

CENTENNIAL

WATER AND SANITATION DISTRICT

Colorado Water Conservation Board
Office of Water Conservation and Drought Planning
1313 Sherman Street, 7th Floor
Denver, CO 80203

RE: Centennial Water and Sanitation District Water Efficiency Plan Update

Gentlemen:

Please find enclosed a copy of Centennial Water and Sanitation District's (Centennial) updated Water Efficiency Plan. The Plan was prepared in accordance with the 2004 Colorado Water Conservation Act by Centennial staff, including members of Centennial's Water Resources, Finance, and Community Relations Departments.

Centennial provides water and wastewater services to the community of Highlands Ranch (HR) in northwest Douglas County. Centennial also provides wholesale water to neighboring Northern Douglas County Water and Sanitation District (NDC). The following table shows the total volume of retail water delivered and billed to Highlands Ranch from 2010 through 2014 along with the corresponding population. Over this five-year period, about 90% of Centennial's water supply came from renewable surface-water sources and about 10% was from non-renewable Denver Basin ground-water sources.

Table of Water Use from 2010 through 2014

Year	Acre-Feet	Population
2010	13,950	91,898
2011	14,742	92,568
2012	15,227	93,514
2013	12,816	94,999
2014	13,097	96,060

The Water Efficiency Plan was available for public review and comment from May 14, 2016 through July 13, 2016. The public was also invited to provide comments during the regularly scheduled Centennial Board Meeting on June 27, 2016. However, no comments (written or oral) about the Plan were received from the public. On June 22, 2016, the Plan was presented to the Highlands Ranch Metropolitan District Board of Directors and received a show of support. Please direct any questions about the Plan to Centennial's Water Conservation & Efficiency Coordinator, Mr. Jon Klassen at (720) 240-4917.

Sincerely,



John M. Kaufman
General Manager

Enclosure: Centennial Water & Sanitation District 2016 Water Efficiency Plan



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2016 WATER EFFICIENCY PLAN



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Table of Contents

List of Tables and Figures.....	i
Acronyms	ii
Definitions	ii
Introduction.....	1
Section 1 Profile of Existing Water Supply System	2
1.1 Overview of Existing Water Supply System	2
1.2 Water Supply Reliability	3
1.3 Supply-Side Limitations and Future Needs	3
Section 2 Profile of Water Demands and Historical Demand Management.....	5
2.1 Demographics and Key Characteristics of the Service Area	5
2.2 Historical Water Demands.....	6
2.3 Past and Current Demand Management Activities.....	10
2.3.1 Foundational Activities.....	10
2.3.2 Targeted Technical Assistance and Incentives.....	12
2.3.3 Rules and Regulations	14
2.3.4 Education Activities	15
2.4 Demand Forecasts	18
Section 3 Integrated Planning and Water Efficiency Benefits and Goals	19
3.1 Water Efficiency and Water Supply Planning	19
3.2 Water Efficiency Benefits and Goals	21
Section 4 Selection of Water Efficiency Activities	21
4.1 Summary of Evaluation and Selection Process.....	22
4.2 Selected Water Efficiency Activities	22
4.2.1 Foundational Activities.....	24
4.2.2 Targeted Technical Assistance and Incentives.....	24
4.2.3 Rules and Regulations	25
4.2.4 Education Activities	25
4.3 Estimated Water Savings	26
Section 5 Implementation and Monitoring Plan	27
5.1 Implementation Plan	27
5.2 Monitoring Plan	28
Section 6 Public Review and Adoption of Water Efficiency Plan.....	29
6.1 Public Review Process	29
6.2 Adoption of the Water Efficiency Plan	29
Appendices	30
Appendix A – Water Efficiency Activities Screening Worksheets.....	31
Appendix B – Public Announcements.....	37
Appendix C – Board of Directors Approval and Adoption.....	40

List of Tables and Figures

Tables

Table 1 - Average and Dry-Year Yields.....	3
Table 2 - Water Supply Limitations and Future Needs	4
Table 3 - 2016 Water Rates.....	11
Table 4 - Charges for Violation of Rules and Regulations	15
Table 5 - Current and Past Water Efficiency Activities and Estimated Savings	17
Table 6 - New Water Efficiency Activities.....	23
Table 7 - Projected Water Savings by Conservation Level	26
Table 8 - Projected Implementation Schedule.....	27

Figures

Figure 1 - Centennial Water & Sanitation District Service Area.....	5
Figure 2 - Annual Billed Demand and Population.....	7
Figure 3 - 2014 Percent of Water Use by Customer Category	8
Figure 4 - Annual Water Use by Customer Category	8
Figure 5 - System-wide Gallons per Capita-Day	9
Figure 6 - Residential Gallons per Capita-Day	10
Figure 7 - Single-Family Bi-Monthly Indoor Use	18
Figure 8 - Baseline Demand Forecast.....	19
Figure 9 - Modified Demand Forecast	20

Acronyms

AF	Acre-Feet
ASR	Aquifer Storage and Recovery
AWC	Average Winter Consumption
AWWA	American Water Works Association
CWCB	Colorado Water Conservation Board
ET	Evapotranspiration
gpcd	gallons per capita per day
HOA	Home Owners Association
mgd	million gallons per day
NDC	Northern Douglas County Water & Sanitation District
PSI	Pounds per Square Inch
SWSI	Statewide Water Supply Initiative
WISE	Water Infrastructure and Supply Efficiency

Definitions

Acre-foot: A volume of water equal to one foot of depth covering an area of one acre. One acre-foot is 325,851 gallons.

American Water Works Association (AWWA): The American Water Works Association is the largest nonprofit, scientific and educational association dedicated to managing and treating water. The AWWA provides solutions to improve public health, protect the environment, strengthen the economy and enhance our quality of life.

Aquifer: An underground deposit of sand, gravel or rock through which water can pass or is stored. Aquifers supply the water for wells and springs.

Aquifer Storage and Recovery (ASR): The process of pumping treated surface water into the aquifer for storage so that it can be used at a later time. Water stored in the aquifer is not susceptible to evaporation loss.

Audit (end-use): A systematic accounting of water uses by end users (residential, commercial or industrial), often used to identify potential areas for water reduction, conservation or efficiency improvement.

Audit (system): A systematic accounting of water throughout the production, transmission and distribution facilities of the system.

Average winter consumption: The average amount of water used during the winter months of November, December, January and February. Average winter consumption is used to estimate indoor and outdoor water use for residential customers.

Colorado Water Conservation Board (CWCB): A division of the Colorado Department of Natural Resources, the CWCB was created in 1937 for the purpose of aiding in the protection and development of the waters of the state. The mission statement of the CWCB is to conserve, develop, protect and manage Colorado's water for present and future generations.

Evapotranspiration: A measurement of the amount of water lost from evaporation and plant transpiration. Weather factors used to calculate ET are temperature, wind, humidity and solar radiation.

Groundwater: Water found below the earth's surface, in the pore spaces of saturated soil and rock that supplies wells and springs.

Loss (apparent): Apparent losses consist of unauthorized consumption, meter inaccuracies and possible data handling errors.

Loss (real): Real losses consist of leaks in the distribution system that does not reach the end user. While the water is lost from the distribution system, the water does eventually return to the South Platte River.

Low water-use landscaping: Use of landscape designs and plant materials that are appropriate for the climate and growing conditions. Usually utilizes the principles of xeriscape.

Non-revenue water: Also referred to as unaccounted for water, non-revenue water consists of unbilled authorized uses (line flushing, new home construction), and system losses. It's important to note that while these items are not directly billed, they are included in rates based on rolling 5-year averages.

Rain sensor: A device connected to an automatic irrigation system that causes the system to shut down in the event of rainfall.

Raw water: Untreated water.

Renewable: A resource that is replaced naturally and can be used again.

Reuse (water): The reclamation and recycling of water for a beneficial use.

Statewide Water Supply Initiative (SWSI): First produced in 2004 SWSI is a comprehensive study, implemented by the CWCB, of how Colorado will meet its future water supply needs. The SWSI study was most recently updated in 2010.

Surface water: Water present on the earth's surface in lakes, reservoirs, and rivers.

System (distribution): A series of interconnected conveyance and treatment facilities owned and operated by a water supplier.

System loss: An amount of water, usually expressed as a percentage, lost from the distribution system due to real and apparent losses. Water loss from leaks and line flushing is not truly lost, it eventually returns to the South Platte River.

Water conservation: Improved water management practices that reduce or enhance the beneficial use of water.

Water efficiency: Accomplishment of a function, task, process, or result with the minimal amount of water feasible. For the purposes of this plan, water efficiency is inclusive of water conservation and is used instead of "water conservation".

Water Infrastructure and Supply Efficiency (WISE): A regional partnership between Aurora Water, Denver Water and the South Metro Water Supply Authority. The agreement will allow for the parties to share available water supplies and infrastructure to deliver renewable water to members of the South Metro Water Supply Authority.

Wholesale water: Water purchased or sold for resale purposes.

Xeriscape: Landscaping that involves seven principles: proper planning and design; soil analysis and improvement; practical turf areas; appropriate plant selection; efficient irrigation; mulching; and appropriate maintenance.

Introduction

The Water Conservation Act of 1991 established a requirement that water providers develop, adopt, make publicly available, and implement a plan to encourage its customers to use water more efficiently. In 1995 Centennial Water and Sanitation District (District) developed a water management plan to comply with the 1991 Act's requirements.

In 2004 the State of Colorado revised the minimum planning requirements established in 1991 under the new Water Conservation Act of 2004. To comply with the new requirements, the District developed a new Water Conservation Plan that was submitted and approved by the Colorado Water Conservation Board's (CWCB) Office of Water Conservation and Drought Planning in 2009.

The 2004 law requires that water conservation plans be updated and submitted to the CWCB every seven years. This new plan, now called the Water Efficiency Plan, is intended to meet the current required elements for water efficiency planning and satisfy the requirement of a seven-year update to the District's plan in accordance with the Water Conservation Act of 2004.

There are additional reasons to update the District's water efficiency plan, which include, but are not limited to:

- Improve public awareness of the need to conserve and use water more efficiently
- Improve public knowledge of water efficiency opportunities and methods
- Improve the District's understanding of water use trends
- Sustain and improve upon past water savings, behavior, and attitudes
- Diminish the need to acquire additional renewable water supplies, thereby reducing associated costs and environmental impacts
- Reduce future District operating costs

This plan follows the format of the *Municipal Water Efficiency Plan Guidance Document* introduced by the CWCB in July 2012, and describes activities to reduce the overall water demand of the District. The plan also includes an overview of the District's water supply system, a profile of water demands and demand management, a discussion of the role that water efficiency plays in water supply planning, a delineation of the District's water efficiency goals, a description of water efficiency activities, and a description of how the plan will be implemented and monitored over the course of the seven-year planning period.

The plan provides a path for making sound decisions about the water efficiency activities that will be funded by the District. The water efficiency activities described in this plan may evolve as necessary to ensure that goals and objectives are met. The water efficiency plan does not describe in detail how each water efficiency activity will be implemented. Those details will be determined as implementation of each activity or group of activities takes place.

Section 1 Profile of Existing Water Supply System

1.1 Overview of Existing Water Supply System

The District provides water and wastewater services to the community of Highlands Ranch and other neighboring residential areas in northwest Douglas County through intergovernmental agreements with the Highlands Ranch Metro District (Metro District) and the Northern Douglas County Water and Sanitation District (NDC).

The District's water-supply portfolio is comprised of renewable surface water from the South Platte River, including tributary alluvial groundwater, and nontributary Denver Basin groundwater. The water supply for Highlands Ranch is predominately renewable surface water from the South Platte River Basin. As needed, the surface water supply is supplemented with nonrenewable, reusable deep groundwater from three Denver Basin aquifers beneath Highlands Ranch. Over the past 30 plus years, surface water has comprised an average of 85 percent of the District's water supply.

Surface water sources are provided from several water court decrees, water contracts, and water leases that the District acquired over the past 36 years. Surface water is stored in one of three reservoirs. McLellan Reservoir and South Platte Reservoir are both located near the South Platte River downstream of Chatfield Reservoir and northwest of the District service area. James Tingle Reservoir is situated near Michigan Creek in Park County.

