City of Longmont

Water Conservation Master Plan

Revised:
August 19th, 2008

by
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and
Great Western Institute

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City of Longmont
Water Conservation Master Plan

Definitions & Abbreviations

acre-foot (AF)……... Unit of volume to measure water, equivalent to an acre of area covered with one foot of water (325,850 gallons)

AMR…….. Automated meter reading

AWWA……. American Water Works Association

BMP……... Best Management Practice

C-BT…….. Colorado-Big Thompson

CRC……... Center for ReSource Conservation

CWCB……... Colorado Water Conservation Board

DF…….. Dual flush toilets (no more than 1.6 gallons per flush for solids and 0.9 for liquids)

ET……...Evapotranspiration, a combination of water evaporation from soil and exposed surfaces and plant transpiration which is the loss of water from plants

FTE…… Full time engineer

gpd…… Gallons per day

gpcd……...Gallons per capita per day

Gross Per Capita Water Use……Total treated water production divided by total service population

HET……... High efficiency toilet (no more than 1.2 gallons per flush)

HOA……..Home Owner's Association

ICI……..Institutional, commercial, and industrial

MG…….Million gallons

mgd……... Million gallons per day

NCWCD……... Northern Colorado Water Conservancy District

OWCDP……Office of Water Conservation and Drought Planning

Residential Per Capita Water Use…….Total Residential + Multifamily metered treated water demand divided by total service population

RWMP……...Raw Water Master Plan

ULF……Ultra low flow toilets (no more than 1.6 gallons per flush)

WET……...Water Education for Teachers

WTP……...Water Treatment Plant

1.0 Introduction

1.1 Purpose

Throughout its history the City of Longmont (the City) has provided safe, reliable potable water to its residential, commercial, industrial, and institutional water users. The City developed a Water Conservation Master Plan in April of 1996, which has successfully been used to support ongoing water conservation, public education, and residential customer rebate programs. However, due to recent changes in the State requirements, coupled with new developments in the field of water conservation, the City has chosen to update its Water Conservation Master Plan (the Plan). The purposes of the Plan are to assess the overall characteristics of current and future City water use, summarize the current status of raw water supply and treatment capacity, and use this information to frame the City's water conservation program with respect to current and ongoing water supply needs and water demand management. In addition, the Plan provides a detailed assessment related to the identification and selection of future water conservation measures and programs that the City will chose to implement.

Noteworthy is that the City is committed to responsible, environmentally sound, and efficient use of its precious natural resources. Although the City owns and maintains a robust water rights portfolio, it is constantly aware of the need to evaluate and refine its water supply and demand management efforts in light of developing trends and the state of the science. To this point, the City understands that both technology and experience have helped to improve water conservation such that wise water use and water use efficiency can be planned and performed more reliably and predictably than at any time in the past. Finally, the City and its customers recognize the importance of wise water use and water use efficiency as an essential component of the community's culture – helping to maintain the local quality of life in a responsible, sustainable manner.

This Plan therefore, defines future water conservation measures and programs that will promote and support efficient water use by the City's residential, commercial, industrial, and institutional customers. The Plan, which identifies the various stages of water conservation extending for the next ten years, has been prepared in adherence with the prevailing state statutory requirements.

1.2 Organization

This Plan was prepared following the nine steps outlined in the Colorado Water Conservation Board (CWCB) Water Conservation Planning Guidance Document. The nine steps are as follows:

1) Profile of Existing Water System,
2) Characterize Water Use and Forecast Demand,
3) Profile Proposed Facilities,
4) Identify Conservation Goals,
5) Identify Conservation Measures and Programs,
6) Evaluate and Select Conservation Measures and Programs,
7) Integrate Resources and Modify Forecasts,

8) Implementation Plan,
9) Monitor, Evaluate, and Revise.

Each step of the planning process is described in a separate section of the Plan, noting that step nine will occur only after the Plan has been accepted, approved and implemented. A discussion of the current water conservation program is included in its own section, as is demand forecasting.

1.3 Acknowledgements

Development of this plan was not possible without the cooperative effort and support of the Public Works and Water Utilities Department, Parks and Open Space Department, Planning Department, and the Water Board. It was prepared under the leadership of the Public Works and Water Utilities Department and funded with a generous grant from the Colorado Water Conservation Board (CWCB).

2.0 Profile of Existing Water System

The following section includes information on the physical characteristics of the water delivery system, as well as summarizing system conditions that may impact water delivery. The City of Longmont (City) is committed to utilizing water conservation as one approach to ensure future source water supply is adequate. A summary of existing water conservation measures and programs is provided in Section 4, Current Water Conservation Activities.

2.1 Water Sources

Raw water rights are received by the City from the St. Vrain Creek Basin and the Colorado River Basin. St. Vrain Creek Basin includes the North St. Vrain Creek, South St. Vrain Creek, St. Vrain Creek and Left Hand Creek, a tributary to St. Vrain Creek. Headwaters of the North St. Vrain Creek are in Rocky Mountain National Park with Ralph Price Reservoir as the primary water storage facility. Headwaters of South St. Vrain Creek are near the Indian Peaks Wilderness Area. In 2005, 42 percent of Longmont's water supply was from North St. Vrain Creek (*2005 Water Quality Report*). The north and south forks combine to form the St. Vrain Creek near the town of Lyons downstream of Ralph Price Reservoir. Water from St. Vrain Creek can be diverted to Burch Lake (also called Oligarchy Reservoir No. 1) for storage. In 2005, 6 percent of Longmont's water supply was from St. Vrain Creek (*2005 Water Quality Report*).

The City also has ownership in the Colorado-Big Thompson (CBT) and Windy Gap trans-mountain diversion projects operated by the Northern Colorado Water Conservancy District (NCWCD). Water from the Colorado River headwaters and the Fraser River are stored in several reservoirs west of the continental divide. CBT water is conveyed through the Alva B. Adams Tunnel to the east slope, and then through several lakes and reservoirs to Carter Lake. From Carter Lake the City receives CBT water through the St. Vrain Supply Canal and Southern Water Supply Pipeline. In 2005, 52 percent of Longmont's water supply was from CBT water (*2005 Water Quality Report*).

Storage reservoirs part of the City's water supply system includes the following:

- Ralph Price Reservoir
- Pleasant Valley Reservoir (also called Terry Lake)
- McCall Lake
- Oligarchy Reservoir No. 1 (also called Burch Lake)
- Clover Basin Reservoir
- Union Reservoir
- Independent Reservoir
- Elliot Ponds 1, 2 and 3 (also called Golden Ponds)

In 2005 the total raw water storage capacity was 31,848 acre feet and the total raw water supply available was 68,679 acre feet. An overview of the City's raw water supply network is shown below in Figure 1.

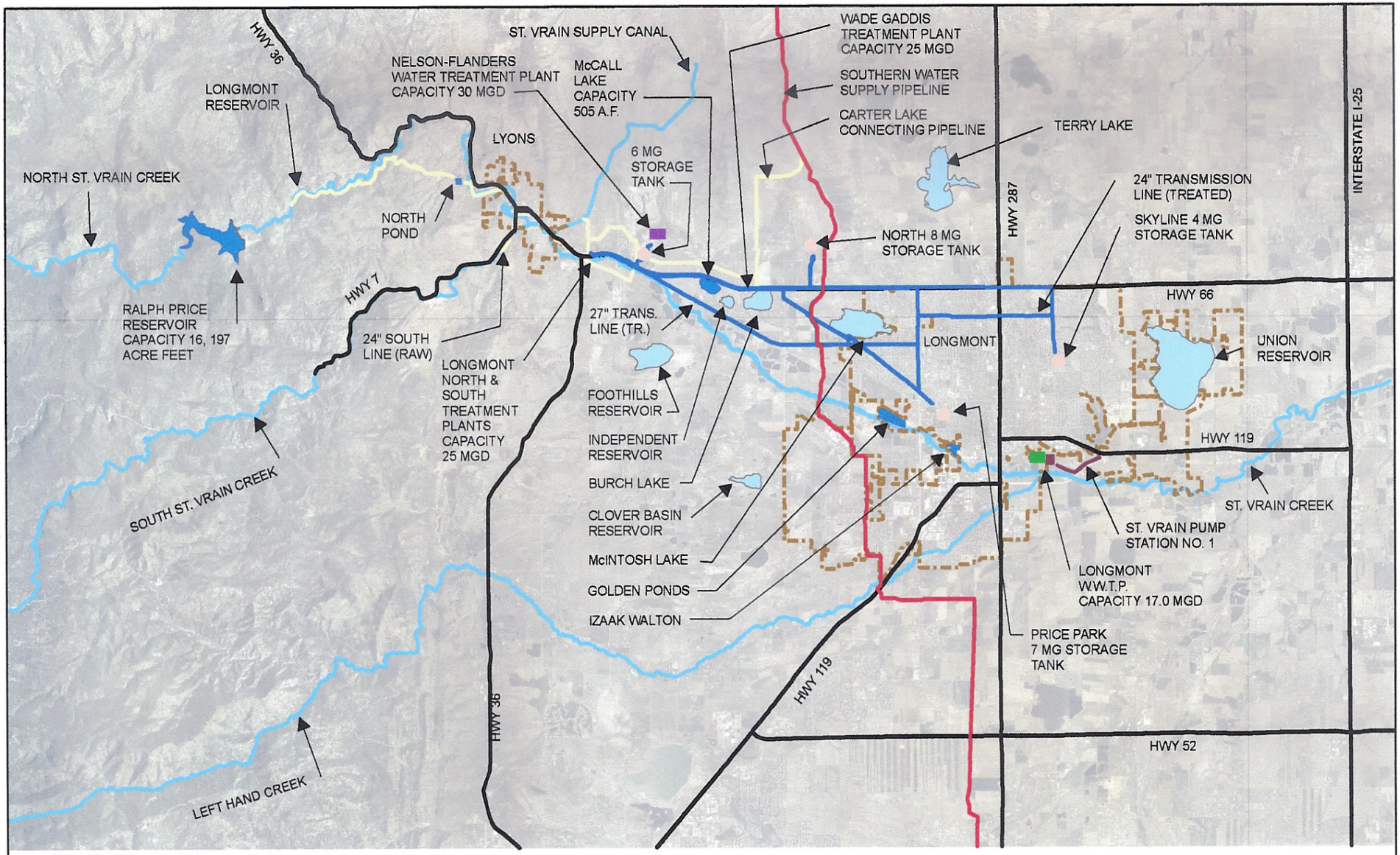


FIGURE 1

City of Longmont Water/Wastewater System

September 2005

2.2 Water Delivery

The City of Longmont is located in Boulder County approximately thirty miles north of the Denver metro area. St. Vrain Creek flows through the City and is a tributary to the South Platte River basin. As of 2005 the City area encompassed 25.65 square miles, or 16,417 acres, which has increased from 10.5 square miles in 1980 (*Longmont Community Profile 2005*). Growth has been primarily due to residential homes, but industrial development has also increased providing a good balance between housing and jobs. A summary of the total population and active and metered water accounts is summarized in Table 1 for 1998 to 2007.

TABLE 1
Population and Water Account Summary

Year	Population Served[d]	City Population	City Population Percent Increase (from previous year)	Total Connections[b]
1998	63,581	62,785	4.6 %	18,972
1999	66,107	65,308	4.0 %	19,693
2000	74,202[a]	73,334	12.3 %[a]	20,823
2001	76,959	76,098	3.8 %	21,740
2002	78,553	77,328	1.6 %	22,583
2003	80,638	79,321	2.6 %	23,212
2004	81,980	81,169	2.3 %	23,724
2005	83,564[c]	82,798	2.0 %	24,216
2006	85,396[c]	84,636	2.2 %	24,387
2007	86,522[c]	85,762	1.3%	-

[a] Increase of 12.3 percent due to 2000 Census adjustment.
[b] Does not include City connections.
[c] Does not include population for Town of Lyons, which was connected to the system in 2005.
[d] Population from Water Utility 5 Year Statistical Summary Reports.

The City has been experiencing consistent growth over the last several years. Since 2000 the average rate of population growth has been 2.4 percent per year. Table 2 summarizes the City's current year water supply and demand information.

In order to keep up with population growth the City has expanded the raw water supply, treatment and distribution systems. As of 2005 the raw water supply system consisted of 31,848 acre feet of raw water storage capacity, with 68,679 acre feet of total available raw water supply, and 18.5 miles of raw water pipelines.

The City has four treatment plant facilities and is currently in the process of decommissioning its oldest treatment plant, the South Treatment Plant, which is currently not in operation. One additional plant, the North Treatment Plant, is currently not operated. Two water treatment plants remain in operation: the Wade Gaddis Filtration Plant and the newly constructed Nelson-Flanders Water Treatment Plant (WTP). The Wade Gaddis plant

has a capacity of 20 million gallons per day (mgd) and operates seasonally. The Nelson-Flanders WTP was commissioned in 2006 and has a capacity of 30 mgd, giving the City a current treatment plant capacity of 50 mgd for the Nelson Flanders and Wade Gaddis water treatment plants. The Nelson Flanders plant has been built to be expandable to 60 mgd to accommodate the City's anticipated water demands at build out, resulting in a total treatment capacity of 80 mgd. Drinking water is distributed to the City through 88 miles of transmission lines and 344 miles of distributions mains which contain approximately 3,638 hydrants.

In addition to its potable water distribution the City has an extensive network of canals and irrigation ditches that convey raw water to parks, golf courses, schools, and greenways for irrigation. Currently raw water is available to irrigate approximately 27 city and community parks, two golf courses, and thirteen schools, which represents 50 percent of parks, 66 percent of golf courses, and 72 percent of school grounds. The site of the City's main recreation facility is also irrigated with raw water. Availability of raw water for irrigation decreases demand for treated water from the treatment plant and conserves energy and chemicals required for treatment.

TABLE 2
Summary of Water Supply Sources

Annual Water Supply	Annual Volume (AF)	Percent Metered
Total Raw Water Used	20,332	-
Non-Potable Used[1]	1,452	0%
Treated Water Production[2]	19,881	100%
Total Annual Water Sold[3]	15,460	100%

[1] Estimated based on 30 inches of raw water applied to 580 irrigated acres of parks, golf courses, greenways, and schools. There are 387 acres irrigated by raw water, and approximately 389 acres that may be irrigated with either raw or treated water. The 580 acres represents all of the irrigated acres with raw water plus 50 percent of the irrigated acres with both raw and treated water.
[2] Total treated water production plus water lost during treatment plant operations is 5.3% based on 2002 to 2007 data.
[3] City does not get billed for treated water used (see Table 3).

3.0 Current Water Use

The following section includes a summary of historical data characterizing water use.

3.1 Water Use

Description of current water use is meant to be consistent with the International Water Association (IWA) and American Water Works Association (AWWA) Water Balance approach, which was published in 2000 as part of the IWA publication *Performance Indicators for Water Supply Services* to provide utilities a consistent methodology for assessing water loss. Though the full assessment of a water balance is outside the realm of this report the terminology is consistent. The main categories discussed for the City are revenue (metered) and non-revenue (metered and unmetered) water, which are defined in Figure 2 below.

