

Final

**Water Conservation and Use Efficiency Plan
Mt. Crested Butte Water and Sanitation District**

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Prepared by

Sustainable Practices

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Executive Summary

The Mt. Crested Butte Water and Sanitation District (hereafter “MCB” or “the District”) chose to develop this Water Conservation Plan to help the organization improve its water use efficiency through improved water loss management and reduce the impact of seasonal customer water demands. The District was not required to develop this Plan; instead it sought State grant funding to voluntarily conduct those tasks needed to create a meaningful Water Conservation Plan. The focus of the planning effort was to collect and organize those data that would help to understand how the District operates, and what the best management practices (BMPs) the District currently uses to measure non-revenue water (i.e., that water that is produced and treated by the District but is not sold), collect customer water metering data, bill water use, and generally manage operation, including budgeting for maintenance and capital projects.

As a result of the data collection and assessment effort presented in the Plan, the District has selected programs that will achieve the stated water conservation goals, including the following measures and programs:

- Improve overall water loss management;
- Update MCB Rules and Regulations that support improved indoor and outdoor water use efficiency;
- Reduce seasonal customer demands; and
- Support improved educational and outreach programs.

The BMPs related to improved overall water loss management include those that:

- Improve quantification of authorized unmetered uses;
- Improve data use and management; and
- Continue real loss management.

The Rules and Regulations that MCB will improve and enhance will include:

- Requiring new construction and retrofits and remodeling efforts to utilize high efficiency plumbing fixtures and appliances;
- Improving the way that the District prepares for and responds to drought;
- Improving the way that the District defines and enforces water waste; and
- Improving how water is charged for especially as it relates to increasing power and chemical costs, and the costs of high seasonal water use.

Seasonal water demand management will leverage the positive impact of improved water loss management and enhanced Rules and Regulations. Seasonal water demand will also be supported with future water auditing of and partnering with large water users to support better customer education.

Costs to implement the Water Conservation Plan will come from current operating expenses and the District’s capital improvement budgeting process.

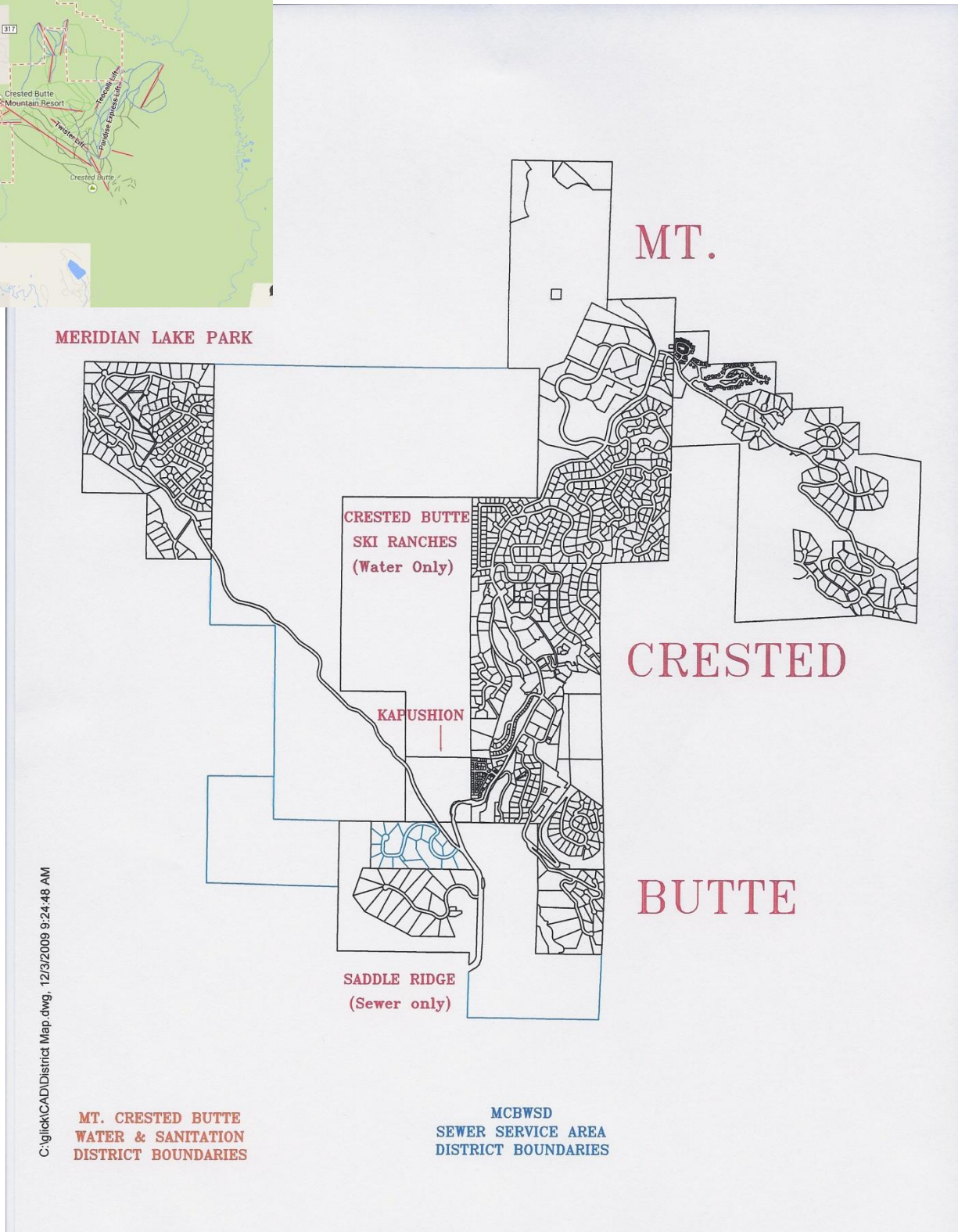
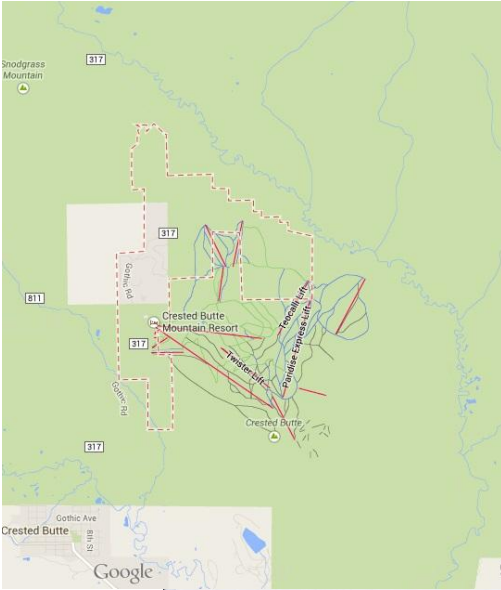


Organizational Background

Mt. Crested Butte Water and Sanitation District (hereafter “MCB” or “the District”) was created in May of 1963 under the State of Colorado Special District provisions, 11 years before the Town of Mt Crested Butte was established in 1974. Mt. Crested Butte Water and Sanitation District is not part of the town; it is its own separate entity. In the early years, from approximately 1963 to about 1971, MCB had one part-time employee to look after both the water and sewer systems. Sometime during 1971 the operator’s job became full-time. In February 1974, staff size was doubled to two operators. MCB now has a staff of 13 full-time employees. Three staff members in the office and five operators in water and four operators in wastewater.

MCB provides water and sewer service to approximately 800 residential and commercial customers, which includes providing potable water service to up to 10,000 people during the winter ski season peak weekends and holidays. MCB serves approximately 3.055 square miles (or slightly less than 2,000 acres) (see Figure 1). MCB provide water and sewer service to all of the town of Mt. Crested Butte and Meridian Lake Park subdivision.

Figure 1 – Mount Crested Butte Water and Sanitation District Service area



Purpose of the Plan

The purpose of this Water Conservation Plan (hereafter “Plan”) is to support improvements in water use efficiency and practices of water conservation within MCB’s service area – associated with system wide management, water production and treatment, water distribution, delivery of water to customers and customer water demand. MCB is not a covered entity¹, by definition; however, the organization realizes that as the Statewide Water Supply Initiative (CWCB, 2004, 2010) indicated, many headwaters locations in the State are subject to seasonal and long-term water shortages. These shortages may be related to the impacts of growth and the lack of viable alternative water supplies. Therefore, MCB has chosen to proactively plan for improved water use efficiency and water conservation as a part of its overall water resources planning strategy.

This Plan will be prepared using the State’s Water Efficiency Plan Guidance Document and the related Water Conservation Plan Template, to the extent that these references are relevant to MCB given its size, nature of its service population (i.e., significant part-time/tourist populations), and geography (i.e., high country and headwaters locale). In addition, this Plan uses the Southeastern Colorado Water Conservancy District’s BMP Tool Box for water conservation to help organize and evaluate measures and programs that are appropriate for MCB. Finally, this Plan is anticipated to be a living document that is used to guide and direct the real time allocation of resources related to the improvements of local water use efficiency both for the management of MCB infrastructure and customer demands.

¹ As per State Statute CRS 60-37-126 (see Appendix A), a “covered entity” means each municipality, agency, utility, including any privately owned utility, or other publicly owned entity with a legal obligation to supply, distribute, or otherwise provide water at retail to domestic, commercial, industrial, or public facility customers, and that has a total demand for such customers of two thousand acre-feet or more. Covered entities are required under statute to develop and submit a water conservation plan to the Colorado Water Conservation Board for review and approval.

Water Supply Characteristics

MCB is a direct diverter of surface water rights that they maintain on the streams and tributaries of the East River above Gunnison. MCB diverts from Woods Creek (as mountain springs) and the East River using direct diversions. In addition, MCB also receives some direct surface supplies from the Malensek #5 Ditch. To serve its customers, MCB operates two water treatment plants – the East River Water Treatment Plant (WTP) and the Meridian Lake WTP. The East River WTP, which has a capacity of 1.0 million gallons per day (mgd), receives direct flows from its three surface water sources listed above, whereas the Meridian Lake WTP receives flows from a reservoir and gravity flows both which originate from Washington Gulch diversions². At these treatment plants, MCB filters and disinfects its potable water with a UV system, which is then chlorinated and pumped to storage for distribution. Each treatment plant serves different portions of the MCB distribution system such that there are no interconnections between the two water supply systems.

Treatment plant backwash constitutes a water loss of about 13-18% of influent water supply at the East River WTP, based on 2012, 2013 and 2014 data. Filter backwash water is recycled back into the source water at the East River treatment facility, where it is blended with raw water coming from the diversions. No data is available to characterize the flush water system at the Meridian Lake WTP due to the lack of physical space for metering. The microfiltration system unit at the Meridian Lake WTP uses flush water, air scrub and less frequently a Clean in Place system. The flush water from the Meridian Lake WTP is discharged to the sanitary sewer for treatment and ultimate discharge back to the Slate River.

Note that water collected for treatment at the East River WTP comes from multiple sources. Water diverted from the East River is pumped on demand to a pre-sedimentation pond. This pond also collects water via gravity feed 24/7 from the mountain springs and the Malensek #5 Ditch (which draws from an East River tributary). When the pond is full, there is an overflow back to the East River³. The Meridian Lake WTP is fed from a reservoir which dictates, along with the water right⁴, the amount of water that may be diverted to that location. However, in most months (when meters are in place and in good working condition), the flow measured at the diversions is less than what is measured as WTP influent. At the East River WTP, combined flow from the three diversions equates to about 55% of the influent flow over the past 20 months (January 2013 through September 2014). Even with the backwash water contribution of 13-17%, there appears to be a gap between diverted water and treated water. It may be that the mountain spring meter is not accurate within certain operating ranges of flow (i.e., between

² Washington Gulch is a tributary of Slate River which is a tributary of the East River. Note that the Meridian Lake WTP receives its flow from a diversion of a small tributary to Washington Gulch via the Jaklich Ditch.

³ A pond overflow meter is scheduled for installation in 2015.

⁴ Both the reservoir and Jaklich Ditch can be subject to a call, which typically occur in September or October and are of a short duration.

peak runoff and late summer, flow can vary greatly⁵). Data characterizing diverted water volumes and influent flows at the Meridian Lake WTP were not available at the time of preparation of this document⁶.

Overall, there appears to be some issues with the accuracy of the flow meters at the upstream end of the MCB water system. It may be that the influent and effluent flow meters are inaccurate, or that the meters measuring diversion flows are inaccurate⁷, or it may be a combination of both. Nonetheless, it would appear that MCB would benefit from testing and if necessary, improving the master metering of its water supply system. Evaluating and effectively managing distribution system water loss, as well as back wash return flows, will be compromised until such time as the diversion and WTP related metering issues are resolved.

On the other hand, the District’s customer meters appear to be functioning well. MCB utilizes radio read (AMR) technologies to collect monthly customer use data from the individual customer water meters that they operate and maintain. At MCB, individual meters⁸ are tracked as either commercial/commercial/condo mix or single meter dwellings. MCB also tracks institutional uses for the Water and Sanitation District and the Town of Mt. Crested Butte⁹. Table 1 summarizes the amount of treated water and retail water sales associated with the past six (6) years of operations.

Table 1 Summary of Water Production and Customer Demand for Mt. Crested Butte						
	Water Treatment Plant Flows (AF)			Customer Demand (AF)	Non-Revenue Water (AF)	% Non-Revenue Water¹⁰
	Meridian Lake	East River	Total			
2008	24.6	509.2	533.8	252.6	281.3	53%
2009	23.2	508.7	531.9	260.5	271.4	51%
2010	26.5	479.1	505.6	265.0	240.6	48%
2011	24.3	487.1	511.4	300.1	211.4	41%
2012	26.9	462.2	489.1	297.7	191.5	39%
2013	31.7	435.3	467.0	260.1	206.8	44%

Based on these data, it can be seen that deliveries of water from the East River WTP have declined fairly consistently since 2008, whereas, customer demand increased from 2008 until it peaked in 2011¹¹. Non-

⁵ It may be of benefit to evaluate a compound meter for this location.

⁶ Metering of reservoir water discharge to the Meridian Lake WTP has been available since about 2007; however, retrieval of the data was hindered by weather 6 months of the year. New SCADA system has been online since October 2014 measuring reservoir discharge to the Meridian Lake WTP.

⁷ MCB replaced the flow meters at the Woods Creek and East River diversions in November 2012. It also installed a flow meter at the Snodgrass Diversion (i.e., the Malensek #5 Ditch) in September 2014. No diversion metering occurs on the water source (i.e., Jaklich Ditch) to the Meridian Lake WTP.

⁸ In 2013, Mt. Crested Butte had 796 customers, with 885 meters.

⁹ Not all water used by the District is metered, as will be discussed in the section on non-revenue water.

¹⁰ Non-revenue water, which is a term defined by the American Water Works Association, is calculated as the difference in the sum of water treatment plant effluent flows less customer demand. Percent (%) non-revenue water is non-revenue water divided by the sum of water treatment plant flows. More detail regarding non-revenue water is discussed in a later section of the Plan.

¹¹ The billing data provided through MeterProof contained a few false high readings associated with isolated irrigation and residential meters. These readings were “scrubbed” from the billing data base. Note that the errors associated

revenue water, which is the difference between water placed into distribution and water sold to customers, has decreased each year through this same period of customer demand increase, continuing through 2012; however, in 2013 non-revenue water increased to greater than 200 AF (or 44% of the combined effluent from the two water treatment plants).

It is worth noting that a reduction in water production could have been a result of aggressive water loss management¹²; however, the District did not implement any rigorous new water loss management programs during the 2008 through 2013 time period, further implicating the lack of master meter accuracy. If water production tracked upward with new customer connections and per connection use (see Tables 2 and 4), annual water production would have been expected to increase by 30 to 40 AF (including the effects of non-revenue water) from 2008 to 2013 rather than decrease by 67 AF¹³.

Given the relative importance of non-revenue water to the District in its future conservation efforts, additional assessment of non-revenue water is provided in a later section of this Plan.

with false high readings which were on occasion substantially were reduced in 2013, as compared to 2011 and 2012. Also note that false high readings for water use mask the “actual” non-revenue water by artificially inflating water sold.

¹² From the period 2008 through 2012, non-revenue water was reduced by over 30%.

¹³ Evapotranspiration for the summer months (May through September) 2009 was less than that for 2013 (24.54 inches versus 25.82, respectively) meaning that seasonal water use should be higher per connection in 2013 versus 2009.

Customer Water Use Characteristics

MCB serves commercial (e.g., hotels and restaurants), mixed use (commercial and condominium mixed units), condominium only, residential and institutional customers. The institutional users include the Town of Mount Crested Butte and the Water and Sanitation District, both of which have 3 customer taps. In addition, the District allows for irrigation only taps that are provided to HOAs and large commercial and condominium customers. Table 2 summarizes the customer types and number of connections over the past six (6) years, based on billing data.

