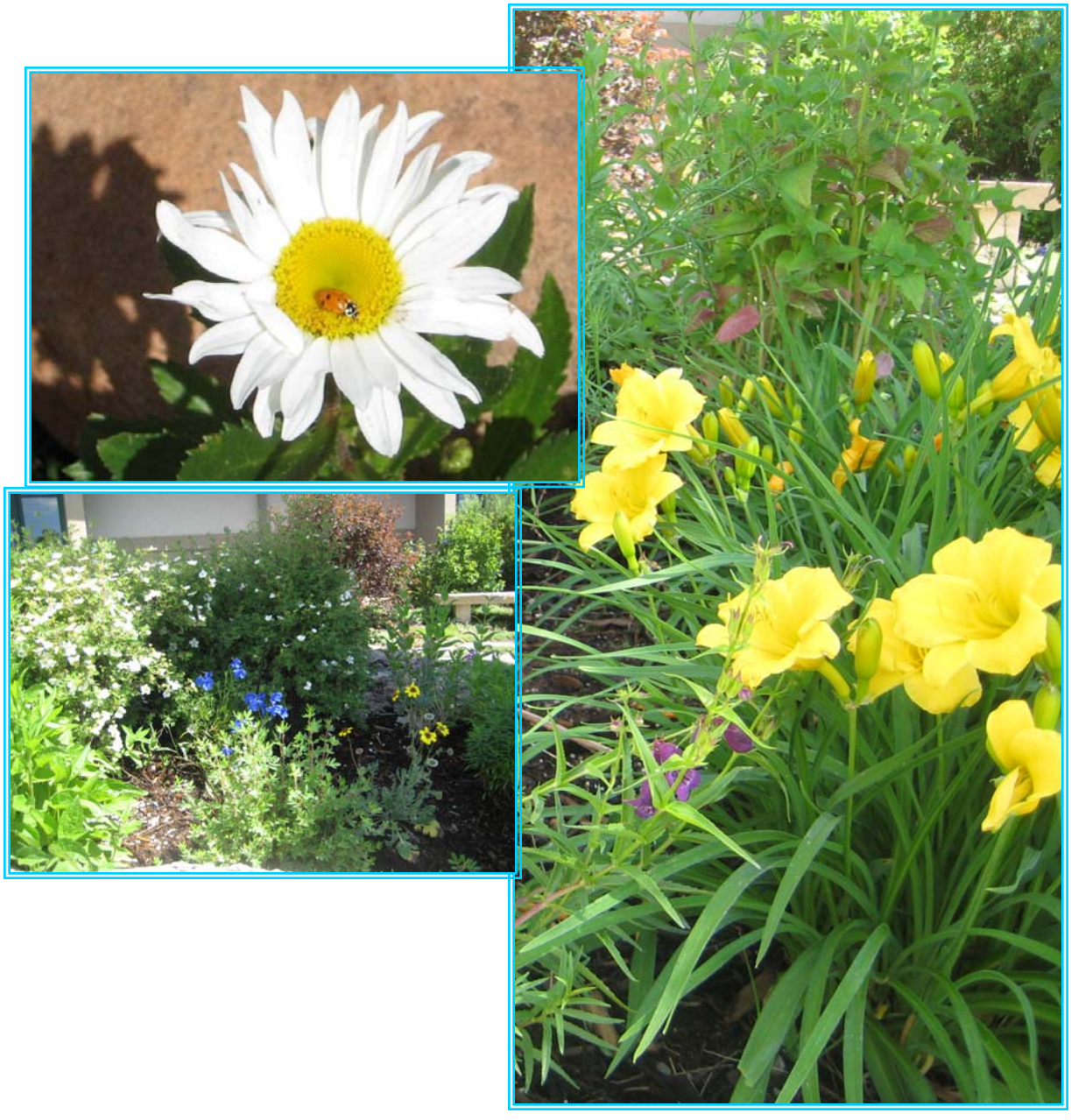
Castle Pines Metropolitan District

Water Conservation Plan

July 2009



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EXECUTIVE SUMMARY

Castle Pines Metropolitan District

The Castle Pines Metropolitan District ("Metro"), a quasi-governmental Special District under Colorado law, was established in 1973 for the purpose of providing water, wastewater collection, operation and maintenance of street improvements and storm drainage services to the Castle Pines Village ("CPV") community. Metro is governed by a five-member Board of Directors who are CPV residents and who are elected by the community to serve four-year terms.

Castle Pines Village

CPV, an unincorporated community, encompasses approximately 2,563 acres in Douglas County. Its principal borders include Interstate Highway 25 on the east, Highway 85 (Santa Fe) on the west and south, and Daniels Parkway on the north. Happy Canyon Road runs through the middle of the village. As of June 30, 2009, CPV had 1,518 homes with an average lot size of .93 acres, a lot size significantly larger than surrounding communities. At full build-out, CPV will have approximately 1,800 homes. In addition, CPV includes several recreational areas, considerable open space and limited commercial property for the benefit of its residents.

Water Supply

Metro currently relies wholly on groundwater pumped from four distinct aquifers of the Denver Basin to serve the community. The only exception to this within CPV is that the two golf courses have always utilized reclaimed water from the Plum Creek Waste Water facility for irrigation and are thus doing their part in conserving the finite groundwater supply and keeping infrastructure costs down. The Denver Basin supply serves communities from Greeley in the north to Colorado Springs in the south and from the Front Range in the west to Limon in the east. Thus, this finite supply must be shared by many and protected by all.

To supplement the groundwater supply, Metro actively seeks to acquire renewable water to provide a more sustainable supply. It is Metro's objective that renewable water will ultimately account for 75% or more of the total water consumption by 2020. The estimated cost of acquisition and the delivery infrastructure for an acre foot in today's market is approximately $35,000. As part of this effort, Metro is seeking to also obtain storage rights in the Chatfield Reservoir expansion. Although Metro currently has some surface water rights in East Plum Creek, such water is not now available for consumption because Metro does not have the treatment facilities necessary to treat surface water (versus groundwater) nor does it have access to pipelines from Chatfield.

Water Demand

CPV usage is billed to consumers in gallons. Billable gallons in the past several years have risen dramatically.

2001 – 239 million gallons
2002 – 254 million gallons
2003 – 240 million gallons
2004 – 225 million gallons
2005 – 266 million gallons
2006 – 300 million gallons
2007 – 294 million gallons
2008 – 331 million gallons

Water demand fluctuates as a result of temperature and precipitation. Some of the increase above is the result of the continued build-out of CPV and this build-out is not yet complete, with approximately another 15% to completion. What may be unique to CPV, because of the larger acreage per home, is that almost 70% of the CPV water consumption is for irrigation purposes, virtually all of which occurs during the seven month period of April through October.

On a per home basis, the average home uses 5,000 to 6,000 gallons per month in the non-irrigation months. In irrigation months, the average balloons to 30,000 to 40,000 gallons per month. Although these monthly gallons by themselves are huge; it is even more pronounced when one considers that peak day demand is even greater. Infrastructure, which is costly, must be adequate to meet this peak day demand and not solely the average demand for the month.

Water Conservation Plan (WCP) Goal: Capital Expenditure Reductions through Irrigation Incentives

Metro recently revised a Long Range Master Plan (LRMP) with the assistance of outside engineering and water consultants. Such plan estimates that, without further conservation, Metro will be forced to spend approximately $43.7 million (2008 dollars) over the next 40 years. With approximately 1,800 homes at build-out, the cost can be viewed as the equivalent of approximately $20,000 to $25,000 per home, a huge amount per unit for any community. However, by lowering the peak-day demand, such infrastructure costs are expected to be reduced in the range of:

- 10% reduction in peak-day demand to save $7 million
- 20% reduction in peak-day demand to save $10 million

In a combination of revenue neutral pricing incentives and high visibility outdoor rebate programs, Metro has developed a comprehensive program that is projected to reduce water consumption by 16% by 2020. Since summer irrigation drives peak day demand, the WCP is designed to yield the necessary results with annual sensitivity analysis and upward or downward rate adjustments over the life of the WCP.

Prior Conservation Techniques

In an effort to keep infrastructure costs to a minimum and to recognize the fact that Metro's current water supply is a finite resource, throughout the years of operation, Metro has implemented numerous conservation techniques. Examples include:

- Had an aggressive leak detection program that audits the whole water distribution system annually

- Established in 2003 a very active Water Conservation Committee comprised of concerned residents and Metro staff
- Implemented a two-tier water usage rate in 2003 with annual increases to those rates commencing in 2007
- Provided annual publications to resident that primarily serve as a water education tool by explaining a range of topics from Colorado climate as a semi-arid region, drawing water from a finite water supply, to educating residents about water conservation.
- Conducted residential and commercial indoor/outdoor water audits
- Provided toilet leak dye kits available to residents
- Designed, installed and maintained a water-wise demonstration garden
- Offered an ET controller rebate program
- Used non-potable irrigation water. One group of cluster homes known as Village Lakes (168 homes with estimated build-out being 200+ homes) currently irrigates with untreated groundwater and utilizes more native grass which requires less water. As a result, two positives occur: less water is used and Metro saves infrastructure and operating costs by not having to treat this water to potable standards.

The Water Conservation Plan

This document is principally about **Water Conservation**, which needs to be continually promoted for two basic reasons as inferred above:

- Protect and prolong Metro's finite supply of water. Our stewardship requirements demand that we think about future generations.
- Minimize costly additional infrastructure assets. Even if demand were to remain constant, as individual well production decreases well pumps must be lowered and new wells added at ever higher costs. Conservation is far less expensive than additional infrastructural investments, whether from groundwater, surface water or a combination of both.

The purpose of the WCP is to provide an operational framework for a program tailored to Metro's water supply system, its LRMP, and one consistent with the values of the community it serves. The WCP has been developed in accordance with the Water Conservation Act of 2004, to meet the provisions of Colorado Revised Statute Section 37-60-126, and in accordance with recommendations from the Colorado Water Conservation Board.

To more aggressively encourage conservation, Metro has "jumpstarted" the plan thusly:

- Implemented a four-tier (versus the previous two tier) water usage rate in 2009 with first stage rates at $3.26 and which gradually increase to $9.47 per 1,000 gallons on a monthly basis for the highest tier.
- Added a new staff position entitled "Water Conservation Coordinator". The position's responsibilities included developing, implementing and monitoring a CWCB approved WCP as well as leading the Metro's water conservation programs.

Four-Tier Water Usage Rates

Commencing in 2009, Metro implemented a four-tier water rate structure as compared to the previous two-tier structure. The four tiers are:

Tier 1 = $3.26 per thousand gallons: 0 to 15,000 gallons
Tier 2 = $5.20 per thousand gallons: 15,001 to 25,000 gallons
Tier 3 = $7.01 per thousand gallons: 25,001 to 50,000 gallons
Tier 4 = $9.47 per thousand gallons: 50,001 gallons and over

Monetary incentives or disincentives through water rates continue to be the principal method in promoting conservation. Similar to consumers' reaction to higher gasoline prices at the pump, it is firmly believed that higher water rates will encourage conservation. Almost every community in the Front Range has adopted a similar approach. As a result of adding additional tiers, it is expected that savings will amount to:

- Year 1 – 5.5 million gallons
- Year 5 – 35 million gallons
- Year 10 – 50.9 million gallons

New Conservation Measures and Incentives

The WCP also provides for new conservation *measures* and *incentives* designed to induce residents to act responsibly and for their own economic well-being. The Water Conservation Committee considered an exhaustive list of options and after resident feedback, selected and tailored those most appropriate to the community.

Measures were defined as programs that were active in nature, included monetary incentives provided by Metro, and allowed for calculation of a benefit to cost ratio that tracked gallons of water saved for dollars spent. The measures selected focus on outdoor activity since that is where high prospects of material success can be expected and also because the indoor fixtures of most CPV homes (1000 of 1518) already meet standards mandated by the 1992 Energy Policy Act. Average consumption activity of 5,000 gallons per month offered minimal opportunity for significant reductions. Although, Metro does provide indoor water-savings fixtures such as low-flow faucet aerators and low-flow shower heads and is replacing five 1.6 g/flush toilets with the dual flush toilets (0.9 g/flush and 1.6 g/flush.)

Incentives are more passive in nature and the results of such educational efforts and policies do not lend themselves to empirical analysis. Their significance cannot be underestimated, because the CPV community continues to be highly receptive to learning new trends and efficiencies in resource management.

The final selection of measures and incentives are shown in Table ES.1. The estimated water savings after full implementation over the ten-year planning period of the WCP is 89.7 MG or 275 AF. The estimated annual water savings in the tenth year is 54.8 MG or 168 AF.

Table ES.1 - Combined Water Savings of Existing and Selected New Conservation Measures and Incentives.

Measures	# Participants Per Year	Estimated Annual Water Savings (gallons)	Estimated Cumulative Water Savings over Ten Year Planning Period(gallons)
Existing			
ET Controller Rebate	23	324,000	3,242,000
Slow the Flow Irrigation Audit	30	1,649,000	16,493,000
Residential and Commercial Indoor/Outdoor Water Audit	20	750,000	7,397,000
New			
4-Tiered Rate Structure	1,339	5,465,000	50,920,000
Irrigation System Repair Rebate	20	282,000	2,819,000
Sub soil Improvement and Plant Replacement Rebate	10	817,500	8,176,000
Rain Sensor Rebate	20	28,200	282,000
Irrigation Head Replacement	20	28,200	282,000
High Efficiency Toilet Replacement – Metro	5	8,300	83,000
Incentives			
Educational articles, bill inserts and seminars	200	NA	NA
ET Controller and Clock Programming On-site Education	40	NA	NA
Annual “Healthy yard” demonstrations at Metro Water-wise garden and Resident’s gardens and garden maintenance and upgrades	40	NA	NA
Post GreenCo BMPs on website	100	NA	NA
Total Water Savings of Water Conservation Program		54,789,000	89,694,000

Implementation Plan

Staff and financial resources can be a limiting factor in implementing and monitoring a water conservation plan. Due to the current economic climate, measures may have to be changed to reflect smaller funding amounts or may be delayed until the economic situation improves.

The following considerations were taken into account with respect to establishing a time schedule for conservation measures and incentives implementation:

- Conservation in conjunction with already planned projects
- Time and effort involved in establishing the measure or incentive
- Initial capital investment
- Expected water savings
- Benefit to cost ratio

The implementation plan for each measure and incentive is shown in Table ES-2. The measures and incentives will be offered every year throughout the ten-year planning period unless shown to be ineffective financially or in regard to water conservation. This determination will be based upon annual review of the WCP. Should voluntary measures fail, pricing mechanisms will be revisited to develop revenue neutral measures that can bring about the necessary results.

Table ES.2 –Implementation Date of New Conservation Measures and Programs.

Measures	Implementation Year	Estimated Annual Cost	Action Required
4-Tiered Rate Structure	2009	$25,000	Staff time
Irrigation System Repair Rebate	2010	$22,000	Staff time and funding*
Sub soil Improvement and Turf grass Replacement Rebate	2010	$51,000	Staff time and funding
Rain Sensor Rebate	2010	$3,000	Staff time and funding
Irrigation Head Replacement	2010	$100	Staff time and funding
High Efficiency Toilet Replacement	2009	$1,500	Staff time
Incentives			
Bi-monthly educational articles in Homes Association newsletter, bill inserts and seminars	2009	$1,600	Staff time
ET Controller Programming Education	2009	$1,100	Staff time
Annual Demonstrations at Metro Water- wise garden and Residents' gardens**	2009	$700	Staff time
Post GreenCo BMP's on website	2009	$55	Staff time

* Funding for measures depends on Metro's financial situation in 2010 and beyond.
**Metro has held demonstrations at the Water-wise Demonstration Garden in the past, but the Water Conservation Coordinator will implement a regular, annual seminar at the Water-wise Demonstration garden as well as at residents' homes. Those residents invited to host a seminar have implemented best management practices in their landscapes, and have decreased landscape water use by 20%.

Notes: If financial resources allow, measures may be implemented sooner. Audits and rebates will be offered on a first come, first serve basis and are based on a limited annual budget.

CHAPTER 1 - INTRODUCTION

Throughout Colorado, municipalities face potential future water supply shortages. CPV relies on groundwater from the Denver Basin to meet the majority of its water needs. However, this supply is nonrenewable. Water is pumped out of the basin faster than the recharge. If Metro and the surrounding water entities in the South Metro area continue to withdraw groundwater at current rates, groundwater levels will decline to a point where it is economically infeasible to pump groundwater.

Metro and other districts around the southern Denver Metropolitan area are faced with a diminishing groundwater supply. To continue to meet demand, acquisition of alternative renewable water supplies is being considered. Metro has compared reliance on the current groundwater supply to developing a surface water system which would utilize Metro's 1985 junior water rights and pending 2004 water rights for surface water in East Plum Creek (EPC) in the LRMP developed by Rothberg, Tamburini, and Winsor, Inc. (RTW) in 2006.

Renewable surface water supply alternatives are becoming more expensive as the competition and expense for surface water supplies is increasing across Colorado. One way to help reduce these expenses is to conserve water. Water conservation can reduce expenses associated with acquisition of the water conveyance and treatment of both potable and waste water. Conservation also promotes the stewardship of natural resources.

Conservation not only reduces water demand but also decreases the amount of energy needed to pump, treat and distribute the water. Conservation is an important component of Metro's integrated water management strategy and LRMP. As the cost of water rises, the economic benefits associated with conservation increase. WCP's are useful tools in developing a conservation program that effectively increases water productivity and water use efficiency while minimizing associated costs. They are most effective when incorporated into the overall integrated water resources management strategy.

Like other municipalities and water districts along the Colorado Front Range, Metro is especially challenged in meeting water requirements associated with high peak demand periods. This peak demand, added to the fact that water supplies are becoming less available and more expensive with time, stresses the importance of a successful water conservation program. Metro clearly recognizes the need to conserve water in order to remain comfortably within the production capabilities of its wells and infrastructure and to delay or eliminate the need for investments in water purchases and infrastructural expansion or replacement. Most importantly, Metro wants to do what it can to preserve water in the region for future generations.

Water conservation will be an important part of Metro's future. As Metro continues to grow, Metro's system will only become more strained if peak demand is not reduced. There are challenges associated with water conservation which include potential lost

revenue, cost of implementation, non-acceptance of conservation strategies in CPV and differing opinions about the importance of conservation among residents. Metro recognizes these challenges and is determined to develop a WCP that is realistic and accepted by the community. Metro has made many proactive conservation efforts to date and will continue its commitment to conservation in the future.

CHAPTER 2 - DEFINITION OF TERMS

Acre-foot:	The amount of water it takes to cover one acre of land to a depth of one foot, approximately 325,851 gallons.
BMP:	Best Management Practice
Reclaimed:	Non-potable treated waste water used for irrigation or other uses other than potable. Metro currently has a reclaimed water supply from Plum Creek Wastewater Authority.
EPC:	East Plum Creek
EQR:	Equivalent Residential Unit. Unit of measure used by Metro to adjust water use for larger taps such as irrigation or commercial, to a single residential tap equivalent of 1".
ET Controllers:	Evapo-transpiration controllers adjust the amount of water applied from sprinkler systems based on soil moisture and weather conditions.
GPD	Gallons per Day
GCD:	Gallons per Capita per Day
MG:	Million gallons
Peak Day Demand:	The largest amount of water used in a single day.
Peak Hour:	The largest amount of water used in a single hour – typically occurs on the Peak Day.
PCWA:	Plum Creek Wastewater Authority
Potable Use:	Water that is treated to drinking water standards for domestic use, including residential and commercial use.
PRV:	Pressure Regulating Valves
WTP:	Water Treatment Plant

CHAPTER 3 – PROFILE OF EXISTING SYSTEM AND DEMANDS

Physical Characteristics of the Existing Water System

Metro currently uses non-renewable Denver Basin groundwater as its water supply. The raw water is treated by one of two water treatment facilities to meet potable drinking water standards. From the treatment plants, the water is conveyed to Metro's customers for consumption and irrigation. Wastewater is collected and conveyed to the PCWA treatment facility located on Highway 85 near Happy Canyon Road. Metro provides operations, maintenance, and management of the raw water system, water treatment plants, distribution system, and wastewater collection system.

Service Connections

Metro currently serves 1,753 Equivalent Residential Units (EQR's). Based on an analysis of the water use per size of tap over a three month period in the summer of 1998, the size of tap was converted to an EQR to normalize water use for domestic, commercial, and irrigation taps. Of these taps, 1,520 are for domestic and commercial use. The remaining 149 taps are dedicated for irrigation and community use. Table 3.1 summarizes the number of taps for each meter size and associated number of EQRs.

Table 3.1 – Number of Taps for Each Meter Size and Associated Number of EQR's.

Description	Number of Taps	EQR/Tap	Number of EQRs
¾ inch Meter	24	1	24
1 inch Meter	1,484	1	1,484
1 inch Flat Rate	17	1	17
1-1/2 inch Meter	35	2.25	78.75
2 inch Meter	3	4	12
3 inch Meter	2	9	18
1" Metro Water Use – Irrigation	89	1	89
Total	1,669	NA	1,753

Growth and Water Demand

Metro experienced two percent growth in 2008. Projected build-out is expected to be completed in 2013. The average annual demand prior to 2007 estimates the build-out population would require a water supply of 1,618 AFY. On a peak day basis, the peak demand would be 4.2 MGD based on 2,000 gpd/EQR. Metro believes that with the adoption of a water conservation program the peak day demand can be reduced at build-out to at least 3.8 MGD or 1,800 gpd/EQR.

Beginning in 1987 Metro has implemented a variety of conservation measures and incentives beginning. These include intensive leak detection, system maintenance, recycled backwash at the WTP's, an ET Controller Rebate Program, installation of a

Water-wise Demonstration Garden, Slow the Flow irrigation audits, water audits provided free by Metro and educational programs that provide information to customers about conservation and other water related topics. A modified 4-tiered block rate structure charging customers (residential and non-residential) more when an allotted usage is exceeded was implemented in 2009. Although Metro offers several water conservation measures and incentives, peak day demand has not decreased to the desired water consumption levels indicating that the conservation efforts have not yet achieved their intended results.

Historical well production data from 1998 to 2008 indicates that demands have generally increased as the community continues to develop. Increased demand occurred in 2002, 2003 and 2008 due to decreased natural precipitation. Reduction in demands occurred in 2006 and 2009 which is likely attributed to an increase in natural precipitation. In July 2008, Metro billed a record number of gallons which was an increase of 27 percent over billed gallons in July 2007. Metro also billed 36 percent more than budgeted in March 2009.

The largest water user category within the community is residential followed by the Castle Pines Homes Association (CPHA) and lastly Metro. The residential sector and CPHA irrigation demands tend to seasonally fluctuate with peak demands occurring during the summer months when outdoor irrigation is highest.

Forecasted demands calculated with data from 2000 through 2006 indicate that Metro's water use at build-out equaling 2,100 EQR's in 2012 will be approximately 1,618 AFY or 527 MG.

The three-year average non-potable treated wastewater (reclaimed) that is reused on the Castle Pines Golf Club and Country Club at Castle Pines golf courses is 567 AF or 185 MG gallons. Reclaimed water supplied by PCWA to the Castle Pines Golf Club and Country Club at Castle Pines in 2008 was 634 AF or 207 MG.

Historical Water Demand

From April 2000 through August 2006, CPV's average daily water use was 688 gallons per day per EQR (gpd/EQR). Table 3.2 summarizes the results of the demand analysis conducted for the LRMP.

Table 3.2 - Water Demand Analysis April 2000 through August 2006.