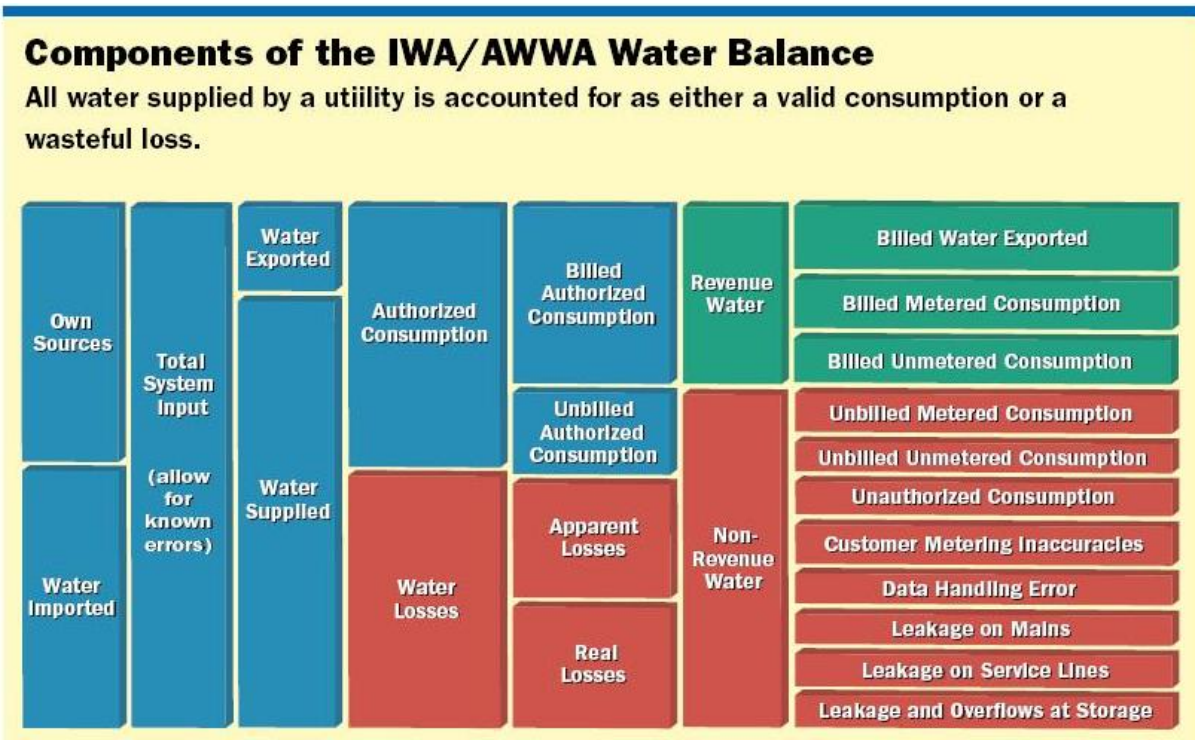


FIGURE 2
IWA/AWWA Water Balance Summary (*Source: AWWA Publication, Opflow, October 2007*)

Potable water use is sold retail to the following six customer classifications: residential (single family and duplexes), multifamily, small commercial, large commercial-industrial, and irrigation. The first meters on residential single-family homes were installed in 1975 and at of the end of 2006 there were no unmetered residential connections. Multifamily dwellings had meters first installed in 1976 and are completely metered. Meters for large commercial and small commercial customers were first installed in 1983 and 1984 respectively. Irrigation was separated into a new customer classification beginning in 2001 and primarily represents Homeowners Association (HOA) neighborhood irrigation systems, and separate irrigation taps for new small commercial establishments. Customer

classification descriptions are summarized in Table 3 and represent accounts that generate revenue for the City.

TABLE 3
Customer Classification

Rate Category	Description
Residential (single family and duplexes)	Residential single family homes and duplexes.
Multifamily	Three or more attached living units, includes mobile home parks. Newer developments may have multiple detached living units on one lot and are classified as multifamily. New multifamily complexes will have a multifamily tap to each building and a dedicated irrigation tap, and may also have a separate tap to the clubhouse area. The buildings are classified as multifamily, irrigation tap as irrigation, and the clubhouse area as small commercial.
Small commercial	Commercial taps that provide water to the building, including hotels, assisted living, and nursing homes. Commercial establishments may also have an irrigation tap, which is classified as irrigation.
Large commercial and industrial	Negotiated services based on water use characteristics. There are currently two of these customers.
Irrigation	Dedicated irrigation taps. A separate irrigation tap is required in all new multifamily complexes and will eventually be required for all commercial as well unless the landscaping is less than a certain square footage. Irrigation for HOA areas and pocket parks are also included in this category.
City (non-billed)	City facilities such as libraries, memorial buildings, City buildings, fire stations, golf courses, greenways, arterials, and parks.
Mixed use (*future classification*)	Mixed use combines residential and commercial uses under one roof. This is an upcoming trend and will see more of these situations. Most would have a commercial tap and a multifamily tap, but may move towards classifying these as commercial and requiring a dedicated irrigation tap.

A summary of water usage for each billing classification including the City's own use is provided in Table 4 below for 2001 to 2006.

For 2006 the total metered water demand (or billed authorized consumption) was 5,284,209 thousands of gallons, which is equivalent to 16,217 acre-feet. Raw water storage capacity for the City is approximately 31,848 acre-feet. However, metered water usage does not represent the total treated water demand, which was approximately 17,692 acre-feet in 2006, as it does not account for other non-revenue uses.

Non-revenue water includes water that is entering the distribution system but not generating revenues for the City. Non-revenue water has three main categories:

- Unbilled authorized consumption – unbilled authorized users, such as hydrant flushing and City irrigation.
- Apparent losses – unauthorized users, metering inaccuracies, data handling errors.
- Real losses – main and service line leakage, overflow leakage.

TABLE 4
Metered Water Use (Billed Authorized Consumption) by Customer Classification 2001-2006 (1,000 gallons)

Year	Residential	Multifamily	Small Commercial	Large Commercial	Irrigation	City	Total
2001	2,162,981	511,265	980,988	381,066	120,112	279,487	4,435,899
2002	2,172,075	479,754	984,418	313,912	155,697	289,684	4,395,540
2003	2,133,369	497,988	916,529	283,817	209,093	235,450	4,276,246
2004	2,091,459	475,709	943,612	244,896	245,071	224,297	4,225,044
2005	2,441,160	496,260	987,240	258,232	271,855	238,930	4,693,677
2006	2,862,999	527,105	1,028,067	250,815	369,496	245,727	5,284,209

Source: City of Longmont Annual Water Reports

In order to more accurately characterize water use, following the nomenclature in Figure 2, an attempt was made to quantify both the unbilled authorized water consumptions and the apparent and real water losses from the system. To begin with, the unbilled authorized consumption was developed looking at unbilled metered and unbilled unmetered authorized consumptions. Unbilled metered water consumptions include hydrant flushing and washdown water at the Wade Gaddis Filtration Plant. Unbilled unmetered water consumptions include, but are not limited to, fire fighting, fire training, grading and dust control, inspection and testing, parks and forestry, sanitary sewer jetting, spring flushing, storm sewer jetting, street sweeping, and tank cleaning. For 2006 the City provided estimates of the total annual volume of these unbilled authorized water consumptions as presented in Table 5.

TABLE 5
Unbilled Authorized Water Consumption Estimate for 2007 (Treated Water Only)

Unbilled Authorized Consumption Category	Estimated Volume (MG)	Notes
Unbilled Metered	364	Bulk water, including washdown water at Wade Gaddis[1]
Unbilled Unmetered	42	Hydrant flushing, fire fighting, fire training, grading and dust control, inspection and testing, parks and forestry, sanitary sewer jetting, spring flushing, storm sewer jetting, street sweeping, and tank cleaning
Total	**406**	Non-revenue categories not accounted for in this estimate include unknown data handling errors, meter inaccuracies, and leakage.

[1] Plant water at the Nelson-Flanders WTP is currently not metered and not accounted for in non-revenue water.

For 2007, the total estimated unbilled authorized water consumption was 406 million gallons (MG), which is about 7.7 percent of the total metered water demand for the year and approximately 1.1 MGD. As indicated in Table 5 water used at the Nelson-Flanders WTP for washdown, chemical feed, and other miscellaneous uses is not included.

Any potable water not accounted for by billed authorized consumption (metered usage), shown in Table 4, and unbilled authorized consumption shown in Table 5, is considered water loss, either real or apparent. Essentially water loss represents the difference between total treated water production entering the distribution system and the authorized and/or measured consumption.

Total treated water production represents the amount of water leaving the drinking water treatment plants. Residential per capita water use represents the total metered usage from residential and multifamily accounts divided by the total service population. Also reported in the table is gross per capita water use, which is calculated as the total treated water production divided by the total service population. Treated water production, residential per capita, and gross per capita water use from 2000 to 2006 is provided in Table 6 below.

TABLE 6
Treated Water Production from 2000-2006 (1,000 gallons)

Year	Total Treated Water Production (1,000 gallons)	Residential Per Capita Water Use[1] (gallons per capita/day)	Gross Per Capita Water Use[2] (gallons per capita/day)
2000	5,763,000	117	213
2001	5,650,000	108	201
2002	5,612,738	109	196
2003	5,279,792	99	179
2004	5,124,472	93	171
2005	5,500,016	97	180
2006	6,151,807	109	197
2007	5,909,126	104	187

[1] Calculated as the total residential + multifamily metered treated water demand divided by total service population. Service population as shown in Table 1.
[2] Calculated as the total treated water production divided by total service population. Service population as shown in Table 1.

The impact from the 2002 to 2003 drought on water use is apparent in both the total treated water demand volume and per capita water use, as shown in Table 6. Following 2002, the response from the customer was lower water usage per capita, which reached its lowest value of 171 gallons per capita per day (gpcd) in 2004. A portion of the increase in gross per capita water use in 2005 and 2006 may be a result of users returning to pre-drought behavior patterns.

TABLE 7
Annual Water Loss Estimate (2007)[1]

Parameter	(1,000 gallons)	Comments
Treated Water Production	5,909,126	Water production leaving the water treatment plants
Billed Authorized Use	5,026,985	Residential, commercial, irrigation estimated hydrant meters
Unbilled Authorized Use	405,982	Unbilled metered, estimated unbilled unmetered, City
Water Loss	476,159	Water Loss = Treated Water Production – Billed Authorized Use – Unbilled Authorized Use
%Treated Water Loss	8.1	% Water Loss = Water Loss/Treated Water Production

[1] Water loss estimate provided by City based on refined data gathering for meters and authorized uses.

Residential accounts were not fully metered until the end of 2006 such that estimating water loss for years prior to this is not as reliable. Water loss parameters for 2007 are summarized in Table 7 below.

For 2007, the estimated water loss from the City's potable water system was 8.1 percent. Note that there are some known authorized uses that are not accounted for in this analysis such as plant water use at Nelson-Flanders WTP. There are no clear standards for an acceptable amount of water loss in a system, but historically 10 to 15 percent water loss has been considered acceptable. For comparison, a report released in 2007 by Western Resource Advocates, titled *Front Range Water Meter*, reported a range of water loss values from 2 percent to 17 percent based on thirteen area communities.

The IWA/AWWA Water Balance method also has a formula to estimate the theoretical low limit of leakage that could potentially be obtained if all available best technologies were successfully applied. The theoretical estimate is based on the miles of water mains, number of service connections, average pressure in the system, and the distance of private water lines (to the curbstop). Based on rough assumptions for the distance of private water lines and an average system pressure of 70 pounds per square inch (psi) the theoretical low limit of annual water loss for the City would be 170,880 thousands of gallons, approximately 691,598 thousands of gallons less than the City's water loss estimate for 2007. Comparing this theoretical number to the estimate for 2007 is equivalent to a water loss of 1.8 percent. This "low limit" number does not represent a realistic goal, but gives a theoretical reference point for the quantity of additional water savings that may be realized with an improved leak detection program.

3.2 Water Billing and Rate Structure

The City's water rates include a monthly service charge (based on meter size) and a volume charge for residential, multifamily, small commercial, large commercial, and irrigation users. The volume charge for residential users (single family and duplexes) is based on an increasing block rate structure, so the cost per unit of water increases with increasing usage. The volume charge for all other users is based on a uniform rate. The current water rate structure is presented in Table 8 for the City.

TABLE 8
City of Longmont Current Water Volume Charge

Single Family and Duplex		
	Inside City Limits	Outside City Limits
0 to 10,000 gallons	$2.53	$3.80
11,000 to 20,000 gallons	$2.91	$4.37
Over 20,000 gallons	$3.41	$5.12
Multifamily (3 or more units)	$2.28	$3.42
Small Commercial	$2.39	$3.59
Large Commercial	$1.76	$2.64
Irrigation	$3.27	$4.91

The City evaluates rates and fees on a regular basis, and is currently involved in a rate and fee structure study planned to be completed later this year.

4.0 Current Water Conservation Efforts

The City's Water Conservation Master Plan in 1996 was used to initiate a number of water conservation best management practices (BMPs) that were used to help the City prolong the adequacy of its existing water resources, and as appropriate, delay capital construction of new treatment plants, reservoirs and related facilities. Given that the City does not have any imminent or pressing water supply or delivery issues requiring immediate or aggressive conservation actions, the City chose the primary emphasis of its BMPs to be education and effective communications rather than regulation. The underlying belief was that if the citizens understand the economics, methodologies, and positive effects of water conservation, they can make informed decisions.

Since 1996, the City has expanded its water conservation measures and programs, beyond those first BMPs identified and selected for implementation in the original Plan (see Appendix A for a listing of the initial BMPs and their status). Table 9 presents a listing of each current water conservation measure and program that the City currently conducts, and indicated how long the activity has been conducted.

This section reviews each of the categories of water conservation measures and programs that the City has implemented, and discusses the water savings that may be related to these efforts.

4.1 Public Education and Resources

The City's network of public water conservation resources continues to evolve, and includes several different types of communication vehicles to share information. Written communications include a biannual column advertisement in the local paper, the Daily Times Call, and information in the City Line once per year, a pamphlet included with monthly utility bills. Information is always available from the Public Works and Water Utilities Department offices. For customers with a more electronic focus, the City's website is updated with the latest water conservation activities and program information, as well as access to E-News, an email list that customers can subscribe to and receive weekly updates on City news and resources. From these various sources, the City's customers can learn about other City measures and programs, including rebates, outdoor water audits, Xeriscape gardens and seminars.

For a more visual demonstration of water conservation options there are two Xeriscape gardens, at the City's Recreation Center (Quail Campus) and Sunset Pool. The Quail Campus garden has 5,000 square feet of terrain and over 42 different types of trees, shrubs, and plants on display. The City also sponsors a Xeriscape seminar for its customers to learn about the philosophy and methods for installing and maintaining Xeriscape

Finally there are a number of public outreach events that the City participates in to increase awareness and educate children on the importance of efficient water use to conserve a valuable natural resource. At the local Rhythm on the River water festival the City has a tent about water conservation and the Longmont water supply system. In 2007, the City held the 8th Annual Water Festival at the St. Vrain Valley School District where there are twelve stations that educate students on water.

