the work includes the installation or replacement of plumbing fixtures and fittings governed by section 102-103(b).
- (Code 1981, § 33-51; Ord. No. 2574, § 1, 11-21-1988)

Sec. 102-102. Maximum capacity of plumbing fixtures and fittings.

- (a) The potable water system in all residential structures shall be equipped with an approved pressure regulator valve when the water pressure at the city water main is greater than 80 pounds per square inch gauge (psi). The maximum water pressure on the discharge side of the pressure regulator valve shall not exceed 75 psi.
 - (b) Tank-type water closets shall be designed to flush with a maximum of 1.6 gallons of water.
 - (c) Showerheads used for the purpose of bathing, lavatory faucets and sink faucets shall have a maximum flow capacity of 2.5 gallons per minute.
- (Code 1981, § 33-52; Ord. No. 2574, § 1, 11-21-1988; Ord. No. 2763, § 1, 11-5-1990; Ord. No. 3127, § 8, 10-24-1994)

Sec. 102-103. Contractor/owner responsibility.

(a) The licensed contractor or owner/occupant responsible for the installation of waterflow control plumbing fittings specified in this division will provide information upon request to the building inspection division certifying that the fittings are in conformance with the maximum waterflow to volumes stipulated herein. Testing reports by a recognized, independent testing laboratory or reports of tests performed by the manufacturer, using established principles of mechanics, are acceptable.

(b) All waterflow control fittings installed as specified in this division will be maintained in a sanitary working condition and free of defects which may reduce the effectiveness of water conservation.

(Code 1981, § 33-53; Ord. No. 2574, § 1, 11-21-1988)

Sec. 102-104. Special equipment for hoses used to wash vehicles.

Hoses used for washing of vehicles shall be equipped with a shut-off valve that is normally closed and necessitates hand pressure on the valve to permit the flow of water.

(Code 1981, § 33-54; Ord. No. 2574, § 1, 11-21-1988)

Sec. 102-105. Appeal for exception.

Relief from the requirements of this division may be granted by the chief building official upon satisfactory demonstration by the appellant that the water conservation requirements stipulated herein are detrimental to health or safety. The city council may waive the enforcement of the requirements of this division if the city council finds and determines that such enforcement creates a financial hardship upon any person.

(Code 1981, § 33-55; Ord. No. 2574, § 1, 11-21-1988)

Sec. 102-106. Waste of water.

(a) *Waste of water is prohibited.* Waste of water is defined as the intentional or nonintentional use of water for a nonbeneficial purpose, including, but not by way of limitation: continuous application of water to any lawn, turf or sodded area resulting in pooling or the flowing of water into the drainage or storm drainage facilities, including sidewalks, gutters, or streets; failure to repair any irrigation system that is leaking; and application of water intended for lawn irrigation to an impervious surface such as building exteriors, a street, sidewalk, or driveway. Notwithstanding the enforcement provisions set forth in subsection (b) of this section, the director may order a shut off of water service to a property if the director reasonably finds that an extreme

waste of water is occurring on the property. The term "director" means the director of the utilities department for the city, or his designee.

(b) *Enforcement.* The director is hereby authorized to enforce this section. The person billed for water service to a property, whether the person is the owner or an occupant of the property, shall be responsible for compliance with subsection (a) of this section and shall be subject to the following actions and penalties:

(1) Upon a first violation, the person billed will be issued a warning notice.

(2) Upon a second violation at the same property within a 12 month period from the date of issuance of the warning notice, the person billed will be issued a written violation and a charge of \$100.00 will be added to the water bill for the property.

(3) Upon a third violation at the same property within a 12 month period from the date of issuance of the warning notice, the person billed will be advised in writing of the violation and a charge of \$250.00 will be added to the water bill for the property.

(4) Upon a fourth or any subsequent violation at the same property within a 12 month period from the date of issuance of the warning notice, the person billed will be advised in writing of the violation and a charge of \$500.00 will be added to the water bill for the property. In addition, the director may order the installation of flow restriction devices and/or a suspension of water service to the property. In the event that water service to the property is restricted or suspended, the person billed shall first be required to make a \$500.00 deposit to the utilities department of the city prior to restoration of full water service. The deposit shall be retained for 12 months from the date of its receipt. The deposit shall be forfeited if there are any further violations within the 12 month period from the date of the last violation. If, during the 12 month period, there are no further violations of this section, the deposit shall be returned to the person responsible for paying the bill for the property.

(5) Any charge imposed pursuant to this section may be appealed by filing a petition with the director no later than 30 days after having been first billed for such charge. The director may hold such hearing him, or designate another as a hearing officer with the authority to hold such hearing. The filing of a petition shall not stay payment for any charge during the pendency of the hearing. Any petition shall be in writing and shall set forth with particularity the reason for the appeal. Any hearing held pursuant to this section shall take place within the city at a date and time set by the director, but not earlier than 14 days nor later than 60 days from the date of receipt of the petition by the director, unless a different time and date is agreed to by the petitioner and the

director. Hearings held pursuant to this section shall be held in accordance with the procedures set forth in section 2-171 et seq.