	2008	2009	2010	2011	2012	2013
Commercial	7	7	7	7	7	6
Mixed Use	11	11	11	11	11	10
Condominiums	47	47	56	56	56	45 ¹⁴
Irrigation Only	16	21	20	21	25	23
Town of MCB	3	3	3	3	3	3
MCB Water and Sanitation District	2	2	3	3	3	3
Residential (Single Family)	521	567	685	690	693	696
Total	607	658	785	791	798	786

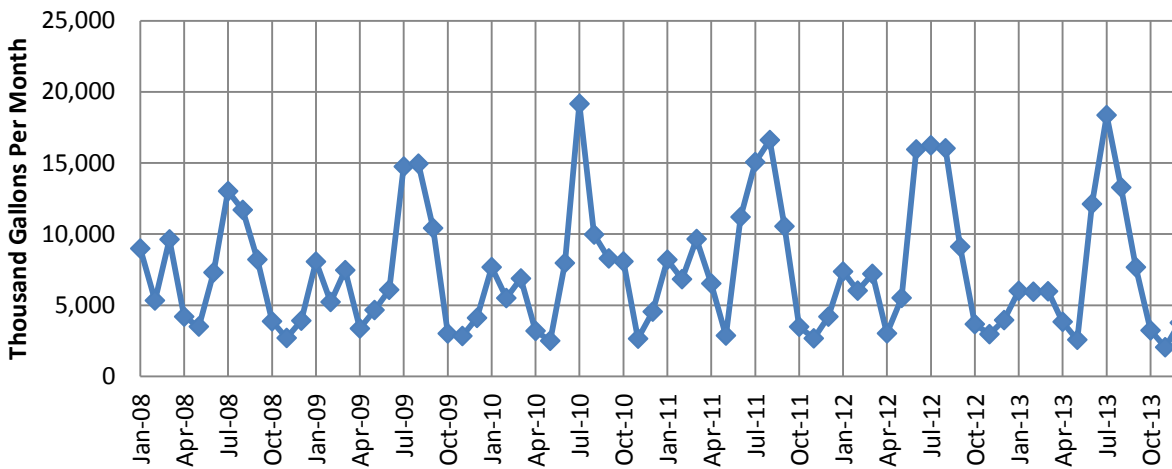
Water use in MCB service area is split somewhat evenly between residential and combination of condominium and mixed use, with both at about 45% of total use, annually. Condominiums and mixed use buildings use more of the wintertime water, whereas residential use is a higher percentage in the summertime. Table 3 presents the breakdown of the percent water use by customer type for MCB.

	Wintertime	Summertime	Annual
Commercial	5%	2%	3%
Mixed Use	29%	16%	21%
Condominiums	33%	23%	23%
Irrigation	0%	6%	4%
Town of MCB	0%	1%	1%
MCB Water and Sanitation District	3%	3%	3%
Residential (Single Family)	30%	49%	45%

The trends of seasonal use are evident in Figure 2 which presents the monthly water demand¹⁵ over the period from 2008 to 2013. The figure illustrates a “double hump” in peak water demand – one in the winter during ski season and the other in July related to summertime visits.

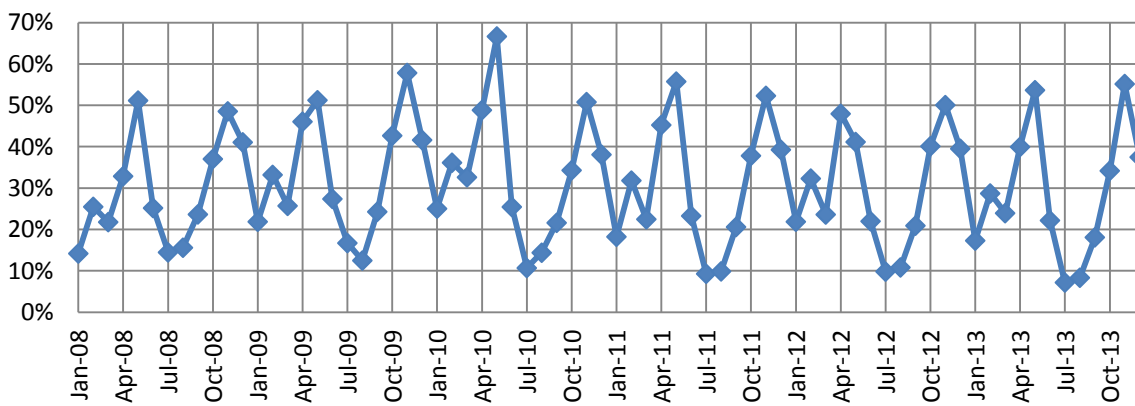
¹⁴ The decrease in condominium connections relates to one building with multiple taps (9) being demolished along with two other buildings (totally 11 taps).

Figure 2 - Water Sold by Month - 2008 to 2013



The trend of seasonal use is further illustrated by the percentage of residential customers that have zero water use for any given month over the six (6) year period of record (see Figure 3). These zero read customers are presumably those entities that have second homes and/or vacation use homes that are occupied for only a portion of the year – which appear to constitute over 45% of the total active residential customers twice per year (in the spring (May) and fall (November)). In May 2010, over 60% of the residential connections were inactive.

Figure 3 - Residential Customers with Monthly Zero Water Use



Based on a comparison of these two figures (Figures 2 and 3), and noting that residential water use constitutes about 50% of summertime demand in the District (Table 3), it may be valuable to address second home water use as a part of future water conservation programs. However, it may be that the second home water use, similar to condominium use, relates to one time visitors to the area; limiting the reach of long-term educational or messaging programs. Because residential and condominium use may

¹⁵ Water demand equals water sold which includes water billed to MCB Water and Sanitation District and the Town of Mount Crested Butte.

be associated with a large percentage of one-time visitors, future residential conservation may be best served through code development and enforcement related to the placement of high-efficiency fixtures and appliances (which would be made to be consistent with EPA Water Sense criteria and/or are more stringent). New and/or amended codes and ordinances could be developed to apply to both new homes and point-of-sale for existing homes, as well as to condominiums.

Table 4 presents the change in annual water demand by per connection by customer type over the period 2008 through 2013.

Table 4 – Annual per Connection Water Demand by Customer Type (in thousands of gallons)						
	2008	2009	2010	2011	2012	2013
Commercial	355.0	487.1	340.9	348.0	388.6	398.8
Mixed Use	1,661.6	1,614.5	1,549.5	1,754.5	1,889.1	1,775.2
Condominium	547.2	576.3	460.9	459.9	414.9	382.0
Irrigation	169.0	259.3	180.7	191.3	183.5	121.7
Residential	58.4	55.3	60.6	59.9	65.8	55.1
Town*	398.0	456.0	182.0	1,154.0	149.0	1,192.0
MCBWSD*	2,485.0	1,978.0	2,104.0	3,954.0	2,218.0	2,430.0
ET ¹⁶	n/a	24.54	25.30	25.18	26.19	25.82
Skier Visits	416,009	358,735	341,260	362,570	305,290	309,412

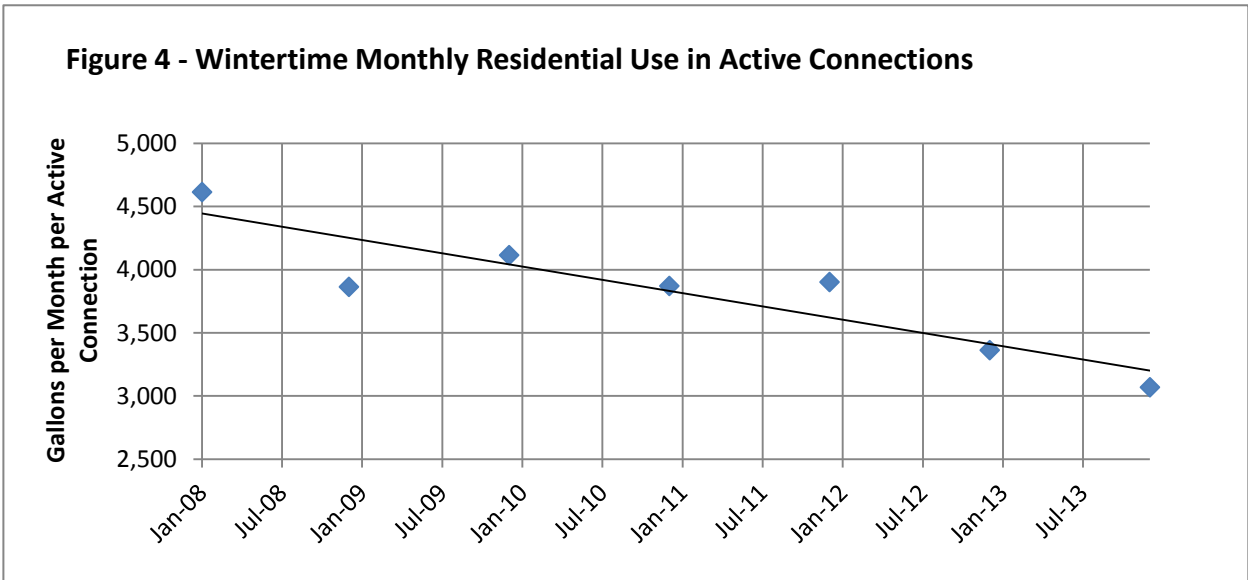
* Town and MCBWSD uses are total annual use for each entity rather than by connection.

This table presents a number of noteworthy points regarding how water demand and customer use has changed in the past 6 years. To begin with, residential per connection water use appears to be trending substantially downward in 2013. This could be related to more efficient water use behaviors by the homeowners, low-reading customer meters, fewer homes being occupied during the year, or a combination of these and other factors.

Given that the great majority of customer meters read less water than is actually used (industry standard for new meters is 98.5% of actual flow; old meters can read only 90% or less of actual flow), customer meters may be under reading the actual use. The District does not have a meter testing program; however, since the new EPA rule regarding metals in customer meters, the District has determined that any poorly performing meter will be replaced, rather than tested.

¹⁶ ET – Evapotranspiration in inches for the period May through September for each year included in the table calculated using Blaney-Criddle method (State Demographer, 2014)

With respect to changing water use behaviors, a closer look at residential per connection data indicates that wintertime water use has been decreasing within the District service area¹⁷ (see Figure 4). This figure shows that on average wintertime water use, which is equated to indoor only water use, decrease by about one third or 33% from the winter of 2007-8 to the winter of 2013-4. If the winter of 2007-2008 was artificially high due to systematic data handling errors (which were known to occur prior to 2011 associated with false meter readings that occurred as irrigation meters were pulled from service), using the average wintertime per connection residential demand from 2009 through 2011 (~3,950 gallons per connection per month (gpcm)) compared to the same figure for 2012 and 2013 (~3,220 gpcm), the reduction is estimated to be in the range of a more modest 18.5%.

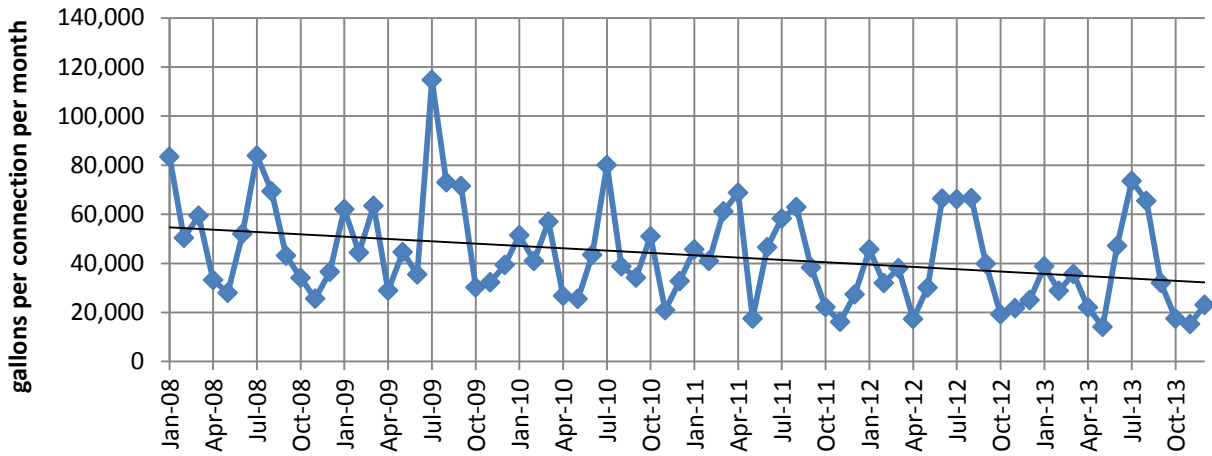


A wintertime indoor water use reduction is typically considered to be related to passive water conservation savings that occur as older fixtures and appliances are updated with new, high efficiency fixtures and appliances as a result of new construction and repairs of older construction. Typically, passive water savings are less than 18.5% for the five years 2009 to 2014; predicted to be closer to 3-4% (GWI, 2010). Therefore, some other factor(s) appear(s) to be influencing indoor wintertime residential water use (e.g., change in occupancy, meter inaccuracy, etc.). Note that annual skier visits have consistently decreased since 2008, which may influence the calculation of gallons per connection (see Table 4), in that skier visits from 2008 to 2013 dropped about 11.5%, such that the combination of passive savings and the drop in skier visits is about 14.5 to 15.5% .

¹⁷ Wintertime residential water use was calculated for the period November through April for each winter, using only those customers with non-zero water use during that period.

Condominium water use has also trended downward within the District’s service area based on the data in Table 4 (also see Figure 5¹⁸). Reduced condominium water use may be influenced by many factors such as increased vacancy (condominium meters service multiple units), changes in number of persons visiting per unit, decreased leaks, improved indoor efficiencies through updated fixtures and appliances, improved water use behaviors by customers (for indoor and outdoor use), decreased accuracy of

Figure 5 - Monthly Condominium Water Use Active Per Connection

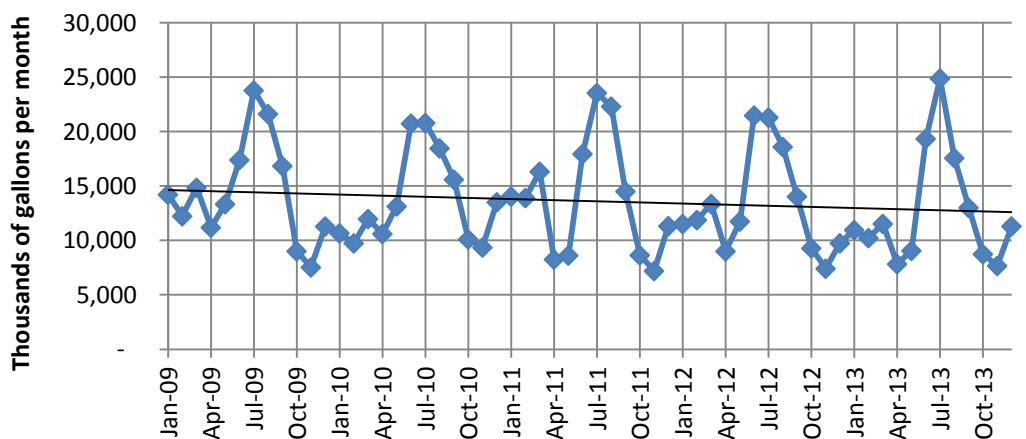


customer meters, etc. It is unclear as to what degree any, if not all, of these factors influence the decrease; however the decrease is marked, estimated using the linear trend line shown in Figure 5 to be as much as 30% (for an average month) from 2008 to 2013. The decrease appears to extend to both indoor and outdoor water use.

Note that neither mixed use or commercial use per connection appear to demonstrate a long-term trend of reduced water use per active connection.

Overall, water production has decreased slightly over the past 5 years as indicated in Figure 6. This decrease, represented

Figure 6* - Monthly Water Production by MCB



*Figure 6 has been deliberately shifted to the right to maintain a scale that is consistent with that used in Figure 5

¹⁸ Figure 5 is monthly condominium water use per active connection (meaning all non-zero customer connections).

by the linear trend line as a decrease of about 15% has not kept pace with the reductions in condominium and residential use. In addition, the number of customer connections being serviced by the District over this period of time (2009-2013) has increased by about 22%.

Therefore, it appears that total water sold (Figure 2) and total water production (Figure 6) indicate that processes are influencing customer water demand within the District that have effectively offset the increased number of customer connections, and have in some cases reduced overall customer water use.

Other important observations associated with the Table 4 per connection uses include the following:

- Municipal use by the Town of Mt. Crested Butte includes three high months of use (April and May 2011 and June 2013). Water use during these three months is nearly equivalent to the combined total water use of the other 6 years of water demand for the Town less these three months. Given that the Town may have short-term intense water use that occurs on rare occasions, it may be valuable for the District to work with the Town to prepare for and support these unusual water use needs as a means to improve water use efficiencies. The District should also verify that these water uses are accurately measured.
- Per connection irrigation use does not logically track with evapotranspiration (ET) (shown in Table 4) in any given year, for high irrigation demand appears to occur during years with lower ET rates (e.g., 2009 and 2011). This observation may relate to false high readings from irrigation meters related to closing meters in the winter and restarting them in the summer. The District should evaluate the practice of how irrigation meter readings are gathered and correct the billing records if usage is inaccurately depicted¹⁹. Over estimating irrigation usage through mis-recordings will reduce the precision of estimates of non-revenue water and real and apparent losses for the District, compromising the integrity of the MCB water loss management program.
- MCB also had unusually high water use in 2011, which appears to relate to the cumulative effects of a number of months of elevated water use. Since 2011, MCB appears to be using about 40% less water as compared to the 2011 demand. The District may find benefit in evaluating the high water use associated with 2011 to determine if BMPs would be of benefit to limit future situations that might substantially increase demands in the future.

Per Capita Water Use

The use of per capita water use as a metric for evaluating water use efficiency is somewhat limited for MCB – since the District’s service area and customer water demands are substantially impacted by tourist visits. MCB chiefly serves as a residential community for seasonal visitors and second home owners since occupancy rate is rarely above 70% (see Figure 3). The District also serves commercial customers including restaurants, bars, multi-use lodging and the ski area, which can be affected by the transient nature of the number of visitors to the area – which can include 6,000 skiers on a peak weekend day.

