

WATER EFFICIENCY PLAN



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Pinery Water and Wastewater District
Douglas County, Colorado



Prepared for:

Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, Colorado 80203



COLORADO

Colorado Water
Conservation Board

Department of Natural Resources

Table of Contents

EXECUTIVE SUMMARY	2
1.0 PROFILE OF EXISTING WATER SUPPLY SYSTEM	4
1.1 OVERVIEW	4
1.2 WATER SUPPLY RELIABILITY	5
1.3 SUPPLY-SIDE LIMITATIONS AND FUTURE WATER NEEDS	5
2.0 WATER DEMANDS AND HISTORICAL DEMAND MANAGEMENT	7
2.1 DEMOGRAPHICS AND SERVICE AREA CHARACTERISTICS	7
2.2 HISTORICAL WATER DEMANDS	7
2.3 PAST AND CURRENT DEMAND MANAGEMENT ACTIVITIES	12
2.4 DEMAND FORECAST	15
3.0 INTEGRATED PLANNING AND WATER EFFICIENCY BENEFITS AND GOALS	18
3.1 WATER EFFICIENCY AND WATER SUPPLY PLANNING	18
3.2 WATER EFFICIENCY GOALS	20
4.0 SELECTION OF WATER EFFICIENCY ACTIVITIES	20
4.1 SELECTION PROCESS SUMMARY	20
4.2 COMPONENTS OF WATER EFFICIENCY PLAN	21
4.2.1 Irrigation and Residential Efficiency Improvements	21
4.2.2 District Operating Efficiencies	21
4.2.3 Customer Education and Incentives	21
4.3 DEMAND MANAGEMENT ACTIVITIES	22
4.3.1 Foundational Activities	23
4.3.2 Targeted Technical Assistance and Incentives	26
5.0 IMPLEMENTATION AND MONITORING PLAN	27
5.1 IMPLEMENTATION PLAN	27
5.1.1 Revenue Stability	27
5.2 MONITORING PLAN	27
6.0 ADOPTION, PUBLIC REVIEW, AND APPROVAL OF WATER EFFICIENCY PLAN	29
6.1 EFFICIENCY PLAN ADOPTION	29
6.2 PUBLIC REVIEW PROCESS	29
6.3 EFFICIENCY PLAN APPROVAL	29
6.3.1 Local Approval	29
6.3.2 CWCB Approval	29
6.4 WATER EFFICIENCY PLAN REVIEW AND UPDATE	29

APPENDIX A: WATER EFFICIENCY PROGRAM MEASURE SCREENING WORKSHEETS

EXECUTIVE SUMMARY

Profile

The Pinery Water and Wastewater District (Denver Southeast Suburban Water and Sanitation District d/b/a Pinery Water and Wastewater District) provides water and wastewater services to approximately 8,500 acres of unincorporated, but urbanized development in northeastern Douglas County. The current service area is located approximately six miles east of I-25 and 25 miles south of Denver along Cherry Creek and State Highway 83 (see Figure 1). The District presently serves about 4,390 single-family units (SFUs) and has projected a total build out of 5,700 SFUs. A total of 3,520 SFUs are planned for east of Parker Road, and 2,180 SFUs are planned for west of Parker Road.

The District's primary current water supply comes from two sources: eighteen (18) nontributary groundwater from Denver Basin aquifer wells and seven (7) tributary groundwater from Cherry Creek Alluvial wells. In July 2018, the District began receiving 500 acre-feet (AF) of WISE water on average each year. In addition, the District owns and operates a tertiary wastewater treatment plant that discharges to Cherry Creek. Average daily wastewater treatment is currently around 1.0 million gallons per day. The treatment plant is rated to treat up to 2.0 million gallons per day. The District exchanges the reusable effluent upstream to its alluvial wells. Development of the Walker Reservoir (Cherry Creek Project Water Authority), and the ability to store reusable effluent junior water rights, will add an additional 400 acre-feet per year to the District's available water supply.

Population

The Pinery Water and Sanitation District provides water and wastewater services to approximately 13,000 people in northeastern Douglas County. The District population is expected to grow slowly and steadily to over 17,000 people by buildout sometime after 2050. This is an increase of 31% over the 2018 population served.

This efficiency plan covers a 25-year period from 2019-2044. In 2044 it is estimated that the population in the District will exceed 16,000.

Future Demand

As part of the water efficiency planning process, a baseline demand forecast was prepared for the 25-year planning period. The baseline forecast did not include the impact of any water conservation savings beyond the measures already adopted as part of the District's 2010 conservation plan. Baseline water demand in 2017 was 3,067 AF and the baseline forecast is expected to increase by 1,202 AF to 4,269 AF in 2044.

Using this baseline forecast, a demand forecast that reflects the impact of the District's planned water efficiency program's activities was prepared. This revised forecast estimates that water demand at 2044

will be reduced by approximately 267 AF to 4,002 AF as a result of passive and active water conservation measures implemented by the District (see Table 7). Another 500 AF will be provided through the WISE water subscription as well as an additional 400 AF from the Walker Reservoir development. The impacts from the enhanced water efficiency efforts indicate a potential capital savings of approximately \$11M over the planning period as the projected savings are realized. This will be reflected in the next update of the capital improvement plan (CIP), and the timing of future capital efforts will be adjusted to ensure exact correspondence with this water efficiency plan.

Efficiency Goal

The identified demand reductions projected in the District's conservation plan are based on estimated reductions in usage from a program of conservation activities. While these estimated water savings appear reasonable and achievable, the goal will be re-evaluated on a regular basis as data becomes available reflecting the actual impact of the program. For example, completion of the planned water loss audit will add additional insights to the causes of water loss in the District's system and the methods and feasibility of addressing those losses. In addition, the District Water Efficiency Plan will be updated every 5-7 years which will afford an opportunity to update and refine the conservation program and goals several times during the plan period.

Efficiency Program

In 2010 the District developed a Water Conservation Plan to support and manage water conservation activities being performed by the District. Vital to this Plan was the use of education and information provided to the District's customers regarding water conservation and water use efficiency. The 2010 conservation plan can account for savings of at least 698 AF, or 140 AF per year, over the past five years. These accomplishments, combined with the continuing need to provide economical water resources for its customers, convinced the District that a more aggressive water efficiency program may produce additional water savings opportunities.

This enhanced water efficiency program continues the existing conservation activities and incorporates a new mix of measures, highlighted by a proposed informational water budget program that is expected to encourage efficiency and assist in targeting outdoor efficiency measures. Other significant efficiency activities include a water loss audit to identify opportunities for reducing non-revenue water losses, targeted financial incentives and educational activities that encourage conservation habits. The plan also calls for the addition of a Water Resources Technician to facilitate the successful achievement of the water efficiency goals.

Efficiency Planning Process

The District carefully developed this conservation plan in accordance with the Colorado Water Conservation Act of 2004 so that it meets or exceeds all statutory requirements. The District utilized the Colorado Water Conservation Board's *Municipal Water Efficiency Plan Guidance Document* to inform and guide the development of this conservation plan.

Stakeholder Participation

The District invited water customers to participate in a Water Efficiency Task Force. Volunteers were solicited through bill inserts and on the District website. A seven-member task force was established which met regularly, reviewed data, offered suggestions and made recommendations to the Board of

Directors. The task force was instrumental in helping to select the water efficiency program measures included in this plan.

1.0 | PROFILE OF EXISTING WATER SUPPLY SYSTEM

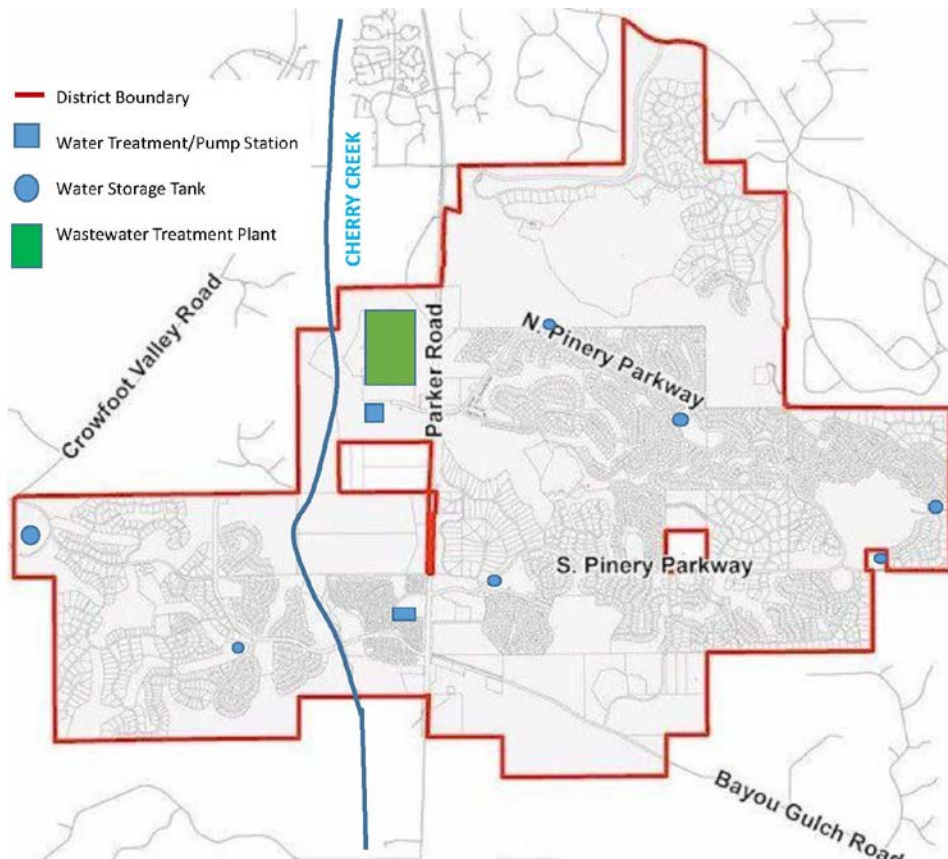
1.1 OVERVIEW OF EXISTING WATER SUPPLY SOURCES

The Pinery Water and Wastewater District (Denver Southeast Suburban Water and Sanitation District d/b/a Pinery Water and Wastewater District) provides water and wastewater services to approximately 8,500 acres of unincorporated, but urbanized development in northeastern Douglas County. The current service area is located approximately six miles east of I-25 and 25 miles south of Denver along Cherry Creek and State Highway 83 (see Figure 1). The District presently serves about 4,360 single-family units (SFUs) and has projected a total build out of 5,700 SFUs. A total of 3,520 SFUs are planned for east of Parker Road, and 2,180 SFUs are planned for west of Parker Road.

The District's primary current water supply comes from two sources: eighteen (18) nontributary groundwater from Denver Basin aquifer wells and seven (7) tributary groundwater from Cherry Creek Alluvial wells. Water from the wells is treated for corrosivity and chlorinated and pumped through the distribution system that consists of seven pump stations and ten underground storage tanks amounting to approximately 10.5 million gallons of storage.

The Water Infrastructure and Supply Efficiency (WISE) Partnership is a regional water supply project between Aurora Water, Denver Water and South Metro Water Supply Authority. The agreement was established in 2009 and shares available water supplies and infrastructure capacity to provide significant benefits to all three WISE partners. It will reduce groundwater reliance and bolster renewable water supplies to the South Metro area, while maximizing the use of existing water assets belonging to Aurora and Denver Water. In July 2018, the District began receiving 500 acre-feet of WISE water on average each year.

FIGURE 1 - Map of the District Service Area



The District owns and operates a tertiary wastewater treatment plant that discharges to Cherry Creek. Average daily wastewater treatment is currently around 1.0 million gallons per day. The treatment plant is rated to treat up to 2.0 million gallons per day. The District exchanges the reusable effluent upstream to its alluvial wells.

1.2 WATER SUPPLY RELIABILITY

The majority of the District's water supply (more than 70%) comes from renewable (reusable effluent and senior tributary) rights that the District owns on Cherry Creek. The District's senior rights to this water date back to the 1870's and except for 2002, these rights produce adequate supply in nearly all years. During the drought of 2002, these rights were unavailable for much of the summer because of the needs of more senior rights downstream on the Platte River. In the interim, the demand was met during that period by relying more heavily on Denver Basin groundwater.