- McLellan Reservoir is a 6,400 acre-foot (AF) reservoir owned by the City of Englewood. The District leases 3,885 AF of space in the reservoir for surface water storage on a long-term basis.
- South Platte Reservoir is owned by the District. The reservoir provides an additional 6,400 AF of surface water storage capacity.
- James Tingle Reservoir is jointly owned by the District and Center of Colorado Water Conservancy District. The District owns 205 AF of surface water storage capacity in this 400 AF reservoir.

The District's nontributary Denver Basin groundwater is currently supplied by 50 deep municipal wells completed in the Denver, Arapahoe, and Laramie-Fox Hills aquifers. The current on-line production capacity of the District's wellfield is approximately 12 million gallons per day (mgd).

Surface water is treated in the Joseph B. Blake Water Treatment Plant, which has a designed peak day operating capacity of about 40 mgd. However, due to seasonal water quality constraints, the peak-day treatment capacity is reduced to about 34 mgd. Groundwater pumped from the Denver Basin aquifers is treated in two groundwater treatment plants that have a combined capacity of 16 mgd. Treated water is either delivered directly into the distribution system, or stored in one of eight treated water storage tanks situated throughout Highlands Ranch. The water delivery system includes 10 pump stations and 443 miles of water transmission and distribution mains.

Municipal wastewater in the Highlands Ranch community is conveyed to the Marcy Gulch Wastewater Treatment Plant where it is then treated and discharged into Marcy Gulch in accordance with stringent water-quality standards and NPDES permit conditions. Marcy Gulch is a tributary of the South Platte River just downstream of Chatfield Reservoir. The wastewater treatment plant has a design treatment capacity of 8.48 mgd.

A portion of the wastewater effluent from the Marcy Gulch Wastewater Treatment Plant is treated for non-potable, irrigation only reuse through three filter units that have a design capacity of 3 mgd.

1.2 Water Supply Reliability

The District operates a robust conjunctive use water supply system that enables the use of surface water and/or groundwater sources to reliably provide water to our customers. Surface water sources are decreed water rights and both long-term and short-term leases of water owned by others. The short-term leases of water are contracts that may be cancelled with 90 days or less notice to the District. The District's Denver Basin decrees allow for groundwater to be pumped from three of the bedrock aquifers beneath Highlands Ranch up to a specified maximum annual appropriation amount for each well. The combination of available surface and groundwater supplies exceed the expected build-out demand for the District service area. In general, renewable surface water is used to the extent available, but is supplemented with the nonrenewable nontributary groundwater and, if necessary, reusable treated water stored in the aquifers, by means of the District's aquifer storage and recovery (ASR) system, resulting in an overall reliable water supply for the District's Highlands Ranch customers.

The District has made projections of both average-year and dry-year yields of its water supply portfolio. Dry-year yields are based on the drought periods of 2002, 2006 and 2012. Average-year yields are based on historical records beginning in 1990. With average annual raw water demands projected to be 18,600 AF at buildout, Table 1 shows how future water demands will be met with average and dry-year yields.

Table 1 - Average and Dry-Year Yields

Yield	Decreed Surface Water Rights and Long-Term Leases (AF)	Surface Water Short-Term Leases (AF)	Decreed Groundwater Rights (AF)	Total (AF)
Average-Year	13,377	1,045	12,800 ¹	27,222
Dry-Year	8,420	0	12,800 ¹	21,220

¹ Total groundwater adjudication is 17,886 AF. Current well field production is limited to 12,800 AF.

The District's ASR system was initiated in 1993. To date, the total volume of water stored in the Denver Basin aquifers beneath Highlands Ranch is approximately 14,000 AF. Unlike a surface storage reservoir, ASR water is not susceptible to evaporation loss. Recovery of stored ASR water was done in 2002 in the amount of 500 AF and 2013 in the amount of 40 AF. Recovery of this stored water is not booked against the District's decreed groundwater rights.

1.3 Supply-Side Limitations and Future Needs

While the District has a reliable water supply to provide safe drinking water to its customers during dry periods, operationally, the District does not want to rely more heavily on nonrenewable nontributary Denver Basin groundwater than it needs to as a supply source. Surface water is preferred to groundwater because it is a renewable resource, meaning that it is replenished annually through precipitation. In contrast, pumping nontributary groundwater from the Denver Basin aquifers gradually decreases the amount of water available from this resource (unless it is replenished by ASR).

The following table, which is based on Worksheet A of the CWCB Guidance Document, summarizes the water supply limitations and future needs of the District. More information on these issues can be found in later sections of this plan.

Table 2 - Water Supply Limitations and Future Needs

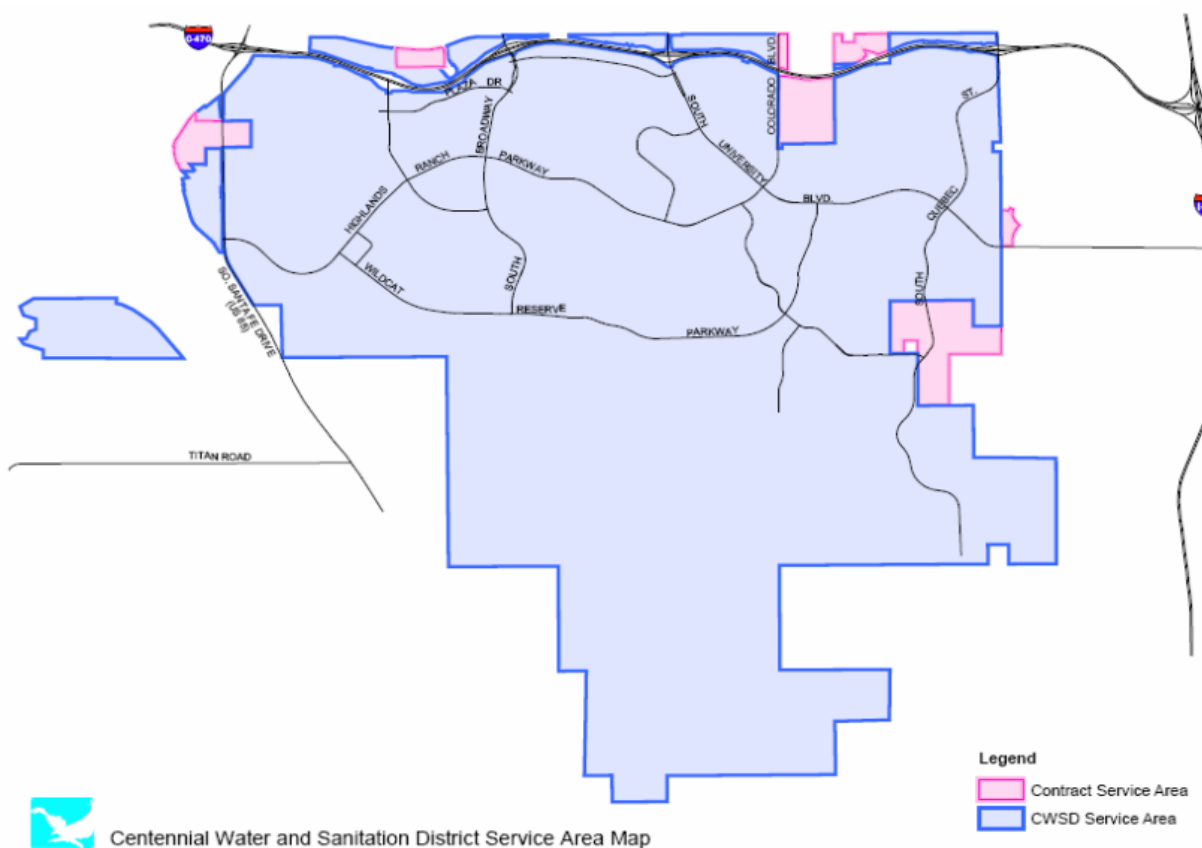
Limitation and/or Future Need	Yes	No	Comments on Limitation or Future Need	How is Limitation or Future Need Being Addressed
System is in a designated critical water supply shortage area	X		South Platte Basin identified in SWSI and State Water Plan as area with supply and storage gap	Increase supply through water acquisitions, leases, reuse, WISE, Chatfield Reallocation project, demand reductions, ASR, and regional cooperation
System experiences frequent water supply shortages and/or emergencies		X		
System has substantial non-revenue water		X		
Experiencing high rates of population and demand growth		X	District is near build-out	
Planning substantial improvements or additions	X		Planning major projects to increase water supply, storage, treatment capacity, and water distribution capacity	Chatfield Reallocation project ; WISE project; reuse study; water efficiency; regional ASR study; WTP utility study; new high-capacity pumping station and water transmission line; alluvial well field expansion study
Increases to wastewater system capacity anticipated		X	The answer could be yes in terms of flow and nutrient levels if treatment of Hwy. 85 corridor wastewater flows are added to the treatment stream	WWTP utility study is in progress, which may include participation with Douglas County
Need additional drought reserves		X		
Drinking water quality issues		X		
Aging infrastructure in need of repair	X		Selected wells, pumping equipment, treatment systems, and conveyance systems	Old wells, pumps, valves, lines, meters, and treatment systems are being upgraded and replaced as necessary
Issues with water pressure in portions of distribution system		X		

Section 2 Profile of Water Demands and Historical Demand Management

2.1 Demographics and Key Characteristics of the Service Area

The District provides water and wastewater services to the unincorporated community of Highlands Ranch through an intergovernmental wholesale agreement with the Highlands Ranch Metropolitan District. Highlands Ranch is located in northwest Douglas County approximately 12 miles south of Denver. It extends from about one mile west of Interstate 25 (I-25) to just east of Chatfield Reservoir. The District's service area includes the entire Highlands Ranch community, a number of small adjacent communities that are served by NDC, which is a wholesale customer of the District, and the planned Plum Creek Development. The District's entire service area is approximately 21.9 square miles and is shown in Figure 1. The District also has intergovernmental agreements to transfer potable water outside of the District's service area to Castle Pines North Metro District and to Roxborough Water and Sanitation District using water owned by those water providers.

Figure 1 - Centennial Water & Sanitation District Service Area



The Highlands Ranch Development Plan was approved by Douglas County in 1979 and laid the foundation for a community designed to provide a variety of land use types. Within the 22,000-acre development of Highlands Ranch, 61 percent of the land is designated for non-urban uses including open space and recreation. Thirty one percent of the land is residential, while the remaining eight percent is commercial property.

Highlands Ranch is served by two quasi-governmental agencies, Centennial Water and Sanitation District and Highlands Ranch Metropolitan District. The Metro District provides recreation services

and is responsible for the management of approximately 25 parks, more than 2,200 acres of open space and landscapes along the community's roadways. Fire services are provided through an intergovernmental agreement between the Metro District and the City of Littleton. Other services are provided by Douglas County as Highlands Ranch is part of unincorporated Douglas County.

Construction in Highlands Ranch began in 1981 with the largest period of growth occurring with in excess of 1,300 single family equivalents annually from 1993 through 2000. The 2015 District service area and contract service area population is approximately 100,000 and buildout is expected before 2020.

To facilitate monitoring and analyzing water use data and trends, customers are assigned to one of the following customer categories defined below:

- *Residential* customers are detached single family homes and make up the largest customer category. Residential water use is comprised of both indoor and outdoor uses.
- *Multi-Family* customers are attached and detached residential housing units containing 2 or more units. Water use is indoor use only.
- *Indoor Commercial* customers are made up of non-residential users such as schools, restaurants, office buildings and car washes. Water use is indoor use only with few exceptions. In 2003, the District eliminated the option of a combined meter for commercial customers. Prior to 2003, commercial customers were encouraged to have a separate meter for indoor and outdoor uses. Currently, only 6 percent of commercial customers have combination meters.
- *Outdoor Commercial* customers consist of irrigation meters for the non-residential customers described above, as well as, the common area landscapes of home owners associations and multi-family complexes.
- *Government Irrigation* is irrigation service for the District and the Highlands Ranch Metropolitan District's park and parkway landscape areas.
- *Raw/Reuse* water users are comprised of customers who receive raw water or reuse water for irrigation. Raw water can be delivered from either surface or groundwater sources. Reuse is delivered from the wastewater treatment facility.