	Overall Demand			Seasonal Demand		Winter Demand	
	MGD	gpd/EQR	AFY/EQR	MGD	gpd/EQR	MGD	gpd/EQR
Average	0.888	688	0.77	1.467	1,134	0.309	254
Max Annual	0.917	832	0.93	2.030	1,288	0.431	300
Max Month	2.200	1,449	NM*	2.200	1,449	0.459	335
Peak Day	2.847	2,059	NM*	2.847	2,059	0.863	747**

* Not Meaningful
** One data point of demand 1,211 gpd/EQR has been excluded due to possible anomaly.

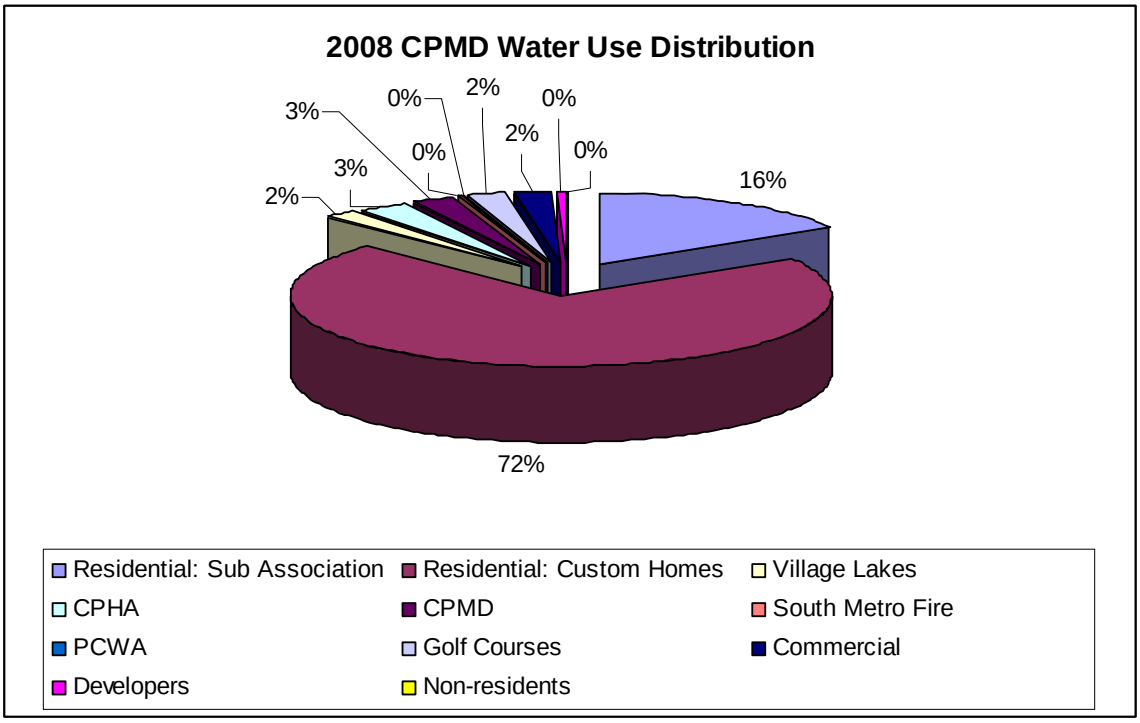
The amount of irrigation water used by CPV was also evaluated by comparing the warm weather water demand with the cold weather water demand. Due to Colorado's seasonal climate, it can be assumed that there is little to no outside watering during the cold weather months of November through March.

The irrigation demand was calculated by subtracting the winter demand from seasonal demand. Seasonal water demand begins in April and ends in October. Utilizing the information presented in Table 3.2, during the irrigation season the average indoor demand is 254 gpd/EQR and the average irrigation use is 880 gpd/EQR calculated from water use consumption data from 2002-2008.

The five-year average potable outdoor residential water use is 67 percent of all water consumed in CPV. This is high compared to surrounding systems suggesting that Metro's residents irrigate more than other water municipalities and districts in Douglas County. One reason for higher outdoor water use is that the typical lot size in CPV is far larger than lots in neighboring communities. Also, CPV has fewer multi-family residences compared to other municipalities or districts.

Figure 3.1 shows Metro's water use distribution and indicates that approximately 88 percent of the water pumped by the wells is used to meet the residential indoor and outdoor demand with only 12 percent required for commercial demand. Residential water use includes irrigation water used by custom homes and 12 sub-associations.

Figure 3.1 – 2008 Metro Water Use Distribution.



Water Distribution System

The following paragraphs describe the Metro water utility system including the distribution system and treatment plants. This description was provided by RTW in the LRMP completed January 2007. A detailed service area map can be found in Appendix F. The potable water distribution system consists of piping ranging from 6-inch to 18-inch diameter, two booster pump stations, two water storage tanks, five pressure relief valve's and numerous air relief valves. The distribution system pipe lengths are summarized according to pipe diameter in Table 3.3.

Table 3.3 - Distribution System Summary

Diameter	Total Length
6-inch (Fire Hydrant Laterals)	16,000 ft
8-inch	182,000 ft
10-inch	51,000 ft
12-inch	114,000 ft
18-inch	14,500 ft

The distribution system was designed with 12-inch and 10-inch diameter mainlines and 8-inch diameter branches. The majority of the residences tap into the 8-inch mains with

1 inch taps. The majority of mainlines are 12-inch diameter pipe with 10-inch in some sections in the central and southeastern areas of Metro.

The majority of the pipe in the distribution system is unwrapped ductile iron pipe. Some plastic permastrand pipe is in place in the central area of Metro. Permastrand pipe and saddle taps have been problematic because of their tendency to leak and break. As a result, it is Metro's policy that all new pipelines be ductile iron with polyethylene wrap.

Pressure Zones

The distribution system is separated into 3 distinct pressure zones, a High Zone, Middle Zone and Low Zone. The High Zone is comprised of the Summit development, The Cliffs, and water and fire protection lines at WTP #2. This zone is fed entirely by pump stations and has no available storage capacity. The pumps are designed with variable frequency drives to maintain pressure based on the demand in the zone. Approximately 15 percent of Metro's current population is served by the High Zone and 10 percent of Metro's planned build-out population will be located in the High Zone. Fire flow to the High Zone is provided by either a fire flow pump located in the Castle Pines Booster Pump Station (CBPS) or the large service pumps in the Upper Zone Booster Pump Station (UZBPS) depending on which pump station is online.

The Middle Zone represents the bulk of the existing Metro users. This zone is the portion of the system that is below the Metro Tank but above the several PRV's located in the southern area of Metro. Service pressures in the Middle Zone range from 35 psi to approximately 180 psi (Service elevations: 6,042 to 6,380 feet). According to Metro staff, residents in the upper areas of this pressure zone report low pressures at upstairs fixtures. Approximately 75 percent of Metro's current population is in the Middle Zone. After completion of the planned build-out, 60 percent of Metro's planned build-out population will be located in the Middle Zone.

The Low Zone is separated from the Middle Zone by five pressure reducing valves (PRVs) located respectively from west to east at Country Club Parkway, Happy Canyon Road (Firehouse PRV), Orofino Drive, Prospect Drive and Castle Pines Drive South (at Ten Mile Place). These PRV's are set to hold a hydraulic grade line of approximately 6,245 feet across the Low Zone. Service elevations in the Low Zone range from 5,980 to 6,140 feet above sea level. This yields a service pressure range of 45 psi to 114 psi in the zone. Approximately 10 percent of Metro's current population is served by the Low Zone. After build-out about 30 percent of the Metro's population will be located in the Low Zone.

Tanks

The system has two water storage tanks. The Metro Storage Tank is located at WTP #2 and the Aslan Tank is located along Country Club Drive at Northwood Lane. The capacities of the two tanks are 2 MG and 1 MG respectively. Both tanks are designed

to be at the same hydraulic grade line of approximately 6,465 feet. The Aslan Tank has shown an inability to maintain a level consistent with the Metro Tank during times of high demand. During high demand, the water velocity through the pipe network connecting the tanks is higher, which causes more friction losses and results in an inability to maintain a water level in the tank.

Booster Stations

There are two booster pumping stations located within CMPD boundaries. Both pumping stations were designed to provide seasonal water demands and fire or emergency flow in the High Zone. The CBPS and UZBPS are both capable of pumping into the higher zone to meet the current demands although they cannot run simultaneously without adverse effects on both stations. Currently the CBPS is used to meet demands of the High Zone. The UZBPS is used as a standby facility.

The UZBPS has five pumps. Three are designed to pump 800 gpm each and two are designed for 100 gpm. The CBPS has four service pumps rated for 500 gpm each with a smaller jockey pump for providing low flow and sustaining pressures. Firm capacity of the CBPS was determined based on using the existing pump curve data and the updated version of the water model that was developed for Metro. Based on results of the water model analysis, firm capacity of the CBPS with three service pumps and one jockey pump on line is estimated at 1,680 gpm for a maximum discharge head of approximately 355 feet (146 psi). The firm capacity is based on using current operating discharge pressure at the CBPS. This pressure results in a minimum residual pressure of 65 psi near the Club House. Metro staff reports that operation of the CBPS is limited to when the water storage tank level is more than half-full.

Due to piping restrictions to and from the Aslan Tank, it cannot completely fill to capacity during peak day demands as confirmed by the water model. Metro has chosen to remedy the situation by manually opening a bypass line from the UZBPS to the Aslan Tank. This allows the pumps at the CBPS to assist the filling of the Aslan Tank by a direct hydraulic connection while still providing for demands seen in the High Zone.

The planned build-out serviced by these pumping stations is 450 EQRs resulting in a peak hour demand of 1,000 gpm as calculated by 2,000 gpd per tap peak day demand multiplied by a peaking factor of 1.6 for peak hour demand. Based on this demand, the existing UZBPS is amply sized to handle the build out population. Therefore, there are no plans to expand the UZBPS in the future.

PRV's

The PRV's in the system are all in the southern portion of the system. The PRV's isolate the lower pressure zone from the middle pressure zone. Of the five PRV's, one is on a 12-inch pipeline on Country Club Parkway, three are on 10-inch pipelines (Prospect, Orofino, and Castle Pines Dr. South), and one is on an 8-inch pipeline at the

firehouse on Happy Canyon Road. The purpose of these PRV's is to act as pressure breakers to the Low Zone. They are each set to hold a hydraulic grade line of approximately 6,245 feet.

The PRVs need to be replaced approximately every 15 years. As part of the capital improvements planning, a budgetary cost of $25,000 every third year has been included for PRV replacement.

System Model

The computer program H2ONET (Version 6.0) has been used to create a model of the distribution system hydraulics. The model contains the known pipes and facilities in Metro. It provides a platform for analysis of the system based on current conditions or hypothetical scenarios. It is a powerful tool for evaluating operations and maintenance issues as well as efficiently prioritizing future capital improvement projects. Demands have been simulated at their points of use for current customers. Future demand has also been input into the model. The model predicts the effects on the system for both peak and average day demand conditions. The model is still in need of further field work in order to calibrate it to the field observed response during fire flow conditions. This is assumed to include further investigation of system elevations relative to tanks and more hydrant tests following American Water Works Association (AWWA) standard procedures.

Current Conditions

The High and Low zones typically have service pressures that are adequate. The Middle Zone however, has a wide range of pressures with upper elevations near 27 psi and lower elevations near 175 psi. Available fire flows across the system are generally greater than 1,500 gpm at peak day demand if the pressures at the higher elevations of the Middle Zone are allowed to drop slightly below 20 psi.

The storage tanks in the model correlate with the field-observed performance of the actual storage tanks. The main problem identified by the model at current conditions is that the 1 MG tank has had difficulty maintaining level at peak day demands unless the level in the Metro Tank is maintained nearly full. This limits the ability to vary the level in the 2 MG storage tank which limits the operational flexibility of the tank. This is considered to be a significant limitation on the overall system at peak day demand.

Water Treatment Plants

Metro currently owns and operates two water treatment plants (WTP). Each of the treatment plants is designed to treat groundwater. Although some of the wells may have water quality that allows the well to pump directly into the distribution system, all the well water is sent through a treatment plant.

WTP #1 – Happy Canyon Road

WTP #1 is located on Happy Canyon Road. Review of current water quality analyses indicate that the raw water iron concentration typically averages about 0.6 mg/L and finished water iron concentrations average 0.02 mg/L or less. Typical raw and finished water manganese concentrations are in the range of 0.07 mg/L and 0.007 mg/L or less, respectively.

Prior to filtration, the water is aerated and pre-chlorinated to oxidize the iron and manganese. Air is added to the mixing tank for oxidation of ferrous iron (Fe2+) to ferric iron (Fe3+). The Fe3+ forms Fe(OH)3 and precipitates out of the water. Because the reaction kinetics for manganese oxidation by aeration is slow, aeration does not readily remove manganese. For manganese removal, chlorine is added between the mixing tank and the filters. The reaction kinetics for manganese oxidation with chlorine occurs rapidly resulting in the formation of a MnO2 precipitate. Chlorination also oxidizes any remaining Fe2+.

After the pretreatment oxidation process, the water is sent through two mixed media filters in parallel. Each filter has a capacity of 1.1 million gallons per day (MGD) for a total capacity of 2.2 MGD. Backwashes are required for these filters approximately every 72 hours at full capacity and require approximately 90,000 gallons per backwash. At this rate, the production efficiency of the filters is approximately 98 percent efficient. The backwash reclaim basin is sized to hold one backwash flow of 91,000 gallons.

The water is then chlorinated for disinfection and to maintain a residual in the distribution system. The plant does not have a sizeable clearwell for storage and chlorine contact time (CT). Because the WTP only treats groundwater, there is no need for chlorine contact time and a clearwell is not required. This requirement changes for treatment of surface water.

The high service pumps utilize a 2,300 gallon wetwell. The treated water is pumped into the distribution system via four high service pumps. Three of these pumps have capacities of 750 gpm and the remaining pump has a capacity of 425 gpm for a total firm capacity of 1,925 gpm. These pumps are undersized on a firm capacity basis which would result in a capacity limitation of 1.33 MGD in the event one of them is out of service. The treatment filters limit the capacity of the treatment facility to a firm capacity of 1.1 MGD and a total capacity of 2.2 MGD.

WTP #1 treats water from Wells A-4R, A-8, A-10, DE-10, and LDA-10. A raw water transfer pumping station and pipeline is constructed connecting WTP #1 and WTP #2. The transfer pump station allows raw water from Metro's lower wells to be treated by either WTP #1 or WTP #2. The pump station is equipped with three 700 gpm pumps resulting in a total capacity of 3 MGD and a firm capacity of 2 MGD.

Assuming the future lower well production remains less than 4.0 MGD, the transfer pump station allows for the supply capacity to be independent of the treatment capacity.

WTP #2 – Country Club Drive

WTP #2 is located on Country Club Drive near Metro's offices. Currently, all wells can be treated at this plant but it is an operational decision as to which wells are treated there. The contaminants of concern for this WTP are iron and manganese like those found in WTP #1. However, the treatment process is different.

When the water enters the plant, the water is oxidized with sodium hypochlorite instead of aeration. After oxidation, the water is sent through an adsorption clarifier. The adsorption clarifier has a smaller footprint than a conventional flocculation and sedimentation basin and it has a high loading rate capacity of 15 gal/ft2.

After the adsorption clarifier, the water is sent through a dual media Trident filter. The media in the filter has high affinity for adsorption of iron and manganese. Due to the adsorption clarifier, the Trident filters at WTP #2 require less frequent backwashing than the filters at WTP #1.

After the water is collected from the filters, it is disinfected with sodium hypochlorite before it is sent by gravity to the 2.0 MG storage tank. WTP #2 utilizes a 36 pound per day on-site generation system to produce the sodium hypochlorite used for disinfection and pre-chlorination. Because WTP #2 only treats groundwater, CT is not required. However, if the plant were to treat surface water, the required CT could be achieved in the 2.0 MG storage tank.

Metro's current water supply is comprised of groundwater from the Denver Basin aquifers. These aquifers consist of the Lower Dawson (shallowest), the Denver, the Arapahoe, and the Laramie-Fox Hills (deepest) aquifers. This section summarizes the amount of water produced by Metro's current groundwater wells.

Metro also has surface water rights on East Plum Creek (EPC). This water is currently not available for consumption because Metro does not have any surface water conveyance or treatment facilities.

Sources of Water Supply

Groundwater Wells

The raw water system consists of seven wells currently connected to the system with construction of additional wells anticipated. The depth of each well varies in order to draw water from the different aquifers. The design production rate, the surface elevation, the static water level, and the pump elevation for each of the wells are summarized in Table 3.4. The 2006 LRMP developed by Jehn Water Consultants (JWC) and RTW was used to provide the well elevations, drop pipe length, material, diameter, pump characteristic curves, and wellhead location.

Table 3.4 - Existing Well Summary.

Well	Surface Elevation (ft)	Design Output (gpm)	Top of Aquifer (ft)	Year of Pump Setting	Bottom of Aquifer (ft)
A-4R	6,158	750	4,758	2005	4,264
A-8	6,130	580	4,764	2006	4,186
A-10	6,053.5	650	4,837.5	2006	4,333.5
A-12	6,486	700	4,816	2004	4,266
DE-8[1]	6,140.9	180	5,675	2005	4,748
DE-10R	6,054	285	5,639	2006	4,754
LDA-10R	6,055	180	6,040	2006	5,690
ASLAN DE-1[2]	6,600	175	5,617	2005	4,757
DE-2	6496.7	275	5,603	2005	4,739

[1] Primarily used for irrigation
[2] Connected to the system but not owned by Metro

From the above table, the current maximum capacity for the existing wells is approximately 3,315 gpm or 4.6 MGD with a firm capacity of 2,435 gpm or 3.5 MGD. ASLAN DE-1 and DE-2 are connected to Metro. However, Metro owns DE-2 and not ASLAN DE-1. For purposes of capacity calculations, DE-2 was included in Metro's water supply capacity but ASLAN DE-1 was not. Well DE-8 is primarily used for irrigation and was not counted toward existing supply capacity. Nonetheless, it is available in the case of emergency.

There are four wells that draw water from the Arapahoe aquifer. The top of the Arapahoe aquifer ranges between 4,758 ft and 4,837.5 ft. Three wells draw from the Denver aquifer where the top ranges between 5,603 ft and 5,675 ft. There is also one shallow well in the Lower Dawson aquifer where the top of the aquifer is 6,040 ft.

Surface Water Rights

Metro currently has a decreed right with a 1985 appropriation date to withdraw up to 3,000 gpm from two points of diversion on EPC. The two points of diversion are shared with the Castle Pines North Metropolitan District (CPNMD). Metro has also filed for an additional conditional water right with an appropriation date of 2004 on EPC. Because the infrastructure for Metro to divert and treat surface water is not yet in place, the surface water is considered a future water supply.

System Limitations

As part of providing an overall perspective, it is appropriate to also provide insight into potential system limitations. Accordingly, major limitations of the water supply components have been provided.

Future water demands were determined and water supply alternatives were evaluated to determine what supplies will be used to meet future demands. The LRMP outlined capital improvement projects required to meet Metro's demands. Opinions of probable cost were developed for each of the identified projects. For Metro to evaluate financing alternatives, Metro's financial plan was revised and integrated by RTW, Inc. into a financial model so that various financial plans could be developed and evaluated.

Based on the water supply evaluation, the LRMP identified a series of projects necessary for the EPC water rights to be reliably used to meet a portion of Metro's demand. The remaining demand must be met with groundwater or additional renewable surface water supplies that must be purchased and developed. Water supply projects in the LRMP include the following.

- Construct, equip, and connect Lower Dawson Well LDA-4 to WTP #1.
- Demolish and reconstruct WTP #1 for treatment of either groundwater or surface water.
- Continue to participate in the reallocation of Chatfield Reservoir to obtain 500 acre-ft of storage in the reservoir.
- Construct Plum Creek Reservoir with CPNMD and the Town of Castle Rock (TCR). Total volume of reservoir is estimated to be 1,760 acre-ft which could be equally divided between the three utilities so that Metro acquires 563 acre-ft of storage.
- Construct shallow wells in the alluvium to divert water from East Plum Creek and pump it to WTP #1 via a raw water pipeline that exists in part today.
- Construct a pump station and pipeline that connects to the alluvial well pipeline to pump water from Plum Creek Reservoir to WTP #1.
- Construct, equip, and connect Lower Dawson Well LDA-12 to WTP #2, currently in progress.
- Construct, equip, and connect Denver Well DE-4 to WTP #1.
- Construct and equip Arapahoe Well A-11 at a new well site 11 and construct a pipeline connecting Well Site 11 to the raw water transfer pipeline.
- Construct, equip, and connect Denver Well DE-11 to the raw water transfer line.
- Construct, equip, and connect Lower Dawson Well LDA-11 to the raw water transfer line.
- Construct and equip Arapahoe Well A-9 at a new well site and construct a pipeline connecting Well Site 9 to WTP #2.
- Construct, equip, and connect Denver Well DE-9 to WTP #2.
- Construct, equip, and connect Lower Dawson Well LDA-9 to WTP #2.

As Metro approaches build-out, improvements will be needed to meet the increased demands due to growth. The LRMP identified the following short-term projects that are recommended to meet the growing demand for Metro.

- Install the third treatment filter at WTP #2, currently in progress.
- Install a new raw water pipeline from the lower wells to the transfer pump station at WTP #1.

- Construct a new 2.0 MG potable water storage tank at WTP #2.

For maintenance and capital replacement the LRMP identified the following projects:

- Replacement of leaking saddle taps on the “permastrand” pipe,
- Routine PRV maintenance and replacement,
- Well pump replacements on an as needed basis.

Certain policies that should be formulated in support of Metro’s water supply projects were also identified. Water conservation management through a WCP is an effective tool that can conserve water annually and lower peak day demand. An effective water conservation program will reduce and/or postpone the infrastructure requirements to meet future demand.

Metro participates in regional renewable water projects. The Douglas County Water Resource Authority (DCWRA) has been established to foster long-term reliable and affordable water supplies in Douglas County. DCWRA works individually and together to develop renewable water supplies, build and finance major water infrastructure, encourage and enhance water conservation and reuse and ensure long-term water for its members and their customers. Metro pays a membership fee to DCWRA as a proportionate share of the costs for studies paid for by DCWRA.

Metro also belongs to the South Metro Water Supply Authority (SMWSA). The SMWSA has been established to foster long-term reliable and affordable water supplies in the southern Denver Metro area. It is made up of 13 water providers in the region who collectively have the ability to develop major water projects to serve residents. The intent of SMWSA is that members work individually and cooperatively to develop renewable water supplies, build and finance major water infrastructure, encourage and enhance water conservation and reuse and ensure long-term water for its participants.

Statewide Water Supply Initiative

In 2003, the Colorado General Assembly authorized the CWCB to implement the Statewide Water Supply Initiative (SWSI) as a result of growing pressure on water supplies in Colorado and the 2002 drought. The study identified current and future water demands, available water supplies, and existing and planned water supply projects in eight major river basins in the State.

The study found a statewide water supply gap of 118,200 AF by 2030 between projected demands and fully implemented water supply processes and projects, which is 20 percent of the 2030 demand.

This finding makes pursuit of all possible future water supplies as well as prudent conservation measures very important to Metro, including conservation. The SWSI study highlighted the relationship between water conservation and water in reserve to meet essential demands during periods of drought. For example, water used to irrigate

lawns and landscapes can be restricted during periods of drought for use to meet life sustaining demands. This illustrates the importance of having ongoing water conservation measures and separate drought restrictions.

Future Water Supply

In the future, hydrogeologists predict that production rates in the Denver Basin aquifers will decrease over the next 50 years. To compensate for the loss of production, Metro has at least two options; 1) use groundwater and continue to drill wells in order to meet demand, 2) develop a renewable surface water source and use it in conjunction with their existing groundwater supply.

The following section identifies the amount of surface water Metro has available from its 1985 junior water right on EPC, the pending 2004 water rights on EPC, and the pending water rights on the South Platte River. Also, predictions of future groundwater supplies available based on projections of declining well production rates are detailed in the following section. Continuing with a "groundwater only" supply is compared to the development of a renewable water resource in conjunctive use with groundwater. Other potential regional renewable water projects are discussed as options for Metro to enhance their renewable water supply.

