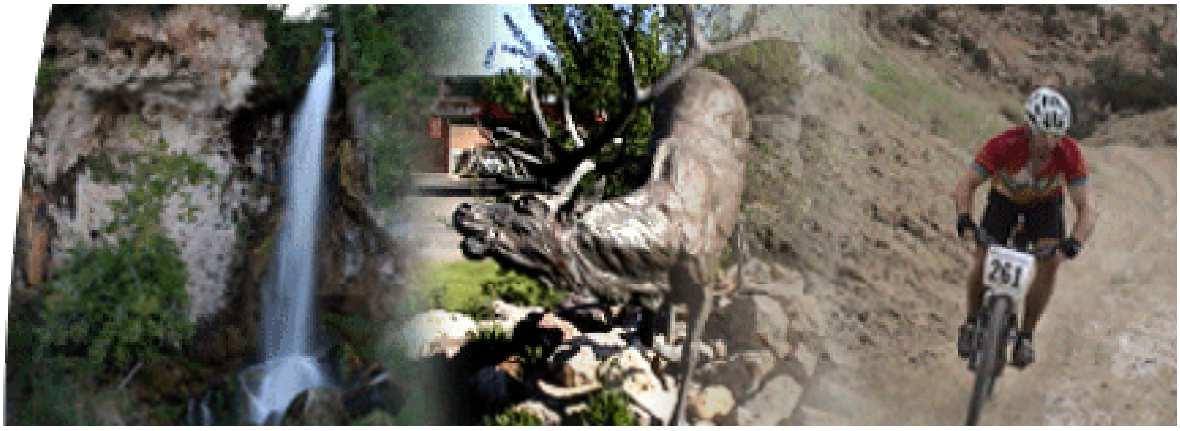
City of Rifle

Water Conservation Plan

FINAL REPORT – JULY 2008



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City of Rifle Water Conservation Plan

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Introduction

Background

The City of Rifle (City) is located in western Garfield County, approximately 57 miles east of Grand Junction along Interstate 70 at an elevation of approximately 5,400 feet. The City of Rifle (City) is an existing home rule city, municipal corporation and political subdivision under the provisions of Article XX of the Constitution of the State of Colorado and the City's Home Rule Charter. Rifle was incorporated in 1905. The City is governed by an elected seven-member council and managed by a City Manager hired by the council. The City owns and operates its water and wastewater systems.

Rifle has been experiencing rapid growth over the past several years, a trend fueled by economic growth in the Roaring Fork and Colorado River valleys and rapid expansion of oil and gas production in Garfield County. The City's population has been growing recently at an annual rate between 4 and 5%, and is currently estimated to exceed 8,800 persons. Rifle's fast-paced growth is expected to continue for the foreseeable future, and this growth has been putting significant pressure on the City's water and wastewater infrastructure. From the City's perspective, a key driver for water conservation is to reduce water demands to help ease this pressure, hopefully reducing and deferring infrastructure expansions.

In the context of statewide water resources planning, the November 2004 Statewide Water Supply Initiative (SWSI) Phase 1 Report identifies Rifle as being in the Colorado River Basin. The SWSI Phase 1 Report projects the Colorado Basin to have:

- the highest population growth rate (99%) of the eight major river basins over the period 2000 to 2030
- a gross water demand increase over the period of 61,900 ac-ft/yr (3rd out of 8)
- a projected municipal/industrial and self-supplied industrial demand "gap" of 5% (3,000 ac-ft/yr).

It is important to note that explosive population and water demand growth, beyond that projected by SWSI is possible; Rifle is located at the epi-center of current oil shale extraction research and possible future full-scale commercial production. SWSI did *not* consider potential future self-supplied industrial water demands associated with oil shale extraction that may be placed on the Colorado River and White River basins. Page 3-16 of the SWSI report makes only a reference to a possible 450,000 ac-ft/yr water need to support a 3 million barrel per day oil industry.

Purpose

The Colorado Water Conservation Act of 2004 (HB 04-1365) requires that any water provider with annual retail water deliveries in excess of 2,000 acre-feet develop a Colorado Water Conservation Board (CWCB)-approved Water Conservation Plan. These "covered entities" are required to have an approved plan in place to maintain eligibility for financial assistance from CWCB or the Colorado Water and Power Authority for water and wastewater infrastructure projects. With its current water usage and rapid growth, the City of Rifle (City) is anticipated to exceed 2,000 ac-ft of retail water delivery in the next year, or so. Thus, these statutory requirements provided the initial impetus for the development of this plan. Entities which have completed an

approved plan also are eligible to apply for CWCB grant funds to implement their water conservation plans.

The City of Rifle has also developed this plan to conserve water within the City to achieve a number of other important goals, including:

- Reducing and/or deferring capital costs for water and wastewater infrastructure
- Reducing water and wastewater system operational costs
- Reducing and/or deferring future water supply acquisition costs
- Reducing environmental impacts of water diversions, water production, treatment, and distribution and wastewater treatment and discharge
- Reducing City and community energy use and greenhouse gas emissions
- Increasing water available for other beneficial uses, such as recreation, agriculture, power development, etc.
- Stretching water supplies to allow for continued growth
- Improving water supply reliability

The purpose of this plan is to chart a course for water conservation in Rifle over the next five to seven years. This plan should be updated within seven years, if not sooner, in compliance with statutory requirements. It is anticipated that development of a successful water conservation program for the City will be an evolutionary process. Using initial City conservation experiences to produce future plan updates will be critical to a successful on-going program.

Document Organization

This document is organized with chapters that correspond to the CWCB-recommended *9-Step* water conservation planning process as outlined in Section 4 of the *CWCB Model Water Conservation Plan Guidance Document* (available at http://cwcb.state.co.us/Conservation/RelatedInformation/Publications/WaterConservationPlanDevelopmentGuidanceDocument/WCPDevelopmentGuidanceDocument.htm)

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1.0 Existing Water System Profile

Section 1.0 summarizes key features of the existing water system including sources of supply, water diversion, treatment, and delivery infrastructure, water use, key system limitations/issues, pricing/policies, planning efforts and conservation activities. This system information is key to identifying and selecting appropriate water conservation measures and programs.

1.1. System Physical Characteristics

Potable System Production Facilities

Figure 1-1 depicts the City's potable water system infrastructure, including sources, treatment facilities, distribution mains, tanks and pump stations.

All of the City's potable water is derived from surface sources. The City's primary supply is the Colorado River. All diverted Colorado River water is directed through a large pre-sedimentation pond and pumped up to the Graham Mesa Water Treatment Plant (GMWTP), its main treatment facility. The GMWTP has a process capacity of approximately 4.5 MGD and has historically accounted for 80 to 90% of total potable water production. From the GMWTP, the water is pumped to the "3-MG Tank," the City's main storage facility, which serves also as a disinfection contactor. Water is distributed to various parts of the distribution system from the 3-MG Tank. Process residuals from the GMWTP are recycled, in part, on an intermittent basis. Wasted residuals flow by gravity to unlined settling ponds located on the south end of Graham Mesa where water either percolates and slowly returns to the Colorado River or evaporates. While the raw water pump station was constructed in 2006, the GMWTP is almost 30 years old and is in need of replacement or major upgrades in the near future.

The City also has a roughly 0.7-MGD treatment facility, the Beaver Creek Water Treatment Plant (BCWTP), located on Taughenbaugh Mesa, south of the City. The BCWTP is located at an elevation that allows its high-quality treated water to flow by gravity to the distribution system through a 0.5-MG finished water reservoir. While the City operates this plant as much as possible due to these benefits, unreliable Beaver Creek flows in a dry year reduce this source's firm capacity to only 0.15 MGD. The BCWTP is nearly 20 years old and has recently undergone modest improvements.

In sum, the City's current total potable water production capacity is about 5.2 MGD in a normal water year and as low as 4.65 MGD in a dry year. Total treatment process waste volume is estimated to account for about 10% of raw water diversions, a fairly high percentage, but there is significant uncertainty in this estimate.

Potable System Storage & Distribution Facilities

The City's potable water distribution system consists of about 64 miles of transmission and distribution mains. These distribution mains cover five pressure zones, which are separated by two booster pump stations (BPSs) and five pressure reducing valves (PRVs). Roughly 20% of the City's current water use is located in pressure zones requiring booster pumping. This percentage will rise significantly with future development targeting higher-elevation areas. Therefore, water conservation in those areas will achieve energy conservation as a result of both reduced raw water and finished water booster pumping. In addition to the 3-MG Tank and 0.5-MG BCWTP finished water reservoir, the system has 2.6-MG of additional storage split across three tanks in

different pressure zones. With the exception of a limited amount of sub-standard non-PVC water mains, the City's distribution system infrastructure meets the City's standards and has many years of remaining useful life. Average distribution system water loss is estimated at about 7% of finished water production, but there is significant uncertainty in this value.

Raw Water System Infrastructure

In addition to supplying potable water to its customers, the City of Rifle also owns and operates raw water delivery facilities to provide irrigation water to Rose Hill Cemetery and Deerfield Regional Park (see **Figures 1-2a and 1-2b**). Both areas are irrigated with Rifle Creek water. Rose Hill Cemetery is supplied from Rifle Creek Canyon Ditch through a diversion located about one-half mile north of CR-293 (N. Graham Rd.); a pair of water tanks at the diversion feed an 8" PVC line that delivers water to the cemetery. Deerfield Park is supplied via the Wisdom Ditch at a diversion point less than 1 mile from the intersection of County Roads 291 and 296. From the Wisdom Ditch, water is diverted via buried 6" PVC pipe to a regulating pond at the west side of Deerfield Park. Because one of the primary goals of this conservation plan is to reduce the need for future potable system infrastructure, the City's raw water system is not discussed much further in this report. It should be noted, however, that expanding raw water use is also a good means, like conservation, for reducing the need for potable system infrastructure. The City should consider watering parks with raw water. MacIntosh Park is currently in the process of being moved off the potable system. The City should also consider requiring raw water use in new developments.

Water Sources/Water Rights

The City has a diverse water rights portfolio, which reliably meets the City's current needs. The current water rights also can meet additional future needs, but not all the water demands projected to be needed by "buildout." While increases in water demand due to additional development are to be met via senior water rights dedicated to the City or cash-in-lieu paid to the City by developers, conservation has the potential to reduce the amount of water the City will need to acquire in the future. Key points regarding the City's current water rights are:

- The City has 10.1 cfs (6.5 mgd) of Colorado River rights, which can be diverted at the GMWTP pre-sedimentation pond and raw water pump station for municipal use, that are considered very reliable (unlikely to be "called-out" in a dry year). These are either rights that are very senior, or are protected by the Green Mountain Reservoir Historic User's Pool. This 10.1 cfs is the core of the City's portfolio.
- The City shares one-half of the 2.0 cfs of senior rights on Beaver Creek. This senior 1 cfs, plus an additional 1 cfs of junior rights in Beaver Creek, allows the City to divert water to its BCWTP. As discussed previously, due to a lack of physical supply at the City's Beaver Creek headgate in a dry year, these rights do not constitute a significant reliable supply.
- The City has an augmentation plan, created in 1986, which increases its reliable Colorado River supply for municipal use. The plan was crafted around two main augmentation water supplies:
    - The dry-up of senior historic irrigation water rights, many of which are associated with ditch water originating from Rifle Creek. The depletion credits from this total 616.5 acre-feet/year with an associated 33.5 ac-ft/yr of return flow obligations.

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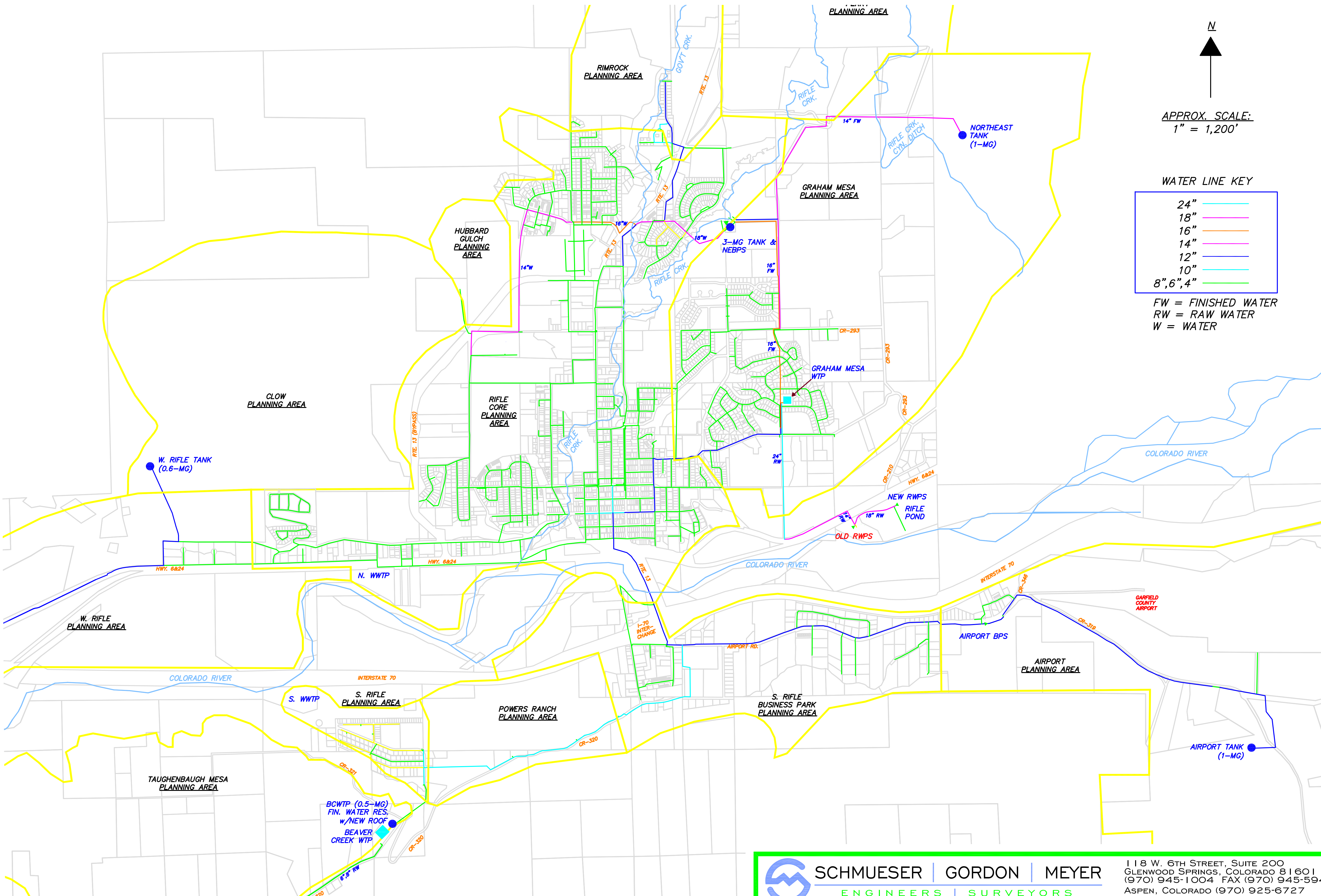

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Figure 1-1
Existing Potable Water System

City of Rifle
Water Cons. Plan

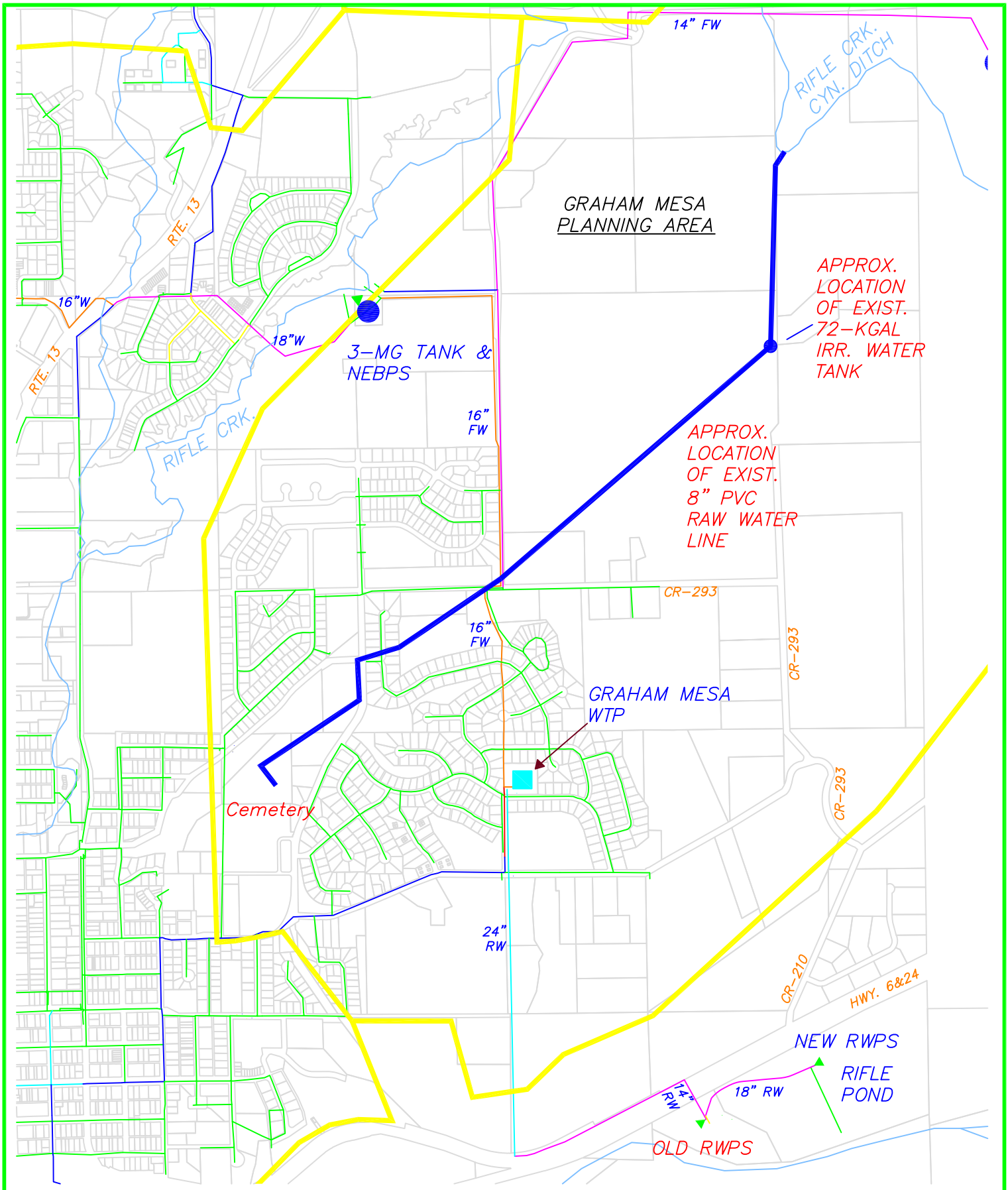

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Figure 1-2a: Cemetery Raw Water Supply Infrastructure