In 2016, the District developed a spreadsheet Operations Optimization Model (OOM) and a separate spreadsheet Water Supply Forecasting Tool (WSFT) to assist staff efficiently utilize its various available water supplies and to forecast water supply needs based on growth.

The District's water usage for 2017 was about 3,067 AF. Of this amount, 2,142 AF came from tributary wells and 925 AF came from non-tributary wells. Table 1 summarizes the 2017 water use for the District.

Table 1: Summary of 2017 Water Use

Water Source	AF
Tributary Wells (Cherry Creek Alluvial)	2142
Non-tributary Wells (Denver Basin Aquifer)	925
Total	3067

With the ultimate build out of 5,700 (SFUs), sometime post-2050, the water requirement is estimated at about 4,423 AF (annually). Although the District is entitled to over three times the build out demand from the Denver Basin aquifer, most of the water will come from tributary groundwater. Pumping from the deeper Denver Basin groundwater source is expected to increase in cost overtime, therefore it is envisioned that this use will be managed very closely to keep water costs for the District's customers reasonable. The Denver Basin aquifer is expected to provide the District's customers with reliable water supply in times of drought.

1.3 SUPPLY SIDE LIMITATIONS AND FUTURE WATER NEEDS

As mentioned above, the District developed a spreadsheet model called the Water Supply Forecasting Tool to help staff understand water supply needs as development occurs in the District. The model projects water supplies under various hydrologic, growth pace and conservation impact scenarios out to the year 2050. The WSFT can:

- incorporate changes in annual and seasonal alluvial groundwater flow to estimate shallow well production;
- track reusable return flows from the District's wastewater treatment plant;
- estimate water demand impacts based on conservation savings; and
- track supply versus demand monthly for all available water supplies.

This model was used to evaluate the District's 10-year capital plan regarding the timing of beginning new water supply projects. Based on the results of this model, the District is in good shape to meet water demands with its current water supplies for the foreseeable future. Near 2040, water demand (in a maximum month scenario, dry year yield and without storage of any kind) comes close to equaling available water supplies. The District is also planning to complete a comprehensive Water Supply Master Plan in the next 2-3 years. This will further help to solidify the District's plans to provide a sustainable water supply to its customers. For now, the plan to provide water is to operate both of the District's water

augmentation plans by using senior tributary water when in priority, using and reusing WISE supplies as available, develop a District-wide Aquifer Storage and Recovery (ASR) program, and develop, over the next ten years, the infrastructure needed to deliver an additional 400 AF of water through the Cherry Creek Project Water Authority.

A summary of the water supply limitations and future needs is shown in Table 2. This table is based on Worksheet A from the CWCB guidance document.

Table 2: Water supply limitations and future needs

Limitation and/or Future Need			Comments on Limitation or Future Need	How is Limitation or Future Need Being Addressed
	Yes	No		
System is in a designated critical water supply shortage area		X		
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		
Planning substantial improvements or additions		X		
Increases to wastewater system capacity anticipated	X		Limited to 2.0 MGD, designated as a regional facility and may need to serve Franktown and/others. Will need hydraulic capacity expansion to serve more than current contracts and service area.	Funds for needed expansions will be the responsibility of the Out-of-District party requesting service. These impacts will be determined if/when service is requested.
Need additional drought reserves		X		
Drinking water quality issues	X		High Iron and Manganese in deep wells. Alluvial groundwater wells may need more robust treatment in the future.	Blending with other supplies helps with aesthetic standards. Future surface water treatment plant is in the financial plans for 10 years out. Would need to be funded through loan.
Aging infrastructure in need of repair	X		Areas of the distribution system are about 50 years old with poor installation. Several leaks are repaired each month.	Funding to replace the oldest pipelines and valves is secured through a CWRPDA Loan. Others will be cash funded in future years. Preventative maintenance programs will reduce the rapid decline of facilities.
Issues with water pressure in portions of distribution system		X		

2.0 | WATER DEMANDS AND HISTORICAL DEMAND MANAGEMENT

2.1 DEMOGRAPHICS AND KEY CHARACTERISTICS OF THE SERVICE AREA

The Pinery Water and Sanitation District provides water and wastewater services to approximately 13,000 people in northeastern Douglas County. It began as a District to serve one master-planned single family residential community in the early 1970's. The oldest houses (and infrastructure) in the District were built in the late 1960's and early 1970's. The District population is expected to grow slowly and steadily to over 17,000 people by buildout sometime after 2050.

The District experiences its peak demand during the summer irrigation season from April to October. Typically, the peak months are June, July, and August. The Peak Day typically occurs in early July before the "monsoon" season begins in Colorado in late July.

The District has the following customer classifications in its billing system:

- Residential (water and sewer)
- Residential (water only)
- Commercial
- Wholesale Wastewater
- Large irrigator (irrigation water only)
- Golf Course

2.2 HISTORICAL WATER DEMANDS

A summary of the water use supported by the District, differentiated by customer class is presented in Table 3 below. The 2010 Pinery Water and Wastewater District Conservation Master Plan listed a goal of transitioning from bimonthly metering to monthly metering as an efficiency goal. In 2013, the District completed its meter conversion and began billing monthly. Therefore, monthly billing data is only available from 2013 to present. An overview of each of the water use types is presented below:

Residential – The District provides water to single family residences within its service area. This water is used for both indoor and outdoor uses.

Commercial – The District provides water to commercial establishments located along the Parker Road corridor, local churches, home owner associations and four schools for indoor and outdoor use.

Large Irrigator / Other Uses – The District supports the irrigation of various parks and green spaces owned and maintained by various home owner associations and Douglas County. These are separate taps from the commercial water users and are only used seasonally. The District also provides construction water on a temporary basis for dust control, make-up water and other uses to developers on an as-needed basis.

Golf Course – The District provides water to three local golf courses (Pinery, Pradera, and Colorado Golf) through both dedicated Denver Basin wells and treated water from all sources. The golf course provided water is contained in a series of small lakes and ponds, such that the amount of water used by the golf courses in any particular year may not be the same as the water pumped to the small lakes and ponds given the storage capacity of these lakes and ponds.

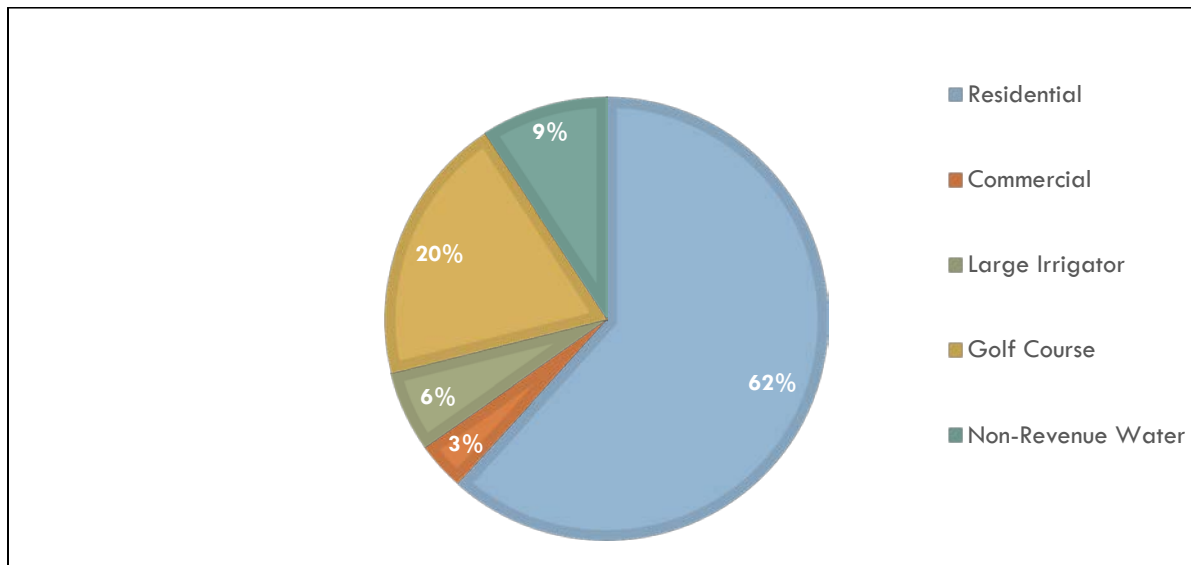
Non-revenue water – Each year, the District estimates the amount of non-revenue water (i.e., water associated with real and apparent system losses, periodically flushing of the water distribution system) that is lost each year. This estimate will be refined as the water conservation plan is implemented. Currently, it is estimated that about 9% of treated water demand is related to the combination of real and apparent system losses.

Table 3: Historic average water deliveries and percentage by customer class, 2007-2017

Customer Class	% of Total Annual Water Deliveries	Average Demands (Ac-ft)
Residential	61.6%	1,843
Commercial	3.5%	104
Large Irrigator	5.8%	174
Golf Course	19.9%	595
Non-Revenue Water	9.2%	275
	100.0%	2,992

Figure 2 displays these historic average water deliveries in a pie-chart format.

Figure 2: Historic average annual water demand and percentage by customer class, 2007-2017



The five largest water users in terms of annual water use are as follows:

1. Pinery Country Club – a 27-hole golf course and country club with a pool located on the south east side of the District.
2. Colorado Golf Country Club, LLC – one full 18-hole course, one 9-hole short course and clubhouse with a pool at the northeast end of the District.
3. Pradera Country Club – one 18-hole golf course with clubhouse and a pool.
4. Douglas County School District – one high school, one middle school and two elementary schools with accompanying irrigation and sports fields.
5. Pinery Glen Homeowners Association – one pool facility, community landscaping tracts and one central sports field/park.

All three golf courses are supplied raw water via delivery from a deep Denver Basin groundwater well to the golf course lakes. The District also has the ability to divert potable water to the golf courses if the pace of irrigation outmatches the raw water deliveries. On occasion (during extremely dry summers, i.e. 2012 and 2017), the golf courses have had to use potable water diversions and/or curtail irrigation for weeks at a time.

The Colorado Golf Club used an extreme amount of water in 2013 preparing to host the international Solheim Cup golf tournament. However, in 2015 the golf course management installed a SMART water controller to reduce the amount of water it uses. There has been an almost 10% reduction in water use since installation of the controller. In 2017, due to the extended dry spell in winter through to early summer, all golf courses applied large amounts of water to keep the courses green.

Pinery conducts occasional water loss audits by comparing pumping records with billing data. Losses include water lost through breaks, leaks, and theft. Comparing the billing data to the pumping records suggest that water lost each year is about 9%.

The annual water deliveries and breakdown by customer class are shown for year 2007 through 2017 in Figure 3.