¹⁹ False high readings of irrigation use are one to two orders of magnitude greater than typical monthly usage. The District has employed “red-flag” checks to find and correct instances of these occurrences in recent years; however past errors in recorded water use may not have been all caught and revised.

Table 5 present estimates of per capita water use based on measured water demand and estimated full time populations used for planning by the District, as well as per capita water use based on estimated skier visits. Note that summertime visitors are not currently tabulated but may be in the range of another 100,000 person days. Summertime visits are not factored into the calculations presented in Table 5. Also note that since customer meter accuracy is in some question, given the age of the meters that are currently in place, per capita water use could be higher than reported in Table 5.

As indicated earlier, population served is not expected to grow at a rate greater than recent past growth, which averages about 0.1% per year for MCB. The actual increase in water demand may be substantially greater or lesser than may be predicted by population served given that water demand fluctuates based on weather and tourist visits.

	Water Demand (AF)	Population Served	Per Capita Water Use (gal/person/day)	With Ski Area Visitors (gal/person/day)^a
2010	265.0	798	296	137
2011	300.1	799	336	149
2012	297.7	799	333	162
2013	260.1	801	290	141

^a based on the number of skier visit days per year (as presented in Table 4).

It will be the goal of the District to utilize this Plan to help understand these trends and utilize this knowledge to develop future conservation programs that address the needs of the District and the community that it serves, along with helping the District to best manage its resources, which includes setting appropriate water rates, managing water loss, and promoting efficient water use.

Non-Revenue Water and Water Loss

Non-revenue water, which was discussed briefly on pages 5 and 6, is the water placed into the distribution but is not sold to customers. Non-revenue water includes both authorized and unauthorized consumption. Authorized consumption may include hydrant flushing, some construction water, water treatment plant uses, and some Town uses, whereas unauthorized consumption may include water theft. The other key components of non-revenue water include real losses and apparent losses. Real losses are both detected and undetected leaks in the distribution system and customer service lines on the utility side of the meter (leaks after the customer meter are not included in non-revenue water; unless the District forgives large one-time leaks for individual customers on a case-by-case basis²⁰).

Just like the situation facing utilities throughout the country, the precision of estimating non-revenue water for the District is influenced by a number of factors. These factors may include some or all of the following:

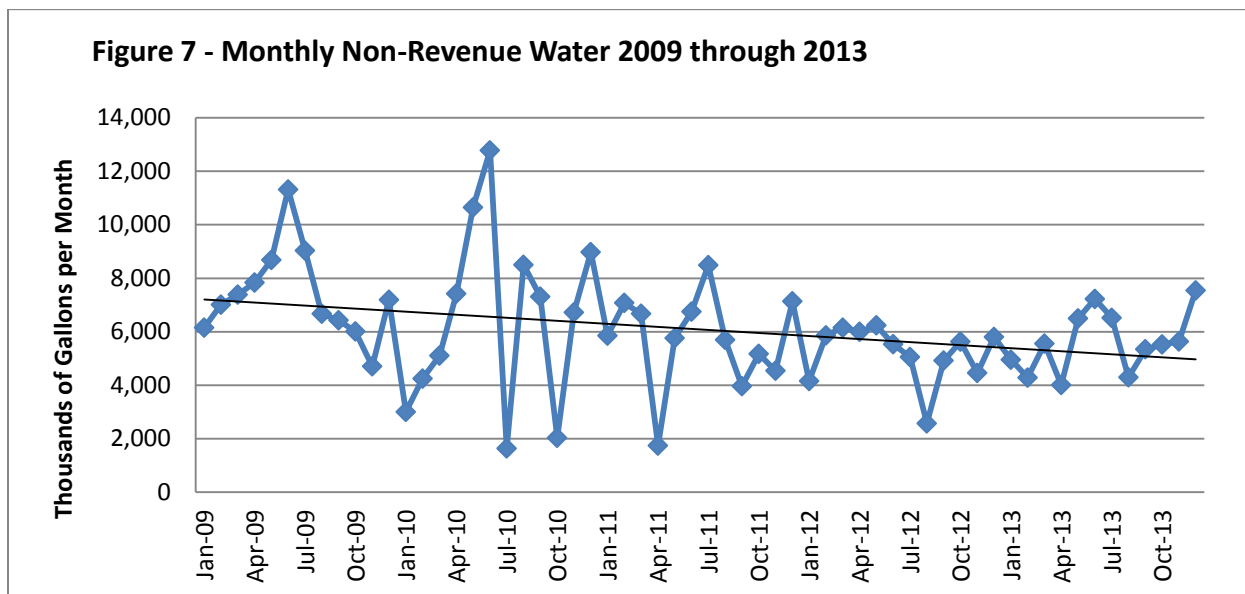
- The accuracy of meters measuring water being placed into the distribution system – for the District, master metering may under estimate water being placed into distribution, with the affect of under estimating non-revenue water;
- The precision of customer meters – for the District, customer meters are fairly accurate but may be reading low (less water recorded than used by the customers), with the affect of over estimating non-revenue water; and
- Some data handling errors – for the District, occasional irrigation meter readings can be too high by a factor of one to two orders of magnitude, with the affect of under estimating non-revenue water.

For these reasons, any estimate of non-revenue water must be tempered with an understanding of the source data.

In addition, non-revenue water includes authorized uses that are unbilled. It is the unauthorized consumption and real and apparent losses portions of non-revenue water that are of concern to utilities nationwide. Non-revenue water is a term of science that the American Water Works Association uses to help utilities track and characterize the value of water that is not sold, and the components of the unsold water.

Figure 7 presents the results of monthly accounting for non-revenue water dating back to January 2009. As illustrated by those data presented, non-revenue water has been highly variable in years past, especially in 2010 when wide swings were observed - from greater than 12 million gallons in one month to less than 2 million. These variations are likely associated with variations in data collection methods and the timing of meter reading, since it appears that typically non-revenue water was high one month, low the next.

²⁰ Forgiveness of customer leaks is considered authorized, unbilled consumption.



Overall, non-revenue water has trended downward (as seen in Figure 7 and in Table 2); both in terms of a percentage of water produced and total volume, dropping from over 280 AF in 2008 to about 200 AF in 2012 and 2013. This represents a nearly 30% reduction in non-revenue water. The observed reduction may relate to leaks being founded and repaired, as well as improved water loss management efforts. Some improvements that have been made to the master metering of water being placed into the distribution system may be partially responsible for the reduction in non-revenue water²¹.

One particular improvement to characterizing non-revenue water that has occurred in recent years by the District relates the reduction of past data handling errors, even though repairing some of these errors has had the effect of increasing estimated non-revenue volumes. For example, in 2009 and 2010, into parts of 2011, the District’s billing data contained a limited number of erroneous customer water use records that had gone undetected and therefore uncorrected. These erroneous records were most often identified as water use volumes for taps that were substantially higher than actual use – sometimes by 2 or 3 orders of magnitude – especially for irrigation only meters that were alternatively active and inactive. The District has since implemented customer meter data reviews to identify and adjust those records that appear suspicious.

As indicated above, not all non-revenue water is unauthorized. For example, the District has a number of authorized uses for water that it does not sell. These authorized, unbilled uses include:

- Water main flushing
- Bulk water fill station (for construction)

²¹ Although MCB has improved its metering of water being diverted from East River and its other surface water supplies, the District would benefit from improved master metering of all flows at diversion points and of treated water being placed into the distribution system as it leaves the treatment facility.

- In-house water use by the District (e.g., treatment and administration building bathrooms and kitchens)
- Water treatment plant water use (including filter back-wash and flushing, turbidity meters and chlorine analyzers, etc.)
- Timberland pump station winter operations (requires running water for freeze prevention)
- Prospect pump station (which is a looped system that recirculates water)

Each of these authorized uses contributes to the amount of non-revenue water realized by the District. In that currently none of the flows associated with these uses are metered, none of these authorized uses is accurately measured. Future improvements in metering of the various authorized uses will likely be a priority for the District in the future, since measuring these authorized uses will help to quantify unauthorized uses and real and apparent water loss.

Similar to all other water utilities, the District realizes, and therefore suffers from, apparent and real water losses. Apparent water losses include three types, or “accounts” – those associated with paper losses (e.g., customer meter inaccuracy), water theft and systematic data handling errors. For MCB, it is possible that all three of these accounts of apparent water loss may be impacting non-revenue water. Specific programs and best management practices (BMPs) may be recommended to help characterize and quantify each of these accounts as an outcome of this water conservation plan. For example, continued scrubbing the billing database to remove erroneous water use reports would be valuable in the support of accurate water loss characterization. Testing and replacing inaccurate customer meters may be another BMP that the District should consider, since some of its current customer meter inventory dates back more than 10 years. These BMPs will help to better characterize apparent losses, which in turn help to better quantify real losses. To this point, the District may wish to consider other BMPs to characterize and track real water losses associated with reported and repaired leaks, and to instigate proactive leak detection programs.

As previously indicated, it is important that the District evaluate means to improve the accuracy of the WTP effluent meters which may be in question due to the water balance tracked at the East River WTP. It is possible that the master meters at both of the District’s WTPs are not entirely accurate – either under reading or over reading the amount of water delivered to the distribution system. It is important, even imperative, for the District to test and evaluate the accuracy of these meters at the soonest possible convenience, for the current estimate of non-revenue water and related water losses may be substantially impacted by master meter inaccuracy.

Based on the available data, the cost of non-revenue water to the District, measured at the current rate of \$2.66 per thousand, has averaged over \$200,000 per year since 2008. **As previously stated, a portion of the non-revenue water is a result of authorized, unbilled uses such as treatment plant water use, preventative maintenance programs, and construction water use.** Metering these various authorized water uses will help the District to more accurately measure and track real and apparent water loss, and in doing so, help the District to make economic decisions regarding leak detection, leak repair, water line replacement, etc.

Forecasted Water Use

Water use within the MCB service area is not currently predicted to increase substantially over the planning horizon, which extends to 2022. This is somewhat evidenced by the slight change of customer demand from 2008 to 2013, which is an increase of about 3% in 6 years. However, this increase may well belie the actual dynamics related to future water demands, since customer use can be influenced by behaviors, weather, and inefficiencies in the delivery system (e.g., leaks). For this reason, a forecast of potential future demands was developed looking at both average (five in every ten years) and above average (nine of ten years) conditions.

As indicated previously, population growth is estimated to be about very low in MCB – only about 0.1% per year which translates to about 7-10 additional full-time residents in MCB by 2022, or about 810. Therefore, population growth does not in itself appear to be a driver with respect to future water needs – measured as either water production or water demand.

However, past changes in residential connections has increased by a factor of close to 1% per year, which would create 6 to 7 new connections per year through the planning period. Therefore, future water demands in 2022 could be in the range of 300 to 400 acre-feet (depending on average versus above average conditions) (see Table 6). Table 6 presents the results of the forecasted water demand based on those analyses presented in Appendix B.

	Average Conditions		Above Average Conditions	
	1000 gals	AF	1000 gals	AF
2013 (actual)	84,759	260	n/a	n/a
2015	90,783	279	121,113	372
2020	96,229	295	128,268	394
2022	100,076	307	133,376	409

Based on these projections, MCB will continue to need to improve its water delivery over time as customer demand increases. Water conservation and improved water use efficiency will continue to provide benefit to the District as customer demands increase, since current supplies are greater than expected demands; however the impact of water loss compromises water delivery such that improvements are needed to allow the current treatment capacity and distribution system to meet projected demands.

Note that typically residential customer water use per connection is expected to decrease over the period 2005 through 2020 related to the effects of passive water savings, which are those demand reductions that occur as fixtures and appliances are replaced organically with high efficiency models thus improving the water use efficiency of each household. For MCB, it is unclear if passive savings will be realized given that the occupancy rates and the number of persons per household change from month to month and year to year. Passive savings that may be on the order of 5 to 9% of indoor (or wintertime) demand for this time period may be masked by variations in visitor trips and household size. For this reason, passive savings reductions were not included in the projections of future water demand.

Current Water Conservation Programs

Water conservation planning and implementation in the upper East River valley has long been important to the management of local water resources. MCB has in place the following water conservation programs:

- Water waste ordinance
- Limitations on outdoor water use (e.g., car washing) and lawn irrigation
- Inclining water rate structure based on use

The water waste ordinance addresses the wise application of irrigation water on to unpaved areas, and dictates time of day watering restrictions. The water waste ordinance also allows the District to issue warnings, and for repeat offenders, fines related to water during restricted hours. Irrigation is only allowed between 5 and 10 am and 5 and 10 pm within the MCB service area.

Inclining block water rates that the District uses (which went into effect in 2015) start at \$2.75 per thousand gallons (after the base rate use of 11,000 gallons per connection is used). The tiers increase by \$0.25 to \$0.28 per thousand with each additional 10,000 gallons of water used by an individual customer up to 40,000, above which all water is \$3.55 per thousand. In addition, the District charges Meridian Lake customers a revenue bond assessment to pay for water treatment plant upgrades. This assessment is expected to be retired in 2015. Appendix C presents information on the District's current water rates and tap fees.

The District intends to consider changing the base rate to reduce the amount of water being provided as a component of the base rate, since about 86% of residential customers use 11,000 gallons of water or less each month. The District may benefit from changing the base rate and the amount of water provided to each tap, including residential taps, such that water bills more closely correlate to water use.

Also note that tap fees are correlated to estimated future water use as depicted in Appendix C²². It is therefore possible for the District to consider policy changes that would take into account high efficiency indoor water use for residential and commercial construction and potentially provide reductions in tap fees in accordance with expected reduced water use. The District may also benefit from developing regulations that define new construction plumbing code requirements and limit lawns in new landscapes.

MCB does not currently monitor and verify the value and impact of these programs on customer water use behaviors or overall water demand. In addition, MCB has not conducted a formal system-wide water audit or a proactive water loss management program. Finally, there may be other best management practices related to water production and treatment, water distribution, customer water delivery, customer water use and overall water system management that may provide cost effective and meaningful water conservation from the District perspective. For this reason, MCB will embrace formal water conservation planning with an eye toward improving local water use efficiency and reducing non-

²² Tap fees are based on square footage and number of fixtures in new structures and remodels. Only the Prospect subdivision (a new single family residential subdivision) has submitted landscape plans for review. The Prospect landscape regulations dictate sprinkler types and capacities.

revenue water. In addition, MCB will evaluate the benefits of water conservation on enhancing instream flows in the East River and its tributaries.

Current Operating Expenses and Capital Projects

MCB maintains a repair and maintenance budget for both the treatment and distribution systems (current 2014 budgets include \$30,000 and \$65,000, respectively, for these efforts²³) which include projects that will improve water loss management. The funding for distribution system repair and maintenance includes approximately \$30,000 for replacing two (2) pressure reducing valves and three (3) fire hydrants. Capital project funding of about \$10,000 has been budgeted for blow-offs on four (4) dead end water mains and another \$10,000 for a flow meter on the Malensek Ditch (which was installed in September 2014). No specific funding is allocated for customer meter testing and replacement, nor is there funding for master meter testing and replacement.

The capital improvement project budget also includes one project (the purchase of new meter reading equipment and VXU receiver) that will support improved customer data collection. This project is budgeted at \$17,000. Another CIP project budgeted at \$10,000 includes development of a GIS database that will be used to help map the water system and its attributes. Both of these projects will assist the District in its water loss management efforts.

The largest capital project that the District has been planning for involves an upgrade to its East River pump station, to increase its capacity to meet summertime peak day demands, since the facility has operated above 80% of capacity in the past. The costs for this upgrade are estimated to be in the range of \$750,000, or a 30-year debt service of about \$40,000 per year²⁴.

Improvements to the MCB water loss could delay the need for a WTP upgrade, perhaps by five years or more, since water losses are in the range of 40-50% of finished water. In other words, reducing water loss by a factor of 50% would provide a reduction of between 0.2 and 0.3 mgd in peak day demand. A five-year delay of the debt service on the WTP upgrade may return costs in the range of \$125,000 in interest expenses to the District budget, as well as \$200,000 in liquidity in that same time period (i.e., funds that could be spent in other ways).

²³ This does not reflect capital budgets in 2014 and 2015 for wastewater leak detection and maintenance in the range of \$750,000 to 1,000,000 per year for equipment and testing, etc.

²⁴ Assuming 30-year note at 3.5% interest with monthly payments of \$3,368.

Water Conservation Goals

The potential goal for future water conservation by the District relates to a number of factors. First and foremost, the District needs to better understand its current water balance – from source through treatment to customer use. For this reason, MCB will be focusing substantial resources on the testing and improvement of its metering systems – for source water, for water production from the treatment plant and for customer use.

With improvements in metering comes better characterization and understand of water loss. Given that over 40% of the water produced and treated by MCB does not reach any of its customers, the District will commit to improvements in its water loss management program. **It is well recognized that a portion of this non-revenue water relates to authorized uses that includes water for operation of the treatment plants, distribution system preventive maintenance programs, etc. Noteworthy is that the lack of metering of these authorized users precludes the District from being able to quantify real and apparent water losses. Therefore, the District will focus some of its efforts in the future to meter these authorized uses.**

Recovery of a portion of the 200 AF of lost water may help to delay, if not eliminate, the need for future water treatment plant expansion. Improving water loss may be less substantially expensive per AF of improved yield versus an upgraded water treatment plant; however, without improved and more accurate data characterizing water loss, economic decision making is strictly limited. Therefore, the District will maintain a deliberate focus on water loss management until it can support a business case for additional debt service.