As part of the wholesale agreement with NDC, NDC is required to follow the District's rate structure, rules and regulations. However, billing, compliance and water efficiency efforts are NDC's responsibility.

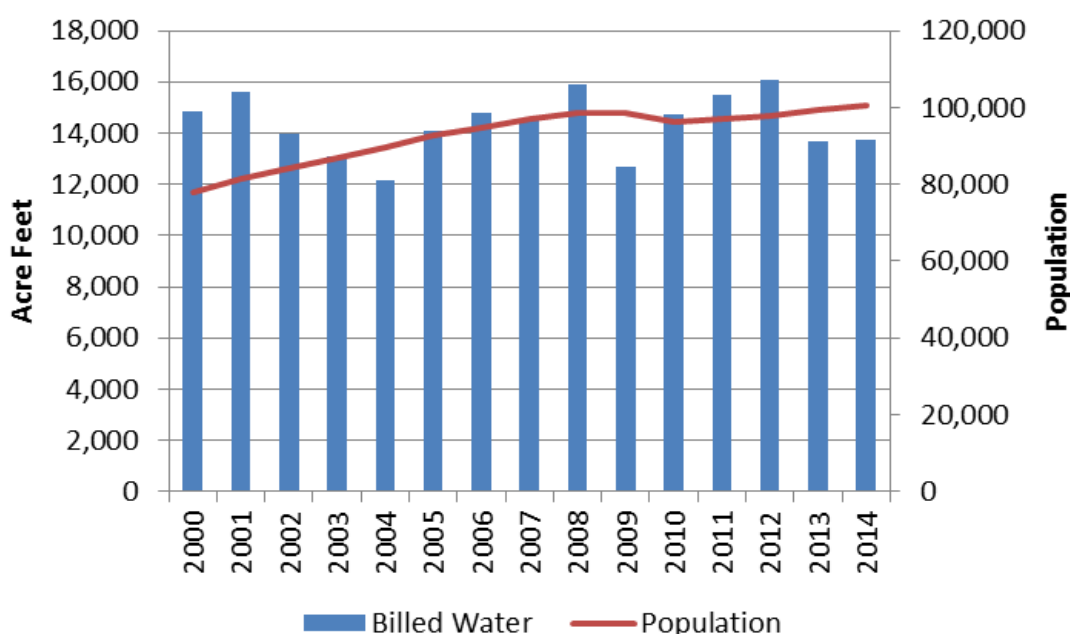
2.2 Historical Water Demands

In response to the 2002 drought, the District implemented a water budget rate structure in 2003 that helped slow demand increases to a rate less than that of the population growth. Average annual billed water demand for the District from 2010 to 2014 is similar to the year 2000, while the population has increased by 29 percent since 2000. Figure 2 shows annual billed demand and population since 2000.

Since 2003, the annual water demand has fluctuated from year to year largely due to varying weather conditions. There were two comparatively wet years in 2004 and 2009, during which

rainfall was 128 percent of the 10-year average. In those years, the demand for landscape irrigation water was considerably less than during the preceding and following years. Conversely, in 2008 and 2012 the total rainfall was 82 percent and 62 percent of the 10-year average, respectively. Demand increased in response to the comparatively dry conditions those years.

Figure 2 - Annual Billed Demand and Population



With drought conditions forecast to continue into 2013, the District, along with other Front Range water providers, embarked on an aggressive messaging campaign that included recommendations for decreasing outdoor water use. The District's customers responded favorably and no restrictions were put into place. Ultimately, 2013 ended up being an average year for rainfall. 2014 was considered to be a comparatively wet year with total precipitation at 113 percent of average.

Residential water users are the largest customer group that the District serves. Figure 3 shows water use by customer category as a percent of total use. Residential water use, which is comprised of single-family homes, accounts for over half of the water demand in Highlands Ranch. Outdoor Commercial is the next largest user group, which consists of dedicated irrigation accounts. Figure 4 shows annual water use by user category in thousands of gallons.

The five largest volume water users in Highlands Ranch for 2014 were:

1. Highlands Ranch Metropolitan District – irrigation for the parks and parkway landscapes.
2. Douglas County School District – indoor and outdoor water use for all schools.
3. Highlands Ranch Golf Club – an 18-hole golf course that receives raw and reuse water for irrigation.
4. Windcrest – indoor and outdoor use for a retirement community. Raw and reuse water is used for irrigation.
5. Backcountry Association – a homeowners association that receives raw water for irrigation of common area landscapes.

Figure 3 - 2014 Percent of Water Use by Customer Category

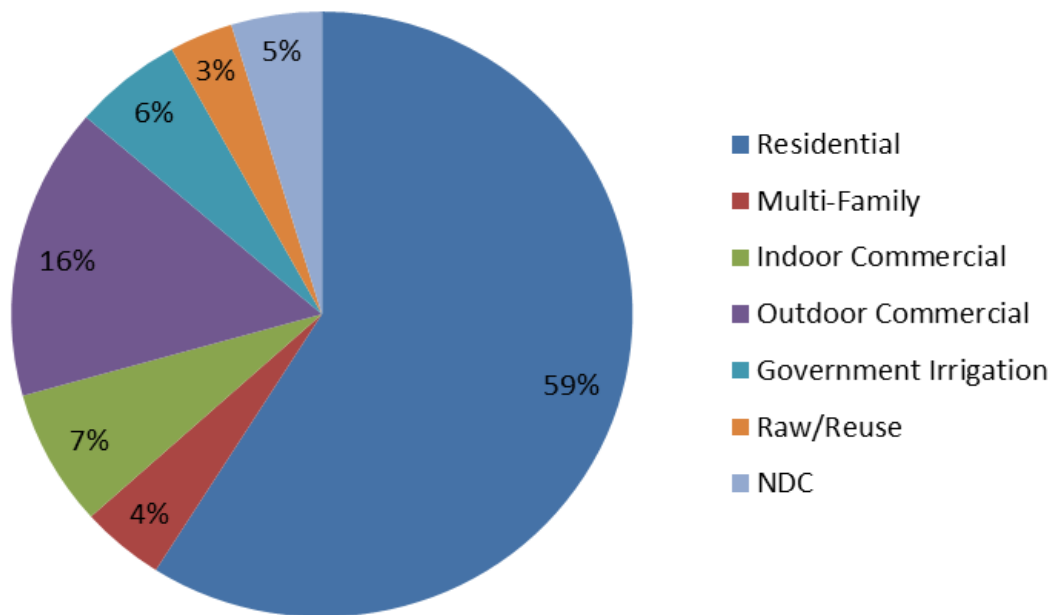
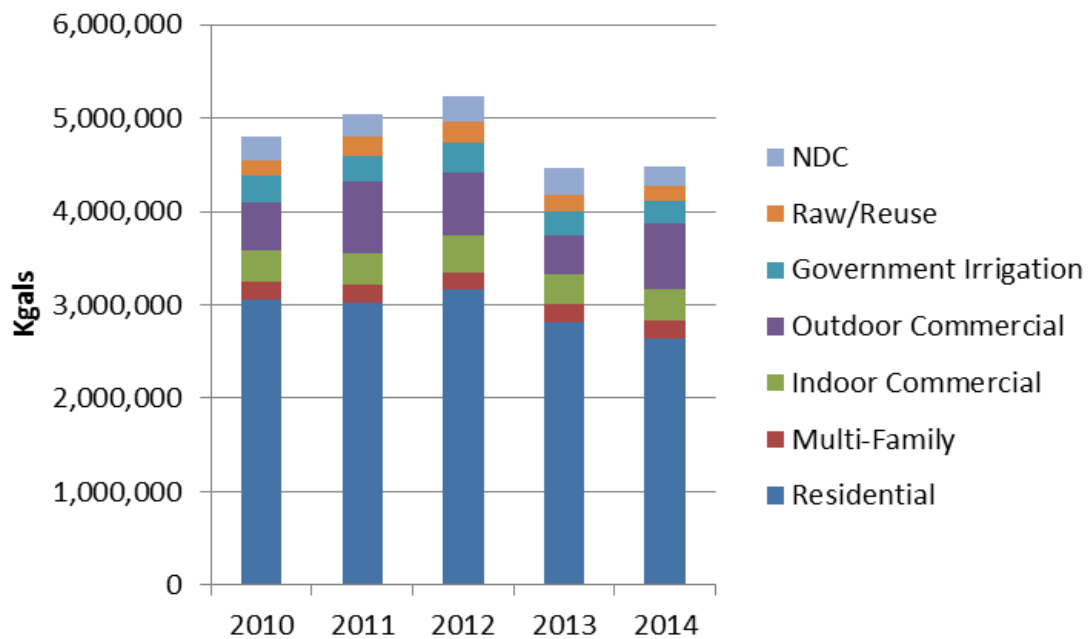


Figure 4 - Annual Water Use by Customer Category



Per Capita-Day Water Use

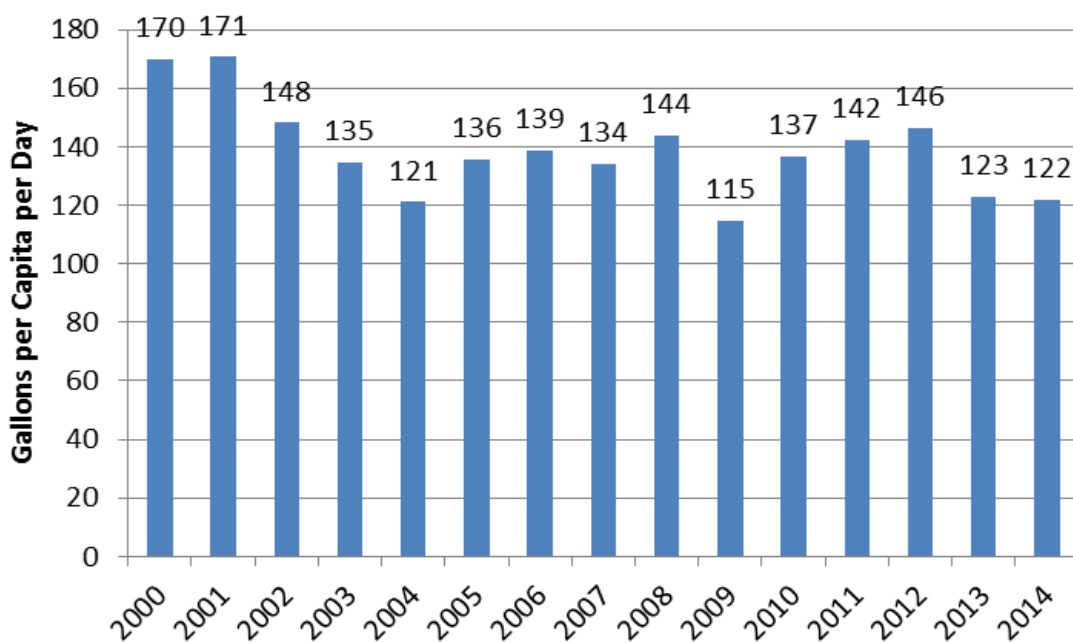
Per capita-day water use, expressed as gallons per capita-day (gpcd), also called gallons per capita per day, is a common way to normalize municipal water use data and can be a useful way to measure the success of water efficiency measures. The District calculates per capita-day water use in the following two ways:

$$\text{System-Wide per capita per day water use} = \text{Total Billed Consumption} \div \text{Population} \div \text{Number of Days}$$

$$\text{Residential per capita per day water use} = \text{Billed Residential Consumption} \div \text{Population} \div \text{Number of Days}$$