TABLE 9
Summary of City's Ongoing Water Conservation Measures and Programs

Water Conservation Measures and Programs
Customer Education
Children's Water Festival
Xeriscape Demonstration Garden
Bill Stuffers
Website
Newspaper Articles
Xeriscape Training Seminar
City Facilities
Meter Replacement/Installation
Replace Inefficient Fixtures
Update Existing Irrigation Systems
Update development standards for New City Parks, Medians and other Open Space
Municipal Xeriscape Gardens
Residential
Outdoor Irrigation Audits
Xeriscape Subsidies (Garden-in-a-box)
Indoor Appliance Rebates
Inclined Block Water Rates
Commercial
AMR Meters
Dishwashing Faucet Replacements
Other
Leak Detection and Repair
Meter Testing, Repair and Replacement
Landscaping Ordinance/Rebate for New Construction
Water Waste Ordinance/Hotline
Plumbing Fixture Requirements
Voluntary Watering Restrictions

4.2 City Facilities

In order to encourage changes in water use behavior and demonstrate its commitment to water conservation, the City has several programs in place so the community can "*learn by example*". Much of the City's water usage is for irrigation of parks, schools, greenways, arterials, and other public spaces.

There are ongoing efforts to improve irrigation efficiency including a new central controller for many of the City's sprinkler systems, and audits to ensure watering times and lengths

are appropriate. In 2007 the City recently completed an initiative that replaced all high flush toilets in City facilities with low flush toilets and the Public Works and Water Utilities building has dual flush toilets in its facilities. The Parks department is also considering a test of waterless urinals in some restrooms of future parks. All City facilities receiving treated water are metered, but this does not include treated water usage at the treatment plants or raw water irrigation systems.

Finally, the City is working to update its requirements for new green and open space areas, including parks, medians, and parkways. These requirements will address soil amendments, sprinkler systems and plant materials.

Non-Potable Municipal Water Use

As mentioned previously, the City has an extensive network of canals and irrigation ditches that convey raw water to parks and golf courses for irrigation. Currently raw water is available to irrigate approximately 27 city and community parks, two golf courses, and thirteen schools totaling about 700 acres. The site of the City's main recreation facility is also irrigated with raw water. Availability of raw water for irrigation decreases demand for treated water from the treatment plant and conserves energy and chemicals required for treatment. Currently raw water used for irrigation is not fully metered.

4.3 Residential

For several years the City has sponsored free irrigation audits to customers in cooperation with the Center for ReSource Conservation (CRC) of Boulder. The audits are free to customers and information is provided in City Line and on the City's website. Also in cooperation with the CRC the City offers affordable "Garden in a Box" packages that include a plan with 30 or more plants and hints for maintaining the plants. The City also supports several rebate programs for ultra low flow toilets, and high efficiency dishwashers and washing machines to improve indoor water usage. Since 2003 the City has supported a toilet rebate program and a clothes washer rebate program. Beginning in 2006, for a three month period, a dishwasher rebate was offered which is now available year-round. An effort has been made to track the rebate information and is summarized in Table 10 below.

Water Rate Structure

As mentioned in the previous section the City's water rates include a monthly service charge (based on meter size) and a volume charge for residential, multifamily, small commercial, large commercial, and irrigation users. The volume charge for residential users (single family and duplexes) is based on an increasing block rate structure, so the cost per unit of water increases with increasing usage. The volume charge for all other users is based on a uniform rate. For customer convenience, comparative water usage for the same month the previous year is shown on monthly residential utility bills. Installation of meters on residential single family homes began in 1975, with a majority of the meter installations occurring in the mid 1990's when the water conservation plan was adopted.

TABLE 10
Historical Rebate Expenses for the City's Water Department

Rebate Type	2003	2004	2005	2006
Clothes Washer Rebate				
No. of Clothes Washers	182	116	142	237
Rebate Amount[1]	$125	$50	$50	$50
Total Rebate Expense to Water Department	$11,375	$2,900	$3,550	$5,925
Estimated Acre-Feet Reduction[2]	3.21	2.05	2.50	4.18
Water Savings Cost ($/AF)	$3,544	$1,417	$1,417	$1,417
Toilet Rebate				
No. of Ultra Low Toilets	212	163	110	62
Rebate Amount	$100	$50	$50	$50
No. of Dual Flush Toilets	-	5	4	7
Rebate Amount	-	$100	$100	$100
Total Rebate Expense to Water Department	$21,200	$8,650	$5,900	$3,800
Estimated Acre-Feet Reduction[2]	6.97	5.55	3.77	2.30
Water Savings Cost ($/AF)	$3,042	$1,559	$1,565	$1,652
Dishwasher Washer Rebate				
No. of Dishwashers	-	-	-	48
Rebate Amount[1]	-	-	-	$50
Total Rebate Expense to Water Department	-	-	-	$1,200
Estimated Acre-Feet Reduction[2]	-	-	-	0.24
Water Savings Cost ($/AF)	-	-	-	$5,000

[1] Water Department contributed ½ of the rebate cost associated with dishwashers and clothes washers. The other half was contributed by the power utility department. Water savings costs were therefore calculated only using the contribution of the Water Department.

[2] Water savings based on assumptions provided in Appendix D.

4.4 Commercial

Automated Meter Reading (AMR)

Accurate and efficient water use metering has been a priority of the City's for many years. The City has taken steps to improve registering water use with automated meter reading (AMR) systems and meters with leak detection capabilities. The City's Tel Data system has 250 addresses that report meter readings hourly, the Metron system has 20 addresses which send readouts to laptops, and the Neptune system has 2,000 addresses with radio meter

readings. Of the Neptune units about 250 are equipped with a program which can detect leaks or backflow at the meter. The City also has a program that regularly inspect its larger meters; half of the meters greater than 3 inches are tested every two years. Meters for large and small commercial customers have been in place since 1983.

Commercial and Industrial Process Water

Recently the City has started to develop water conservation techniques for small commercial and industrial businesses. The City has been following the development of the potential for a regional ICI (institutional, commercial, and industrial) Study, but there is no indication of when the results of study may be cooperatively initiated. In 2007, the City worked with Partners for Clean Environment to replace dishwashing faucets in 20 restaurants throughout the City.

4.5 Other

Regulation through Ordinances

Several practices supporting efficient water use and responsible building practices have been implemented into City ordinances for enforcement for new development areas. Ordinances include the requirement for low flow fixtures (non-reimbursable) and a soil amendment of three cubic yards per 1,000 feet, tilled to a depth of six inches, (reimbursable) to obtain a Certificate of Occupancy (CO). Incentives are in place for using Xeriscape as well as landscaping ordinances which encourage more drought-tolerant vegetation. In addition, Section 15.05.090.H of the Land Development Code and Section 600 of the Design Standards and Construction Specifications require developers to utilize xeric practices in the design, installation and maintenance of landscaping and irrigation systems in private common open spaces areas in residential developments.

The City also has a water waste ordinance. To facilitate this ordinance, the City maintains a water waste hotline for the public to call if they observe water waste. The City also has voluntary watering restrictions and required plumbing fixture requirements.

Leak Detection and Repair

Currently there is no formal leak detection program in place in the distribution system, but the City does regularly address reported and detected leaks as part of their regular distribution system maintenance. Some meters are equipped with leak detection capabilities and larger meters (greater than three inches) are tested biannually.

4.6 Existing Program Effectiveness

The effectiveness of individual programs is difficult to quantify based on available historical data. However, using the metric of *gross per capita water use* (in gallons per capita per day (gpcd) , which is arrived at by dividing total treated water production by total service population, a general decrease in water use is observed as shown in Figure 3 even as the City's population increases.

There is a noticeable decrease in gross per capita water use between the years of 1964-1980 and 1980-1994. This observed decrease may be attributed to the shutdown of a large sugar

factory in 1979, and the increased number of meters that were installed during this period of time for small commercial and industrial customers, and multifamily units. Due to the metering, customers reduced their water use, presumably because they had to pay for the water they used, rather than pay a flat rate.

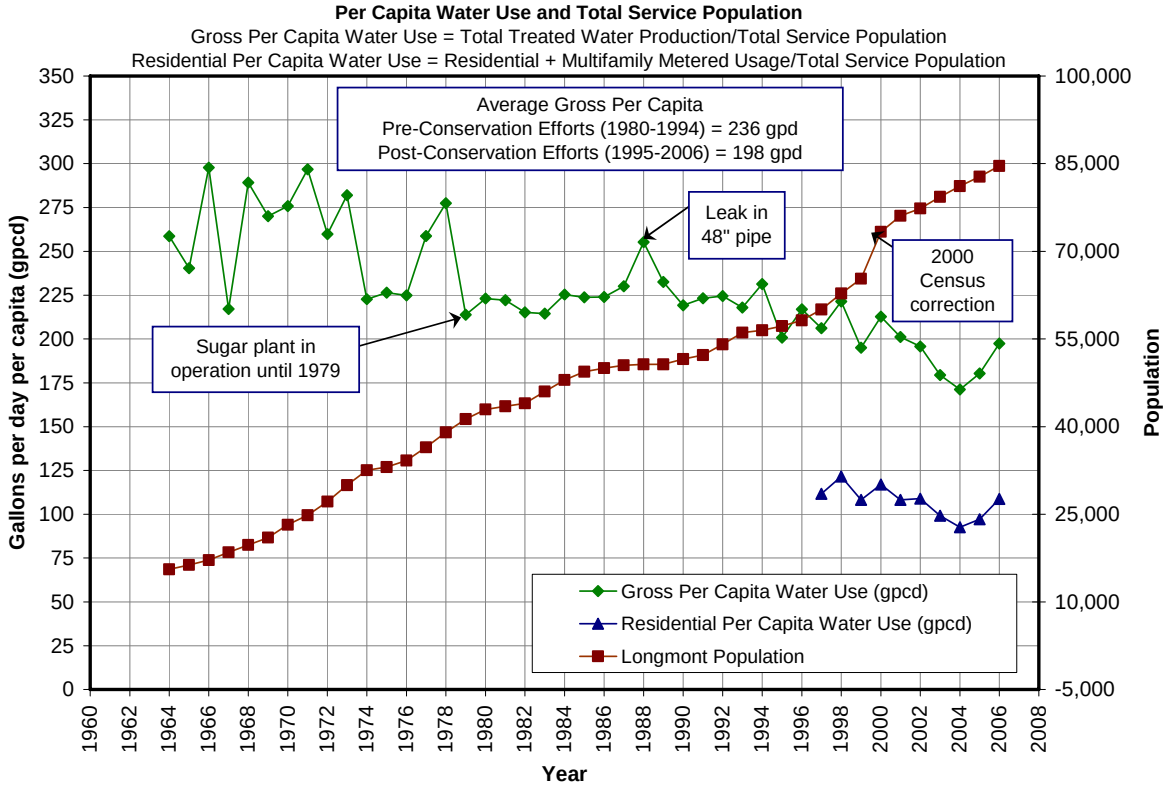


FIGURE 3

There is another noticeable decrease in gross and residential per capita water use between the mid-1990s and the years after 2000. The reduction in gross per capita water use after 2000 is likely due to a number of reasons. To begin with, the City's first water conservation planning effort, conducted in 1996 was implemented shortly thereafter. The impact of increased customer education and various municipal retrofit projects likely assisted in the reduction of overall per capita water use in the late 1990s. However it wasn't until the year 2000 when the City implemented inclining block water rates that per capita water use steadily dropped. Average gross per capita water use from 1997 to 2000 was about 210 gpcd. Since 2000, ignoring the drought year of 2003, gross per capita water use has average about 189 gpcd, for a reduction of about 10%.

Similarly, residential per capita water use, also shown on Figure 3 for the period 1997 to 2006, has also seen a reduction. The average residential per capita water use from 1997 to 2000 was 114 gpcd, whereas since 2000 (ignoring the drought year of 2003) the average residential per capita water use is about 103 gpcd, indicting a drop of about 10%.

Increased water rates by themselves would not account for the observed drop in per capita water use. It is the combination of measures and programs that the City has implemented, as shown in Table 9, including rebates, ordinances, educational programs and improvements in institutional efficiencies that have helped the City to reduce water demand.

It is important to note that the per capita water use reported herein does not include raw water used to irrigate about 580 acres in the City, including some of its parks, school grounds, arterials and golf courses. Resources will be spent in the future to better monitor the non-potable uses and include these water supplies in the overall per capita water use evaluations.

5.0 Forecasting Future Water Demands

The Section provides an overview of the demand forecasting that was developed to estimate future water use by the City and its customers, as a means to determine the needs and the effectiveness of proposed water conservation measures and programs discussed in later sections. Future water use forecasts were developed to estimate total annual water use and peak daily and monthly treated water demands for the City and all its customers. Annual treated water demand is used to evaluate the availability of water within the City's water rights portfolio, whereas peak daily and monthly treated water demand is used to evaluate current and future water treatment and delivery capacity. A detailed description of the forecasting methods and relevant data are provided in Appendix B.

Note that the forecasted annual water demand will focus on treated water given the lack of available information regarding past and current raw water use. Future water conservation activities will likely be selected to include full metering of raw water use by the City's facilities; including schools, parks, parkways and golf courses. Until such time as the raw water characterization can occur, only an estimate of the total raw water use, as presented in Table 2, can be made. Therefore, total water demand will be estimated from the sum of the treated water demand and the current raw water demand, which is estimated to be about 1,450 AF assuming that ongoing water conservation activities are maintained.

Forecasting water demand is a critical part of the water conservation planning process, and is usually done as part of a raw water or treated water master planning effort. The City has recently completed both these master planning efforts: the *Treated Water Master Plan* was completed in 2000 and the *Raw Water Master Plan (RWMP)* was updated in 2004. Any demand forecasting conducted for this effort will need to be corroborated with these other master planning efforts either now or at some time in the future.

One means to corroborate the water conservation forecasting with these other master planning efforts is to utilize the same population growth projects, since future water demand will be tied to some extent on expected future population. The most recent population projections were obtained from the RWMP and confirmed by the Planning Department. The RWMP also forecasted treated water demands until buildout. Since the most recent water use patterns were evaluated as part of this water conservation plan update, the forecasting results were compared to those from the 2004 RWMP and are discussed below.

The potential effects of new water conservation efforts that may be selected during this planning process have not been included in the demand forecasts in this section, rather are discussed later in Section 8.0 Integrate Resources and Modify Forecasts. The forecasts in this section are based on recent patterns of water demands that would reflect ongoing water conservation efforts and "passive conservation" as older appliances and fixtures are replaced with those that meet current efficiency standards. Forecasting was completed through the year 2017, a shorter time period than typical master planning studies, which reflects the continual monitoring and verification effort that is required for conservation planning and implementation.