Figure 3: Pinery Water and Wastewater District annual water deliveries, 2007-2017

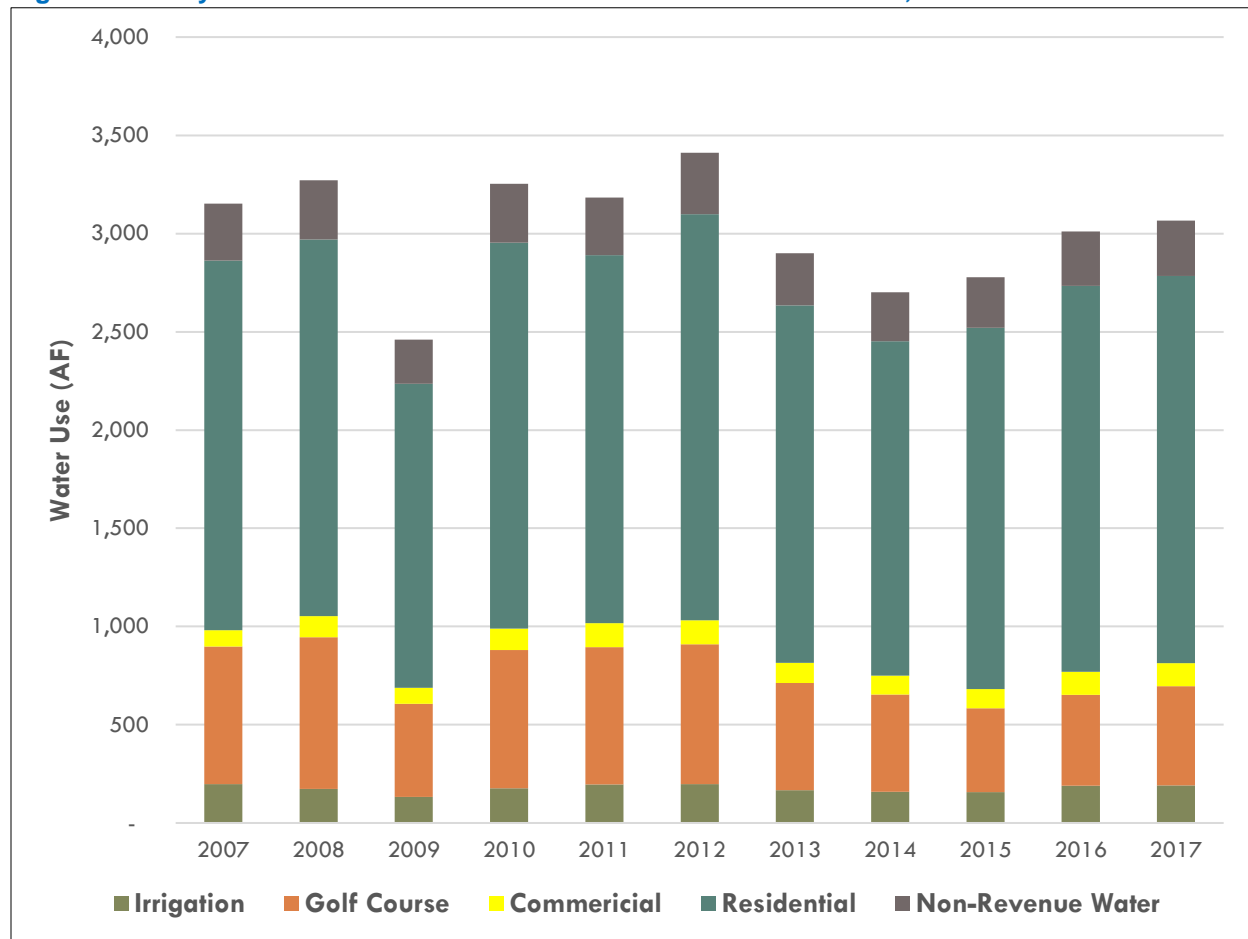
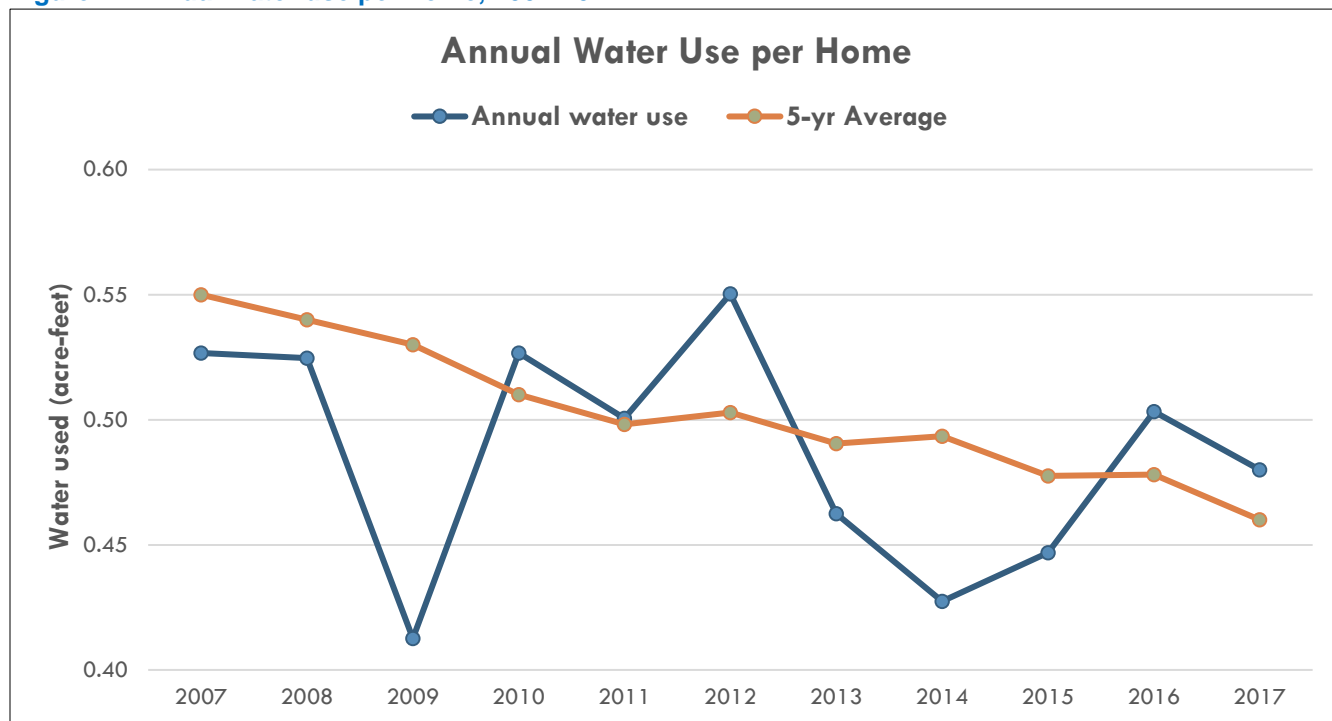
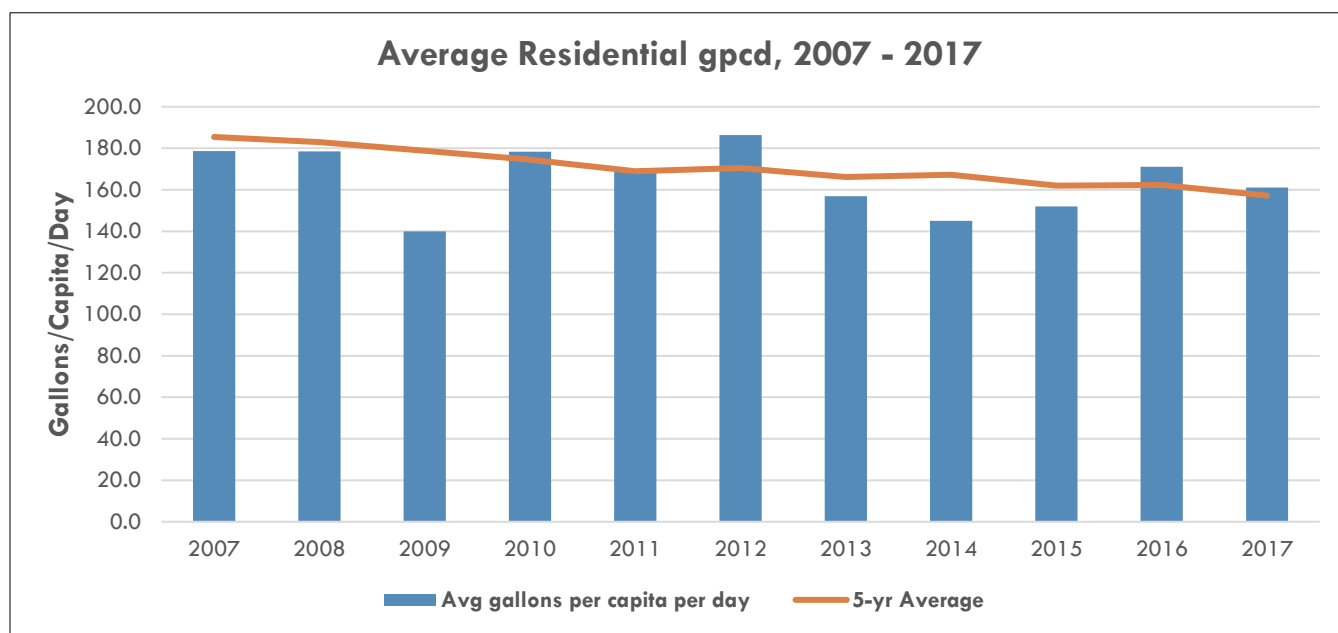


Figure 4: Annual water use per home, 2007-2017



As shown in Figure 4 (above) by the 5-year average line, the annual residential water use has decreased over time, primarily due to the water efficiency activities that have been implemented. In 2007, the average amount of water used per residential connection was about 0.55 AF per year. By 2017, the District saw a sixteen percent reduction (16%), to 0.46 AF of water used per residential connection. As would be expected, Figure 5 shows an equally substantial reduction in the average residential gallons per capita per day (gpcd), decreasing by 15%, from 185 gpcd in 2007 to 157 gpcd in 2017.

Figure 5: Average Residential Use



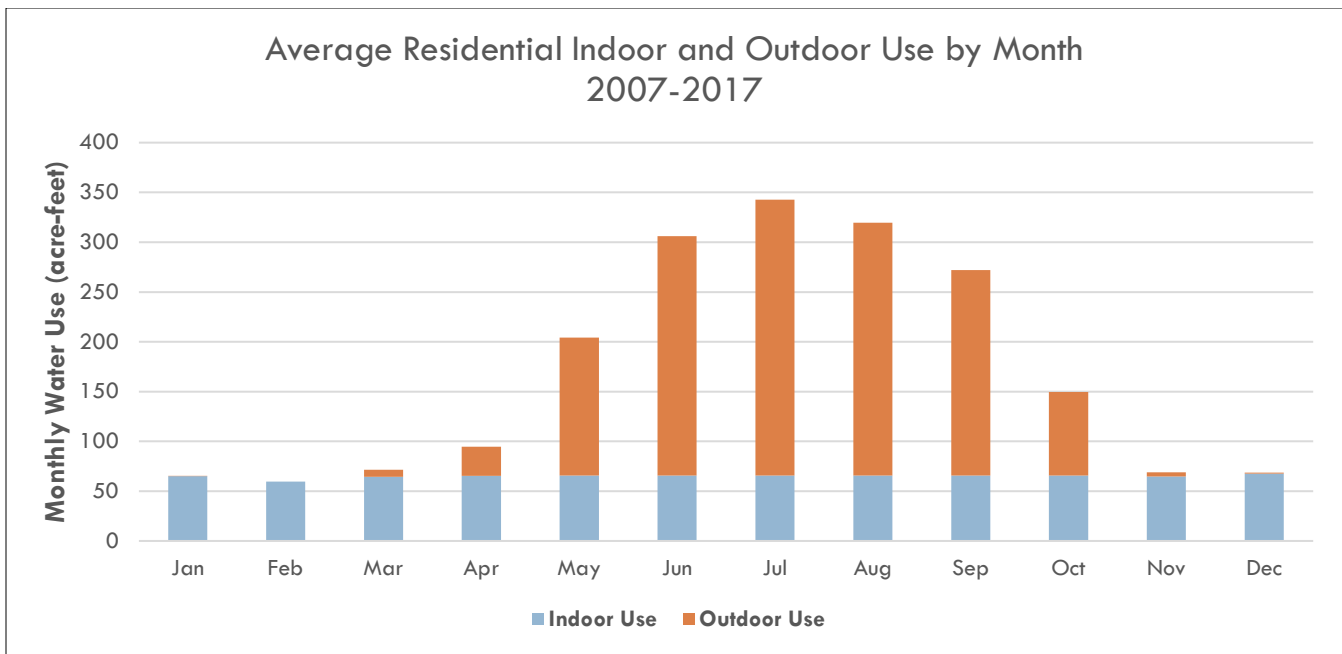
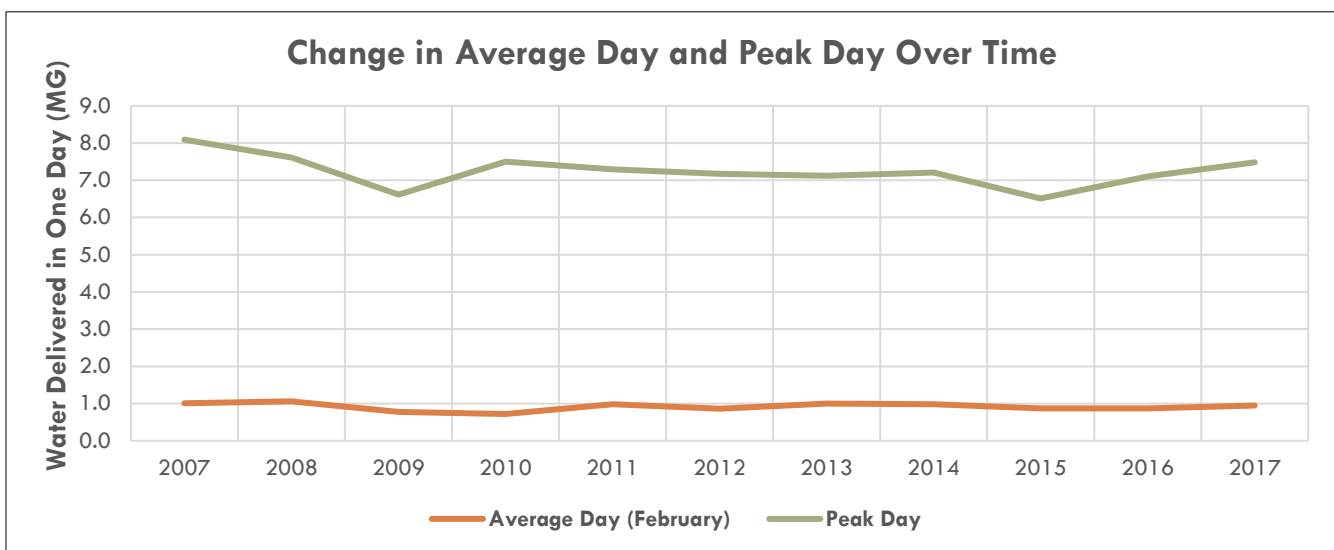