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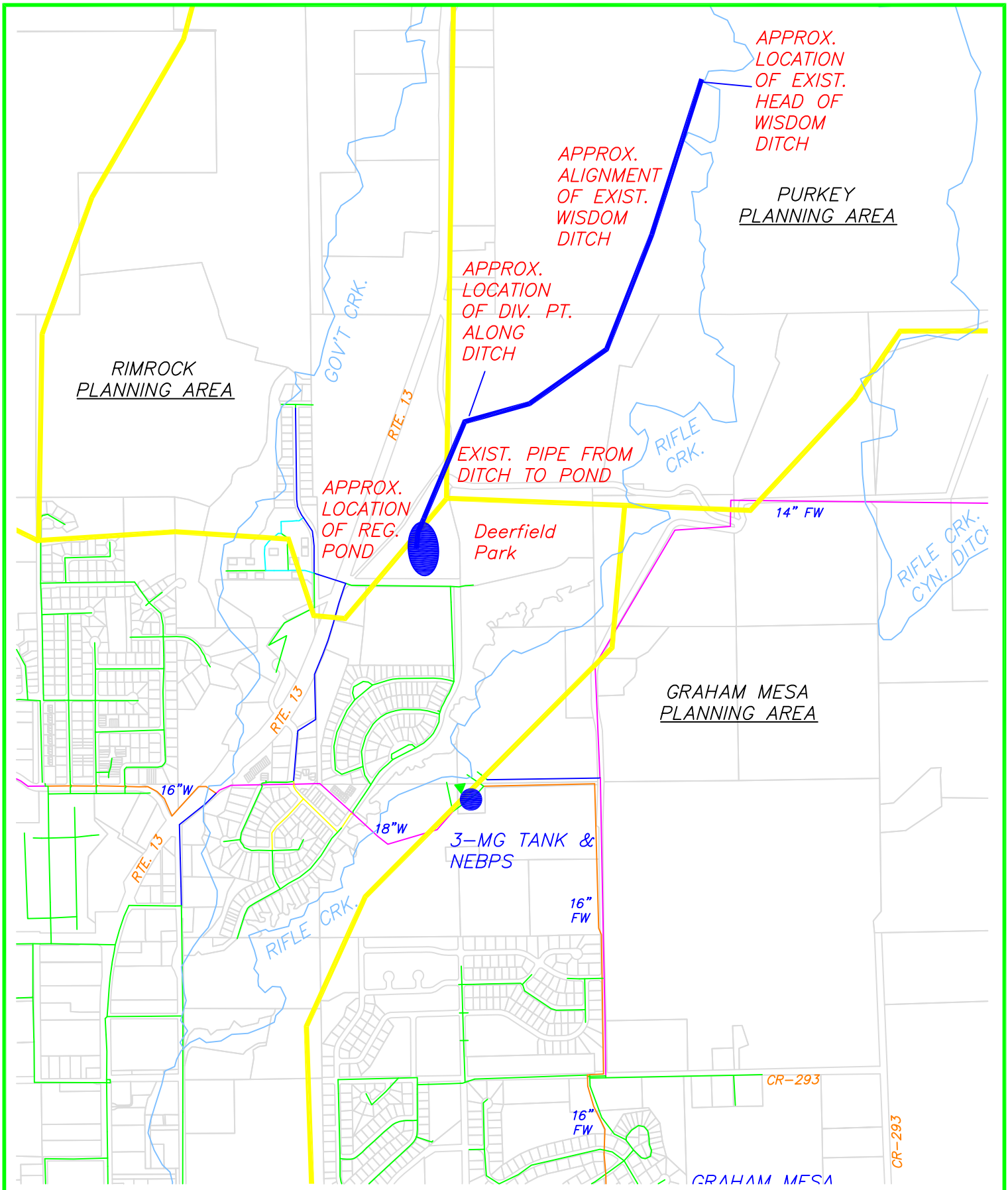

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Fig 1-2b: Deerfield Park Raw Water Supply Infrastructure

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  - Ruedi Reservoir Water. The City currently has a 20-year lease (through 2019) with the U.S. Bureau of Reclamation for 350 ac-ft/yr of Ruedi water as an augmentation supply. The City pays approximately $49/ac-ft toward reservoir construction reimbursement, plus about $4/ac-ft for O&M. A 10% transit loss applies to this supply, reducing its effective value to 315 ac-ft/yr.

- Water accounting calculations in the City's 1986 augmentation plan assume that irrigation water use is highly "efficient." That is, 90% of all water diverted for outdoor use is consumed with 10% being return flow (i.e. excess water that makes it back to the river). This assumption's legal implication is that reducing irrigation water deliveries in the City produces a very direct, pronounced reduction in officially calculated out-of-priority water diversions. Therefore, reducing irrigation water deliveries can have a marked impact on reducing the City's need to acquire additional firm municipal water supplies in the future.
- The City has acquired additional senior historic irrigation water rights, which it could convert in the future to depletion credits through another augmentation plan. This could result in another approximately 124 ac-ft/year of depletion credits to cover out-of-priority diversions for municipal use. Return flow obligations of 5 to 10 ac-ft/yr might be expected from dry-up of the associated irrigation rights.
- In contrast to Front Range water providers, the City's water utility, like many on the Western Slope, does not currently face exceptional raw water supply/water rights costs. The implication for water conservation is that reducing overall annual water consumption does not, in and of itself, provide large economic benefits at this time, or in the near future.

In summary, based on the current municipal-use water rights portfolio for its potable system, the City has approximately 10.1 cfs of reliable direct diversion rights, plus about 1,015 ac-ft/yr in existing/potential augmentation supplies, all on the Colorado River.

Potable System Limitations

Key existing City of Rifle potable water system limitations are:

- Water production capacity barely exceeds current peak demands. Peak day demands of about 4 mgd are approaching the dry-year capacity of about 4.65 mgd. Because of the GMWTP's sedimentation process design, true "firm" production capacity is effectively zero.
- The GMWTP, the City's main production facility, suffers from aging equipment throughout, a lack of process redundancy that inhibits effective maintenance and increases the frequency of water service curtailments, an unreliable clarification process design, obsolete and undersized filtration technology, a lack of on-site chorine contacting, and a site whose location and size do not fit with either the need for significant future capacity expansion or with local land use patterns.
- Replacing or upgrading the GMWTP with a higher-capacity, higher-reliability, state-of-the-art facility will cost the City tens of millions of dollars in the near future.
- The BCWTP does not have a water supply that is reliable in a dry year. Therefore, the only reliable water supply in a dry year to service areas south of the Colorado River is a single transmission line crossing the Colorado River.
- As upstream trans-mountain (and other) diversions occur out of the Colorado River basin, the river will continue to become more saline, reducing its quality as a potable supply. Winter TDS levels regularly reach 700 to 800 mg/L at Rifle and have

exceeded 900 mg/L at times. High salinity can contribute to degraded water taste, which may reduce public confidence in the City's water utility.

Water efficiency, especially measures and programs that reduce peak day demands, can help defer and/or reduce the magnitude and cost of capital improvements, and to some extent, ease the pressures associated with the above-noted system limitations.

Water Rates, Fees, and Revenue

Section 13, Article I, Division 3 along with Appendix A of the City of Rifle Municipal Code (www.colocode.com/rifle) sets forth charges for potable water service in Rifle. Historically, these charges have been revised periodically, as determined to be necessary, but not on a defined regular schedule. **Table 1-1** summarizes key water rates for 2007. Rates currently are set to increase along with the Consumer Price Index, plus 1.5% (about 4% per year, total) on January 1st of each year through 2009. **Table 1-1** shows that the City has a flat inclining block rate structure, which would not be expected to promote water conservation. The City's rates do, however, consider customer location, elevation, ability to pay, service reliability needs, and point of service.

Table 1-1: 2007 Monthly Water Rates

Type	Description/Usage Block	Amount
Basic Rate Structure		
All user classes inside City limits		
-Flat fee	1 through 4,000 gallons	$ 14.55 per EQR
-Variable – 1st tier	4,001 through 30,000 gallons	$ 2.81 per 1,000 gallons used
-Variable – 2nd tier	over 30,000 gallons	$ 3.33 per 1,000 gallons used
Other Rates		
Users outside City limits	multiplier on total bill	200%
In-City seniors/disabled users	multiplier on total bill	80%
Interruptible service rate	Single tier/rate – irrigation only	$ 2.53 per 1,000 gallons used
Bulk water sales (hydrant meter)	Multiplier on app. in-City rate	400% (+$100 acct. activation fee and $25 monthly meter rental fee)
Bulk water sales (vend. machine)	Single tier/rate	$ 8.69 per 1,000 gallons used
Pressure surcharge (s. of river)	Single tier/rate	$ 0.45 per 1,000 gallons used
Meter/account activation fee	One-time fee	$ 25.00

In addition, the City has charges associated with water meter installation, inspections, late payment, and duplicate bill requests. The City also has a contract to supply potable water to its single biggest user (when it runs), a Tri-State Generation & Transmission Association natural gas-fired cogeneration power plant referred to as the "CoGen Plant." The pricing terms of this contract are:

- Metered use is billed per the current in-City rates (see **Table 1-1**)
- A set annual water rights dedication fee of $7,164 (in 2007) set to escalate 5% per year is assessed.
- A water rights delivery fee is assessed at about $63.19 per ac-ft delivered and also escalates at 5% per year. A minimum of 275 ac-ft is paid for each year.

The City's base tap fee in 2007 was $4,725 per EQR and is set to increase 5% annually on January 1st of each year through 2011. An additional fee of $1,860 per EQR for taps served by the City's Northeast Tank is imposed on top of the base tap fee.

The rates and fees collected historically have been inadequate to fund the entire cost of system operation, maintenance, and capital replacement. Over the past 5 years, or so, the City has received significant funding from the Colorado Department of Local Affairs (DOLA) to perform modest improvements to the water system, primarily for asset rehabilitation/replacement projects. In this regard, an increase in rates and fees is needed as part of achieving financial sustainability for the water utility. Independent of water conservation initiatives, the City has been considering modifying water rates in 2008 to increase revenue.

Table 1-2 summarizes water sales revenues from 2002 through 2007 by general revenue stream source. The City switched from bi-monthly to monthly water billing frequency in January 2006. The table indicates that water sales revenues have steadily climbed over the period. While potable water production has also climbed during this period (see **Section 2.0**), it has not climbed as much as revenue. This can be attributed to a rate increase in 2005, plus improved metering and billing. Improving water use and revenue tracking will be an important water conservation activity recommended by this plan. The City has already begun this process by bringing new utility accounting software online.

Table 1-2: Water Sales Revenue (2002 through 2007)

Category	2002	2003	2004	2005	2006	2007
All standard billing classes: residential, commercial, industrial, gov't, irr.	$ 997,926	$1,033,955	$1,170,971	$1,314,765	$1,693,322	$1,984,742
CoGen Plant	$ 234,493	$ 114,601	$ 42,190	$ 57,325	$ 56,580	$ 146,350
Bulk Water (hydrant meters)	$ 38,684	$ 43,305	$ 19,462	$ 87,628	$ 80,464	$ 83,292
Bulk Water (vend. Machine)	$ 12,143	$ 10,577	$ 15,918	$ 14,983	$ 18,424	$ 20,542
Total	$1,283,246	$1,202,438	$1,248,541	$1,474,701	$1,848,790	$2,234,926
Annual Change	--	-6.3%	+3.8%	+18.1%	+25.4%	+20.9%

Table 1-3 breaks-out water sales revenue by customer class for 2007. In general, the breakdown is as might be expected for a primarily bedroom community with a modest, growing commercial core and minimal industry. The CoGen plant accounted for 6.5% of annual water sales revenue in 2007, which was a year in which the plant did not run very frequently. The CoGen plant, whose use will likely be unaffected by water conservation initiatives, provides a reliable revenue stream to the City.

Current Water Usage Policies

The City of Rifle has several codified water usage policies relevant to water conservation and drought response. These are listed in Division 4 of Article I of Section 13 of the City of Rifle Municipal code. Summaries of key provisions include:

- City Council may impose water use restrictions as necessary due to water shortages.
- The City Manager, in the event of an emergency that threatens water quantity, quality, or pressure, when he deems it impractical to wait for City Council direction, can impose water use restrictions and/or water rationing, as necessary.

- The City Manager, in the event of a water shortage, may regulate the use of water for irrigation and other non-essential purposes; this includes the setting of special hours, dates, or locations for certain water uses.

Water Planning Initiatives

The City completed water and wastewater system master plans in 2006. These plans focused on water supply-side (production/distribution infrastructure) solutions to meet projected future demands over the next 30+ years and at a "buildout" condition with a population of approximately four times the current one. Water quality and regulatory compliance was considered in detail. The plans touched on water supply/water resources as well as impacts on water rates and fees but did not include comprehensive water resource or financial plans. Potential water conservation effects were not considered. A goal of this plan is to re-project water infrastructure needs given possible water conservation effects on demand.

Table 1-3: 2007 Water Sales Revenue by Customer Class

Customer Class/Category	Total Revenue	% of Total	
Standard Service Connections			
Commercial	$402,798		18.0%
Government	$ 183,971		8.2%
City Building	$ 19,753	0.9%	
City Property/Parks	$ 42,570	1.9%	
Other Government	$ 76,038	3.4%	
Public School	$ 45,610	2.0%	
Industrial (excludes CoGen)	$ 4,783		0.2%
Irrigation/Sprinkler	$ 36,407		1.6%
Residential	$ 1,356,772		60.7%
Duplex 1 Meter	$ 24,228	1.1%	
Duplex 2 Meters	$ 18,359	0.8%	
Mobile Home Park	$ 123,099	5.5%	
Multi Family Multi Meter	$ 96,788	4.3%	
Multi Family 1 Meter	$ 101,809	4.6%	
Single Family	$ 992,489	44.4%	
Other Sales			
CoGen Plant	$ 146,350	6.5%	
Bulk Water (hydrant meters)	$ 83,292	3.7%	
Bulk Water (vending machine)	$ 20,542	0.9%	
Sub-total Other Sales	$ 250,184		11.2%
Total	**$ 2,234,926**		**100.0%**

Current Conservation and Drought Mitigation Activities

The City does not currently, nor has it historically had, a water conservation plan or program. The City does not have a drought mitigation plan.

2.0 Historic Water Use and Forecast Demand

Section 2.0 characterizes current water use over time, by demand condition, by type (raw vs. potable), by end-use (indoor vs. outdoor) and by customer class. It also presents estimates of water loss. Finally, development and water demand projections (for the "no conservation" condition) are presented. This information serves as an important basis for identifying best-fit water conservation measures and programs for Rifle and associated implementation costs and water demand reduction benefits.