EPC Surface Water Supply

As previously described, Metro has a decreed right to divert water from EPC under a 1985 date of appropriation and a pending application in Division 1 Water Court to divert water from EPC and the South Platte River under a 2004 date of appropriation. An analysis completed by JWC was performed to determine the volume of water available to Metro from 1950 to 2006 based on these water rights. The following section summarizes the findings of the JWC report.

Water Availability

The analysis performed to determine the amount of surface water available to Metro utilizes the assumptions listed below.

- The pending 2004 conditional water rights are granted with the terms outlined in the filings.
- The decree for the 1985 junior water right is changed to allow for storage in Plum Creek Reservoir (PCR) and Chatfield Reservoir as applied for in the pending 2004 filing.
- Treated reclaimed is available for use after irrigation demands for the golf courses have been met.
- The TCR's treated reclaimed is available and is applied to the golf courses as outlined in current contract documents on file at Metro.
- Futile call at Louviers is not included.

- Metro will have 500 acre-ft of storage in Chatfield Reservoir.
- The constructed volume of PCR is 1,700 acre-ft and the Metro will have 563 acre-ft of storage (assuming that the reservoir space will be equally divided between the TCR, Metro and CPNMD).

Based on the assumptions listed above, a firm yield analysis model was created that first evaluated the volume of water legally available based on the 1985 and 2004 water rights. The model uses historical streamflow data from October 1949 through June 2006. The model begins with evaluating the physical water available in the Plum Creek Basin measured by three USGS gauges (monitoring gauge number 06709550 on Plum Creek at Louviers, 06709530 on Plum Creek near Louviers at Titan Road, and 06708800 on EPC below Haskins Gulch).

Further stream basin analyses identify what would be available to the 1985 water right on EPC. The data was then adjusted to predict the physical water available at the decreed point of diversion for Metro. From this data, the model deducts all senior water rights calls on the stream and calculates the volume legally available to Metro for their 1985 and pending 2004 water rights. The firm yield analysis took into account the storage capabilities in both the PCR and Chatfield. During the non-irrigation season when there is wastewater reclaimed is available, it is added to the available EPC water. The model calculates the water available on a monthly basis.

The demands used in the water rights evaluation were based on the ultimate build out of 2,100 EQRs as outlined in the section below entitled “Future Growth and Water Supply”. The model was run with three different treatment availability scenarios. It is assumed that the surface water treatment plant will be constructed of 1.0 MGD modules. Therefore, to help determine the recommended treatment plant size, the surface water availability model was run with 1.0, 2.0, and 3.0 MGD treatment capacities. Table 3.5 summarizes the average amount of water available for the EPC water rights.

Table 3.5 - Average Surface Water Availability with Storage in Chatfield and PCR.

Treatment Limitation (MGD)	Average Demand Met By Surface Water (Acre-ft/year)	Percent of Demand Met By Average Surface Water	Average Demand Not Met By Surface Water (Acre-ft/year)
1.0	788	48%	846
2.0	1,103	68%	531
3.0	1,229	75%	405

There is a diminishing return on the average amount of surface water available as the treatment capacity increases (i.e. doubling the treatment capacity will not double the amount of surface water available).

Future Growth and Water Supply

Based on future development plans, it is estimated that build-out for Metro will be 2,100 EQRs. At build out, it is anticipated there will be a total of 1,980 taps (assuming the EQR distribution remains constant with respect to tap size). It is anticipated that the growth rate will be between four and six percent which will achieve build-out sometime between January 2012 and January 2013. Table 3.6 illustrates the number of EQRs for each projected growth rate from January 2009 to build-out. Build-out includes a total of 432 EQRs for the ASLAN development. Table 3.6 also summarizes the projected number of EQRs for each year from 2009 until build-out.

Table 3.6 - Real and Projected Growth Rates.

Year	Projected EQRs at 4.0 Percent Growth Rate	Projected EQRs at 6.0 Percent Growth Rate
2009	1820	1855
2010	1892	1966
2011	1968	2084
2012	2047	2100
2013	2100	2100

Physical Water Availability in EPC

The water availability analysis performed for this LRMP is based on historical streamflow at the USGS gauging stations discussed above. EPC is tributary to Plum Creek. Therefore, EPC only counts as a portion for the actual flow in Plum Creek.

In 1999, the USGS installed gauging station 06708800 on EPC below Haskins Gulch north of Castle Rock. Haskins Gulch is upstream of the Metro diversion points and the PCWA treatment plant. Based on this limited data, Table 3.7 was developed by RTW summarizing the probability of water available in EPC. It should be noted that Table 3.7 accounts for all the physical water in the stream.

Table 3.7 - Physical Stream flow Available in EPC.

	Probability of Sufficient Stream Flow for 1 MGD	Probability of Sufficient Stream Flow for 2 MGD	Probability of Sufficient Stream Flow for 3.0 MGD
Annual	90	75	55
Jan	99	70	45
Feb	100	90	65
Mar	99	85	65
Apr	100	90	80
May	99	97	80
Jun	90	80	65
Jul	80	60	40
Aug	75	65	55
Sep	80	60	35
Oct	90	55	50
Nov	100	65	55
Dec	100	70	40

There are anomalies noted when the flowrates measured at the Haskins Gulch gauge are compared to the flowrates measured at the Titan Road gauge. There are numerous instances when the total flowrate measured by the Haskins Gulch gauge is greater than the total flowrate measured by the Titan Road gauge. Considering the Haskins Gulch gauge on EPC is a contributory stream to the Titan Road gauge on Plum Creek, the Haskins Gulch gauge should read less than the Titan Road gauge. The only way the streamflow could be less downstream would be if the water is infiltrating into the alluvial deposits or if there is a diversion point between the stations.

The measurement difference between the two stations is thought to be caused by the design of the Titan Rd station. In this location, Plum Creek is wide and “braided” with the water spread out. At the wide location, more of the water in the stream is traveling through the alluvium and is therefore not being measured by the gauging station. It is thought that the Haskins Gulch gauge is more accurate than the Titan Rd station.

The analysis did use streamflow data from the Haskins Gulch station once it came online in 1999. There is not enough data to develop a statistically reliable relationship between the two gauging stations that could be used to transfigure Titan Rd data to Haskins Gulch data. Because this relationship cannot accurately be determined, Titan Rd station data should result in a more conservative analysis equating to possibly more water available than indicated.

The model used to determine the water availability described above uses the philosophy of maximizing surface water use. The average water available under a maximized condition is summarized in Table 3.8.

Using this scenario, during dry years the available water in EPC will not meet all demands. These additional demands will need to be met by wells. Based on the well

analysis, only one additional well would be required for the following described scenarios where the reservoirs are kept full for peaking purposes. In this case, the reservoirs are not kept full to provide relief during droughts. Consequently, there are times when there is not enough water in storage to meet demands during longer droughts. Based on the model, approximately 10 percent of the time there is no surface water available in EPC or the reservoirs. During these years, all demands must be met by wells. As a result, Metro must maintain a completely redundant well capacity to handle drought years.

The groundwater well system would not require as many future wells as determined in the analysis where only groundwater was used. The majority of the time, a portion of Metro's demand will be supplemented by surface water. This will put less strain on the wells which should result in a slower diminishing capacity in production rates. Preliminary modeling shows that it is likely that 4 additional wells will be required over the next 50 years. Also, when there is excess surface water, the water can be treated and recharged into the aquifer.

Metro has acquired an Aquifer Recharge Permit. This practice should help maintain aquifer water levels and well production capacity. Metro has begun researching the length of time it takes the bubble to migrate. In other words, how long does the recharge water stay in the aquifer? Metro staff believes aquifer recharge will be useful on an annual basis, but it long-term availability is uncertain.

The Denver Basin aquifers are considered a non-renewable supply. Current knowledge reveals that very little to no recharge occurs to these aquifers. Therefore, as water is removed it is not replaced. The decreased production rate of the wells, as noted earlier in the report, is referred to as "diminishing capacity". Since there is no replacement water being added to these aquifers, as water levels decline the upper portions of the aquifer become desaturated, resulting in a lower production rate.

Historical water levels in the aquifer fluctuate due to pumping. When the pumps are turned off, the aquifer level goes up. At the end of the summer in 2005, the recovery in the static water level was below the top of the aquifer, meaning that the aquifer became unconfined. Since then, the well production in the Arapahoe aquifer wells has begun to decrease.

Future Production for Existing and Future Wells

The future production rate for wells within Metro was projected based on historical aquifer static water elevations, local aquifer characteristics, and future demands. JWC performed this analysis for three different scenarios including: a peak day build-out demand of 3.78 MGD supplied only by wells; a max day build-out demand of 4.2 MGD supplied only by wells; and an average annual well demand of 2.7 MGD with the peaks met by surface water. Tables including this information can be found in Appendix D. The analysis included projecting production rates for existing and future wells for the next 50 years.

Peak day build-out demand of 3.78 MGD was determined using the build-out population of 2,100 EQRs at a demand of 1,800 gpd/EQR. As described in Chapter 4, Metro historically had a demand of 2,213 gpd/EQR in 2008. It is the goal of Metro to decrease the demand to a minimum of 1,800 gpd/EQR through conservation strategies. The JWC analysis concluded that to supply the reduced future demand of 1,800 gpd/EQR, Metro would be required to drill an additional 14 wells on six new well sites between 2006 and 2056. Currently, Metro has easements for two new well sites. As a result, easements for four additional wells sites would be required.

If Metro is unable to reduce the peak day demand to 1,800 gpd/EQR, the build-out peak day demand may be 4.2 MGD for 2,100 EQRs. An analysis by JWC concluded that Metro would require an additional 18 wells and seven new well sites between 2006 and 2056 at the 4.2 MGD.

Appendix D illustrates four scenarios if peak day demand remains consistent with historical demand and if peak day demand is reduced by ten percent:

1. Number of wells needed to meet peak demand at full build-out – Without adding surface water at a peak day demand of 3.78 MG
2. Number of wells needed to meet peak demand at full build-out with no surface water at a peak day demand of 3.78 MG
3. Number of wells needed to meet peak demand at full build-out – Without adding surface water at a peak day demand of 4.2 MG
4. Number of wells needed to meet peak demand at full build-out with no surface water at a peak day demand of 4.2 MG

Water Costs and Pricing

All things being equal, reduced water usage will cause a short-term loss in revenue in favor of extending the life of existing infrastructure and water supplies. Conversely, non-efficient use of water may yield short-term increases in revenues and an increased demand on infrastructure and water supplies. However, these increases are insufficient to meet the ever-increasing costs of capital infrastructure and additional rights to surface water. This fact places added emphasis and importance on conservation measures. Since these decisions involve benefit to cost scenarios, understanding Metro's rate structures, water revenues and costs of raw water acquisition is an important part of the planning process.

Rate Structure

Metro's rate structure is shown in Table 3.8.

Table 3.8 – Metro Rate Structure and Miscellaneous Billing Information.

RESIDENTIAL AND COMMERCIAL RATES

Meter Rate Code	Meter Size (Inches)	Additional Description	Tiered Usage Schedule, Cost per 1000 Gallons	Fixed Monthly Charges: Water	Sewer	Storm Drainage	Typical (but not all) Users
REGULAR USAGE METERS							
1	0.75	.75" Mtr 4-T	3.26/5.20/7.01/9.47	$22.73	$26.04	$4.34	Ridge and Morningstar cluster homes constructed prior to 2002. As ownership changes, the 1" meter rate goes in effect.
2	1.00	1" Mtr 4-T	3.26/5.20/7.01/9.47	$28.94	$43.41	$7.23	Vast majority of homes
4	1.50	1.5" Mtr 4-T	3.26/5.20/7.01/9.47	$37.20	$86.82	$14.47	Mostly irrigation; a few homes
6	2.00	2" Mtr 4-T	3.26/5.20/7.01/9.47	$59.94	$138.92	$23.15	Golf Club and CIC buildings
7	3.00	3" Mtr 4-T	3.26/5.20/7.01/9.47	$227.39	$260.46	$43.41	Canyon Club and grounds
8	1.00	1" Mtr 3.26	$3.26	$28.94	$43.41	$7.23	Metro/Castle Pines HOA
9	1.50	1.5" Mtr 3.26	$3.26	$37.20	$86.82	$14.47	Castle Pines HOA
10	3.00	3" Mtr 3.26	$3.26	$227.39	$260.46	$43.41	Castle Pines HOA
19	Various		$3.26	$28.94	$43.41	$7.23	Metro irrigation & office, 40+ individual meters
FLAT (NO-USAGE) METERS							
21	0.75		None	$22.73	$26.04	$4.34	The flat, no-usage meters are normally used
22	1.00		None	$28.94	$43.41	$7.23	for homes under construction and for certain
24	1.50		None	$37.20	$86.82	$14.47	other low usage buildings (golf rain shelters)
26	2.00		None	$59.94	$138.92	$23.15	
27	3.00		None	$227.39	$260.46	$43.41	

TIERED USAGE SCHEDULE PER 1,000 GALLONS PER MONTH

Tier #1	1 to 15,000 gallons	$3.26	per 1000 gallons	Tier #1 - domestic and limited garden and tree watering
Tier #2	15,001 - 25,000 gallons	$5.20	per 1000 gallons	Tier #2 - lawn irrigation and more extensive garden and tree watering
Tier #3	25,001 - 50,000 gallons	$7.01	per 1000 gallons	Tier #3 - additional lawn irrigation and extensive garden & tree watering
Tier #4	50,001 gallons and over	$9.47	per 1000 gallons	Tier #4 - extensive watering

VILLAGE AGENCIES EXCEPTION

Village agencies include the Castle Pines Homes Association and the Castle Pines Metropolitan District.
Since these agencies serve approximately 1,500 plus homes, volumes will be billed at the Tier #1 rate of $3.26 per 1000 gallons.

ADDITIONAL COMMENTS

1. Irrigation meters, homes or otherwise, do not pay fixed monthly sewer charges.
2. Irrigation meters, which irrigate homes (single family or sub-association homes) do not pay fixed drainage charges because the individual homes already pay such drainage charges.
3. In calculating the tiered rate structure for sub-association irrigation meters, the number of homes served will be considered in applying the tiered rates. Also, in order to have equitable treatment with single family homes, the tiers will be adjusted for the volumes going through the individual home domestic meters.
4. Commercial customers will be charged the tiered rate structure noted above except that such charges will be applied on a meter by meter basis. Note that certain commercial customers have more than one meter.
5. The Upper Zone charge of $.20/1000 gallons has been removed, as of 1-1-09.
6. A Capital Improvement Fee of $10 per month will be added to the base charges, **one per household**, to help offset capital costs.
7. New multi-tiered rates were designed to encourage conservation and to better manage community demand. Water had been priced low at base usage and then higher at more discretionary, controllable volumes.

Water Revenues

Metro separates its water customers into Sub-associations, Other Homes, and Other Customers. Metro's total water sales from 2002 to 2008 are shown in Table 3.9.

Table 3.9 – Metro Yearly Revenue.

Year	Revenue
2002	$1,662,000
2003	$1,774,000
2004	$1,765,000
2005	$2,012,000
2006	$2,263,000
2007	$2,405,000
2008	$2,741,000

Billing and Collections

Metro bills its water customers based on tap size and water usage. For each household tap, there is a base fee for water, sewer and storm drainage. In addition, there is a new 4-tier usage rate structure, based on tap size and water usage.

Billing is performed on a monthly basis, with meters being read on the last day of each month. The billing software used by Metro reports high or low use compared to an average use for that household and bills with this distinction will be stamped saying "High Usage, Please call for a water audit." Statements are mailed out by the 5th of each month, with payment due by the 25th of each month. A late fee of $15.00 per account is charged if payment is not received by the last day of the month. A "late letter" is mailed to all homeowners that run 60 days past due. The certified late letter is mailed to homeowners after accounts become 90 days delinquent.

At 120 days past due, staff prepares an Intent to Lien, which is mailed to the homeowner. Homeowners then have ten days to make payment on the account, or a lien is processed and mailed to Douglas County for recording against the property. Liens will only be released when payment is made in full. Each October, Metro records outstanding liens against the homeowner's property tax bill for collection the following year.

Metro does not shut-off water for non-payment. Every home in Metro is required to have a fire sprinkler system due to the close proximity of many homes to indigenous pine trees and the resulting high risk of forest fires. Hence, water must be available to all homes at all times.

Current Policies and Planning Initiatives

Current Policies

The Board of Directors of Metro retains full discretion with respect to upgrading and expanding the system based on the ability to serve, technical evaluation and current policy. Policies are in place to ensure the efficient operation of Metro in terms of finances, infrastructure and water sources.

Metro is not in the business to make money, but to provide reliable and affordable services to its clients.

The following policy directly affects the water use of the customer base under normal and/or drought conditions. Metro will give a homeowner a credit on their water bill if it is determined that a water leak was detected (and corrected) at their residence. The resident is required to send Metro a copy of a plumber or contractor bill which determined there was a leak and show corrective measures. Credit will only be given for a one month billing cycle, and only once a calendar year. The homeowner will be responsible for the amount of gallons used if another leak occurs in the calendar year. The gallons used in the prior year, same month, will be the basis for determining the credit to be given.

Taps and tap fee payments are required of all parcels that will be connected to Metro 's water system. Tap fees consists of a water, sewer, storm drainage and road maintenance component. All remaining taps for Castle Pines Village have been pre-purchased by Developers, so any new taps (connections) must be purchased from the appropriate developer.

Planning Initiatives

As mentioned previously, RTW developed a LRMP for Metro in 2006. The LRMP focused on infrastructure and system capacity needs to meet future growth. It identified capital improvement projects within Metro, the implementation timing of those projects using a WaterCAD hydraulic model and specific documentation of the existing distribution system.

Using the information in the LRMP, areas of water conservation can be identified. Metro cooperation with CPV residents to identify conservation incentives and measures that will be accepted by the community will be the first stage in developing a WCP.

The second stage will focus on evaluation of water conservation measures and incentives Metro has implemented by tracking the subsequent water use by its customers.

The following stages will rely heavily on the education of CPV residents and landscape contractors working within the Village. Demonstration will also be an important piece of

residential education. Metro will be conducting research to determine plant health standards in relation to reduced irrigation and regular irrigation system repair. Results and conclusions of such studies will illustrate more potential conservation strategies which are specific to the CPV community.

Current Water Conservation Activities

Metro implemented water conservation strategies on the system operation side in 1987 with leak detection and recycled backwash at the WTP's. Outdoor residential conservation initiatives began with the design and installation of the Water-wise Demonstration Garden in 1999. The following water conservation strategies have been implemented at various times and are still employed at Metro:

- Water-wise Demonstration Garden
- Water-wise Gardening Classes
- 4-tiered water rates that encourage conservation (beginning 2009)
- Raw water used for irrigation within Metro – on Sub-Association property
- Aggressive Leak Detection and Repair Program
- Billing software that identifies high use by individual accounts
- Leak Credit Policy that encourages repair on the customer's side of the meter
- Residential and Commercial Water Audits – indoor and outdoor
- Irrigation System Audits "Slow the Flow" – offered by Center for Resource Conservation
- Rebate for Weather-based (ET) Controllers
- Public information in billings and newsletters.

The five-year average residential water use per capita is 199 GCD which is a little higher than the surrounding area. The higher GCD figure relates to the lack of multi-family residences which dilutes the GCD figure. Also, CPV lot sizes are larger in relation to other municipalities and special districts.

Conservation incentives in this WCP refer to public education campaigns, rate strategies, and policies that promote conservation and motivate consumers to adopt specific measures but by themselves do not save water. Conservation measures are specific tools and technologies and behavior changes that directly result in more efficient water use. Metro's conservation program includes a strategic combination of measures and incentives.

Evaluation of Conservation Measures and Incentives

A set of preliminary conservation measures and incentives were selected for further evaluation. This set consisted of conservation measures and incentives that were likely to contribute to the attainment of conservation goals and were compatible with the community. Estimated water savings for each conservation measure or incentive were identified as well as anticipated costs to implement the measure or incentive. Table 8.2

provides a description for each of the selected measures and incentives following the evaluation.

For the purposes of this document and Metro's conservation program the following definitions are utilized according to Amy Vickers book, "Water Conservation Handbook." Conservation incentives refer to public education campaigns, rate strategies, and policies that promote conservation and motivate consumers to adopt specific techniques but do not save water directly. Conservation measures are specific technologies and behavior changes that directly result in more efficient water use. Conservation programs include a strategic combination of measures and incentives.

Conservation Incentives

Conservation incentives supported by Metro are primarily informational and educational. They are considered to be passive conservation strategies. The following incentives are already instituted by Metro:

- Bill inserts
- Articles in the Village Reporter, a bi-monthly newsletter distributed to all residents
- Open house and on-going workshops in the Water-wise Demonstration Garden
- New product exhibit
- Green builders best management practices
- Irrigation clock programming education
- Irrigation design review and approval – practiced in cooperation with the CPHA Design Review Committee (DRC)
- Seminars for efficient landscape water use

Metro has been very proactive with passive conservation through the distribution and availability of water conservation information and education materials. Attendance at past "Water-wise Garden Open Houses" and "New Product Exhibits" suggests that Metro's customers believe in a water conservation ethic, are aware of and make use of the information. Individual water bill/consumption evaluations, conducted by staff, continue to be valued and appreciated by Metro customers. The large numbers of water audit requests by customers are a measure of its success.

Educational seminars, which are designed to share knowledge about efficient use of water and to encourage "water-conservation behaviors", are a long term commitment. Seminars will be ongoing, constantly being evaluated and updated targeting areas that are time-sensitive and offer the greatest amount of monetary and water consumption savings.

Conservation Measures

Conservation measures promote a higher level of conservation and efficient water use. The following are existing active conservation measures:

- Intensive Leak Detection and Whole System Audit – Metro conducts monthly leak detection audits and an annual third party whole system audit to identify potential leakage and existing leaks. Leak audits are conducted using sonic devices. Correlators are sonic detection devices in the system that offers another layer of leak identification.
- Indoor and Outdoor Water Audits – Metro goes to residences and commercial properties to teach customers how and where they can save water.
- Central Irrigation Control System – Metro supplies local weather data to be utilized by weather-based irrigation technology.
- Weather-based Controller Rebates – Metro offers rebates for installation of water saving devices.
- Designated Watering Hours – designating and limiting the days and hours residences are allowed to irrigate landscapes.
- Conservation Water Rate Structure – tiered rate structures that reward conservation and increase rates for excessive water use.
- Water Conservation Building Codes – require new construction to utilize water-efficient fixtures and appliances.

The conservation measures and incentives selected for implementation shown in Table ES-1 are estimated to provide water savings of 275 AF or 89.7 MG during the ten-year planning period from 2010 to 2020. Savings may increase over time as the number of participants in the programs increase. Conservation savings will reduce annual operating costs, the amount of water that needs to be treated and distributed, the number of new wells to be drilled, and the amount of water rights that would need to be purchased for surface water supplies.

Implementation Plan

The new conservation measures identified in Table ES-1 are planned to be implemented in 2010 unless otherwise noted. This will provide a suitable period of time for Metro to organize the facilitation of the measures and programs. An effective monitoring and evaluation process will play a key role in the success of the conservation effort. Successes as well as improvements will be identified further improving the overall conservation program.

CPV residents will also play a key role in the effectiveness of the WCP. CPV residents formed a Water Conservation Committee (WCC) in 2003 which is working closely with the Water Conservation Coordinator and other Metro employees to develop the WCP. The success of Metro's water conservation program depends on public response. Conservation measures and incentives will be more effective as the community becomes more engaged in altering their behavior to use water more efficiently which reduces water consumption.