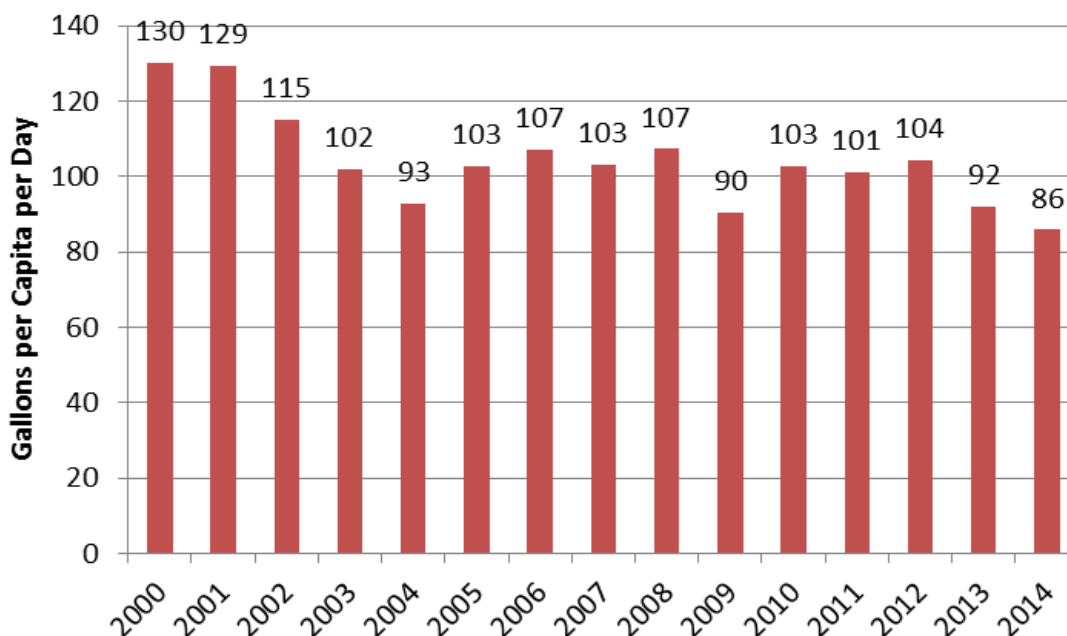
System-wide per capita-day water use includes all billed water consumption regardless of user type or water source. Using system-wide per capita-day water use to compare different communities can be misleading because the customer make-up of different communities can vary greatly. Figure 5 shows the system-wide per capita-day water use from 2000 through 2014.

Figure 5 - System-wide Gallons per Capita-Day



Residential per capita-day water use can provide a more “apples-to-apples” type of comparison, but it too can vary based on how a community calculates population. The District estimates population based on the number of residential and multi-family taps in Highlands Ranch and Northern Douglas County multiplied by household population and occupancy rates. Household population and occupancy rates are taken from the most recent Community Survey and U.S. Census data. Figure 6 shows annual residential per capita-day water use from 2005 through 2014.

Figure 6 - Residential Gallons per Capita-Day



2.3 Past and Current Demand Management Activities

Water efficiency has been an important part of the District's management plan since its inception in 1980. A water management study/conservation plan was completed in 1995 in compliance with the Water Conservation Act of 1991. This plan helped identify demand management potential in the District and focus the District's water efficiency efforts. The updated requirements of the Water Conservation Act of 2004 prompted the most recent water efficiency plan that was approved by the CWCBC in 2009.

Water efficiency activities that were implemented during the previous planning period are categorized by the *Statewide Water Supply Initiative Conservation Levels Framework* and described in the following sections.

2.3.1 Foundational Activities

Water Efficiency Oriented Rates

One of the District's most effective methods of demand management has been the water budget rate structure implemented in 2003. After the drought of 2002, the District implemented a water budget rate structure. The rate structure has two key components: A fixed water service availability fee and a variable water consumption rate. The fixed water service availability fee helps to assure revenue stability to meet on-going debt service and customer service staff obligations. The variable consumption component consists of a four-tier rate structure where the break point between tiers is based on a percentage of water budget assigned to each customer. Table 3 shows the 2016 water rates and tiers.

Table 3 - 2016 Water Rates

Percent of Budget	Residential		Commercial	
	Summer	Winter	Indoor	Irrigation
0 – 100%	\$3.21	\$3.21	\$2.97	\$3.28
101 – 120%	\$4.33	\$4.33	\$4.01	\$5.00
121 – 140%	\$6.57	\$4.33	\$4.01	\$8.00
> 140%	\$9.94	\$7.08	\$6.97	\$13.00

Residential water budgets are formulated from an indoor and an outdoor component. The indoor component is 12,000 gallons every two months based on an assumed 65 gpcd for a family of three. Customers can sign an affidavit to receive an additional indoor allowance for larger families. The outdoor component is based on the customer's actual lot size multiplied by an irrigable area factor of 45 percent. An allowance of 27 inches of water based on historical evapotranspiration (ET) rates for the area, minus average annual measurable rainfall, is provided. These budgeted outdoor amounts are then based on historical ET for the weeks within each billing cycle.

Commercial indoor water budgets are calculated based on the size of the meter servicing the business. Each customer is allotted 189,000 gallons per $\frac{3}{4}$ " equivalent. Outdoor budgets are based on actual irrigated areas for the customer. The customer is responsible for supplying the landscape area data to the District.

The flexibility of the water budget rate system allows the District to adapt to different issues as they arise. Some of the more notable changes that have been made over the years are:

- Adding a permit program to allow extra budget once per year for customers wanting to add new sod in April, May, September or October discourages planting during the heat of the summer.
- A variance for households with a population greater than three persons supports demographic fairness throughout the service area.
- Water budgets were increased by 1,000 gallons per month during the winter to accommodate winter watering of trees and shrubs, enabling customers to care for their landscape during the winter months.
- In 2007 the commercial irrigation water rates were increased in order to help encourage more efficient water use in that customer sector.
- In December 2007 commercial indoor water budgets were changed from allotments based on historical usage to an allotment based on meter size as stated above. Budgets based upon historical usage were not effective in promoting water efficiency.
- In 2009 a new customer category was created for Sports Fields. Since some sports don't coincide with the traditional water budget season, a Sports Field customer can apply for an annual water budget which allows them to apply water at any time during the year to help manage the stress of athletics on the turfgrass. The allocation of 27 inches per year remains the same.

The water budget rate structure has been well received by customers of the District, and has been successful at promoting water efficiency.

Metering and Data Collection

Since construction began in 1981, the District has metered every water user category. Separate commercial irrigation meters have been encouraged since 1981, and in 2003 commercial combination indoor and irrigation meters were no longer allowed. In addition, the District has an ongoing program to conduct maintenance, sample meter accuracy and replace aging meters on a

scheduled basis. Residential water meters are repaired or maintained in compliance with American Water Works Association (AWWA) standards. Every 10 years the body, including the measuring device and radio of residential meters, is replaced and every 20 years the entire meter, generator and remote are replaced. In 2012, the District began upgrading residential water meters to a more accurate and advanced system that will require meters to be exchanged only once in a 20 year period, thus reducing replacement costs while increasing accuracy as well as revenues. Commercial irrigation meters are pulled annually and checked for accuracy. Any repairs or maintenance is also done at this time.

Water meters provide indirect water savings as they allow the District to measure water use and collect data that allows us to monitor the effectiveness of water efficiency efforts. Meters also help to identify possible leaks and losses through the distribution system.

System Water Loss Management and Control

Rigorous system-wide water audits are conducted by the District annually to determine the efficiency of the water distribution system. The volume of water produced and authorized consumption (total water billed and accounted for/not billed) is tracked on a monthly basis to determine a rolling 12-month average system loss. Water that is accounted for but not billed includes water-distribution system development, maintenance, and system failures. System water loss includes unauthorized water use, inherent water meter inaccuracies, distribution system leakage, and new home construction water use. The AWWA guidelines consider up to 10 percent system loss to be acceptable. The average system water loss for the District over the past five years from 2014 was 5.61 percent of the total water production. At this time, the District has no plans to use the AWWA M36 software for its future water-audit reporting, but will consider incorporating elements of M36 into the District's water audit system, as deemed useful and appropriate for the District's needs.

The District uses sonic leak detection equipment to locate leaks within the distribution system when they appear. Leaks that are identified are located and repaired immediately. Estimates of the number of gallons lost by each repaired leak are recorded in a log book once the repairs are made. Although customers are responsible for leaks that occur after the service connection, the District uses the billing system to help identify possible leaks. When the meter is read, and the use is high, a work order is generated to tag the home for leak detection and high use.

The District's distribution system contains six different pressure zones that are monitored at the water treatment plant for safety and optimal service. In addition service pressure regulation is mandated by the District on domestic water service lines and irrigation service lines. The pressure is restricted to 65 PSI on residential lines and 80 PSI on irrigation service lines. This pressure regulation has been shown to save an average of 6 percent when compared to unregulated service pressure.

2.3.2 Targeted Technical Assistance and Incentives

Level 1: Utility Facility Water Efficiency

The District has three major facilities where they are responsible for the water use. They include the John D. Hendrick Office Building, Joseph B. Blake Water Treatment Plant and Marcy Gulch Wastewater Treatment Plant.

The John D. Hendrick Office Building houses staff from both the District and Highlands Ranch Metropolitan District. In 2010 all bathrooms were remodeled and fixtures were replaced with high efficiency models. In 2005 several changes were made to a portion of the landscape to include low water using plant varieties and improved efficient irrigation equipment. In 2014 a detailed landscape irrigation audit was performed by a third party to identify inefficiencies and make recommended improvements. As a result a renovation of the landscape will take place in 2016, which will include the addition of a Xeriscape demonstration garden.

The Blake Water Treatment Plant has separate meters for indoor and outdoor water use. The plant received an irrigation audit in 2012 which provided detailed information about potential improvements to increase water efficiency. As a result, changes to the scheduling of the irrigation system and changes in irrigation equipment have been made in order to improve efficiency. The average outdoor water use has decreased by over 50 percent since the audit was performed.

The Marcy Gulch Wastewater Treatment Plant utilizes reuse water for landscape irrigation. An audit was performed in 2012 in an effort to identify where efficiency can be improved. Due to the construction projects taking place at the wastewater treatment plant staff is examining how the landscape and irrigation system can be overhauled as part of the facility improvements.

The District also manages landscape water use at several well sites that are located throughout the community. Since 2007 any new well site landscapes have been reviewed by the Water Conservation & Efficiency Coordinator to ensure a water efficient design of the landscape and irrigation system. In 2015 management of the maintenance contracts for all District facilities was turned over to the Conservation and Efficiency Coordinator to oversee water use and verify that efficiency maintenance practices are implemented.

Level 2: Management of Largest Customer Demands

Highlands Ranch Metropolitan District is the largest water customer and accounts for approximately 5 percent of the water use in Highlands Ranch. The Metro District irrigates almost 450 acres of landscape in parks and along roadways. The District has and will continue to partner with Metro District in an effort to help improve water efficiency. Workshops for Metro District staff have been provided and have covered multiple topics including the Irrigation Associations Certified Landscape Irrigation Auditor program. Financial Assistance has been provided so that the Metro District can improve efficiency with improved irrigation equipment. The largest park, covering more than 30 acres, is supplied with reuse water instead of treated water.

The Highlands Ranch Golf Club and Windcrest Retirement Community, two more of the District's larger customers, are supplied with reuse water, which lessens the amount of treated water needed each year. The Backcountry HOA is also supplied with raw water instead of treated water. They have entered into an agreement where they receive a lower water budget, which limits the amount of high-use turfgrass, in exchange for a waiver of system development fees for their private open space areas. Instead of using turfgrass like Kentucky bluegrass, they landscaped large open areas with low water-consuming native grasses.

Level 3: Management of Remaining Customer Demands

Targeted Non-Residential Irrigation Audits

Targeted irrigation audits for commercial irrigation customers have been implemented since 2007. Commercial irrigators who either continuously exceed the water budget or exceed it by a large percentage are identified through billing data and are contacted to receive an audit. Using billing

system data, the District estimates that these customers have saved 170 acre feet of water over the past 5 years.

Residential Irrigation Audits

In 2007, the District established a partnership with the Center for ReSource Conservation to provide irrigation audits to residential customers. The audits, or evaluations, identify areas where residents can improve how they manage their landscape water use. This includes scheduling and irrigation system improvements. The District has provided more than 1,100 audits to residential customers since the partnership began, resulting in an estimated savings of 70 acre feet over the past 5 years.