Figure 6: Average Indoor and Outdoor Use

The indoor and outdoor water use, shown in Figure 6, was calculated by setting the average indoor monthly water consumption (IMWC) as the average monthly water use in months November through February – this is the indoor water use shown in the previous chart. The outdoor use is then the difference between the average monthly water demand and the IMWC. On average, indoor use is about 40% and outdoor use is about 60% of the average residential customer's demand.

The peak day demand usually occurs in July each year. The peak day demand in 2017 was 7.48 million gallons per day. The average day demand in 2017 was 0.95 million gallons per day, which suggests that the Pinery had a peak factor of 7.9. The average peak factor from 2007 through 2017 is 8.0, as shown in Figure 7. The fact that the Pinery is a relatively small service area while serving three full golf courses leads to such an extreme peak factor.

Figure 7: Average Day and Peak Day



2.3 PAST AND CURRENT DEMAND MANAGEMENT ACTIVITIES

To support and manage water conservation activities performed by the District, it developed a Water Conservation Plan in 2010. Vital to this Plan was the use of education and information provided to the District's customers regarding water conservation and water use efficiency. Below is a list of the water conservation measures and programs practiced by the District since the early 2000's and before.

Water-Efficient Fixtures

The District falls under the Douglas County Plumbing Codes, which mandates low-flow indoor plumbing fixtures. The District also maintains a list of certified water saving plumbing fixtures on file at the District's office.

Voluntary Watering Schedule

A voluntary outdoor watering schedule was developed and approved by the District Board in 2006 for all residents based on an every-other-day watering by address, with Friday being a no watering day for the entire residential community. No watering is recommended from 10 am to 6 pm any day of the week, and hand watering is allowed at any time. District staff posts reminders on the District website, on customers' bills and on standing A-frame signs that are located throughout the community during the irrigation season.

Customer Education

The District produces monthly newsletters, which are mailed to all its customers discussing water conservation, and other water related issues, regularly promoting wise water use, improved outdoor watering practices, Xeriscaping, and other water conservation practices. Water conservation kits (with low-flow shower head, toilet displacement bag, 1.5 gpm bathroom faucet aerator, kitchen faucet aerator, home water audit booklet, flow gauge bag, two toilet leak detection dye tablets) are available to all homeowners.

The District supports K-12 education through its membership with the South Metro Water Supply Authority "Water Ambassadors" program. The Water Ambassadors program provides water education training for high school students who then educate elementary school children.

The District also owns and maintains a Xeriscape demonstration garden at its administrative offices on Old Schoolhouse Road. The District also maintains two ET (evapotranspiration) measurement stations to assist customers in using and operating ET controllers.

Finally, the District maintains a program of tracking and contacting high water users on a monthly basis to help educate individual homeowners regarding their water use. The District has also implemented a BEACON Eye-On-Water Advanced Metering Infrastructure (AMI) system that would allow customers to monitor their water use real time using an app on their personal digital device.

Low-water Use Landscapes

The District encourages the use of low-water landscapes (Xeriscapes) in all landscaping projects. The typical residential lot size lends itself to encourage the homeowner to xeriscape. The District has constructed a xeriscape demonstration garden located at the District Office.

Commercial and Industrial Processing

A separate, interruptible, metered service may be obtained by a commercial or industrial facility for irrigation. To obtain this service the area to be irrigated must be greater than 30,000 square feet and be approved by the District. These separate taps help the District to better track irrigation water and its impact on summer-time water demand.

Irrigation must be done between the hours of 10:00 p.m. and 6:00 a.m. in accordance with the conservation measures established by the District.

Distribution System Water Losses

Staff monitors the difference between the water pumped from District wells and the amount of water actually delivered to the end user. The District currently has an estimate of unaccounted water of approximately nine percent. Very strict construction standards are in place, which are rigidly administered through a full-time inspector and enforcement activities to maintain the highest integrity of the distribution system. Much of the distribution system has been installed in the last 20 years under these strict construction standards.

All repairs are documented in the GIS-based asset management database system. The District uses this information to identify problem areas that can then be evaluated for replacement or repair. The District also mandates, in its Rules and Regulations, that any leak in a service line or lawn irrigation system, on the homeowner side of the meter, must be repaired within a 72-hour period from notification of such condition.

Water Reuse

Through the District's augmentation plans, all wastewater flows and lawn irrigation return flows associated with non-tributary water are reused by exchange with alluvial wells located along Cherry Creek. The District owns and operates a tertiary wastewater treatment plant that discharges to Cherry Creek. Average daily wastewater treatment is currently around 1.0 million gallons per day. The treatment plant is rated to treat up to 2.0 million gallons per day. Credits for wastewater and lawn irrigation return flows total approximately 15.2 million gallons (46.7 ac-ft) per year.

Inclining Block Water Rate Structure

The District uses a tiered rate structure for the residential, commercial and golf course customer classes specifically designed to encourage water conservation.

Inclining Block Rate Structure for residential water use (monthly billing):

Base Rate		\$29.22
Tier 1	0 – 5,000 gallons	\$2.58/1,000 gallons
Tier 2	5,000 – 20,000 gallons	\$3.74/1,000 gallons
Tier 3	20,000 – 30,000 gallons	\$4.71/1,000 gallons
Tier 4	30,000 – 50,000 gallons	\$6.13/1,000 gallons
Tier 5	50,000 – 60,000 gallons	\$8.36/1,000 gallons
Tier 6	Over 60,000 gallons	\$16.78/1,000 gallons

Inclining Block Rate Structure for commercial water use (monthly billing):

Base Rate (Based on meter size – ¾" shown)		\$30.02
Tier 1	0 – 3,000 gallons	\$2.58/1,000 gallons
Tier 2	3,000 – 20,000 gallons	\$3.74/1,000 gallons
Tier 3	20,000 – 30,000 gallons	\$4.71/1,000 gallons
Tier 4	30,000 – 50,000 gallons	\$6.13/1,000 gallons
Tier 5	Over 50,000 gallons	\$8.36/1,000 gallons

Inclining Block Rate Structure for golf course water use (monthly billing):

Base Rate		\$30.02
Tier 1	0 – 150 acre-feet in one year	\$3.46/1,000 gallons
Tier 2	Over 150 acre-feet in 1 year	\$5.76/1,000 gallons

Large irrigation accounts with a separate interruptible meter are billed monthly at a rate of \$3.83/1000 gallon with a \$29.22 monthly base rate. Large irrigator accounts include, among others, Douglas County Schools and Douglas County Parks. These large irrigators have turf managers and are on an informal water budget program, which involves direct communication between the District and the turf managers on water use.

Regulatory Measures

Irrigation by the District's large irrigation customers, in accordance with the water conservation measures established by the District, must occur between the hours of 10:00 p.m. and 6:00 a.m. If irrigation is carried on at other hours without prior approval the customer could be subject to a penalty and increased charges as determined by the District's Board of Directors.

If a homeowner leak is not fixed within the prescribed 72-hour period from time of notification the District has the right either to repair it or to have it repaired, in which case the customer shall be assessed 110% of the actual cost accrued by the District.

It is prohibited by the District's Rules and Regulations for any entity to waste water supplied by the District. Runoff of water from landscaped and irrigated properties, and over-spray from irrigation systems to impervious surfaces is prohibited. Some subdivisions within the District also have covenants limiting the area of grass allowed for irrigation.

In summary, the District's 2010 Water Conservation Master Plan aimed to reduce overall water demand by about 8-10% by 2020. According to Table 4 in the 2010 Water Conservation Master Plan, the forecasted demand in 2017 was 3,832 AF. Actual demand in 2017 was 3,067 AF – about 80% of the forecasted demand. Part of this difference is likely explained by the recent wetter years in 2013-2015.

Table 4 meets the statutory requirement included in C.R.S. 37-60-126 (4) stating that all State approved water conservation plans must include an estimate of the amount of water saved through previous demand management efforts. Savings estimates in the table below were estimated using 1) *Water Conservation for Small- and Medium-Sized Utilities* (2010 American Water Works Association, Deborah Green) and 2) *Guidebook of Best Practices for Municipal Water Conservation in Colorado* (2010 Colorado WaterWise).

Table 4: Current and past water efficiency program measures and estimated water savings, 2013-2017

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
		2013	2014	2015	2016	2017		
Foundational Activities								
Separate Irrigation Taps	1998 - Present	0	0	0	0	0	0	0
Water Augmentation and Reuse Program	1977 - Present	20	35	40	50	50	195	39
Asset Management Program	2014 - Present	0	0	0	5	5	10	2
Customer Leak Detection and Repair Program	1990 - Present	3	3	3	3	3	15	3
Inclining Block Rate Structure	2001 - Present	5	5	5	5	5	25	5
Transition to Monthly Customer Billing	2013 - Present	80	80	80	80	80	400	80
Subtotal							645	129
Targeted Technical Assistance and Incentives								
Water Conservation Kits	2002 - Present	0	1	2	1	1	5	1
BEACON AMI Pilot	2016 - Present	0	0	0	0	0	0	0
Subtotal							5	1
Ordinances and Regulations								
Douglas County Plumbing Codes	1994 - Present	3	3	3	3	3	15	3
Voluntary Watering Schedule	2006 - Present	3	3	3	3	3	15	3
Irrigated Turf Restrictions	2001 - Present	2	3	5	4	4	18	4
Water Waste Ordinance	1998 - Present	0	0	0	0	0	0	0
Subtotal							48	10
Education Activities								
Xeriscape Demonstration Garden	1999 - Present	0	0	0	0	0		
High Water Use Customer Tracking and Contact	2003 - Present	0	0	0	0	0		
K-12 Education	2007 - Present	0	0	0	0	0		
Newsletters	1998 - Present	0	0	0	0	0		
Subtotal							0	0
Total Savings							698	140