Annual monitoring results of the effectiveness of the conservation programs and measures will be conveyed to the public. Public feedback as well as staff input will be incorporated into the WCP no later than June of 2014 even though CWCB does not

require a review until 2016. The modified WCP will incorporate findings of the annual monitoring data together with public feedback. CPV residents will then have an opportunity to review the modified WCP.

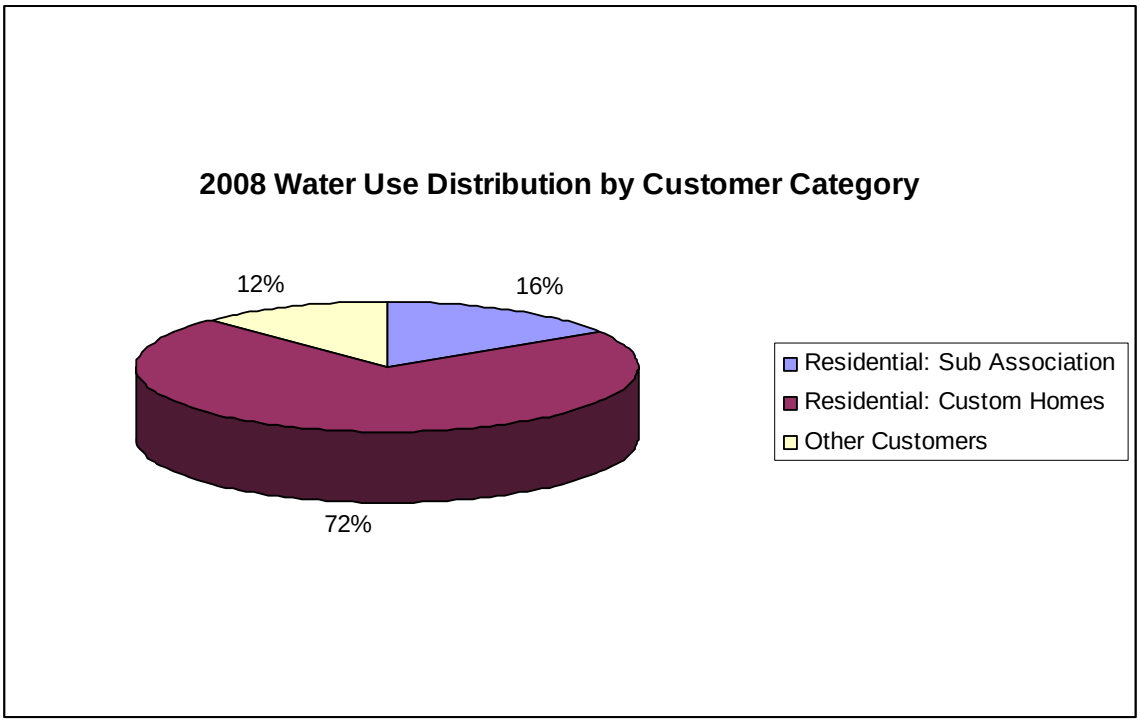
2008 Water Use

Metro supplied 1,017 AFY of potable water to customers within the following categories; Sub-association Homes, Custom Homes, and Other Customers including unaccountable losses. Table 4.1 summarizes the various water uses per customer category. Figure 4.1 shows this same information in graphical form.

Table 4.1 –2008 Water Use by Customer Category

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
A. TOTAL GALLONS BILLED													
SUB-ASSOCIATION HOMES:													
Number of Homes	330	331	331	330	333	333	333	331	333	333	333	333	332
Total Gallons	1,140,000	1,016,000	1,268,000	1,360,000	4,491,000	8,971,000	13,671,000	9,100,000	7,373,000	3,050,000	974,000	1,560,000	53,974,000
Average Mean Per Home	3,455	3,069	3,831	4,121	13,486	26,940	41,054	27,492	22,141	9,159	2,925	4,685	162,572
OTHER HOMES:													
Number of Homes	983	983	993	995	998	994	1,004	1,005	1,001	1,003	1,003	1,006	997
Total Gallons	5,699,000	5,229,000	5,478,000	9,146,000	22,400,000	36,449,000	50,965,000	34,768,000	34,319,000	18,594,000	5,739,000	6,795,000	235,581,000
Average Per Home	5,798	5,319	5,517	9,192	22,445	36,669	50,762	34,595	34,285	18,538	5,722	6,754	236,211
FULL METRO HOMES:													
Number of Homes	1,313	1,314	1,324	1,325	1,331	1,327	1,337	1,336	1,334	1,336	1,336	1,339	1,329
Total Gallons	6,839,000	6,245,000	6,746,000	10,506,000	26,891,000	45,420,000	64,636,000	43,868,000	41,692,000	21,644,000	6,713,000	8,355,000	289,555,000
Average Per Home	5,209	4,753	5,095	7,929	20,204	34,228	48,344	32,835	31,253	16,201	5,025	6,240	217,820
OTHER CUSTOMERS:													
Village Lakes	464,000	423,000	447,000	438,000	518,000	565,000	740,000	519,000	613,000	565,000	433,000	580,000	6,305,000
Non-residents	4,000	7,000	6,000	7,000	10,000	24,000	69,000	27,000	21,000	7,000	5,000	0	187,000
CP Homes Association	60,000	13,000	13,000	767,000	872,000	2,123,000	2,325,000	1,839,000	1,408,000	484,000	23,000	21,000	9,948,000
CP Metro District	27,000	18,000	10,000	370,000	1,255,000	1,525,000	2,198,000	1,191,000	1,269,000	664,000	2,000	2,000	8,531,000
South Metro Fire	14,000	12,000	11,000	9,000	21,000	48,000	37,000	26,000	60,000	30,000	6,000	11,000	285,000
Plum Creek Waste Water Authority	6,000	8,000	5,000	8,000	17,000	31,000	46,000	153,000	57,000	5,000	4,000	4,000	344,000
CP Golf Club & International	52,000	45,000	52,000	135,000	378,000	586,000	1,379,000	537,000	504,000	269,000	70,000	95,000	4,102,000
Country Club at CP	61,000	100,000	17,000	125,000	247,000	321,000	503,000	169,000	650,000	326,000	44,000	245,000	2,808,000
Summit Club												0	
Urban Village, Commercial	638,000	625,000	618,000	616,000	759,000	719,000	1,121,000	679,000	623,000	538,000	423,000	585,000	7,944,000
Cielo Event Center - Commercial												0	
Castle Hawk Development	0	0	0	0	77,000	110,000	235,000	126,000	104,000	49,000	0	0	701,000
Toll Brothers	0	0	0	0		0	0	0	0	0	0	0	0
Fidelity/Lexi/CIC	2,000	2,000	3,000	2,000	47,000	165,000	215,000	147,000	131,000	31,000	2,000	2,000	749,000
Total Other	1,328,000	1,253,000	1,182,000	2,477,000	4,201,000	6,217,000	8,868,000	5,413,000	5,440,000	2,968,000	1,012,000	1,545,000	41,904,000
TOTAL WATER BILLED	8,167,000	7,498,000	7,928,000	12,983,000	31,092,000	51,637,000	73,504,000	49,281,000	47,132,000	24,612,000	7,725,000	9,900,000	331,459,000
Cumulative YTD	8,167,000	15,665,000	23,593,000	36,576,000	67,668,000	119,305,000	192,809,000	242,090,000	289,222,000	313,834,000	321,559,000	331,459,000	

Figure 4.1 – 2008 Water Use Distribution by Customer Category.



Residential Water Uses

Indoor and outdoor residential consumption constitutes the largest water use in Metro, at 88 percent of all billed water. Sub-association Homes and Custom Homes are two customer categories that comprise almost all residential water use. Whole system water billed in 2008 is 331 MG or 1,017 AF. The five-year average whole system water billed is 293 MG or 899 AF.

Metro has many large-lot residential water users that require more water supply than those with smaller lot sizes. Average lot size is 0.93 acre. Figure 4.1 graphically displays the significant difference in water use between larger and smaller lots, which constitute 72 percent and 16 percent respectively. In 2008, sub-association and custom home customer categories consumed 291 MG or 889 AF of water.

Table 4.2 shows the 2009 budget calculated based on a ten percent water use reduction due to the 4-tier water rate schedule.

Table 4.2 – 2009 Budgeted 4-Tiered Conservation Rate Structure
Residential Water Use.

B. ALL HOMES CONSERVATION STATISTICS	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Volumes of 15,000 Gallons or Less													
-Number of homes	1,279	1,286	1,290	1,185	683	260	161	296	288	873	1,287	1,282	
-Total gallons	5,859,000	5,294,000	5,631,000	6,492,000	6,112,000	2,312,000	1,380,000	3,076,000	2,618,000	7,329,000	5,456,000	6,735,000	58,294,000
-Average per home	4,581	4,117	4,365	5,478	8,949	8,892	8,571	10,392	9,090	8,395	4,239	5,254	
Volumes of 15,001 to 25,000 Gallons													
-Number of homes	19	18	21	90	339	353	208	356	395	259	27	39	
-Total gallons	373,000	332,000	402,000	1,734,000	6,690,000	7,335,000	4,273,000	7,195,000	8,026,000	5,108,000	517,000	747,000	42,732,000
-Average per home	19,632	18,444	19,143	19,267	19,735	20,779	20,543	20,211	20,319	19,722	19,148	19,154	
Volumes of 25,001 to 50,000 Gallons													
-Number of homes	12	6	8	39	228	451	494	439	471	155	20	14	
-Total gallons	442,000	205,000	269,000	1,353,000	7,736,000	16,213,000	18,657,000	15,608,000	16,754,000	5,407,000	618,000	501,000	83,763,000
-Average per home	36,833	34,167	33,625	34,692	33,930	35,949	37,767	35,554	35,571	34,884	30,900	35,786	
Volumes of 50,001 Gallons or More													
-Number of homes	3	4	5	11	81	263	474	245	180	49	2	4	
-Total gallons	165,000	414,000	444,000	927,000	6,353,000	19,560,000	40,326,000	17,989,000	14,294,000	3,800,000	122,000	372,000	104,766,000
-Average per home	55,000	103,500	88,800	84,273	78,432	74,373	85,076	73,424	79,411	77,551	61,000	93,000	
Total Full Metro Homes													
-Number of homes	1,313	1,314	1,324	1,325	1,331	1,327	1,337	1,336	1,334	1,336	1,336	1,339	
-Total gallons	6,839,000	6,245,000	6,746,000	10,506,000	26,891,000	45,420,000	64,636,000	43,868,000	41,692,000	21,644,000	6,713,000	8,355,000	289,555,000
-Average per home	5,209	4,753	5,095	7,929	20,204	34,228	48,344	32,835	31,253	16,201	5,025	6,240	

Other Water Uses

Other Water users in Metro are CPHA, Metro, Village Lakes, Commercial, South Metro Fire, Country Club at Castle Pines, Castle Pines Golf Club, PCWA, Cielo Event Center and others. Commercial water users include office buildings, retail stores, restaurants, and a car wash. The Other Customer category uses approximately 12 percent of total water billed equaling 41.7 MG or 128 AFY.

The largest water users in the Other Customer water use category include CPHA, Metro, and Commercial. Usage is a percentage of the total water billed equaling 3.0 percent, 2.5 percent, 2.3 percent, respectively.

Unaccountable Water Loss

Metro billed 1,017 AF to customers in 2008, but produced 1,251 AF. The basis for the water billed is the amount of water registered at customer meters. Metro must produce additional water at their treatment facilities to account for various system and distribution losses that occur during delivery to customers. On average over the last five years, 8.3 percent of all water produced by Metro is unaccountable or non-revenue generating. In 2008 unaccounted loss increased to 9.6 percent. Unaccounted water losses include leakage, firefighting and street sweeping. See Table 7.1.

Reclaimed Water Uses

PCWA currently supplies non-potable treated waste water (reclaimed) to the Country Club at Castle Pines and the Castle Pines Golf Club. Reclaimed water billed in 2008 was 207 MG or 635 AF.

Non-potable, Untreated (Raw) Water Uses

Village Lakes is a sub-association of CPV that is irrigated by untreated well water. Village Lakes used 6.3 MG in 2008 which is less than one percent of the total water supplied in 2008. The irrigation system used is a central control system utilizing on site weather data to calculate ET.

Demand Forecast

The LRMP for Metro provides a comprehensive study of Metro's service area characteristics and associated water demands for purposes of planning for Metro's future infrastructure needs.

Metro build-out is projected to be 2,100 EQRs or 1,980 taps. This number includes all residential and commercial taps inside the current Metro boundary. Based on the historical average demand per EQR, the average annual demand at build-out would be 1.44 MGD or 1,618 AFY. The peak day demand is an important parameter to accurately know because the capacity of the wells and treatment plants need to be sized to meet that demand. The years 2001 through 2007 have seen the peak day demand decrease from 2,059 gpd/EQR to 1,517 gpd/EQR. However, in 2008 gpd/EQR increased to 2,213.

Table 4.3 summarizes the peak day demands per EQR from 2000 through 2008. The table shows that on a per EQR basis the demands vary from year to year. This change in demand is most likely due to the weather conditions for the summer. The summer of 2004 was a wetter summer than other years which resulted in the lower demands. The year 2008 saw a record number of homes in the Metro service area and only received nine inches of precipitation. These two factors may explain the high water use during that period. Demand on a per EQR basis is beneficial in order to prepare the operating system for peak demands in the future.

Table 4.3 shows the whole system peak daily demand (including unaccountable losses). The peak daily demand varies between 2,213 and 1,438 gpd/EQR.

Table 4.3 - Peak Day Demand 2000 through 2008.

Year Maximum	Peak Day Demand (MGD)	Peak Day Demand (gpd/EQR)
2000	2.096	1,917
2001	2.388	2,059
2002	2.291	1,895
2003	2.265	1,798
2004	1.937	1,438
2005	2.407	1,647
2006	2.847	1,788
2007	2.430	1,517
2008	3.700	2,213

Future Water Demand Projections

The projected build-out peak day demand is estimated to be 2,000 gpd/EQR or 4.2 MGD using demand projections from the LRMP. Metro's goal is to reduce demands to at least 1,640 gpd/EQR. 1,640 gpd/EQR is equivalent to a 18 percent water consumption reduction. The cumulative irrigation demand over the 10-year period of this WCP is 6,567 AF.

Although Metro offers several water conservation measures and incentives, the peak day demand has not decreased to desired levels. This seems to indicate that the conservation efforts have not yet achieved their intended results.

CHAPTER 5 – Proposed Facilities

Proposed Facilities

Potential Facility Needs

Table 5.1 presents a brief summary of the capital improvements identified in the LRMP. Each item has been assigned a time-frame for implementation and estimated costs are listed in Table 5.2. The implementation time frames indicate the relative degree of urgency associated with each item.

Scheduling over a range of years for implementation allows flexible capital improvement planning by allowing adjustment based on availability of funding and human resources. Generally, the timing of implementation is controlled by the priority of the item. More urgent items need to be implemented sooner while lower priority items can be deferred.

Incremental Costs Analysis

The project capital cost from the LRMP for each item is presented in 2006 dollars and has not been adjusted for inflation in the future scenarios. The estimated project costs for the WTP expansions are also included.

As stated in Chapter 3, Table 3.4, the current maximum capacity for the existing wells is approximately 3,315 gpm or 4.6 MGD with a firm capacity of 2,435 gpm or 3.5 MGD. 3.5 MGD is less than the forecasted demand with 20 percent conservation or 1600 gpd/EQR. The estimated project costs for water storage facilities were developed from information provided by storage tank manufacturers and cost data from similar recently constructed projects. The estimated project costs for the pumping facilities were also developed from information provided by manufacturers and cost data from similar recent projects. The estimated pipeline costs were estimated using total project costs from numerous previous pipeline projects that were bid in the last five years. Table 5.2 presents a summary of the identified capital costs.

Estimated costs through 2014 are anticipated to be approximately $21.8 million, half of the total capital improvement project total. Like the project schedule, the estimates provided above are most accurate until 2014 or five years after the LRMP update was developed in 2009. The bulk of the five-year cost is in the development of surface water treatment capability.

The estimated cost for the capital improvement projects was compared to the reliance on groundwater only. The estimated cost for this option was estimated to be $42.3 million by 2056. For the next five years, the estimated cost is $13.5 million and the following ten year estimated cost was $7.1 million. The remaining cost for the “groundwater only” option occurred in the last 25 years of the analysis. It consists entirely of the cost for additional wells to maintain ample supply. The large future cost

suggests (as does the analysis) that it will continue to be considerably more costly to rely on groundwater beyond 2056.

Estimated costs associated with renewable surface water are roughly $35,000 per AF. These costs detailed in the LRMP were obtained from other sources.

Table 5.1 - Summary of Capital Improvements Schedule.

Project Description	Project Start Date	Project Completion Date
Increase Capacity of Existing Booster Pumping Station	Dec-06	Jun-07
Existing Well DE-10 Redrill	Jan-07	Jun-07
Existing well LDA-10 Redrill	Jan-07	Jun-07
WTP #2 Expansion	Jun-07	Jun-09
WTP #1 Reconstruction	Jun-11	Jun-12
Groundwater supply pipeline from lower well fields to WTP #1 prior to paving Happy Canyon Road by the County. Additional potable water pipeline along Happy Canyon Road to replace portion used for Transfer Pumping Station project.	Oct-08	Jan-09
New 2.0 MG Storage Tank	Oct-10	Jun-11
Well LDA-12 at WTP #2	Jun-08	Jun-09
Chatfield Reservoir	Present	Dec-12
Well DE-4	Jan-11	Jun-11
Replacement Program of existing "Permastrand" saddle taps within the distribution system	May-07	Dec-17
Distribution System Leak Detection Program	May-07	On-going
Well LDA-4	Jan-20	Jun-20
Well Site 11 construction, drilling of Well A-11, and construction ofa raw water pipeline from well site to raw water transfer pipeline	Jun-23	Jun-24
Well DE-11	Jan-30	Jun-30
Well LDA-11	Jan-37	Jun-37
Well Site 9 construction, drilling of Well A-9, and construction of a raw water pipeline from well site to WTP #2	Jun-43	Jun-44
Well LDA-9	Jan-47	Jun-47
Well DE-9	Jan-50	Jun-50
Capital replacement program from aging pipeline in the distribution system	Jan-07	Dec-50

The combined projects listed in the table above make up the capital improvement projects for Metro. The capital improvement projects estimated costs are shown in Table 5.2.

Table 5.2 – Capital Improvement Probable Project Costs.

Project Description	Opinion of Probable Cost in 2006 Dollars
Reconstruction of WTP #1 with Surface Water Treatment Capability	$5,170,000
Groundwater Raw Water Pipeline Upgrade	$959,000
Chatfield Reservoir Storage and Capacity Reallocation	$8,450,000
Buried 2.0 MG Storage Tank Construction	$3,446,000
Surface Water Pipeline Connection to Chatfield	$14,800,000
Well DE-4 Drill and Construction	$712,000
Plum Creek Reservoir	$8,420,000
Permastrand Pipe Tapping Saddle Replacement	$413,000
Well LDA-4 Drill and Construction	$361,000
Well Site 11, Well A-11 Drilling, and Raw Water Pipeline Construction	$2,383,000
Well DE-11 Drill and Construction	$794,000
Well LDA-11 Drill and Construction	$361,000
Well Site 9, Well A-9 Drilling, and Raw Water Pipeline Construction	$4,766,000
Well LDA-9 Drill and Construction	$361,000
Well DE-9 Drill and Construction	$753,000
CIP Project Total	$43,730,000

CHAPTER 6 – WATER CONSERVATION GOALS

Mission Statement:

"Encouraging customers to practice water conservation through a comprehensive program of price incentives, rebates, and educational efforts focusing on growing healthy landscapes."

Metro will focus on educating residents of CPV to achieve water conservation goals. Members of the WCC, comprised of CPV residents, Metro staff, and Metro Board members, have determined that enforcement is not in the best interests of CPV residents. Water conservation education and incentives will maintain the positive relationship between Metro staff and CPV residents. It is also believed that an aggressive educational effort along with a tiered rate structure and a comprehensive rebate program will achieve the desired results.

The Water Conservation Coordinator will be conducting regular on-site visits for homeowners, sub-associations, and the commercial customers to determine possible problems and identify potential conservation measures to implement. The Water Conservation Coordinator will also be regularly authoring articles and developing effective marketing tools like attention-grabbing brochures which offer Metro's free services.

Water Conservation Goals

Establishing a water conservation goal is an iterative process that begins with quantifying future demand for water based on the current water-use habits and identifying areas where water use can be feasibly and effectively reduced. Reduction of future water demand through water conservation could potentially delay planned water supply acquisition and the need for infrastructure improvements.

Metro's total water demand in 2008 was approximately 1,017 AF or 331 MG. As previously discussed, Metro recognizes the need to further develop its water conservation efforts for outdoor consumption in Residential: Sub-Association and Residential: Custom Homes categories. The reduction goal established for this WCP is based on the water demands for these customer categories and discussions with Metro staff and the WCC.

Table 6.1 shows the 2008 water use, the target reduction goal, and the associated amount of water savings for each targeted customer category. By the time the WCP is fully implemented, it is estimated that the water usage for the targeted customer categories will be reduced by a total of 168 AF or 54.8 MG.

The residential domestic and irrigation water demand in the 10th year or 2019 provided by RTW is 1047 AFY or 341 MG. The savings goals outlined in Table 6.1, below, will

result in an overall reduction in water use of 16 percent. Table 6.1 reflects the total projected water savings.

Table 6.1 – Water Conservation Goals.

Water Use Categories With and Without Conservation	10th year Residential Water Use	
	AF	MG
With Conservation		
Residential: Custom Homes and Sub-Associations	878	286
Without Conservation		
Residential: Custom Homes and Sub-Associations	1,046	341

The water conservation measures currently implemented include advanced sonic leak detection, whole system annual audits, indoor and outdoor residential and commercial water audits, Water-wise demonstration garden and classes, and public education via bill inserts, web site, and direct mailings. Metro's five-year average potable residential per-capita water use is 199 GCD.

The goal for the WCP is to reduce the overall water use by 16 percent over the ten-year planning period. This equals 168 AF or 54.8 MG of water saved. Water savings will come mostly from two sources. One is the water use categories identified through the planning process focusing on outdoor consumption, 1) Residential: Sub-Association and 2) Residential: Custom Homes.

Water waste ordinances required by the CWCB are implemented in the irrigation plan requirement administered by CPHA. CPHA requires irrigation plans be submitted with landscape plans then cooperates with Metro to allow the Water Conservation Coordinator to review and approve irrigation plans. See addition to CPHA Landscape Standards document in Appendix J. Also, CPHA requires no more than 4,000 square feet of turfgrass per lot. Metro does not have control over building in CPV, only CPHA has control of building and construction projects.

Water waste is also addressed in the "Cycle and Soak" educational effort as well as the aggressive Irrigation System Repair Rebate and Sub-soil Improvement and Plant Replacement Rebate. Also, Metro imposes a voluntary restriction on times and days when residents can irrigate, which reduces water waste. The Water Conservation Coordinator makes regular trips around CPV to look for water waste. If any leaks or excessive run-off are identified, she contacts the responsible party and helps them correct the problem.

Metro and CPHA have a central irrigation control system (Toro Sentinel) to irrigate their property along roadsides, parks, and open spaces equaling approximately 14 acres.

Metro controls this irrigation system and will be exploring deficit irrigation and alternate turf species to reduce irrigation gallons consumed while maintaining a high quality turf.

Also, Metro is engaging in water conservation research by planting hybrid bluegrass and a new vegetative variety of bluegrass at the Metro office. The hybrid bluegrass variety studied is 'Reveille®' and the vegetative variety is 'Bella®', which only grows to a two-inch height. There is still much needed data regarding water use on 'Bella®' and the hybrid bluegrasses even though they have been on the market as water-saving turfgrasses for approximately ten years.