2.1 Raw Water Irrigation Use

As mentioned in **Section 1.0**, the City utilizes raw water for irrigation of open spaces at Rose Hill Cemetery and Deerfield Park. Because records with exact volumes of raw water pumped at these two locations were not available, estimates of typical use were developed based on irrigated area and target water application rates and watering schedules as reported by City Parks staff. The annual volumes, applied during April through October, were determined to be:

- Deerfield Park: 85 ac-ft
- Rose Hill Cemetery: 53 ac-ft

2.2 Potable Water Production and Demand Trends

Water Consumption by the Treatment Plants

In the potable system, raw water is diverted from the Colorado River and Beaver Creek. This water passes through the water treatment plants, which produce potable water that flows into the water distribution system. A portion of the raw water is lost through the treatment process as a waste residuals stream containing the concentrated river water solids. This stream is discharged to ponds and subject to evaporation and percolation. While at the BCWTP clarified residuals pond water is pumped back to the initial presedimentation pond to reduce water waste, there are also times when the plant is unable to process all the water diverted from Beaver Creek, causing the presedimentation pond to overflow, thereby wasting water that would otherwise have been in the creek. One significant problem for overall water use tracking in the City is that its largest plant, the GMWTP, does not have a reliable finished water flow meter. This complicates the determination of water loss both through the plant and within in the distribution system. As part of this planning project, field tests were performed to determine outputs of individual GMWTP finished water pumps and combinations thereof. Pump run hours for part of 2007 were then used in combination with pump flow test results to estimate actual finished water production during those months in 2007. The BCWTP, however, has had both raw and finished water flow meters since 2006. Data analysis indicates the following:

- GMWTP average process efficiency: 90%, estimated as about ±3% accurate
- BCWTP average process efficiency: 91%, measured

System Demand Peaking

Peak day demand is the most important water use concept/phenomenon for water conservation planning in Rifle. This is because water resources and supply, water production and treatment, and to some extent, water distribution and storage needs are

driven by the need to meet peak demands. Therefore, by reducing peak demands, system requirements, including the amount of augmentation water needed and the capacity of water delivery infrastructure, can be downsized and costs reduced. Peak demands are presented here under "water production" because flow meters at the treatment plants are the only places where daily measurements of water produced are made, and thus, are the only places where short-term water demand is gauged. In general, the two treatment plants are run at a steady rate throughout any given day in order to produce approximately the amount of water to be consumed. **Figure 2-1** illustrates the magnitude of peak potable water demand in Rifle in 2007 for various peaking durations, ranging from one day (called "peak day") to 30 days ("peak month") as compared to the average annual demand ("average day"). The figure shows that the ratio of the peak day and peak month demands to the average day demand ranged from about 2.4 to 2.1, typical values for Rifle. The *2006 Water Master Plan* found a multi-year average peak day to average day demand ratio of 2.56 for Rifle's potable system.

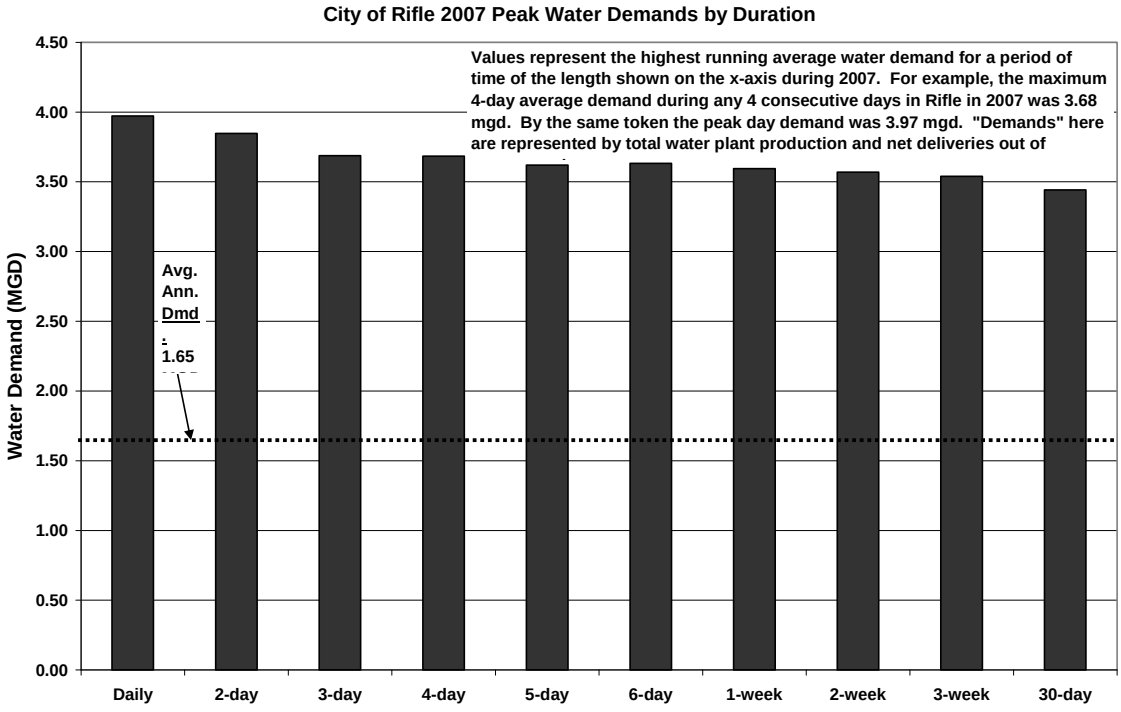

Figure 2-1: 2007 Potable Water Demand Peaking

Rifle's peak water demands are driven by outdoor water use during the irrigation season, as illustrated by **Figure 2-2**. Average water demand during core non-irrigation season months (December through February) is a good indicator of indoor water use. Considering this along with lost water volumes, two key points can be made:

- Almost 50% of the annual potable water volume delivered to Rifle customers is used outdoors.
- Approximately 75% of the water production/treatment capacity needed to meet peak day demand is to supply water for outdoor uses.

These values are not atypical for non-conserving water systems in the arid West. The implication for Rifle is that reducing outdoor water use can reduce required infrastructure capacities and should be a critical water conservation goal that can have tangible economic benefits for the City and its ratepayers.

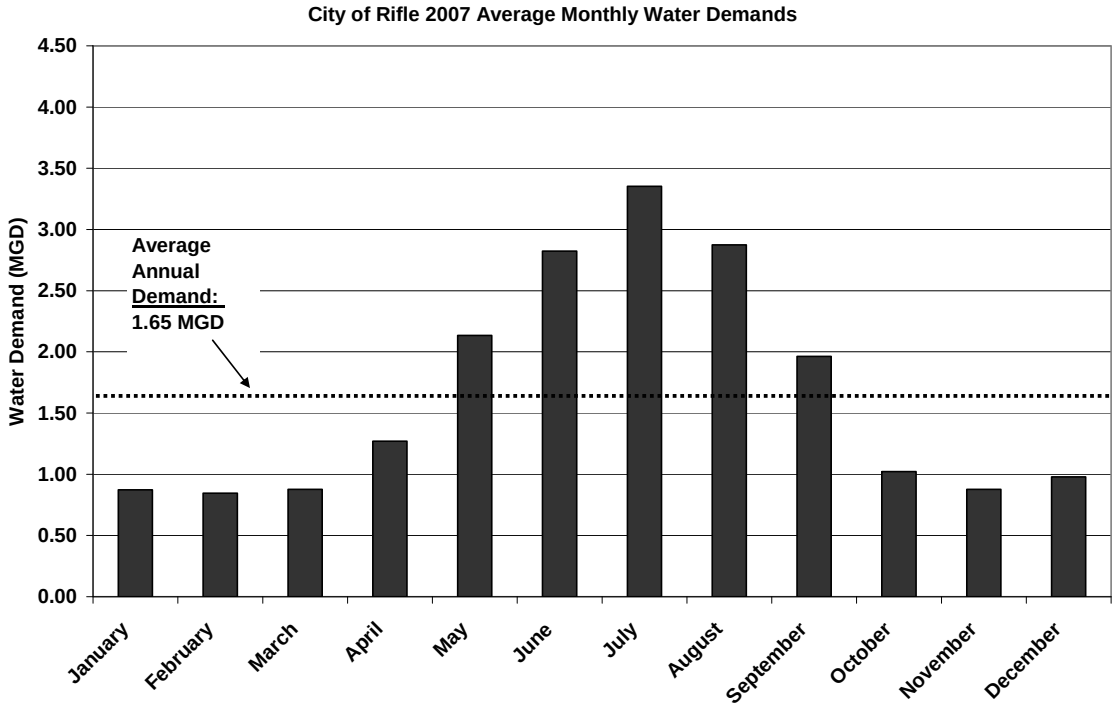

Figure 2-2: 2007 Monthly Potable Water Demands

2.3 Metered Potable Water Use Analysis

Use by Customer Class

The City of Rifle classifies all of its potable system users into several primary categories and numerous sub-categories for residential and government connections. Due to a conversion of water accounting systems in 2007, accurate data on water use by customer class were not available to include in this plan. Furthermore, metered use data by customer class prior to 2006 are of questionable quality. Therefore, only 2006 metered use data by customer class are presented. For each customer class, **Table 2-1** shows the number of accounts and units, annual metered water volume, average use per unit, and percent of total use for this group of standard service connection types. The data show that most of the use was residential and commercial at 69% and 20%, respectively, with the highest single sub-category of use being single-family residential at 48%. Also, in the residential category, single family residences and mobile homes registered significantly higher average water use rates per housing unit than did duplexes and multi-family dwellings. For the single family residences, this is likely due to the greater amount of irrigable space per unit.

Individual Accounts with Highest Summer Use Rates

Because reducing peak demands must be a primary goal for City of Rifle water conservation efforts, 2006 billing data were analyzed for largest peak season water users. The analysis identified the single accounts with the highest (>500 kgal) metered water volumes per unit per month for any meter reading conducted in either June, July, or August, the three months in which peak day demand is most likely to occur in Rifle. **Figure 2-3** presents the findings. All are either government or large commercial entities, not individual residences. The total combined use of these 10 accounts accounted for 7.6% of the total finished water produced in the three peak months of 2006. Targeting top peak demand season water users for water efficiency audits could be an effective peak demand reduction strategy for the City.

Table 2-1: 2006 Metered Water Use at Standard Service Connections

Billing Category/ Customer Class	Number of Accts.	Number of Units	Total Annual Water Volume Used	Average Water Use Rate	% of Standard Service Connection Total Vol.
	(--)	(--)	(gallons)	(gpd/unit)	(%)
Commercial	260	332	97,552,700	806	20
Government	64	64	52,092,700	2,230	11
City Building	8	8	4,440,300	1,521	0.9
City Property/Parks	13	13	13,840,000	2,917	2.9
Other Government	32	32	17,801,400	1,524	3.7
Public School	11	11	16,011,000	3,988	3.3
Industrial (excludes CoGen)	8	8	1,018,000	349	0.2
Irrigation/Sprinkler	2	2	389,000	533	0.1
Residential	2,857	3,635	332,618,000	251	69
Duplex 1 Meter	48	96	5,949,600	170	1.2
Duplex 2 Meters	63	63	4,244,000	185	0.9
Mobile Home Park	20	322	36,435,000	310	7.5
Multi Family Multi Meter	416	416	25,353,100	167	5.2
Multi Family 1 Meter	74	502	27,159,600	148	5.6
Single Family	2,236	2,236	233,476,700	286	48
Total	**3,191**	**4,041**	**483,670,400**	**328**	**100**

2.4 Potable System Water Balance and Lost Water

Previous sections have presented trends and components of City of Rifle water use. **Table 2-2** presents an estimated overall water balance for the City's potable system over the past five years. Because of missing, partial, or inaccurate data for various quantities in different years, numerous educated estimates and best assumptions were required to compile the table. However, **Table 2-2** serves as a best available baseline water balance against which future values can be compared as the City pursues water conservation. **Table 2-2** shows that the difference between treatment plant finished water production and accounted-for water use is estimated at 2 to 10% with roughly 12 to 19% of the raw water entering the treatment plants lost prior to a known end-use. **Table 2-2** also shows that total annual retail water deliveries are approaching the 2,000 ac-ft mark, which will trigger the City to have an approved water conservation plan in place in order to remain eligible for certain State funding assistance programs.

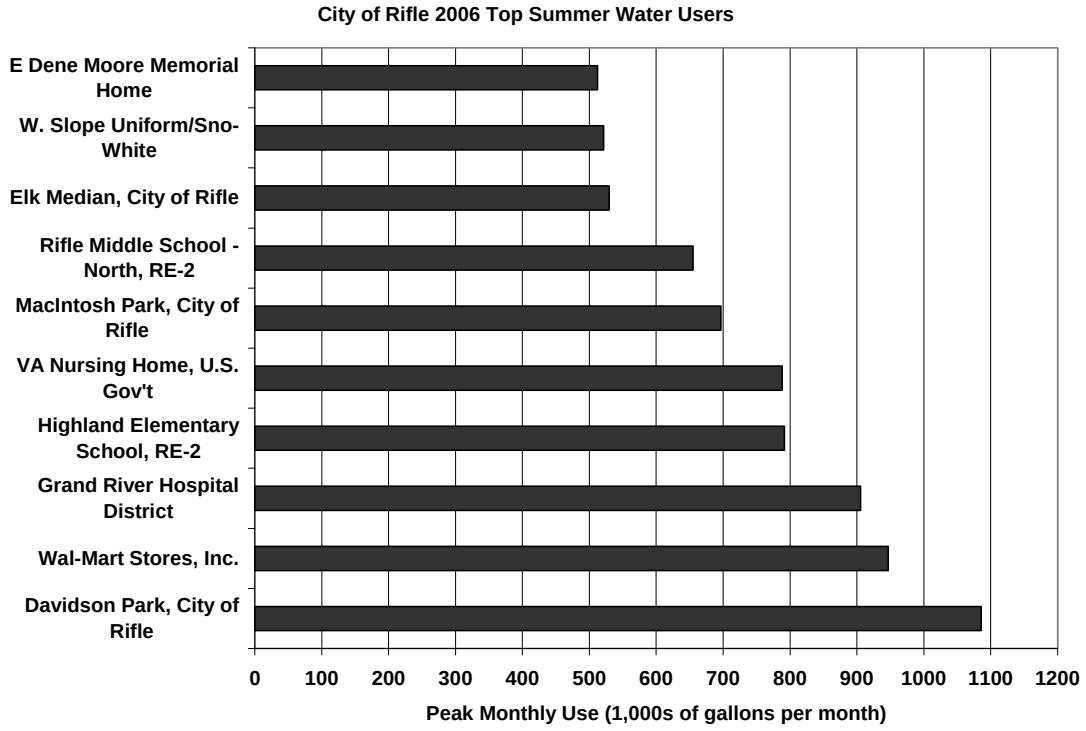

Figure 2-3: Top 10 Summer Water Users in 2006

Table 2-2: Potable System Water Balance

Water Stream	Units	2003	2004	2005	2006	2007
Water Plant Production						
Raw Water, Avg. Flow	(mgd)	1.723	1.720	1.664	1.779	1.969
Raw Water, Ann. Volume	(ac-ft)	1,930	1,927	1,864	1,992	2,205
Finished Water, Avg. Flow	(mgd)	1.553	1.549	1.498	1.602	1.776
Finished Water, Ann. Volume	(ac-ft)	1,739	1,736	1,678	1,795	1,990
Metered Potable Water Deliveries						
All Std. Service Taps, Avg. Flow	(mgd)	1.240	1.417	1.225	1.324	1.588
CoGen Plant, Avg. Flow	(mgd)	0.131	0.044	0.053	0.052	0.100
Hydrant Meters, Avg. Flow	(mgd)	0.029	0.012	0.047	0.039	0.023
Water Vending Machine, Avg. Flow	(mgd)	0.005	0.006	0.005	0.006	0.008
Total Water Sold, Avg. Flow	(mgd)	1.405	1.480	1.329	1.421	1.719
Total Water Sold, Ann. Volume	(ac-ft)	1,574	1,658	1,489	1,592	1,926
Total Water Sold, % of Fin. Water	(%)	90%	96%	89%	89%	97%
Est. Flushing Use, Avg. Flow	(mgd)	0.019	0.019	0.019	0.019	0.019
Tot. Accounted-for Use, Avg. Flow	(mgd)	1.424	1.499	1.348	1.440	1.738
Tot. Accounted-for Use, Ann. Vol.	(ac-ft)	1,596	1,680	1,510	1,614	1,947
Tot. Accounted-for Use, % of Fin. Wtr	(%)	92%	97%	90%	90%	98%
Tot. Accounted-for Use, % of Raw	(%)	83%	87%	81%	81%	88%

Figure 2-4 presents the water balance graphically. Water demand rose an average of about 9% annually in 2006 and 2007.