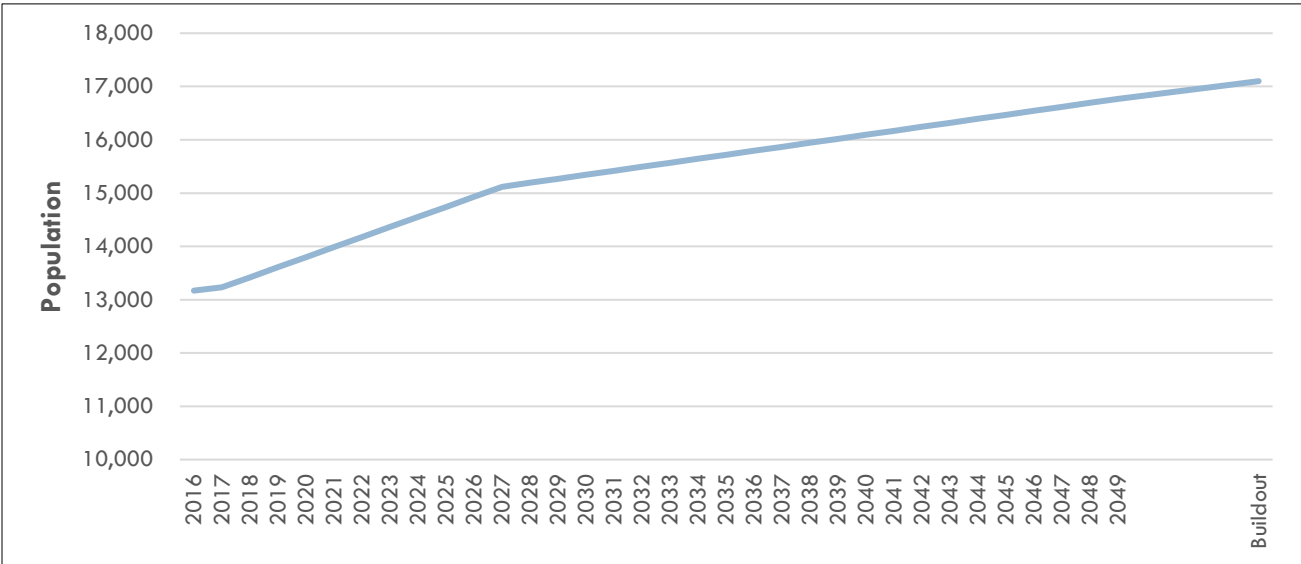
2.4 DEMAND FORECAST

Forecasting water use (or water demand) is a critical part of the planning process. Forecasts can help to frame the need for water conservation based on identifying system limitations and/or future water supply needs. For the District, limitations related to future water supply needs, especially during times of drought when the Cherry Creek alluvial wells may have future limited use due to calls, whether futile or not, will likely influence the development of water conservation goals and the selection of water conservation measures and programs.

This section of the Plan presents the future water demands predicted for the District service area. The baseline demand forecast presented does not include any impacts from proposed water conservation and efficiency efforts. Demand forecasting at this point, therefore, only has been developed to predict future water demand based on the continuation of the current and ongoing water conservation efforts and “passive conservation” as older fixtures and appliances wear out and are replaced with models that meet current efficiency standards

The District’s population is expected to grow steadily over the next 25-30 years from the current level of just over 13,000 people at the end of 2017 to over 17,000 people at buildout sometime after 2050. The population forecast is shown in Figure 8 below.

Figure 8: Population forecast, 2016-Buildout



To begin with, the forecasting methods that were utilized in this planning effort were based on past water use and expected future housing starts in the District. Total water demand was therefore developed based on the following assumptions:

- Annual residential growth rate was developed assuming 63 new single-family units (SFU) for the next 10 years beginning in 2018, and 25 units each year thereafter until buildout sometime after 2050.
- Estimated permanent population is based on 3.0 persons per SFU.
- Residential water demand is estimated at 0.55 acre-feet per household per year.
- Commercial water demand was estimated to increase slightly in the next ten years due to the construction of a commercial development in Pinery West. To account for this new demand, commercial demand was assumed to increase 1% (over the average of the last five years of measured commercial demand) on average over each of the next ten years.
- Large Irrigator demand is assumed at 175 acre-feet per year consistent with the average use over the last 10 years.
- Golf course irrigation is assumed at 600 acre-feet per year.
- Non-revenue water, including real and apparent losses, is assumed to be about 9% of total water demand.

Projected total demand from 2018 through buildout is shown in Table 5 below, with total demand at buildout at 4423 AF.

Table 5: Projected Total Demand

Year	Large Irrigator (AF)	Golf Course (AF)	Commercial (AF)	Residential (AF)	Non-Revenue Water (AF)	Total Demand (AF)	Dwelling Units
2018	175	600	109	2,449	327	3,660	4,453
2019	175	600	110	2,484	330	3,699	4,516
2020	175	600	112	2,518	334	3,739	4,579
2021	175	600	113	2,553	337	3,778	4,642
2022	175	600	114	2,588	341	3,817	4,705
2023	175	600	115	2,622	344	3,857	4,768
2024	175	600	116	2,657	348	3,896	4,831
2025	175	600	117	2,692	351	3,935	4,894
2026	175	600	118	2,726	355	3,974	4,957
2027	175	600	118	2,761	358	4,012	5,020
2028	175	600	118	2,775	359	4,027	5,045
2029	175	600	118	2,789	361	4,042	5,070
2030	175	600	118	2,802	362	4,057	5,095
2031	175	600	118	2,816	363	4,072	5,120
2032	175	600	118	2,830	365	4,088	5,145
2033	175	600	118	2,844	366	4,103	5,170
2034	175	600	118	2,857	368	4,118	5,195
2035	175	600	118	2,871	369	4,133	5,220
2036	175	600	118	2,885	370	4,148	5,245
2037	175	600	118	2,899	372	4,163	5,270
2038	175	600	118	2,912	373	4,178	5,295
2039	175	600	118	2,926	374	4,193	5,320
2040	175	600	118	2,940	376	4,208	5,345
2041	175	600	118	2,954	377	4,223	5,370
2042	175	600	118	2,967	378	4,239	5,395
2043	175	600	118	2,981	380	4,254	5,420
2044	175	600	118	2,995	381	4,269	5,445
2045	175	600	118	3,009	382	4,284	5,470
2046	175	600	118	3,022	384	4,299	5,495
2047	175	600	118	3,036	385	4,314	5,520
2048	175	600	118	3,050	386	4,329	5,545
2049	175	600	118	3,064	388	4,344	5,570
Buildout	175	600	118	3,135	395	4,423	5,700

The District has four sources of water for future water supply, the tributary shallow wells constructed in the Cherry Creek alluvium, deep non-tributary Denver Basin Aquifer wells, the Wise water supply, and the Walker Reservoir (Cherry Creek Project Water Authority) currently under design with anticipated availability in 2020. Maximum appropriated water rights for the wells total 15,037 AF/yr. Average yearly subscription to the WISE water will rise to 500 AF/yr by 2021 and remain consistent after that. The Walker Reservoir will supply 400 AF/yr. These supplies well exceed the anticipated demand, even at buildout. However, a considerable portion of the supply is in deep wells with higher costs for pumping, providing an impetus on water conservation to deliver water at the lowest possible cost.

The yield of the District's Denver Basin water rights is not affected by a dry year. Thus, the dry year and average year will be the same and will be as decreed. The District's Cherry Creek alluvial water rights can be impacted by a dry year in terms of both physical supply and water available through the

administration of water rights. The combined senior and junior water rights during a dry year can be 1,700 AF/yr with the expected average yield at 2,150 AF/yr.

The water demand forecast is shown in Figure 9. With this forecast, water use in the District increases from 3,660 AF in 2018 to 4,423 AF at buildout, an increase of 763 AF or 21%. The beginning average year yield from all the District's water sources is 16,054 AF which is sufficient to meet demand through buildout, as is the dry year yield of 15,604 AF. As previously stated, the District has sufficient water sources to meet foreseen demand and providing water at the lowest possible cost is the motivation for continued and enhanced water conservation efforts.

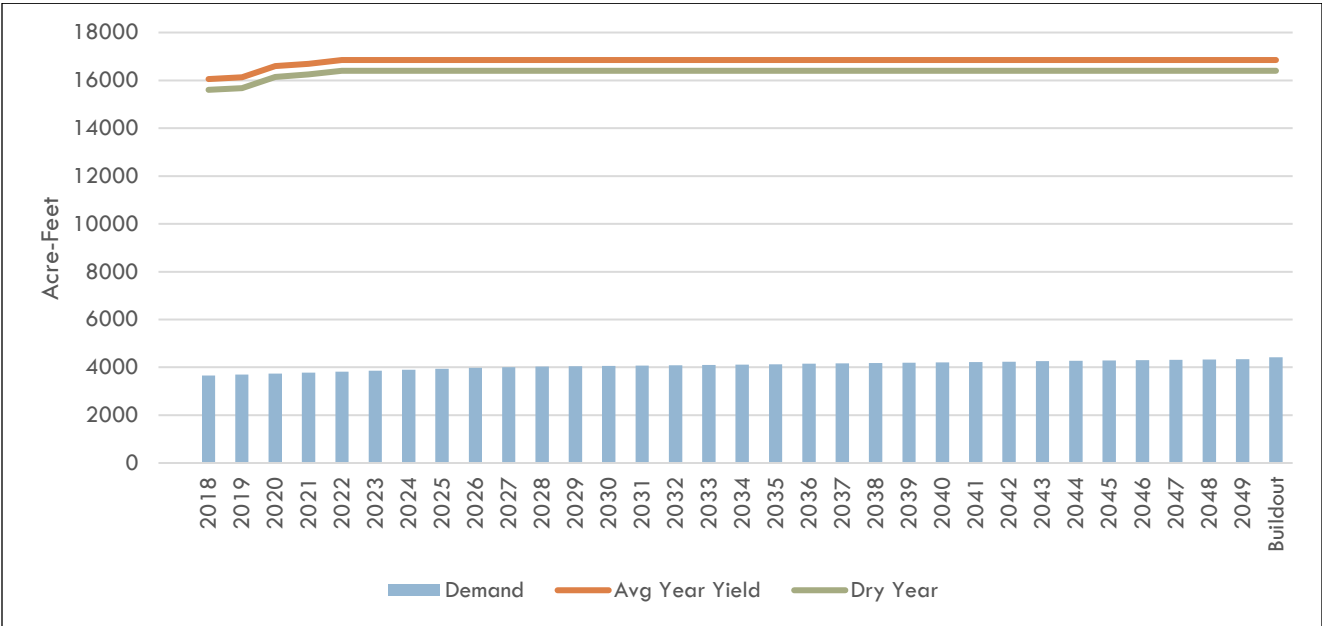


Figure 9: Baseline demand forecast and current water rights yield, Pinery Water District

3.0 | INTEGRATED PLANNING AND WATER EFFICIENCY BENEFITS AND GOALS

The District practices integrated resource planning in which all supply options including developing new supplies and implementing water efficiency programs are considered and compared. Through this process sufficient water sources have been acquired to meet anticipated demand through buildout. However, these resources do include significant deep well sources which increase operating costs.

3.1 WATER EFFICIENCY AND WATER SUPPLY PLANNING

Water efficiency is an important component of the District's focus on managing the resource and the operating costs. To address these objectives, the District is implementing a three-pronged approach to supplement the drilling of new wells. This approach includes the following three elements:

1. A water efficiency program (see 3.2) that will reduce demand by about 267 AF/yr by 2044.
2. The purchase of 500 AF/yr from the WISE water subscription.
3. About 400 AF through the development of the Walker Reservoir.

These efforts will conserve and develop at least 29,175 AF of water over the next 25 years. Figure 10 shows the contribution of each of the new supply sources for the District. Figure 11 shows the modified forecasted demands through the planning period incorporating the projected water savings.