Toilet Rebates

A toilet rebate program was implemented in 2009 targeting customers with homes that were built before 1994. The 1992 U.S. Energy Policy Act established 1994 as the date for compliance with maximum allowable flow rates for plumbing fixtures. Customers with homes built prior to 1994 were equipped with toilets that used 3.5 gallons per flush or more. The toilet rebate program was designed to encourage, by providing a rebate, customers to replace older toilets with more efficient models. The rebate program replaced over 1,300 toilets in over 800 homes from 2009 through 2015. It is estimated that approximately 64 acre feet of water was saved through 2014 by the toilet rebate program. However, in 2016 the District decided to end the toilet rebate program. Data monitoring shows that indoor water use has declined at a rate greater than that which could be attributed to the toilet rebate program. Declining indoor water use through passive conservation and possible demographic changes caused the District to look at other water efficiency activities.

Rain Sensor Rebates

In 2010 the District implemented a rain sensor rebate program for both residential and commercial customers. Rain sensors automatically shut off the irrigation system when a minimum amount of rain has been measured. The amount of water saved by rain sensors is difficult to measure and varies greatly each year. In wet years rain sensors can achieve substantial savings but during dry years the opportunity to save water is far less. While participation in the rain sensor program is not great, the District believes that irrigating landscapes during or immediately following a rain event is wasteful and will continue the program.

Low Water Use Landscapes

The District and the Center for ReSource Conservation came together again in 2015 to implement the Garden In A Box program. The Garden In A Box program provides customers with a professionally designed low water use landscape plan and the accompanying plant materials. The program overcomes a perceived barrier to low water use landscapes by providing a "Plant by Number" approach that is easy to follow. The program also provides District customers with a discount on the garden of their choice. The program was popular in the first year and the District monitors water use for those customers who have participated.

2.3.3 Rules and Regulations

Douglas County is the agency with land use authority for Highlands Ranch and landscape regulations, such as sod limitations and plant materials, cannot be regulated directly.

The District has several requirements governing the direct use of water in its service area. Beginning in 2004, no outdoor watering can occur between the hours of 10 a.m. and 6 p.m. to minimize the loss of water due to wind and evaporation. Hand watering and car washing is allowed, but hoses must be equipped with a shut-off device to prevent a constant flow of water.

Water waste is prohibited at all times. Water waste includes allowing excess water flow across sidewalks and down curb gutters. Neglecting to repair leaks is another example of water waste. And since 2009, all commercial irrigation systems are required to have a functioning rain sensor installed. Rules and regulations are enforced by seasonal water monitors who patrol the District during the summer months. Table 4 shows the penalties that the District imposes if customers violate the rules and regulations.

Table 4 - Charges for Violation of Rules and Regulations

Meter Type/Size	First	Second	Third	Fourth	Fifth	Subsequent
Residential	Warning	\$50	\$100	\$250	\$500	Shut off
Commercial						
1" or less	Warning	\$100	\$200	\$500	\$1,000	Shut off
1-1/2" or greater	Warning	\$600	\$1,200	\$3,000	\$6,000	Shut off

2.3.4 Education Activities

The District considers public education to be an important component of the water efficiency plan. Even though it is virtually impossible to measure actual water savings achieved through public education, the District has a continuous public education program to help inform its customers of ways to conserve water both indoors and outdoors.

Information Dissemination

The District strives to reach its customers throughout the year with information about water efficiency practices and programs. Customers are reached in a variety of ways that include:

- Bill Stuffers/Messages
- Direct Mail
- Website
- Social Media
- Monthly Email Newsletters
- Community Events

K-12 Education Programs

The Water Ambassador Program is a partnership with South Metro Water Supply Authority designed to educate both high school and elementary school students about water issues, including water efficiency, in northern Douglas County and southern Arapahoe County. High school students attend a multi-day workshop where they learn about water issues and how to conduct activities focused on teaching elementary school students about water efficiency. The high school students then lead assemblies where they conduct activities with the 5th graders of the feeder elementary schools.

Technical Assistance

Technical assistance in the way of community workshops, presentations and direct consultation are available to all customers. The District has a full-time Water Conservation and Efficiency Coordinator who assists customers by request and actively seeks groups for presentations and workshops.

Table 5 shows the water efficiency activities that were implemented during the previous planning period along with their estimated water savings. Water savings were estimated using billing records and the *Guidebook of Best Practices for Municipal Water Conservation in Colorado* (2010 Colorado Water Wise). Billing records were used to compare water use before participation in a water efficiency activity and after participation. Challenges with this method include an estimation of

indoor water usage based on average winter consumption (AWC) and normalizing the data for varying weather in a particular year. The Colorado Best Practices Guidebook includes a range of water savings estimates for a variety of water efficiency activities.

Table 5 - Current and Past Water Efficiency Activities and Estimated Savings

Historical and Current Water Efficiency Activities	Period of Implementation	Annual Water Savings for Past Five Years (AF)					Total Five-Year Water Savings	Average Annual Savings
		2010	2011	2012	2013	2014		
Foundational Activities								
Water Budget Rate Structure	2003 - Present	228	239	248	211	212	1138	228
Passive Conservation		196	194	203	181	170	944	189
Subtotal		424	433	451	392	382	2082	416
Targeted Technical Assistance and Incentives								
Residential Irrigation Audits	2007 - Present	7	15	16	17	19	74	15
Targeted Commercial Irrigation Audits	2007 - Present	17	21	36	45	52	171	34
Residential Toilet Rebates	2009 - 2015	8	10	14	16	16	64	13
Residential Rain Sensor Rebates	2010 - Present		< 1	< 1	< 1	< 1	< 1	< 1
Commercial Rain Sensor Rebates	2010 - Present		1	1	1	2	5	1
Subtotal		32	47	67	79	89	314	63
Ordinances and Regulations								
Water Waste Ordinance	2003 - Present	-	-	-	-	-	-	-
Commercial Rain Sensor Ordinance	2009 - Present	-	-	-	-	-	-	-
Daytime Watering Restriction	2002 - Present	-	-	-	-	-	-	-
Subtotal		87	69	43	75	82	356	71
Education Activities								
Public Information and Education								
Subtotal		0	0	0	0	0	0	0
Total Savings								551

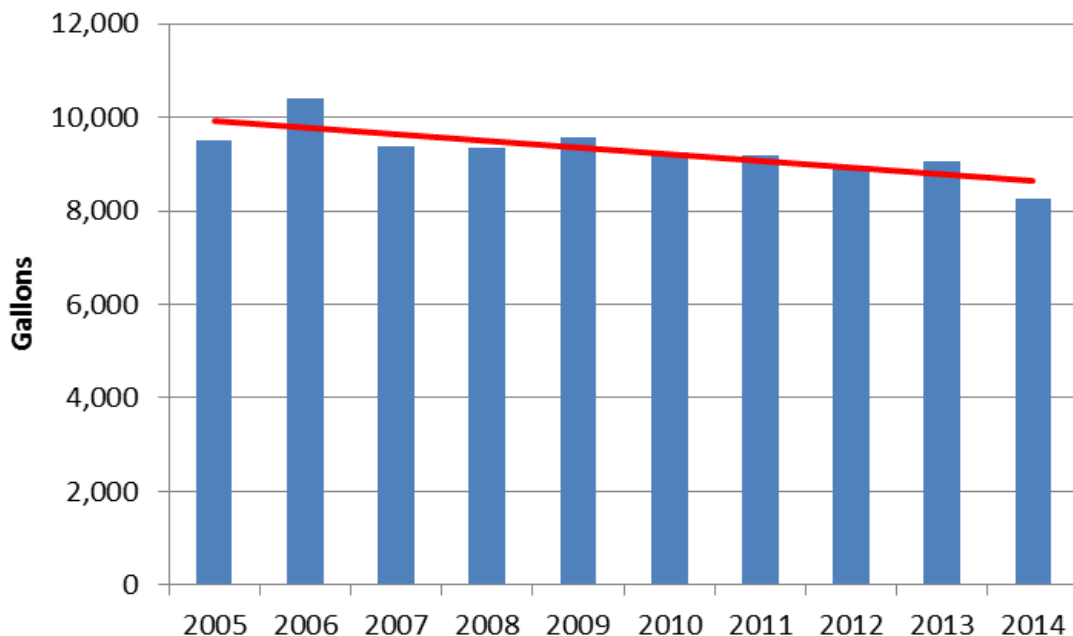
Passive Savings

Of the estimated 551 AF of savings from current and past activities, approximately 34 percent are from passive savings. Passive savings are those savings attributed to customers who replace plumbing fixtures and appliances without any incentive from the utility. Fixtures are often replaced as part of remodeling or when they have reached the end of their useful life. The Federal Energy and Policy Act of 1992 and local plumbing codes make certain that plumbing fixtures meet water efficiency standards. Figure 7 shows the declining indoor water use in Highlands Ranch from 2010 through 2014.

Passive water savings were estimated by modifying Equation 3 in the *Municipal Water Efficiency Plan Guidance Document (AMEC 2012)*:

$$\text{Passive Water Savings} = ((2010 \text{ Indoor SF Use} - 2014 \text{ Indoor SF Use}) \div 2010 \text{ Indoor SF Use}) \div 5 \text{ years}$$

Figure 7 - Single-Family Bi-Monthly Indoor Use



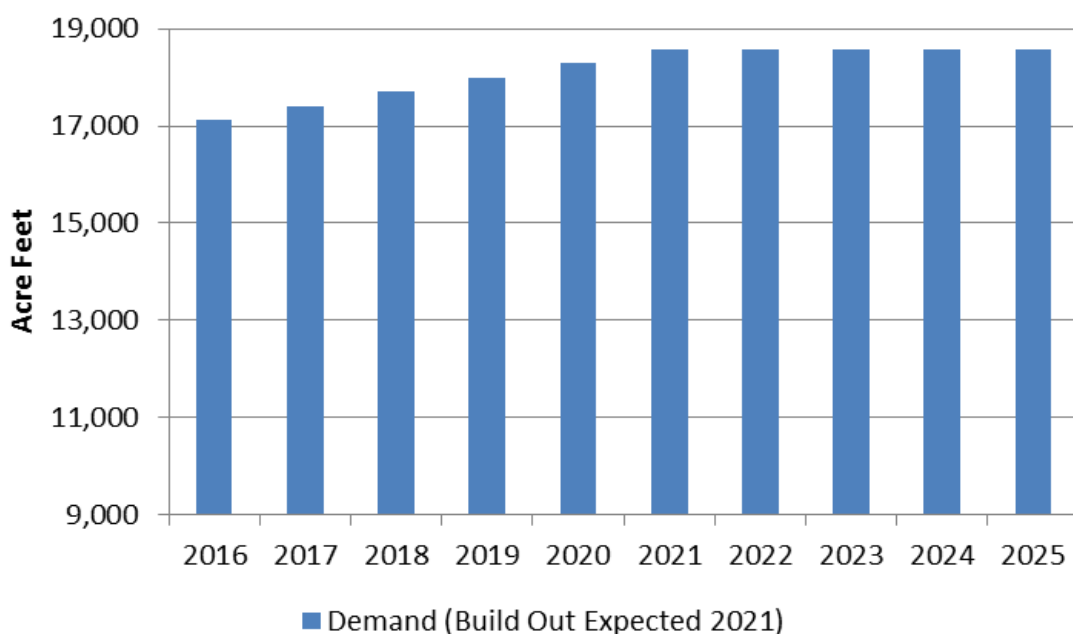
2.4 Demand Forecasts

An important part of developing the water efficiency plan is determining how much water the District will need to supply as the service area nears build-out. Since this plan will be renewed every seven years, the District has forecasted water demand over the next 10 years. This initial baseline demand forecast is based on the number and type of development that will occur over the planning period. The remaining development in Highlands Ranch will be a mix of residential and multi-family housing along with some commercial office and retail space.

The baseline demand forecast in Figure 8 shows that estimated raw water demand in the year 2025 will be 18,600 AF, an approximate increase of 14 percent over 2015. Raw water demands include metered customer demand as well as distribution system water loss

The baseline forecast does not include any impacts that are expected from efficiency activities identified for implementation later in this plan.