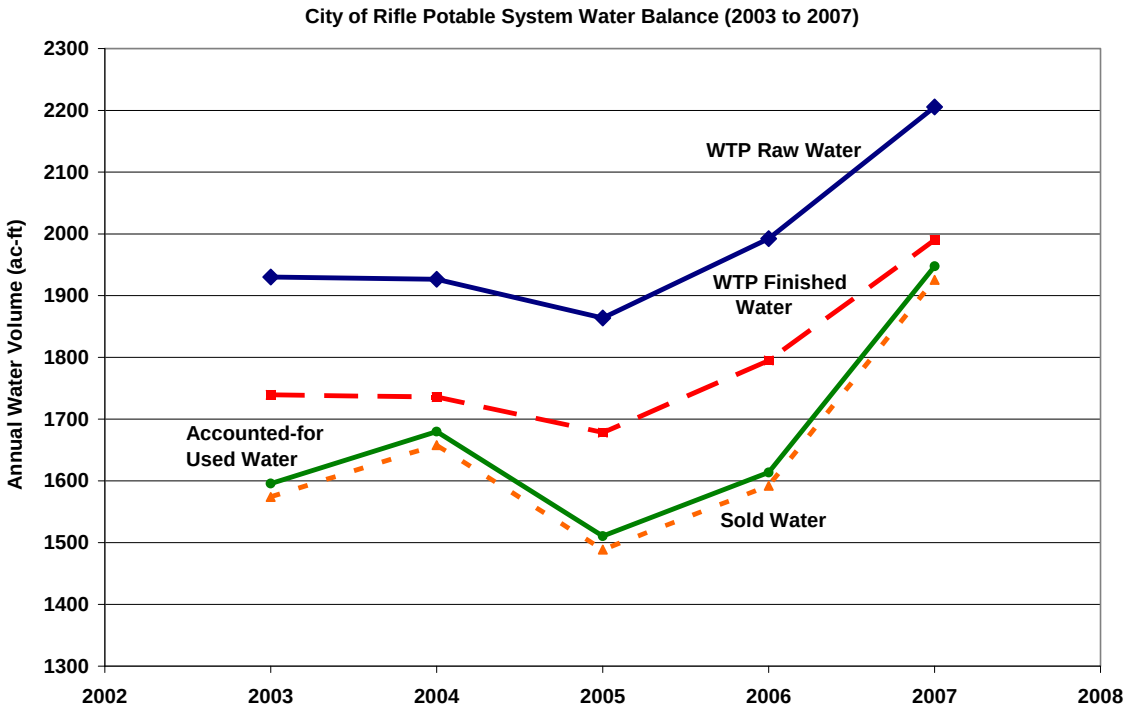

Figure 2-4: Potable System Water Balance (2003 to 2007)

2.5 Water Demand per Capita and per Equivalent Residential Unit

Water consumption per capita and per equivalent residential unit (EQR) are common water demand metrics. They are also often used as a basis for projecting future water demands. **Table 2-3** tabulates key unit water demand metrics for recent years. Variability in the per capita water use figures likely are due to a combination of inaccuracies in the water use data and population estimates. Based on a typical peak day to average day demand ratio of 2.56 and a typical average day finished water production rate of about 400 gpd/EQR, a peak day finished water production requirement of 1,024 gpd/EQR is used in the *2006 Water Master Plan* to project future water infrastructure needs in the "no conservation" case.

2.6 Water Demand Forecast

There is currently very significant growth pressure on the City of Rifle. The City provides significant housing opportunities for both the energy industry in western Garfield County and the local and upvalley tourism-based economies. As indicated in **Table 2-3**, the City has been experiencing rapid growth. City Planning Department and Utility Department staff have made conservative projections of growth over the next 20 years based on recent trends, growth likely to occur in known future developments currently in the planning process, and overall housing market/local industry forces.

Table 2-4 contains population and EQR growth projections and associated peak day demand projections, based on the 1,024 gpd/EQR planning value for the "no conservation" condition, as noted in **Section 2.5**. Peak day demand, and the opportunity to reduce it, serves as the driver for water conservation planning in Rifle.

Table 2-3: Per Capita and Per EQR Water Demand

	Units	2003	2004	2005	2006	2007
Population / EQR Data (estimated)						
Population	(cap.)	7,541	7,760	8,118	8,706	8,800[3]
Water System EQRs (includes 700 for CoGen Plant)	(eqr)	n/a	n/a	4,225[1]	4,371[2]	4,475[2]
*Water Use / Production Data (from **Table 2-2**)*						
Accounted-for Water Use	(mgd)	1.42	1.50	1.35	1.44	1.74
Residential Water Use	(mgd)	n/a	n/a	n/a	0.91	n/a
Finished Water Production	(mgd)	1.55	1.55	1.50	1.60	1.78
Unit Consumption/Production Metrics (calculated)						
Average Per-Capita Water Use	gpcd	189	193	166	165	198
Average Residential Per-Capita Water Use	gpcd	n/a	n/a	n/a	107	n/a
Average Finished Water Production per EQR	gpd/eqr	n/a	n/a	426	366	398

1. City does not actually track total system EQRs. This value is based on annual average metered use of 388 gpd/EQR for group of known 1-EQR residences and total annual system water use.
2. These values are based on 0.88 EQRs per housing unit estimated in 2005 times the number of housing units added by 2006 and 2007.
3. This population value is estimated based on average population per housing unit times the number of housing units added between 2006 and 2007.

Table 2-4: Population, EQR, and Peak Day Water Demand Projections for "No Conservation" Condition

Year	Projected Population[2]	Projected Water System EQRs[1]			Projected Peak Day Demand[3]
		CoGen	Non-CoGen	Total	
	(capita)	(EQRs)	(EQRs)	(EQRs)	(mgd)
2007	8,800	700	3,775	4,475	4.6
2008	9,383	700	4,025	4,725	4.8
2009	9,965	700	4,275	4,975	5.1
2010	10,548	700	4,525	5,225	5.4
2011	11,130	700	4,775	5,475	5.6
2012	11,713	700	5,025	5,725	5.9
2013	12,412	700	5,325	6,025	6.2
2014	13,111	700	5,625	6,325	6.5
2015	13,810	700	5,925	6,625	6.8
2016	14,509	700	6,225	6,925	7.1
2017	15,208	700	6,525	7,225	7.4
2018	15,907	700	6,825	7,525	7.7
2019	16,606	700	7,125	7,825	8.0
2020	17,305	700	7,425	8,125	8.3
2021	18,004	700	7,725	8,425	8.6
2022	18,703	700	8,025	8,725	8.9
2023	19,402	700	8,325	9,025	9.2
2024	20,101	700	8,625	9,325	9.6
2025	20,800	700	8,925	9,625	9.9
2026	21,499	700	9,225	9,925	10.2
2027	22,198	700	9,525	10,225	10.5

1. Based on City of Rifle staff projection that 250 EQRs will be added annually through 2012 and 300 EQRs per year thereafter

2.Based on an average of 2.33 capita per EQR added; 2.33 is average of ratios of non-CoGen EQRs to total population for 2005, 2006, and 2007.

3. Based on average of approximately 400 gpd/EQR of average finished water production required per EQR historically times the historical average multiplier of 2.56 for peak day to average day water production, yielding 1,024 gpd/EQR.

3.0 Proposed Facilities

The *2006 Water Master Plan* presents infrastructure recommendations to meet future water demands projected for the "no conservation" condition. Since that plan was completed, EQR growth projections have changed. More rapid growth, as shown in **Table 2-4**, is now anticipated. Accordingly, water system infrastructure planning has been revised. This section summarizes a recent snapshot of the infrastructure plan.

3.1 Potable Water System

The 2*006 Water Master Plan* identified over $40M in potable water production, transmission, and storage improvements to be needed over a 20-year period. This is to upgrade/replace and expand the capacity of water production, storage, and delivery facilities within the current service area only. It does not account for water distribution, transmission, and storage infrastructure that would be constructed in areas outside of the existing system where new development would occur. This would be funded by individual developers. Similarly, this water conservation plan will not account for water conservation-related cost-savings for down-sizing of infrastructure within future new developments since the City itself will not be paying for that infrastructure, and thus, will not realize significant savings.

A significant part of future potable system capital improvements is likely to be replacing the existing Graham Mesa WTP with a new, higher-capacity facility (8 mgd vs. 4.5 mgd) located near the existing pre-sedimentation pond. New finished water transmission lines from the WTP also will be major projects. Without water conservation, the new WTP is anticipated to be needed by about 2014. The plan also calls for pumping Colorado River water to an expanded (2 mgd, reliable vs. 0.7 mgd, unreliable) Beaver Creek WTP. This project, slated for 2010, may not be constructed based on a recent intake siting/feasibility study's results, but would be replaced by additional capacity at the aforementioned new WTP. As shown in **Table 2-4**, the 10-mgd treatment capacity total would be needed to meet demands through 2025. Then, another expansion would be required. Water conservation that effectively reduces peak day demand will have the potential to defer these projects and/or allow a reduction in constructed capacities. **Table 3-1** presents a summary of capital improvement project costs in the "no conservation" case aggregated by category over time. **Appendix A** contains a complete listing of individual projects and costs. [**Note**: since the analyses in this plan were completed, the capital improvements planned in the "no conservation" case have changed, though it is not anticipated that the changes will affect the major findings of this plan].

3.2 Wastewater System

The City is in the midst of constructing a new 2-mgd (expandable to 4-mgd) wastewater treatment facility. Furthermore, few capacity improvements are anticipated to be required for the primary wastewater interceptor lines within the City's existing collection service area (see *2006 Wastewater Master Plan*). Therefore, there is no significant opportunity for water conservation to reduce wastewater-related infrastructure costs in the near future in Rifle. For this reason, reduction of indoor water use is not a primary focus of this plan, and no further analysis of water conservation effects on the wastewater system is presented herein.

Table 3-1: Projected 20-Year Potable Water System Capital Improvement Costs for "No Conservation" Case

	Projected Capital Improvement Costs (in $M in year 2006)			
Year	**GMWTP/ New WTP**	**BCWTP**	**Distribution & Storage**	**Other[1]**
2008	$0.04	$0.075	$0.200	$0.100
2009	$0.26	$7.35	$0.630	$0.010
2010			$0.48	
2011	$0.40			$0.03
2012				
2013				$0.040
2014	$23.35			
2015				
2016			$2.92	$0.150
2017				
2018				$0.040
2019	$2.55			
2020			$2.93	
2021				$0.025
2022		$1.30		
2023				$0.040
2024	$5.00			
2025				
2026				
2027				
Total	**$31.6**	**$8.7**	**$7.2**	**$0.44**

1. Consists primarily of various evaluations/studies

4.0 Conservation Goals

4.1 Goal Development Process

There are many reasons for cities and utilities to adopt a water conservation program. The following list contains potential reasons that the City of Rifle considered before creating the plan.

1. Cost savings: Reducing water demands and associated water production/ delivery requirements can save a utility and its ratepayers money by reducing water system operating costs, and reducing/deferring capital expenses.
2. Wastewater treatment and disposal benefits: Reducing interior water use lowers wastewater flows, resulting in treatment cost savings and reduced environmental impacts of treated wastewater disposal.
3. Environmental impacts: Water removed from a water body for human use could be used for environmental and other purposes. For example, protection of endangered species or wetlands often requires a reliable source of quality water, this could be increased by water conservation.
4. Regulatory compliance: State laws require water conservation plans with implementation progress to qualify for grants and loans.
5. Energy savings: Reducing water production and delivery saves energy and reduces greenhouse gas emissions.
6. Utility stewardship and sustainability: Utilities that conserve water demonstrate leadership in resource management and are working toward sustainability. More economic activity can occur on the same water resource
7. Competing beneficial uses: In addition to the environment, water left in place could be used for agriculture downstream, power production, recreation, aesthetic enjoyment, etc.
8. Water supply limitations: Few places enjoy unlimited water supplies. Water conservation can stretch existing supplies, whether supply is from groundwater or surface water.
9. Improved supply reliability: Conservation can reduce the frequency and duration of drought water use curtailments, essentially increasing supply.
10. Customer benefits: Customers who conserve water enjoy lower utility bills and lower wastewater and (possibly) energy bills.
11. Public Perception: The public often insists on demonstrating efficient use of existing water supplies before supporting expansion of supplies to meet new water needs.

The City of Rifle is committed to water conservation for many reasons. Through discussions with City Council, City staff and various stakeholders, the benefits of water conservation that emerged as priorities for the City are as follows:

- Minimizing the overall cost of potable water service to the City's citizens and ratepayers, especially by quickly reducing peak demands to reduce/defer major water production capital expenditures
- Being good stewards of the local and global environments, including:
  - Keeping more water in local rivers and creeks
  - Reducing greenhouse gas emissions
- Increasing the community's awareness of the value of water, especially in an arid environment
- Firming and extending the City's water supply, especially in support of the City's continued growth
- Achieving associated energy savings
- Maintaining same/similar level of service with less water
- Identifying/implementing measures/programs with highest benefit-cost ratio
- Improving the City/water utility's local image
- Improving drought/emergency preparedness
- Complying with regulatory requirements and maintain eligibility for CWCB and CWPA funding assistance

4.2 Water Conservation Goals

The role of water conservation in City of Rifle water supply planning primarily is to reduce peak summer water demands to enable the down-sizing/deferment of future water production/treatment infrastructure projects. Quantifiable water conservation program goals are:

- Overall Program
  Reduce peak day treated water production needs (excluding the CoGen plant) from a current baseline planning value of 1,024 gpd/EQR to about 890 gpd/EQR (13%) by 2015.

- New Users
  Reduce total peak month metered water use per EQR for new residential and commercial accounts (i.e. those connected after 2008) by 15 to 20% by 2015 as compared to the 2008 value. The 2008 value shall be determined based on measured water use and assignment of EQRs to all existing water accounts.

- Existing Users
  Reduce total peak month metered water use per EQR for existing residential and commercial accounts (i.e. those existing by the close of 2008) by 8 to 10% by 2015 as compared to the 2008 value. The 2008 value shall be the same value as that described above for "New Users."

- Total/Average Annual Use Reduction
  Reduce average annual water production needs by at least 5% system-wide by 2015, from about 400 gpd/EQR to less than 380 gpd/EQR.

5.0 Conservation Measures and Programs

5.1 Conservation Measures and Programs Considered

A comprehensive list of conservation measures and programs considered applicable to the City of Rifle was created as a starting point. The measures were organized into five primary categories for implementation purposes. Included in this list are all of the measures and programs required by state statute to be considered. The list is as follows:

Municipal Facilities

- Replace appropriate toilets, urinals, faucets and showerheads with low-flow fixtures.
- Establish a policy that requires all new city-funded plumbing fixtures and appliances to meet or exceed the best practice standards.
- Replace conventional landscape with xeriscape at select sites.
- Plan/design/install water-efficient landscapes for new City open space/public park areas.
- Require irrigation efficiency audits of all city-maintained irrigation systems.
- Establish an annual water budget for City departments as appropriate.
- Reward the City department with the largest percentage water use reduction.
- Create a 'buying guide' for staff for City-purchased plumbing fixtures and appliances.
- Create a 'design guide' for staff for City-owned xeriscape landscaping and irrigation systems.
- Create a 'maintenance guide' for staff for maintaining plumbing fixtures, appliances and irrigation systems.
- Irrigate parks and cemetery only at night.
- Restrict water features/fountains.

Rebates & Incentives

- Provide free audits for top ten water users.
- Provide rebates for low-flow fixtures, such as toilets & urinals, showerheads, faucets and clothes washers.
- Provide rebates for smart irrigation controls and/or irrigation audits.

Utility Operations

- Modify water rates to promote water conservation.
- Improve system-wide water accounting to better track the use of potable water and better quantify lost water.
- Improve the measurement of, and reduce the magnitude of, water treatment plant process waste streams.
- Improve the detection and control of water distribution system leaks.
- Continue the policy that requires large leaks to be repaired immediately and smaller leaks to be repaired in less than two days, after discovery.
- Establish a policy that requires that a system-wide leak-detection audit be conducted at least every 5 years.
- Reduce construction water use by increasing the rates.
- Reduce construction water use by exploring the use of raw water for compacting and dust control.

Educational Programs

- Spearhead the creation of a City Water Conservation Taskforce.
- Provide and advertise a website with useful water conservation information and links targeted at Rifle citizens and businesses.
- Conduct an annual outdoor irrigation watering efficiency and xeric landscaping practices workshop for interested citizens and landscaping suppliers and installers.
- Improve water bills to include water conservation tips/information and historical water use trends on water bills.
- Produce or purchase pamphlets on water-wise landscaping and irrigation design and place at nurseries, tree farms, sod farms, and other prominent retail locations and City facilities.
- Create and use online water-use surveys to identify conservation potential.
- Provide leak detection tips on the water utility website and utility billings.

Regulatory

- Draft and adopt a "water waste" ordinance.
- Establish landscaping/irrigation system design requirements for new development.
- Require water-efficient plumbing fixtures/appliances to be installed in new residential and/or commercial/industrial buildings.
- Require high use new Industrial/Commercial/Institutional construction to be reviewed to allow for recycled uses. (Example: recycle only carwashes)
- Require water use audits at any change of use, building permit application and/or time of sale.
- Require limited watering times, such as odd/even days.
- Require new hotel/motels to use water conserving fixtures, appliances, etc.
- Establish stricter irrigating guidelines/restrictions applicable to drought conditions.

Other

- Promote water conservation by partnering with other organizations such as non-profits and/or industry professionals.
- Work with the Department of Local Affairs to get assistance with drafting policy/code ordinances and/or resolutions, creating a new tiered rate or to improve system-wide water accounting.
- Develop a program, perhaps in cooperation with other entities, to remove phreatophytes from the surrounding area.