Customer water demand management does not appear to be a current need for the District given current downward trends in water use. However, it may be that some larger customers, such as the Town of Mt. Crested Butte and/or some irrigators, would benefit from some water management resources that might be provided by the District. In addition, further customer demand management may become vital for the District, if and when tourist visits increase and/or new construction occurs. Therefore, the District will look to implement programs that will support and encourage long-term customer water use efficiencies.

Based on these observations, the goals for this water conservation plan are as follows:

- Reduce non-revenue water by 20-30%, or 40-60 AF, by 2022 using improved meter replacement, audits and related BMPs to track and reduce real and apparent losses, and characterize authorized unbilled uses.
- To support the projects that will be associated with the improved water loss management program, and to provide encouragement for improved customer water use efficiency, the District will conduct water rate assessments and studies to evaluate decoupling the service fee with water use and revising the tiered water structure to one more conducive to seasonal water use reductions.
- Delay water treatment plant upgrade to reduce cost of carrying debt service through reduced water production and customer water demand.

- Reduce irrigation and Town demands through improved metering programs that will detect customer side leaks and more accurately track water use, as well as developing and using more punitive water rate structures (saving 5 AF).

It is important to note that a portion of the District's non-revenue water is made up of authorized water uses, which may be substantial. It will be important for MCB to more accurately characterize authorized uses, such that the portion of non-revenue water related to real and apparent losses can be better estimated. It is also important to note that the current estimate of non-revenue water, and associated real and apparent water losses may be masked by metering inaccuracies (both from the master meters measuring flow into the distribution system and/or the customer meters), and/or systematic errors. Therefore, it will be of benefit for the District to implement not only structural/equipment changes, but to implement data handling and analysis methods as well.

To achieve the stated goals, the District will evaluate and select a group of measures and programs that address the specific areas of desired water use efficiency improvements (i.e., water loss management and summertime water use), that are cost effective, implementable within the operational constraints of the utility (e.g., staff availability, funding availability) and will be acceptable to the community. The evaluation and selection of water conservation and water use efficiency measures and programs is presented in the next section.

Identification and Evaluation of Water Conservation and Efficiency Measures and Programs

Identification of Candidates

Identifying candidate water conservation and efficiency measures and programs has its roots in two key resource areas. First is the State of Colorado Revised Statute 37-60-126 (4)(a) which addresses water conservation planning for municipal water providers (see Appendix A). Although this statute is not directly applicable to the District²⁵, it requires that “at a minimum, [planning entities should] consider the following,” which is a list of water-saving measures and program types that may be used by a water provider for water conservation and improved water use efficiency. The second is the Southeastern Colorado Water Conservancy District’s Best Management Practices (BMP) Tool Box, which is a web-based water conservation planning tool that contains a wide variety of relevant information regarding best practices that water utilities can use to improve water use efficiency and support smart water use. The Tool Box contains categories of measures and programs that address the five different operational areas that all utilities conduct - system wide management, water production and treatment, water distribution, delivery of water to customers and customer demand management.

Table 7 presents a discussion of how each of the State’s required types of water conservation measures and programs were considered and incorporated into the District’s evaluation of candidate water conservation and water use efficiency programs. In general, MCB has determined that customer demand management techniques are not particularly relevant to the issues that the District currently faces, due to the demographic served which includes low and high density development of high-end vacation homes and condominiums used chiefly by part-time residents.

For these reasons, MCB will choose to focus its resources on maintaining and upgrading the water system infrastructure – managing data collection, water loss, and revenue generation – over providing incentives and financial support for customer demand management. MCB will also look to strengthen its customer education and engagement programs recognizing the challenges of reaching part-time residents. Note that a broader range of customer demand management programs such as those listed by the State for consideration under CRS 37-60-126 (4)(a) may become more applicable to the needs of MCB and its customer base in the future. However, for the current planning period, there is limited utility of some of those measures and programs contained in Table 7, as noted.

²⁵ See footnote 1.

Table 7 Review of State Required Measures and Programs for Consideration Under CRS 30-67-126 (4)(a)			
Measure or Program	Relevance to MCB	Applicability to the MCB's Water Conservation Needs	Status for Further Evaluation
Water-efficient fixtures and appliances, including toilets, urinals, clothes washers, showerheads, and faucet aerators	As a resort community, MCB has substantial indoor use related to single family homes and condominiums where one time visitors as well as area residents utilize water. New construction is anticipated, as are retrofits and upgrades to existing structures.	Customer efforts to replace aging water using fixtures and appliances will create water demand reductions over the planning period. The District would benefit from expanding its Rules and Regulations to address new construction indoor plumbing fixtures (including retrofits). More customer education related to indoor water efficiency will be considered (see below).	Include expanding District Rules and Regulations in coordination with the Town of Mt Crested Butte for evaluation.
Low water use landscapes, drought-resistant vegetation, removal of phreatophytes, and efficient irrigation	July demands are the highest observed by MCB. They occur as a result of coupled seasonal outdoor uses and increased occupancy rates. Improving outdoor water use efficiency will help the District to delay future capital improvements related to water treatment plant expansion.	MCB maintains, and continues to improve, its Rules and Regulations that limit area of irrigatable lawns and efficient irrigation practices. More customer education related to landscape management will be considered (see below) including customer audits that will lead to use of more native landscapes and more efficient irrigation practices.	Include expanding District Rules and Regulations in coordination with the Town of Mt Crested Butte for evaluation. Also evaluate customer audits and partnering with large outdoor users.
Water-efficient industrial and commercial water-using processes	MCB has only a few commercial customers which are chiefly bars and restaurants. MCB understands that rules and regulations can improve customer water use efficiency.	Improved efficiency in local commercial facilities will chiefly relate to the same fixtures and appliances that the District will evaluate regulating with updated Rules and Regulations. Improved process water efficiencies are beyond the scope of the District's efforts at this time.	Include expanding District Rules and Regulations in coordination with the Town of Mt Crested Butte for evaluation.
Water reuse systems		The District does not have any reusable water supplies in its portfolio.	No further evaluation necessary
Distribution system leak identification and repair	Non-revenue water and unmetered, unbilled authorized uses are of key concern for the District. Improvements to managing these and real and apparent losses have been part of recent MCB improvements.	The District has a number of opportunities to continue to improve its water loss management programs including upgrades and new infrastructure, and the implementation of some BMPs focused on data collection and management.	Include water loss management improvements for evaluation
Dissemination of information regarding water use efficiency measures, including by public education, customer water use audits, and water-saving demonstrations	The District is challenged in how it can engage and educate its customers given the that many residents are not local much of the year, and there are many tourist visitors.	MCB will look to develop a "fun and engaging" messaging program that is in-keeping with the nature of the area and the nature of the homeowner needs and interests.	Include water education programs for further evaluation

Table 7 (continued)**Review of State Required Measures and Programs for Consideration Under CRS 30-67-126 (4)(a)**

Measure or Program	Relevance to MCB	Applicability to the MCB's Water Conservation Needs	Status for Further Evaluation
Water rate structures and billing systems designed to encourage water use efficiency in a fiscally responsible manner	MCB is always interested in maintaining appropriate and fair water rates, as well as finding ways to encourage more efficient customer water use.	The District has tiered water rates with an inclining water rate structure (see Appendix C). New water rates may be needed to keep up with increased cost of energy, chemicals and system maintenance requirements, as well as to provide encouragement to the MCB customers to use less water during peak summer demand.	Include a water rate study and revised water rates for further evaluation
Regulatory measures designed to encourage water conservation	MCB understands that appropriate and effective rules and regulations can help to improve customer water use efficiency.	The District has extensive water use and water waste Rules and Regulations that it continues to improve on a regular basis.	Include expanding District Rules and Regulations in coordination with the Town of Mt Crested Butte for evaluation.
Incentives to implement water conservation techniques, including rebates to customers to encourage the installation of water conservation measures		The District's customer base is currently replacing older fixtures and appliances as retrofits occur and fixtures and appliances are replaced. Incentives are not considered to be as high a priority as water loss management and improved data collection at this time.	No further evaluation necessary

Water conservation and/or efficiency measures and programs that the District may choose to implement have been identified using the template presented in the BMP Tool Box discussed above. The results are listed in Table 8.

To this point, Table 8 is organized by each of the five areas that define water utilities operations and the time frame during which implementation of the candidate measures and programs may occur. Table 8 has been segregated into the three key time periods as follows:

- Short-term (1 to 2 years)
- Mid-term (2 to 3 years)
- Long-term (3 to 5 years)

Table 8 Summary of Water Conservation and Efficiency Measures and Programs Under Consideration				
System Wide Management	Process and Treatment	Distribution System	Customer Water Delivery	Customer Demand Management
Short-Term (1-2 years)				
Continue improved data management for water loss assessment and water utility management	Develop Best Management Practice (BMP) for tracking production and distribution metering	Continue water line repair and replacement, as needed	Continue meter testing and replacement, as needed	Continue current customer education with the newsletter
Initiate annual system-wide water audits (based on AWWA M-36 methodology)	Install metering as possible to measure authorized unbilled uses	Develop BMP to track storage tank levels at off peak hours	Improve/revise current “red-flags” for high (and perhaps low) customer water use to help identify customer-side leaks and find abnormal water use conditions	
Update and improve Rules and Regulations related to, new and retrofit building construction, enforcement authority of water waste, and drought response		Initiate improved water loss control program including improved data tracking and leak detection		
Conduct water rate study to evaluate changes to water rates and customer billing structure; in part to de-couple base rate with “free” water				
Adjust capital budget to address water loss projects				
Mid-Term (3 – 5 years)				
Same as above	Same as above	Same as above	Same as above	Same as above
		Update water line replacement program to address water loss management needs	Develop customer meter testing and replacement program including prioritized replacement of older and larger meters	Evaluate and develop training and/or audit program for irrigators and Town
Long-Term (>5 years)				
Same as above	Same as above	Same as above	Same as above	Same as above
			Implement AMR device upgrades/battery replacement program	

These time frames have been developed to differentiate those activities that the utility will initiate shortly after plan acceptance and approval from those activities that will occur in future years, still within the 7-year planning horizon, depending on:

- The results of the short-term implementation activities;
- The applicability and relevance of the mid-term and long-term measures and programs; and
- The changing needs of MCB and its customers.

Overall, the District will look to select programs that will do the following throughout the planning horizon:

- Improve overall water loss management;
- Update MCB Rules and Regulations that support improved indoor and outdoor water use efficiency;
- Reduce seasonal customer demands; and
- Support improved educational and outreach programs.

Components of each of these programmatic areas that MCB will consider for implementation are described in more detail below.

Improved Overall Water Loss Management

Although the District has number of processes in place that it uses to track and managing system wide water loss, there are some improvements that can be made that will help MCB better characterize non-revenue water and real and apparent losses, which in turn support more rigorous economic assessments of future capital expenditures and operating expenses. The improvements, which consist of various BMPs, will also help to support more accurate tracking of authorized unbilled water use, which in turn supports a more complete assessment of real and apparent water losses.

The BMPs related to improved overall water loss management include those that:

- Improve quantification of authorized unmetered uses;
- Improve data use and management; and
- Continue real loss management.

Improved Measurement of Authorized Uses

Through the process of developing this Plan, the District has identified a number of authorized water uses that would benefit from the installation of meters to quantify these water uses, and to help characterize the components of non-revenue water for MCB. Specifically, the following authorized uses may require future metering:

- Water main flushing
- Bulk water fill station (which is currently water provided to landscapers and contractors without charge)

- District water use in its treatment and administration buildings
- Water used in water treatment including turbidity monitoring and chlorination, filter back washing and recycling
- Water used for freeze protection

Each of these processes and uses warrants consideration for metering such that the District can segregate authorized from unauthorized water use, and to this point, understand its non-revenue water differentiating real and apparent leaks from authorized uses.

Improved Data Management and Assessment

The District should consider implementing an annual system wide water audit, performing audits in a manner consistent with the American Water Works Association (AWWA) M-36 Manual on Water Loss Control and Management. Conducting the water audit using this methodology will help to maintain a consistency in data collection and use, and will support benchmarking and comparative analyses with other similar utilities that the District may wish to perform in the future. Given that the M-36 methodology is focused on supporting economic decision-making by utilities related to water loss management, it fits nicely with the current and expected future needs of the District and its customers.

As part of implementing annual water audits, the District may wish to develop processes that help to capture information and evaluate the accuracy of the information as it is collected. For example, MCB currently has processes in place to evaluate the accuracy of customer demand data collected from customer meters. The processes used may have areas where improvements can be made regarding tracking and categorizing data entry changes and billing revisions such that future assessments can identify where and how such changes were made and justified.

Another BMP that the District may consider relates to tracking storage tank levels during periods of low to very low water use. This BMP is worth considering since the District currently has SCADA and level sensors installed in its water storage tanks. The BMP would involve eliminating water production to the tanks for a 30 to 60 minute period and tracking tank levels during off-peak hours (e.g., 2:30 to 3:30 am). Changes in tank levels may help to quantify system real water losses.

In addition, MCB is in the process of better characterizing its process flow diagram and how various authorized unbilled water uses occur. The system wide audit which MCB may choose to conduct annually in the future, would need to take into account the process flow to identify areas where data collection improvements and enhancements may be needed to support more rigorous water loss calculations.

Continued Real Loss Management

The District has various programs that address real water loss including leak identification and repair, replacement of aging water lines and service lines, and various preventive maintenance routines. The District should continue these programs and look for ways to enhance those preventive maintenance

programs that improve distribution system water quality and reduce water loss including hydrant flushing and valve exercising, and leak detection.

Update District Rules and Regulations

The District maintains Rules and Regulations that regulate tap fees and requirements, water rates, water waste, and other issues relevant to MCB's operations. As part of future water conservation efforts, the District should consider making revisions to its Rules and Regulations to require prescriptive levels of water use efficiency in new construction, retrofits or both. For example, new Regulations could require all new construction to adhere to certain types of toilets, bathroom faucet, and/or showerhead performance in conjunction with EPA's WaterSmart programs. These same requirements could be developed to apply to all real estate as it is sold (i.e., point of sales conditions).

The District may also want to consider setting outdoor irrigation requirements, such as limiting irrigated turf area, promoting native plantings, and/or requiring irrigation types and efficiencies. The cost of Rules and Regulation changes for the District will occur chiefly after the changes have been made and District staff is called upon to review plans and specifications and conduct field inspections to verify compliance.

Reduce Seasonal Demands

Although the District has always had more than adequate water treatment capacity to deliver potable water during peak summertime demands, current and expected future peak summertime demand nonetheless tax the water system, as flows are high and operating water pressure fluctuates. In addition, future increases in peak summertime water demand could approach current treatment capacity, with the potential to require treatment plant capacity upgrades which would be costly. Therefore, MCB will consider implementing water conservation programs that will reduce summertime peak demand, since water conservation programs related to this kind of effort are typically far less costly than treatment plant expansions or upgrades.

To address the improved management of seasonal demands, the District may consider a number of programs that will work to reduce customer demands, which may occur continuously and/or just during peak demand periods²⁶. The list which that MCB may consider includes:

- Improving the development, use, and tracking of "red-flags" that utilize the District's customer water use data collected using the AMR system to identify unusually high customer water use.
- Developing more prescriptive and in some cases (e.g., during drought) restrictive water waste ordinances that allow for time of day and day of the week watering restrictions; overspray restrictions; and water waste enforcement.

²⁶ Note that improvements in system wide water loss management will also work to reduce seasonal peak water demand; however these programs are discussed elsewhere in this Plan.

- Establishing more pronounced drought triggers and drought response programs for control of seasonal water use in times of water shortage.
- Developing more punitive inclining block water rates that promote more efficient customer water use; and/or decouple current practice of providing 11,000 gallons of water with the base service fee.
- Continuing and enhancing customer water education programs to create more awareness and engagement as it relates to seasonal water use and water waste.

Note that customer education can include customer water audits that allows for data sharing and technology transfer to occur between the utility and its customers.

Other Educational and Engagement Programs

The District has been challenged by the nature of its customer base regarding water conservation related education, and water education in general. It may be worth consideration for the District to initiate more engaging water conservation messaging within the community through newspaper articles, signage on major roadways, and billing inserts that allow the MCB customers to better understand ongoing conservation programs and activities that the District is implementing. In addition, the District may benefit in supporting water use efficiency programs that target tourists with either in-room messaging (such as sign hangers) and/or signage in restaurants and bars. Some educational programs may be most effective if conducted in concert with other local area providers such as Skyland and the Town of Crested Butte.

As indicated in Table 8, the various components of future water conservation measures and programs that the District will consider for implementation have different time frames within which each are considered to be appropriate. For example, most improvements to data collection and management are considered important and appropriate in the short-term (1-2 years). This is due to the fact that improved data collection and management BMPS are the basis for future program selection and development. In the mid-term (i.e., the next 2 to 5 years), the District will continue to implement BMPs that enhance its current water conservation and efficiency programs leveraging better and more accurate data collection, improved data assessment and evaluation programs. In addition, the District is proposing to consider conducting a water rate study based, in part, on the improved customer data collection efforts conducted in the years prior.

In particular, MCB should evaluate the need for conducting a water rates study to support changes to rates in response to increasing chemical and energy costs, the increasing need for reserves, and the need for capital outlays related to water loss control, system maintenance and system upgrades. MCB should also consider decoupling its base fee from water provided such that water bills are more aligned with water use.

The District should consider expanding its testing and/or replacing of its oldest customer meters and the meters of its largest water customers.