Figure 8 - Baseline Demand Forecast



Section 3 Integrated Planning and Water Efficiency Benefits and Goals

The District has included water use efficiency as part of its water supply planning for many years. Water use data collected from the billing system has enabled the District to understand the impacts that water efficiency activities have on water demand. The information enables the District to forecast water efficiency savings into the future.

3.1 Water Efficiency and Water Supply Planning

The District's water supply is largely surface water from the South Platte River, supplemented with deep groundwater from Denver Basin aquifers. While the conjunctive use of surface water and deep groundwater provides the District with the ability to support the District's needs for the foreseeable future, the District strives to meet the majority of demand at build-out with renewable surface water.

In 2015, the District conducted an internal water resources workshop to examine total build-out demand and how the District would meet that demand using predominately surface water sources. Multiple strategies were identified to maximize the amount of surface water provided to customers. One strategy is that the District will continue to pursue existing and future opportunities to add to its permanent and long-term surface water supply sources. Several projects are currently under way to increase water supplies.

- Chatfield Reallocation Project – The District is a major participant of this project and is expecting to realize 2,500 AF per year of new supply by obtaining the right to store water in 6,922 AF of the reallocated storage space for subsequent municipal use.
- Water Infrastructure and Supply Efficiency (WISE) Partnership – The District is one of ten participants in the formation of the South Metro WISE Authority and will receive 1,000 AF per year of new reusable (but sometimes interruptible) yield through the project agreements with Denver Water and Aurora Water.

- Reuse Study – The District is studying alternatives to increase its reuse of wastewater effluent, including the alternative of direct potable reuse.
- Aquifer storage and recovery using available free-river water and excess WISE water.
- Other cooperative initiatives through the South Metro Water Supply Authority.

The District also aggressively protects its decreed and leased water rights against other water rights applications that would cause injury to the District's rights.

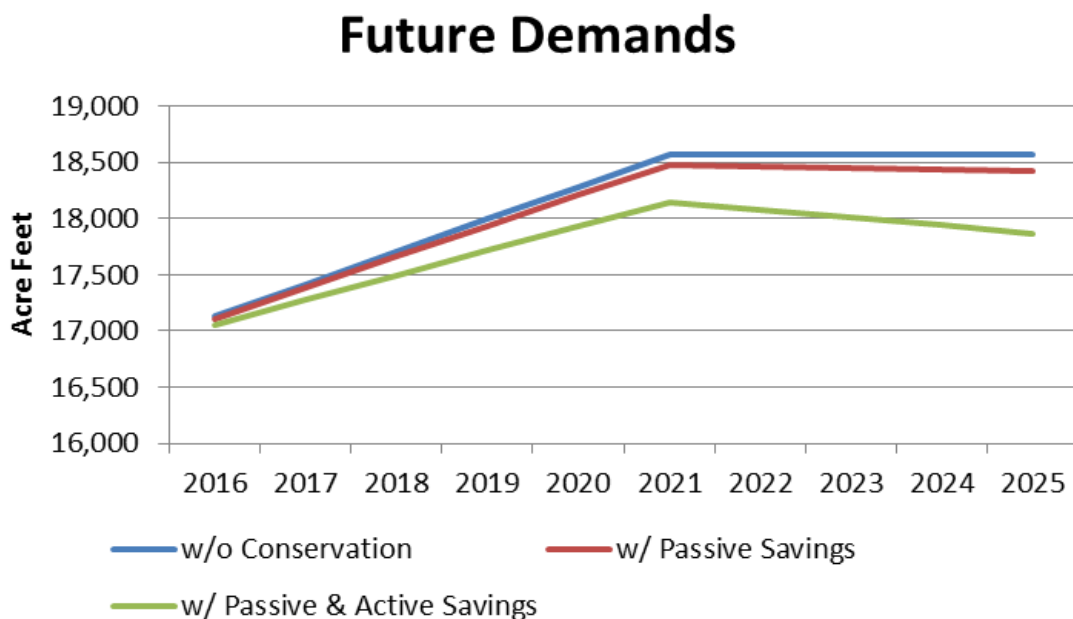
Another strategy is to develop a more aggressive approach to water efficiency. Since reliable, cost-effective, renewable water supplies are becoming scarcer, an alternative to acquiring new water supplies will be to reduce water demand. Water saved through implementation of water efficiency activities will reduce the amount of new water supply needed to meet future demands.

In order for the District to provide its customers with a long-term, reliable, high-quality product, the District will implement an approach that combines improving treatment capacity and managing customer demand. An evolving and proactive water efficiency plan will help to reduce total demand, enabling the District to achieve the objectives of a high quality, renewable surface water supply without compromising desired water services.

Modified Demand Forecast

After the evaluation and selection of water efficiency activities described in Section 4, a modified demand forecast was created. Figure 9 shows demand forecasts with and without future water savings.

Figure 9 - Modified Demand Forecast



Baseline demands at build-out are estimated to be 18,600 AF, decreasing to 17,850 AF with future water savings. The modified demand will allow the District to provide customers with 80 percent surface water at build-out with current average-year yields. With the Chatfield Reallocation and WISE projects adding an additional 3,500 AF of average-year yield, future demands can be met with 100 percent surface water in average and wet years.

3.2 Water Efficiency Benefits and Goals

Setting goals is an important step in developing a successful water efficiency plan. Most importantly, it allows the District to measure the overall success of the plan. The effectiveness of the water efficiency plan is enhanced if the goals are measurable.

Three factors were considered as the water efficiency goals were developed. First, is the need for demand management or a reduction in water use. Second, is the water user categories that the District wants to target for improved water efficiency. For example, examination of past water demands revealed that two user categories of concern within the District are non-residential and residential outdoor demand and consumptive use. Third, the District staff developed a list of benefits that could be expected when the water efficiency goals were met. The benefits include:

- Reduced future operating costs
- Reduced cost and environmental impact of new water supplies
- Lower wastewater flows to the wastewater treatment plant
- Reduced peak day demands
- Lower customer water bills
- Reduced runoff from irrigation, which can impact water quality and increase treatment costs
- Meet the requirements of the Water Conservation Act of 2004, as described in House Bills 04-1365 and 10-1051

Through the process described above, the District developed the following water efficiency goals:

- Reduce District annual build-out demand by an additional 750 AF
- Implement water efficiency activities that target high water uses; customers or customer categories who consistently exceed the water budget
- Implement publicly acceptable water efficiency activities
- Maintain average system loss below 6%
- Implement a cost-effective water efficiency program that achieves targeted water savings

The goals of the water efficiency program will continue to evolve. As steps are taken to reach the goals, the need for new goals will arise. The District will establish a plan for monitoring these goals and continue to develop new goals as the successes of the plan are demonstrated.

Section 4 Selection of Water Efficiency Activities

To select water efficiency activities for this plan the District employed the four-phase approach recommended by the CWCB Guidance Document. This approach recommends the following four phases to fully evaluate an effective portfolio of water efficiency activities: 1 – Assessment, 2 – Identification, 3 – Qualitative Screening, 4 – Evaluation and Selection.

4.1 Summary of Evaluation and Selection Process

Assessment

In this phase the District gathered information about the former and current water efficiency activities, water supply system and service area. An assessment was made about the success of those activities and how they might be improved moving forward while also considering any water supply issues and compatibility with the service area. Former water efficiency activities were organized according to the SWSI Levels Framework and any gaps in the SWSI Levels were identified to help guide the selection of future activities.

Identification

From the assessment of former and current water efficiency activities a comprehensive list of potential new activities was created. Reference materials used to create the list included the Colorado Best Practices Guidebook, the CWCB Guidance Document and information from other water providers. The list included past and former water efficiency activities as well.

Qualitative Screening

Once the list of past, current and potential water efficiency activities was created, a set of qualitative screening criteria was developed by the District staff. The screening criteria selected were reflective of the goals for water efficiency created in Section 3 of the plan. Using the spreadsheets from the CWCB Guidance Document, the list of water efficiency activities and qualitative screening criteria was reviewed and ranked by District staff. Qualitative screening included:

- Does the activity match our customer base and service area?
- Is the activity likely to be accepted and implemented by the public?
- Is the technology reliable and easy to implement?
- Are there any known legal constraints to implementation?
- Will the activity lead to measurable water savings?

Evaluation and Selection

Based on the results of the qualitative screening process, a final list of potential water efficiency activities was created for evaluation. The evaluation of the potential activities included a quantitative analysis of the estimated water savings and estimated cost of implementation to determine the cost-effectiveness of the activity. Readers of this plan should note that an activity that was found to be cost effective was not automatically selected for implementation. Activities were analyzed by District staff and compared to each other to ensure that activities were complementary of other activities and that they contributed to meeting the targeted water savings and other goals. Once the water efficiency activities were fully evaluated, the final selection was made by the Water Conservation & Efficiency Coordinator, Director of Finance, General Manager, and the District Board of Directors.

4.2 Selected Water Efficiency Activities

The District will implement a number of existing and new water efficiency activities in order to meet the goals of the water efficiency plan. Table 6 shows new and existing activities selected by the District for implementation over the planning period. Existing activities are described in Section 3.2, Current and Past Demand Management Activities. New water efficiency activities are described in the following sections and are organized by the SWSI Levels Framework.

Activities selected for implementation have been chosen based on the evaluation process described in the previous section. The following descriptions of activities are intended to provide an overview

of each activity and do not provide specific detail for any one program. Many programs will be introduced as pilot programs in order to work through the details that cannot be determined during the evaluation phase. Each program will be refined as the District works through the implementation phase.

Table 6 - New Water Efficiency Activities

Selected Water Efficiency Activities	New or Existing Activity	Targeted Customer Category
Foundational Activities		
Water Budget Rate Structure	Existing	All
Conservation Oriented Tap Fee	New	All Future
Targeted Technical Assistance and Incentives		
Residential Irrigation Audits	Existing	SF Outdoor
Targeted Non-Residential Irrigation Audits	Existing	Comm, HOA, Muni Outdoor
Rain Sensor Rebates	Existing	All Outdoor
High Efficiency Nozzle Rebates	New	All Outdoor
Residential Turf Replacement Program	New	SF Outdoor
Targeted Non-Residential Indoor Audits	New	Comm Indoor
Non-Residential Smart Controller Rebate	New	Comm, HOA, Muni Outdoor
Municipal Turf Replacement Program	New	Muni Outdoor
Rules and Regulations		
Water Waste Regulation	Existing	All Outdoor
Non-Residential Rain Sensor Requirement	Existing	Comm, HOA, Muni Outdoor
Daytime Watering Restriction	Existing	All Outdoor
Landscape Design and Installation Regulations	New	Future Outdoor
Landscaper Certification and Training Requirements	New	Comm Outdoor
Education Activities		
Information Dissemination; Bill Stuffers, Direct Mail, Website, Newsletters, Social Media, Community Events	Existing	All
K-12 Education; Water Ambassador Program	Existing	SF Indoor, Outdoor
Technical Assistance; Efficiency Expert, Consultations, Workshops, Presentations	Existing	All
Focus Groups	New	All
Customer Survey	New	All
Xeriscape Demonstration Garden	New	All

4.2.1 Foundational Activities

Conservation Oriented Tap Fees

Conservation oriented tap fees can be used to encourage developers of significant new development to install water efficient plumbing fixtures and water efficient landscapes. The District will establish a tap fee that is discounted for developers who demonstrate reduced water demands by following a set of plumbing and/or landscape standards. The reduced tap fee will be for new residential and commercial construction, as well as remodels. The plumbing standards for new residential and multi-family construction will follow the Environmental Protection Agency's WaterSense New Home specifications.

Landscape and irrigation plans will require submittal and must meet minimum water efficiency standards established by the District as described in Section 4.2.3.

4.2.2 Targeted Technical Assistance and Incentives

High-Efficiency Nozzle Rebates

High-efficiency sprinkler nozzles have been designed to apply more efficiently than older, standard sprinkler nozzles. This program will provide a rebate to customers who replace their older sprinkler nozzles with high-efficiency models. The District will have a list of approved nozzles that will be eligible for the rebate program. This program will target both residential and non-residential outdoor water use.