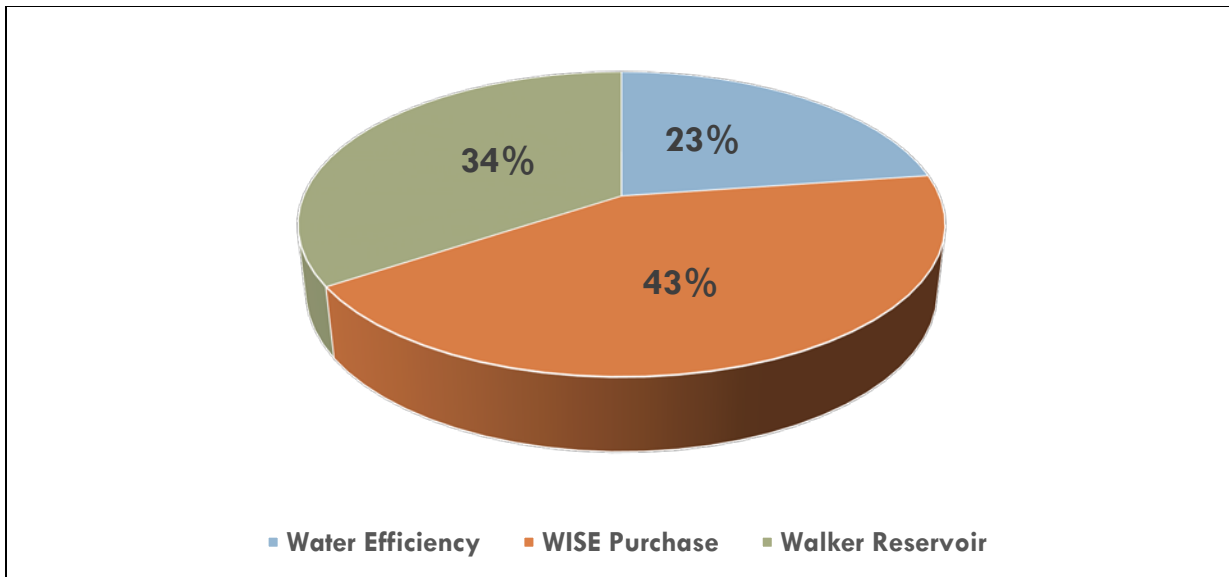


Figure 10: Sources of new water supply

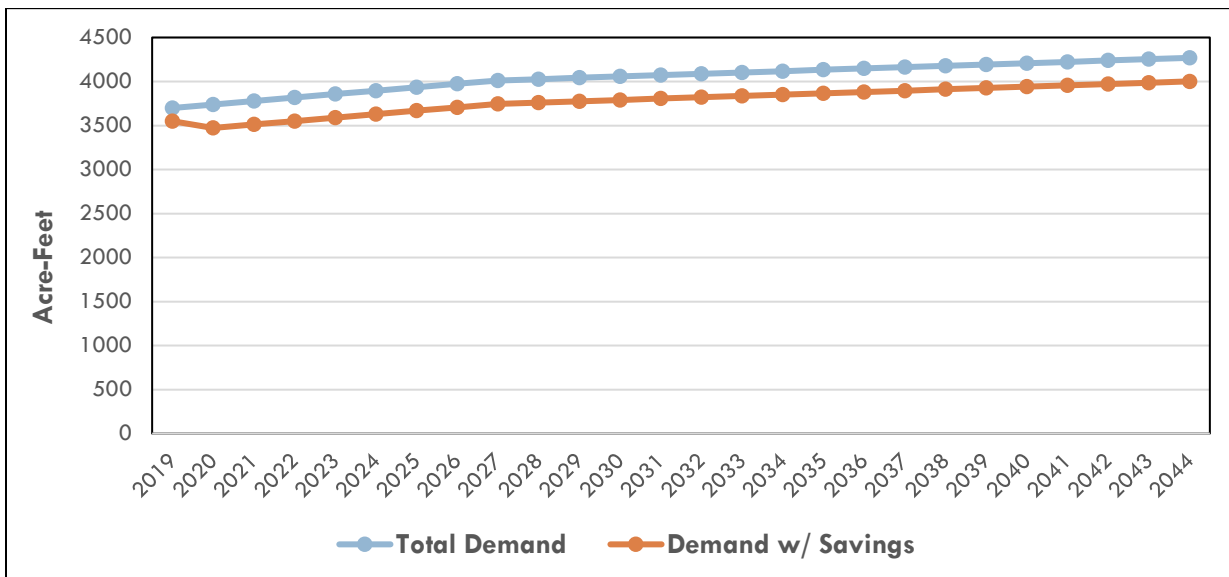


Figure 11: Forecasted Demands

Capital Improvement Plan Harmonization

The District has a Capital Improvement Plan (CIP) which is updated every year. The WISE water purchase and the Walker Reservoir development have been a part of the plan for several years. The impacts from the enhanced water efficiency efforts indicate a potential capital savings of approximately \$11M over the planning period as the projected savings are realized. This will be reflected in the next update of the plan, and the timing of future capital efforts will be adjusted to ensure exact correspondence with this water efficiency plan.

3.2 WATER EFFICIENCY GOALS

To facilitate its water efficiency efforts the District formed a Water Efficiency Task Force, comprised of members of the District staff and residents from the District, to review water efficiency opportunities in the District. The task force established five general goals for the program:

- Establish a water savings target by customer class
- Lower peak day water use
- Establish a savings goal for non-revenue water
- Evaluate the water rate structure
- Enhance public education and involvement

These goals support the overall objective of the District to reduce forecasted baseline demand by approximately 6,675 AF over the next 25 years through water efficiency. This amounts to an average annual reduction in demand of 267 AF per year.

To accomplish this objective the District will implement an enhanced water efficiency plan which is designed to encourage efficiency among all water users – residential and non-residential and new and existing. The plan also incorporates District operations water efficiencies through reductions in physical (real) water loss in the water distribution system.

The District's water efficiency plan considers both water efficiency and new supply options. The new efficiency efforts described in this plan are very economical sources of water on a cost per AF basis and complement the existing plans for added sources. In addition, the anticipated benefits of implementing this plan are expected to be substantial from a water supply, service and reliability standpoint while helping to keep water rates as low as reasonably possible.

The goal of conserving 6,675 AF (267 AF/yr) by 2044 represents a significant increase in efficiency for the District. The 2010 water conservation plan called for just 140 AF/yr of water savings by 2020. As the cost for developing new water supplies has continued to rise, the benefits associated with the lower cost water efficiency program has become increasingly attractive. This water efficiency plan was prepared in response to these changes. The District plans to update this plan periodically to ensure the water efficiency goals are being met and to incorporate any changes necessary to ensure the savings goals are achieved.

4.0 | SELECTION OF WATER EFFICIENCY ACTIVITIES

4.1 SELECTION PROCESS SUMMARY

The activity selection worksheets developed by CWCB were used as guides in the activities screening process. (See Appendix A) Existing efficiency activities were included in the list of measures and will continue as part of the ongoing water efficiency program.

Initial Screening. The Task Force performed the initial screening of potential activities using the CWCB worksheets and the *Guidebook of Best Practices for Municipal Water Conservation in Colorado* (CWW 2010) as resources. Activities deemed practical and implementable for the District were evaluated and presented to the Board of Directors for review.

Board of Directors Review. In consultation with the Task Force, the Board of Directors reviewed the recommended water efficiency activities and determined the final list of activities to be implemented. Procedures for implementing the activities are being incorporated into the District's future operating plans.

4.2 COMPONENTS OF WATER EFFICIENCY PLAN

The water efficiency plan consists of three major components, Irrigation and Residential Efficiency Improvements, District Operating Efficiencies, and Customer Education and Incentives. Specific descriptions of efficiency program measures are provided in section 4.3.

4.2.1 Irrigation and Residential Efficiency Improvements

This component of the plan assumes the implementation of a water budget rate structure for all large irrigation and residential users. In addition to the tiered rate structure for billing, supplemental information such as comparisons with historical consumption and established benchmarks for efficient usage will also be shown on the bill to provide useful context on consumption and encourage conservation. The net effect is projected to reduce demand by 5% during the irrigating season, resulting in a drop in total annual demands of 3179 AF over the 25-year period.

4.2.2 District Operating Efficiencies

The second component of the efficiency plan puts additional focus on selected practices and activities in the District's operations. Expanding leak detection activities and conducting water audits are expected to result in reductions in the District's non-revenue water to 5%, or 2825 AF, over the 25-year period and will support the District's goal of limiting real and apparent losses to economically efficient levels. The District is fully metered, with automatic meter reading (AMR) meters at all locations. All shallow well meters are periodically tested for accuracy in accordance with State mandate, and when wells are rehabilitated new magnetic read meters are always added. Robust planning with integrated plans does not directly contribute to water savings but is instrumental in keeping costs as low as possible while meeting all essential planning activities. To facilitate effective implementation of the efficiency activities, the plan recommends the establishment of a Water Resources Technician in the District staff (discussed in further detail in section 4.3). While this position alone does not save water, it will further successful program implementation and enhance a conservation culture within the District.

4.2.3 Customer Education and Incentives

The final component of the efficiency plan is a combination of customer education and outreach efforts along with selected incentives on efficient irrigation and monitoring equipment which are expected to reduce demand by 1%, or 675 AF when implemented. In addition, conservation outreach programs will help establish a culture of wise water stewardship which changes behavior over time and increases participation levels in all conservation programs.

4.3 DEMAND MANAGEMENT ACTIVITIES

To accomplish the objectives of the water efficiency plan, the District has outlined specific activities designed to produce the anticipated water savings. Included in this plan is the addition of a Water Resources Technician to the District staff whose focus will be coordinating the implementation of

conservation activities, monitoring and tracking efficiency progress, and providing conservation advice and expertise to District customers.

Table 6 presents the new and updated water efficiency activities selected for inclusion in this plan. Each activity is described further in the sections below.

Table 7 displays the projected water savings by customer category along with the water efficiency activities that will impact demand in the category.

Figure 12 shows the percent of water efficiency savings by group as a pie chart.

Table 6: New and updated water efficiency activities

Water Efficiency Activities	Sectors Impacted	Implementation Period of New Activities
Foundation Activities		
Regulations/Limitations on Area of Irrigated Land	SF, outdoor	2019 - 2044
Water Budget Rate Structure	SF, indoor & outdoor	2019 - 2044
System Wide Water Audits	ALL	2018 - 2044
Leak Detection & Repair	ALL	2018 - 2044
Master Plans/Water Supply Plans	ALL	2019 - 2044
Water Resources Technician	ALL	2019 - 2044
Targeted Technical Assistance and Incentives		
Efficient Irrigation Equipment Incentives	ALL	2019 - 2044
Landscape Water Budget Information & Feedback	Res, outdoor	2019 - 2044
Landscape Efficiency Incentives	Res, outdoor	2019 - 2044
Education Activities		
Customer Water Use Workshops	ALL	2019 - 2044
Landscape Design and Maintenance Workshops	ALL	2019 - 2044
Water Conservation Expert Available	ALL	2019 - 2044

Table 7: Projected water savings by customer category

Sector	Water Efficiency Activities Impacting Sector	Projected Water Savings	Projected Yearly Savings (AF)
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		2019 – 2044 (AF)	
Irrigation & Residential	Regulations/Limitations on Area of Irrigated Land	3179	127
	Water Budget Rate Structure		
District Operations	System Wide Water Audits	2825	113
	Leak Detection & Repair		
	Master Plans/Water Supply Plans		
	Water Resources Technician		
All Customers	Efficient Irrigation Equipment Incentives	675	27
	Landscape Water Budget Information & Feedback		
	Landscape Efficiency Incentives		
	Customer Water Use Workshops		
	Landscape Design and Maintenance Workshops		
Total Projected Savings		6679	267

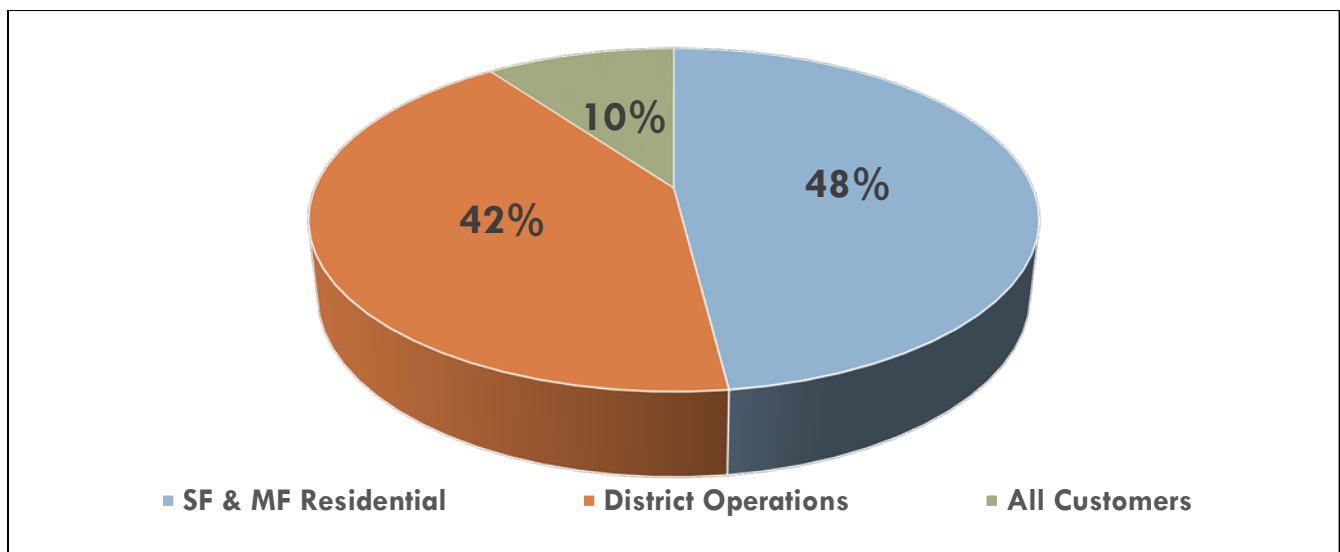


Figure 12: Projected water savings percent by user group

4.3.1 Foundational Activities

Individualized, Information Water Budget Program

Pinery Water District is fully metered, bills monthly, and has in place an inclining-block rate structure. The rate structure for single-family residential customers is shown in Table 8. This rate structure encourages water conservation by sending a financial signal to customers who use large amounts of water. The structure has continued to provide stable revenue to the District. Based on rate studies, the District has adjusted the cost of water within the rate blocks every 2-3 years to cover the increasing costs of operating the water system.