Another mid-term program that the District will consider is the implementation of water audit program that targets the District's largest outdoor water users – its irrigation only customers (which includes the Town of Mt. Crested Butte parks) and its largest commercial and industrial water users (which includes Town properties and some HOAs). This may involve holding meetings to discuss irrigation practices, or it may involve conducting onsite visits to review past water use and current irrigation methods and practices.

In the long-term, the District may plan to utilize improved water loss management data collection and tracking methods to reduce both apparent and real losses – by directing capital improvements and focusing day-to-day operational activities. Other long-term conservation programs may include updating and revising the District's Rules and Regulations as needed, updating and replacing customer meter reading device batteries and equipment, and considering updating the District's web site to include more water conservation and water education content.

Other water conservation measures and programs may be included in the implementation of this Plan in support of achieving the specified goals, since the District may choose alternative actions in response to changing conditions and customer needs. However, the basis for changing direction and making revisions to planned water conservation and water use efficiency measures and programs will be those data that are collected as a result of the early phases of Plan implementation.

Evaluation

In general, the water conservation measures and programs that MCB will implement align with those activities that the District has been and continues to do on a regular basis. This includes those activities that are budgeted for and conducted on an annual basis such as:

- Meter instrumentation upgrades (i.e., adding AMR transponders);
- Meter testing and replacement, as needed; and
- Water line repair and replacement, as needed.

The District also collects data on a daily and monthly basis to monitor and characterize water production rates, treatment efficiencies, and customer water demand. Implementation of this Plan will therefore, at the very least, refine and redefine how funds are spent on a typical year and adjust how data are collected and managed with an eye toward improved organizational efficiencies. Overall, improvements in standard operating procedures will allow MCB to more accurately characterize customer water use patterns, including MCB authorized unbilled uses, and more accurately track non-revenue water such that overall water loss management can be more effectively monitored and quantified.

Improved data collection and management efforts that the District chooses to implement as a result of this planning effort are focused on improving the quality of the information that is collected such that more rigorous economic decision-making related to infrastructure investments and water rate setting may occur. For example, real water loss occurs daily within the distribution system of all water utilities. The key question for the District is, therefore, what are the costs of repairing

infrastructure and reducing water loss as compared to the costs of allow water loss to continue. Only with rigorous and orderly data collection and management can these questions be answered. Given that the District has about \$200,000 of lost water sales due to non-revenue water, it will be of value to the City to improve its characterization of non-revenue water, authorized unbilled water use and real and apparent water losses, for the purposes to improving the efficiency of the water distribution and delivery system. Since the District budgets about \$65,000 per year on water distribution system maintenance and repair, and has reserves that may be used for larger expenditures as needed, improved data collection and assessment will help MCB to better manage water loss, reduce non-revenue water and more accurately characterize customer water use behaviors.

Specific measures and programs that have been selected for implementation by the District include **improved water loss management** which begins with improved data collection and management. The District will focus improvements in data collection and management on:

- Performing explicit mapping of water use by and within the District, including identifying locations where master metering of diversions, overflows, and treatment processes need to be quantified.
- Characterizing authorized unbilled water use including tracking currently unmetered uses (e.g., bulk water use, hydrant flushing, filter backwash, etc.).
- Explicitly tracking water leak repairs with formal work order logs that identify the type and location of the leak, the nature of the leak repair, the time of the leak reporting and the time of the leak repair (to help estimate water loss), the materials involved, etc.

The next component of improved data collection and management by the District is the initiation of system-wide water audits on an annual basis by MCB. Using the AWWA M-36 methodology, water production and sales are tracked on a monthly basis to characterize non-revenue water and water loss. Having this procedure in place will help to support more rigorous economic decision making related to future capital budgeting, and will support improved understanding of authorized and customer water use which will support future water rate studies.

The cost to the District to implement these improvements to the best management practices currently being conducted by the District will involve capital investments for meters; but it will also involve changing the habits and underlying processes of a select few practices currently conducted by utility staff. For this reason, aside from the cost of the meters²⁷, there is little cost to implement, with substantial return expected.

In general, water loss management BMPs and the benefits related to improved data collection and management processes are not costly; they just require that some changes occur to allow the utility to operate more efficiently. These improvements in efficiency are in part related to changing and improving technology, and in part due to improvements in the sophistication of utility operations being discovered as a result of joint industry research being conducted by AWWA. To wit, the District

²⁷ The exact number and placement of meters needed to characterize authorized unbilled water uses by the District is not fully understood as of the writing of this Plan; however, once the District initiates the system-wide audit and maps its water system more accurately, the number and size of meters will become apparent.

is not trailing other utilities across the nation, but rather is moving forward at a pace consistent with those other utilities that realize change and improvement is a continuous process that requires vigilance and vision.

Seasonal water use demand management is also a goal of the District's; however, it is more challenging to manage since it involves developing and utilizing BMPs that influence and control customer water use behavior. For this reason, it will be in the best interest of the District to address seasonal water demand management with a multi-pronged approach aligning customer education with more aggressive conservation related water rates and more restrictive Rules and Ordinances.

Note that District reductions to non-revenue water and real and apparent water losses will also help reduce summertime water use demand.

To being with, the District currently maintains a “red-flag” program that sorts and identifies customer water use data that has been deemed unusually high, helping to identify customer-side water leaks and inappropriate water use behaviors. These practices will need to continue and be tracked more explicitly to help document the results and savings associated with the program, and to identify historically chronic problems that may occur. This is particularly important as it relates to identifying summertime water use excessive use.

The District will also need to re-evaluate its water waste ordinance which regulates time of day and day of the week watering restrictions; as well as overspray and excess watering requirements. As part of this effort, it is of particular importance that the District evaluates how to tie watering restrictions to different stages of drought responses that may occur in the future. However, water waste should exist under all conditions; becoming more restrictive as water supplies become more limited. One additional component of water waste that the District should consider relates to enforcement and penalties that may be issued to repeat offenders.

Water rate structures, which will be studied and refined by the District in the future, should also incorporate the potential for future drought restrictions as part of the rate setting effort. Increasing the size of steps between the tiers of the inclining block rate currently used by MCB is warranted; as is decreasing the amount of water use that invokes an upward change in cost per thousand gallons. Increases in the “steepness” of inclining blocks of water rate can bring substantial reductions in outdoor water use. Finally, the District will look at decoupling the base service fee from having any minimum amount of water provided by the customer, to more explicitly connect billings with customer water use.

Each one of the above policy related programs will help to reduce seasonal water use; however, explicitly linking drought planning and response with water waste ordinances and inclining block water rates will best serve the District's needs in the short-, mid-, and long-term. Noteworthy is that improved data collection and management programs will support better policy development, ultimately improving the overall sustainability and financial viability of the organization.

Finally, the District will look to develop a customer audit program to allow for the education of the District's biggest outdoor water users. The audit program will focus on partnering with the largest

seasonal water users, linking an assessment of water use with watering needs and alternatives for improved irrigation efficiency and/or native plantings.

Implementation Plan

Implementation Tasks

Based on the needs of MCB and its customers, the District will implement those selected water conservation and water use efficiency programs listed in Table 9, with the intention of achieving the water conservation goals listed previously. Implementation will occur over a number of years as ongoing programs are continued and new programs are phased in. Funding levels are always a consideration, as operating expenses and water sales income change seasonally and from year to year. However, the programs that have been selected for implementation are those that the District believes are best for the organization in the short-term and mid-term; helping to improve processes, enhance business practices, and support customer needs.

**Table 9
Summary of Selected Water Conservation and Water Use Efficiency Measures and Programs for Short-Term (1-2 years) and Mid-Term (3-5 years) Implementation**

Selected Measure/Program	BMP Category(ies)	Key Attributes	Description	Estimated Cost
Water Loss Management				
Ongoing				
Continue water line repair and placement projects (one year only), then update based on results of improved water loss management BMPs	Distribution System/Customer Water Delivery	Supports reduced water loss through installation of improved distribution piping and new valves and appurtenances	Utilizes resources which are budgeted and expensed annually, then makes adjustments based on the audit results and improved data collection efforts, such that funding can be funneled to those areas of greatest benefit (e.g., more aggressive replacement of cast iron pipe)	\$25-50,000/yr
Continue service line repair and replacement	Distribution System/Customer Water Delivery	Supports reduced water loss through installation of improved service line/metering couplings	Utilizes resources which are budgeted and expensed annually to replace lead service lines when water mains are replaced.	(included in water line replacement and repair)
Continue meter repair and replacement (one year only), then update based on results of improved water loss management BMPs	Customer Water Delivery	Supports improved accuracy of tracking customer water use which improves organization's water sales revenues and reduces water loss	Utilizes resources which are budgeted and expensed annually to replace existing under-performing customer meters. Revise program to be more aggressive in the future based on results of the audits and improved data collection efforts.	\$2-5,000/yr
Enhancements and New Programs				
Improve BMPs related to measuring finished water production from each of the two WTPs; including an assessment of meter applicability and meter calibration methods.	System Wide Management	Supports more accurate characterization of water placed into distribution	Developing procedures for measuring and tracking water production rates, and for evaluating the adequacy of current meter replacement programs. Link to annual system wide water audits.	District Labor Only
Improve BMPs related to measuring authorized water use, including water treatment plant uses, hydrant flushing, bulk water sales, etc.	Water Production and Treatment/Water Distribution	Supports more accurate tracking of authorized water uses and real and apparent water loss	Conduct thorough review of water production, treatment and distribution processes and meter and/or formally estimate water uses through BMPs	\$35,000 (for mapping and metering) District Labor for BMPs
Continue Best Management Practice (BMP) related to data collection and management in support of water loss management	System Wide Management	Supports more accurate characterization of water loss through distribution to customers	District will strive to develop and link BMPs based on a more rigorous accounting of non-revenue water, authorized unbilled water, and estimates of real and apparent water loss in accordance with AWWA standards (i.e., M-36). BMPs will include improving the collection and tracking of water placed in distribution, unbilled water uses, and customer water use.	District Labor Only
Conduct annual system wide water audits	System Wide Management	Supports more accurate characterization of water loss through both water treatment and distribution to customers	Utilize District resources to conducted annual system-wide water audits using the AWWA M-36 methodology (see Appendix D). District will consider conducting third party audit every 3 to 5 years to support data checking and to evaluate BMPs.	District Labor Only (except for 3 rd party audit which is \$5-7,000)

Table 9 (continued)

Summary of Selected Water Conservation and Water Use Efficiency Measures and Programs for Short-Term (1-2 year) and Mid-term (3-5years) Implementation

Selected Measure/Program	BMP Category(ies)	Key Attributes	Description	Estimated Cost
Seasonal Water Demand Management				
Revise and Update District’s Rules and Regulations related to water waste, new building construction, outdoor irrigation restrictions, and lawn size limitations, etc. working with the Town	System Wide Management/Customer Demand Management	Defines requirements for new construction, retrofits, and for operation of irrigation systems; as well as better defines water waste requirements and links drought planning and response to water waste.	Updating the Rules and Regulations involves reviewing and revising components of the existing ordinances and codes to incorporate new technology, new development trends and new costs for taps, water waste requirements, etc.	District Labor Only
Enhance current “red flag” system for identifying (and correcting, if possible) high water use by customers (or false readings in the billing database)	Customer Water Delivery	Supports the identification of customer side leaks – especially in homes that are vacant in the non-irrigation periods.	Requires making selected adjustments to billing software and/or billing data processing and comparison to previous months use, tracking back into historical use to be able to differentiate high use from differences between occupied property and vacant.	District Labor Only
Conduct a water rate study to evaluate changes to water rates and fee structures (will need to occur every 3-5 year depending on water sales revenues)	System Wide Management	Supports improving revenue generation to support more aggressive leak detection and water loss management through capital projects, improved metering; and enhanced BMPs	Supports evaluations required to develop working capital and reserved needed to support future infrastructure investments and to maintain pace with increasing energy costs	\$15,000 (one time cost)
Initiate customer education and training for largest water users/outdoor irrigators	Customer Demand Management	Supports reducing customer demand through focused educational efforts and awareness-generating audits	Utilize District newsletter to reach customers through web-based content, and develop messaging program that engages and educates some of the District’s biggest outdoor water users (irrigation only customers and the Town) through focused water audits	\$200/yr plus \$20,000 one time to develop audit program (with \$5,000 from District)

Effects of Plan Implementation on Future Water Demands

Future water demand for MCB may vary substantially based on tourism, housing demand, and weather. However, based on estimates presented in Appendix B, some growth in customer water demand has been predicted between now and 2022 – about a 10% increase in customer water demand, which results in about 30 to 40 AF of additional water delivery needs depending on the year (i.e., average year versus above average demand year (e.g., a drier and hotter summer than average)).

Also based on the data previously presented, non-revenue water has dropped somewhat consistently over the past 6 years, whereas, customer demand has trended downward but has varied both up and down. It therefore does not appear that the two are strongly correlated to one another. In addition, changes in non-revenue water are not expected to reduce customer demand directly. However, reductions in non-revenue water can offset increases in customer demand by reducing demand on treatment plant deliveries.

Based on the program that MCB is proposing to implement, water loss reductions are expected in 20 to 40 AF range, which could offset some, and potentially a substantial portion of the projected future customer demands in 2022 regardless of the type of water year it becomes. The water loss management BMPs that the District will implement includes:

- Better and more consistent tracking of all water loss tracking data and data sources;
- Continuous comparison of non-revenue water over the prior 12 months using monthly production and billing data using the method presented in Appendix D;
- Improved metering of authorized, unbilled uses (e.g., bulk water, water treatment plant water, Prospect Pump Station and Timberline Pump Station);
- Improved hydrant flushing and valve exercising; and
- Customer meter testing, especially for older and larger meters.

Note that some of the non-revenue water is currently an apparent loss, such that improvements in metering accuracy and authorized unbilled use data collection may create revenue while not reducing water production demand. Therefore, it is estimated that only a portion of the water loss management BMPs will reduce demand on the WTP and address the 30 to 40 AF increase in customer demand.

For this reason the District will implement new and amended conservation focused ordinances and regulations to help manage and influence water efficiency in new construction; as well as develop new water rates to help encourage seasonal water use reductions during high demand periods, especially summer. It is anticipated that effect rate setting coupled with rules and ordinances will reduce seasonal summer time demand by about 7-10%, or 5 to 7 AF. This will be accomplished in part by reducing the amount of water included in the base fee, and more directly coupling water use with billings. In addition, more punitive impacts of the District's current tiered water rate structure (see Appendix B) are expected to both create additional revenue and reduce wasteful summertime water use.

Note that the impact of the new rules and ordinances on future customer demand will be highly dependent on the amount and type of new growth in the area. Without growth and/or existing structure's being retrofit, the new construction rules and ordinances will have little impact. Of course, if no new construction and/or retrofitting occurs, it is less likely the MCB will realized increased customer demand – although increases in skier visits and the occupancy rate of existing condominiums could cause an increase in customer demand. For this reason, the District will be increasing water rates with a focus on large water users.

Also note that the District has identified large water user audits as another way to support seasonal summertime water demand reductions.

Plan Monitoring and Assessment

Many of the measures and programs that have been selected for implementation have imbedded within them data collection and evaluation BMPs that constitute plan monitoring and assessment practices. For example, the goal associated with reductions in system wide water loss will be assessed through the deliberate use of the AWWA M-36 water accounting methodology described in Appendix D. Similarly, the goal associated with reduced summertime water demand will be characterized and tracked as customer water use and total distribution system demanded are measured. A summary of the data collection and assessment that will occur to monitor and assess the benefits of the various selected measures and programs is presented in Table 10.

Table 10
Summary of Monitoring and Assessment Data Collection

Type of Data	Timing			Uses		
	Hourly	Daily	Monthly	Distribution System Water Loss Metrics ¹	System Wide Water Use Metrics ²	Customer Demand Management
Water to Treatment		X	X	X	X	
Water to Distribution		X	X	X	X	
Metered Unbilled Water Use			X	X	X	
Metered Customer Water Use (by category)			X	X	X	X
Unmetered Authorized Water Use (bulk water sales, construction water, etc.)			X	X		
Estimates of Other Authorized or Known Uses (e.g., losses due to leaks, line flushing, etc.)			X	X		
Tank Level Data (off peak hours, 0.5 to 1 hour once per month)	X			X		
Number of Leaks Found/Repaired			X	X		
Number of Customer High Use Accounts Identified			X			X
Number of Customer Accounts			X	X		X
Number of Skier Visits			X	X		X

¹ Includes: (all are monthly) water to distribution, water sold, non-revenue water, authorized unbilled consumption, estimated apparent losses, estimated current monthly water loss (see Appendix D)

² Includes: (all are monthly) water sold per single residential connection, water sold per multi-tap residential connection, water sold per commercial connection, number of connections, highest water use connections (top 5)

Updating the Plan

The MCB Water and Sanitation District's Water Conservation and Efficiency Plan will be reviewed and updated informally throughout the planning period (i.e., until the end of 2022). The District may choose to formally update the plan whenever it is valuable to the organization dependant on financial needs, and/or substantial changes to its current operating conditions. At the very least, MCB will update the plan in 7 years, or by the end of 2022.

Plan Public Review and Comment

The MCB Water Conservation and Efficiency Plan has undergone public review in accordance with the requirements of the State regulations for a period of 60 days – from May 15, 2015 to July 14, 2015. A notice of the public review was printed in the local newspaper (see Appendix E). A copy of the draft Plan was made available to the public at the offices of the District. Public comments are provided in Appendix E, as well as the responses that were developed for each comment.