The following population projections, presented in Table 11, were used based on the RWMP. The City of Longmont Planning Department noted that these projections were based on a buildout

population of 104,000 being reached in 2025, and due to a number of land use amendments, the buildout population has been adjusted to 111,618 as of June 2007. Since the rate of growth was not assumed to change the population projections through 2020, the projections contained in the RWMP are considered valid, but the year the City reaches residential buildout may be later than 2025.

TABLE 11
Population Projections (from 2004 Raw Water Master Plan Update)

Year	Population
2008	86,723
2009	87,387
2010	88,050
2011	89,030
2012	90,202
2013	91,000
2014	91,980
2015	92,970
2016	93,950
2017	94,940
2018	95,920
2019	96,900
2020	97,890

5.1 Annual Treated Water Demands

Annual treated water demand forecasts were prepared based on the separate customer categories of water use; residential and multifamily, industrial, small commercial, irrigation, city, and other authorized uses. Residential and multifamily customer classes were grouped together for purposes of forecasting, which allowed the forecasting model to predict future residential and multifamily water use based on an average residential per capita water use calculated for this combined customer class. Average residential per capita water use (including residential and multifamily metered data) was estimated from 1997 through 2006 based on the sum of residential and multifamily demand divided by the total service population. Since not all of the residential customers were metered until 2006, the annual demand for this customer class was adjusted to account for the number of meters not installed during any one year. Residential per capita water use from 1997 to 2006 is summarized in Table 12 below.

The average residential per capita water use from 1997 to 2006, as shown in the Table 12 was 107 gpcd. However, the 2002 to 2003 drought artificially reduced per capita water use in the years 2003 to 2005. Removing the drought-influenced demand years from the calculation, the average residential per capita water use was 112 gpcd. The range of residential per capita water use since 1997 was 93 to 122 gpcd. In order to illustrate this potential range of residential per capita water use the value of 90 gpcd has also been included in graphs and tables throughout this section, but has only been applied to the new population and not to the existing population.

For purposes of evaluating water conservation measures and programs the residential and multifamily demand was forecasted using the average (non-drought influenced) residential per capita water use of 103 gpcd applied to the population projections, assuming that the current water conservation programs would remain in place and that average residential water use would remain at this level.

TABLE 12
Residential Per Capita Water Use (Residential and Multifamily demand)

Year	Residential + Multifamily Annual Treated Water Demand (MG)	Residential Per Capita Water Use (gpcd)
1997	2,479	112
1998	2,821	122
1999	2,611	108
2000	3,167	117
2001	3,040	108
2002[1]	3,124	109
2003[1,2]	2,919	100
2004	2,772	93
2005[2]	2,961	97
2006	3,390	109
2007	3,296	104

[1] Watering restrictions in place August 2002 through Spring 2003.
[2] Year potentially influenced by drought.

The City currently has two large industrial user accounts: a pharmaceutical company and a food processing facility. Since the City has a diverse portfolio of water rights to support additional industrial development, growth is expected in this customer class in the future. Forecasting for future industrial growth is not necessarily linear; however, a linear projection was used, given the lack of other data. To this end, future treated water use for the industrial accounts was based on past usage and growth projections.

Small commercial treated water demand growth has been variable in the past. In 2000 and 2001 there were observed growths spurts in small commercial water use, but the rate has declined in the past several years. Forecasting small commercial water demand was based on the growth rate as indicated by the estimated building permit square footage increase from 2008 to 2012. Data on non-residential building square footage was obtained from the Planning and Development Services Division. The annual growth rate of small commercial square footage between 2008 and 2012 was estimated as 1.7 percent. Even though this percentage is based on building square footage projections for five years, it was applied to water use through 2017 for purposes of this evaluation.

The irrigation water use category was established in 2001 and represents taps specifically dedicated to irrigation such as HOA areas, neighborhood common areas, and some small

commercial establishments with large irrigable acreage that utilize sub-metering (i.e., these businesses have a separate water tap for irrigation water). Based on the observed growth of irrigation watering use since 2001 (see Appendix B), annual treated water demand for this customer category was assumed to be linear based on historical use patterns, with an average annual increase of 1.7 percent.

City treated water demand was assumed to be consistent with historical usage from the past ten years. Increasing water efficiency as well as offsets from converting treated water irrigation to raw water irrigation resulted in assuming no growth for City treated water demand.

Additional authorized uses, including unbilled metered and unmetered demand, were assumed to increase slightly at a growth rate of 0.25 percent based on the historical value estimated from 2006.

Figures detailing the predicted water use for each of these water use customer categories are presented in Appendix B.

With the forecasting methodology established for authorized use demands, the unauthorized uses need to be accounted for. Previously the unauthorized uses (water losses) were estimated for 2007 and summarized in Table 7. The total water loss percentage was estimated as 8.1 percent for 2006. Since this represents the most recent estimate it was assumed for this evaluation that losses due to unauthorized uses remained at 8.1 percent through 2017. Therefore the evaluation of measures and programs does not account for increased losses that may occur due to aging infrastructure or decreased losses due to a more aggressive leak detection program.

Combining the results from these various customer classes and water users allowed for the prediction of future treated annual water demand, as summarized in Table 13.

Raw water irrigation, which is currently used by the City to maintain various parks, school grounds, arterials, golf courses and other City facilities, is not consistently metered. Therefore, there is not an estimate of current raw water use, let alone future raw water use. The best current estimate of raw water use on the 27 parks, two golf courses, 13 schools, and other City facilities, which cover about 580 irrigated acres is about 1,450 acre-feet per year, assuming about 30 inches of water is applied each year. Since an increase in raw water use would be offset by a reduction of treated water use, future forecasts do not included increases in future raw water irrigation, per se. Additional raw water irrigation that will be implemented by the City in the future will be offset by a reduction in treated water demand with a net effect of reducing unaccounted for water and water use at the treatment plant (which totals about 13.7% of total treated water demand). As previously indicated, forecasting under current water conservation practices does not include an increase in the amount of raw water being used for irrigation through 2017. This is especially appropriate for Longmont since many raw water irrigation supplies are from different sources than the raw water supply sources for the treated water system.

Significant effort has been made to realistically reflect forecasted treated water demands, however there are some critical assumptions that have been made and are summarized below:

- No increase in system losses was attributed to aging infrastructure,
- New water use categories were not considered,
- Potential impacts from climate change were not quantified or incorporated.

TABLE 13

Annual Treated Water Demand Forecast Summary

Year	Estimated Population[a]	Residential & Multifamily[b]	Industrial[c]	Small Commercial[d]	Irrigation[e]	Other Billed Metered[f]	City[g]	Unbilled Metered[h]	Unbilled Unmetered[i]	Treated Water Demand[j]	Treated Water Demand[j]	Treated Water Demand[k]
		(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)	(MG)
Per capita water use (gpcd)[k] =		*103 gpcd*	-	-	-	-	-	-	-	*103 gpcd*	*110 gpcd*	*90 gpcd*
2008	86,723	3,264	303	1,014	438	19	246	118	42	5,885	5,887	5,882
2009	87,387	3,289	315	1,031	484	19	246	118	42	5,994	5,997	5,987
2010	88,050	3,314	326	1,049	530	19	246	118	42	6,103	6,108	6,092
2011	89,030	3,351	338	1,067	575	19	246	118	42	6,223	6,231	6,208
2012	90,202	3,395	350	1,085	618	19	246	118	43	6,350	6,361	6,328
2013	91,000	3,425	361	1,104	658	19	246	118	43	6,458	6,472	6,433
2014	91,980	3,462	373	1,123	693	19	246	118	43	6,569	6,585	6,539
2015	92,970	3,499	385	1,142	723	19	246	118	43	6,675	6,694	6,640
2016	93,950	3,536	396	1,161	746	19	246	118	43	6,775	6,796	6,734
2017	94,940	3,574	408	1,181	763	19	246	118	43	6,867	6,891	6,821

[a] Source: Raw Water Master Plan 2004. Note the Planning Department has adjusted the population at buildout to 111,618. The rate of growth was not changed for this analysis through 2017.
[b] Based on average residential and multifamily per capita water use from 2001 through 2006, without drought year of 2003, of 103 gpcd. Estimated residential gpcd adjusted for number of unmetered customers.
[c] There are two customers currently billed as industrial. Projections based on historical water demand and growth estimates.
[d] Projections based on information from Planning Department on historical small commercial building square footage, and forecasted building permits for 2008-2012. Growth rate from 2008-2012 of 1.7 carried forward through 2017.
[e] Growth consistent with pattern of last 5 years.
[f] Bulk water permits, assumed no growth rate.
[g] Average water usage over the last 10 years. Considering conversions to raw water for irrigation, the City usage was expected to stay the same.
[h] Hydrant meters and cleaning Wade Gaddis Basins.
[i] Based on estimate from 2006 and growth of 0.25% per year. Fire fighting, fire training, grading dust control, inspection and testing, parks and forestry, sanitary sewer and storm sewer jetting, spring flushing, street sweeping, and tank cleaning.
[j] Includes unauthorized uses (water loss) of 8.1%., excludes losses due to water treatment plant efficiency.
[k] Per capita water use for the population up to 2006 was 103 gpcd. A range (90 and 110 gpcd) of per capita water use was used to quantify forecasted treated water demand for NEW population from 2007 through 2017.

As summarized above in Table 13, if the residential and multifamily per capita water use decreases from the average of 103 gpcd to 90 gpcd for new construction there is a slight decrease in the treated water demand, which decreases from 3,574,000 to 3,531,000 thousands of gallons, approximately 1.2 percent. This is also illustrated in Figure 4 below.

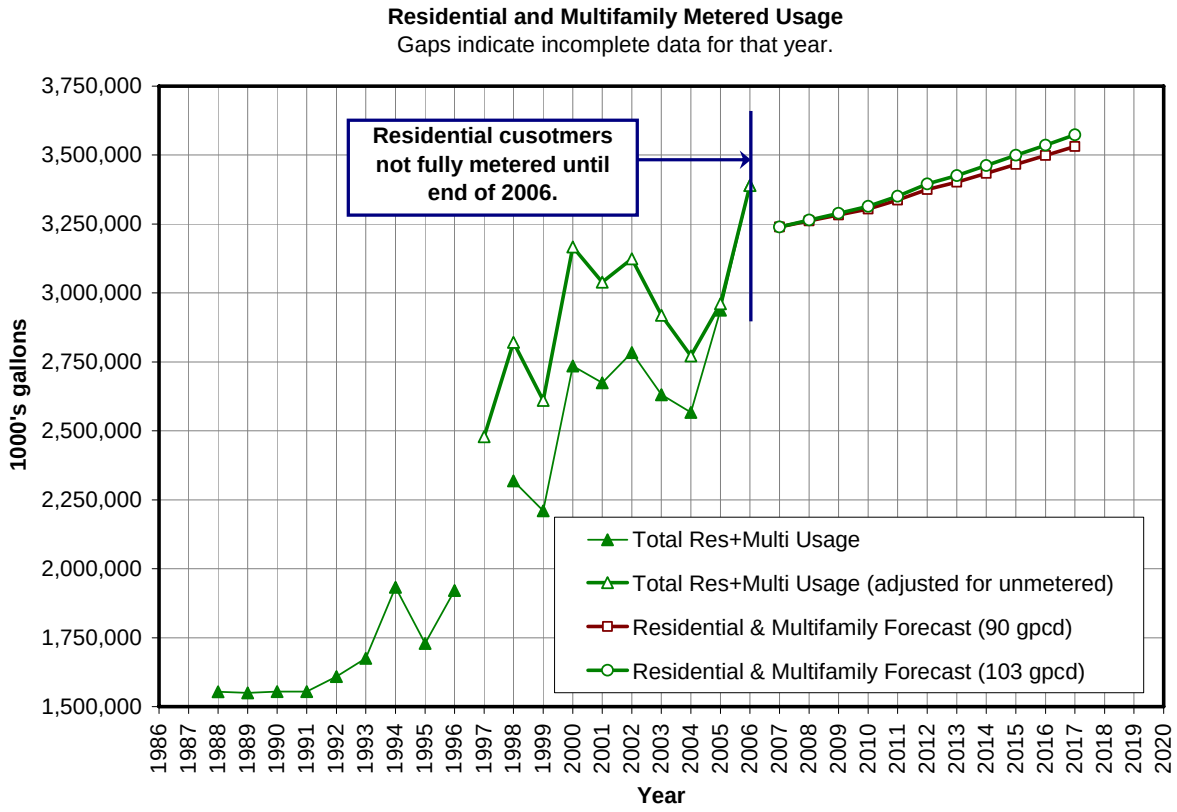


FIGURE 4

5.2 Peak Monthly and Daily Treated Water Demands

Forecasted demands presented in the subsection represent total treated annual water demand projections. However, it is important and useful to also predict the daily peak and total monthly water demand as a means to evaluate the potential need for water demand management to reduce peak demand on infrastructure such as water treatment capacity. To this point, forecasted daily peak water demands may be compared to current system capacity for treatment and distribution and identify any critical capital needs the system faces.

The following is a brief summary of the methodology used to predict daily peak water demands:

- Annual total treated water demand forecasts (in million gallons) from the previous section were converted to annual average production rates in million gallons per day (mgd),
- Daily plant production data was evaluated from 2002 to 2006 to determine the peak-day values for each month, and the annual average in mgd,

- The peak-day to annual average was calculated for each month, the average of this value from 2002 to 2006 was the peak-day to annual average factor,
- The peak-day was forecasted for each month by applying the peak-day to annual average factor to the forecasted annual average through 2017.

Appendix B provides additional detail regarding how the forecasting of daily water demands was calculated.

Based on the methodology described above the peak-day water demand in 2017 was estimated as 40 mgd, which is below the current water treatment plant capacity of 50 mgd. Peak-day forecasting results are presented in Figure 5.