5.2 Screening Criteria

Every measure and program has been evaluated with the following criteria:

- Water savings potential
- Capital and/or O&M savings potential
- Customer / public acceptance
- Staff and Council acceptance
- Ease and cost of implementation

5.3 Screening of Conservation Measures and Programs

Once the screening criteria were established, each measure and program was screened, resulting in a 'Top 17' list. Both the comprehensive list and the 'Top 17' were presented to staff and the City Council. Below is a description of every measure and program with an explanation of why it did or did not make the 'Top 17' short list.

Municipal Facilities

Replace non low-flow fixtures *(in 'Top 17')*

The City intends to replace inefficient fixtures either through attrition or through targeted replacement as funding allows. Installing low-flow fixtures in its own facilities, especially those with high public visitation, sets a good example and provides an educational opportunity for users.

Require low-flow fixtures and appliances in new installations *(in 'Top 17')*

This measure involves setting policy that requires all new fixtures and appliances meet the EPA's WaterSense or equivalent efficiency standards. This measure was selected for reasons similar to those for the previous one.

Replace conventional landscape with xeriscape *(in 'Top 17')*

The staff would like to replace conventional landscapes (primarily turf) with xeriscape at select sites where feasible and acceptable to demonstrate the City's commitment to water conservation and to document the process and results. Proposed areas include the Elk median, other CDOT medians, and on the east and west sides of Railroad Avenue downtown for a total of almost 2 acres. These projects are also planned to serve as demonstration projects for the general public.

Plan/design/install water-efficient landscapes *(in 'Top 17')*

This measure would require that any new City-owned landscapes be designed and installed to meet established xeriscape guidelines. This measure was selected for reasons similar to those for the previous one. Upcoming projects could include new landscapes in Centennial Park, Deerfield Park, and around City Hall for a total of 6 acres, or so.

Restrict water features/fountains *(in 'Top 17')*

While this measure is not expected to save a significant amount of water, it was determined that purely decorative water features/fountains send a counter-productive message to the public that de-values water in the arid West. Therefore, the City will adopt a policy that restricts its own use of water fountains to those which serve a useful purpose, such as aeration of an otherwise stagnant pond to maintain water quality.

Require annual or biannual irrigation audits *(not selected)*

Irrigation audits by a third party could possibly identify additional water savings; however, the current City staff's commitment to irrigation efficiency reduces the opportunity for significant savings.

Establish an annual water budget & reward reductions *(not selected)*

Although tracking water use by City department could yield savings by tapping the competitive spirit, it would require valuable time and resources from staff and may not produce significant results.

Create a 'buying/design guide' for staff *(not selected)*

To facilitate the implementation of the above mentioned measures, it was thought that a guide to assist in selecting low-flow fixtures, designing xeriscape landscapes, and maintenance of all the above would be beneficial. However, given the time required to create them and the resources available online, this measure was not selected.

Irrigate parks and cemetery only at night *(not selected)*

There is concern that this policy, given existing irrigation system designs, would too significantly restrict operational flexibility needed for watering large parks or those with sprinkler heads near property lines (noise issues).

Rebates & Incentives

Provide free audits for top ten water users *(in 'Top 17')*

An effective way to reduce existing water consumption is to improve the efficiency of the largest water users. Auditing the largest users so that site-specific recommendations can be made to lower water use is a cost-effective measure.

Rebates for smart irrigation controls and/or irrigation audits *(in 'Top 17')*

Developing and implementing a rebate program for smart irrigation controllers will be pursued, primarily as a means to reduce peak summer demand in existing developments. It also will provide homeowners interested in lowering their water bills with additional means and incentive to do that.

Rebates for low-flow fixtures *(not selected)*

A high-efficiency indoor plumbing fixture rebate program was not selected because of the substantial resources required to create and administer the program and the lack of significant impact on peak day water demand reduction.

Utility Operations

Modify water rates to promote water conservation *(in 'Top 17')*

This measure has support as implementation of a tiered water rate structure has proven to be an effective and equitable means to reduce inefficient water use community-wide. The City is in need of modifying its rates to compensate for increased expenses, so development of a new inclining-block rate structure fits in with other water utility goals.

Improve system-wide water accounting to better track the use of potable water and better quantify lost water *(in 'Top 17')*

The long-term success of a water conservation program hinges upon the ability to measure and track progress. The City will install a new finished water flow meter at the Graham Mesa WTP to accurately track total water production and to enable determination of water loss at the plant versus in the distribution system. The City will keep a single compiled log of monthly volumes metered for all accounted-for end uses of water in the system for side-by-side comparison with produced water volumes. The City will also track the EQRs added to the water system annually and the total system EQRs over time using 3,525 total system EQRs in 2005 as a base starting point (see **Table 2-3**). This will facilitate water use tracking on a per EQR basis into the future.

Establish a leak detection audit policy *(not selected)*

City staff believes that it has implemented good historical water distribution leak detection surveys and it continues to survey the system on a 5-year cycle. Unless future, more accurate, system-wide water balance determinations indicate high distribution system water loss, increasing leak detection/repair effort may not have a favorable cost/benefit ratio.

Continue the leak repair policy *(not selected)*

The existing policy requires large leaks to be repaired immediately and smaller leaks to be repaired in less than two days, after discovery. Because this program is already in place, it is unnecessary to include it in this plan.

Reduce construction water use *(not selected)*

Construction projects use a significant amount of potable water for compacting soils and for dust control. Two options have been proposed to reduce this water use. The first is to increase the water rates charged to contractors. The second is to explore the use of raw water for construction purposes. Adjusting the water rate will likely be reviewed in conjunction with the system-wide rate analysis. Given the magnitude of this use compared to peak day demand, creating a raw water source for construction does not have a favorable cost/benefit ratio.

Educational Programs

Spearhead the creation of a City Water Conservation Taskforce *(in 'Top 17')*

Water conservation programs must have community and stakeholder support to be successful. Even though this program has no quantifiable water savings, it is a critical element. This effort would entail creating a group of business owners, residents, City staff, large water users, industry professionals and others to make ongoing recommendations to the City Council on how to pursue the measures and programs outlined in this plan.

Create a water conservation website *(in 'Top 17')*

No community outreach campaign can be complete without a website to explain and help implement a water conservation plan. The City of Rifle intends to add a water conservation plan webpage to its water utility's website with useful information and links targeted at Rifle citizens and businesses.

Conduct an annual water conservation workshop *(in 'Top 17')*

The City will hold an annual efficient irrigation and xeric landscaping workshop that will provide interested citizens with information to help them reduce peak summer water use and avoid the highest water rate tiers. The event(s) will also showcase City-owned/operated low-water use demonstration areas.

Water-efficient landscape and irrigation system brochures *(in 'Top 17')*

The purchase of brochures to provide interested consumers with more information about outdoor water use efficiency measures will be pursued. The information will be placed at local retail suppliers of landscaping and irrigation products as well as displayed at City facilities. This will provide interested citizens with more tools to help them reduce peak summer water use and associated water bills.

Provide conservation tips on water bills *(in 'Top 17')*

The City's billing system allows for the inclusion of short water conservation tips. The City would also like to include historical use information specific to the customer, however it is still unknown whether or not that the City's system has that capability. The two types of educational messages are powerful when presented with the invoice and implementation has a favorable benefit/cost ratio.

Website-specific tools for water conservation *(not selected)*

Two specific tools proposed for the new water efficiency website are online water-use surveys to identify and quantify conservation potential and instructions for in-home leak detection simply by tracking water meter readings. Both are considered feasible, but are not considered to be a high-priority at this time.

Regulatory

Create and enforce a new 'water waste' ordinance *(in 'Top 17')*

The City should create and enforce a new ordinance that prohibits the 'wasting' of water. The ordinance would define specific actions that qualify as violations subject to issuance of warnings, fines, and/or water service termination. The program goal is to emphasize the value of water to the community as well as to reduce demands, especially peak demand. Since outdoor water use is not only the most visible and easily policed, it also contributes the most to peak day demand, and should be a primary focus of the ordinance.

Establish landscaping and irrigation system design requirements for new development (in 'Top 17')

With the projected growth in the City of Rifle, new irrigated landscapes represent a significant source of future peak water use. Adopting and enforcing design requirements for irrigation systems and landscape design/installation practices has the potential to significantly reduce outdoor water use in an arid climate. It is envisioned that new regulations would incorporate some of Dr. Curtis Swift's (CSU Extension) suggested 'Landscape Specifications' into the Municipal Code.

Establish high-efficiency indoor fixture requirements for new development (in 'Top 17')

Although reducing indoor water in new development will not significantly reduce peak summer water demand in the short-term, it adds up over the long-term if significant growth is projected, as is the case in Rifle. Establishing high-efficiency plumbing fixtures, including toilets, clothes washers, dishwashers, showerheads, and bathroom faucets to be installed in new development is a lower implementation cost means to improve indoor water use efficiency in the community. It is envisioned that the City's new regulations would reference the USEPA Water Sense Program product listings, and/or similar sources for approved fixtures/devices and be incorporated into the Municipal Code.

Allow recycled water where appropriate *(not selected)*
Because the City's water rights due not allow for sequential uses of water or significant utilization to extinction, recycling water is currently not a viable option.

Require water use audits *(not selected)*

Water audits can be an effective tool to educate the public about efficient water use and achieve immediate water demand reductions, especially when coupled with give-aways or rebates for water-efficient fixtures/systems. However, conducting many water audits requires significant internal resources and/or ample budget to hire qualified water audit contractors. This program was deemed unmanageable for the City at the current time. As the City grows, and as the pool of locally-based water efficiency auditors grows, the City may wish to reconsider a larger auditing program.

Require limited watering times *(not selected)*

This program is very popular in other areas, however new research is indicating that restricting watering times does not always lead to more efficient water use, and therefore, it was not selected.

Drought-specific guidelines *(not selected)*

Rifle Municipal Code already gives both the City Council and the City Manager the power to implement water use restrictions in drought conditions. Therefore, this is not considered a new measure/program.

Other

Partner with other stakeholders to promote water conservation (*included in others*)
Several of the measures and programs included in this plan involve partnering, including development of a Water Conservation Taskforce and working with local irrigation system suppliers and landscaping professionals to conduct annual workshops and make conservation information available to the public.

Use DOLA assistance for rate structure and billing methods development (*not selected*)
State statute requires that this plan consider the inclusion of DOLA technical assistance to help the City implement tiered rate structures and a water billing system that shows customer water usage. The City already has the in-house systems and resources for these.

Removal of phreatophytes
Phreatophytes are water-loving plants that reduce available raw water supply through excessive evapotranspiration rates and water consumption. Phreatophyte removal does not help the City reduce peak summer potable system water demands, nor is the program expected to be economical for the City to undertake, therefore it has not be selected.

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6.0 Evaluation and Selection of Conservation Measures and Programs

The project team evaluated the Top 17 water conservation measures and programs identified in Section 5 using both quantitative and qualitative criteria.

The quantitative analysis estimated:

- Implementation costs
- Peak day demand reduction
- Water demand reduction-related cost savings (energy, chemicals, water supply, water infrastructure)
- Benefit-cost ratio

The qualitative analysis scored measures and programs against the following:

- Customer acceptability
- Ease of implementation
- Consultant preference
- City staff/council preference

While there is a large body of information and experience with municipal water conservation programs in the United States and in Colorado, it must be recognized that there is significant uncertainty in water conservation measure/program evaluations, such as the one performed herein. There are several reasons for this:

- Estimating benefits and costs of water conservation measures and programs lies at the nexus of engineering, economics, and human behavior, the last of which can be considerably variable and site-specific.
- The vast majority of water conservation experience, especially that which has been documented, is applicable to very large water utilities. These often have considerably more resources both internally and within their communities to implement water conservation.
- Most of the Colorado water conservation experience has been on the Front Range, which has very different drivers (primarily, reduction of total annual water use due to high water supply costs), and again, much greater community/organizational resources.
- There is relatively little published data available on exactly how much water demand reduction, especially on peak day, can be achieved for a given water conservation measure or program. This is even more true for those focusing on outdoor water use reduction (indoor measures are more readily quantified), education, and water rate changes, which comprise the bulk of the overall recommended program for Rifle.

That being said, the project team developed this analysis using a number of references, including:

- Water conservation texts (*Water Use and Conservation*, Vickers, 2001 was especially useful)
- American Water Works Association (AWWA) reports and manuals
- CWCB-sponsored water conservation workshop presentations
- CWCB-approved water conservation plans for other Colorado water utilities
- Engineering analyses using Rifle-specific infrastructure planning information, energy and chemical costs, water supply plans and costs, etc.

A list of references is included at the rear of this report.

6.1 Quantitative Benefit-Cost Analysis Results

Table 6-1 presents the results of the quantitative benefit-cost analysis. The project team recognizes that successful water conservation planning and implementation is an iterative process with a feasible planning horizon that is relatively short (i.e. 5 to 7 years). That is, some recommended programs and measures may be found within a few years to not be effective or to suffer from too low of a benefit-cost ratio; these may be abandoned for other more promising alternatives. However, for the City of Rifle, the real economic benefits of a successful water conservation program will only be realized over a longer time frame. This is primarily because the City's current costs for energy, chemicals, and raw water supply are relatively low. The real benefit is demand reduction to allow down-sizing and deferment of future water infrastructure projects, specifically, water production and treatment facility expansions. A secondary benefit is the reduction in future water supply costs. For this reason, a 20-year analysis period was selected. This represented a compromise between a period not long enough to capture the benefits and one (such as time to system build-out, estimated to be 30+ years in the future) that might be too subject to conjecture.

Table 6-1 presents 20-year implementation costs, 20-year total water volume and peak day demand reductions (referenced against current water consumption rates), associated energy, chemical, water supply and water infrastructure savings, and finally, a benefit-cost ratio (total 20-year cost savings divided by 20-yr implementation cost). Measures and programs with a benefit-cost ratio greater than one (unity) are considered to have favorable economic payback.

Table 6-1 illustrates the following key results:

- As compared to the "no conservation" case, the proposed program is projected to reduce peak day demand by almost 1.9 mgd, or 18%, by 2027 and save over 8,700 ac-feet of water over the 20-year period.
- The reduction in peak day demand, and the corresponding water production/treatment infrastructure cost savings able to be achieved over the long term, produces almost 90% of the total projected cost savings of the overall program. The implication is that the bulk of the program's payback to the City will be in the long term.
- The overall program's projected 20-year benefit-cost ratio is 1.9, which is favorable.
- The upfront implementation cost over the first two to three years is projected to be $385K. Roughly one-half of this initial cost is for design and installation of xeriscaping in existing and new City landscapes. This has a low benefit-cost ratio, but its main value is in education and example-setting. Implementation costs will need to be covered through existing City staff hours, grant funds, the Utility Department budget, or other sources. Obviously, if implementation is not funded, the plan will fail.
- The average annual cost over a 20-year period is projected to be about $85K.
- Implementing a strong inclining-block water rate structure and landscaping and irrigation system design requirements for new development are projected to achieve the most water and cost savings. These two items economically "carry" the overall program and are critical to its success.
- High-efficiency fixture/appliance requirements for new development and targeted water audits are also projected to save significant amounts of water with favorable benefit-to-cost ratios.