Appendix A – CRS 37-60-126



C.R.S. 37-60-126

COLORADO REVISED STATUTES

*** This document reflects changes current through all laws passed at the First Regular Session of the Sixty-Ninth General Assembly of the State of Colorado (2013) ***

TITLE 37. WATER AND IRRIGATION
WATER CONSERVATION BOARD AND COMPACTS
ARTICLE 60. COLORADO WATER CONSERVATION BOARD
PART 1. GENERAL PROVISIONS

C.R.S. 37-60-126 (2013)

37-60-126. Water conservation and drought mitigation planning - programs - relationship to state assistance for water facilities - guidelines - water efficiency grant program - repeal

(1) As used in this section and [section 37-60-126.5](#), unless the context otherwise requires:

(a) "Agency" means a public or private entity whose primary purpose includes the promotion of water resource conservation.

(b) "Covered entity" means each municipality, agency, utility, including any privately owned utility, or other publicly owned entity with a legal obligation to supply, distribute, or otherwise provide water at retail to domestic, commercial, industrial, or public facility customers, and that has a total demand for such customers of two thousand acre-feet or more.

(c) "Grant program" means the water efficiency grant program established pursuant to subsection (12) of this section.

(d) "Office" means the office of water conservation and drought planning created in [section 37-60-124](#).

(e) "Plan elements" means those components of water conservation plans that address water-saving measures and programs, implementation review, water-saving goals, and the actions a covered entity shall take to develop, implement, monitor, review, and revise its water conservation plan.

(f) "Public facility" means any facility operated by an instrument of government for the benefit of the public, including, but not limited to, a government building; park or other recreational facility; school, college, university, or other educational institution; highway; hospital; or stadium.

(g) "Water conservation" means water use efficiency, wise water use, water transmission and distribution system efficiency, and supply substitution. The objective of water conservation is a long-term increase in the productive use of water supply in order to satisfy water supply needs without compromising desired water services.

(h) "Water conservation plan", "water use efficiency plan", or "plan" means a plan adopted in accordance with this section.

(i) "Water-saving measures and programs" includes a device, a practice, hardware, or equipment that reduces water demands and a program that uses a combination of measures and incentives that allow for an increase in the productive use of a local water supply.

(2) (a) Each covered entity shall, subject to [section 37-60-127](#), develop, adopt, make publicly available, and implement a plan pursuant to which such covered entity shall encourage its domestic, commercial, industrial, and public facility customers to use water more efficiently. Any state or local governmental entity that is not a covered entity may develop, adopt, make publicly available, and implement such a plan.

(b) The office shall review previously submitted conservation plans to evaluate their consistency with the provisions of this section and the guidelines established pursuant to paragraph (a) of subsection (7) of this section.

(c) On and after July 1, 2006, a covered entity that seeks financial assistance from either the board or the Colorado water resources and power development authority shall submit to the board a new or revised plan to meet water conservation goals adopted by the covered entity, in accordance with this section, for the board's approval prior to the release of new loan proceeds.

(3) The manner in which the covered entity develops, adopts, makes publicly available, and implements a plan established pursuant to subsection (2) of this section shall be determined by the covered entity in accordance with this section. The plan shall be accompanied by a schedule for its implementation. The plans and schedules shall be provided to the office within ninety days after their adoption. For those entities seeking financial assistance, the office shall then notify the covered entity and the appropriate financing authority that the plan has been reviewed and whether the plan has been approved in accordance with this section.

(4) A plan developed by a covered entity pursuant to subsection (2) of this section shall, at a minimum, include a full evaluation of the following plan elements:

(a) The water-saving measures and programs to be used by the covered entity for water conservation. In developing these measures and programs, each covered entity shall, at a minimum, consider the following:

(I) Water-efficient fixtures and appliances, including toilets, urinals, clothes washers,

showerheads, and faucet aerators;

(II) Low water use landscapes, drought-resistant vegetation, removal of phreatophytes, and efficient irrigation;

(III) Water-efficient industrial and commercial water-using processes;

(IV) Water reuse systems;

(V) Distribution system leak identification and repair;

(VI) Dissemination of information regarding water use efficiency measures, including by public education, customer water use audits, and water-saving demonstrations;

(VII) (A) Water rate structures and billing systems designed to encourage water use efficiency in a fiscally responsible manner.

(B) The department of local affairs may provide technical assistance to covered entities that are local governments to implement water billing systems that show customer water usage and that implement tiered billing systems.

(VIII) Regulatory measures designed to encourage water conservation;

(IX) Incentives to implement water conservation techniques, including rebates to customers to encourage the installation of water conservation measures;

(b) A section stating the covered entity's best judgment of the role of water conservation plans in the covered entity's water supply planning;

(c) The steps the covered entity used to develop, and will use to implement, monitor, review, and revise, its water conservation plan;

(d) The time period, not to exceed seven years, after which the covered entity will review and update its adopted plan; and

(e) Either as a percentage or in acre-foot increments, an estimate of the amount of water that has been saved through a previously implemented conservation plan and an estimate of the amount of water that will be saved through conservation when the plan is implemented.

(4.5) (a) On an annual basis starting no later than June 30, 2014, covered entities shall report water use and conservation data, to be used for statewide water supply planning, following board guidelines pursuant to paragraph (b) of this subsection (4.5), to the board by the end of the second quarter of each year for the previous calendar year.

(b) No later than February 1, 2012, the board shall adopt guidelines regarding the reporting

of water use and conservation data by covered entities and shall provide a report to the senate agriculture and natural resources committee and the house of representatives agriculture, livestock, and natural resources committee, or their successor committees, regarding the guidelines. These guidelines shall:

(I) Be adopted pursuant to the board's public participation process and shall include outreach to stakeholders from water providers with geographic and demographic diversity, nongovernmental organizations, and water conservation professionals; and

(II) Include clear descriptions of: Categories of customers, uses, and measurements; how guidelines will be implemented; and how data will be reported to the board.

(c) (I) No later than February 1, 2019, the board shall report to the senate agriculture and natural resources committee and the house of representatives agriculture, livestock, and natural resources committee, or their successor committees, on the guidelines and data collected by the board under the guidelines.

(II) This paragraph (c) is repealed, effective July 1, 2020.

(5) Each covered entity and other state or local governmental entity that adopts a plan shall follow the entity's rules, codes, or ordinances to make the draft plan available for public review and comment. If there are no rules, codes, or ordinances governing the entity's public planning process, then each entity shall publish a draft plan, give public notice of the plan, make such plan publicly available, and solicit comments from the public for a period of not less than sixty days after the date on which the draft plan is made publicly available. Reference shall be made in the public notice to the elements of a plan that have already been implemented.

(6) The board is hereby authorized to recommend the appropriation and expenditure of revenues as are necessary from the unobligated balance of the five percent share of the severance tax operational fund designated for use by the board for the purpose of the office providing assistance to covered entities to develop water conservation plans that meet the provisions of this section.

(7) (a) The board shall adopt guidelines for the office to review water conservation plans submitted by covered entities and other state or local governmental entities. The guidelines shall define the method for submitting plans to the office, the methods for office review and approval of the plans, and the interest rate surcharge provided for in paragraph (a) of subsection (9) of this section.

(b) If no other applicable guidelines exist as of June 1, 2007, the board shall adopt guidelines by July 31, 2007, for the office to use in reviewing applications submitted by covered entities, other state or local governmental entities, and agencies for grants from the grant program and from the grant program established in [section 37-60-126.5 \(3\)](#). The guidelines shall establish deadlines and procedures for covered entities, other state or local governmental entities, and agencies to follow in applying for grants and the criteria to be

used by the office and the board in prioritizing and awarding grants.

(8) A covered entity may at any time adopt changes to an approved plan in accordance with this section after notifying and receiving concurrence from the office. If the proposed changes are major, the covered entity shall give public notice of the changes, make the changes available in draft form, and provide the public an opportunity to comment on such changes before adopting them in accordance with subsection (5) of this section.

(9) (a) Neither the board nor the Colorado water resources and power development authority shall release grant or loan proceeds to a covered entity unless the covered entity provides a copy of the water conservation plan adopted pursuant to this section; except that the board or the authority may release the grant or loan proceeds notwithstanding a covered entity's failure to comply with the reporting requirements of subsection (4.5) of this section or if the board or the authority, as applicable, determines that an unforeseen emergency exists in relation to the covered entity's loan application, in which case the board or the authority, as applicable, may impose a grant or loan surcharge upon the covered entity that may be rebated or reduced if the covered entity submits and adopts a plan in compliance with this section in a timely manner as determined by the board or the authority, as applicable.

(b) The board and the Colorado water resources and power development authority, to which any covered entity has applied for financial assistance for the construction of a water diversion, storage, conveyance, water treatment, or wastewater treatment facility, shall consider any water conservation plan filed pursuant to this section in determining whether to render financial assistance to such entity. Such consideration shall be carried out within the discretion accorded the board and the Colorado water resources and power development authority pursuant to which such board and authority render such financial assistance to such covered entity.

(c) The board and the Colorado water resources and power development authority may enter into a memorandum of understanding with each other for the purposes of avoiding delay in the processing of applications for financial assistance covered by this section and avoiding duplication in the consideration required by this subsection (9).

(10) Repealed.

(11) (a) Any section of a restrictive covenant or of the declaration, bylaws, or rules and regulations of a common interest community, all as defined in [section 38-33.3-103, C.R.S.](#), that prohibits or limits xeriscape, prohibits or limits the installation or use of drought-tolerant vegetative landscapes, or requires cultivated vegetation to consist wholly or partially of turf grass is hereby declared contrary to public policy and, on that basis, is unenforceable. This paragraph (a) does not prohibit common interest communities from adopting and enforcing design or aesthetic guidelines or rules that require drought-tolerant vegetative landscapes or regulate the type, number, and placement of drought-tolerant plantings and hardscapes that may be installed on the unit owner's property or property for which the unit owner is responsible.

(b) As used in this subsection (11):

(I) "Executive board policy or practice" includes any additional procedural step or burden, financial or otherwise, placed on a unit owner who seeks approval for a landscaping change by the executive board of a unit owners' association, as defined in [section 38-33.3-103, C.R.S.](#), and not included in the existing declaration or bylaws of the association. An "executive board policy or practice" includes, without limitation, the requirement of:

(A) An architect's stamp;

(B) Preapproval by an architect or landscape architect retained by the executive board;

(C) An analysis of water usage under the proposed new landscape plan or a history of water usage under the unit owner's existing landscape plan; and

(D) The adoption of a landscaping change fee.

(II) "Restrictive covenant" means any covenant, restriction, bylaw, executive board policy or practice, or condition applicable to real property for the purpose of controlling land use, but does not include any covenant, restriction, or condition imposed on such real property by any governmental entity.

(II.5) "Turf" means a covering of mowed vegetation, usually turf grass, growing intimately with an upper soil stratum of intermingled roots and stems.

(III) "Turf grass" means continuous plant coverage consisting of nonnative grasses or grasses that have not been hybridized for arid conditions which, when regularly mowed, form a dense growth of leaf blades and roots.

(IV) "Xeriscape" means the application of the principles of landscape planning and design, soil analysis and improvement, appropriate plant selection, limitation of turf area, use of mulches, irrigation efficiency, and appropriate maintenance that results in water use efficiency and water-saving practices.

(c) Nothing in this subsection (11) precludes the executive board of a common interest community from taking enforcement action against a unit owner who allows his or her existing landscaping to die or go dormant; except that:

(I) No enforcement action shall require that a unit owner water in violation of water use restrictions declared by the jurisdiction in which the common interest community is located, in which case the unit owner shall water his or her landscaping appropriately but not in excess of any watering restrictions imposed by the water provider for the common interest community;

(II) Enforcement shall be consistent within the community and not arbitrary or capricious;

and

(III) In any enforcement action in which the existing turf grass is dead or dormant due to insufficient watering, the unit owner shall be allowed a reasonable and practical opportunity, as defined by the association's executive board, with consideration of applicable local growing seasons or practical limitations, to reseed and revive turf grass before being required to replace it with new sod.

(d) This subsection (11) does not supersede any subdivision regulation of a county, city and county, or other municipality.

(12) (a) (I) There is hereby created the water efficiency grant program for purposes of providing state funding to aid in the planning and implementation of water conservation plans developed in accordance with the requirements of this section and to promote the benefits of water efficiency. The board is authorized to distribute grants to covered entities, other state or local governmental entities, and agencies in accordance with its guidelines from the moneys transferred to and appropriated from the water efficiency grant program cash fund, which is hereby created in the state treasury.

(II) Moneys in the water efficiency grant program cash fund are hereby continuously appropriated to the board for the purposes of this subsection (12) and shall be available for use until the programs and projects financed using the grants have been completed.

(III) For each fiscal year beginning on or after July 1, 2010, the general assembly shall appropriate from the fund to the board up to five hundred thousand dollars annually for the purpose of providing grants to covered entities, other state and local governmental entities, and agencies in accordance with this subsection (12). Commencing July 1, 2008, the general assembly shall also appropriate from the fund to the board fifty thousand dollars each fiscal year to cover the costs associated with the administration of the grant program and the requirements of [section 37-60-124](#). Moneys appropriated pursuant to this subparagraph (III) shall remain available until expended or until June 30, 2020, whichever occurs first.

(IV) Any moneys remaining in the fund on June 30, 2020, shall be transferred to the severance tax operational fund described in [section 39-29-109 \(2\) \(b\)](#), C.R.S.

(b) Any covered entity or state or local governmental entity that has adopted a water conservation plan and that supplies, distributes, or otherwise provides water at retail to customers may apply for a grant to aid in the implementation of the water efficiency goals of the plan. Any agency may apply for a grant to fund outreach or education programs aimed at demonstrating the benefits of water efficiency. The office shall review the applications and make recommendations to the board regarding the awarding and distribution of grants to applicants who satisfy the criteria outlined in this subsection (12) and the guidelines developed pursuant to subsection (7) of this section.

(c) This subsection (12) is repealed, effective July 1, 2020.

HISTORY: Source: L. 91: Entire section added, p. 2023, § 4, effective June 4.L. 99: (10) repealed, p. 25, § 3, effective March 5.L. 2003: (4)(g) amended and (11) added, p. 1368, § 4, effective April 25.L. 2004: Entire section amended, p. 1779, § 3, effective August 4.L. 2005: (11) amended, p. 1372, § 1, effective June 6; (1), (2)(b), and (7) amended and (12) added, p. 1481, § 1, effective June 7.L. 2007: (1)(a), (2)(a), (5), (7), and (12) amended, p. 1890, § 1, effective June 1.L. 2008: IP(4) amended, p. 1575, § 30, effective May 29; (12)(a) amended, p. 1873, § 14, effective June 2.L. 2009: (12)(a) amended, ([HB 09-1017](#)), [ch. 297](#), p. 1593, § 1, effective May 21; (9)(a) amended, ([SB 09-106](#)), [ch. 386](#), p. 2091, § 3, effective July 1.L. 2010: (4)(a)(I) and (9)(a) amended and (4.5) added, ([HB 10-1051](#)), [ch. 378](#), p. 1772, § 1, effective June 7; (12)(a)(III), (12)(a)(IV), and (12)(c) amended, ([SB 10-025](#)), [ch. 379](#), p. 1774, § 1, effective June 7.L. 2013: (11)(a), (11)(b)(III), IP(11)(c), (11)(c)(I), and (11)(c)(III) amended and (11)(b)(II.5) and (11)(d) added, ([SB 13-183](#)), [ch. 187](#), p. 756, § 1, effective May 10; (6) and (12)(a)(IV) amended, ([SB 13-181](#)), [ch. 209](#), p. 873, § 24, effective May 13.

Editor's note: Subsection (12) was originally enacted as subsection (13) in House Bill 05-1254 but was renumbered on revision for ease of location.

Cross references: (1) In 1991, this entire section was added by the "Water Conservation Act of 1991". For the short title and the legislative declaration, see sections 1 and 2 of chapter 328, Session Laws of Colorado 1991.

(2) For the legislative declaration contained in the 2004 act amending this section, see section 1 of chapter 373, Session Laws of Colorado 2004.

Appendix B – Water Demand Forecast



Appendix B – Forecasted Water Demand

The forecast of future demand for Mt. Crested Butte was developed based on the characteristic parameters of mean and standard deviation for monthly water use normalized per connection for each of the organization’s customer types – residential, mixed use, condominiums, irrigation, municipal, utility and residential – for the period January 2009 through December 2013. The characteristic parameters for monthly water demands per active connection, as presented in Table B-1, were used to estimate average and dry conditions water demand for each month in 2015, 2020 and 2022 based on an estimated growth of residential taps of 1% per year over this same time period. Commercial, mixed use, and condominium connections were predicted to grow slightly through 2022 as well. Table B-2 provides the listing of past and predicted taps for each of the customer types.

Average future monthly demand was calculated using the product of average monthly demand per active connection from Table B-1, the number of expected connections, and the average monthly occupancy rate presented in Table B-3. Monthly demand was then summed to estimate average annual demand for each of the three target years in the future.

In that average demand represents the demand expected for average conditions (a 50% chance of being exceeded), it is valuable to estimate demand under above average conditions which for this study relate to those demands that have a 10% chance of being exceeded. Said another way, average conditions may be exceeded in 5 out of every 10 years/chances, whereas above average conditions estimates may be exceeded in only 1 out of ten years/chances. For above average years, future monthly demand was calculated by using the product of the same numbers listed in the paragraph above, except that the average monthly demand per active connection was increased by the standard deviation for the monthly demand per active connection multiplied by 1.28 (which is the factor that adjusts the mean to the 90% percentile assuming that average monthly water demand is normally distributed).