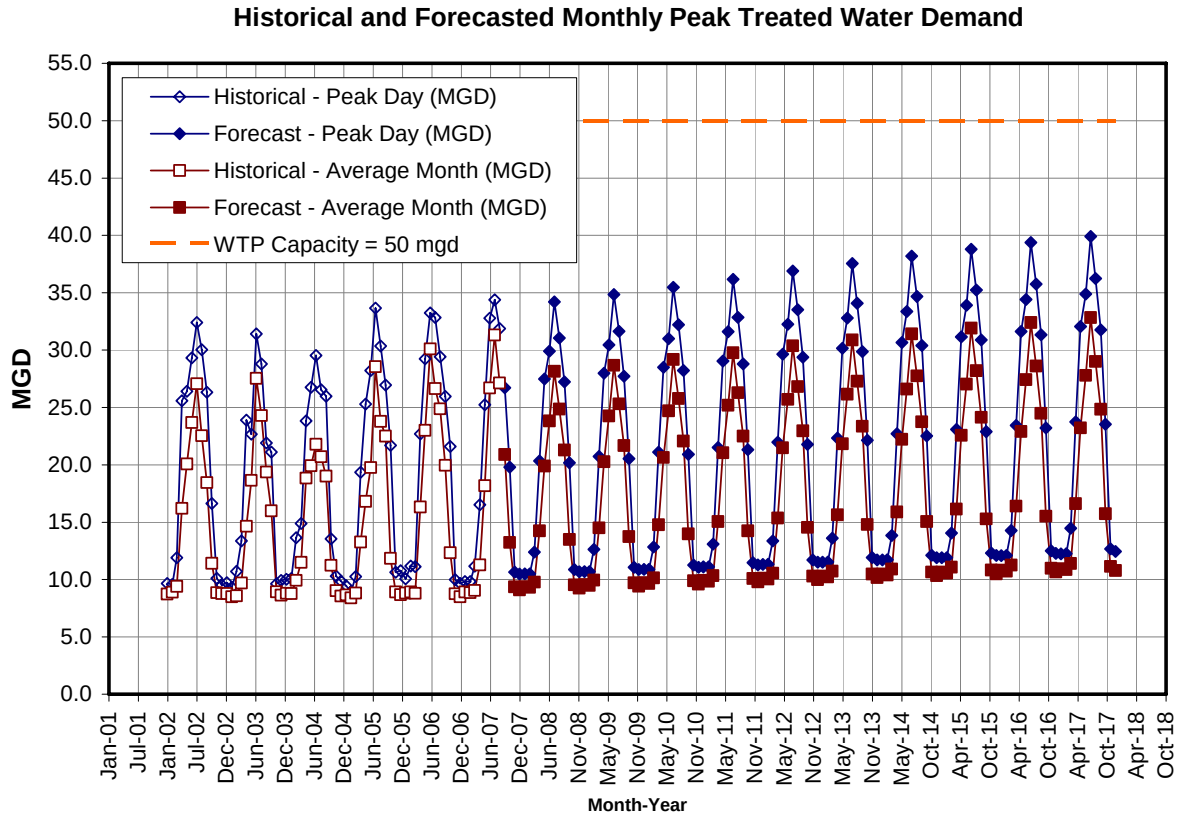


FIGURE 5

The total forecasted monthly treated water production (in acre-feet) was also estimated based on a similar procedure to calculate average month production. The following is a brief summary of the methodology used to predict average month water demands:

- Annual total treated water demand forecasts (in million gallons) from the previous section were converted to annual average production rates in million gallons per day (mgd),
- Daily plant production data was evaluated from 2002 to 2006 to determine the average values for each month, and the annual average in mgd,

- The average month to annual average was calculated for each month, the average of this value from 2002 to 2006 was the average month to annual average factor,
- The average month was forecasted for each month by applying the average month to annual average factor to the forecasted annual average through 2017.

Appendix B provides additional detail regarding how the forecasting of monthly water demands was performed.

Based on the methodology described above the total annual treated water demand in 2017 including 8.1% unaccounted for water and treatment plant efficiency of 94.7% was estimated as 21,080 acre-feet, with a monthly peak of slightly under 3,200 acre-feet. Current water treatment capacity for the City is about 56,000 acre-feet annually. Monthly production forecasting results are presented in the Figure 6.

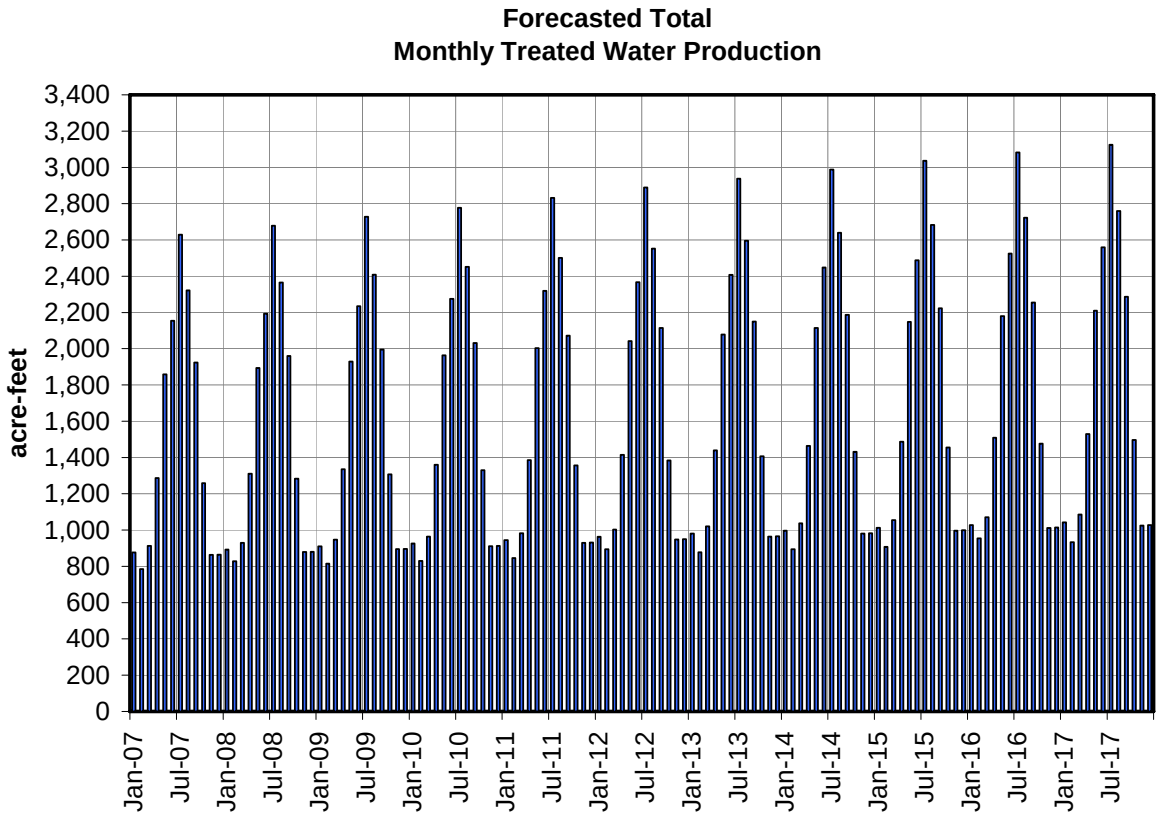


FIGURE 6

6.0 Proposed Facilities

6.1 Raw Water Supply

As summarized previously, in 2005 the total raw water storage capacity was 31,848 acre feet and the total raw water supply available was 68,679 acre feet. The estimated annual total treated water production that will be required in 2017 based on forecasting methodology above is 21,080 acre-feet (without accounting for additional conservation measures). This does not account for water treatment plant efficiency, which represents the percentage of incoming raw water that becomes treated water. The average water treatment plant efficiency from 2002 to 2006 was 95 percent. Based on this the estimated annual raw water demand to the treatment plants are 22,190 acre-feet for the year 2017. It therefore appears that the City does not necessarily need to establish water conservation goals based on raw water supply limitations through 2017.

Alternatives for additional raw water supply evaluated in the 2004 RWMP include enlargement of the Button Rock Dam to increase the capacity of Ralph Price Reservoir, enlargement of Union Reservoir and pipeline, and participation in the Windy Gap Firming Project. Other alternatives, not requiring construction modifications, include increasing C-BT trade, purchasing additional C-BT rights, purchase St. Vrain Creek water rights, and acquiring additional water rights through annexation, and water conservation. However, water conservation efforts implemented by the City do not appear to influence the need for or the timing of these various capital projects.

6.2 Treated Water Facilities

Forecasted peak-day water flow (without accounting for additional conservation measures) was in the range of 40 mgd in the year 2017. The current treatment plant capacity of the Nelson-Flanders WTP and the Wade Gaddis WTP is 50 mgd. The Nelson-Flanders WTP may be expanded to increase capacity. Modifications to one of the plants will probably be required near 2020 to increase plant capacity. Water conservation efforts by the City may postpone the need for treatment plant expansion in 13 to 20 years, but probably not prior.

7.0 Conservation Goals

Given that the City does not have any pressing infrastructure or raw water supply shortages that might require immediate aggressive water conservation activities, the goals and objectives for future water conservation measures and programs set by the City have been developed to help address future community sustainability and regional water supply reliability. The City has always been a good steward of the community, the region and the environment, and those policies that the City has established and implemented in the past will be further strengthened by additional, meaningful water conservation.

To this end, the City is looking to reduce customer and City raw water demands by approximately 10 percent by buildout, for an expected reduction of about 3,500 acre-feet. Given that this Plan focuses on only those measures and programs that will be implemented in the next ten years, from 2008 to 2017, the amount of raw water demand reduction estimated over the next ten-year period is approximately 1,600 acre-feet, or 7.7 percent of the 2017 forecasted total raw water demand. Additional water savings are expected as the City expands and enhances its reuse program; however, specific details regarding how return flow will be captured and put to beneficial use are beyond the scope of this document.

The water savings expected from the water conservation measures and programs identified in this plan have an estimated value of approximately $27 million in 2008 dollars, based on a treated water development cost of $15,000 per acre-foot.[1]

[1] The future cost of water includes the combined cost of new raw water supply, estimated to be $10,000 per acre-foot, plus system costs for collection, treatment and distribution, estimated to be $5,000 per acre-foot. It is possible that the future cost of water maybe substantially higher than what has been used in this exercise.

8.0 Identification and Screening of Potential Water Conservation Measures and Programs

This section will look at the universe of measures and programs that have relevance to the City, including all the categories that are required under CRS 37-60-126. The City has ongoing water conservation measures and programs that will be included in the evaluation. Section 4 contains a listing of these ongoing activities.

It is important to understand the meaning of measures and programs within the framework of the City's water conservation plan. Based on the prevailing literature[2], measures include both hardware devices and practices that actually reduce demand, whereas programs are strategic combinations of activities and measures (e.g., education and incentives with measures) that will bring about reduced water use demands. To this point, hardware measures are typically more reliable in achieving long-term water savings because they typically need to be installed only once and require no ongoing effort to maintain water savings. In contrast, educating water users to adopt low-water-use or native landscaping and irrigation practices can require considerable time and ongoing reminders are needed if water-efficient landscape and irrigation practices are to be maintained. The best water conservation programs link hardware installations with practices that support behavioral changes such that end user water demands are measurably reduced to levels that can be maintained and sustained. This is exactly the approach that the City plans to implement.

The water conservation measures and programs are focused on those activities that will occur over the next ten years, or until 2017. Any planning horizon beyond this time period, albeit valuable for long range and strategic planning, is wrought with extrapolations and estimates that do not necessarily support the short and midrange planning that is needed to develop the tactics which must be included in the water conservation plan. Therefore, the identification and selection of water conservation measures and programs will limit its efforts chiefly on an evaluation of the activities planned for the next ten years.

8.1 Initial Screening of Measures and Programs

Focusing this plan on defining the future water conservation activities that will be implemented within the next ten year period serves two key functions for the City:

- It allows the City to collect information that the City currently lacks regarding customer water use and develop specific measures and programs to address customer water conservation needs to improve their water use efficiency; and
- It allows the City to respond as its customers embrace and engage the various measures and programs being promoted and provided by the City to save water.

As indicted above, behavioral changes, which occur as a result of institutional, business, association, and/or individual customer's response to key water conservation measures and programs, are important components of any water conservation effort. Meaningful water conservation requires that end users respond to the education, request and utilize rebates,

[2] Water Use and Conservation, Amy Vicker, 2001

conduct audits and/or adhere to ordinances being implemented by the water utility for water demand to be reduced. Given that behavioral changes strongly influence the acceptance and effectiveness of any water conservation measure or program, it is imperative that continuous and deliberate monitoring and verification of the proposed activities occur, and that the information collected is used to refine and alter the ongoing programs as they are implemented in response to customer behavior. The City will link any water conservation measure that it proposes to implement with appropriate monitoring and verification activities for just this purpose.

To this point, having water conservation measures and programs that include explicit means to monitoring customer/end user acceptance and adherence, ultimately allowing for the measurement of "saved water" is vital to the overall success of the water conservation plan. Monitoring customer water use becomes increasingly important as water conservation programs mature, such as those measures and programs that the City has implemented and is looking to implement. Therefore, key components of this water conservation plan will include individual customer water use tracking for existing customers, substantial education for new customers (including both residential and commercial water users), and the use of deliberate customer feedback mechanisms to track perceptions and behaviors.

To these points, the universe of water conservation measures and programs available to the City was developed and screened based on the following criteria:

- Is additional information needed to complete an evaluation of water savings and cost benefit to the City and its customers?
- Does the measure and program allow for the tracking of future water savings?
- Are there other considerations that dictate whether or not an identified measure and program could not be implemented by the City (e.g., some ordinances would not meet with public acceptance, some measures and programs are not allowed by State regulation, etc.)?

Appendix C contains a summary of identified and screened conservation measures and programs, presenting those measures and programs that were selected to be carried forward for further, detailed evaluation. Please note that many of the screened measures and programs will likely be implemented in the future by the City; however, adequate information does not currently exist to support a cost benefit analysis at this time. Also note that educational efforts will be an important component of the future water conservation activities conducted by the City. The direct measurement of the water savings created by effective educational practices is not necessarily easy to determine. However, it is clear that without ongoing, appropriate education of the City's customers regarding water resources and its water conservation efforts, meaningful water conservation will be difficult to implement. Therefore, educational practices will be carried forward.

8.2 Detailed Description of Selected Measures and Programs

A listing of the water conservation measures and programs that passed the initial screening process is provided below, with a brief explanation of each as it relates to the City. The list that was developed is summarized in Table 14 to align with the requirements specified in CRS 37-60-126 (4)(a).

Supply Side Measures and Programs

Metering

Critical to any water conservation and/or management activity is the collection of reliable information regarding water use. Metering is the front line of water use data collection. Effective meter testing and replacement must occur to support accurate billings, reliable water audits, and as indicated above, identification of unaccounted for water loss. Accurate and efficient water use metering has been a priority of the City's for many years.