Table 6-1: Quantitative Benefit-Cost Analysis of Proposed Conservation Measures and Programs

Measure or Program (M/P) # and Description		Qty.	Estimated initial labor cost ($)	Estimated initial material cost ($)	Estimated initial total cost ($)	Estimated 20-yr. total cost ($)	Projected 20-year total water volume savings (gals)	Projected 20-year total energy and chemical cost savings ($)	Projected 20-year total water supply cost savings ($)	Projected Peak day demand reduction in year 20 (gpd)	Fraction of total peak-day demand reduction attributed to this M/P (%)	Water production infrastruc-ture cost savings attributed to this M/P ($)	Total 20-year cost savings (=N+O+R)	Benefit / Cost ratio
1	Modify water rates to promote water conservation	1	$ 5,040	$ -	$ 5,040	$ 29,040	1,400,000,000	$ 108,500	$ 83,885	975,000	52.43%	$1,494,204	$1,686,589	58
2	Install a new finished water flow meter at the Graham Mesa Water Treatment Plant to improve system-wide water accounting to determine distribution system lost water and excess water losses in the treatment plant.	1	$ -	$ 45,000	$ 45,000	$ 45,000	NC	NA	NA	NA	NA	NA	NA	NA
3	Create and enforce a new "water waste" ordinance.	1	$ 5,000	$ -	$ 5,000	$ 15,000	NC	NA	NA	NA	NA	NA	NA	NA
4	Develop and implement a rebate program for smart irrigation controllers.	1	$ 10,000	$ 3,000	$ 13,000	$165,000	11,212,800	$ 869	$ 5,248	61,000	3.28%	$93,484	$99,601	0.6
5	Establish landscaping and irrigation system design requirements for new development	1	$ 10,000	$ -	$ 10,000	$ 510,000	854,100,000	$ 66,193	$ 50,761	590,000	31.73%	$904,185	$1,021,139	2.0
6	Establish high-efficiency indoor plumbing fixture design requirements for new development.	1	$ 7,500	$ -	$ 7,500	$ 150,000	468,000,000	$ 36,270	$ 10,668	124,000	6.67%	$190,032	$236,971	1.6
7	Spearhead the creation of a City Water Conservation Taskforce comprised of stakeholders such as citizens, business owners, developers, landscape and irrigation professionals, conservation groups, City staff members,	1	$ 2,500	$ -	$ 2,500	$ 21,500	NC	NA	NA	NA	NA	NA	NA	NA
8	Provide and advertise a website with useful water conservation information and links targeted at Rifle citizens and businesses	1	$ 5,200	$ -	$ 5,200	$ 65,200	NC	NA	NA	NA	NA	NA	NA	NA

CONTINUED ON NEXT SHEET

9	Implement municipal facility indoor conservation measures. Indoor measures include efficient toilets and waterless urinals	Qty.	Estimated initial labor cost ($)	Estimated initial material cost ($)	Estimated initial total cost ($)	Estimated 20-yr. total cost ($)	Projected 20-year total water volume savings (gals)	Projected 20-year total energy and chemical cost savings ($)	Projected 20-year total water supply cost savings ($)	Projected Peak day demand reduction in year 20 (gpd)	Fraction of total peak-day demand reduction attributed to this M/P (%)	Water production infrastruc-ture cost savings attributed to this M/P ($)	Total 20-year cost savings (=N+O+R)	Benefit / Cost ratio
	Indoor Conservation Measures (Water Savings)													
a	Replace aeraters with 0.5 - 1.5 GPM aeraters	38	$ 25	$ 2	$ 1,026	$ 1,026	3,277,948	$ 254	$ 39	449	0.02%	$688	$981	3.3
b	Replace toilets with 1.6 GPF toilets	38	$ 150	$ 100	$ 9,500	$ 9,500	15,017,600	$ 1,164	$ 177	2,057	0.11%	$3,153	$4,494	0.47
c	Install waterless urinals	9	$ 100	$ 400	$ 4,500	$ 12,500	7,200,000	$ 558	$ 85	986	0.05%	$1,512	$2,154	0.17
d	Replace faucet fixtures with self-closing metering faucets	14	$ 100	$ 150	$ 3,500	$ 11,500	3,712,800	$ 288	$ 44	509	0.027%	$779	$1,111	0.15
e	Replace faucet fixtures with self-closing timed faucets	14	$ 100	$ 350	$ 6,300	$ 14,300	3,712,800	$ 288	$ 44	509	0.027%	$779	$1,111	0.12
	Indoor Conservation Measures (Energy Savings)						**(kWh)**							
a	Replace aeraters with 0.5 - 1.5 GPM aeraters	38		(included above)			851,200	$ 2,451		(included above)			$2,451	
d	Replace faucet fixtures with self-closing metering faucets	14		(included above)			211,120	$ 608		(included above)			$608	
e	Replace faucet fixtures with self-closing timed faucets	14		(included above)			211,120	$ 608		(included above)			$608	
10	Establish and execute a policy that requires all new city-funded plumbing fixtures & appliances (for new construction and replacement of existing) meet or exceed the best practice standards													
a	Replace toilets with 1.6/0.8 GPF Dual flush toilets	38	$ 150	$ 350	$ 19,000	$ 19,000	5,912,192	$ 458	$ 70	810	0.04%	$1,241	$1,769	0.09
b	Replace flushmeter with 1.6/1.1 GPF Dual flushmeter	23	$ 100	$ 300	$ 9,200	$ 17,200	2,430,272	$ 188	$ 29	333	0.02%	$510	$727	0.04
c	Install waterless urinals	9	$ 100	$ 400	$ 4,500	$ 12,500	7,200,000	$ 558	$ 85	986	0.05%	$1,512	$2,154	0.17
d	Replace faucet fixtures with self-closing metering faucets	28	$ 100	$ 150	$ 7,000	$ 15,000	7,425,600	$ 575	$ 88	1,017	0.055%	$1,559	$2,222	0.15
11	Implement municipal facility outdoor conservation measures. Outdoor measures include water efficient landscape designs, efficient irrigation, and xeriscape. Replace conventional landscape with xeriscape at select sites where feasible and acceptable							$ -						
a	Water efficienct landscape designs Area (sq.ft.)	80,566	$ -	$ 0.15	$ 12,085	$ 92,085	NC	NA	NA	NA	NA	NA	NA	NA
b	Replace an existing controller with a SWAT System	6	$ 400	$ 1,300	$ 10,200	$ 90,200	3,600,000	$ 279	$ 129	1,500	0.08%	$2,299	$2,707	0.03
c	Replace turf with Xeriscape Area (sq.ft.)	80,566	$ -	$ 0.83	$ 66,870	$ 66,870	9,039,505	$ 701	$ 324	3,766	0.20%	$5,772	$6,797	0.10
12	Conduct an annual outdoor irrigation watering efficiency and xeric landscaping workshop for interested citizens	1	$ 3,000	$ -	$ 3,000	$ 41,000	2,458,020	$ 190	$ 88	1,024	0.06%	$1,570	$1,848	0.05
13	Plan/design/install water-efficient landscapes where possible for new City open space areas Area (sq.ft.)	309,920	$ -	$ 0.33	$ 102,274	$ 102,274	34,773,024	$ 2,695	$ 1,247	14,489	0.78%	$22,204	$26,146	0.26
14	Improve water bills to include water conservation tips and historical water use trends	1	$ 1,700	$ -	$ 1,700	$ 41,700	NC	NA	NA	NA	NA	NA	NA	NA
15	Provide free audits for top ten water users.	10	$ 2,000	$ -	$ 20,000	$ 110,000	9,466,875	$ 734	$ 6,990	81,250	4.37%	$124,517	$132,241	1.2
16	Purchase and distribute/display pamphlets on water-efficient landscape and irrigation design.	1	$ 5,000	$ 3,000	$ 8,000	$ 39,000	NC	NA	NA	NA	NA	NA	NA	NA
17	Develop a policy to restrict water features/ fountains on City property to those serving useful function only.	1	$ 3,000	$ -	$ 3,000	$ 5,000	NC	NA	NA	NA	NA	NA	NA	NA
	TOTALS		**$ 61,265**	**$ 54,503**	**$ 384,894**	**$ 1,701,394**	**2,825,571,373**	**$ 224,429**	**$ 160,000**	**1,859,685**	**100.00%**	**$2,850,000**	**$3,234,429**	**1.9**

- Many of the programs and measures, such as educational programs, better water tracking, and many City water use reduction measures do not have favorable benefit-cost ratios. However, this does not imply that these individual measures and programs are not 'worthwhile,' especially as components of a larger, economically-justifiable program. These are generally aimed at increasing community awareness of the value of water and giving people the knowledge and tools to conserve water on their own.

6.2 Qualitative Analysis Results

Table 6-2 summarizes the results of the qualitative analysis. The purpose of this analysis was to rate the anticipated effectiveness of each measure and program independent of the quantitative analysis. It is recognized that some measures and/or programs that do not rank high in the quantitative analysis may have a greater chance of success because of other, less tangible factors. Therefore, the categories for analyzing each measure or program consist of customer acceptance, ease of implementation, consultant preferences, and City of Rifle staff/Conservation Taskforce preferences.

As stated earlier, the compelling reasons for water conservation on the Western Slope are less apparent than they are on Colorado's Front Range, so this analysis was particularly useful.

6.3 Selected Programs and Measures

Based on the results of this evaluation, the project team recommends that all Top 17 measures and programs be implemented. This is because of the favorable benefit-cost ratio of the overall program, and the fact that the individual measures and programs that have unfavorable benefit-cost ratios:

- do not have unreasonably high implementation costs, and
- all serve other valuable purposes in the overall program.

Municipal Facilities

- Replace appropriate toilets, urinals, faucets and showerheads with low-flow fixtures.
- Establish a policy that requires all new city-funded plumbing fixtures & appliances to meet or exceed the best practice standards.
- Replace conventional landscape with xeriscape at select sites where feasible and acceptable.
- Plan/design/install water-efficient landscapes where possible for new City open space/public park areas.
- Restrict use of water features/fountains to those serving useful function only.

Rebates & Incentives

- Provide free audits for top ten water users.
- Develop and implement a rebate program for smart irrigation controllers.

Utility Operations

- Modify water rates to promote water conservation.
- Improve system-wide water accounting to better track the use of potable water and better quantify lost water.

Educational Programs

- Spearhead the creation of a City Water Conservation Taskforce.

- Provide and advertise a website with useful water conservation information and links targeted at Rifle citizens and businesses.
- Conduct an annual outdoor irrigation watering efficiency and xeric landscaping practices workshop for interested citizens and targeted landscape/irrigation suppliers.
- Improve water bills to include water conservation tips/information and historical water use trends on water bills.
- Develop/purchase and distribute/display information pamphlets on water-efficient landscape and irrigation practices and design.

Regulatory

- Strengthen and enforce the City's "water waste" ordinance.
- Establish landscaping and irrigation system design requirements for new development.
- Establish high-efficiency indoor plumbing fixture design requirements for new development.

Table 6-2: Qualitative Analysis of Measures and Programs

	Measure or Program (M/P) # and Description	Customer Acceptance	Ease of Implementation	Consultant Scoring	City and Task Force Preference	Total Score
1	Modify water rates to promote water conservation	2	4	5		11
2	Install a new finished water flow meter at the Graham Mesa Water Treatment Plant to improve system-wide water accounting.	5	5	5		15
3	Create and enforce the City's "water waste" ordinance.	4	4	4		12
4	Develop and implement a rebate program for smart irrigation controllers.	5	2	3		10
5	Establish landscaping and irrigation system design requirements for new development	4	3	4		11
6	Establish high-efficiency indoor plumbing fixture design requirements for new development.	4	3	2		9
7	Spearhead the creation of a City Water Conservation Taskforce comprised of stakeholders	5	4	5		14
8	Provide and advertise a website with useful water conservation information and links targeted at Rifle citizens and businesses	5	4	3		12
9	Implement municipal facility indoor conservation measures. Indoor measures include efficient toilets and waterless urinals	5	3	3		11
10	Establish and execute a policy that requires all new city-funded plumbing fixtures & appliances (for new construction and replacement of existing) meet or exceed the best practice standards	5	4	3		12
11	Implement municipal facility outdoor conservation measures, including water efficient landscape designs, efficient irrigation, and xeriscape.	4	2	4		10
12	Conduct an annual outdoor irrigation watering efficiency and xeric landscaping practices workshop for interested citizens	5	4	3		12
13	Plan/design/install water-efficient landscapes where possible for new City open space areas	4	3	4		11
14	Improve water bills to include water conservation tips/information and historical water use trends on water bills	4	4	4		12
15	Provide free audits for top ten water users.	4	3	4		11
16	Purchase and distribute/display information pamphlets on water-efficient landscape and irrigation practices and design.	5	3	2		10
17	Develop a policy to restrict water features/ fountains on City property to those serving useful function only.	4	5	2		11

Scoring Key: 5 = Highest/Best; 1 = Lowest/Worst

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7.0 Integrated Resources and Modified Forecasts

Sections 2.0 and **3.0** present potable water demand and infrastructure projections for the "no conservation" condition. This section presents modified 20-year forecasts for the "with conservation" condition. Achieving the water conservation goals of this plan is anticipated to result in infrastructure, water supply, and other savings. These savings are considered in a cost-benefit analysis of implementing water conservation in Rifle.

7.1 Modified Water Demand Forecast

Table 7-1 presents projected population, EQRs, and peak day water demands based on successful implementation of the water conservation measures and programs identified in this plan. Population and EQR values are unchanged from those projected in **Table 2-4**. The re-forecasted demands are based on achieving the following reductions in peak day demand through water conservation (as compared to a baseline value of 1,024 gpd/EQR):

- For existing EQRs: 5% reduction in 3 years; 10% in 7 years; 11% in 20 yrs
- For new EQRs: 17% reduction n 3 years; 22% in 7 years; 24% in 20 yrs

Table 7-1: Population, EQR, and Peak Day Water Demand Projections for "Conservation" Condition

Year	Projected Population	Projected Water System EQRs			Projected Peak Day Demand
		CoGen	NonCoGen	Total	
	(capita)	(EQRs)	(EQRs)	(EQRs)	(mgd)
2007	8,800	700	3,775	4,475	4.6
2008	9,383	700	4,025	4,725	4.8
2009	9,965	700	4,275	4,975	4.9
2010	10,548	700	4,525	5,225	5.0
2011	11,130	700	4,775	5,475	5.1
2012	11,713	700	5,025	5,725	5.3
2013	12,412	700	5,325	6,025	5.5
2014	13,111	700	5,625	6,325	5.7
2015	13,810	700	5,925	6,625	5.9
2016	14,509	700	6,225	6,925	6.2
2017	15,208	700	6,525	7,225	6.4
2018	15,907	700	6,825	7,525	6.6
2019	16,606	700	7,125	7,825	6.8
2020	17,305	700	7,425	8,125	7.1
2021	18,004	700	7,725	8,425	7.3
2022	18,703	700	8,025	8,725	7.5
2023	19,402	700	8,325	9,025	7.7
2024	20,101	700	8,625	9,325	7.9
2025	20,800	700	8,925	9,625	8.2
2026	21,499	700	9,225	9,925	8.4
2027	22,198	700	9,525	10,225	8.6

A comparison of **Tables 2-4** and **7-1** shows that by 2027, meeting the conservation goals is projected to reduce the peak day demand by almost 1.9 mgd (18%). Not shown is that it is not until 2033 in the "with conservation" condition that peak day demand exceeds 10

mgd. Thus, water production capacity expansion beyond 10 mgd would be deferred by about 7 years as compared to the "no conservation" condition.

7.2 Modified Potable System Improvements Forecast

Re-forecasted water demands allow for the timing and capacity of water system infrastructure projects to be modified. **Table 7-2** below presents a summary of re-forecasted water system improvement project costs. **Appendix A** contains a detailed listing of individual projects. The main effects of conservation are:

- Immediate BCWTP (or other) production capacity improvements would be able to be delayed one to two years (bumped from 2010 to 2011/12)
- The major expense for a new WTP to replace the GMWTP could be delayed by about three to four years (2014 to 2017/18).
- A final production capacity expansion within the study period could be delayed six to seven years (2025 to 2031/32).
- Storage/distribution improvements could be deferred about 2 years, on average.
- Within a 20-year planning timeframe peak day production needs could be reduced by almost 1.9 mgd, which might be expected to translate into about $2.8 million in water treatment capacity savings. In **Table 7-2**, this is accounted for by a reduction in the cost of the final plant expansion, which is shown as deferred until 2031. The cost savings, alternatively, could be achieved by constructing a lower-capacity replacement plant for the GMWTP in 2017.

[**Note**: During development of this plan, the infrastructure plan for the "no conservation" case was continuing to evolve due to changing water demand projections and in response to the findings of various studies. The "no conservation" water system capital improvements plan has changed since the completion of this conservation plan, and thus the ability of conservation to defer certain projects will change; however, the changes are not anticipated to affect the major findings of this plan – that is, the projected value of conservation in reducing peak demand and long-term infrastructure capacity needs and associated costs.]

Table 7-2: Projected 20-Year Potable Water System Capital Improvement Costs for "Conservation" Case

	Projected Capital Improvement Costs (in $M in year 2006)			
Year	**GMWTP/New WTP**	**BCWTP**	**Dist. & Storage**	**Other[1]**
2008	$0.04		$0.200	$0.100
2009	$0.26	$0.315	$0.315	$0.010
2010			$0.48	
2011	$0.40	$7.030		
2012				$0.03
2013				$0.040
2014				
2015				
2016			$0.320	$0.150
2017	$23.35		$2.60	$0.040
2018				
2019	$2.55			
2020				
2021		$1.300		$0.025
2022				
2023				$0.040
2024			$2.93	
2025				
2026				
2027				
2028				
2029				
2030				
2031	$2.60			
Totals	**$29.2**	**$8.7**	**$6.8**	**$0.44**

1. Consists primarily of various evaluations/studies

7.3 Conservation Effect on Water Supply Needs

Detailed water accounting calculations were made, in accordance with the City's current augmentation plan, to calculate Colorado River depletions that would occur through 2027 due to out-of-priority diversions required in both the "no conservation" and "conservation" scenarios. The base assumption is that when the City's current Ruedi Reservoir contract for stored augmentation water expires in 2019, the City will need to purchase additional storage to cover these depletions. The analysis accounts for an additional 124 ac-ft/yr due to dry up of existing historical irrigation rights it owns that have not yet been converted to depletion credits through an augmentation plan. The analysis does not account for the possibility that future developers will dedicate significant senior water rights to the City upon annexation. If sufficient rights are transferred, the City may not need to acquire any augmentation water within the study period. However, based on the assumptions used, the analysis indicates that:

- A total of 13 ac-ft, occurring only in the last year of the study period, 2027, would need to be augmented in the "conservation" case.
- A total of 446 ac-ft, occurring over 2022 through 2027, with a maximum of 148 ac-ft in 2027, would need to be augmented in the "no conservation" case.

- The difference is a maximum annual need of 135 ac-ft.
- At a cost of $150 per ac-ft (the current market rate for Ruedi Reservoir storage), eight years of 135 ac-ft/yr storage amounts to a potential savings of about $160K.