Table 8: Pinery Water District's Water Rate Structure (SF Residential)

Rate Tier	Water Rate
-----------	------------

		per 1000 gal.
Base Rate		\$29.22
Tier 1	0 – 5,000 gallons	\$2.58
Tier 2	5,000 – 20,000 gallons	\$3.74
Tier 3	20,000 – 30,000 gallons	\$4.71
Tier 4	30,000 – 50,000 gallons	\$6.13
Tier 5	50,000 – 60,000 gallons	\$8.36
Tier 6	Over 60,000 gallons	\$16.78

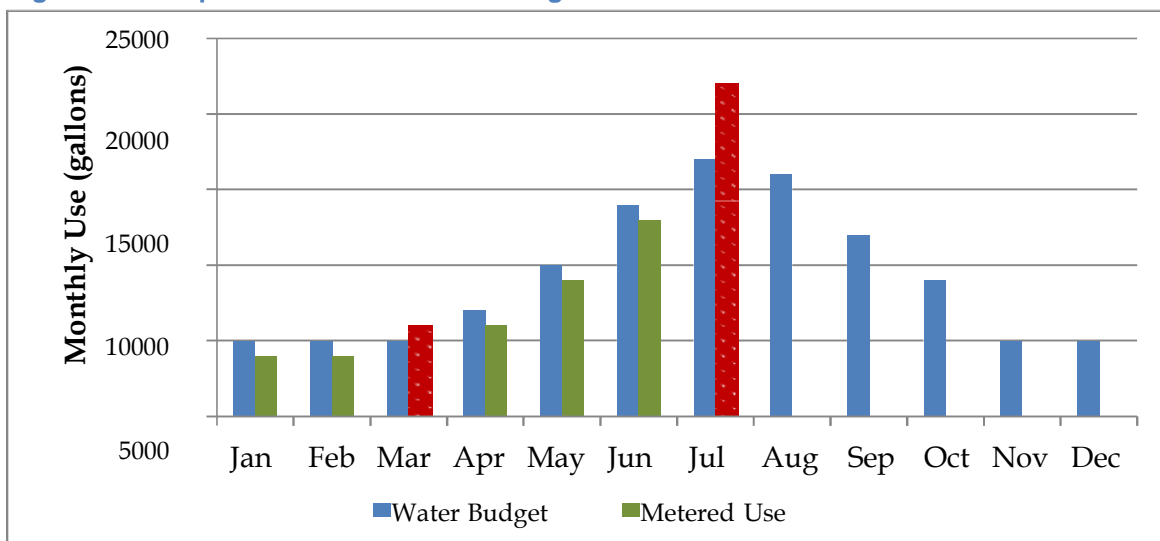
A new efficiency activity to begin implementation in the Pinery Water District starting in 2019 is an individualized, informational water budget that has been developed for each residential customer. This program will provide useful efficiency information on each customer's water bill that will inform them if the most recent month of usage was below or above an established efficiency benchmark. Initially, the Pinery's water budget program will be informational only and not yet tied in to the District's water rate structure.

The water budget created for each customer will include two components: Indoor budget and Outdoor budget. The **indoor** component of the water budget for each customer will be calculated as the smaller of the average winter monthly consumption (AWMC) used by the customer (i.e. the average of monthly consumption over the months of November, December, January, and February from the previous year). The **outdoor** component of each residential customer's water budget will be based on the landscaped area at the property estimated from the Pinery's GIS parcel level data and a spectrographic analysis of recent aerial photographs of the service area that help distinguish between pervious and impervious areas. Outdoor water budgets will be provided only during the irrigation season from April – October. The monthly outdoor water budget will be calculated for each customer using the following equation:

$$\text{Water budget (gal)} = \text{Irrigated Area (sf)} \times 0.8 \times \text{Monthly Net ET (inches)} \times 0.623 \text{ (gal/inch/square foot)}$$

As part of the informational water budget program, as each customer's account is converted to the water budget, the water bill will include a water budget usage comparison like the example shown in Figure 13. This theoretical example shows usage through the month of July. Monthly usage that is at or below the water budget is shown in green. When usage in a month exceeds the water budget, the usage will be shown in red.

Figure 13: Sample informational water budget



An informational message will also be provided each month, based on the level of usage. If usage is at or below the water budget volume the message will state: *“Your water use last month was 12% below your budgeted amount. Thank you for using water efficiently.”* If usage is above the water budget volume, the message will state: *“Your water use last month was 30% above your budgeted volume. Please check for leaks, review your water usage practices, and contact the District if you would like more information on how to conserve water in your home and on your landscape.”*

There will be no consequences for the customer who exceeds their water budget, but the District expects the informational component of the water budget to be a powerful motivator for water efficiency. The informational water budget program is the central feature of the District’s water efficiency program and is expected to significantly help spur efficiency. In addition, the District plans to use the water budgets to target water efficiency incentives toward customers who regularly exceed their water budget.

The District also plans to utilize social normalizing messaging to encourage water use reductions among customers who exceed their budget. For example, a customer who exceeds their water budget two months in a row would receive the following message on their water bill:

“You have exceeded your water budget allocation in each of the past two months. This could indicate a leak in your system or other excessive usage. Your efficiency as compared to your neighbors is also shown. The District urges you to be as water efficient as possible. If you have any questions about your water use or your bill, please contact us. Thank you.”

As additional experience with the residential water budget program is gained, the informational water budget program may be expanded to all customers.

Enhanced Water Loss Control

The District has historically performed some water loss analysis and leak detection and repair activities and will enhance those activities through implementation of an aggressive water loss control program that includes use of the AWWA Water Loss Audit methodology based on AWWA’s *Water Audits and Loss Control Program: Manual of Water Supply Practices (M36)*. In 2018, the District will begin a water loss audit to more accurately determine the actual water loss and to focus available resources on the most likely water loss improvements. Along with the water loss audit will be a review of pressure zones within the system to identify where water pressure is higher than optimal. Zones identified for possible reduced pressure will be prioritized to maximize the likely water savings by decreasing the potential for developing new water leaks and lowering losses from existing leaks.

Also, in 2018, the District will begin a proactive water main rehabilitation and replacement project targeting the areas of the distribution system with the highest recorded main line leaks and repairs. Additional areas will be identified using age and repair data from the asset management data base combined with an acoustic water leak detection survey.

Enhanced Planning

The District has detailed Water Resources Plans and Water Supply Plans which will be modified to reflect the anticipated and realized water savings achieved from the water efficiency activities planned for implementation. While the District appears to have sufficient sources of water through buildout and beyond, the improved vision of the timing and need of any future resources available from integrated plans will provide additional insight for the efficient and effective management of the District.

Water Resources Technician

As stated earlier, to accomplish the anticipated water savings stated in the objectives of the water efficiency plan activities, the District is planning the addition of a Water Resources Technician to the District staff. This position's focus will be coordinating the implementation of conservation activities, monitoring and tracking efficiency progress, and providing conservation advice and expertise to District customers. This conservation expert will be added in either 2019 or 2020.

4.3.2 Targeted Technical Assistance and Incentives

Efficient Irrigation Equipment Rebates

To encourage increased efficiency in the design and irrigation of the District's customer yards, the Water Resources Technician will make available to the customers the technical information regarding the most efficient methods of irrigating and monitoring water usage during the irrigation season. Included will be information on smart controllers which are rain sensitive, offer remote programming by Smartphone Apps, and other useful features to allow the homeowner to effectively manage irrigation needs.

Also, currently offered by the District is the BEACON® Advanced Metering Analytics system which works with EyeOnWater® consumer tools to provide customers with access to their consumption data, allowing them to view their usage activity and gain a greater understanding and control of the water they consume. An incentive program supported by a first-come, first served yearly budget will offer specific rebate amounts for approved products and applications. A rebate limit per household will be established and rebates will appear as credits to future water bills.

Education Activities

Part of the Water Resources Technician's job duties will be customer education and support to encourage and facilitate conservation. Printed information, website features, and workshops on customer water use and efficient landscape design and maintenance will be offered. While such programs do not directly result in measurable water savings, conservation outreach programs will help establish a culture of wise water stewardship which changes behavior over time and increases participation levels in all conservation programs.

In addition to these new activities, the District will continue to provide the following information and education activities focusing on water efficiency and conservation:

- Provide water conservation information to customers through the newsletter included in the monthly bill, including water use and landscape workshops, and general information for frequently asked questions
- Maintain conservation materials and information that are available upon request.
- Maintain a xeriscape garden at the District headquarters.
- Maintain a website which includes water conservation techniques and ideas.
- Post voluntary water restriction signs throughout the District during high usage months encouraging efficient water usage.
- Continue support and involvement in the K-12 education program.
- Conduct field trips of the water and wastewater facilities as requested.

5.0 IMPLEMENTATION AND MONITORING PLAN

5.1 IMPLEMENTATION PLAN

Implementation of this plan will be the primary responsibility of the Water Resources Technician, a new position in the District, which will be added in either 2019 or 2020. The Coordinator will be assisted by the Water Efficiency Task Force and members of the District staff. The District will continue to budget necessary funding and pursue CWCB water efficiency grants to further its water conservation goals. The conservation plan and implementation that began in 2010 will continue, and the new activities selected in this plan will begin implementation in the 2019-2020 timeframe. The implementation schedule is shown in Table 9.

Table 9: Water efficiency activity implementation schedule

Water Efficiency Activities	Implementation Period of New Activities
Foundation Activities	
Regulations/Limitations on Area of Irrigated Land	2019 - 2044
Water Budget Rate Structure	2019 - 2044
System Wide Water Audits	2018 - 2044
Leak Detection & Repair	2018 - 2044
Master Plans/Water Supply Plans	2019 - 2044
Water Resources Technician	2019 - 2044
Targeted Technical Assistance and Incentives	
Efficient Irrigation Equipment Incentives	2019 - 2044
Landscape Water Budget Information & Feedback	2019 - 2044
Landscape Efficiency Incentives	2019 - 2044
Education Activities	
Customer Water Use Workshops	2019 - 2044
Landscape Design and Maintenance Workshops	2019 - 2044

5.1.1 Revenue Stability

Revenue stability is an important concern for the District as it moves forward with the water efficiency program. A new Rates and Fees Study will be conducted in connection with the full implementation of the water budget rate structure to support the District's revenue model. Other costs and savings associated with the implementation of the efficiency plan will be reflected in the yearly operating budgets, and progress on the impacts of the efficiency activities will be monitored and evaluated to assure their ongoing economic viability.

5.2 MONITORING PLAN

The District monitors water demand on a daily basis. Conservation program impacts are evaluated annually. Staff maintains an extensive data set of water use and summarizes and evaluates water demands on a regular basis. The Water Resources Technician will use this demand data along with other conservation related data (use and cost of incentives, water loss mitigation activities and impacts, etc.) to evaluate efficiency impacts on a regular basis.