TABLE 14

Summary of the City of Longmont's Ongoing and Planned Water Conservation Measures and Programs as Compared to the Requirements of CRS 37-60-126 (4)(a)

Requirement	Current Program	Proposed Program
Water efficient fixtures and appliances (e.g., toilets, urinals, etc.)	The City currently has established a residential rebate program for ultra-low flow toilets, dishwashers and washing machines. The City has also replaced inefficient fixtures with high efficiency fixtures in its offices and buildings	The City plans to continue its residential rebate program and expand its rebates for commercial appliances and fixtures.
Low water use landscapes, drought-resistance vegetation, efficient irrigation	The City provides educational material to residents regarding the benefits of Xeriscape plant material.	The City is planning to initiate Rain sensor and ET controller rebate programs for commercial, residential and irrigation only customers. The City is also looking to initiate outdoor audit programs for these customers. The City is also looking to implement a non-potable irrigation system for a selected number of its parks to reduce treated water demand and upgrade irrigation systems to include remote ET controllers.
Water-efficient industrial and commercial processes	The City has conducted limited review of commercial and irrigation accounts to identify high water use. The City is also working with a regional team to develop an ICI audit program.	The City is planning to initiate commercial customer audits that will evaluate both indoor and outdoor use, establish the need for additional programs, and initiate commercial indoor appliance rebate programs.
Water reuse systems	The City has a number of water rights that allow for reuse of return flows. The City currently utilizes exchanges with downstream water users to obtain return flow credits at its water treatment plant diversion.	The City will explore options to expand its water reuse program in the future to include capturing return flows in downstream reservoirs and circulating the captured water back into the City. The evaluation effort is ongoing.
Distribution system leak identification and repair	The City has implemented a meter installation program that has over the past 20 years completed metering of all its customers by the year 2006. The City also conducts meter testing and replacement for its large water customers. The City has taken steps to improve registering water use with automated meter reading (AMR) systems and meters with leak detection capabilities for about 250 of its customers.	The City will evaluate the cost and benefit of installing additional automatic meter reading (AMR) equipment (i.e., meters and transponders) at high use customers and in new construction in the future. The new meters would record and store data tracking very low water use that would be used for leak detection. The City will also evaluate sonic leak detection devices.
Public education, customer audits	The City currently utilizes bill inserts, newsletters, advertisements, customer training seminars and youth education programs to educate and engage its customers regarding water conservation and water resources management. Create interpretive signs in parks and golf courses that tell the users both the water savings and energy savings that are saved by the City using raw water and following watering restrictions.	The City will continue these efforts and plan to add indoor and outdoor commercial audits, outdoor residential and irrigation account audits and customer water use and landscaper training workshops. The City will also plan to increase K-12 educational efforts.
Water rates structure and billing systems that encourage water efficiency	The City currently utilizes inclining block rates for its residential customer accounts. It bills its customers monthly and includes billing inserts discussing water conservation.	The City plans to conduct water rate studies every 3 to 5 years in the future. These rate studies will set rate increases for multiple years that follow.
Regulatory measures	The City currently has ordinances for landscape plan review and approval, which include Xeriscape provisions, water waste ordinance, voluntary watering restrictions, and plumbing fixture requirements.	The City is planning to develop better inspection and enforcement practices related to its landscape and water waste ordinances. A recent example of this is the City's new requirement that all irrigation plans for common open space areas in residential are reviewed by City staff and certified by the designer and installer that they are designed and built to meet City Standards which are written to minimize the wasting of water.
Incentives including rebates	The City has residential indoor appliance rebates for ultra-low flow toilets, dishwashers and washing machines. The City also has soil amendment rebates for commercial and residential developers.	The City plans to continue its residential rebate program and expand its rebates for commercial appliances and fixtures, and residential, commercial and irrigation outdoor equipment.

The City has installed meters on all of its customers over the past 20 years, including over 1,680 in 2005 and 2006.

The City has also taken steps to improve registering water use with automated meter reading (AMR) systems and meters with leak detection capabilities. The City's Tel Data system has 250 addresses that report meter readings hourly, the Metron system has 20 addresses which send readouts to laptops, and the Neptune system has 2,000 addresses with radio meter readings. Of the Neptune units about 250 are equipped with a program which can detect leaks or backflow at the meter.

The City also has a program that regularly inspect its larger meters; half of the meters greater than 3 inches are tested every two years. Meters for large and small commercial customers have been in place since 1983. Meters that are older than 10 years may be targeted for replacement in order to maintain accurate water use readings.

Finally, the City plans to evaluate the value of installing electronic automated meter reading (AMR) metering in all new construction and/or for high water use customers to reduce the labor burden of meter reading and data management, and to improve site-specific leak detection monitoring.

Leak Detection and Repair

Leak detection and repair is the very first and most basic water conservation activity that any water provider should perform. Minimizing leaks that drain the resources of the water provider is a basic requirement for sound "standard of care" management. To this end, leak detection and repair focus on locating and identifying water that is either unaccounted for or is not billed to customers.

The City has maintained a leak detection and repair program over the years, which focuses on responding to leaks and conducting quick and appropriate repairs when leaks have been identified. The City will plan to continue to track leaks and conduct leak repairs, perform spot audits for unusually high water use, and conduct annual distribution system pipe replacement for those areas with aging infrastructure. The City will also evaluate the benefits of overall water distribution system mapping using sonic detection devices and risk evaluations to identify and schedule future pipe replacement activities. The City will review water valve and fire hydrant flushing practices to identify potential water savings.

Reuse

The City has a water rights portfolio that allows for reuse of certain ditch transfers of consumptive uses and Windy Gap water. Currently the City utilizes downstream exchanges of its wastewater return flows to allow for increased surface water diversions at its water treatment plant and other raw water supply ditches. In the future, the City will evaluate other options to capture and reuse wastewater return flows utilizing Union Reservoir and the existing network of canals and ditches that cross the City. Given the complexity of the water rights and the potential reuse scenarios, the evaluation of reuse options is continually reviewed.

Non-Potable Water Use

The City has the ability to reduce its overall treated water demand through the use of non-potable water. As with any other Colorado municipal water provider, non-potable water can be used for outdoor irrigation to save treatment and energy costs, especially in cases where direct ditch rights

are available adjacent or in close proximity to parks and athletic fields. The City currently uses ditch water to irrigate approximately 27 city and community parks, two golf courses, and thirteen schools totaling about 700 acres. The site of the City's main recreation facility is also irrigated with raw water. Availability of raw water for irrigation decreases demand for treated water from the treatment plant and conserves energy and chemicals required for treatment. Currently raw water used for irrigation is not consistently metered.

Future non-potable water use by the City will be evaluated to be improved and expanded. Improvements to the non-potable irrigation system will be evaluated looking at more efficient controllers and pumping stations, as well as expanding the use of non-potable water to other City facilities. Conversion of treated water irrigation to non-potable irrigation effectively reduces overall water use by the City, since raw water savings will be realized due to reduced treatment plant water requirements (e.g., filter backwash) and distribution system losses. Additionally, removing irrigation demands from treated water supplies allows instream flows to remain in the St. Vrain Creek, one of the area's most important cool and warm water fisheries, from the point of diversion at the water treatment plant to diversions further downstream. Additional instream flows, which are important to the City and its customers, can thereby be enhanced by increasing the use of non-potable water for irrigation.

Demand-Side Measures and Programs

Educational Activities and Public Outreach

Water resources and water conservation education is the backbone of all water provider customer-based programs. It is imperative that water customers have a basic understanding of the very systems that support their way of life in such an essential manner. Not surprisingly, much of the water conservation measures and programs that a water provider can conduct to promote meaningful water conservation are based on managing and adjusting water customer behaviors – behaviors that are based on customers understanding how their actions influence the overall water system being managed by the water provider.

In addition, customer awareness of City rebate and technical assistance programs, such as audits, is required for these types of measures and programs to develop adequately and reach into the City's customer base.

The City currently utilizes bill inserts, newsletters, advertisements, customer training seminars, and youth education programs to educate and engage its customers regarding water conservation and water resources management. Many of these specific activities will be included in future water conservation programs; however, the City plans to evaluate its overall educational program developing a focused public relations campaign to develop more effective messaging, enhance promotion of ongoing rebate programs (to increase the level of participation), and to promote new rebate and audit programs available to residential and commercial customers.

The City will also evaluate additional K-12 educational efforts utilizing teacher training programs such as Project Water Education for Teachers (WET) and target specific training seminars for homeowners, business owners, and landscape and irrigation installation contractors.

Incentives

Residential and Commercial Rebates

One of the best methods to create measurable water conservation is to offer customer rebates for indoor appliances. Outdoor irrigation system rebates and sod replacement can also be effective in saving water; however, outdoor irrigation effectiveness can be influenced by variations in annual precipitation, existing irrigation system inefficiencies and other circumstances beyond the control of the water provider. Nonetheless, outdoor irrigation rebates can be of great benefit to the overall customer water use efficiency, albeit somewhat difficult to measure when compared to indoor rebates.

The City currently has a rebate program that offsets the cost for residential customers to purchase and install ultra low-flow toilets, high-efficiency dishwashers, and washing machines. Analyses will be prepared to evaluate the efficacy of continuing these programs and expanding the incentives to include commercial toilets and urinals, commercial pre-rinse spray valves, and residential and commercial rain sensors and ET controllers. Turf replacement incentives can also be evaluated in this Plan.

Technical Assistance

Residential Outdoor Irrigation Management and Audits

Outdoor summertime water use constitutes about 50 percent of the total water use in the City. Many residential water customers rely upon irrigation systems to water their lawn and shrubs on a pre-set schedule, based on a programmable logic controller. Unfortunately, some of these customers set the timers and forget them which results in watering at inappropriate times such as every day and night, during a rainstorm, or during the day after 10 am and before 6 pm. To this point, the City will plan to evaluate the cost/benefit of continuing to conduct individual residential outdoor irrigation audits through the Center for ReSource Conservation (CRC), and provide additional education to homeowners regarding low water-use landscapes, Xeriscaping, and overall soil and plant management. The City plans to evaluate providing rebates for outdoor irrigation equipment, specifically rainfall sensors and ET controllers.

Commercial, Industrial, Institutional and Irrigation Account Water Audits

Commercial and irrigation customers make up the fastest growing water users served by the City. These large water users often do not track their water use closely, and therefore may not be especially efficient with regard to their outdoor and/or indoor water use. It will be valuable for the City to audit key commercial and residential customers to help them to identify potential water savings measures that can be implemented to improve the efficiency of their processes and water applications thereby saving the City water and its customer's money.

To this point, the plan will evaluate commercial, industrial, institutional and irrigation account audits for both indoor and outdoor applications, as appropriate. The City also plans to evaluate the benefits of increasing commercial and irrigation customer education regarding low water-use landscapes, Xeriscaping, and overall soil and plant management. The City also plans to evaluate providing rebates for outdoor irrigation equipment, specifically rainfall sensors and ET controllers to commercial and irrigation customers.

The importance of the commercial audit program, which includes audits of institutional and irrigation accounts, is likely to become a vital component of the City's future water conservation activities. Currently, information is not readily available regarding individual customer water use

history and ongoing water conservation programs. Through the audit process, the City plans to identify and support individual customer water use habits to help selected entities better manage their water use management. Potential measures and programs that will be developed as a result of the audits may include:

- Cooling tower and system management programs;
- Car wash efficiency programs;
- Irrigation and landscape management programs;
- Process water management programs;
- Cleaning and sanitation water use improvement programs;
- Commercial kitchen and restaurant improvement programs; and
- Boiler and heating system improvement programs.

The efficacy of creating and implementing these programs, and potentially others, will hinge on the results of the audits, which will be used to identify the number of entities that may benefit from these programs and the amount of potential water savings. The audits and related studies may also be used to evaluate alternative water rate programs (e.g., alternative block rates, water budgets, etc.) for selected irrigation taps.

Municipal Use Efficiency

Water Efficient Fixtures

The City has replaced most, if not all, of the toilets and urinals in its offices and public buildings. The City will evaluate in the future the cost-benefit of retrofitting its facilities with water efficient fixtures including ultra low-flow toilets, high efficiency and waterless urinals, and automated sinks.

City Park and Golf Course/Irrigation

As previously indicated, a number of the City's parks and golf courses are irrigated with ditch water. These facilities are without consistent metering, although information exists regarding pump and/or system run times such that rough estimates of past water use could be developed. Potential future water conservation measures and programs that may be appropriate for these City facilities include performing audits to determine actual past water use and current irrigation practices. The City will also utilize focused audits to evaluate options for upgrading the irrigation and pumping systems at existing facilities by identifying opportunities for adding meters where possible and improving irrigation efficiencies, planting materials, and overall water use.

The City also plans to evaluate the benefits and costs related to changing the requirements for new City built parks and parkways and medians to include requirements or restrictions related to sprinkler types and plant materials.

Regulations and Ordinances

Plumbing Fixtures and Pressure Reducing Values

The City maintains ordinances that require fixtures including toilets, urinals, showerheads, etc. to provide maximum flows for service. Although some of the flow requirements are consistent with

what is allowed by the Unified Plumbing Code of 1994, the City will evaluate the benefits of updating its plumbing code as a component of this plan.

Water Waste Ordinance

The City has developed an ordinance that prohibits water waste by its customers defined as water running to any gutters and/or impervious surface without beneficial use. There is no dedicated staff for enforcement of this ordinance; however the City owns and maintains a hotline for citizen reporting. The City will evaluate the efficacy of seasonal staff for an enforcement program which would provide enforcement services for repeat water wasters.

Landscaping and Soil Amendment Requirements

New development continues within the City limits, expanding the number of residential, commercial and irrigation taps on a yearly basis. The City understands that the best time to place soil amendments to support and sustain low-water use plantings and install efficient sprinkler systems is at the outset of construction. The City has therefore developed landscape regulations that set forth basic landscape planning and review requirements for all new HOA area construction. The landscape requirements include provisions for Xeriscape, and require that sprinkler systems do not water impervious areas, streets or pavement.

The City also has implemented a soil amendment program that requires the addition of 3 cubic yards of organic materials to every 1,000 square feet of landscaped area. The City has provided limited inspections to ensure that compliance with the program is occurring. The City has also implemented a soil amendment rebate program to help improve compliance. They have provided over $50,000 in rebates through the program over the past 3 years.

This Plan will evaluate the efficacy of continuing the soil amendment rebate program and look at the costs and benefits of increasing inspections and other enforcement activities in accordance with these regulations.

Watering Restrictions

The City has voluntary watering restrictions that suggest limiting all outdoor watering to once every two days, between the hours of 6 pm and 10 am. Hand watering and watering associated with the primary course of any business are exempt. When mandated due to a drought or other water emergency, the City also has the ability to assess fines on violators with the first offense of any restriction being $25, the second offense $50, and the third offense $100.

As indicated earlier, the City will evaluate stepping up its enforcement measures to identify and notify those customers in violation of City watering restrictions, if and when the watering restrictions become mandatory. No additional restrictions are being considered at this time.

As part of this plan it is suggested the City conduct an evaluation of implementing mandatory residential watering times between 6 pm and 10 am.

Water Billing

Inclining Block Rate and Water Budgets

Pricing water is one of the most difficult tasks that area water providers must undertake. Water pricing must be equitable for its customers, but it must also reflect changing costs for energy, infrastructure maintenance, and development of new reliable and sustainable water supplies. Water pricing can also be developed to help promote water conservation.

The City currently utilizes an inclining block rate structure to bill its residential customers. The City will be conducting additional water rates studies, under separate cover, to set and implement future water rate fee increases for residential and commercial customers. It is anticipated that the City will conduct water rate studies every three to five years into the future during the next ten year planning horizon.

8.3 Evaluation and Final Selection of Measures and Programs

The City does not have unlimited resources to implement its water conservation program. Therefore, efforts of the City will focus its resources on those programs that provide the most cost-effective water savings based on the cost-benefit analyses presented in Appendix D and summarized in Table 15 below.

Based on the evaluations presented in Appendix D, including the cost-benefit information provided in Table 15, the City has selected the following water conservation measures and programs to implement.