7.4 Revenue Impacts of Conservation

One of the major existing City water system needs and one of the primary water conservation programs recommended by this plan is the implementation of a new water rate structure. The City currently needs to increase revenue to achieve a financially more self-sustaining system. The impact of reducing peak water use will be a reduction in the peak rate tier in which many customers will fall during irrigation months. The reduced irrigation season use will also reduce the total amount of water consumed and billed. This will reduce revenue unless rates are set properly. Development of the new rate structure will need to consider this impact in order to achieve sufficient revenue. The rates will likely need to be re-evaluated annually once the new structure is implemented to determine how customers' water use behavior has responded. Rates would then be adjusted iteratively in subsequent years to help achieve simultaneously the City's revenue and water conservation goals.

8.0 Implementation Plan

8.1 Implementation Plan and Schedule by Program Element

Table 8-1 is a preliminary outline and schedule of how and when each measure / program will be implemented. Each one will require staff time to plan and implement, therefore the schedule is intended to provide some flexibility.

The Implementation Plan takes into consideration the following:

- Staff/consultant resources to implement
- Time sensitivity of delaying water and wastewater treatment improvements
- Costs of implementation

8.2 Plan for Public Participation in Implementation

Measure #7, 'Spearhead the creation of a City Water Conservation Taskforce,' is intended to involve the general public and stakeholders to the fullest extent possible. The idea is that the Taskforce will make recommendations to the City on implementation strategies and participate in implementation as appropriate.

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Table 8-1: Implementation Plan and Schedule by Program Element

City of Rifle Water Conservation Plan - Implementation

	Measure / Program	Required Action	Beginning Date	Completion Date	Notes
1	Modified water rates to promote conservation	1. Develop tiered rate structure (using alt. 1 or alt. 2) to reduce peak water demand; 2. City Council to adopt rate structure; 3. inform customers of increase	Jun 2008	Dec 2008	Re-evaluate rate structures during annual budget process and increase/decrease as appropriate
2	Improve system-wide water accounting	1. Install finished water flow meter at the Graham Mesa WTP. 2. Develop and utilize a spreadsheet for tracking all accounted-for water on a monthly basis next to water production figures. 3. Define EQR start point and track all subsequent and future additions.	Oct 2008	Apr 2009	Important to do as soon as possible - 2008/09 low water demand season.
3	Create & enforce Water Waste ordinance	1. Review examples of comparable waste ordinances; 2. Develop enforcement plan; 3. Revise and adopt new ordinance; 3. Enforce as appropriate	Jun 2009	Dec 2009	Important, but not time critical
4	Develop and implement a rebate program for smart irrigation controllers	1. Verify local availability; 2. Establish rebate amount based on net cost increase compared to conventional controls; 3. Develop protocol for disbursing rebates.	Jan 2009	Apr 2009	It would be very helpful to track water use and retrieving data should be incorporated into protocol.
5	Establish landscaping & irrigation design requirements for new development	1. Adopt Dr. Swifts' Landscape and Irrigation Specifications into the City code; 2. Modify the permit process to include Irrigation Permits and inspection; 3. Randomly audit water accounts to verify post CO compliance	Oct 2008	Jun 2009	It would be beneficial to have the water conservation website (#6) up prior to implementing this measure.
6	Establish high-efficiency indoor plumbing fixture design requirements for new development	1. Establish mimimum standards for fixtures; 2. Incorporate standards into municipal code; 3. Incorporate inspection procedures	Jan 2009	Dec 2009	If additional 'green building' standards are contemplated, incorporate them at the same time.
7	Create a water conservation taskforce	1. Solicit membership for task force from primary stakeholders & general public for the purpose of advising on and promoting water conservation efforts; 2. Assign staff liaison; 3. Review all actions with task force	July 2008	Dec 2008	Create early to facilitate implementation of all other measures and programs.
8	Create a water conservation website	1. Develop website with water conservation tips; 2. Promote prominently on homepage and in City Hall; 3. Update seasonally	Oct 2008	Mar 2009	Good to have in place early as a coordination and education tool.

Table 8-1 Cont.: Implementation Plan and Schedule by Program Element

9	Implement City facility (indoor) conservation measures	1. Replace all urinals with waterless urinals; 2. Replace all >1.6 gpf toilets; 3. Replace all other plumbing fixtures with low-flow types with attrition	Jan 2009	Dec 2009	Not time-critical, but good as an educational tool. Do high public-traffic sites first.
10	Create a City facility water efficient plumbing fixture & appliance policy	1. Develop and adopt policy that requires all applicable new city-funded plumbing fixtures (new construction or replacement) to meet EPA WaterSense standards	Oct 2008	Mar 2009	May want to coord-inate implementation with creating new requirements for new development (#6)
11	Replace existing City facility landscape with xeriscape	1. Identify all potential landscapes that could be replaced with xeriscape, 2. Plan replacement as demonstration project; 3. Replace landscape and irrigation system	Jan 2009	Dec 2010	Planning in early 2009 with implementation during 2009 and 2010.
12	Develop an irrigation and xeriscape workshop	1. Use City landscape retrofit project as spring public demonstration; 2. Advertise and film the event; 3. Air the video of the demonstration on public TV; 4. Plan to be annual event	May 2009	Aug 2009	If a retrofit project is not ready in 2009 as a demo. site, event may need to be held in Spring 2010.
13	Create a City facility water-efficient landscaping policy	1. Develop and adopt policy that requires all new City landscapes and irrigation systems meet Dr. Swift's specifications.	Sep 2009	Feb 2010	Use experience of creating new development landscape requirements (#5).
14	Provide water conservation tips & info in water bills	1. Increase use of message blocks to promote water conservation measures and programs; 2. Evaluate feasibility of providing historical water use data for comparison	Sep 2008	Jun 2009	Coordinate roll-out timing with new water rate structure and 2009 irrigation season.
15	Provide free audits for top 10 water users	1. Identify the top 10 water users; 2. Contact and inquire about desire to have audit conducted; 3. Match user with appropriate auditor; 4. Coordinate audit.	May 2009	Aug 2009	It is likely that different users will require different auditing services.
16	Purchase, distribute and display brochures on water-efficient landscape and irrigation practices and design	1. Identify brochures and numbers to purchase; 2. Secure agreements at supply stores and other locations; 3. Purchase and distribute brochures.	Jan 2009	May 2009	Target brochure roll-out for spring/summer 2009.
17	Restrict City use of water features/fountains to those serving useful function only	1. Draft and request adoption of policy articulating this measure; 2. Establish the policy in everyday practice.	July 2009	Dec 2009	Not time-critical

9.0 Monitor, Evaluate, and Revise Conservation Activities and the Conservation Plan

The development of this water conservation plan benefited greatly from the successful monitoring and evaluation of other plans. It is the intent to maintain the same level of data collection in the monitoring and evaluation of this plan.

9.1 Plan for Monitoring and Evaluation Processes

Table 9-1 outlines the information needed to accurately monitor and evaluate the implementation progress of all measures and programs. In addition to the data collection described below, total annual system-wide water use and population data will be compared with historical and projected demands to determine overall savings. Annual and seasonal water use by account type will also be evaluated with consideration of climatic and other noteworthy factors.

9.2 Plan for Updating and Revising the Conservation Plan

The City will update and revise the plan as necessary, but in no longer than seven years, as required by CWCB. Factors that will impact how frequent the plan needs updating include its determined success (or lack thereof), water availability, infrastructure needs, and customer participation.

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Table 9-1:Plan for Monitoring and Evaluating the Implementation Process

City of Rifle Water Conservation Plan - Monitoring Plan

	Measure / Program	Data Collection
1	Modified water rates	Random, periodic review of water use from various accounts.
2	System-wide water accounting	Monthly balancing of water produced and water delivered.
3	Strengthen & enforce Water Waste ordinance	Annual review of citation/warnings issued and before/after water usage comparisons for those receiving citations.
4	Develop and implement a rebate program for smart irrigation controllers.	Annual review number of rebates disbursed and tracking of water use for those accounts receiving rebates.
5	Landscaping & irrigation design requirements	Annual review of seasonal water use in newly constructed homes. Compare use to pre-existing development.
6	Establish high-efficiency indoor plumbing fixture design requirements for new development.	Annual review of seasonal water use in newly constructed homes. Compare use to pre-existing development.
7	Water Conservation Taskforce	Annual review of volunteer member and hour numbers and contribution to program.
8	Water conservation website	Annual review number of hits.
9	Municipal facility (indoor) conservation measures	Record number of and location of new fixtures/appliances, when replaced, cost of replacement and difference in listed volume.
10	Plumbing fixture & appliance policy - City facilities	Record number of and location of new fixtures/appliances, when replaced, cost of replacement and difference in listed volume.
11	Replace landscape with xeriscape	Record number of acres and location of repalced sprinklerheads, when replaced, cost of replacement, details regarding sprinkler activity, and difference in listed volume.
12	Irrigation and xeriscape workshop	Record number of attendees/participants and cost to host event.
13	New water-efficient landscapes	Record number of acres and location of new landscape, cost of installation, details regarding irrigation system and activity. Make annual comparisons of per acre use at City facilities with water-efficient versus conventional landscaping.
14	Water bills tips/information	Record number of messages distributed and number of phone calls and emails received regarding the messages.
15	Free audits for top 10 water users	Track and monitor account data for these users before audit, after audit, and after implementation of any reduction measures. Record cost to audit and implement solutions.
16	Purchase and distribute/display brochures on water-efficient landscape and irrigation practices and design	Track brochure consumption numbers annually. Periodically survey personnel where brochures are displayed to understand public reaction and gauge effectiveness.
17	Restrict City use of water features/fountains	Periodically review policy.

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Appendix A

Capital Improvements with and without Water Conservation

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Table A-1: Projected Capital Improvements Program – NO CONSERVATION CASE

Year	Project Description	Estimated Cost ($M)
2008	GMWTP Clar-Vac Drive Replacement (sed. basin)	$0.025
2008	GMWTP Slide Gates Replacement (contingency to replace one gate)	$0.010
2008	GMWTP Flocculator Baffle Panel (repair only)	$0.008
2008	BCWTP CO River Intake Siting/Approach Evaluation	$0.075
2008	Water Rights/Aug. Plan Update	$0.025
2008	W. Rifle Auto-isolation Valve	$0.090
2008	W. Rifle Tank Mixing	$0.055
2008	Airport Tank Mixing	$0.055
2009	Unidirectional flushing program development	$0.010
2009	BCWTP 600-kgal Res. Improvements	$0.315
2009	River Crossing Flow Meter	$0.110
2009	W. Rifle Re-zoning	$0.060
2009	Airport Area Re-zoning	$0.120
2009	W. Rifle Auto-flush Hydrant	$0.025
2009	GMWTP HVAC Improvements	$0.100
2009	GMWTP Finished Water Flowmeter	$0.045
2009	GMWTP Light Fixtures	$0.030
2009	GMWTP RW Pipe Gallery Improvements	$0.065
2009	GMWTP MIOX System Improvements	$0.020
2009	BCWTP CO River RWPS	$0.650
2009	BCWTP CO River Raw Water Transmission Line	$1.540
2009	South side low-head BPS and minor water transmission upgrades	$1.000
2009	BCWTP 1.2-MGD (sized for 2.2 MGD) MF Facility	$2.700
2009	BCWTP Spent Backwash/Flush Water Reclamation Adder (2nd MF stage)	$0.250
2009	BCWTP Pre-Oxidant (KMnO4 at RWPS)	$0.150
2009	BCWTP 2.2-MGD Chem. Feed/Mixing and Raw Water Flow Metering	$0.200
2009	BCWTP 2.2-MGD Flocculation	$0.250
2009	BCWTP Control System Improvements	$0.030
2009	BCWTP 12" Sewer Line to base of Mesa	$0.160
2009	BCWTP Facility/workspace improvements (as part of new building)	$0.100
2010	Intermediate/NE Zone Boundary Shift	$0.125
2010	Northwest Rifle Re-zoning and pipeline	$0.350
2011	GMWTP Flocculators Replacement Contingency (replace one unit)	$0.070
2011	GMWTP Raw/Fin Water Line Repair Contingency	$0.250
2011	GMWTP Filter Carriage Repair Contingency	$0.075
2011	S. Rifle Tank Siting Evaluation	$0.010
2011	Water Master Plan Update	$0.020
2013	Water Conservation Plan Update	$0.015
2013	Water Rights Portfolio Update	$0.025
2014	New Rifle Pond WTP - 8- MGD MF-based	$20.000
2014	New 24" finished water line for Rifle Pond WTP	$3.200
2014	Rifle Pond RWPS conversion to low-head at 6 mgd	$0.120
2014	New 24" short RW line for Rifle Pond WTP	$0.030
2016	Old RWPS Demo. & Site Reclaim.	$0.075
2016	Water Master Plan Update	$0.075
2018	Water Rights Portfolio Update	$0.025
2018	Water Conservation Plan Update	$0.015
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2019	GMWTP FW Line Upgrade (from end of new PVC to Tank)	$0.650
2019	2nd FW Line From New WTP Direct to Core	$1.900
2020	0.6-MG S. Rifle Tank (with transmission lines)	$1.730
2020	New 24" Line from 3-MG Tank to Hwy 13	$1.200
2021	Water Master Plan Update	$0.025
2022	BCWTP RW Line Replace	$1.300
2023	Water Rights Portfolio Update	$0.025
2023	Water Conservation Plan Update	$0.015
2024	2-MGD CO River WTP Expansion	$5.000
2016	Water Master Plan Update	$0.075

Table A-2: Projected Capital Improvements Program – WITH CONSERVATION CASE

Year	Project Description	Estimated Cost ($M)
2008	GMWTP Clar-Vac Drive Replacement	$0.025
2008	GMWTP Slide Gates Replacement Contingency (replace one gate)	$0.010
2008	GMWTP Flocculator Baffle Panel (repair only)	$0.008
2008	BCWTP CO River Intake Siting/Approach Evaluation	$0.075
2008	Water Rights/Aug. Plan Update	$0.025
2008	W. Rifle Auto-isolation Valve	$0.090
2008	W. Rifle Tank Mixing	$0.055
2008	Airport Tank Mixing	$0.055
2009	Unidirectional flushing program development	$0.010
2009	BCWTP 600-kgal Res. Improvements	$0.315
2009	River Crossing Flow Meter	$0.110
2009	W. Rifle Re-zoning	$0.060
2009	Airport Area Re-zoning	$0.120
2009	W. Rifle Auto-flush Hydrant	$0.025
2009	GMWTP HVAC Improvements	$0.100
2009	GMWTP Finished Water Flowmeter	$0.045
2009	GMWTP Light Fixtures	$0.030
2009	GMWTP RW Pipe Gallery Improvements	$0.065
2009	GMWTP MIOX System Improvements	$0.020
2010	Intermediate/NE Zone Boundary Shift	$0.125
2010	Northwest Rifle Re-zoning and pipeline	$0.350
2011	BCWTP CO River RWPS	$0.650
2011	BCWTP CO River Raw Water Transmission Line	$1.540
2011	South side low-head BPS and minor water transmission upgrades	$1.000
2011	BCWTP 1.2-MGD (sized for 2.2 MGD) MF Facility	$2.700
2011	BCWTP Spent Backwash/Flush Water Reclamation Adder (2nd MF stage)	$0.250
2011	BCWTP Pre-Oxidant (KMnO4 at RWPS)	$0.150
2011	BCWTP 2.2-MGD Chem. Feed/Mixing and Raw Water Flow Metering	$0.200
2011	BCWTP 2.2-MGD Flocculation	$0.250
2011	BCWTP Control System Improvements	$0.030
2011	BCWTP 12" Sewer Line to base of Mesa	$0.160
2011	BCWTP Facility/workspace improvements (as part of new building)	$0.100
2011	GMWTP Flocculators Replacement Contingency (replace one unit)	$0.070
2011	GMWTP Raw/Fin Water Line Repair Contingency	$0.250
2011	GMWTP Filter Carriage Repair Contingency	$0.075
2012	S. Rifle Tank Siting Evaluation	$0.010
2012	Water Master Plan Update	$0.020
2013	Water Conservation Plan Update	$0.015
2013	Water Rights Portfolio Update	$0.025
2016	Old RWPS Demo. & Site Reclaim.	$0.075
2016	Acacia Ave. 8" line extension across creek to Whiteriver ave.	$0.320
2016	Water Master Plan Update	$0.075
2017	New Rifle Pond WTP - 8- MGD MF-based	$20.000
2017	New 24" finished water line for Rifle Pond WTP	$3.200
2017	Rifle Pond RWPS conversion to low-head at 6 mgd	$0.120
2017	New 24" short RW line for Rifle Pond WTP	$0.030
2017	Water Rights Portfolio Update	$0.025
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2017	Water Conservation Plan Update	$0.015
2017	Other Baseline DS Projects (need to be phased in gradually over 20 yrs)	$2.600
2019	GMWTP FW Line Upgrade (from end of new PVC to Tank)	$0.650
2019	2nd FW Line From New WTP Direct to Core	$1.900
2021	Water Master Plan Update	$0.025
2022	BCWTP RW Line Replace	$1.300
2023	Water Rights Portfolio Update	$0.025
2023	Water Conservation Plan Update	$0.015
2024	0.6-MG S. Rifle Tank (with transmission lines)	$1.730
2024	New 24" Line from 3-MG Tank to Hwy 13	$1.200
2030	2-MGD CO River WTP Expansion	$5.000

Appendix B

Definition of Terms

appropriation. The right to withdraw water from its source.