Metro will continue its commercial audits even though there has been very little commercial participation. Metro will increase its marketing to the commercial sector. Metro's Water Conservation Coordinator will approach businesses directly to offer free audits.

Goal Development Process

The goal development process was a collaborative effort between RTW, Metro staff, Metro Board of Directors, and the WCC. Information was gathered from billing records and existing planning documents to properly characterize the system, resources, and water use for Metro.

Development of this data showed Metro's highest use customer categories, seasonal usage, system limitations and losses, and outlined Metro's existing conservation program and its measured effectiveness.

The largest water demand categories were evaluated to determine where the greatest savings through conservation could be implemented. Once the largest water use categories were identified, RTW and Metro staff met with the WCC to discuss water conservation goals and the potential methods to reach those goals. Initial reduction percentages were established and a universal list, Appendix E, of measures and incentives were compiled by RTW for consideration. These goals were based on what had the largest impact and the highest probability of success, considering all factors such as costs and public acceptance.

Metro staff and the WCC identified the aforementioned two customer categories in which to focus water conservation efforts because residential use is 88 percent of the total water billed. Metro staff is diligent in maintaining the entire system regularly and the operating system is relatively new. Therefore, Metro did not want to limit its focus efforts to the operating system. Unaccounted losses are not currently identified as areas of concern in regard to water conservation. Metro will have a clearer idea about conservation measures focusing on unaccounted losses by the WCP review period in 2016.

CHAPTER 7 – CONSERVATION MEASURES AND INCENTIVES

Existing Water Conservation Program

Metro has engaged in water conservation activities for many years. RTW developed a comprehensive list of conservation measures and incentives used through the identification and selection process. The list considered the screening criteria mentioned in Chapter 8 and also considered benefits and costs. It is shown in Appendix E with existing measures highlighted in green and is separated into four major categories; Residential New, Residential Existing, Commercial New, Commercial Existing.

Existing measures and incentives are described in detail below. These conservation efforts have not yet been fully evaluated to determine achieved water savings. Existing measures and incentives will be evaluated in the same manner as new measures and incentives. Evaluation is detailed in Chapter 8. Selected new measures and incentives are described in detail in Appendix A.

Rate Structure

- Conservation Rate Structure - Metro has used a two-tiered (conservation) rate structure since 2003. The four tiers implemented in 2009 show threefold increase from the first tier to the fourth tier. If residents choose to conserve approximately 20 percent, their bills will generally not reflect an increase in amount billed.

Utility Maintenance

- Recycled Backwash – Metro recycles backwash at the Water Treatment Plants. In 2008, Metro recycled 3.5 MG.

- Leak Detection and System Audit - Metro's operating system is relatively new and is only now experiencing problems associated with an aging system. A third party conducts annual leak detection audits using sonic equipment.

  Table 7.1 shows the Unaccounted Water Loss of 2008. The calculations used in this table show all losses and are based annually rather than monthly. Some municipalities calculate these losses monthly tends to reflect a lower percentage of Unaccounted Water Loss.

Table 7.1 – 2008 Unaccounted Water Loss.

Castle Pines Metropolitan District		
Water Accounting Spreadsheet		
2008		
Supply		
`Total Supply (Wells)	408,023,323	
Total Adjustments to Supply (Reclaim, Aquifer injection, etc)	-3,471,000	
Total Treatment Plant Uses/Adjustments	-7,304,933	
Adjusted Total Supplied to Distribution System		397,247,391
Metered		
Metered Deliveries (House meters, Flat rate)	331,908,000	
Meter Errors (1.5%)	4,282,005	
Total Corrected Metered Deliveries		336,190,005
Authorized un-metered water uses		
Fire Department (includes fire fighting)	13,000	
Hydrant Flushing & Hydrant Meters	471,925	
New Lines (construction flushing)	11,534	
Street Sweeping	113,920	
Expected Water System Leakage	17,290,944	
Authorized Unmetered water use	96,000	
Miscellaneous leaks, storage tank overflow, etc.	5,058,540	
Total		23,055,863
Unaccounted for Water	38,001,523	9.6%

Audits

- Irrigation System Audit entitled "Slow the Flow" – As irrigation equipment ages, water use efficiency decreases. Metro has participated in the Slow the Flow program offered through the Center for Resource Conservation, www.conservationcenter.org since 2007. The entire cost at $100 per audit is paid by Metro. Representatives from the Center for Resource Conservation conduct on-site irrigation audits at residents' homes and sub-association common areas. A written

report including recommendations is provided. Metro membership in the program provides access to program services for all residents, sub-associations and commercial properties.

Results from Slow the Flow's 2008 Annual Report showed the following: 1) 24 percent of tested irrigation zones had acceptable distribution uniformity, 2) 50 percent of all spray zones had high pressure and 1 percent had extremely high pressure, 3) only 21 percent of all zones were efficient, and 4) 33 percent of all properties evaluated had leaking pipes. Drip systems are an outdoor conservation technology identified by the Center for Resource Conservation and 90 percent of the properties evaluated have drip systems installed. From these results, Metro will continue to educate CPV residents and landscape contractors to increase irrigation efficiency.

- Indoor and Outdoor Residential and Commercial Audits – Metro provides a free service of scheduling a water audit for any interested customer whether residential or commercial. The billing software highlights increased water use over normal use, then Metro contacts those customers and offers a free water audit. Metro employees conduct the water audit and then provide recommendations on how indoor and outdoor water usage could be more efficient.

Rebates

- ET Controller Rebate – Metro pays 50 percent of equipment and labor costs up to $500.00 to install ET Controllers on existing irrigation systems. Weather-based controllers regulate irrigation based on factors such as solar radiation, temperature, humidity and wind speed that influence evapotranspiration (ET).

Educational Incentives

- Water-wise Demonstration Garden - The Demonstration Garden was designed to display many varieties of native plants that may be used in a designed garden rather than as open space plants. Metro will continue to update the site and offer classes and tours in the garden throughout the growing season.

- Water-wise Workshops/Classess – These classes have been offered one or two times per year since 2003. They have been well attended and the public education efforts have created an expectation of conservation from the Board and the public in general. Best Management Practice's (BMP's) are encouraged and detailed in these classes.

- BMP's Posted on Website – Metro will encourage volunteer adoption of The Green Industries of Colorado (GreenCo) BMP's through marketing via Metro's website, direct mailings, and bill inserts.

New measures and incentives implemented by Metro in 2010 are:

- Sub-soil Improvement and Plant Replacement Rebate
- Irrigation System Repair Rebate
- Rain Sensor Rebate
- Irrigation Nozzle Replacement

New Conservation Measures and Incentives Assumptions and Calculations

4-Tiered Conservation Rate Structure – This rate structure is a conservation type rate structure where, when more gallons are used, more money per thousand gallons is charged. There is a threefold increase from the first tier to the fourth tier. Metro expects a two and one/half percent increase in water saved each year after implementation.

Irrigation System Repair Rebate - According to Colorado State University (CSU) Extension Specialists and other Front Range researchers, annual irrigation system repairs will result in up to 50% water savings. CSU Extension in the Tri-River area saw a 40% water use reduction after clients repaired irrigation systems. A conservative estimate is an average of 10% in water savings per irrigation system per year.

Sub-soil Improvement and Plant Replacement Rebate - According to research at universities across the world, increasing organic matter in the soil increases water retention and infiltration which increases water efficiency equating to approximately 20% in water savings. This measure will not see 20% water savings if irrigation controller education is not provided to residents. Therefore, participants will be educated on how to program their controllers for maximum water efficiency in conjunction with sub soil and plant replacement. Participants will most likely be in the Residential: Custom Homes customer category but Sub-associations will also be eligible.

Rain Sensor Rebate - According to studies in Utah and California, water savings of up to 40% can be achieved. A conservative estimate of 5% has been used for the purposes of these calculations.

Irrigation Head Replacement Program - Dry and wet spots in the lawn many times are caused by inadequate irrigation coverage. Inadequate irrigation coverage is caused by poor distribution uniformity. Poor distribution uniformity may be caused by different types of irrigation heads on the same zone. To alleviate this problem which has been observed in every audited irrigation system in CPV, Metro is offering rotator-type irrigation heads at wholesale cost to homeowners and sub-associations. They are easy to install and will provide a uniform irrigation distribution per zone.

High Efficiency Toilet Replacement – CPMD replaced five 1.6 gal/flush toilets with dual-flush toilets saving an average of 0.7 gallons per flush. There is an average of 19 employees flushing 2.5 times per day at 250 work days per year equal about 8300

gallons saved per year. CPMD wanted to teach conservation through example and therefore, implemented the indoor conservation measure.

Educational Articles, Bill Inserts – Water Conservation Coordinator will produce 1 direct mailing, quarterly bill stuffers, and six bi-monthly articles in the HA newsletter per year. Participation is a conservative estimate (5%) based on percentage readership studies.

ET Controller Programming On-site Education - CSU Extension in Tri-River area showed a 40% reduction in residential water use after auditors educated clients how to program weather-based (ET) irrigation controllers. Also, the Metro Water Conservation Coordinator has found controllers incorrectly programmed at over 50% of the properties audited.

Annual "Healthy Yard" Demonstrations – The Water Conservation Coordinator will present water-saving techniques in the lawn and garden with technological demonstrations. Costs include garden maintenance and upgrades.

Screening Criteria

The following screening criteria were compiled based on discussions with Metro staff, Metro's Board of Directors, and the WCC. The criteria were chosen as a general screening to pare down the universal list to a list of measures and incentives that Metro would evaluate further, including reviewing costs to implement, expected water savings, and loss of revenue from the water savings. Each measure and incentive in Table 7.2 was screened by the WCC with the following criteria.

1. Resident acceptance – offered by WCC
2. Staff and Board approval
3. Benefit/cost ratio

The resulting decisions are noted in Table 8.2. Each selected measure and incentive from the universal list are described in detail in Table 8.2 and Appendix A.

CHAPTER 8 – EVALUATION AND SELECTION

Estimated Water Savings and Costs of Conservation Programs

For this benefit cost analysis, measures and incentives were evaluated individually to provide a more detailed analysis. In this way Metro could make better decisions on which measures and incentives to implement. For the final selection of measures and incentives to implement, discussions between Metro staff and the WCC as well as review of historic data helped to understand what kind of water savings and participation may be expected for certain measures. However, it is difficult to accurately estimate all water savings and the actual result may differ from these estimations.

Many resources were used to estimate water savings including Colorado State University Extension research, GreenCo's Best Management Practices, Amy Vickers Handbook of Water Use and Conservation, research from universities across the nation, local studies available from the American Water Resource Association (AWRA), the U.S. Environmental Protection Agency (EPA), Western Resource Advocates, information from Colorado municipalities, and the CWCB Worksheets 6-3, 7-2, and 7-3.

Table 8.1 shows the estimated costs which include set-up and ongoing costs, expected participation, the annual water savings in year one of implementing the measure, the cumulative water savings over the ten-year planning period, and the benefit to cost ratio for each measure and incentive. Assumptions used for each measure and incentive are explained in Chapter 7. The costs shown in Table 8.1 are in 2009 dollars and have not been adjusted for future inflation. Selection decisions are described in Table 8.2. Annual estimated water savings per measure and incentive was calculated from the 5-year average residential irrigation gallons consumed between 2004 and 2008.

It is important to differentiate between irrigation and non-irrigation gallons saved because of the operating system demands. Measures and incentives that reduce irrigation gallons consumed will reduce the need to increase capacity of the operating system, thus delaying or eliminating expensive capital improvement costs.

Table 8.1 –Benefit Cost Ratios for New and Existing Conservation Measures and Incentives.

Measures	# Partici-pants	Total cost $/ Year	Annual Gallons Saved	Annual Savings (AF)	Annual Cost/AF Saved	$$/AF New Supply	Avoided Cost/AF	B/C ratio (avoided cost per AF *annual AF savings/total cost)
4-Tiered Rate Structure	1,339	$2,500	5,465,452	16.77	$149	$35,000	$34,851	**444.16**
Sub soil Improvement and Plant Replacement Rebate	10	$51,000	817,513	2.51	$20,328	$35,000	$14,672	**2.26**
Rain Sensor Rebate	20	$3,500	28,190	0.09	$40,457	$35,000	-$5,457	**0.64**
Irrigation System Repair Rebate	20	$22,000	281,901	0.87	$25,430	$35,000	$9,570	**1.61**
Irrigation Head Replacement	20	$100	28,190	0.09	$63,575	$35,000	-$28,575	**57.5**
High Efficiency Toilet Replacement	5	$1,505	8,300	0.03	$59,085	$35,000	-$24,085	**0.12**
ET Controller rebate	23	$11,500	324,186	0.99	$11,559	$35,000	$23,441	**80.29**
Slow the Flow irrigation audits	30	$5,500	1,649,121	5.06	$1,087	$35,000	$33,913	**31.21**
Residential and Commercial Indoor/Outdoor Water Audits	20	$600	750,143	2.30	$261	$35,000	$34,739	**133.29**

Comparison of Benefits and Costs

Metro calculated benefit cost ratios using an avoided cost model. As stated in the table above, the benefit cost ratio equals the avoided cost of program per AF multiplied by the annual savings of the program in AF divided by the annual cost of the program. If the ratio is greater than one, the measure or incentive is identified as having a greater benefit than cost. This method is used by many districts and municipalities for ease of benefit cost analysis comprehension. Appendix H includes a worksheet graphically displaying the assumptions and calculations of the benefit cost ratio.

Comparing measures and incentives according to the water savings and implementation costs provides a good start to the selection process, but should not be the only criteria for selection. Estimated costs help determine when implementation of

conservation measures and incentives will be initialized to stay within a planned annual water conservation budget. Finally, resident participation and perception is critical to Metro in order to sustain the positive relationship between CPV residents and Metro.

Evaluation Criteria for Selection of Measures and Incentives to Implement

The goal of a successful water conservation program is to have measures and incentives that can be reasonably implemented and will continue to provide satisfactory outcomes for CPV residents. With this in mind, the criteria for selecting the final measures and incentives for implementation was compiled through review of the benefit cost ratio with Metro staff, Metro's Board of Directors and the WCC. Other criteria were identified as a result of further discussions. The final set of selection criteria is as follows:

- Amount of water savings
- Expected resident participation and interest
- Cost of implementation
- Benefit cost ratio

Table 8.2 lists the measures and incentives as detailed in Appendix E, their associated benefit cost ratio, Metro's decision, and the reason for selecting or rejecting the measure or program. The benefit cost ratio incorporates a capital improvement project cost reduction benefit per measure. This benefit is calculated as a dollar amount equal to the percent savings per measure multiplied by the total capital improvement project reduction provided by TetraTech, Inc.

Table 8.2 – Benefit Cost Ratio and Criteria for Selecting or Rejecting Conservation Measures and Incentives.

Conservation Measure or Incentive	Benefit Cost Ratio	Final Selection	Criteria for Selecting of Rejecting Measure or Program
Regulatory Controls including Ordinances			
4-Tiered Rate Structure	444	Yes	Metro has implemented a 4-tier conservation rate structure. Metro has engaged CPHA to require irrigation plan submission with landscape plans which require landscape contractors to design and install irrigation systems correctly. The Water Conservation Coordinator will examine projects to ensure work is done correctly and within Metro's water conservation standards.
Rebates			
Irrigation System Repair Rebate	1.61	Yes	Irrigation systems in CPV are now an average of 8 years old. Many have not been properly maintained. Metro feels that this rebate measure could potentially save the most water because it is relatively inexpensive to the resident to implement and the realized savings may be many times more than could be achieved.
Sub soil Improvement and Plant Replacement Rebate	2.26	Yes	Metro has conducted over 60 residential water audits and greater than 75% of the landscapes have not been properly amended.
Rain Sensor Rebate	0.64	Yes	WCC identified as a measure CPV residents would embrace.
Irrigation Head Replacement	57.5	Yes	This rebate will be promoted in conjunction with the Irrigation System Repair Rebate. Every irrigation audit done in CPV has revealed mismatched irrigation heads within a zone. This reduces efficiency and therefore increases water consumption.
High Efficiency Clothes Washer Rebate	0.08	Not yet	Most homes in CPV already have HEW's. The return on investment to the homeowner is between 9 and 28 years. Also, washers are not fixed appliances. Lastly, Metro is currently focusing on outdoor consumption as it averages 72% of the total consumption.
High Efficiency Toilet Rebate	0.07	No	Benefit Cost ratio not great enough to financially justify offering rebate measure.
High Efficiency Toilet Replacement	0.12	Yes	Benefit to cost low but because Metro wants to lead by example, five toilets in the business office were chosen to be replaced.
Educational Programs			
Educational articles, bill inserts, and direct mailings	NA	Yes	The new Water Conservation Coordinator position has the background to effectively get a message across to an audience via written materials. Benefits far out-weigh costs.
Annual "Healthy yard" demonstrations at METRO Water-wise garden and resident's gardens and garden maintenance and upgrades	NA	Yes	This incentive puts the fun into water conservation. These types of activities further strengthen the relationship between CPV residents and Metro.
Post GreenCo BMP's on website	NA	Yes	Metro wants to support research-based information in relation to water conservation and GreenCo's BMP's are the most robust set of industry standards in Colorado. Required staff time will be minimal.
ET Controller and Clock Programming Education "Cycle and Soak"	NA	Yes	Metro water use data shows that irrigation clocks could be fine-tuned to improve water efficiency in the landscape.

Selected Conservation Measures and Programs

In Chapter 6, conservation goals were established for Residential customer categories; Sub-association and Custom Homes. A 16 percent goal was established for both customer categories.

As mentioned earlier, water conservation goal setting is an iterative process because original goals are established, evaluated and selected based on appropriate criteria, and the resulting water savings are compared to the original goals.

The measures and incentives selected to be implemented focus on education. However, Metro may have to take a stronger approach if circumstances beyond its control arise, or increased cooperation of residents is not forthcoming.

Metro serves residents and members of the CPHA. These two governing entities frequently overlap in regard to decision-making and policy. CPHA has regulations and standards surrounding landscape design and installation of new and existing landscapes which indirectly requires more efficient water use in the landscape. CPHA has a Design Review Committee (DRC) which is responsible for developing, updating and enforcing these standards and regulations. Going forward, the DRC has agreed to allow the Metro Water Conservation Coordinator to review irrigation plans for new construction and upgrades which satisfies the regulatory aspect of the state statute.

Table 8.3 describes chosen new conservation measures and incentives.

Table 8.3 - Description and Implementation Date of New Conservation Measures and Incentives.

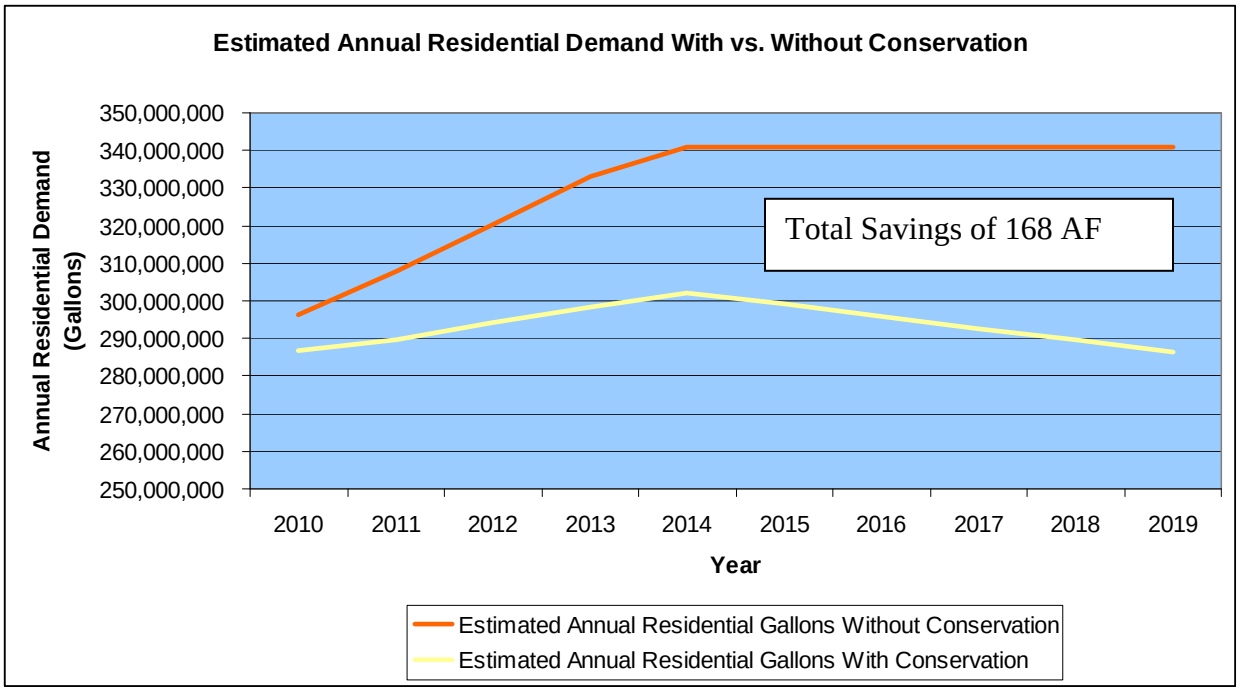
Measures	Implementation Year	Estimated Cost	Description
4-tier Rate Structure	2009	$25,000	The four tiers implemented in 2009 show threefold increase from the first tier to the fourth tier. If residents choose to conserve by 10%, then their bills will not increase.
Irrigation System Repair Rebate	2010	$22,000	Residents who use landscapers listed in the Preferred Landscape Contractor List to conduct two maintenance/repair visits on irrigation systems per year will receive a 50% rebate on labor and material costs up to $1,000. On a first-come-first-serve basis. See Appendix A.
Sub soil Improvement and Plant Replacement Rebate	2011	$51,000	50% of material and labor cost up to $5,000 to remove existing turfgrass, amend soil with compost to a 4 to 6" depth and replace with appropriate plant species for the location specifications. On a first-come-first-serve basis. Implementation depends on funding. See Appendix A.
Rain sensor Rebate	2010	$3,000	50% of material and labor cost up to $100 per household. Rain sensor has to be approved by CPMD before rebate is given. The same procedures apply as the existing ET controller rebate measure. See Appendix A.
Irrigation Head Replacement	2010	$100	Rotator irrigation heads offered to residents at a wholesale cost. See Appendix A.
High Efficiency Toilet Replacement	2009	$1,500	CPMD replaced five 1.6 gal/flush toilets with dual-flush toilets saving an average of 0.7 gallons per flush.
Incentives			
Bi-monthly educational articles in HA newsletter, bill inserts and seminars	2009	$1,500	The Water Conservation Coordinator will write bi-monthly horticulture/irrigation related articles entitled "*Growing Healthy Landscapes*" in the Village Reporter. The Coordinator will create a quarterly bill insert that will focus on over-watering and its impact on plant health care.
ET Controller Programming Education, "Cycle and Soak"	2009	$1,100	On-site visit by Coordinator to teach residents how to manage irrigation controllers. Eligible residents must have an ET Controller installed in irrigation system.
Annual Demonstrations at CPMD Water-wise garden and Resident's gardens	2009	$700	The Water Conservation Coordinator will offer a yearly "Spring Fling" in the demonstration garden and discuss how to reduce residents' water bills by incorporating water-wise horticultural practices.
Post GreenCo BMP's on website	2009	$55	The Green Industries of Colorado have developed a comprehensive document entitled, "Best Management Practices" that outlines how to incorporate sustainability into the green industry operations.

CHAPTER 9 – FORECAST MODIFICATION AND RESOURCE INTEGRATION

Modified Demand Forecast

The modified demand forecast with water conservation is shown in Table 9.1 and was forecasted from average domestic and irrigation gallons consumed from 2002 to 2008. Table 9.1 illustrates the total demand in AFY with conservation and without conservation.