Residential Turf Replacement Program

The residential turf replacement program will provide an incentive to customers who replace high water use turf with more water-efficient plant materials. Replacement of turf with plant materials that use less water can result in significant water savings. This program will target residential customers whose water use is consistently at or above our third tier, 120% of water budget. Additionally, customers with larger lots containing a high percentage of turf will be targeted.

Non-Residential Indoor Audits

Non-residential indoor audits are designed to identify potential efficiency improvements of water use practices and equipment in the commercial, institutional and industrial (CII) sector. These customers include schools, car washes, restaurants, office buildings, and many other types of facilities. In addition to identifying the water saving potential in these facilities, the water audit will evaluate the cost and payback period for implementing the identified activities.

Non-Residential Smart Controller Rebates

Traditional controllers rely on the user to manually change the irrigation schedule based on the perceived need of the landscape. Manual adjustment of the irrigation schedule often occurs on a limited basis throughout the summer and requires maintenance personnel to be on-site for adjustment. Smart controllers automatically make changes to the schedule in real-time and can significantly reduce the amount of water applied to the landscape. This program will provide a rebate to customers who install a smart controller on their irrigation systems. Due to the complexity of programming and managing a smart controller, customers who wish to participate will have to attend a workshop designed to train the user on proper set-up of a smart controller as well as long term maintenance. This complexity has limited the program to be targeted to the non-residential irrigation accounts that include businesses, home owners associations, schools and other common landscape areas.

Municipal Turf Replacement Program

A majority of the landscape area managed by Metro District consists of irrigated turf that requires a significant amount of supplemental water during the growing season. The District will work with Metro District staff to identify areas where water-efficient plant material can replace turf and reduce water consumption. The District will coordinate with the Metro District to facilitate the replacement of turf in areas identified as having the potential to save a significant amount of water.

4.2.3 Rules and Regulations

Landscape Design and Installation Regulations

As a special district that was formed to provide water and wastewater services to the community of Highlands Ranch, landscape regulations such as sod limitations and plant materials cannot be directly regulated by the District. However, developers and builders who wish to qualify for the conservation oriented tap fee described in a previous section must comply with a set of standards designed to promote water efficiency. These standards will incorporate landscape industry accepted best management practices for landscape and irrigation. Limitations will be placed on the landscape water requirement and the types of irrigation equipment that may be used. New irrigation systems will be designed to meet minimum efficiency standards. Beginning in 2017 this program will target residential and non-residential new construction and may be adapted to non-residential retrofits when possible.

Landscaper Certification and Training

Non-residential outdoor irrigation accounts for approximately 25 percent of water use in Highlands Ranch. The landscaper certification and training program requires the professionals who are responsible for the management and maintenance of non-residential landscape areas to have minimum training and certification. There are many certifications available to the landscape industry and the District will create a list of qualified programs. Landscape professionals who manage non-residential irrigation systems within the District service area will be required to submit proof of certification. Failure to comply with this regulation will result in the potential fines as described in Section 2.3.3.

4.2.4 Education Activities

Focus Groups and Customer Survey

Focus groups and a customer survey will allow the District to gain a better level of understanding about the attitudes, behaviors and beliefs concerning water use and water efficiency. The results of these activities will help the District identify the best ways to communicate with our customers and further engage them in the topic of water efficiency. These activities will be one of the first steps in the implementation of this plan and may be conducted prior to the plan being approved by the CWCB.

Xeriscape Demonstration Gardens

The intent of a xeriscape demonstration garden is to promote the use of water efficient plant materials. The demonstration garden also provides customers with ideas for the types of plants they can use in their own landscapes. A demonstration garden won't have any direct water savings unless it replaces an area of turf, but it does supplement programs like the turf replacement program and Garden in a Box. The District will be constructing a demonstration garden at the entrance of the John D. Hendrick Office Building in 2016. Additional opportunities to partner with other local agencies such as the Metro District and Douglas County Parks will be explored in future years. In addition, a virtual garden will be promoted on the District's website once plants are established.

4.3 Estimated Water Savings

Through the implementation of the new and existing activities described in the plan, the District expects to meet the water savings goal of an additional 750 AF annually by 2025. Table 7 shows the expected water savings by SWSI Conservation Level and customer category and the water efficiency activities that will contribute towards the water savings.

Table 7 - Projected Water Savings by Conservation Level

Water Efficiency Activities	Targeted Customer Category	Projected Water Saved
Foundational Activities		
Water Budget Rate Structure	All	190
Conservation Oriented Tap Fees	All	
Passive Water Savings	All	
Incentives and Technical Assistance		
Residential Irrigation Audits	SF Outdoor	510
Residential Rain Sensor Rebates	SF Outdoor	
Residential High Efficiency Nozzle Rebates	SF Outdoor	
Residential Turf Replacement Rebate	SF Outdoor	
Garden in a Box	SF Outdoor	
Non-Residential Indoor Audits/Surveys	Comm Indoor	
Non-Residential Irrigation Audits	Comm, HOA, Muni Outdoor	
Non-Residential Rain Sensor Rebates		
Non-Residential High Efficiency Nozzle Rebates		
Non-Residential Smart Controller Rebates		
Municipal Turf Replacement	Muni Outdoor	
Rules and Regulations		
Landscape Design/Installation Specifications	All	50
Landscaper Training and Certification	All	
Educational Activities		
K-12 Education (Water Ambassadors)	SF & MF	-
Newsletters, Bill Stuffers, Flyers	All	-
Xeriscape Demonstration Gardens	SF, Comm, HOA Outdoor	-
Focus Groups	All	-
Customer Surveys	All	-
Total		750

Section 5 Implementation and Monitoring Plan

5.1 Implementation Plan

The implementation of the water efficiency plan is the responsibility of the District's Water Conservation & Efficiency Coordinator. This full-time position was first filled by the District in 2004. In addition to the full time position, the District employs three to four seasonal Water Monitors who help educate the community about water efficiency and enforce the District's rules and regulations concerning water efficiency.

Implementation of the existing activities has been ongoing and is well under way for 2016. Most of the new activities will be implemented over a period of several years beginning in 2016. Table 8 shows the projected implementation schedule for the selected new water efficiency activities.

Table 8 - Projected Implementation Schedule

New Water Efficiency Activities	Projected Implementation
Foundational Activities	
Conservation Oriented Tap Fees	2017
Incentives and Technical Assistance	
Residential High Efficiency Nozzle Rebates	2017
Residential Turf Replacement Rebate	2018
Non-Residential Indoor Audits/Surveys	2018
Non-Residential High Efficiency Nozzle Rebates	2017
Non-Residential Smart Controller Rebates	2017
Municipal Turf Replacement	2017
Rules and Regulations	
Landscape Design/Installation Specifications	2017
Landscaper Training and Certification	2017
Educational Activities	
Xeriscape Demonstration Gardens	2017
Focus Groups	2016
Customer Surveys	2016

The District will introduce most of the programs as "pilot programs" for the first year. This approach will allow the District to better understand actual costs, water savings and other details of program implementation. It will also allow the District to make adjustments to the program as necessary to ensure that the program is effective and meeting goals and objectives.

There are several steps that will be taken before the implementation of each activity. These steps include:

- Develop an action plan identifying project schedule, key tasks and the responsible parties.
- Research previous implementations of the program and talk with other water providers to identify strengths and weaknesses of program design.

- Determine the program requirements including prospective bidders, evaluation criteria and marketing strategy.
- Develop a budget for the program that includes cost of materials and/or services necessary to implement and manage the program, including staff resources.
- Evaluate potential legal constraints for review by the District attorney.
- Present final program details to Board of Directors for review and approval.

5.2 Monitoring Plan

The District understands that for water efficiency activities to be successful, they need to be monitored and evaluated for effectiveness. As new water efficiency activities are implemented the District will gather water use data in an effort to quantify water savings attributed to those activities. The following data will be used to evaluate water efficiency activities where appropriate:

- Billed water use before and after implementation of the activity
- Number of participants
- Irrigation application rates
- Daily ET rates from surrounding weather stations
- Measured rainfall
- Implementation costs for each activity including: rebates, administration, data collection, data entry and evaluation
- Billed water use by customer type
- Number of acres irrigated
- Gallons per capita per day
- Annual water use compared to water budget
- Any public feedback from program participants including feedback from public meetings, public events, direct correspondence or surveys

Conclusions drawn from analyzing the above data will be used to help direct future water efficiency efforts by the District. This data will be collected and evaluated on an annual basis. A timeline for this review and evaluation is outlined in the section below. Any additional water efficiency activities implemented by the District in future years will be subject to similar monitoring efforts.

Review

The activities implemented by the District to promote water efficiency will be reviewed on a yearly basis. Below is the review schedule that will be used to assess the progress and development of the water efficiency plan annually.

January/February – Present final recommendations for implementation to the Board of Directors.

March/April/ May – Begin to develop and implement new activities. Hire and train additional staff if needed. Develop literature, handouts, marketing materials etc.

June/July – Continue implementation of new and existing activities.

August/September – Begin gathering data used to evaluate the effectiveness of each activity. Review other potential strategies for the water efficiency program. Begin the screening and evaluation process for new measures and programs. Discuss potential additions with Board of Directors.

October – Assess the overall effectiveness of the water efficiency program.

November/December – Further evaluate potential activities to be implemented. Water efficiency activities that prove to be consistent with the stated goals of the water efficiency program will be continued.

Section 6 Public Review and Adoption of Water Efficiency Plan

The District began a 60 day public comment period on May 14, 2016 that ended on July 13, 2016. The purpose was to solicit community input about the water efficiency plan.

6.1 Public Review Process

On May 13, 2016 the Centennial Water and Sanitation District Water Efficiency Plan was posted to the District's website www.centennialwater.org. A news release was provided to the Highlands Ranch Herald on May 9, 2016 announcing the opportunity to review and provide comments on the plan. Comments could be submitted in writing through email at conservation@highlandsranch.org or mailed to the Hendrick Office Building (62 Plaza Drive).

Notice was also provided that comments would be heard at the June 27th Board of Directors Meeting. Copies of public notice announcements are provided in Appendix B.

No comments, written or verbal, were received by the District during the 60 day public review period.

A presentation of the plan was also given to the Highlands Ranch Metropolitan District Board of Directors and received a show of support. The District provides water and wastewater services to Highlands Ranch through an intergovernmental agreement with Highlands Ranch Metropolitan District.

6.2 Adoption of the Water Efficiency Plan

After completing the public review process the final plan was presented to the Centennial Water and Sanitation District Board of Directors. On July 25, 2016 the Board of Directors formally adopted the 2016 Water Efficiency Plan. A copy of the resolution is included in Appendix C.