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

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

available supply. The maximum amount of reliable water supply, including surface water, groundwater, and purchases under secure contracts.

average-day demand. A water system's average daily use based on total annual water production (total annual gallons or cubic feet divided by 365); multiple years can be used to account for yearly variations.

avoided cost. The savings associated with undertaking a given activity (such as demand management) instead of an alternative means of achieving the same results (such as adding supply); can be used to establish the least-cost means of achieving a specified goal. Can be measured in terms of **incremental cost.**

baseline. An established value or trend used for comparison when conditions are altered, as in the introduction of water conservation measures.

beneficial use. A use of water resources that benefits people or nature. State law defines beneficial use.

benefit-cost analysis. A comparison of total benefits to total costs, usually expressed in monetary terms; used to measure economic efficiency and evaluate alternatives. See **cost-effectiveness** and **avoided cost.**

best management practice. A measure or activity that is beneficial, empirically proven, cost-effective, and widely accepted in the professional community.

block. A quantity of water for which a price per unit of water (or billing rate) is

established.

budget (water-use). An accounting of total water use or projected water use for a given location or activity.

capital facilities. Physical facilities used in the production, transmission, treatment, and distribution of water or the collection, treatment, and disposal of wastewater.

CII customers. Commercial, institutional, and industrial water users.

commodity charge. See **variable charge**.

community water system. According to the federal Safe Drinking Water Act, a drinking water conveyance system serving at least 15 service connections used by year-round

residents of the area served by the system or regularly serving at least 25 year-round residents.

conservation (water). Any activity that increases the productivity of water supply and use in order to satisfy water needs without compromising desired water services.

Includes **water use efficiency**, **wise water use**, **system efficiency**, and **supply substitution**.

conservation pricing. Water rate structures that help achieve beneficial reductions in water usage. See **non-promotional** rates.

consumptive use. Use that results in water being unavailable for recapture within a local or regional water system; e.g., **evapotranspiration** of irrigation water into the air.

cost effectiveness. A comparison of costs required for achieving the same benefit by different means. Costs are usually expressed in dollars, but benefits can be expressed in another unit (such as a quantity of water). See **net benefits.**

covered entity. As defined by the Water Conservation Act, any " municipality, agency, utility, including any privately owned utility, or other publicly owned entity with a legal obligation to supply, distribute, or otherwise provide water at retail to domestic, commercial, industrial, or public facility customers, and that has a total demand for such customers of two thousand acre-feet or more."

curtailment. Actions that forego or reduce desired water uses; e.g., prohibitions on lawn watering or car washing during a drought water emergency. In this document, curtailment is not considered **water conservation**. See **rationing.**

customer class. A group of customers (residential, commercial, industrial, wholesale, and so on) defined by similar costs of service or patterns of water usage.

decreasing-block (or declining-block) rate. A pricing structure for which the dollar amount charged per unit of water (such as dollars per gallon) decreases with the amount water usage.

demand forecast. A projection of future demand that can be made on a system-wide or customer-class basis.

demand management or **demand-side management.** Measures, practices, or programs deployed by water utilities to permanently reduce the level or change the pattern of demand for a utility service.

demographic. Having to do with population or socioeconomic conditions.

discount rate. A percentage that is used to adjust a forecast of expenditures to account for the time value of money or opportunity costs; it can be based on the utility's cost of capital.

distribution facilities. Pipes, treatment, storage and other facilities used to distribute drinking water to end users.

drought. A sustained period of inadequate or subnormal precipitation that can lead to water supply shortages, as well as increased water usage.

efficiency. Reduced use or losses of a resource while providing a desired service, or increased level of productivity per unit of a resource. See **water use efficiency** and **system efficiency.**

end use. Fixtures, appliances, and activities that use water.

end user. Residential, commercial, industrial, governmental, institutional or other water user that applies water to **beneficial use**.

EQR. Equivalent residential unit. A measure used to express the water use of all different types of development (commercial, industrial, etc.) in terms of that used by a typical, detached single family residence.

escalation rate. A percentage that is used to adjust a forecast of expenditures to account for the increasing value of a good or service over time (apart from the discount rate and inflationary effects).

evapotranspiration. Water losses from the surface of soils and plants.

fixed charge. The portion of a water bill that does not vary with water usage.

fixed costs. Costs associated with water service that do not vary with the amount of water produced or sold.

graywater. Water captured after initial use and reused for nonpotable purposes, such as irrigation, usually with minimal treatment.

increasing-block (or inclining-block) rate. A pricing structure for which the dollar amount charged per unit of water (such as dollars per gallon) increases with the amount water usage.

incremental cost. The additional cost associated with adding an increment of capacity.

instream flow. River and stream waters that maintain stream quality, aquatic life, and recreational opportunities.

integrated resource planning. An open and participatory planning process emphasizing least-cost principles and a balanced consideration of supply and demand management options for meeting water needs.

investor-owned utility. A private utility owned by investors and regulated by the Colorado Public Utility Commission.

irrigation scheduling. A method for optimizing outdoor water use by matching the watering schedule to plant needs; can refer to manual or automated scheduling.

large-volume user. A water customer, usually industrial or wholesale, whose usage is substantial relative to other users; large-volume users may present unique peaking or other demand characteristics.

leak detection. Methods for identifying water leakage in pipes and fittings.

life span. The expected useful life of a supply-side or demand-side project, measure, or practice. (The life span may not be identical to useful life for tax purposes.)

load management. Methods for managing levels and patterns of usage in order to optimize system resources and facilities.

losses (water). Metered source water less revenue-producing water and authorized

un-metered water uses.

low water-use landscaping. Use of landscape designs and plant materials that are appropriate to an area's climate and growing conditions (usually native and adaptive plants). See **Xeriscape™.**

market penetration. The extent to which an activity or measure is actually implemented compared to all potential uses or markets.

marginal-cost pricing. A method of rate design where prices reflect the costs associated with producing the next increment of supply.

master metering. A large meter at a point of distribution to multiple uses or users that could be further sub-metered. Includes metered wholesale sales.

maximum-day demand. Total production for the water system on its highest day of production during a year.

measure (conservation). A technology or practice that directly reduces water use.

meter. An instrument for measuring and recording water volume.

mixed-use meter. A meter measuring water use for more than one type of end use

(such as indoor and outdoor use).

model plan. The template for water conservation plan structure and content provided in this document; includes the "scope of work" (recommended headings and content) and worksheets for each planning step.

needle peaks. Persistent levels of **peak demand** that drive the capacity needs of a water system despite reductions in **average demand.**

net benefits. The numerical difference between total benefits and total costs, both of which must be expressed in the same unit (usually dollars). See **cost-effectiveness.**

net present value. The present value of benefits less the present value of costs.

nominal dollars. Forecast dollars that are not adjusted for inflation.

non-account water. Metered source water less metered water sales.

non-consumptive use. Water withdrawn and returned to the source.

non-promotional rates. Rates that do not encourage additional consumption by water users.

non-residential customer. A commercial or industrial utility customer.

normalization. Adjustment of a variable to a "normal" level based on averaging over an accepted period of time; used in forecasting.

opportunity cost. The value of a foregone opportunity that cannot be pursued because resources are taken up by a chosen activity.

peak demand. The highest point of total water usage experienced by a system, measured on an hourly or a daily basis.

per-capita use. Total use divided by the total population served.

per-capita residential use. Residential use divided by the total population served.

phreatophyte. A plant that obtains water from the water table or the unsaturated zone just above it. Often found along water supply canals, phreatophytes can consume significant quantities of water through evapotranspiration, reducing the availability of water to a water system and its users.

precipitation rate (sprinkling). The surface application rate for landscape watering, usually expressed in inches per hour.

present value. Future expenditures expressed in current dollars by adjusting for a discount rate that accounts for the time value of money.

pressure regulator. A post-meter device used to limit water pressure.

price elasticity of demand. A measure of the responsiveness of water usage to changes in price; measured by the percentage change in usage divided by the percentage change in price.

program (conservation). An action or policy that encourages, requires, or otherwise leads to implementation of water-saving **measures**.

rationing. Mandatory water-use restrictions sometimes used under drought or other emergency conditions. See **curtailment**.

raw water. Untreated water.

reclamation. Treatment of used water to make it available for beneficial reuse.

real dollars. Forecast dollars that are adjusted for inflation.

retrofit. Replacement of parts in an existing plumbing fixture or water-using appliance in order to improve its operational efficiency.

revenue-producing water. Water metered and sold.

reuse (water). Beneficial use of treated wastewater.

Safe Drinking Water Act (SDWA). Federal drinking water quality legislation administered by the U.S. Environmental Protection Agency (EPA) through state primacy agencies; amended in 1996.

safe yield. The maximum reliable amount that can be withdrawn from a source without compromising quality or quantity, as defined by hydrological studies; can be based on acceptable withdrawals during a critical supply period or drought with a specific probability of occurrence.

seasonal rate. A pricing structure for which the dollar amount charged per unit of water (such as dollars per gallon) varies by season of use; higher rates usually are charged in the season of **peak demand.**

sensitivity analysis. An analysis of alternative results based on variations in assumptions; a "what if" analysis.

service area or **service territory.** The geographic area served by a water utility.

source-of-supply. Facilities used to extract and/or store raw water prior to transmission and distribution.

source meter. A meter used to record water withdrawn from a surface water or groundwater source, or purchased from a wholesale supplier.

State Revolving Fund (SRF). State loan funds for water utilities established under the Safe Drinking Water Act.

supply management or **supply-side management.** Measures and programs deployed by the utility that improve the efficiency of production, transmission, and distribution facilities.

submetering. Metering for units comprising a larger service connection, such as apartments in a multifamily building.

surcharge. A special charge on a water bill used to send customers a specific pricing signal and recover costs associated with a particular activity.

system (water). A series of interconnected conveyance and treatment facilities owned and operated by a water supplier; some utilities operate multiple water systems.

system efficiency. Water conserving improvements to a water supply and distribution system, such as operational changes that stretch supplies or distribution system leak repairs that reduce water losses.

supply substitution. Use of alternative supply sources to increase the productivity of water supplies; for instance, dry year leases from agricultural water rights holders, use of reclaimed wastewater, etc.

take-or-pay. A contract provision obligating a purchaser to pay for a commodity whether or not delivery is taken.

tariff. The schedule of a **utility**'s rates and charges.

toilet tank displacement device. A plastic bag or dam installed in a toilet tank to reduce flush volume. Considered effective only for fixtures using more than 3.5

gallons per flush.

toilet flapper. Valve in the toilet tank that controls flushing.

transfers (water). Exchange of water among willing buyers and sellers.

transmission facilities. Pipes and canals used to transport raw or treated water to distribution facilities.

treated water. Water treated to meet drinking water standards.

ultra-low-flush toilet. A toilet that uses not more than 1.6 gallons per flush.

unaccounted-for water. The amount of **nonaccount** water less known or estimated losses and leaks.

uniform rate. A pricing structure for which the dollar amount charged per unit of water (such as dollars per gallon) does not vary with the amount of water usage.

universal metering. Metering of all water-service connections.

Un-metered water. Water delivered but not measured for accounting and billing

purposes.

user class. See customer class.

utility. An organization that provides a commodity or service, such as water supply, to end users.

variable charge. The portion of a water bill that varies with water usage; also known as a commodity charge.

variable cost. Costs associated with water service that vary with the amount of water produced or sold.

Water Conservation Act. The "Water Conservation Act of 2004," which amended

Section 37-60-126 of the Colorado Revised Statutes concerning water conservation planning by **covered entities** and the role of the state with regards to plan review and approval.

water right. A property right or legal claim to withdraw a specified amount of water in a specified time frame for a beneficial use.

watershed. A regional land area, defined by topography, soil, and drainage characteristics, within which raw waters collect and replenish supplies.

water use efficiency. Technologies and practices that provide the same or better level of end-use service, e.g., toilet-flushing or showering, with less water.

wise water use. Includes "water-conserving behaviors" such as not letting the water run while shaving or brushing one's teeth, and "water-wise choices" such as installing low-water-use plants or xeric landscaping instead of conventional turf.

weather-adjusted. Water demand, revenues, or other variables adjusted to a "normal" weather year; also known as weather **normalization.**

wholesale water. Water purchased or sold for resale purposes.

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

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Appendix C

Public Review and

City Council Approval

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July 7, 2008

Veva Deheza
Section Chief
Office of Water Conservation and Drought Planning
Colorado Water Conservation Board
1313 Sherman St., Room 721
Denver, CO 80203

Re: City of Rifle Water Conservation Plan – City Council and Public Input

Dear Veva,

The purpose of this letter is to document the public review/comment process and the City Council input/approval process executed during development of the City of Rifle Water Conservation Plan. The following bullets summarize these processes:

Public Review & Comment:

- The City held three open public meetings at which the Water Conservation Plan was discussed and the floor was opened for public comment. The Water Conservation Plan discussions were listed on the meeting agendas, which are made available to the public on the City's website at least one week prior to the meeting. These were City Council meetings as follows:
  - December 19, 2007 – initial introduction to Council/public of the water conservation planning project
  - May 21, 2008 – presentation and discussion of the draft Plan
  - July 2, 2008 – final comment solicitation on the draft Plan

- The City posted a public notice in the Glenwood Springs Post-Independent (proof of publication attached) and the Rifle Citizen-Telegram announcing the availability of the draft Plan for review and comment for a 60-day period. Hardcopies were made available for review at City Hall and the draft Plan was posted in PDF on the City's website.

- No public comments were received during the 60-day period.

City Council Input & Approval:

- As noted above, the Water Conservation Plan was discussed at three regular City Council meetings, plus one Council Worksession (on December 19). Comments during the meetings were largely supportive of pursuing water conservation.

- City Council provided verbal comments and asked questions regarding the draft Plan at the July 2, 2008 meeting, which coincided with the closing of the 60-day public review period. The comments were largely supportive. The most significant comment was concern regarding the funding and resources required to implement the Plan. It was recognized that program phasing and grant fund acquisition will be critical to the program's successful implementation. The Council voted unanimously to approve the Plan.

If you have any questions, or need any further information or documentation regarding the public review and/or City Council aspects of the plan development process, please do not hesitate to contact me at 970-625-6272.

Sincerely,

Charles G. Stevens
Utility Director
City of Rifle

Attachment: draft plan review notice proof of publication

41496

PROOF OF PUBLICATION
GLENWOOD SPRINGS POST INDEPENDENT

STATE OF COLORADO, COUNTY OF GARFIELD (ss)

I, Andrea Porter, do solemnly swear that I am

Publisher of THE GLENWOOD SPRINGS POST INDEPENDENT; that the same is a weekly newspaper printed, in whole or in part, and published in the County of Garfield, State of Colorado and has a general circulation therein; that said newspaper has been published continuously and uninterruptedly in said County of Garfield for a period of more than fifty-two consecutive weeks next prior to the first publication of the annexed legal notice or advertisement; that said newspaper has been admitted to the United States mails as second-class matter under the provisions of the Act of March 3, 1879, or any amendments thereof, and that said newspaper is a weekly newspaper duly qualified for publishing legal notices and advertisements within the meaning of the laws of the State of Colorado.

That the annexed legal notice or advertisement was published in the regular and entire issue of every number of said weekly newspaper for the period of 1 consecutive insertions; and that the first publication of said notice was in the issue of said newspaper dated May 2 A.D., 20 08, and the last publication of said notice was in the issue of said newspaper dated May 2 A.D., 20 08.

In witness whereof I have hereunto set my hand this 2 day of May A.D., 20 08.

General Manager/Publisher

Subscribed and sworn to before me, a notary public in and for the County of Garfield, State of Colorado, this 2 day of May A.D., 20 08.

(SEAL)

NOTARY PUBLIC MARY E. BORKENHAGEN STATE OF COLORADO

My Commission Expires 08/27/2011

Mary E. Borkenhagen
Notary Public Signature

My Commission expires 8/27/2011

2014 Grand Avenue Glenwood Springs, CO 81601

PUBLIC NOTICE
CITY OF RIFLE
202 RAILROAD AVENUE
RIFLE, COLORADO 81650

The City of Rifle is developing a water conservation plan. The public is invited to review and comment on the draft plan document. The draft document will be available electronically on the City's website at www.rifleco.org/index.asp?NID=141 paper copies will also be available at Rifle City Hall (Utilities Department), located at 202 Railroad Avenue, Rifle, CO 81650. Written comments will be received through July 1, 2008 at 12 Noon at the same address, directed to the attention of Charlie Stevens, Utilities Director. A presentation on the draft conservation plan will be given at the City Council meeting to be held in the Council chambers at City Hall on May 21, 2008. The public will have the opportunity to comment on the plan at that time as well. Formal adoption of the plan is scheduled for the City Council meeting at City Hall on July 2, 2008. Questions may be directed to Charlie Stevens at (970) 625-6272.

April 30, 2008 /s/ Charlie Stevens
Date Utility Director

Published in the Post Independent on May 2, 2008
(1505443)

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