Meter testing and replacement – continue this program annually through the planning horizon. The City plans to enhance the current meter replacement program by providing AMR meters to those commercial and irrigation customers that agree to audits, as a means to improve leak detection and overall customer water use efficiency.

TABLE 15
Summary of Costs for Water Saved for Various Measures and Programs

Measure and/or Program	Cost of Saved Water ($ / acre-foot)	Cumulative Savings through 2017 (acre-feet)[1]	Source of Information
Pre-Wash Spray Nozzle Giveaway	100	190	Appendix D
Water Rate Studies	650	579	Appendix D
Commercial ET Controller Rebate	900	84	Appendix D
Residential ULF Toilet Rebates	1,520	33	Appendix D
Commercial and Residential Education	1,580	266	Appendix D
Commercial Rainfall Sensor Rebate	1,590	23	Appendix D
Commercial ULF Toilet Rebate	1,920	13	Appendix D
Commercial Indoor Audits	2,060	52	Appendix D
Commercial ULF Urinal Rebate	2,310	27	Appendix D
Residential Rainfall Sensor Rebate	2,620	3	Appendix D
Residential ET Controller Rebate	2,730	43	Appendix D
Residential Washing Machine Rebates	2,830	22	Appendix D
Non-Potable Irrigation Upgrades/Audit	4,000 to 8,000	148	Appendix D
Commercial/Irrigation Outdoor Audits	4,770	12	Appendix D
Commercial Landscape Ordinance	5,600	Not implemented	Colorado Springs Water Conservation Plan
Residential Dual Flush Toilet Rebate	5,820	9	Appendix D
Residential Whole House Audit	5,820	10	Appendix D
Residential Dish Washer Rebate	5,820	0.4	Appendix D
Residential Outdoor Irrigation Audits	7,440	12	Appendix D
Soil Amendment Rebate	10,890	40	Appendix D
AMR Metering[2]	11,500 to 18,400	varies	Appendix D
Meter Testing and Replacement	16,090	16	Appendix D
Water Waste Code Enforcement	17,500	8	Appendix D
Residential/Commercial Turf Replacement[3]	10,000 to 20,000	Not implemented	WeatherTrak$_{tm}$ Analysis

[1]Cumulative treated water savings based on assumptions provided in Appendix D regarding timing of implementation and water use.
[2]Includes an offset for increased revenues from more accurate water use billing.
[3]Based on a range of turf replacement rebates of $0.50 to $1.00 per square foot. Note that customer turf replacement costs are $2.00 to $10.00 per square foot.

Water Rate Studies – The City will conduct a water rate study in 2008 and at least ever 3 to 5 years thereafter. Until then the City will utilize the following block rates for its various customers. Current inclining block rates that the City uses for its residential customers are shown in Table 16.

TABLE 16
City of Longmont Current Water Volume Charge

Single Family and Duplex		
	Inside City Limits	Outside City Limits
0 to 10,000 gallons	$2.53	$3.80
11,000 to 20,000 gallons	$2.91	$4.37
Over 20,000 gallons	$3.41	$5.12
Multifamily (3 or more units)	$2.28	$3.42
Small Commercial	$2.39	$3.59
Large Commercial	$1.76	$2.64
Irrigation	$3.27	$4.91

The City evaluates rates and fees on a regular basis, and is currently involved in a rate and fee structure study planned to be completed later this year.

Commercial Water Conservation Programs – The City will be initiating a commercial water conservation program in 2008 and continuing it through the planning horizon. In the next 1 to 2 years, the City will begin a commercial water audit program that will be used to identify and evaluate the water use patterns of its largest commercial, industrial, institutional and irrigation water users. The audits will be used to characterize both indoor and outdoor water use and identify means for water savings. As indicated above, the City will plan to provide new AMR meters to those large customers that take part in the audit program.

The City will also begin its pre-rinse spray valve giveaway program for local restaurants and commercial and institutional kitchens. This program will continue through the planning horizon until as many kitchens in the City as is reasonable are properly outfitted with the pre-rinse spray valves. Finally, the City will initiate an ET controller and Rainfall Sensor rebate program for commercial, industrial, institutional and irrigation customers that have participated in the City sponsored outdoor irrigation audit. The City will also initiate a rebate program for indoor commercial appliances and fixtures, including high efficiency toilets, and ultra low flow urinals.

The City will also begin conducting commercial and irrigation customer workshops within the next 2 to 3 years and continue throughout the planning horizon to:

- Provide general education on water wise practices and water use efficiency,
- Promote the rebate and audit programs, and
- Collect feedback on the efficacy of the City's water conservation measures and programs.

Critical to these above efforts (i.e., commercial and irrigation customer workshops, commercial and irrigation rebates and outdoor irrigation audits) will be the tracking of individual customer

water use. It is only through the tracking of individual customer use can the effectiveness of these programs be verified.

The City will also begin landscaper and irrigation system installer training within the next 3 to 4 years to support the needs of new and retrofit commercial, parkway and open space construction regarding:

- City codes and ordinances;
- The City's soil amendment requirements and rebate program;
- Sprinkler system design and construction;
- Education of private HOA's; and
- The principles of Xeriscape.

Residential Water Conservation Programs – The City will continue its indoor appliance residential rebate programs for ultra low flow toilets, dual flush toilets, high efficiency dish washers, and high efficiency washing machines. The City will also initiate an ET Controller and Rainfall Sensor rebate program for those residential customers that have participated in the City sponsored outdoor irrigation audit. The City will also continue its ongoing residential outdoor irrigation audit program with CRC throughout the planning horizon.

The City will also continue and possibly expand its residential customer workshops within the next two years, continuing throughout the planning horizon to provide general education on water wise practices and water use efficiency, promote the rebate and audit programs, and collect feedback on the efficacy of the City's water conservation measures and programs. Critical to these above efforts (i.e., residential customer workshops, residential rebates and outdoor irrigation audits) will be the tracking of individual customer water use. It is only through the tracking of individual customer use can the effectiveness of these programs be verified.

The City will also begin landscaper and irrigation system installer training within the next 3 to 4 years to support the needs of new and retrofit residential construction regarding:

- City codes and ordinances;
- The City's soil amendment requirements and rebate program;
- Sprinkler system design and construction; and
- The principles of Xeriscape.

Finally, the City will continue to sponsor its Xeriscape Demonstration gardens and the CRC's "Garden in a Box" program for residential customers.

Municipal Use – The City will conduct an audit of its raw water irrigation systems to estimate past and current water use, and review the adequacy and integrity of the existing irrigation plumbing. As a result of the audit, numerous capital improvement efforts will likely be identified to improve irrigation efficiency at those locations that currently use raw water.

In addition, the City plans to expand its use of raw water into parks, schools and the Sunset Golf Course. These projects are expected to provide irrigation to an additional 400 acres of City property by 2017. There will be a net savings of water once the new raw water irrigation systems are constructed for existing facilities since they will eliminate some inefficiency related to water treatment and transmission. Water savings were not identified for construction of raw water irrigation systems at new facilities.

Finally, the City will conduct a study of those private entities providing irrigation of public lands along throughways. This study, coupled with the proposed audit programs will be used to help identify water savings programs that may include alternative water pricing strategies.

Other Education and Outreach Efforts – The City will conduct substantial educational efforts over the next ten years to better reach and educate its customers and citizens about its water resources, water supply and the importance of water conservation. To begin with, the City will develop a public relationships campaign to help coordinate and improve the effectiveness of its continuing outreach and educational program, which includes bill stuffers, newsletters, and newspaper advertising. Mass and multi-media channels will be evaluated, and new messaging and branding may be developed. Advertising and outreach programs will be identified and coordinated based on the outcome of the public relations analyses.

The City will also increase its effort to support K-12 education. It will continue to support the local water fair. It will also sponsor Project WET (Water Education for Teachers) into the local school district twice a year starting in 2010.

Ordinances – The City will evaluate the cost and impact of adding seasonal and/or full-time staff to support the City's enforcement of existing relevant ordinances (e.g., water waste, soil amendment requirements for new commercial construction) and perform site inspections.

Monitoring and Verification – The City will step up its efforts to monitor and verify that the various water conservation measures and programs are cost-effective and efficient in saving water. For this to occur, the City will begin to track overall customer, as well as selected individual water use over the planning horizon, especially at those homes and businesses that have taken advantage of the City's audits and other educational efforts, and rebate programs. Details regarding monitoring and verification efforts are provided in Section 10.

9.0 Impacts of Proposed Water Conservation

The City is planning to implement water conservation measures and programs as discussed in the prior section for purposes of reducing the amount of raw water used on an annual basis by the City's customers. A reduction of raw and treated water use will allow the City to extend its current water supplies further into the future without additional water supply development, maintain more flow in the St. Vrain Creek as it passes through the City, and reduce energy and water treatment costs associated with the production of potable and non-potable water supplies. Overall, meaningful water conservation will help the City to maintain its focus on being a sustainable community into the 21st century.

The estimated water savings that the City will realize through the implementation of proposed water conservation efforts over the next ten years are summarized in Table 17 and presented in Figures 7 and 8. The estimated water savings have been developed using those assumptions and analyses presented in Appendix D. Actual water savings will be dependent upon numerous internal and external forces influencing customer water use. Therefore, the City will continuously monitor the progress of its proposed water conservation programs, such that the actual water savings are tracked and reported on a regular basis to the City Council and the public.

TABLE 17
Estimated Water Savings

Year	Annual Treated Water Savings (acre-feet)	Cumulative Treated Water Savings (acre-feet)	Cumulative Raw Water Savings (acre-feet)[1]
2008	107	107	121
2009	113	220	249
2010	158	378	429
2011	149	527	598
2012	165	692	785
2013	160	852	966
2014	185	1037	1176
2015	187	1224	1388
2016	200	1424	1615
2017	185	1609	1825

[1] Assumes 8.1% unaccounted for water loss after treatment and 94.7% water treatment plant efficiency

The overall cost to implement this plan is estimated to be about $3.3 million over the next ten years with about $1.4 million for incentives and rebates, education and training, audits and related measures and programs, and monitoring and verification activities. The remaining balance will be used for ordinance inspections and enforcement, raw water conversion and improvement projects, meter testing and replacement, and water rate assessments and implementation efforts. For the

City to obtain a similar amount of replacement water to meet this supply (i.e., 1,600 acre-feet), it would cost approximately $27 million.[3]

As discussed in the next section, it is anticipated that the City would pursue approximately $100,000 over the next four years from the State grant program to initiate some of the most important components of this plan. The grant requests will focus upon providing audits, education and rebates to the City's commercial and irrigation customers, but will include some programs that support residential water savings, as well.

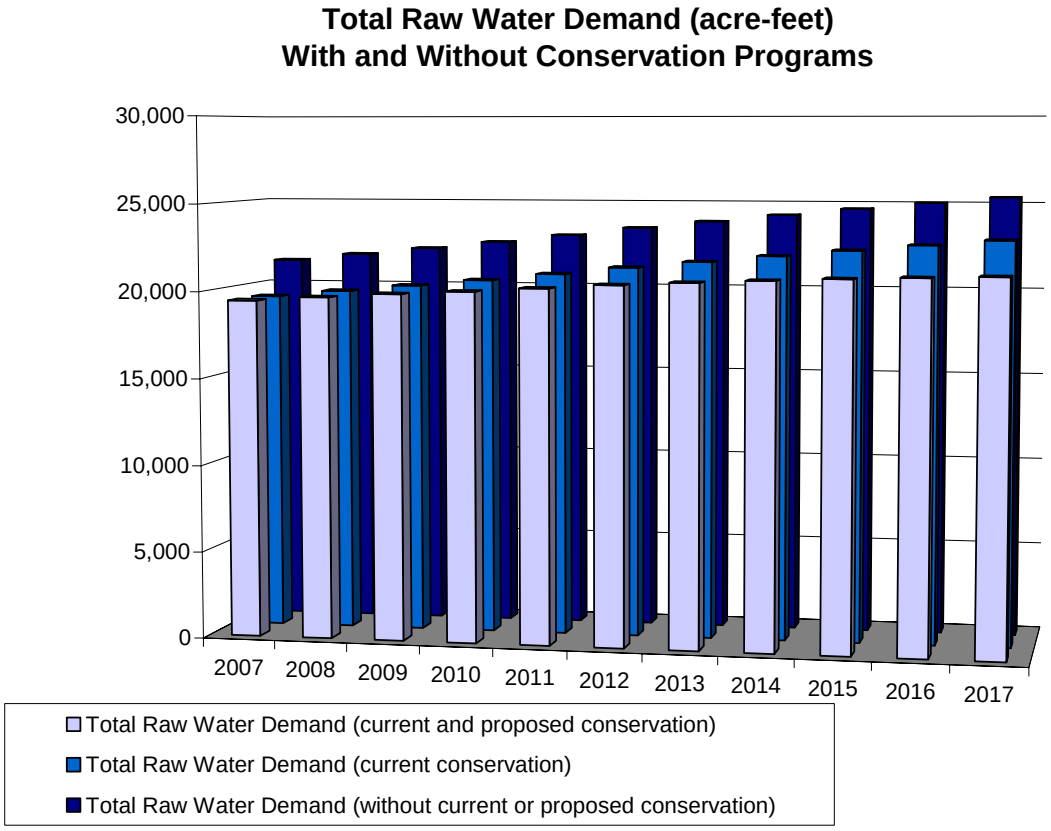


FIGURE 7
Estimated Total Water Demand With and Without Proposed Water Conservation Program

[3] The future cost of water includes the combined cost of new raw water supply, estimated to be $10,000 per acre-foot, plus system costs for collection, treatment and distribution, estimated to be $5,000 per acre-foot. It is possible that the future cost of water maybe substantially higher than what has been used in this exercise.