The results of the forecasting calculations are presented in Table B-4.

Table B-4 – Forecasted Annual Water Demand (AF)		
	Average Conditions	Above Average Conditions
2015	279	372
2020	295	394
2022	307	409



Table B-1 – Monthly Water Demand per Active Connection

Normalized Past Demand												
	(in gallons)											
Mean	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Commercial	65,691	41,766	64,345	32,250	38,789	30,255	55,069	64,544	18,078	12,053	15,228	38,706
Mixed Use	205,615	177,654	267,599	113,019	72,725	156,858	264,797	240,504	148,694	78,340	57,829	119,830
Condominium	54,540	39,595	52,459	32,855	26,652	48,527	79,458	62,696	43,190	29,041	22,013	30,708
Irrigation Only	5,657	4,792	1,465	880	8,261	44,034	59,609	56,398	48,661	13,940	300	1,231
Municipal	2,667	1,667	2,667	31,944	30,833	49,556	30,500	28,222	11,556	2,389	2,278	1,889
Utility Uses	71,750	87,333	93,778	52,250	75,139	100,417	136,222	118,583	90,111	78,889	25,750	36,472
Residential	5,225	3,848	4,751	3,127	4,241	10,436	14,564	12,305	9,216	4,195	3,205	3,171
Standard Deviation												
Commercial	9,030	9,502	20,228	12,047	47,233	36,008	31,404	55,348	8,068	6,700	10,494	7,065
Mixed Use	36,219	28,502	62,836	16,820	29,650	63,548	57,911	59,713	12,305	21,609	12,531	20,780
Condominium	16,157	7,955	12,293	18,449	10,751	10,313	19,638	12,217	14,441	12,538	6,312	6,548
Irrigation Only	8,591	9,448	1,879	1,468	9,422	25,101	17,625	14,990	20,249	9,940	562	1,174
Municipal	730	298	516	70,903	63,792	97,493	25,960	22,484	9,561	491	390	272
Utility Uses	35,724	75,589	98,967	27,056	58,468	28,872	33,875	47,347	29,032	117,871	14,673	25,252
Residential	1,042	596	1,387	308	1,241	3,213	2,112	1,995	1,286	1,559	205	177

Table B-2 – Listing of Customer Connections (at end of each year) - Past and Projected for the Future

	Commercial	Mixed Use	Condominium	Irrigation Only	Municipal	Utility Uses	Residential
2009	7	11	47	21	3	2	567
2010	7	11	56	20	3	3	685
2011	7	11	56	21	3	3	690
2012	7	11	56	25	3	3	693
2013	6	10	45	23	3	3	696
2014	6	10	45	23	3	3	696
2015	6	10	45	23	3	3	703
2020	7	11	48	23	3	3	735
2022	8	12	50	23	3	3	748

Table B-3 – Number of Connections with Zero Water Use and Average Occupancy Rates by Customer Type

Average Occupancy Rates by Month based on 2009-2013 Rate of Vacancy													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Commercial	100%	100%	86%	86%	57%	71%	71%	71%	57%	57%	71%	86%	
Mixed Use	91%	100%	91%	91%	91%	91%	91%	91%	91%	91%	91%	91%	
Condominium	91%	94%	94%	87%	91%	89%	91%	91%	94%	91%	87%	89%	
Irrigation Only	56%	69%	50%	56%	63%	81%	88%	88%	88%	44%	25%	38%	
Municipal	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Utility Uses	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Residential	86%	75%	78%	67%	49%	75%	86%	84%	76%	63%	51%	59%	



Appendix C – Current Water Rates



Rates & Fees

The District uses a combination of rates and fees to balance the budget in order to provide water and sewer services to our customers. There is a minimum monthly charge that reflects the amount it costs the District to open its doors to serve you when you turn on the water tap or flush, any time of the day or night. The base rate includes 11,000 gallons of water.

Current Rates

USER FEES:

User fees are billed on a monthly basis. Water consumption is metered and billed per 1,000 gallons of usage. Sewer service is a flat fee.

Base Rate: Water \$33.15 - Sewer \$37.25 = Total base monthly bill \$70.40

Water Metered Base Rate includes up to 11,000 gallons, plus

- › For Tier 2 - \$2.75/1000 11,001 to 20,000 gallons

- › For Tier 3 - \$3.02/1000 20,001 to 30,000 gallons

- › For Tier 4 - \$3.30/1000 30,001 to 40,000 gallons

- › For Tier 5 - \$3.55/1000 40,001 gallons and up

Fee Schedule:

Lien Placement and Release	\$100.00
Property Assessment/Research	\$ 30.00
Return Check Fee	\$ 35.00
Second Return Check Fee	\$ 25.00
Tap Fee Calculation	\$100.00
New Account Set-Up	\$ 25.00
Penalty 60 days delinquent	\$ 40.00
Interest per month on delinquent	1%
Disconnect Water Notice	\$200.00
Certify delinquent acct to County	\$100.00
Service Calls	\$50.00

(Service calls include line inspections and leak analysis and does NOT include meter battery maintenance.)

AVAILABILITY OF SERVICE FEES:

Availability of Service fees are charged where water and/or sewer main lines are within 100 feet of the property line of a vacant property, parcel, or lot. These services are charged on vacant land lots not currently



tapped to the District system, if the main lines are within 100 feet of the property line. By charging for Availability of Service, payment for bond indebtedness incurred for capital expenses such as infrastructure is more equally distributed among all property owners. Availability fees are not used for operational costs, only capital infrastructure. This fee structure was established in 1978 and is provided for in Section 32-1-1006 (D) of the Colorado State Statutes. The Availability of Services fees are a means of making up the difference between developed versus undeveloped land. The alternative would be a high mill levy on property tax rates. It would also be extremely expensive and not feasible for individual property owners to run lines to their lots. Availability fees are billed for each lot on a single family equivalent per quarterly basis. There are additional fees for Low Density and High Density Multi-Family property.

Base Rate: Water \$46.67 Sewer \$52.69 - Total base quarterly bill \$99.36

Meridian Lake Park Rates

In addition to the usage and availability fees above, Meridian Lake Park customers are charged for the 1996 Revenue Bond Assessment repayment at \$36.27 per lot per month. This assessment was for the 1996 upgraded water treatment plant and capital improvements and will expire in 2015.

In addition, a capital improvements assessment has been established to run from 2010-2012 at \$25.00 per lot, per month. This assessment covers the expanded water treatment plant, the improved pump station and the fire flow system design. Rate DISCONTINUED in January 2013.

Billing, Penalties and Interest

The District accepts payment in the form of cash, check, money order, or auto payment draft.

In addition to mail-in payments and paying at the office, there is a payment drop slot at the Main Office front door. Also available is an Electronic Funds Transfer, please view the **EFT form**.

Water meters are read by radio read around the 25th of each month. Utility bills are then prepared and mailed at the end of each month for the previous months' usage. Payment is due on the 20th of the month. We do **not** accept postmarks. Payment must be received at the office by the due date.

Quarterly bills for the Availability fees are mailed in advance of the quarter in March, June, September and December. Payment is due on the 20th of the next month.

If payment is not received by the 20th of the month for all billings, a penalty is charged at 1% of the balance due.

If your bill contains a penalty, this simply means the District did not receive payment for the previous bill when the calculations for the current bill were made. This does not necessarily mean your payment was not received before the bill was sent, but it was not available when the calculations were done.

Appendix D – AWWA M-36 Methodology



Appendix D
Best Management Practice for Estimating and Tracking Water Losses
Mt. Crested Butte WSD

	in thousands of gallons												Annual Total	Comment	
	2013														
	Jan	Feb	Mar	April	May	June	July	August	September	October	November	December			
Production															
East River System															
Diversion/Source Water															Input Metering Readings
Malensek #5 Ditch (not available in 2013)															No Meter Until Sept 2014
Woods Creek (aka - mountain springs)	283	233	234	234	679	633	696	836	728	577	520	525	6,178	Input meter readings	
East River (pumped diversion)	8,789	8,957	8,718	6,998	5,155	12,895	15,661	8,342	4,882	2,936	4,223	8,916	96,472	Input meter readings	
Into East River WTP (calculated)	9,072	9,190	8,952	7,232	5,834	13,528	16,357	9,178	5,610	3,513	4,743	9,441	102,650	Sum of Diversions	
East River WTP															
Influent (from pre-sedimentation pond) (metered)	12,111	10,963	12,217	8,446	10,966	21,297	25,293	19,290	14,814	10,054	9,991	14,804	170,246	Input meter readings	
Effluent	10,513	9,841	11,046	7,484	8,465	17,721	21,498	16,475	12,268	8,380	7,307	10,835	141,833	Input meter readings	
Back Wash Losses	1,598	1,122	1,171	962	2,501	3,576	3,795	2,815	2,546	1,674	2,684	3,969	28,413	Calculated from influent less effluent	
Meridian Lake System															
Diversion/Source Water															
Jaklich Ditch (not metered)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No meter
Meridian Lake WTP															
Influent (from reservoir discharge) (new metering began Oct 2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	No consistent meter until Oct 2014
Effluent	446	387	483	355	598	1,617	3,383	1,100	744	370	368	469	10,320	Input meter readings	
Flush Water Losses (not estimated)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Calculated from influent less effluent
Total Finished Water to Distribution	10,959	10,228	11,529	7,839	9,063	19,338	24,881	17,575	13,012	8,750	7,675	11,304	152,153		
Demand															
Commercial	326	264	249	142	56	105	700	161	69	69	49	203	2,393	From billing data	
Mixed Use	1,340	1,799	1,889	1,264	677	1,596	2,993	2,244	1,327	918	524	1,181	17,752	From billing data	
Condominium	2,057	1,529	1,855	1,147	735	2,358	3,531	3,011	1,346	665	581	925	19,740	From billing data	
Irrigation	4	1	-	1	15	765	1,058	701	444	5	-	-	2,994	From billing data	
Municipal	8	6	6	7	20	745	186	142	53	7	7	5	1,192	From billing data	
Utility	171	411	182	123	131	413	460	268	271	-	-	-	2,430	From billing data	
Residential	2,099	1,933	1,792	1,145	931	6,130	9,434	6,751	4,157	1,561	878	1,447	38,258	From billing data	
Total Customer Demand	6,005	5,943	5,973	3,829	2,565	12,112	18,362	13,278	7,667	3,225	2,039	3,761	84,759	sum of billing data	
Non-Revenue Water	4,954	4,285	5,556	4,010	6,498	7,226	6,519	4,297	5,345	5,525	5,636	7,543	67,394	Calculate as total finished water production less total water sold	
													44%	Calculated Percent Non-Revenue (as percent of total finished water production)	
Water Loss Summary															
Apparent Water Loss	% of Water Sold	261	254	264	172	142	506	737	530	326	160	116	194	3,662	Sum Apparent Water Losses
Unauthorized Consumption	0.70%	77	72	81	55	63	135	174	123	91	61	54	79	1,065	Unauthorized Consumption (as a percentage of production = production*percentage)
Customer Meter Inaccuracies	2.50%	154	152	153	98	66	311	471	340	197	83	52	96	2,173	Customer Meter Inaccuracies (as a percent of demand adjusted upward = demand/(1-percentage) - demand)
Systematic Data handling Errors	0.50%	30	30	30	19	13	61	92	66	38	16	10	19	424	Systematic Data handling Errors (as a percentage of demand = demand*percentage)
Real Water Loss															
Current Monthly Real Water Loss (CMRL)		4,693	4,032	5,292	3,837	6,356	6,720	5,782	3,767	5,019	5,365	5,520	7,349	63,732	Calculate Real Water Loss (Non-Revenue Water less Authorized Unbilled Consumption and Apparent Water Loss)
Unavoidable Background Leakage (UBL)															Unavoidable Background Leakage (UBL) which is a component of UARL - UBL (1000 gallons per day) = ICF*(0.2*TL)+(0.008*NC)+(0.34*TPL)*(P/70)*1.5; for the purposes of this exercise, ICF (the Infrastructure Condition Factor is set to 1.0 - it can vary in practice from 1.0 to 1.5)
Characteristic Parameters of Water Supply System															
Total Length of mains, TL (miles)															
Number service connections, NC															
Total Length of private pipes, TPL (miles)															
Average system pressure, P (psi)															

Appendix E – Public Notice and Comment





HIGH COUNTRY CONSERVATION ADVOCATES

P.O. Box 1066 • Crested Butte, CO 81224
970.349.7104 • office@hccacb.org • www.hccacb.org

June 11, 2015

Re: Draft Water Conservation and Use Efficiency Plan Mt. Crested Butte Water and Sanitation District

Dear Mt. Crested Butte Water and Sanitation District:

Please accept these comments on behalf of High Country Conservation Advocates (HCCA) concerning the draft Water Conservation and Use Efficiency Plan for the Mt. Crested Butte Water and Sanitation District.

I. Introduction

HCCA is submitting these comments for consideration by the Mt. Crested Butte Water and Sanitation District (MCB) as it further develops the Water Conservation and Use Efficiency Plan. HCCA's mission is to protect the health and natural beauty of the land, rivers, and wildlife in and around Gunnison Country. Many of our members live and work in the Gunnison Basin, including in Mt. Crested Butte. Gunnison County rivers and public lands provide our members with recreational opportunities and a quality of life that is preserved by the wildlife, habitat, and water resources.

We commend MCB for voluntarily taking on the formidable undertaking of developing a Water Conservation and Use Efficiency Plan. The effort that has already been invested in formulating the draft Plan is readily apparent. Overall, the draft Water Conservation and Use Efficiency Plan appears to address a range of key considerations that will result in system conservation and efficiency improvements in MCB's service area. HCCA supports many components of the proposed Plan and only offer the comments below as suggestions for how the draft may be strengthened.

As described in the Plan's executive summary, the purpose of the planning effort was to collect data related to the MCB's operations. The Plan understandably provides a wealth of information describing the current water use, demographics, and projected growth. Less time was devoted to investigating how different conservation strategies could be implemented. Thus, our comments below primarily focus on actionable strategies for real loss management and suggest several potential options for taking the next steps towards reducing real losses and consumptive use in Mt. Crested Butte.

II. Summary of recommendations

HCCA supports the vast majority of the monitoring and conservation strategies identified in the Water Conservation and Use Efficiency Plan. We offer the following suggestions for how to expand and/or implement some of these strategies:

- a. Invest in conservation to avoid the need to invest improve the East River pump station.
- b. Set a quantifiable GPCD target for efficiency savings.
- c. Set a peak demand reduction goal.
- d. Consider changes in rate structuring and pricing.
- e. Improve metering and use additional funds from water ordinance violations to replace residential meters.
- f. Work with local entities to enhance and restore flows in the East River.
- g. Consider developing a drought contingency or water shortage plan.
- h. Adopt appropriate regulations, codes and ordinances designed to reduce consumptive uses and peak demands.

III. Set a goal to save enough water through efficiency and conservation improvements so that it is unnecessary to debt service improvements in the East River pump station.

Because the population of MCD is slow-growing and water use is trending downwards, it may be quite feasible to avoid upgrading the East River pumping station.¹ As noted in the draft Plan, the MCD is experiencing “current downward trends in water use” (page 20). Furthermore, the “[p]opulation served is not expected to grow at a rate greater than recent past growth, which averages about 0.1% per year for MCB” (page 13). According to the MCD, this means that “water use within the MCB service area is not currently predicted to increase substantially over the planning horizon, which extends to 2022” (page 17). Thus, the only primary need to increase the capacity of the East River pump station is to meet peak demands. At the same time, one of the goals of the draft Plan includes “delay water treatment upgrade to reduce cost of carrying debt service” (page 20). Investments in these improvements may be avoided with serious investments in conservation and efficiency.

We urge MCB to prioritize the conservation measures in the draft Plan before considering a debt service to expand capacity. As noted in the draft Plan, “water conservation and improved water use efficiency will continue to provide benefit to the District as customer demands increase, since current supplies are greater than expected demands” (page 17). The Plan even suggests that

¹ The draft Plan discusses potential upgrades to the East River Water pump station. Page 19 explains: The largest capital project that the District has been planning for involves an upgrade to its East River pump station, to increase its capacity to meet summertime peak day demands, since the facility has operated above 80% of capacity in the past. The costs for this upgrade are estimated to be in the range of \$750,000, or a 30-year debt service of about \$40,000 per year.

Improvements to the MCB water loss could delay the need for a WTP upgrade, perhaps by five years or more, since water losses are in the range of 40-50% of finished water. In other words, reducing water loss by a factor of 50% would provide a reduction of between 0.2 and 0.3 mgd in peak day demand. A five-year delay of the debt service on the WTP upgrade may return costs in the range of \$125,000 in interest expenses to the District budget, as well as \$200,000 in liquidity in that same time period (i.e., funds that could be spent in other ways). Page 19.

With conservation measures, it appears that the primary challenges that MCB will face is meeting peak demands and a small, incremental growth. Additional strategies for reducing peak demand are discussed below. By emphasizing conservation and reducing peak demands, the MCB may be able to avoid wastewater treatment expansion and save financially.

IV. Set a quantifiable GPCD target for efficiency savings

We encourage MCB to consider setting a target for reducing per capita per day (GPCD) water use.² For instance, MCB could strive to reduce GPCD use by 30% by 2025. After meeting this first benchmark, MCB could continue to incrementally ratchet down the target GPCD.