Figure 9.1 – Projected Annual Residential Demand With Conservation vs. Without Conservation.



As displayed in Figure 9.1 below, the reason why Metro is implementing a water conservation program is to eliminate capital improvement costs by reducing annual and peak day demand. This reduction in demand and hence the delay or elimination of capital improvement projects will save approximately $9 million not including reduced maintenance costs. Estimated cost for capital improvement projects is $43.7 million without conservation. Estimated cost for capital improvement projects with ten percent conservation is $36.7 million. Metro's goal of this WCP is to save 16 percent or 168 AF or 54.8 MG of water in the tenth year of the ten year planning period. If Metro achieves a 20 percent reduction in peak day demand, then $10.1 million in capital improvements will be deferred which is 23.2 percent of the total Capital Improvement Plan (CIP). The ten-year cumulative cost of Metro's water conservation program is $1.9 million.

The water use with conservation is based on a savings of ten percent, twenty percent, and thirty percent. The peak day demand forecast provided by RTW in the LRMP is 2,000 gpd/EQR. Peak day demand is displayed as Max day demand.

Figure 9.2 – Comparison of Peak Day Demand Forecast to CIP Cost with Conservation and Without Conservation.

Capital Improvements Plan Summary of Opinions of Probable Construction Cost With Water Conservation Goals

1,400 gpd/EQR Max Day

Project Description	LRMP Update Opinion of
Reconstruction of WTP #1 With Surface Water Treatment Capability	$5,170,000
Groundwater Raw Water Pipeline Upgrade	$959,000
Chatfield Reservoir Storage and Capacity Realocation	$8,450,000
Buried 2.0 MG Storage Tank Construction	$3,446,000
Surface Water Raw Water Pipeline Connection to Chatfield	$14,800,000
Permastrand Pipe Tapping Saddle Replacement	$413,000
CIP Project Total	**$33,240,000**
Percent Savings	**23.99%**

1,600 gpd/EQR Max Day

Project Description	LRMP Update Opinion of
Reconstruction of WTP #1 With Surface Water Treatment Capability	$5,170,000
Groundwater Raw Water Pipeline Upgrade	$959,000
Chatfield Reservoir Storage and Capacity Realocation	$8,450,000
Buried 2.0 MG Storage Tank Construction	$3,446,000
Surface Water Raw Water Pipeline Connection to Chatfield	$14,800,000
Permastrand Pipe Tapping Saddle Replacement	$413,000
Well LDA-4 Drill and Construction	$361,000
CIP Project Total	**$33,600,000**
Percent Savings	**23.16%**

1,800 gpd/EQR Max Day

Project Description	LRMP Update Opinion of Proable Cost
Reconstruction of WTP #1 With Surface Water Treatment Capability	$5,170,000
Groundwater Raw Water Pipeline Upgrade	$959,000
Chatfield Reservoir Storage and Capacity Realocation	$8,450,000
Buried 2.0 MG Storage Tank Construction	$3,446,000
Surface Water Raw Water Pipeline Connection to Chatfield	$14,800,000
Well DE-4 Drill and Construction	$712,000
Permastrand Pipe Tapping Saddle Replacement	$413,000
Well LDA-4 Drill and Construction	$361,000
Well Site 11, Well A-11 Drill, and Raw Water Pipeline Construction	$2,383,000
CIP Project Total	**$36,690,000**
Percent Savings	**16.10%**

2,000 gpd/EQR Max Day

Project Description	LRMP Update Opinion of Proable Cost
Reconstruction of WTP #1 With Surface Water Treatment Capability	$5,170,000
Groundwater Raw Water Pipeline Upgrade	$959,000
Chatfield Reservoir Storage and Capacity Realocation	$8,450,000
Buried 2.0 MG Storage Tank Construction	$3,446,000
Surface Water Raw Water Pipeline Connection to Chatfield	$14,800,000
Well DE-4 Drill and Construction	$712,000
Permastrand Pipe Tapping Saddle Replacement	$413,000
Well LDA-4 Drill and Construction	$361,000
Well Site 11, Well A-11 Drill, and Raw Water Pipeline Construction	$2,383,000
Well DE-11 Drill and Construction	$794,000
Well LDA-11 Drill and Construction	$361,000
Well Site 9, Well A-9 Drill, and Raw Water Pipeline Constuction	$4,766,000
Well LDA-9 Drill and Construction	$361,000
Well DE-9 Drill and Construction	$753,000
CIP Project Total	**$43,730,000**

(1) The original OPCs were updated for 2009 dollars using Denver Construction Cost Index from Dec 2006 to May 2009. Index changed 3.16% over period.

Assumptions

Metro's 16 percent water conservation goal lies between 16.10 percent and 23.16 percent savings on capital improvement projects but cannot predict whether the 16 percent will be entirely peak day demand reduction.

RTW evaluated two possible sources for financing the capital improvement projects in the LRMP. For purposes of the LRMP, it was assumed there are two ways to fund the capital improvement projects. Metro can finance the projects by increasing rates, increasing taxes, or a combination of both. Since the LRMP was completed, Metro has implemented an aggressive 4-tier conservation rate structure which reflects one of the suggested avenues of financing capital improvement projects.

The first financing method in the LRMP modeled a rate increase and financed all projects from paid user fees. The second financing method was reallocating Debt Service Mills from the Debt Fund to the General Fund and financing all the projects from the General Fund through property taxes.
Both financial models make the following assumptions:

- Inflation rate for property, utility rates, construction costs, and operating expenditures is three percent per year. All other inflation rates are two percent per year.
- The average single family residential home value in 2006 in CPV is $899,100.
- Operating expense per connection is $1,235.

- Capital improvement projects that are not directly financed by Metro have 20 year revenue bonds with a five percent discount rate.

The results of the financial model if Metro were to maintain the 2006 mill levy distribution and keep the 2006 rate structure with only correcting the rates for inflation. Metro's Board of Directors did decide to implement a rate increase in 2009. The Enterprise Fund, consisting of paid user fees, balance would have been depleted by 2011 if the first option was chosen.

Revenue Effects

Rates were set so that Metro would be revenue neutral after the implementation of the 4-tiered rate structure if homeowners conserved by twenty percent. However, impacts to operating revenues should be offset by the re-structuring of water rates, as well as decreased costs related to renewable water acquisition and capital construction.

Metro maintains a sophisticated water rate model and can respond to changes in revenues to maintain rates that reflect the cost of service to its customers.

Benefits of Conservation

Water conservation is a cost-effective way to meet a portion of the projected water demand for Metro in regard to the cost savings by delaying or eliminating capital improvement projects. Other benefits with the WCP may be qualification for grant money and renewable water source supply projects. Since the WCP is directed toward existing customers, the success of it is not dependent on new growth.

The majority of future water demand will still be met by expensive water supplies like participation in the Chatfield Reallocation project and possible Plum Creek Reservoir project, but the total requirement for new water will be less than projected according to the success of this WCP.

Metro is integrating its staff and monetary resources in order to implement a comprehensive water conservation program for CPV. Metro is dedicated to exploring all avenues of water conservation and will be targeting unaccountable losses in the near future.

CHAPTER 10 – IMPLEMENTATION, MONITORING AND EVALUATION

Implementation Schedule

All of the proposed water conservation measures and programs will require staff resources for planning and coordination before implementation. This will necessitate strategic thinking for implementation of the most beneficial measures first. Considerations in the implementation of the WCP are:

- Benefit to cost ratio
- Time and effort involved in establishing the measure or program
- Initial capital investment
- Expected water savings

The soonest possible approval of the WCP will be in the latter part of 2009. Indoor and outdoor audits and ET Controller Rebates already implemented by Metro will continue. New rebates will be ready to implement in 2010 and 2011. Educational incentives will begin in 2009 and continue throughout the planning period. Likewise, each measure will be researched prior to the implementation date. See Table 7.2 for implementation dates.

The selected strategies have been grouped into two programs to ease implementation and allow for easier monitoring set up. Looking at the water use per tap, as shown in Chapter 3, is one way to monitor water use per customer category. CPV population can be tracked according to residential billings and published people per household values. The GCD and peak demand can then be tracked from year to year to monitor progress.

Public Participation

Metro has utilized conservation techniques since 1987, but the educational portion of the conservation program began in 1999. The public has become familiar with conservation concepts and activities due to these educational efforts and they have contributed to this level of awareness. For the public review process, residents will be notified of the 60-day comment period from July 27 to September 25, 2009 and instructed on how to submit comments. The WCP will be available on Metro's website and in its office for review. Written comments and responses to those comments will be included in Appendix B.

Metro staff has utilized public participation throughout WCP development especially in regard to measure selection and WCP review. Metro staff, the WCC, and the Metro Board of Directors reviewed the WCP for correctness and completeness.

Monitoring and Evaluation

Monitoring the success of this WCP includes measuring water use as well as money spent on the selected conservation measures and incentives. Metro currently measures water use in all customer categories and will continue to collect that necessary data to measure success. Participants in the rebate and audit measures can be recorded and individual accounts tracked for specific water reductions.

Expenditures for conservation will be documented by Metro staff and reported to Metro's Board of Directors on a regular basis. This will be valuable information in evaluating benefit/cost ratios and to validate the success of implementing the selected conservation measures and incentives. Since the WCP will be implemented in phases, there will be time to evaluate and establish effective methods to monitor the success of each incentive and measure.

Plan Updates and Revisions

The required schedule for updating the WCP is seven years. The progress towards achieving the water savings goals will be monitored on an annual basis by Metro. Metro will update this WCP in five years as evaluations and analyses expose deviations from expected costs and benefits. This deviation may be caused by several factors including less than anticipated participation and the inability to implement the plan due to lack of funding.

Plan Adoption and Approval

After the public comment period, the comments will be incorporated into the planning document as well as any additional revisions. The Metro Board held a public hearing at the October 15, 2009 regular Board meeting and adopted the WCP at this meeting. The WCP was submitted to CWCB. CWCB will provide written notification of approval, conditional approval or disapproval within 90 days of submittal.

REFERENCES:

American Water Works Association, 2006. Water Conservation Programs – A Planning Manual, Manual of Water Supply Practices M52.

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U.S. Environmental Protection Agency, 2007. Cases in Water Conservation: How Efficiency Programs Help Water Utilities Save Water and Avoid Costs.

Vickers, Amy, 2001. Handbook of Water Use and Conservation: Home, Landscapes, Business, Industries, Farms. WaterPlow Press, Amherst, MA.

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Resolution of Castle Pines Metropolitan District Regarding Adoption of a Water Conservation Plan

Resolution 2009-10

Whereas, the Board of Directors of the Castle Pines Metropolitan District ("Metro") recognizes the importance of conserving water and improving water use efficiency; and

Whereas, Metro desires to adopt a Water Conservation Plan ("WCP") substantially in accordance with the Colorado Revised Statute 37-60-126 and the Water Conservation Act of 2004, and

Whereas, a draft WCP that describes the role of water use plans in Metro's water supply planning was presented for review and comment at the Board meeting held July 16, 2009; and

Whereas, a public notice announcing the availability of the WCP for review and comment was published, and the WCP was publicly available for a period of not less than sixty days and the public was invited to be heard at the Board meeting held on October 15, 2009; and therefore

BE IT RESOLVED that the Board of Directors of Castle Pines Metropolitan District hereby adopts the WCP on file with Metro and incorporated herein by reference.

Passed and adopted at a regular meeting of the Board of Directors of Castle Pines Metropolitan District held day October 15, 2009.

BY: _____
Joe Gschwendtner
Chairman

ATTEST:

Jackie Sundquist _____
Jackie Sundquist
Secretary

Appendix A - Water Conservation Program Rebate Measures Criteria and Procedures

All Rebate Eligibility Requirements must be met in order to receive a rebate. Rebate eligibility requirements and other rebate details are subject to change pending program evaluation results.

Metro is not responsible for maintenance of any product or landscape.

Proposed water savings will ONLY be achieved if multiple water conservation methods are integrated into a holistic approach to landscape management. Many factors influence water consumption and directly relate to the amount of water saved per water conservation method adopted.

Due to circumstances beyond its control, Metro cannot guarantee that participation in the following rebate programs will result in lower utility costs.

CASTLE PINES

METROPOLITAN DISTRICT

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Castle Pines Metropolitan District
Existing ET Controller Rebate Program

ET or SMART Irrigation Controllers

Weather- or sensor-based irrigation control technology uses local weather and landscape conditions to customize irrigation schedules to actual conditions on the site or to historical weather data. Instead of irrigating according to a preset schedule, advanced irrigation controllers allow irrigation to more closely match the water requirements of plants. These new control technologies offer the potential to improve irrigation practices in homes and reduce water use in the landscape.

Controller Requirements:

1. Meet the Irrigation Associations (IA) definition of SMART controllers
2. Weather-Based – using local weather data
3. Considers soil type (s)
4. Considers plant types
5. Considers microclimates
6. Considers rainfall
7. Considers type of sprinkler heads – different heads have different characteristics that greatly affect water distribution
8. Variable cycles
9. Efficiency rating of 80% or greater – the average irrigation system is 50 to 60`% efficient

Improvements in technology now allow a homeowner to install an ET device to integrate into their irrigation time clock. ET is the amount of water that Evaporates from the soil plus the amount that Transpires through the plants' leaves. ET is affected by temperature, humidity, solar radiation and wind speed. If the ET monitor indicates satisfactory water content, the clock automatically bypasses its next cycle. This process is repeated until the ET controller advises that the moisture content is below a set threshold. This signal causes the clock to resume its normal programmed sequence. Some existing clocks can be upgraded to an ET controller, or the new ET controllers can replace the old clocks.

Metro is offering a rebate of 50 percent of the cost of an ET controller clock and its installation, up to $500. This is a one-time rebate per household. (Sub-associations are eligible for one rebate per controller/clock.) This program provides residents with a rebate to offset the purchase of a new irrigation controller. Since this program is limited, funds will be disbursed on a first-come, first served basis. Expect rebates within 4 to 6 weeks of Metro receiving the required proof of purchase and the eligibility requirements are met.

Homeowners with installed ET systems will be EXEMPT from the voluntary every-other-day watering schedule.

Metro staff will make recommendations for this upgrade. Please have your landscape contractor call the Water Conservation Coordinator prior to purchase of the clock/controller. This will avoid purchase and installation of a controller that is not covered under this rebate.

The following models and vendors are recommended for homes in CPV. Prices do not include installation or miscellaneous costs.

Signal-type Models – These devices receive local microclimate weather data, which creates the scheduling commands and a service fee is charged for the transmitted information.

Manufacturer	Price Range	Annual Fee	Website
WeatherTrak	$549 to $859	$48 or $84	www.weathertrak.com
Rain Master Irritrol	$399 to $889	$48 to $84	www.irritrol.com
ET Water	$360 to $1400	$199 (per controller)	www.etwater.com
WGL	$250 to $1000	$0	www.wgldesigns.com

Stand-alone Models – Requires user input, based on weather history, uses on-site weather station sensors for data; no monthly service fee.

Manufacturer	Price Range	Website
Rainbird	$315 to $570	www.rainbird.com
Hunter	$206 to $719	www.hunterindustries.com
Acclima	$196 to $429	www.acclima.com
*Weathermate	$120 to $520	www.weathermatic.com
*Aqua Conserve	$240 to $1,047	www.aquaconserve.com

* Weathermate and Aqua Conserve are modified ET based systems that use only on-site temperature and rainfall measurements to calculate ET.

Rebate Eligibility Requirements:

- Residents must have an irrigation audit that indicates the irrigation system is at least 70% efficient before the ET Controller is installed.
- The Water Conservation Coordinator must conduct an on-site inspection while ET Controller is being programmed in order to be eligible for rebate.
- Residents are limited to one rebate per household and sub-associations are limited to one rebate per clock.
- ET Controllers must be installed at a residence served by Metro.
- Original invoices for work completed must be provided to Metro before Metro will consider applicant for receipt of rebate credit.
- Rebate application form must be filled out in its entirety and returned with a copy of the invoice to Metro no later than December 31, 2010.

- Offer is good until funds are depleted on a first-come, first-serve basis.
- Rebate credit will be issued to your water bill or made payable by check. Allow 4 - 6 weeks from the date of inspection, invoice, and rebate application form to receive your rebate credit.

Selection and installation of the product is the sole responsibility of the applicant, as is determination of the adequacy and compatibility to their irrigation existing system. Metro assumes no responsibility for any damage that may occur to an applicant's property as a result of participation in this rebate program. Due to circumstances beyond its control, Metro cannot guarantee that the installation of the rotators will result in lower utility costs. Metro, its consultants and their sub-consultants do not assume any liability for services performed and are not responsible for any agreements made between customers and landscape contractors. Metro does not warrant the performance of any product listed above. Actual water savings may vary.

Castle Pines Metropolitan District
Irrigation System Repair Rebate Program

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(Implementation in 2010 and each year thereafter depends on funding availability.)

Irrigation System Repair Rebate

Metro is offering a rebate of 50 percent of the cost of irrigation system repairs and maintenance, up to $500. For example, if the labor and repairs cost $1500, then Metro would rebate $750. This program provides residents with a rebate to offset the essential maintenance performed on their irrigation systems. Since this program is limited, funds will be disbursed on a first-come, first serve basis. Expect rebates within 4 to 6 weeks after repair work if all rebate eligibility requirements are met (see below).

New technologies in irrigation systems are regularly emerging in the market, improving irrigation efficiency. The irrigation field has grown dramatically in the last 10 to 20 years and irrigation system design has become more efficient. If a customer system is more than eight years old and the designer or installer is unknown, time and money will be saved by participating in this rebate program.

According to CSU Extension Specialists and other Front Range researchers, annual irrigation system repairs (maintenance) will confer up to 50% water savings. CSU Extension in the Tri-River area saw a 40% water use reduction after clients repaired irrigation systems. Metro believes a conservative estimate in water savings per irrigation system is more realistic.

Irrigation system maintenance is offered by most landscape companies. To protect residents of CPV from landscape contractors who are not familiar with proper irrigation design, installation, and maintenance, the Water Conservation Coordinator developed a list of landscape contractors who are certified by professional societies focused on irrigation.

Customers must choose a landscape contractor from the Certified Landscape Contractor List provided by the Water Conservation Coordinator or work to be rebated must be to standards provided by the Water Conservation Coordinator in order to be qualified for the Irrigation System Repair Rebate.

Rebate Eligibility Requirements:

- Upon completion of repairs, irrigation systems must be audited and receive a 70% efficiency rating by a Certified Irrigation Auditor or the Slow the Flow program. Rebate will not be approved if the system is less than 70% efficient.
- Rebates will not be issued retroactively for irrigation systems maintained or audited before January 1, 2010.
- The Water Conservation Coordinator must conduct an on-site inspection when project is near-completion in order to be eligible for rebate.

- Original invoices for work completed must be provided to Metro before Metro will consider applicant for receipt of rebate credit.
- The repaired irrigation system must be at a residence served by Metro.
- Residents and sub-associations are limited to up to one rebate per household per season.
- Offer is good through December 31, 2010 or until funds are depleted, whichever comes first.
- Residents or sub-associations will not be eligible for this rebate if they have received a leak credit according to the District's Leak Credit Policy.
- Rebate credit will be issued to your water bill or payable by check. Allow 4 to 6 weeks from the date of inspection to receive a rebate credit if all rebate eligibility requirements are met.

Repair, selection and installation of irrigation products are the sole responsibility of the applicant, as is determination of the adequacy and compatibility to their irrigation existing system. Metro assumes no responsibility for any damage that may occur to an applicant's property as a result of participation in this rebate program. Due to circumstances beyond its control, Metro cannot guarantee that the installation of the rotators will result in lower utility costs. Metro, its consultants and their sub-consultants do not assume any liability for services performed and are not responsible for any agreements made between customers and landscape contractors. Metro does not warrant the performance of any product listed above. Actual water savings may vary.

(Implementation in 2010 and each year thereafter depends on funding availability.)

Sub-soil Improvement and Plant Replacement Rebate

Metro is offering a rebate of 50 percent of the cost of sub-soil improvement and plant replacement up to $5,000. For example, if labor and material costs are $7,000, then Metro would rebate $3500. This program provides residents with a rebate to offset soil improvement costs critical to healthy plant root growth. This rebate is offered one per household per season. Since this program is limited, funds will be disbursed on a first-come, first serve basis. Expect rebates within 4 to 6 weeks of Metro receiving the required documents.

Local landscape contractors may charge in the range of $7,000 to $10,000 per 5,000 square feet for three phases: 1) complete removal of turfgrass (or “kill and till” method of preparing the soil for new sod, seed or ornamentals), 2) sub-soil improvement by incorporating compost into existing soils at a for to six-inch depth, and 3) replacement with more appropriate turfgrass species or other plant material. The larger the area to be improved the more inexpensive services become. Landscape contractors may charge an average of $10,000 to $15,000 per 10,000 to 15,000 square feet for sub-soil improvement. Therefore, the rebate is equal to 50% of sub-soil improvement for the average lawn size per single family residence.

Healthy plant growth is essential to mitigate pest and disease damage. More importantly in regard to water conservation in the landscape, healthy plants express increased drought tolerance. Healthy plants also require less maintenance in the form of mowing, fertilizing, pest control applications, and minimized labor costs.

Healthy plant growth which includes root growth begins with the soil. Soils in CPV are largely composed of bentonite clays and rock. This soil texture is not ideal for the turfgrass varieties chosen by residents of CPV to cover sometimes large areas of the landscape. Hence, sub-soil tilling and amending is required to grow healthy turfgrass and promote drought tolerance.

According to CSU Extension Specialists and Green Industry professionals, sub-soil improvements via tillage and amendment incorporation, will confer up to 50% water savings. CSU Extension in the Tri-River area saw a 30% water use reduction after client’s amended soils under turfgrass and ornamental landscape areas.

This type of service is offered by most landscape companies. To protect residents of CPV from landscape contractors who are not familiar with proper sub-soil improvement techniques, the Water Conservation Coordinator developed a list of landscape

contractors who are certified by professional societies focused on proper landscaping practices.

Customers must choose a landscape contractor from the Certified Landscape Contractor List provided by the Water Conservation Coordinator or work to be rebated must be to standards provided by the Water Conservation Coordinator in order to be qualified for the Sub-soil Improvement and Plant Replacement Rebate.

Rebate Eligibility Requirements:

- Rebate application form must be filled out in its entirety and returned to the Water Conservation Coordinator before work to be rebated commences.
- Sub-soil improvements must be made after January 1, 2010. Rebates will not be issued retroactively for sub-soil improvements and plant replacements made before January 1, 2010.
- Sub-soil improvements must be made at a residence served by Metro.
- The Water Conservation Coordinator must conduct an on-site inspection with the Certified Landscape Contractor or homeowner near project completion.
- Residents and sub-associations are limited to one rebate per household per year.
- Offer is good through December 31, 2010 or until funds are depleted, whichever comes first.
- Original invoices for work completed must be provided to Metro before Metro will consider applicant for receipt of rebate credit.
- Rebate credit will be issued to resident's water bill or made payable by check. Allow four weeks from the date of inspection, invoice, and rebate application form to receive a rebate credit.

Removal, selection and installation of plant material are the sole responsibility of the applicant, as is determination of the adequacy and compatibility to their landscape and irrigation system. Metro assumes no responsibility for any damage that may occur to an applicant's property as a result of participation in this rebate program. Due to circumstances beyond its control, Metro cannot guarantee that the installation of the rotators will result in lower utility costs. Metro, its consultants and their sub-consultants do not assume any liability for services performed and are not responsible for any agreements made between customers and landscape contractors. Metro does not warrant the performance of any product listed above. Actual water savings may vary.

Castle Pines Metropolitan District
Rain Sensor Rebate Program

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(Implementation in 2010 and each year thereafter depends on funding availability.)