(6) In addition to the notice of violation served upon, or delivered to the person responsible for payment of the bill, a copy of such notice shall also be mailed to the owner of record of the real property served, if the owner's address differs from the subject property address. Failure to serve the property owner shall not relieve the person responsible for payment of the bill from the obligations or charges set forth in this section.

(c) *Restrictions on uses.* Restrictions on the hours of use, days of use, amounts of use and types and places of use may be placed upon users of water supplied by the city water system. The director shall determine the necessary and proper restrictions and shall cause such restrictions to be promulgated by administrative rule or regulation and duly enforced. The charges and penalties provided in this section shall apply to violations of restrictions on uses as well as for waste of water.

(d) *Administrative rules.* Procedures necessary to give effect to this section that are applicable to the public, and that are not otherwise specified in this section, are hereby authorized. Pursuant to section 2-141 et seq., the director is authorized and directed to promulgate such administrative rules as are useful, convenient or necessary to give effect to the terms and provisions hereof, including by way of illustration but not by limitation, restrictions on hours of irrigation, permissible schedules for outdoor use, length of time of irrigation, restrictions on types of outdoor uses, restrictions on car or fleet washing, uses on impervious surfaces, irrigation of common areas and parks, irrigation of golf courses, hand watering, exemptions and exceptions, or any other related matter or activity dependant upon or utilizing water from the city water delivery system. Where city council has by resolution declared a drought, the director is authorized and directed to promulgate such administrative rules without utilizing the procedures set forth in section 2-141 et seq. In such event, the director shall publish such rules in a newspaper of general circulation in the city at least five days before the rules become effective.

(e) Consistent with, and subject to, the city's contractual obligations to water users of the city water supply system that receive untreated water or resell treated water to third parties, such users shall, to the extent permitted or otherwise required by contract, adopt rules and regulations consistent with the requirements placed upon the city by the Denver Water Board with respect to the conservation of water. The director shall be authorized to enforce the terms of such contracts as they may pertain to the conservation of water.

(Code 1981, § 33-56; Ord. No. 2574, § 1, 11-21-1988; Ord. No. 3755, § 3, 7-1-2002; Ord. No. 3760, § 3, 7-15-2002; Ord. No. 3877, § 1, 5-3-2004)

Sec. 102-108. Car washes.

(a) The following words, terms and phrases, when used in this division, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

Car wash installation means any area or business using in-bay automatic or conveyor equipment for cleaning and washing motor vehicles, whether as a part of another business operation or as a stand alone operation, of any type, on a commercial basis and shall include fleet and municipal in-bay automatic and conveyor car wash facilities.

Conveyor car wash installation means a system where the car moves through the facility on a conveyor belt while being cleaned.

In-bay car wash installation means a system where the car remains stationary while a machine moves back and forth over the vehicle to clean it.

Operator means the person, business, or municipal entity responsible for the operation of the car wash installation, whether as owner or lessee of said car wash installation, as indicated in the business license, sales tax or property records of the city.

Self-service car wash installation means a system where the customer washes the car themselves using a wand that dispenses water and cleanser.

(b) All in-bay automatic and conveyor car wash installations that obtain a certificate of occupancy or a temporary certificate of occupancy from and after June 1, 2003 that use water supplied by the city water system shall be required to be equipped with, and shall maintain in operation, a water recycling system that will recycle not less than 50 percent of the water being used by such car wash installation.

(c) Any operator of a in-bay automatic and/or conveyor car wash installation that has obtained a certificate of occupancy or a temporary certificate of occupancy prior to June 1, 2003 shall be required to install, and maintain in operation, a water recycling system that will recycle not less than 50 percent of the water supplied by the city water system by such car wash installation as a condition of any permit granted by the city to:

(1) Enlarge the water tap, meter or service line in any such car wash installation; or

(2) Demolish, destroy or remove and then replace more than 50 percent of the gross square footage of the floor area of the car wash installation building as it exists on June 1, 2003, except for the purpose of replacing under floor heating equipment; or

(3) Expand the gross square footage of the floor area of the car wash installation building by more than 50 percent of the square footage of the car wash installation building as it exists on June 1, 2003.

(d) All self-service car wash installations shall be exempt from the provisions of this article.

(Code 1981, § 33-59; Ord. No. 3761, § 1, 2-3-2003)

Sec. 102-109. Irrigation water to landscaped common area.

(a) The annual allocation of water for irrigation of the total landscaped common area is included in the annual allocation of water acquired when the tap fee is purchased for the residential or nonresidential type of property as set forth in sections 102-34, 102-161(3) and 102-163(3). The city will permit installation of up to three service connections to the city water main for the common area irrigation system by the property owner or responsible caretaker association upon payment of connection costs, tapping and inspection fees as set forth in sections 102-44 and 102-164(a)(1) and (2) or section 102-166(a)(1) and (2). Each landscaped common area irrigation service connection will be assigned a service address and billing account in the name of the property owner or responsible caretaker association. The department of utilities prior to issuance of building permits must approve the landscape and irrigation plans.