On page 5 of the draft Plan, the plan describes that MCB tracks individual meters as either commercial/commercial/condo mix or single meter dwellings. This data could provide a rudimentary way to estimate GPCD. MCB would also want to incorporate any proposed GPCD target as part of the education and outreach process used to engage customers and contractors.

V. Set a peak demand reduction goal

To better coordinate MCB policies the District may want to strive to set a peak demand reduction goal. Such a goal could phase in reduction targets. For instance, MCB could decide to reduce water demand during peak season by 10%, 25%, or 50% based on a target year schedule.

VI. Pricing

Rate structuring is a highly effective way to encourage customers to conserve water. The District currently uses inclining block water rates which were set into effect in 2014 (page

²² Typically GPCD is calculated by dividing the total annual production by the total population divided by 365. Given the difficulty with estimating populations in Mt. Crested Butte, MCB may have to play around with strategies to arrive at the most accurate population number possible. GPCD can also be followed by looking at a sample of household usages if Mt. Crested Butte's tourist influx makes it too difficult to accurately use the entire population. The benefit of using the population figure against the total water use is that all uses of water (including residential, multi-family, commercial, industrial, and non-revenue) are accounted for.

18). These inclining rates are certainly a step in the right direction. More aggressive pricing reformation could continue to financially incentivize users to reduce water use and help the District meet its goal for increased customer conservation. As noted in the draft Plan, the District is considering changing the base rate and the amount of water provided to each tap so that water bills more closely correlate to water use.³ HCCA encourages MCB to do so. Additional rate reforms that could be considered include:

- Adopting pricing strategies designed to encourage water conservation. Such methods include:
 - o Repealing volume discounts or free allocations to eliminate any disincentives for conservation.
 - o Increase rates during peak demand seasons. The draft Plan repeatedly notes that “the District’s service area and customer water demands are substantially impacted by tourist visits” (page 12). As noted on page 1 of the draft Plan, MCB provides service to up to 10,000 people during the winter ski season and peak weekends and holidays. Increasing peak demand rates may incentivize tourist industry businesses to engage in their own educational and efficiency campaigns. (i.e., hotels could use in room pamphlets asking guests to reuse towels or limit towels per day).
 - o MCB could charge excess use fees for high-use consumers.
 - o Consider charging for certain water uses currently considered “non-revenue authorized” uses. Page 14 of the draft Plan discusses non-revenue water, or water placed into distribution but not sold to customers. Authorized uses that fall within this category include hydrant flushing, construction water, water treatment plant uses, and some Town uses (page 14)⁴. MCB may want to consider charging for these currently non-revenue uses that are not indispensable public services. For instance, perhaps a reduced rate could be charged for construction water.

The Plan discusses a strategy to begin metering these non-revenue uses. We support this suggestion. Metering these uses may prove to be the first step in determining what uses, if any, should become uses that are paid for by water users.⁵

In addition to increasing water conservation, charging for some non-revenue water will likely help the MCB’s bottom line. “[T]he cost of non-revenue water to the District,

³ Table 8 Summary of Water Conservation and Efficiency Measures and Programs Under Consideration discusses “evaluate changes to water rates and customer billing structure; in part to de-couple base rate with “free” water.” Page 25.

⁴ Pages 15 and 16 discuss additional non-revenue uses, including:

- Water main flushing,
- Bulk water fill station (for construction),
- In-house water use by the District,
- Timberland Pump Station winter operations; and
- Prospect Pump Stations uses.

⁵ The draft Plan discusses this on page 16: “...metering of the various authorized uses will likely be a priority for the District in the future, since measuring these authorized uses will help to quantify unauthorized uses and real and apparent water loss.” See also page 26, where the Plan suggests that “more accurate tracking of authorized unbilled water use.”

measured at the current rate of \$2.66 per thousand, has averaged over \$200,000 per year since 2008” (page 16).

Focusing on pricing will likely help the MCB meet the goals articulated in the executive summary of reducing seasonal customer demands. This could be particularly effective if implemented in tangent with ordinances and regulations that reduce irrigation water use.

VII. Metering

HCCA supports the draft Plan’s proposed metering improvements. Metering improvements can help identify where repairs and conservation efforts can be most effective. In particular, HCCA supports the suggestions that MCB test and improve the master metering of its water supply system (see page 5 of the draft for discussion).

The Plan discusses that “[t]esting and replacing inaccurate customer meters may be another BMP that the District should consider... [to] better characterize apparent losses [and] better quantify real losses”(page 16). To that end, “MCB will be focusing substantial resources on the testing and improvement of its metering systems- for source water, for water produced from the treatment plant and for customer use.” Page 20. However, “no specific funding is allocated for customer meter testing and replacement, nor is there funding for master meter testing and replacement.” Page 19. One potential way to fund meter testing and replacement could be through fines for Town water use ordinance violations. Finally, MCB should ensure that meters are appropriately sized for residential customers. If a meter is too large for a customer, it will typically under-register water use and result in lower revenues for the provider.

VIII. Work with local entities to restore flows in the East River

On page 18, the draft Plan explains that “MCB will evaluate the benefits of water conservation on enhancing instream flows on the East River and its tributaries.” HCCA strongly supports the objective of maintaining, protecting, and enhancing instream flows in the East River. As MCB moves forward with future development plans, we encourage it to emphasize this goal and to collaborate with outside entities, including HCCA, on strategies to effectuate real instream flow protections on the East River.

One existing opportunity to keep more water in the East River may be by dialing in withdrawals. Page 4 of the draft Plan discusses pond overflow from the pre-sedimentation pond fed by water pumped directly from the East River. In FN 3, the draft Plan discusses installation of a pond overflow meter in 2015. HCCA encourages MCB to prioritize installation of this meter. Information provided by the meter could provide MCB with an opportunity to stop diverting just before overflow occurs. Although overflow may eventually make its way back to the East River, avoiding unnecessary diversion more directly supports healthy instream flows.

We encourage the MCB to consider adopting an effective monitoring program to further efforts to protect instream flows in the East River. There are several ways MCB could do

this and incorporate the efforts into the Plan. First, MCB could place a gage nearer to the MCB diversion on the East River. This would enable better monitoring to ensure that critical instream flows for East River fisheries are sufficiently protected. Alternatively, MCB could collaborate with other local entities and the USGS to determine methods to more accurately ground-truth the regression equations currently used to calculate these flows or MCB could chose to more closely monitor its own withdrawals and report those withdrawals.

There are a range of other creative solutions that could use water conservation to enhance instream flows on the East River and its tributaries. HCCA would like to encourage the MCB to collaborate with us to brainstorm and discuss potential opportunities.

IX. Consider creating a drought contingency or water shortage management plan

One of the MCB goals articulated in the executive summary when discussing rules and regulations is to improve the way that the District prepares and responds to drought. Furthermore, as noted on page 2 of the draft Plan, “many headwaters locations in the State are subject to seasonal and long-term water shortages.” HCCA encourages MCB to consider developing a plan that could be implemented in times of drought or water shortage. A drought contingency plan or water shortage protocol could consider specific metrics that would trigger additional regulations or acts to conserve water.

Water shortage or drought contingency plans can incorporate a range of different measures designed to meet crucial demands while experiencing reduced supplies.

Measures that could be considered in these planning efforts include:

- Doubling fines for water waste. The fines assessed to violators could be used to fund audit programs for high water use restriction violators.
- Restrict customers to a three-day per-week watering schedule.
- Provide public drought updates and public radio announcements encouraging water users to conserve water where possible. For example, this could entail drought education and public awareness programs on KBUT.
- Design regulations and ordinances specifically targeted to address drought.
 - o Create special regulations triggered by “drought” or “low moisture” conditions.
 - o Create bans or restrictions on certain non-essential water uses that can be instituted during times of drought or water stress.
 - o Enforce water waste ordinances more aggressively during times of drought or during other water supply emergencies.

X. Adopt appropriate regulations, codes, and ordinances

Regulations, codes, and ordinances could be an effective way to address peak demand and visitor use issues. Indeed, the Plan suggests “updat[ing] MCB Rules and Regulations that support improved indoor and outdoor water use efficiency; reduce seasonal customer demands; and support improved educational and outreach programs.” Page 26. More

directly, one of the system wide management strategies articulated in Table 8 Summary of Water Conservation and Efficiency Measures and Programs Under Consideration is to “update and improve rules and regulations related to, new and retrofit building construction, enforcement authority of water waste, and drought response.” Page 25. The ordinances and regulations discussed below could help to achieve these objectives.

a. Adopt codes and ordinances requiring WaterSense certification or other efficiency standards for appliances

Mt. Crested Butte could adopt a code requiring that all new homes joining the water system should meet or exceed the Environmental Protection Agency’s (EPA’s) WaterSense specification. The EPA’s WaterSense program certifies toilets, bathroom faucets, and showerheads. Requiring the installation of these WaterSense certified products can be a starting point for development of new indoor water conservation building standards. Mt. Crested Butte could incorporate WaterSense standards into all new homes, for indoor water uses and landscape regulations.

WaterSense landscape suggestions include:

- Turf grass in new homes should cover no more than 40% of the landscape
- Pools must be covered when not in use; and water features must use re-circulated water
- Irrigation systems must not have leaks, runoff, or overspray and should be equipped with a rain sensor
- Sprinklers should not be used to water landscape other than turf grass
- Micro-irrigation systems must be equipped with pressure regulators, filters, and flush end assemblies
- Schedules developed at the audit phase should be posted at the controller

WaterSense requirements for all new homes could include efficiency criteria that covers: leaks, service pressure, hot water delivery systems, toilets, bathroom faucets, kitchen sink faucets, and showerheads. If installed by the builder, the following components could also be mandatory: dishwashers, clothes washers, evaporative cooling systems, water softeners, and drinking water treatment systems.⁶

b. Adopt codes supporting xeriscaping

Currently, MCB has in place limitations on outdoor water use (e.g. car washing) and lawn irrigation (page 18). Mt. Crested Butte could advance water conservation in the MCB by adopting ordinances that would require xeriscaping or a landscape design regime that is less water intensive.

⁶ Colorado WaterWise. 2010. Guidebook of Best Practices for Municipal Water Conservation in Colorado. Denver, CO. August.

The draft Plan includes figures that in 2013, 23 of MCB's customer connections were for irrigation only (see page 7; Table 2). Presumably, the mixed use and residential connections also use a portion of their water demand for irrigation.⁷

Irrigation is water-intensive and tends to require more water during the warmer summer months, during roughly the same time MCB is experiencing increased demands due to tourist visits. For instance, the section explaining customer water use characteristics discusses a "double hump" in peak water demand, one during ski season and another in July related to summertime visits (page 7). Residential use, which presumably includes some water for irrigation, constitutes about 50% of summertime demand in the District (page 8; Table 3).

A xeriscaping ordinance could provide effective means for conserving water by decreasing municipal and domestic outdoor irrigation demand. Xeriscape regulations can require the use of drought-tolerant plants from a published list and it may also permit non-listed plants on small, defined oasis areas. In this manner, xeriscaping permits homeowners to still pick their favorite varieties while keeping irrigation use to a minimum. The "oasis" area can be explicitly limited to a percentage of the lot site, say 5%. Such a code could also incorporate irrigation efficiency requirements. Such an ordinance could also encourage native vegetation to be left in place, an option that many homes in Mt. Crested Butte already take advantage of by choosing to leave our gorgeous native wildflower landscapes intact.

Codes to support xeriscaping could approach the issue from two different angles. New development, new landscape projects, or remodels could be required to adhere to codes discussed below. Additionally, a xeriscaping program could offer rebates for customers that voluntarily xeriscape lawns that were previously Kentucky bluegrass or another water-intensive form of vegetation.

A potential xeriscape rebate program could focus exclusively on outdoor consumptive water use. To do this, MCB could:

- Require that customers are educated on the water requirements of xeriscaping prior to receiving the rebate.
- Offer a rebate of .75/square foot for converting high water use grass to lower water use grass
- Increase the rebate for commercial, institutional, and industrial customers to \$1.50/square foot for all projects and to \$2/square foot for slopes and small areas.

Irrigation efficiency rebates could also be provided to residential users. Rebates could be offered for efficient stream nozzles, for wired or wireless rain sensors, or for smart irrigation controllers.

⁷ On average, throughout the country, outdoor water use accounts for about 40 percent of all residential water use.

XI. Conclusion

We appreciate the considerable effort and consideration that MCB has already invested in developing this voluntary Water Conservation and Use Efficiency Plan. We encourage MCB to consider the above comments when revising and refining the Plan to arrive at a final draft.

Thank you for this opportunity to comment.

Sincerely,

A handwritten signature in cursive script that reads "Julie V. Nania".

Julie V. Nania
Water Director
julie@hccacb.org

** Received Wednesday, 7/22/2015 at 4:25 PM via email **

Thank you for the opportunity to comment on the Mt Crested Butte Water Conservation Plan

The summary findings of the water budget for Mt Crested Butte were very informative.

I agree with the assessment that an 11,000 gallon minimum is definitely not an incentive to conserve water. In the numerous large and small communities that I have lived in this minimum amount is less than half than currently in place in Mt Crested Butte. I would like to see a fee structure that supports conservation and charges consumers for the water that they use, with lower per gallon rates for lower consumption and ramping up as consumption exceeds a more reasonable minimum. Perhaps defining a water budget per residence based on number of occupants and then establishing a fee structure base on the percentage used of that budget (less than or more than 100%) would be a possible option.

I agree with the report that a more accurate input/output accounting of water is an important goal, but regardless of the results of that accounting, I think we can agree that an adjusted rate structure could be put in place immediately.

I am a year-around resident of Mt Crested Butte in a 3 BR/2BA single-family house and I am happy to share my water use data (I have an RF meter).

Please let me know if I can help with your efforts to conserve water.

Lewis Abrams
15 Castle Rd
Mt Crested Butte, CO
720-320-8696

Public Comment Response

Received June 11, 2015 from High Country Conservation Advocates (HCCA)

General

The comments that the District received from HCCA were well thought out and informative. In general the comments appeared to agree with the premise, content and conclusions of the District's Draft Water Conservation Plan. Key areas that the HCCA requested additional information and/or language changes to the Plan relate to providing clarifications in some key areas, and including more detail and breadth with regard to candidate water conservation measures and programs that were not covered and/or were not included in detail in the Draft Plan.

The specific manner in which the key comments provided by HCCA are addressed in the Final Plan are provided below. In general, the District was very appreciative of the comments that were received from the HCCA and will attempt to include those portions of the comments that are relevant to the District's planning efforts in the Final document. Notable is that water conservation planning within the District will occur through an adaptive management process, and that some of the customer demand management programs favored by HCCA may be considered at a later time; however, current resources available to the District will focus on infrastructure and water loss management as a way to improve water use efficiency addressing peak day demand reductions and overall water conservation. Peak day demand reductions will help the District to postpone future capital improvement projects, thus delaying debt service, which provides improved cash flow in the mid and long-term – cash flow that can then be used for future customer demand management programs, if appropriate.

Specific Comments and Responses

I Introduction

Noted

II Summary of recommendations

- a. Noted. This is the focus of the current water conservation plan as approved by the District Board.
- b. GPCD goals are not applicable to the circumstances at the District due to the large variability in tourist visits.
- c. Noted and included in the plan.
- d. Noted and included in the plan.
- e. Noted. Metering improvements are included in the plan. Water ordinance violations may be an outcome depending on future policy decisions by the District Board as new policies and ordinances are created.
- f. Noted.
- g. Noted.
- h. Noted and included in the plan.

III Set a goal to save enough water through efficiency and conservation improvements so that it is unnecessary to [incur] debt service improvements in the East River pump station

Noted and included in the Plan as per the District's general comment response provided above. However, it is unclear as to whether future demand or changes in water supply yield may dictate the need for future pump station improvements or increases in capacity. Therefore the District will look to utilize water rate structure revisions to support creation of reserve accounts to help reduce future reliance on debt service.

IV Set a quantifiable GPCD target for efficiency savings

As previously indicated, gpcd is not a reasonable metric for evaluating water use characteristics, and therefore the efficacy of efficiency and conservation programs, for the District given the variability of tourist visits to the service area. Nonetheless, the District will collect data that monitors and verifies the impact of proposed water conservation and efficiency programs such that improvements made by the District can be validated. The implementation plan section of the Plan presents the data collection proposed.

V Set a peak demand reduction goal

Peak day reduction goals are difficult to develop due to the influence of external factors on peak daily demands – e.g., weather, tourist visits, etc. The District will link reductions in real water loss to reductions in peak daily demand for the short-term.

VI Pricing

Noted and included in the Plan.

VII Metering

Noted and included in the Plan.

VIII Work with local entities to restore flows in the East River

Noted

IX Consider creating a drought contingency or water shortage management plan

Noted

X Adopt appropriate regulations, codes and ordinances

Noted and included in the Plan.

Received July 22, 2015 from Lewis Abrams

General

The District agrees with these comments and will look to make changes to the District water rate structure in the future with the intension of enhancing the connection between water use and improved customer water use efficiency.

Specific Comments and Responses

The District agrees that a more incentivized water rate structure is warranted, especially with respect to providing more meaningful control of seasonal water use during periods of summer time peak periods. Water budgets may or may not be appropriate for MCB; however, the appropriateness and effectiveness of water budgets and alternative tiered rate structures will be accessed as part of the proposed water rate studies recommended in the Plan.

The District also agrees that more accurate accounting of water placed into the water distribution system and delivered to customers is an important goal; and one that the District will pursue along with revising future water rates.