Appendices



Appendix A – Water Efficiency Activities Screening Worksheets

Worksheet D - Screening of Foundational Activities								
Water Efficiency Activities for Screening	State Statute Requirement	Identification		Qualitative Screening			Carry to Evaluation	Reason for Elimination
		Existing/ Potential Activity	Targeted Customer Category	Matches Service Area	Socially Acceptable	Significant Water Savings Expected		
Metering (BP1)	V, VII							
Automatic Meter Reading Installation and Operations		E	All					
Submetering for Large Users (Indoor and Outdoor)		E	All					
Meter Testing and Replacement		E	All					
Meter Upgrades		E	All					
Identify Unmetered/Unbilled Treated Water Uses		E	All					
Data Collection - Monitoring and Verification (BP2)								
Increased Frequency of Meter Reading		P	All	Y	Y	N	No	Not enough water savings
Tracking Water Use by Customer Type		E	All					
Tracking Water Use for Large Customers		E	All					
Area of Irrigated Lands in Service Area (e.g. acres)		E	All					
Water Use Efficiency Oriented Rates and Tap Fees (BP1)	VII, VIII							
Volumetric Billing		E	All					
Water Rate Adjustments		E	All					
Frequency of Billing		P	All	Y	Y	N	No	Not enough water savings
Inclining/Tiered Rates		E	All					
Water Budgets		E	All					
Tap Fees with Water Use Efficiency Incentives		P	All	N	Y	Y	Yes	

Worksheet D - Screening of Foundational Activities								
Water Efficiency Activities for Screening	State Statute Requirement	Identification		Qualitative Screening			Carry to Evaluation	Reason for Elimination
		Existing / Potential Activity	Targeted Customer Category	Matches Service Area	Socially Acceptable	Significant Water Savings Expected		
System Water Loss Management and Control (BP3)	V							
System Wide Water Audits		E	Municipal					
Control of Apparent Losses (with Metering)		E	Municipal					
Leak Detection and Repair		E	Municipal					
Water Line Replacement Program		P	Municipal	N	Y	N	No	System not experiencing significant breaks; Not enough water savings
Planning (BP2)								
Integrated Water Resources Plans		P	Municipal	Y	Y	N	No	Currently in progress
Master Plans/Water Supply Plans		E	Municipal					
Capital Improvement Plans		E	Municipal					
Feasibility Studies		E	Municipal					
Staff (BP4)								
Water Conservation Coordinator		E	Municipal					
Water Conservation Monitors		E	Municipal					

Worksheet E - Screening of Targeted Technical Assistance and Incentives								
	State Statute Requirement	Identification		Qualitative Screening			Carry to Evaluation	Reason for Elimination
		Existing/ Potential Activity	Targeted Customer Category	Matches Service Area	Socially Acceptable	Significant Water Savings Expected		
Water Efficiency Activities for Screening								
Installation of Water Efficient Fixtures and Appliances I								
Indoor Audits		P	Res	N	N	N	No	Not enough water savings
Toilet Retrofits		P	Res	N	N	N	No	Difficult to implement
Urinal Retrofits		P	Comm	N	N	N	No	Difficult to implement
Showerhead Retrofits		P	Res	N	N	N	No	Difficult to implement
Faucet Retrofits (e.g. aerator installation)		P	All	N	N	N	No	Difficult to implement
Water Efficient Washing Machines		P	Res	N	N	N	No	Difficult to implement
Water Efficient Dishwashers		P	Res	N	N	N	No	Difficult to implement
Efficient Swamp Cooler and Air Conditioning Use		P	All	N	N	N	No	Difficult to implement
Low Water Use Landscapes II								
Drought Resistant Vegetation		P	All	Y	Y	Y	Yes	
Removal of Phreatophytes		E	Municipal					
Irrigation Efficiency Evaluations/Outdoor Water Audits		E	All					
Outdoor Irrigation Controllers		P	All	Y	Y	Y	Yes	
Rain Sensors		E	All					
Residential Outdoor Meter Installations		P	Res	Y	Y	N	No	Not enough water savings
Xeriscape		E	Municipal					
Irrigation Equipment Retrofits		P	All	Y	Y	Y	Yes	

Worksheet E - Screening of Targeted Technical Assistance and Incentives								
	State Statute Requirement	Identification		Qualitative Screening			Carry to Evaluation	Reason for Elimination
		Existing/ Potential Activity	Targeted Customer Category	Matches Service Area	Socially Acceptable	Significant Water Savings Expected		
Water Efficiency Activities for Screening								
Water- Efficient Industrial and Commercial Water-Using Processes								
III								
Specialized Nonresidential Surveys, Audits and Equipment Efficiency Improvements		E	Comm					
Commercial Indoor Fixture and Appliance Rebates/Retrofits		E	Comm					
Cooling Equipment Efficiency		P	Comm	Y	Y	Y	Yes	
Restaurant equipment		P	Comm	Y	Y	Y	Yes	
Incentives								
X								
Toilet Rebates		E	All					
Urinal Rebates		E	Comm					
Showerhead Rebates		P	Res	Y	Y	N	No	Not enough water savings
Water Efficient Faucet or Aerator Rebates		P	Res	Y	Y	N	No	Not enough water savings
Water Efficient Washing Machine Rebates		P	Res	N	Y	Y	No	Customers remove from service area when they move
Water Efficient Dishwasher Rebates		P	Res	Y	Y	N	No	Not enough water savings
Efficient Irrigation Equipment Rebates		P	All	Y	Y	Y	Yes	
Landscape Water Budgets Information and Customer Feedback		E	All					
Turf Replacement Programs/Xeriscape Incentives		P	All	Y	Y	Y	Yes	
Give-aways		E	Res					

Worksheet F - Screening of Ordinances and Regulations								
Water Efficiency Activities for Screening	State Statute Requirement	Identification		Qualitative Screening			Carry to Evaluation	Reason for Elimination
		Existing/ Potential Activity	Targeted Customer Category	Matches Service Area	Socially Acceptable	Significant Water Savings Expected		
General Water Use Regulations IX								
Water Waste Ordinance (BP 5)		E	All					
Time of Day Watering Restriction		E	All					
Day of Week Watering Restriction		P	All	Y	N	N	No	Not enough water savings
Water Overspray Limitations		E	All					
Landscape Design/Installation Rules and Regulations IX								
Rules and Regulations for Landscape Design/Installation (BP 9)		P	Comm	Y	Y	Y	Yes	
Landscape Training and Certification (BP 8)		P	Comm	Y	Y	Y	Yes	
Irrigation System Installer Training and Certification (BP 8)		P	Comm	Y	Y	Y	Yes	
Soil Amendment Requirements (BP 9)		P	Comm	Y	Y	Y	Yes	
Turf Restrictions (BP 9)		P	Comm	Y	Y	Y	Yes	
Irrigation Equipment Requirements		E	Comm					
Outdoor Water Audits/Irrigation Efficiency Regulations (BP 10)		P	Comm	Y	Y	Y	Yes	
Indoor and Commercial Regulations IX								
High Efficiency Fixture and Appliance Replacement (BP 12)		P	Comm	Y	N	N	No	Not enough water savings
Commercial Cooling and Process Water Requirements (BP 14)		P	Comm	Y	N	N	No	Not enough water savings
Green Building Construction (BP 12)		P	All	N	N	N	No	Doesn't match service area
Indoor Plumbing Requirements (BP 12)		P	All	N	N	N	No	Doesn't match service area
City Facility Requirements (BP 12)		P	Municipal	Y	Y	N	No	Not enough water savings
Required Indoor Residential Audits (BP 13)		P	Res	Y	N	N	No	Not enough water savings
Required Indoor Commercial Audits (BP 14)		P	Comm	Y	N	N	No	Not enough water savings
Commercial Water Wise Use Regulations (Car Washes, Restaurants, etc.)		P	Comm	Y	Y	N	No	Not enough water savings

Worksheet G - Screening of Education Activities								
	State Statute Requirement	Identification		Qualitative Screening			Carry to Evaluation	Reason for Elimination
		Existing/ Potential Activity	Targeted Customer Category	Matches Service Area	Socially Acceptable	Significant Water Savings Expected		
Water Efficiency Activities for Screening								
Customer Education (BP6)		VI						
Bill Stuffers		E	All					
Newsletter		E	Res					
Newspaper Articles		E	All					
Mass Mailings		E	All					
Web Pages		E	All					
Water Fairs		P	Res	Y	Y	N	No	Not enough water savings
K-12 Teacher and Classroom Education Programs		E	Res					
Message Development/Campaign		E	All					
Interactive Websites		P	All	N	Y	N	No	Not enough water savings
Social Networking (e.g Facebook)		P	All	Y	Y	N	Yes	
Customer Surveys		P	All	Y	Y	N	Yes	
Focus Groups		P	All	Y	Y	N	Yes	
Citizen Advisory Boards		P	All	N	Y	N	No	Not enough water savings
Technical Assistance		VI						
Customer Water Use Workshops		E	Res					
Landscape Design and Maintenance Workshops		E	Comm					
Xeriscape Demonstration Garden		P	All	Y	Y	N	Yes	
Water Conservation Expert Available		E	All					

Appendix B – Public Announcements



FOR IMMEDIATE RELEASE
May 9, 2016

FOR MORE INFORMATION:
Sherry Eppers, 720-240-4908

Centennial Water's Water Efficiency Plan posted for public comment

In accordance with State Law, Centennial Water & Sanitation District is updating its Water Efficiency Plan. Centennial Water is seeking public comment on the draft plan over a 60-day period beginning Saturday, May 14. A public meeting will be held Monday, June 27 from 6:30 until 7:30 p.m. at the John D. Hendrick Building, 62 Plaza Drive, Highlands Ranch. Comments on the water efficiency plan will be heard at that time.

The Water Efficiency Plan is designed to provide information about how Centennial Water & Sanitation District will promote water efficiency to residents, businesses and local governments. The plan also provides an overview of Centennial Water's service area, facilities and water supply. A copy of the plan will be available at Centennial Water's office, at the address above, during regular business hours -- or can be viewed and downloaded at www.centennialwater.org.

Any person wishing to comment on the plan may submit their comments in writing or at the public meeting. Written comments can be delivered to the address above or via email at conservation@highlandsranch.org. Written comments must be received no later than 5 p.m., Wednesday, July 13.

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Centennial Water & Sanitation District is the water and wastewater utility in Highlands Ranch. Centennial Water provides high quality water through the Joseph B. Blake Water Treatment Plant located in Highlands Ranch. Wastewater is treated at the Marcy Gulch Wastewater Treatment Plant to meet stringent water quality standards before it is discharged.

Over the past 35 years, Centennial Water has built a reliable and highly-respected water portfolio, based on a conjunctive use system, to serve its customers. Its major water source is surface water from the South Platte River, supplemented with groundwater from deep aquifer wells throughout Highlands Ranch. For more information about Centennial Water & Sanitation District, which serves Highlands Ranch, please visit www.highlandsranch.org, or call 303-791-0430.

Water district plan available - Colorado Community Media

Posted Tuesday, May 10, 2016 4:05 pm

Centennial Water & Sanitation District is updating its water-efficiency plan due to state law. Centennial Water is seeking public comment on the draft plan over a 60-day period beginning May 14. A public meeting will be held from 6:30 to 7:30 p.m. June 27 at the John D. Hendrick Building, 62 Plaza Drive. Comments on the plan will be heard at that time.

The plan is designed to provide information about how the district will promote water efficiency to residents, businesses and local governments. The plan also provides an overview of Centennial Water's service area, facilities and water supply.

A copy of the plan will be available at the John D. Hendrick Building during regular business hours and online at www.centennialwater.org/water-conservation/program-information/.

Anyone wishing to comment on the plan may submit his or her comments in writing or verbally at the public meeting. Written comments can be delivered to the John D. Hendrick Building or by email at conservation@highlandsranch.org. Written comments must be received no later than 5 p.m. June 27.

Print



CENTENNIAL
WATER AND SANITATION DISTRICT

**BOARD OF DIRECTORS MEETING
JUNE 27, 2016 6:30 P.M.
62 WEST PLAZA DRIVE
HIGHLANDS RANCH, CO 80129**

PUBLIC HEARING

- Public Hearing for the Proposed 2016 Budget Amendment

PUBLIC COMMENTS

- 2016 Water Efficiency Plan

DISCUSSION ITEMS

- No items

PRESENTATIONS

- No presentations

CONSENT BUSINESS

Approve a Grant of Easement to Xcel Energy along Summit View near Zone 4 Reservoir

Ratify May 2016 cash and investment transactions (including expenditures)

GENERAL BUSINESS

Approval of the 2016 Budget Amendment

EXECUTIVE SESSION

Regarding conference with legal counsel for the District for the purpose of receiving advice on specific legal questions regarding the District's boundary and governance pursuant to 24-6-402(4)(b) C.R.S."



Appendix C – Board of Directors Approval and Adoption

CENTENNIAL WATER AND SANITATION DISTRICT

RESOLUTION NO. 16-125

WHEREAS, water is one of our most precious resources, and water conservation planning is a vital component of water supply management; and,

WHEREAS, Centennial provides water and wastewater services to the planned community of Highlands Ranch; and,

WHEREAS, a draft of Centennial Water Efficiency Plan was made available to the public, a public meeting was held, and comments were incorporated in the final plan; and

WHEREAS, the 2016 Water Efficiency Plan conforms to Colorado Revised State Statute §37-60-126; and,

NOW, THEREFORE, BE IT RESOLVED, that the 2016 Water Efficiency Plan be approved and adopted as submitted.

Adopted this 25th day of July, 2016

Ayes 4 Nays 0 Abstained 0 Absent 1

Certified by  Secretary