(b) All determinations concerning qualification as landscaped common area, non-water conserving open space, water conserving open space or nonirrigated open space, and all determinations as to the size and type of irrigation tap required, shall be at the sole discretion of the director of utilities or his duly authorized representative, consistent with the provisions of this article I. Any such determination involving area demarcations or calculations, or volumetric calculations, shall be made available to the user for inspection, upon request.

(Code 1981, § 33-61; Ord. No. 3202, § 4, 8-7-1995; Ord. No. 3262, § 7, 4-15-1996)

Sec. 102-110. Irrigation water demand for open space.

(a) For nonwater conserving open space, the annual volumetric water demand shall be calculated at 18 gallons per square foot per year for the purpose of establishing the size and cost of the irrigation tap to be purchased in accordance with sections 102-34, 102-164(b), and 102-166(b).

(b) For water conserving open space, the annual "volumetric" water requirement for irrigation shall be calculated at nine gallons per square foot per year for the purpose of establishing the size and cost of the irrigation tap in accordance with sections 102-34, 102-164(b), and 102-166(b).

- (c) For open space that has no installed irrigation system and will not be irrigated, no water demand will be assigned.
- (d) All determinations concerning qualification as landscaped common area, non-water conserving open space, water conserving open space or nonirrigated open space, and all determinations as to the size and type of irrigation tap required, shall be at the sole discretion of the director of utilities or his duly authorized representative, consistent with the provisions of this article I. Any such determination involving area demarcations or calculations, or volumetric calculations, shall be made available to the user for inspection, upon request.
- (Code 1981, § 33-62; Ord. No. 3262, § 8, 4-15-1996)

Rebates and Incentives

Between 1990 and 1995 the City of Arvada provided rebates to customers who replaced non-conserving toilets with ULV toilets using 1.6 gallons or less water per flush. Over the five year period, 3,410 ULV's were installed. The project cost the City at total of \$265,500, and saved 80.4 AF of water. In 2002 and 2003, the City implemented five rebate programs at a cost of nearly \$400,000.

Table 11: Previous Rebate Programs

Rebate Name	Number of Participants		Cost	
Deep Root	648	14%	\$6,477	2%
Soaker Hose	854	19%	\$8,317	2%
Toilet	1,583	35%	\$173,177	46%
Clothes Washer	716	16%	\$89,500	24%
Landscape	700	16%	\$99,952	26%
Total	4,501	100%	\$377,423	100%

Rebate programs are quite costly in comparison to other water-saving measures. Incentives for buying eco-friendly products can lose their effectiveness as those products become widely available and prices drop. Many municipalities across the country are dropping their rebate programs in favor of more cost-effective measures, such as the Garden-in-a-Box and water-use audits the City will be implementing in 2013.

The City does offer reduced tap fees as an incentive to encourage conservation. As explained in the Landscape Efficiency section of the Plan,

tap fees are reduced by 50% for the installation of water-conserving landscape. Additionally, our three-tiered billing system promotes conservation by offering a lower water rate as incentive for reduced water consumption.

All required measures and programs set forth by statute 37-60-126 have been considered by the City of Arvada.

Monitoring, Evaluating, and Revising the Conservation Plan

The City of Arvada will continue to monitor its water conservation activities throughout the year, ensuring that the programs set forth in this plan are being implemented efficiently and to maximum benefit. Water consumption trends and data from the leak detection program will continue to be monitored and evaluated on a monthly basis. The latest water conservation information will be provided to the public on an on-going basis by way of public outreach events, internet, and billing inserts. Budgetary confinements will be evaluated at the end of each year to determine if existing programs can be expanded or new programs added. The plan as a whole will be reviewed at the end of each year, with any pertinent revisions posted by June of the following year.

The City of Arvada has extensive public education programs and regulations in place that not only promote conservation, but also raise awareness of the importance of water conservation. The City's water rate structures reward efficient water use and discourage water waste. The City also has conservation resources available on its website that are continually updated and expanded.

By focusing on the aspects of water conservation that have proven effective, and improving upon those aspects with advances in technology, the City of Arvada has cultivated a realistic and cost-effective Water Conservation Plan that will enable the City to provide high-quality water to its customers now and in the foreseeable future.

The addition of three new programs in 2013 will expand our existing water conservation efforts. At the end of 2013, we will be able to assess the new programs' successes, quantify actual water savings, and determine future involvement in these programs.

In accordance with Colorado Revised Statutes 37-60-126, this Water Conservation Plan is scheduled for re-evaluation no later than January 2017, at which point existing conservation activities will be re-examined and new conservation activities evaluated.ⁱ

ⁱ Revision date June 26, 2012