Rain Sensor Rebate

Metro is offering a rebate of 50% of product and installation up to $100.00 for a tipping bucket rain sensor or a rain sensor with the following specifications.

- Compound lens that is the sensing surface
- Two open collector-style outputs
- Microprocessor
- Measures both rain accumulation and rain intensity

This rebate is offered one per household. Sub-associations are eligible for one rebate per clock. This program provides residents with a rebate to offset the cost of a qualified rain sensor to install in conjunction with irrigation clocks. Not all clocks are compatible with qualified rain sensors. Since this program is limited, funds will be disbursed on a first-come, first serve basis. Expect rebates within 4 to 6 weeks of Metro providing assistance on installation of the qualified rain sensors.

Sensor-based irrigation control technology uses landscape conditions to customize irrigation schedules to on-site weather conditions. Instead of irrigating according to a preset schedule, advanced irrigation controllers allow irrigation to more closely match the water requirements of plants. These new control technologies offer the potential to improve irrigation practices in homes and reduce water use in the landscape.

According to Green Industry professionals, qualified rain sensors may reduce water use up to 20%. These types of rain gauges are used by the National Weather Service and many other organizations that require accurate weather data in their operations.

Metro's Water Conservation Coordinator may order the rain gauge to ensure the proper rain gauge is purchased. The Water Conservation Coordinator will also educate the homeowner or Sub-association landscape manager on installation, use, and maintenance of the qualified rain sensor.

Rebate Eligibility Requirements:

- The Water Conservation Coordinator must conduct an on-site inspection of rain sensor in order to be eligible for rebate.
- Qualified rain sensors must be installed after January 1, 2010. Rebates will not be issued retroactively for any other rain gauges or qualified rain sensors purchased before January 1, 2010.
- Qualified rain sensors must be installed at a residence served by Metro.
- Residents are limited to one rebate per household and sub-associations are limited to one rebate per clock.

- Offer is good through December 31, 2010 or until funds are depleted, whichever comes first.
- Original invoices for work completed must be provided to Metro before Metro will consider applicant for receipt of rebate credit.
- Rebate credit will be issued to resident's water bill or made payable by check. Allow 4 - 6 weeks from the date of inspection and after all rebate eligibility requirements are met to receive a rebate credit.

Selection and installation of the product is the sole responsibility of the applicant, as is determination of the adequacy and compatibility to their irrigation existing system. Metro assumes no responsibility for any damage that may occur to an applicant's property as a result of participation in this rebate program. Due to circumstances beyond its control, Metro cannot guarantee that the installation of the rotators will result in lower utility costs. Metro, its consultants and their sub-consultants do not assume any liability for services performed and are not responsible for any agreements made between customers and landscape contractors. Metro does not warrant the performance of any product listed above. Actual water savings may vary.

Castle Pines Metropolitan District
Irrigation Head Replacement Program

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Irrigation Head Replacement

Metro is offering rotator irrigation heads for a wholesale cost. Homeowners are eligible after an irrigation audit or assessment has been conducted by the "Slow the Flow Colorado" program or a Certified Landscape Contractor provided by Water Conservation Coordinator. Metro realizes the importance of a minimum 70% efficient irrigation system and how that efficiency is related to distribution uniformity of irrigation heads.

New technologies in irrigation systems are regularly emerging in the market, improving water distribution efficiency. The irrigation field has grown dramatically in the last 10 to 20 years and irrigation system design has become more efficient. Rotator heads are easy to install and easily replace pop-up type spray heads. If a system is more than eight years old and the designer or installer is unknown, time and money will be saved by participating in this program.

Program Eligibility Requirements:

- Application form must be filled out in its entirety and returned to the Water Conservation Coordinator before product is installed.
- The rotator nozzles must be installed when Water Conservation Coordinator delivers product to residence which will be coordinated and scheduled prior to delivery.
- Rotators must be installed at a residence served by Metro.
- Offer is good through October 31, 2010.

Selection and installation of the product is the sole responsibility of the applicant, as is determination of the adequacy and compatibility to their irrigation existing system. Metro assumes no responsibility for any damage that may occur to an applicant's property as a result of participation in this rebate program. Due to circumstances beyond its control, Metro cannot guarantee that the installation of the rotators will result in lower utility costs. Metro, its consultants and their sub-consultants do not assume any liability for services performed and are not responsible for any agreements made between customers and landscape contractors. Metro does not warrant the performance of any product listed above. Actual water savings may vary.

Appendix B– Resident Comments to Metro WCP during Public Review Period, July 27, 2009 to September 25, 2009.

The only comments received were prior to the public review period and were incorporated into the WCP for public review. Public Hearing Notice was published Thursday, October 1, 2009 as per image below.

Metro announced the Public Review Period via three avenues; email sent to all residents in July, two articles in the Village Reporter editions April/May and June/July, and on two bills June and July.

PublicNotices

CPAXLP

PUBLIC NOTICE

Castle Pines Metropolitan District
Notice of Proposed Water Conservation Plan

Notice is hereby given that a proposed Water Conservation Plan has been submitted to the Castle Pines Metropolitan District. A copy of such proposed Water Conservation Plan has been filed in the office of the District at 5880 Country Club Drive, Castle Rock, Colorado, in the office of the Castle Pines Homes Association at 668 Happy Canyon Road, Castle Rock, CO; and on the District's web site at www.castlepinesmetro.com where same is and has been open for public inspection and comment for 60 days.

Such proposed Water Conservation Plan will be considered at a regular meeting of the Board of Directors of Castle Pines Metropolitan District to be held in the Board conference room at the District's office on Thursday, October 15, 2009 at 7:30 a.m.

Any interested member of the public within Castle Pines Metropolitan District may inspect the proposed Water Conservation Plan and file or register any comments thereto at any time prior to the final adoption of the Water Conservation Plan.

BY ORDER OF THE
BOARD OF DIRECTORS
CASTLE PINES METROPOLITAN DISTRICT
By: -s- Paul Dannels
Co-Secretary to the Board of Directors

Legal Notice No.: W08-8186
First Publication: October 1, 2009
Last Publication: October 1, 2009
Publisher: Douglas County News-Press

PUBLIC NOTICE

Castle Pines Metropolitan District

NOTICE OF INCLUSION

NOTICE IS HEREBY GIVEN that there has been filed with the Board of Directors of Castle Pines Metropolitan District, County of Douglas, State of Colorado, a petition for inclusion requesting the inclusion of certain property into the boundaries of the Castle Pines Metropolitan District.

1. The name and address of the petitioners and a general description of the property reference in said petition are as follows:

Kirk Montague Kimball
P.O. Box 2648,
Elizabeth, Colorado 80107

Ted Blank & Associates, Inc.
7240 E. Euclid Dr.
Centennial, Colorado 80111

General Description: Property which includes all of Lot 1, Block 1, Kimball Subdivision, and an adjoining strip of land described in a Deed of Trust recorded in Book 823 at Page 423, Douglas County records, all within the east half of section 8, township 7 south, range 67 west, of the 6th principal meridian, in the County of Douglas, state of Colorado.

2. The prayer of the petition is that the above property be included within the boundaries of the District.

3. The property sought to be included into the District is located entirely within the County of Douglas, Colorado, and does not include property within any other county or incorporated city, town or city and county. Therefore, no notice of the proposed inclusion under Section 32-1-207(2), C.R.S., as amended, is required.

Accordingly, notice is hereby given to all interested persons to appear at a regular meeting of the Board of Directors of the District at 7:30 am, Thursday October 15, 2009, at 5880 Country Club Drive, Castle Rock, CO, which meeting may be continued from time to time, and show cause in writing, if any, why such petition should not be granted.

BY ORDER OF THE BOARD
OF DIRECTORS:
Castle Pines Metropolitan District
By: -s- Paul Dannels
Co-Secretary to the Board

Legal Notice No.: W08-8187
First Publication: October 1, 2009
Last Publication: October 1, 2009
Publisher: Douglas County News-Press

Appendix C– 2009 Water Usage Budget Showing Change in Revenue based on Conservation Efforts Assuming 10% Water use Reduction.

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	Year 2007		Usage 2007 with New 2007 Tiers				Year 2007 Usage with 2008 Rates					2009
							Two Tiers	Usage 2007 with New 2008 4 Tiers				Budget
	Actual	RTW Model (a)	No Conserv	With Conserv	With Conserv		Actual	No Conserv	With Conserv	With Conserv		Tier Increase of 5%
Gallon Assumptions												
Primary water usage	288,182,000											
CPMD	6,042,000											
Village Lakes	na	na	na	na	na		na	na	na	na		
Gallons subtotal	294,224,000	293,757,000	293,757,000	293,757,000	293,757,000		293,757,000	293,757,000	293,757,000	293,757,000		
% Increase		-0.16%	<< Difference Immaterial									
Conservation target												
0-15k gallons	na	0.0%	0.0%	0.0%	0.0%		na	0.0%	0.0%	0.0%		
15k to 25k gallons	na	0.0%	0.0%	10.0%	10.0%		na	0.0%	10.0%	10.0%		
25k to 50k gallons	na	0.0%	0.0%	20.0%	20.0%		na	0.0%	20.0%	20.0%		
50k gallons and over	na	0.0%	0.0%	30.0%	30.0%		na	0.0%	30.0%	30.0%		
Overall reduction	na	0.0%	0.0%	17.6%	17.6%		na	0.0%	17.6%	17.6%		
Gallon reduction	0	0	0	51,769,000	51,769,000		0	0	51,769,000	51,769,000		
Total Gallons after conservation	294,224,000	293,757,000	293,757,000	241,988,000	241,988,000		293,757,000	293,757,000	241,988,000	241,988,000		
Revenue Rate Assumptions												
Base Rate (1" meter)	$26.25	$26.25	$26.25	$26.25	$26.25		$27.56	$27.56	$27.56	$27.56		$28.94
Capital improvement base rate *	na	na	$5.00	$5.00	$10.00		na	$5.00	$5.00	$10.00		$10.00
* Should be special line on customer bills												
						Tier					Tier	
Tier 1 rate	$2.95	$2.95	$2.95	$2.95	$2.95	Change	$3.10	$3.10	$3.10	$3.10	Change	$3.26
Tier 2 rate	$4.72	$4.72	$4.72	$4.72	$4.72	60.0%	$4.95	$4.95	$4.95	$4.95	59.7%	$5.20
Tier 3 rate	na	na	$6.37	$6.37	$6.37	35.0%	na	$6.68	$6.68	$6.68	34.9%	$7.01
Tier 4 rate	na	na	$8.60	$8.60	$8.60	35.0%	na	$9.02	$9.02	$9.02	35.0%	$9.47
Revenues												
Base revenues	$490,402	$502,084	$502,084	$502,084	$502,084		$527,140	$527,140	$527,140	$527,140		
Capital improvement revenues	$0	$0	$95,635	$95,635	$191,270		$0	$95,635	$95,635	$191,270		
Water usage	$1,091,586	$1,123,680	$1,386,972	$1,011,807	$1,011,807		$1,179,363	$1,455,506	$1,062,043	$1,062,043		
CPMD usage	$34,550	Included above	Included above	Included above	Included above		Included Above	Included Above	Included Above	Included Above		
Total Revenues	$1,616,538	$1,625,764	$1,984,691	$1,609,526	$1,705,161		$1,706,503	$2,078,281	$1,684,818	$1,780,453		
Net change from RTW model		Base Rev	$358,927	($16,238)	$79,397		Base Rev	$371,778	($21,685)	$73,950		
% Increase		Base Rev	22.08%	-1.00%	4.88%		Base Rev	21.79%	-1.27%	4.33%		

Comments:

(a) RTW model recalculated the revenues based on each customer's usage for each month of 2007. Difference between actual and model is insignificant for purposes of these calculations.

Appendix D– Four scenarios, Tables E-1 through E-4, show the number of wells needed to meet peak day demand at two different demand levels and the addition of renewable water sources to the Metro system. Proposed by Jehn Water Consultants, Inc., 1565 Gilpin Street, Denver, CO 80218, (303) 321-8335, (303) 321-8346 fax.

Number of Wells Needed To Meet Peak Demand at Full Build Out - Without Adding Surface Water
Castle Pines Metropolitan District 3.78 MGD Peak Day

		Well ID	Current Rate 2006	Average Max Rate 2016	Average Max Rate 2026	Average Max Rate 2036	Average Max Rate 2046	Average Max Rate 2055
Lower Dawson	Existing Well	LDa-10	150	149	145	140	135	130
	New Wells		0	0	145	140	135	130
	Total New Wells (this period)		0	0	1	1	1	1
	Total Dawson gpm before new wells (this period)		150	149	145	280	405	520
	Total Dawson gpm		150	149	290	420	540	650
Denver	Existing Well	De-8	130	98	77	58	45	34
	Existing Well	De-10	285	218	172	130	100	77
	Existing Well	Aslan -2	250	218	172	130	100	77
	New Wells		0	176	140	0	82	0
	Total New Wells (this period)		0	1	1	0	1	0
	Total Denver gpm before new wells (this period)		665	534	561	530	408	377
	Total Denver gpm		665	711	702	530	489	377
Arapahoe	Existing Well	A-4R	750	556	358	301	247	194
	Existing Well	A-8	400	297	191	161	132	103
	Existing Well	A-10	650	482	310	261	214	168
	Existing Well	A-12	700	556	358	301	247	194
	New Wells		0	473	609	256	210	330
	Total Wells (this period)		0	1	2	1	1	2
	Total Arapahoe gpm before new wells (this period)		2500	1890	1522	1791	1680	1484
	Total Arapahoe gpm		2500	2363	2130	2047	1890	1814
Laramie-Fox Hills	Existing Well	LFH-10	40	0	0	0	0	0
	New Wells		0	0	0	0	0	0
	Total New Wells (this period)		0	0	0	0	0	0
	Total Laramie gpm		0	0	0	0	0	0
Total gallons/day availablebefore addition of new wells			**4,773,600**	**3,704,976**	**3,207,939**	**3,745,709**	**3,589,163**	**3,428,606**
Peak Day Demand Full Build out Gallons/day			**2,500,000**	**3,780,000**	**3,780,000**	**3,780,000**	**3,780,000**	**3,780,000**
Excess (Deficit) Capacity Gallons/day			2,273,600	(75,024)	(572,061)	(34,291)	(190,837)	(351,394)
Total Capacity With Wells Gallons/day			4,773,600	4,641,600	4,495,168	4,315,733	4,203,359	4,090,718
Additional Capacity With New Wells Gallons/day			0	936,624	1,287,229	570,024	614,196	662,112
Additional Capacity after Peak Day met Gallons/day			2,273,600	861,600	715,168	535,733	423,359	310,718
Safety Factor Required			1,080,000	800,640	515,520	433,440	355,680	279,360
Number of Additional Wells			0	2	4	2	3	3
Cumulative Total Additional Wells			0	2	6	8	11	14

Number of Wells Needed To Meet Peak Demand at Full Build Out With No Surface Water
Castle Pines Metropolitan District 4.2 MGD Peak Day

		Well ID	Current Rate 2006	Average Max Rate 2016	Average Max Rate 2026	Average Max Rate 2036	Average Max Rate 2046	Average Max Rate 2056
Lower Dawson	Existing Well	LDa-10	150	149	145	140	135	130
	New Wells		0	298	145	140	135	260
	Total New Wells (this period)		0	2	1	1	1	2
	Total Dawson gpm before new wells (this period)		150	298	435	560	675	910
	Total Dawson gpm		150	596	580	700	810	1170
Denver	Existing Well	De-8	130	98	77	58	45	34
	Existing Well	De-10	285	218	172	130	100	77
	Existing Well	Aslan -2	250	218	172	130	100	77
	New Wells		0	178	140	0	82	126
	Total New Wells (this period)		0	1	1	0	1	2
	Total Denver gpm before new wells (this period)		665	534	561	530	408	377
	Total Denver gpm		665	711	702	530	489	503
Arapahoe	Existing Well	A-4R	750	556	358	301	247	194
	Existing Well	A-8	400	297	191	161	132	103
	Existing Well	A-10	650	482	310	261	214	168
	Existing Well	A-12	700	556	358	301	247	194
	New Wells		0	473	609	256	210	165
	Total Wells (this period)		0	1	2	1	1	1
	Total Arapahoe gpm before new wells (this period)		2500	1890	1522	1791	1680	1484
	Total Arapahoe gpm		2500	2363	2130	2047	1890	1649
Laramie-Fox Hills	Existing Well	LFH-10	40	0	0	0	0	0
	New Wells		0	0	0	0	0	0
	Total New Wells (this period)		0	0	0	0	0	0
	Total Laramie gpm		0	0	0	0	0	0

Total gallons/day available before addition of new wells	4,773,600	3,919,536	3,625,539	4,148,909	3,977,963	3,990,206
Peak Day Demand Full Build Out Gallons/day	2,500,000	4,200,000	4,200,000	4,200,000	4,200,000	4,200,000
Excess (Deficit) Capacity Gallons/day	2,273,600	(280,464)	(574,461)	(51,091)	(222,037)	(209,794)
Total Capacity With Wells Gallons/day	4,773,600	5,285,280	4,912,768	4,718,933	4,592,159	4,782,962
Additional Capacity With New Wells Gallons/day	0	1,365,744	1,287,229	570,024	614,196	792,757
Additional Capacity after Demands are met Gallons/day	2,273,600	1,085,280	712,768	518,933	392,159	582,962
Safety Factor Required Gallons/day	1,080,000	800,640	515,520	433,440	355,680	279,360
Number of Additional Wells	0	4	4	2	3	5
Cumulative Total Additional Wells	0	4	8	10	13	18

Number of Wells Needed To Meet Peak Demand at Full Build Out - With Adding Surface Water
Castle Pines Metropolitan District

3.7 MGD Demands, 1000 gpm Surface Water Available

		Well ID	Current Rate 2006	Average Max Rate 2016	Average Max Rate 2026	Average Max Rate 2036	Average Max Rate 2046	Average Max Rate 2056
Lower Dawson	Existing Well	LDa-10	150	149	145	140	135	130
	New Wells		0	0	145	140	135	130
	Total New Wells (this period)		0	0	1	1	1	1
	Total Dawson gpm before new wells (this period)		150	149	145	280	405	520
	Total Dawson gpm		150	149	290	420	540	650
Denver	Existing Well	Da-8	130	98	77	58	45	34
	Existing Well	Da-10	285	218	172	130	100	77
	Existing Well	Aslan-2	250	218	172	130	100	77
	New Wells		0	0	0	0	82	0
	Total New Wells (this period)		0	0	0	0	1	0
	Total Denver gpm before new wells (this period)		665	534	421	318	245	251
	Total Denver gpm		665	534	421	318	326	251
Arapahoe	Existing Well	A-4R	750	556	358	301	247	194
	Existing Well	A-8	400	297	191	161	132	103
	Existing Well	A-10	650	482	310	261	214	168
	Existing Well	A-12	700	556	356	301	247	194
	New Wells		0	0	0	0	0	165
	Total Wells (this period)		0	0	0	0	0	1
	Total Arapahoe gpm before new wells (this period)		2500	1890	1217	1023	840	660
	Total Arapahoe gpm		2500	1890	1217	1023	840	825
Laramie-Fox Hills	Existing Well	LFH-10	40	0	0	0	0	0
	New Wells		0	0	0	0	0	0
	Total New Wells (this period)		0	0	0	0	0	0
	Total Laramie gpm		0	0	0	0	0	0
Total gallons/day available before addition of new wells Gallons/day			4,773,600	3,704,976	2,567,702	2,335,021	2,144,916	2,060,425
Peak Day Demand Full Build Out Gallons/day			2,500,000	3,700,000	3,700,000	3,700,000	3,700,000	3,700,000
Surface Water Available Gallons/day			0	1,440,000	1,440,000	1,440,000	1,440,000	1,440,000
Excess (Deficit) Capacity in System Gallons/day			2,273,600	1,444,976	307,702	75,021	(115,084)	(199,575)
Total Capacity With Wells (Existing and New) Gallons/day			4,773,600	3,704,976	2,776,502	2,536,621	2,456,784	2,465,081
Total Capacity of New Wells Gallons/day			0	0	208,800	201,600	311,868	424,656
Additional Capacity after Demands are met Gallons/day			2,273,600	1,444,976	725,302	478,221	508,651	649,737
Safety Factor Required			1,080,000	800,640	515,520	433,440	355,680	279,360
Number of Additional Wells			0	0	1	1	2	2
Cumulative Total Additional Wells			0	0	1	2	4	6

Number of Wells Needed To Meet Peak Demand at Full Build Out - With Adding Surface Water
Castle Pines Metropolitan District **4.2 MGD Domands, 1042 gpm Surface Water Available**

		Well ID	Current Rate 2006	Average Max Rate 2016	Average Max Rate 2026	Average Max Rate 2036	Average Max Rate 2046	Average Max Rate 2056
Lower Dawson	Existing Well	LDa-10	150	149	145	140	135	130
	New Wells		0	0	145	140	135	130
	Total New Wells (this period)		0	0	1	1	1	1
	Total Dawson gpm before new wells (this period)		150	149	145	280	405	520
	Total Dawson gpm		150	149	290	420	540	650
Denver	Existing Well	De-8	130	98	77	58	45	34
	Existing Well	De-10	285	218	172	130	100	77
	Existing Well	Aslan -2	250	218	172	130	100	77
	New Wells		0	0	140	106	0	0
	Total New Wells (this period)		0	0	1	1	0	0
	Total Denver gpm before new wells (this period)		665	534	421	424	408	314
	Total Denver gpm		665	534	561	530	408	314
Arapahoe	Existing Well	A-4R	750	556	358	301	247	194
	Existing Well	A-8	400	297	191	161	132	103
	Existing Well	A-10	650	482	310	261	214	168
	Existing Well	A-12	700	556	358	301	247	194
	New Wells		0	0	0	0	210	165
	Total Wells (this period)		0	0	0	0	1	1
	Total Arapahoe gpm before new wells (this period)		2500	1890	1217	1023	840	825
	Total Arapahoe gpm		2500	1890	1217	1023	1050	989
Laramie-Fox Hills	Existing Well	LFH-10	40	0	0	0	0	0
	New Wells		0	0	0	0	0	0
	Total New Wells (this period)		0	0	0	0	0	0
	Total Laramie gpm		0	0	0	0	0	0

Total gallons/day available before addition of new wells Gallons/day	4,773,600	3,704,976	2,567,702	2,487,729	2,379,851	2,388,331
Peak Day Demand Full Build Out Gallons/day	2,500,000	4,200,000	4,200,000	4,200,000	4,200,000	4,200,000
Surface Water Available Gallons/day	0	1,440,000	1,440,000	1,440,000	1,440,000	1,440,000
Excess (Deficit) Capacity in System Gallons/day	2,273,600	944,976	(192,298)	(272,271)	(380,149)	(371,669)
Total Capacity With Wells (Existing and New) Gallons/day	4,773,600	3,704,976	2,976,547	2,842,037	2,876,579	2,812,987
Total Capacity of New Wells Gallons/day	0	0	410,845	354,308	496,728	424,656
Additional Capacity after Demands are met Gallons/day	2,273,600	944,976	629,392	436,346	613,307	477,643
Safety Factor Required	1,060,000	800,640	515,520	433,440	355,680	279,360
Number of Additional Wells	0	0	2	2	2	2
Cumulative Total Additional Wells	0	0	2	4	6	8

Appendix E - Universal List of Conservation Measures and Incentives.

Key for following table:
Orange cells = Table headings.
Purple cells = Conservation efforts in residential sector for existing and new homes.
Red cells = Conservation efforts in multi-family sector for existing and new residences.
Dark green cells = Conservation efforts in commercial sector for existing and new residences.
Yellow cells = Existing conservation measures and incentives.
Green cells = Conservation measures and incentives identified to conduct cost benefit analyses and selected for further discussion as potential new measures and incentives.