The District has historically performed some water loss analysis and leak detection and repair activities and, beginning in 2018, will enhance those activities through implementation of an aggressive water loss control program that includes use of the AWWA Water Loss Audit methodology based on AWWA's *Water*

Audits and Loss Control Program: Manual of Water Supply Practices (M36). Along with the water loss audit will be a review of pressure zones within the system to identify where water pressure is higher than optimal. Zones identified for possible reduced pressure will be prioritized to maximize the likely water savings by decreasing the potential for developing new water leaks and lowering losses from existing leaks. Also, in 2018, the District will begin a proactive water main rehabilitation and replacement project targeting the areas of the distribution system with the highest recorded main line leaks and repairs. Additional areas will be identified using age and repair data from the asset management data base combined with an acoustic water leak detection survey.

Data gathered from these efforts will be used to more accurately determine the actual water loss and to focus available resources on the most likely water loss improvements. A summary of the data to be collected for efficiency plan monitoring is shown in Table 10 which is based on Worksheet K from the Guidance Document.

Demand and production data are monitored and recorded by the District's water staff on a daily basis and monthly and yearly summaries are produced. This data forms the basis for much of the monitoring and assessment that the Water Resources Technician will perform. Ongoing progress on expected achievements for each goal will be evaluated for adjustments or modifications that may be appropriate for the plan.

Objective and actual demand reductions achieved by the components of the plan will be monitored and reported to the Board of Directors on an annual basis.

Table 10: Worksheet F – Selections of demand data for efficiency plan monitoring

Monitoring Data	HB 10-1051 Reporting Requirement		Selection			Entity/Staff Responsible for Data Collection and Evaluation	Schedule/Timing of Monitoring	
	Annual	Monthly	Annual	Monthly	Daily			
Total Water Use								
Total treated water produced				X	X	X	Water Staff	Daily
Total treated water delivered	√			X	X		Water Staff	Monthly
Per capita water use				X			WRT*	First Quarter
Indoor and outdoor water deliveries (res)				X	X		WRT*	First Quarter
Water peak day produced				X	X		Water Staff	Monthly
Non-revenue water	√			X			WRT*	First Quarter
Water Use by Customer Type								
WRT*								
Treated water delivered		√		X	X	X	Water Staff	Daily
Raw non-potable deliveries				X	X	X	Water Staff	Daily
Reclaimed water delivered				X	X		WW Staff	Daily
Residential per capita water use				X			WRT*	First Quarter
Unit water use (AF/account or AF/irrigated acre)				X			WRT*	First Quarter
Indoor and outdoor water deliveries				X	X		WRT*	First Quarter
Large users				X	X	X	Water Staff	Daily
Other Demand Related Data								
Irrigated landscape (AF/acre or irrigated acres)				X			WRT*	First Quarter
Precipitation				X	X	X	WRT*	First Quarter

Temperature			X	X	X	WRT*	First Quarter
Drought index information			X			WRT*	First Quarter
Population			X	X		WRT*	First Quarter
New taps			X	X		WRT*	First Quarter

* Water Resources Technician

6.0 | ADOPTION, PUBLIC REVIEW, AND APPROVAL OF WATER EFFICIENCY PLAN

6.1 EFFICIENCY PLAN ADOPTION

On May 16, 2018, the first draft of this plan was presented to the Board of Directors of the Pinery Water and Wastewater District. The Board discussed the draft and provided comments. The 60-day period for public comments began June 10, 2018 and ended August 9, 2018.

6.2 PUBLIC REVIEW PROCESS

On June 21, 2018 this plan was posted on the District website and hard copies were made available to any interested members of the community at the District office located at 5242 Old Schoolhouse Road, Parker, CO 80134.

A Public Information Meeting was scheduled on Wednesday, June 27, at 7:00 PM at the District Headquarters Building, 5242 Old Schoolhouse Road, Parker, Colorado where members of the District's Board of Directors and staff were available to give an update on the work the Task Force had been doing and share their thoughts on the initial steps in implementing the plan.

A public hearing was scheduled for August 15, 2018, during the regular Board of Directors Meeting.

A total of **XX** comments were received from the public during the 60-day public comment period. To the extent possible, all comments received were addressed in this revised efficiency plan.

Copies of all public notice announcements, all public comments, and the official plan adoption resolution from the Board of Directors are provided in **Appendix C.**

6.3 EFFICIENCY PLAN APPROVAL

6.3.1 Local Approval

Public comments and proposed changes were presented to the District Board of Directors on August 15, 2018. The Pinery Water and Wastewater District Board of Directors formally adopted the 2018 Water Efficiency Plan on August 15, 2018.

6.3.2 CWCB Approval

The Pinery Water and Wastewater District 2018 Water Efficiency Plan was submitted to the Colorado Water Conservation Board and Drought Planning (CWCB) on August 22, 2018. On September **XX**, 2018, the District received official notification that the plan was approved by the CWCB.

6.4 WATER EFFICIENCY PLAN REVIEW AND UPDATE

The District plans to review and update this conservation plan every seven years. The next update is scheduled to be completed in 2025.

APPENDIX A

Water Efficiency Activities for Screening [1]	State Statute Requirement [2]	Identification		Qualitative Screening [5]					Carry to Evaluation [6]	Reason for Elimination [7]
		Existing/ Potential Activity [3]	Targeted Customer Category [4]	High Public Acceptance	Implementable from Staff/Resource	Technically Feasible	Economically Viable/Cost Effective	Sufficiently Reflects Goals		
Metering (BP1)	V, VII									
Automatic Meter Reading Installation and Operations		E	All	X	X	X	X	X		
Submetering for Large Users (Indoor and Outdoor)		E	C,L	X	X	X	X	X		
Meter Testing and Replacement		E	All	X	X	X	X	X		
Meter Upgrades		E	All	X	X	X	X	X		
Identify Unmetered/Unbilled Treated Water Uses		E	All	X	X	X	X	X		
Data Collection - Monitoring and Verification (BP2)										
Frequency of Meter Reading		E	All	X	X	X	X	X		
Tracking Water Use by Customer Type		E	All	X	X	X	X	X		
Upgrade Billing System to Track Use by Sufficient Customer Types		E	All	X	X	X	X	X		
Tracking Water Use for Large Customers		E	C,L	X	X	X	X	X		
Area of Irrigated Lands in Service Area (e.g. acres)		P	R	X		X		X	X	
(BP1)	VII, VIII									
Volumetric Billing		E	All	X	X	X	X	X		
Water Rate Adjustments		E	All	X	X	X	X	X		
Frequency of Billing		E	All	X	X	X	X	X		
Inclining/Tiered Rates		E	R	X	X	X	X	X		
Water Budgets		P	R			X		X	X	
Tap Fees with Water Use Efficiency Incentives		P	All	X		X		X	X	
<i>Add additional activities</i>										
System Water Loss Management and Control (BP3)	V									
System Wide Water Audits		P	All	X		X		X	X	
Control of Apparent Losses (with Metering)		E	All	X	X	X	X	X		
Leak Detection and Repair		P	All	X		X		X	X	
Water Line Replacement Program		E	All	X	X	X	X	X		
Planning (BP2)										
Integrated Water Resources Plans		P		X		X		X	X	
Master Plans/Water Supply Plans		P		X		X		X	X	
Capital Improvement Plans		E		X	X	X	X	X		
Feasibility Studies		E		X	X	X	X			
Staff (BP4)										
Water Resources Technician		P	All	X		X		X	X	
Instructions:										
[1] This column provides a list of possible activities & identifies the Best Practice activity as defined in the Colorado WaterWise Guidebook of Best Practices (BP) for Municipal Water Conservation in Colorado. List additional activities identified through the planning process.										
[2] This column identifies, by roman numeral, the elements that correspond with the best practices and that shall be fully considered in the planning process per Colorado State Statute 37-60-126.										
[3] Specify whether the activity is "Existing" or a "Potential" activity to carry through screening by entering an "E" or "P", respectively.										
[4] As applicable, specify which customer category (residential, commercial, etc.) is/would be impacted by the activity.										
[5] Enter screening criteria based on qualitative goals developed in Step 3 and insert an "X" for activities that meet the listed screening criteria.										
[6] Based on the screening process, indicate which activities will be carried onto the the evaluation phase with an "X".										
[7] If eliminated via screening, comment on why.										
Legend:						Explore the Item				
						Requires Additional Staff and/or New Staff Responsibilities				
						Recommend Doing				
						Ongoing Effort/Scheduled				
						Already Doing				

APPENDIX B

DEFINITIONS

Acre-Feet; AF	An acre-foot is a unit of volume commonly used in the United States in reference to large-scale water resources. As the name suggests, an acre-foot is defined as the volume of one acre of surface area to a depth of one foot. One acre-foot equals about 325,581 gallons
ET; Evapotranspiration	Evapotranspiration (ET) is the sum of evaporation and transpiration and includes evaporation from surface-water bodies and from the ground surface along with the release (transpiration) of water from plant leaves.
SMWSA	The South Metro Water Supply Authority (SMWSA), founded in 2004 created a regional water authority with 13 south Denver Metro water provider members which represent about half of Douglas County and 10% of Arapahoe County, based on land area, with a mission to provide a secure and sustainable water future for the region.
Tertiary Wastewater Treatment	Tertiary wastewater Treatment refers to a three-stage treatment process for wastewater. The purpose of tertiary treatment is to provide a final treatment stage to further improve the effluent quality before it is discharged to the receiving environment (sea, river, lake, wet lands, ground, etc.).
WISE	The Water Infrastructure and Supply Efficiency (WISE) Partnership is a regional water supply project between Aurora Water, Denver Water and South Metro Water Supply Authority. The agreement was established in 2009, when the parties determined they would collaborate to utilize available resources for the benefit of each participating water provider.

APPENDIX C

PUBLIC NOTICE ANNOUNCEMENT, PUBLIC COMMENTS, AND OFFICIAL PLAN ADOPTION RESOLUTION

The following Public Notice was published on June 21, 2018 in the Douglas County News Press and on the Denver Southeast Suburban Water and Wastewater District, d/b/a Pinery Water District website (www.pinerywater.com).

WATER EFFICIENCY PLAN

Subject: Denver Southeast Suburban Water and Sanitation District,
d/b/a Pinery Water and Wastewater District

PUBLIC NOTICE OF WATER EFFICIENCY PLAN

DENVER SOUTHEAST SUBURBAN WATER AND SANITATION DISTRICT, D/B/A PINERY WATER AND WASTEWATER DISTRICT

PUBLIC COMMENT PERIOD: JUNE 21 – AUGUST 20, 2018

**PUBLIC HEARING: DENVER SOUTHEAST SUBURBAN WATER AND SANITATION DISTRICT,
D/B/A PINERY WATER AND WASTEWATER DISTRICT BOARD of DIRECTORS, AUGUST 15, 2018**

Notice is hereby given that the Denver Southeast Suburban Water and Sanitation District, d/b/a Pinery Water and Wastewater District ("District") is updating its Water Efficiency Plan, pursuant to State Statute. The District is seeking public comment over the next 60-days and will conduct a Public Hearing on the Plan during the Board of Directors Meeting on August 15, 2018. The Board of Directors Meeting will be called to order at 6:30 PM in the Board Room at the District headquarters building, 5242 Old Schoolhouse Road, Parker, Colorado. Comments on the Water Efficiency Plan will be received during the time designated in the meeting's agenda.

The District's Water Efficiency Plan is designed to promote the efficient consumption of all water usage by residents and other users in the District to more beneficially use our water resources and insure a future adequate water supply. The Water Efficiency Plan is available for review by the public at the District headquarters during regular business hours, or a copy of the plan can be downloaded from the District's website: www.pinerywater.com.

Anyone wishing to comment on the Plan may submit their comments in writing or can present their comments in person at the August 15, 2018, Board Meeting, or have written comments submitted to the District headquarters no later than 4:00 PM on Monday, August 20, 2018.

The District's Board of Directors will consider the Plan in the form presented at the Board of Directors Meeting on August 15, 2018. In the event that the Board votes to approve the Plan at the Board of Directors Meeting on August 15, 2018, such approval shall be subject to additional substantive written public comments received no later than 4:00 PM on Monday, August 20, 2018.

BY ORDER OF THE BOARD OF DIRECTORS OF
DENVER SOUTHEAST SUBURBAN WATER AND

SANITATION DISTRICT, D/B/A PINERY WATER
AND WASTEWATER DISTRICT

/s/ Walter E. Partridge

Chairman