2009 Water Conservation Plan

Program Screening

March 16, 2009

Prepared by Tetra Tech for Castle Pines Metropolitan District

CASTLE PINES METROPOLITAN DISTRICT

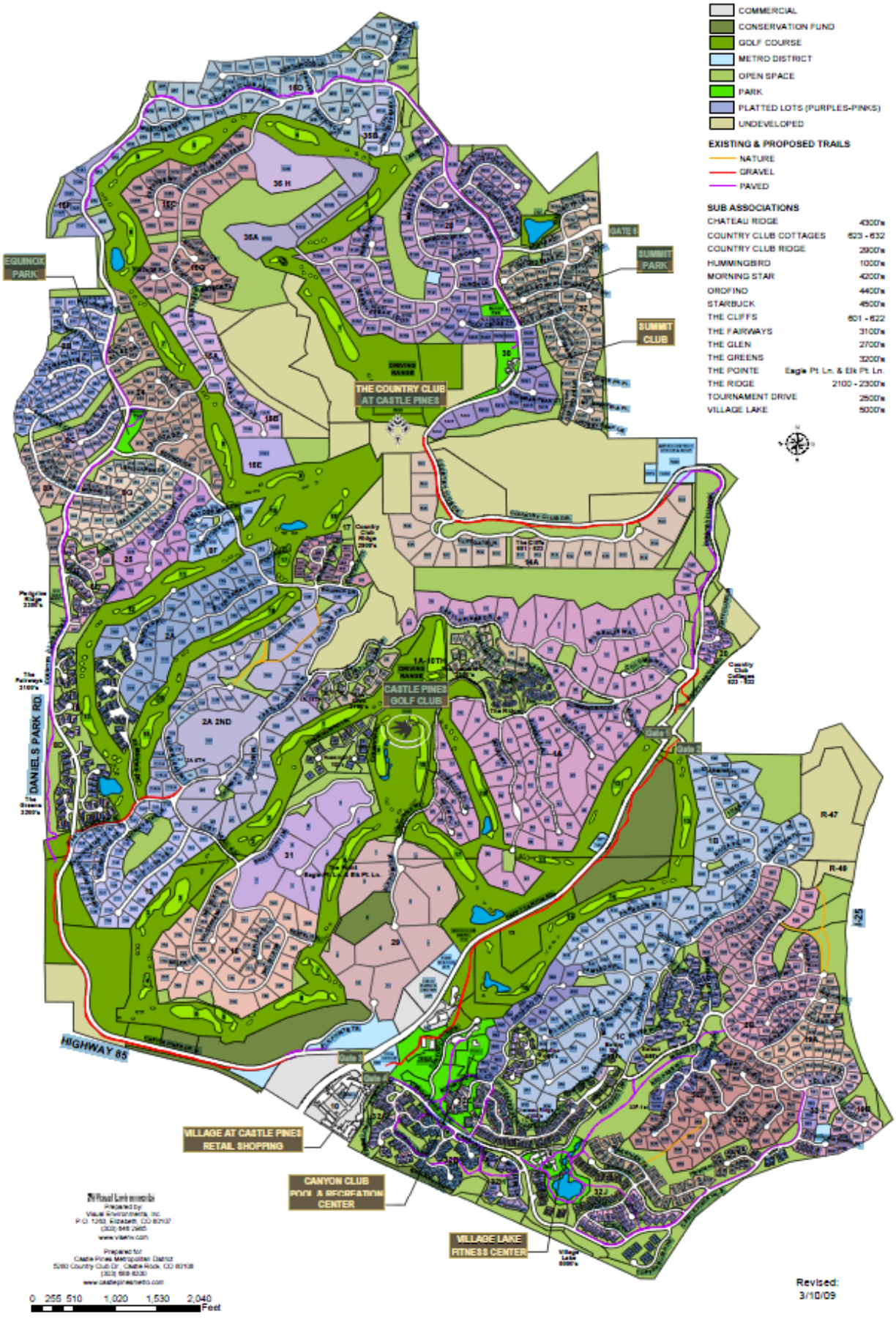
Program Category	Program	Water Savings Potential	Social Acceptance	Likelihood of Success	Neighboring Districts (CPN, CR, DW)
Residential - EXISTING HOMES					
Education and Awareness					
(Support Programs)	Information & Advertising Materials	XXX	X	X	CPN CR DW
	Guidelines - Lawn Watering	XXX	X	X	CPN CR DW
	Xeriscape Web Site/Plant Database	XXX	X	X	CPN CR DW
	Xeriscape Demonstrations	XXX	X	X	CPN CR DW
	Landscape Symposium	XXX			CPN CR DW
	Xeriscape Classes, Workshops and Seminars	XXX	X	X	CPN CR DW
	Recognition - Water Makeover, Xeriscape	XXX			DW
	Partnership - WaterWise Council, GreenCO	XXX	X	X	CPN CR DW
	School Program	XXX			CPN CR DW
Rebates and Incentives					
Indoor **(LOW)**	Low-Flush Toilet Rebate (1.6 gfp or lower)	H	X		CPN DW
	Dual-Flush Toilet Rebate	M			CPN DW
	High-Efficiency Toilet Rebate	M			CPN DW
	Low-Flow Showerhead Rebate				CPN
	High-Efficiency Clothes Washer Rebate	H			CPN CR DW
	Energy Star Dishwasher Rebate	L			
	Hot Water Recirculation Rebate	L			
Outdoor **(HIGH)**	Rain Bucket Rebate	M	X	X	CPN DW
	Soil Moisture Sensor Rebate	M			
	Programable Irrigation Clock	H			CPN CR DW
	ET Controller Rebate	H	X	X	CPN CR DW
	Irrigation System Repair Rebate	H	X	X	
	Xeriscape Rebate	M			
	Mulch Rebate	M			
	Sub-soil Improvement Rebate	H	X	X	
	Rebate - % Useage Reduction				CPM DW
	Turf Reduction Rebate	M			CPN
Audits and Retrofits					
Indoor **(LOW)**	High-Bill Complaints & Leak Identification	H	X	X	
	Indoor Water Use Audit	H	X	X	Most of these
	Indoor Efficiency Kits/Components	L			Programs have
	Low-Flow Faucet Aerator Distribution	L			been Used with
	Low-Flow Showerhead Distribution	L			Education Efforts
Outdoor **(HIGH)**	Outdoor Water Use Audit	H	X	X	
	Positive Shut-Off Nozzle Distribution	L			
Ordinances and Regulations					
Indoor **(LOW)**	Low-Flow Faucet Aerator Retrofit on Resale	M			
	Low-Flow Showerhead Retrofit on Resale	M			
	Low-Volume Toilet Retrofit on Resale	M			
	Dual-Flush Toilet Retrofit on Resale	M			
	High-Efficiency Toilet Retrofit on Resale	M			
	Leak Detection and Repair on Resale	M			
	Whole-House Retrofit on Resale	M			
Outdoor **(HIGH)**	No Watering - Heat of Day	M	X	X	
	Irrigation Schedules	H	X	X	CR DW
	Turf Removal	H			
	Water Waste Ordinance*	H	X	X	CPN CR DW
Rates an Metering					
	Conservation Rate Structure	H	X	X	CR DW
	Captial Investment Fee	H	X	X	CPN CR
	Water Budgets	L			CPN CR
Market Transformation					
	E T Irrigation Scheduling Network		X	X	
	EPA's Water Sense Program	M			
	Irrigation Association Training		X	X	
	Plumbing Contractors & Suppliers	M	X		

Residential - NEW HOMES					
Education and Awareness					
(Support Programs)	New Homeowner Packets	III	X	X	CR DW
	Builder/Developer Symposium	M			CR
	Builder Education Series	M			CR DW
	Model Home Xeriscape Demonstrations	L			
	Realtor Education Series	L			CR
Rebates and Incentives					
Indoor **(LOW)**	Development Fee Efficiency Incentive	M			DW
	Rating System Efficiency Incentive	M			DW
	Dual-Flush Toilet Rebate	M			DW
	Low-Volume Toilet Rebate	H	X	X	DW
	High Efficiency Clothes Washer Rebate	H	X	X	CPN CR DW
Outdoor **(HIGH)**	Development Fee Efficiency Incentive	H			DW
	Irrigation Efficiency Rebate	H			DW
	Rating System Efficiency Incentive	H			DW
	Soil Amendment Rebate	H	X	X	DW
	Irrigation System Repair Rebate	H	X	X	DW
	Rain Bucket Rebate	H	X	X	DW
	Soil Moisture Sensor Rebate	M			
	ET Controller Rebate	H	X	X	DW
	Strip Turf Rebate	M			
	Xeriscape Rebate	M			
Ordinances and Regulations					
Indoor **(LOW)**	Dual-Flush Toilet Requirement	H			
	Low-Volume Toilet Requirement	H			
Outdoor **(HIGH)**	Decorative Water Feature Limitation	L			CR DW
	ET Controller	H	X	X	CR
	High-Water-Use Turf Limitation	M			CR
	Irrigation efficiency standards	M	X	X	CR
	Irrigation equipment standards	M	X	X	CR
	Landscape design standards	M	X	X	CR
	Low-water-use plant requirement	M			CR
	Landscape inspection requirement	M			CR
	Soil amendment requirement	H	X	X	CR DW
	Strip turf standards	M			CR DW
Rates an Metering					
	AMR/Smart Metering	M			
	Critical Peak Pricing	M			
	Indoor/Outdoor Metering	M			CPN CR DW
	Smart Water Readers	M			
	Time-of-Use Rates	L			
Market Transformation					
	E T Irrigation Scheduling Network	H	X	X	CR DW
Multi-Family Properties - EXISTING					
Education and Awareness					
(Support Programs)	Property Manager Education Series	NA			CR DW
Rebates and Incentives					
	Dual-Flush Toilet Rebate	M			DW
	Low-Volume Toilet Rebate	H	X	X	DW
	High Efficiency Clothes Washer Rebate	H	X	X	CPN CR DW
	Energy Star Dishwasher Rebate	L			
	Hot Water Recirculation Rebate	L			
Audits and Retrofits					
	Indoor Efficiency Kits	M			
	Indoor / Outdoor Water Use Audits	H	X	X	
	Low-Flow Faucet Aerator Distribution	M			
	Low-Flow Showerhead Distribution	M			
Ordinances and Regulations					
	Low-Volume Toilet Retrofit on Resale	H	X	X	
	Dual-Flush Toilet Retrofit on Resale	M			
	Leak Detection and Repair on Resale	H	X	X	
	Low-Flow Faucet Aerator Retrofit on Resale	L			
	Low-Flow Showerhead Retrofit on Resale	M			
	Whole-Unit Retrofit on Resale	H			
Rates an Metering					
	Individual Unit Meter Retrofits	L			DW
Multi-Family Properties - NEW					
Rebates and Incentives					
	Dual-Flush Toilet Rebate	M			DW
	Low-Volume Toilet Rebate	M	X	X	DW
	Energy Star Clothes Washer Rebate	M	X	X	CPN CR DW
	Energy Star Dishwasher Rebate	L			DW
	Hot Water Recirculation Rebate	L			
Ordinances and Regulations					
	Dual-Flush Toilet Requirement	L			
	Low-Volume Toilet Requirement	H	X	X	
	Landscape Code and Policy Review	H	X	X	
Rates an Metering					
	Individual Unit Meter Requirements	M			

Program Category	Program	Water Savings Potential	Social Acceptance	Likelihood of Success	Neighboring Districts (CPN, CR, DW)
Commercial and Public - EXISTING					
Education and Awareness					
(Support Programs)	Operations Manager and Staff Education	H	X	X	CR DW
	Restaurant and Lodging Education Series	L			CR DW
Rebates and Incentives					
Indoor **(LOW)**	Dual-Flush Toilet Rebate	M			CPN DW
	Low-Volume Toilet Rebate	M	X	X	CPN DW
	Low-Flow Showerhead Rebate	L			CPN
	Low Flow Urinal Rebate	L			DW
	Pre-Rinse Spray Nozzle Rebate	L			DW
	ET Controller Rebate	H	X	X	CPN CR DW
Outdoor **(HIGH)**	Irrigation System Repair Rebate	H	X	X	
	Rain Bucket Rebate	M			CPN DW
	Soil Moisture Sensor Rebate	M			
	Strip Turf Retrofit Rebate	M			
	Turf Reduction Rebate	L			CPN DW
	Xeriscape Rebate	M			DW
	Cooling System Incentive	M			DW
Custom	Irrigation System Incentive	M			DW
	Process Water Incentive	L			DW
	Water Efficiency Study	H	X	X	DW
	Commercial Car Wash Efficiency Equipment	H	X	X	DW
Targeted	Commercial Laundry Efficiency Incentive	L			DW
	Pressure Washing Efficiency Incentive	L			DW
Audits and Retrofits					
	Cooling Tower Monitoring	L			
	Large Facility Audits	L			
	Large Landscape Audits	H	X	X	
	Public Building Audit and Retrofit	L			
	Utility Building Audit and Retrofit	L			
Rates an Metering					
	Automated Meter Reading	M			DW
	Critical Peak Pricing	H			DW
	Dual Water Meter Requirement	L			DW
	Sub-Metering Requirement	L			DW
	Captial Investment Fee	H	X	X	DW
	Time-of-Use Rates	M			DW
	Water Budgets	L			
Market Transformation					
	ET Irrigation Scheduling Network	H	X	X	CPN CR DW
	Turf-to-Native Conversion Program	H			CPN
Commercial & Public - NEW CONSTRUCTION					
Rebates and Incentives					
Indoor **(LOW)**	Low-Volume Toilet Rebate	H	X	X	CPN DW
	Low Flow Urinal Rebate	L			DW
Outdoor **(HIGH)**	Irrigation Equipment Rebate	H			DW
Ordinances and Regulations					
Indoor **(LOW)**	Dual-Flush Toilet Requirement	H			
	High-Efficiency Toilet Requirement	H			
	Single-Pass Cooling System Prohibition	M			CR DW
Outdoor **(HIGH)**	Decorative Water Feature Limitation	M			CR DW
	ET Controller	H	X	X	CR DW
	Irrigation Efficiency Standards	H	X	X	CR DW
	Landscape Code and Policy Review	H	X	X	CR DW
Targeted **(LOW)**	Commercial Car Wash Efficiency Standards	H			CR DW
	Commercial Laundry Efficiency Standards	L			CR DW
	Pressure Washing Efficiency Standards	L			CR DW
Distribution System					
(HIGH)	Leak Detection Program	H	X	X	CPN CR DW

Appendix F – Metro Detailed System Map.

CASTLE PINES VILLAGE



Appendix G – Compliance with State Planning Requirements

Compliance with State Planning Requirements

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

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

This section of the plan details Metro's compliance with this statute.

Metro Compliance

Metro carefully developed this WCP to achieve full compliance with the Colorado statute. Each element of compliance is documented below.

1. Consideration of specific conservation measures

(I) *Fixture and appliances* – Current program includes potential implementation of residential clothes washer rebate, and general promotion of water efficient fixtures and appliances.

(II) *Water wise landscape* – Current program includes: efficient irrigation rebate for ET controllers and an irrigation system repair rebate; sub-soil amendment and plant replacement rebate; residential irrigation audit program; water-wise education and demonstration garden.

(III) *Water reuse systems* – Current program includes using recycled wastewater (reuse) on the two golf courses in CPV.

(IV) *Water loss and system leakage reduction* – Current program includes a utility water loss reduction program and customer level exception reporting and leak investigation.

(VI) *Information and public education* – Current program includes: various public information campaigns with bill stuffers and related informational materials; water-wise landscape education.

(VII) *Water rate structure* – Current program includes a four-tier increasing block rate structure.

(VIII) *Technical assistance* – Metro offers technical assistance in regard to indoor and outdoor water conservation techniques.

(IX) *Regulatory measures* – CPHA enforces water-wise plant material designs and installations of which Metro has an agreement with CPHA to review irrigation plans required for submittal with landscape plans.
(X) *Incentives* – A broad range of incentive and rebate programs are included in the measures described above.

2. Role of conservation in Metro supply planning. Metro takes water conservation seriously. The conservation program is well integrated into overall water supply planning and anticipated conservation savings are included in future demand projections.

3. Plan implementation, monitoring, review, and revision. Metro has developed an implementation plan along with monitoring mechanisms, scheduled reviews and WCP updates.

4. Future review of plan within 7 years. Metro intends to review and update the water conservation every 5 years. The next scheduled will be in 2014.

5. Estimated savings from previous conservation efforts and current plan. Metro has not evaluated conservation program impacts because until 2009, there was no staff member able to take the time to evaluate program impacts.

6. Public comment period. The public participation process was officially started on July 27, 2009. In June 2009 the draft WCP was presented to the WCC which consists of 15 CPV residents two of whom are also on the Metro Board of Directors and three Metro staff employees. All WCC members were then given a copy of the WCP for review. On June 13, 2007, the WCP was made available at the Metro and CPHA office as well as being posted on Metro's website. A notice was also placed in the Village Reporter, the bi-monthly CPV newsletter, printed an announcement of the draft WCP and where to locate a copy to review. Also, a notice was sent via e-blast to the CPV community. The public comment and participation period will end on September 25, 2009. All comments were directed back to Emily Coll, Water Conservation Coordinator for Metro.

Appendix H – Benefit Cost Ratio Worksheet

Measures	Savings (AF) Year 1	Avoided Cost/ AF	Total Annual Benefit	Cost/AF Saved	Incentive	Total Annual Cost	B/C ratio
4-Tiered Rate Structure	16.77	$34,851	$1,110,404	$149	$2,500	$2,500	444.16
Sub soil Improvement and Plant Replacement Rebate	2.51	$14,672	$115,466	$20,328	$51,000	$51,000	2.26
Rain Sensor Rebate	0.09	-$5,457	$2,240	$40,457	$3,500	$3,500	0.64
Irrigation System Repair Rebate	0.87	$9,570	$35,402	$25,430	$22,000	$22,000	1.61
Irrigation Head Replacement	0.09	-$28,575	$250	$63,575	$5,500	$5,500	0.05
High Efficiency Toilet Replacement	0.03	-$24,085	$185	$59,085	$1,505	$1,505	0.12
ET Controller rebate	0.99	$23,441	$923,321	$11,559	$11,500	$11,500	80.29
Slow the Flow irrigation audits	5.06	$33,913	$171,634	$1,087	$5,500	$5,500	31.21
Residential and Commercial Indoor/Outdoor Water Audits	2.30	$34,739	$79,974	$261	$600	$600	133.29
Total	28.71	$93,070	$2,438,876	$221,930		$103,605	25.19

Appendix I – CPHA and Metro Required Irrigation Plan Submittal and Approval Document.

To reduce water waste in CPV, Metro has partnered with CPHA to require irrigation plan submission by landscape contractors installing a new landscape or retrofitting an existing landscape.

CPHA has adopted the following requirement and is included in their Landscape Standards which is omitted from this document. Please visit http://www.castlepinesvillage.org/design-review-landscaping.php to review the entire Landscape Standards document.

Irrigation Requirement Guidelines

Irrigation plan submittal is required with landscape plan submittal for new landscapes and retrofit landscape projects. An irrigation plan is a scale drawing that illustrates the layout of the irrigation system.

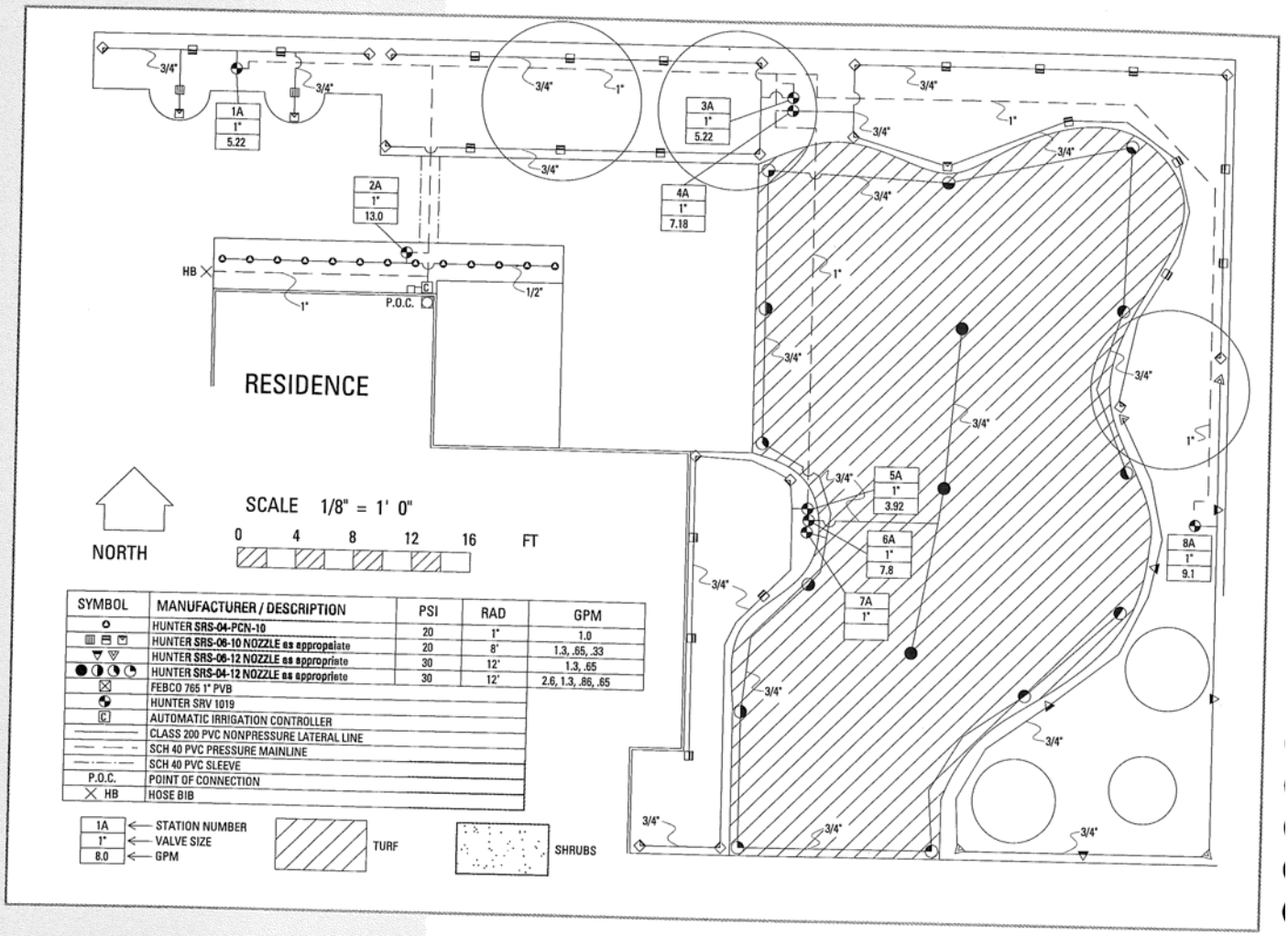
The irrigation plan must be its own document and not incorporated into the landscape plan. It must include all of the following components where applicable:

- Property lines
- Structures
- Turf areas
- Planting beds
- Trees and shrubs
- Decks and patios
- Walkways, roadways and parking areas
- Sprinkler head types and locations
- Bubbler types and locations
- Valve locations
- Types of piping (mainline, laterals, drip)
- Quick coupler locations
- Backflow locations
- Controller types and locations
- Sleeve locations
- Point of connection
- Title block
- North arrow
- Legend
- Specifications
- Drawing scale

The legend must include the types of heads (manufacturer and series) shown in the plan and the radius and flow rate in gallons per minute of each head type. See following sample irrigation plan.

Please call the Water Conservation Coordinator at Castle Pines Metropolitan District with any questions regarding this requirement and irrigation plans.

No one manufacturer is endorsed by Castle Pines Homes Association or Castle Pines Metropolitan District.



Sample Irrigation Plan