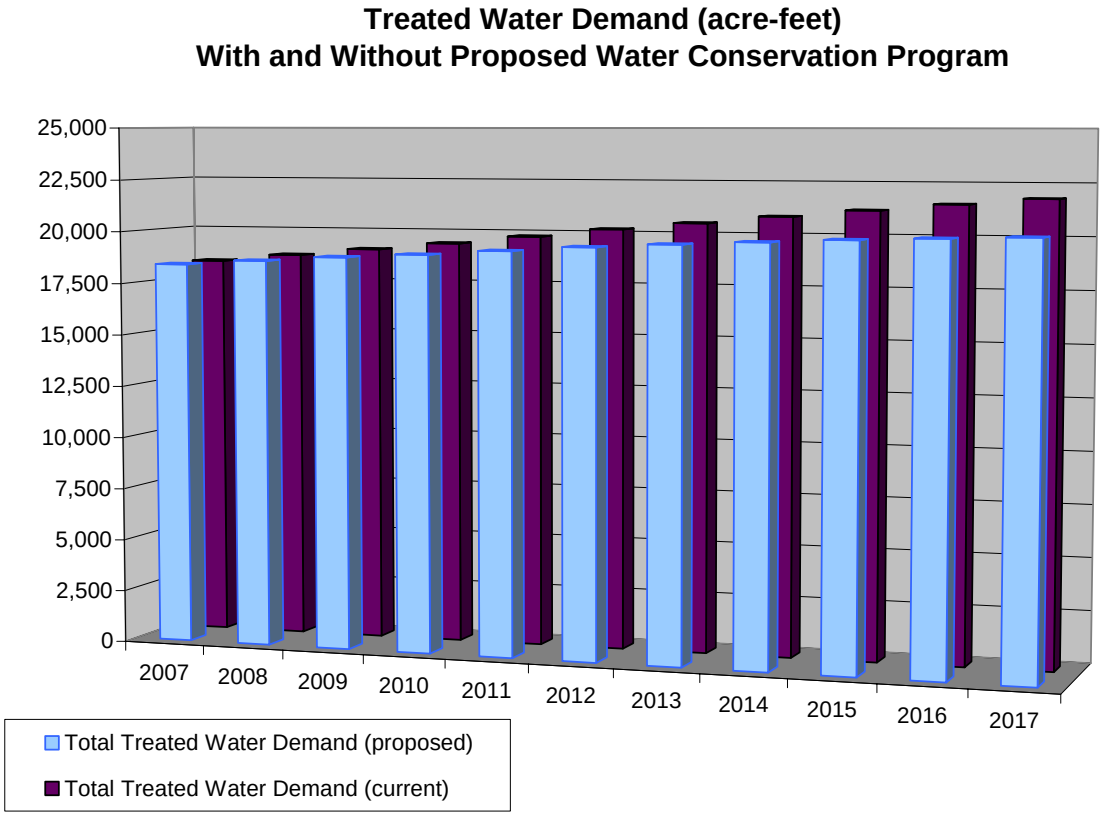


FIGURE 8
Estimated Treated Water Demand With and Without Proposed Water Conservation Program

10.0 Plan Adoption and Implementation

The following section discusses the process the City used to adopt the plan, the estimated implementation schedule of selected measures and programs, the plan for monitoring and evaluating data, and for updating the plan.

10.1 Public Input

Public participation and support of the conservation plan is critical for plan implementation. The City organized several public input periods during plan development which are summarized below.

PUBLIC INPUT PROCESS DURING PLAN DEVELOPMENT

Event	Date
Water Board Review with Public Input Opportunity	2007: March, July, November 2008: January, March, April to July
Joint Water Board/Environmental Affairs Board Meeting	April 7, 2008
City Council Review with Public Input Opportunity	April 29, 2008
Times-Call article	May 12, 2008
City-Talk column in Times Call	Spring 2008
City e-News Posting	Spring 2008
Channel 3 Community Bulletin Board	June 2008
Public Open House Notice (Times-Call)	June 4 and June 7, 2008
Public Open House	June 19, 2008
Draft Water Conservation Master Plan available at Library	May 2008
Draft Water Conservation Master Plan posted to web	May 2008
Public Works & Water Utilities Web Page Information/Survey	May-July 2008
Booth at Rhythm on the River	July 12, 2008
Longmont Golf Advisory Board with Public Input Opportunity	July 28, 2008
Meetings with select stakeholders (St. Vrain Valley School District, Trout Unlimited, St. Vrain and Left Hand Water Conservancy District)	Spring and Summer 2008

A summary of the comments received during the public input process from the open house and the web survey are included in Appendix E. Some suggestions for additional measures to promote efficient water use include rebate programs for efficient sprinkler heads, additional promotion of water-efficient landscaping, and assistance for HOA's when initiating contracts with landscape maintenance companies. The overall response to water conservation efforts was positive and 68 percent of surveyed residents agree that conserving water will help preserve the quality of life.

Feedback from the community as portions of the plan are implemented will be a continuous process. The City will plan to use educational and public outreach programs, such as Rhythm on the River and the annual St. Vrain Water Festival, to receive feedback. During plan updates the public input process will be revisited.

10.2 Implementation

The City will need to initiate implementation of a number of measures and programs for the predicted water savings to occur. The estimated implementation schedule for the selected measures and programs is summarized in Table 18. Some of the relevant activities for the City include the following:

- Maintain ongoing residential appliance and fixture rebates,
- Maintain CRC outdoor irrigation audits,
- Maintain ongoing public education and outreach efforts related to supporting the water fair, operating and maintaining the Xeriscape demotion garden, and providing customers with the "Garden-in-a-Box",
- Prepare and implement changes in water rates as determined from rate studies,
- Develop the following:
  - Training programs for residential and commercial and irrigation customers,
  - Individual customer water use tracking program (including conducting a raw water use audit on all relevant City facilities),
  - Water conservation public relations program complete with messaging, media channel management (newspaper, television, radio),
  - CWCB grant application to initiate commercial and irrigator audit programs in each of the next 4 years, and begin commercial and irrigation rebate and AMR installation programs,
  - Meaningful soil amendment inspection program.

TABLE 18
Estimated Implementation Schedule for Measures and Programs

Estimated Implementation Time Frame	Measure/Program
2009 to 2010	Commercial Rainfall Sensor Rebate
	Commercial ET Controller Rebate
	Commercial Indoor Audits
	Commercial/Irrigation Outdoor Audits
	Pre-Wash Spray Nozzle Giveaway
	Commercial ULF Toilet Rebate
	Commercial ULF Urinal Rebate
	Residential Rainfall Sensor Rebate
	Residential ET Controller Rebate
	AMR Metering (Commercial)
	Project WET Teacher Training
2010 to 2011	Commercial and Residential Education
	Landscaper Irrigation Contractor Training
	Non-Potable Irrigation Upgrades/Audit
2011 to 2012	Residential Whole House Audit
Current/Ongoing	Meter Testing and Replacement
	Residential ULF Toilet Rebates
	Residential Outdoor Irrigation Audits
	Residential Dish Washer Rebate
	Residential Washing Machine Rebates
	Residential Dual Flush Toilet Rebate
	Water Waste Code Enforcement
	Soil Amendment Rebate
	Raw Water Conversion Projects
	Water Rate Studies (every 3 to 5 years)

State Grant Applications

Vital to the successful implementation of the Final Plan will be the procurement of Office of Water Conservation and Drought Planning (OWCDP) water conservation plan implementation funds over each of the next four years. Specific grant applications will be developed to support the City's activities related to the following key measures and programs:

- Commercial and irrigation customer audits; ET controller and rainfall sensor rebates and water use tracking pilot programs,
- Raw water audits, and
- Landscaper and irrigation contractor and HOA maintenance contractors training efforts.

These combined programs are expected to become important components of the core areas for future water savings by the City's customers, and the importance and value to the City of OWCDP monetary support to initiate these programs cannot be overstated. Grant applications will be prepared as soon as the Final Plan is approved by CWCB.

The City may also want to perform additional studies to evaluate water use in more detail and may include a study on the Impact of Mandatory Residential Watering Times, or an Evaluation of Private Irrigation of Public Lands.

10.3 Monitoring and Verification of Program Effectiveness

Monitoring and verification of program effectiveness will be conducted through a combination of tracking efforts to measure the value of the various individual measures and programs being implemented by the City. Of course, some of the proposed water conservation measures and programs such as general customer education and increased water rates will not be measured directly, but will instead be characterized by average annual and peak monthly per capita water use. However, for some of the measures and programs, such as the commercial and irrigation account audits and rebates, tracking individual customer water use will be performed to monitor water efficiency and track customer water use.

The monitoring and verification efforts that the City proposes to initiate for each measure or program identified in Section 8 is presented in Table 19. The City will need to begin to track the metrics identified in Table 19, with particular attention to individual customer water use for those residential, commercial and irrigation customers that receive audits, rebates and/or training.

10.4 Updating and Revising the Plan

The City will summarize the findings of the monitoring and verification efforts of Public Works and Water Utilities and provide a briefing to the Water Board and City Council once a year. These briefings will be documented in a white paper which can be updated and revised as information and data are collected and analyzed. The City will use these data as the basis for formally updating the Water Conservation Plan once every seven years, as required by the CWCB. The plan will be updated by the end of 2015.

10.5 Plan Approval

The Water Conservation Master Plan was approved by the Longmont City Council on XXX, 2008.

TABLE 19

Summary of Monitoring and Verification Activities for Tracking Water Savings

Measures and/or Programs	**Tracking Methods and Metrics**					
	Number of audits and/or rebates[a]	Individual customer water use[b]	Customer class water use	Per capita water use	Unaccounted for Water	Peak and Annual Treated Water Demand
Commercial/Irrigation Customers						
Indoor/Outdoor Audits	x	x	x	x		x
ET Controller/Rain Sensor Rebates[c]	x	x		x		x
Indoor Appliance Rebates	x	x		x		x
Customer Workshops		x		x		x
Pre-Wash Spray Nozzle Giveaways	x	x		x		x
Residential Customers						
Outdoor Irrigation Audits	x	x	x	x		x
ET Controller/Rain Sensor Rebates[c]	x	x		x		x
Indoor Appliance Rebates	x	x		x		x
Customer Workshops		x		x		x
Other						
Landscaper and Irrigation Contractor Training			x	x		
Water Rate Increases			x	x		x
Landscape Ordinance/Soil Amendment Rebates	x	x		x	x	x
Meter Testing and Replacement		x		x	x	x
Non-Potable Water Projects (Audits and Capital Improvement Projects)		x		x		x
General Customer Education			x	x	x	x
Water Waste Ordinance Enforcement		x		x		x

[a] Only rebates with verified installations will be counted.
[b] Outdoor water use for pre- and post- installation periods will be compared to estimated ET calculated for each year of interest.
[c] ET controller and rain sensor rebates will only be provided to customers in conjunction with outdoor irrigation audits and proof of irrigation system integrity.

APPENDIX A
Summary of Water Conservation Efforts Identified in 1996 Plan

Appendix A
SUMMARY OF CURRENT CONSERVATION ACTIVITIES (AS IDENTIFIED IN THE 1996 PLAN)

Existing Category (1996 Plan)	Measures and Programs	Comments	Years Implemented	Status
1. City as Role Model	Meter all City facilities and tracking consumption	Treated water City facilities are metered.	19XX-20XX	Completed
	Evaluate retrofit of City Buildings w/ low flow fixtures	Replace high flush toilets with low flush toilets.	2006-2007	Completed 2007 (project MUW-178)
	Appropriate Xeriscape plant materials	Replacement of plant materials at existing demonstration gardens		Municipal Code 18.76.010
	Appropriate irrigation timing	As part of the Drought Response Plan, and depending on the level, this may be mandatory.		per Drought Response Plan
	City irrigation system improvements	New central controller for sprinklers (parks, greenways, arterials), not all sprinklers are on the system.		
	Retro fit City irrigation timers	This is part of the program above, and was the installation of new computer controllers.		
	Select water conserving systems in new parks and medians	Includes smart xeriscape plant materials, using raw water if available, amending soil (new homes must amend soil) parks may not be amending soil all the time.		
	Contract for irrigation audits	City budgets ~$10,500 for this yearly. Costs approx $70 per home lot ($35/hour). HOA could take 4-6 hours), HOAs are encouraged to sign up. The City maintains an HOA contact sheet.		Annually
	City compliance with watering restrictions	Ongoing checking to make sure the irrigation times are being followed.		On-going
	Incentives to encourage city departmental water conservation	The incentive is for the water funding to share the cost of programs, such as toilet replacement, retrofit irrigation timers.		
	Evaluate and improve City system operations	Leak detection, optimizing water efficiency for use at the water treatment plant processes.		On-going
2. Registering Use	Convert all residential service to metered service	Done	19XX-2006	Completed
	Automated Meter Reading (AMR)	Tel Data: 250 addresses phoning in readings hourly or at 15 min. intervals. Neptune units: 2000 addresses drive by radio readings, with 200-250 of these have E-coder which can detect leaks or back flows. Metron: 20 addresses laptop radio readouts.		On-going
	Read meters monthly			On-going
	Show comparitive usage data on monthly utility bills			On-going
3. Water Rates	Increasing block rate for metered service	Single family and duplex are metered. Other rate categories are flat rate.		On-going
4. Public Education/Resources	Communicate conservation program to public	There is a column in the Daily Times Call newspaper (2 times per year) that the City can advertise in, City Line pamphlet is in utility bills (notice once per year), City has an email list (once per week) that has general information (E-News), Rhythm on the River (environmental tent),Annual Children's water festivel (800 students from St. Vrain calley district, 4 hours, 12 stations available) 8th annual was in 2007.		On-going
	Develop public education partnership with local school district	Annual Water Festival for St. Vrain Valley school district, 4 hours with 12 stations.		Annually
	Sponsor a local water festival	Rhythm on the River environmental tent.		Annually
	Develop a public relations program	General all-encompassing programs.		On-going
	Demonstration Xeriscape gardens	Longmont Rec Center and Sunset Pool.		2 completed
	Xeriscape information	Provided at the City's Service Center, and on website.		On-going
	Sponsor Xeriscape seminars			Annually
	Garden in a box program	The City has partnered with the Center for ReSource Conservation. Choose from three affordable ($65-$100) pre-planned Xeriscape gardens designed by landscapers. Each box includes a plan, 30 or more plants and helpful hints.		On-going
	Toilet rebate program (ultra low volume and dual flush)	Staff estimates that every old toilet replaced saves about 14,800 gallons annually. Now all rebate programs are all year.	2003-present	On-going
	Clothes washer rebate program	ENERGY STAR estimates that its qualified clothes washers save an average of 6,345 gallons annually. Now all rebate programs are all year.	2003-present	On-going
	Dishwasher rebate program	ENERGY STAR estimates that its qualified dishwashers save an average of 860 gallons annually. Now all rebate programs are all year.	3 month trial period in 2006 present	On-going
5. Regulation	Ordinance on low flow fixtures	Plumbing code, green build ordinance just passed (you need a ceratin amount of green points to get a building permit) 02007-53.		Municipal Code 16.03
	Restricted watering days	Depending on drought level these may be mandatory.		per Drought Response Plan
	Waste of water ordinance	Waste of water prohibited. One written warning per year for the violation.		Municipal Code 14.04.490
	Landscaping ordinance			Municipal Code 18.76
	PUD incentive for Xeriscape			Municipal Code 19.60.060
	Soil amendment requirement	3 cubic yards per 1,000 square feet till to a depth of 6 inches, required for building permits after July 1, 2004		Municipal Code 15.05.09
6. Leak Detection and Repair	Set max unaccounted for water goals	Trying to compare to national average of non-accounted for water.		Goal of no greater than 10% identified in 1996 plan
	Meter leak detection	Neptune units: 2000 addresses drive by radio readings, with 200-250 of these have E-coder which can detect leaks or back flows. There are 100 meters >3". 50% are tested every two years.		Partially on-going
	Annual leak detection programs	No formal leak detection program.		No formal programs
7. Reuse of Non-Potable and Potable Water	Conversion of treated irrigation systems to raw	Sunset Golf Course (to be converted), Clark Park (last year converted), NE section of Longmont all parks will be raw water, Ute Creek is raw water, Fox Hill Golf Course is raw, Quail campus is raw water.		On-going
	Exchange of re-use water for potable water supply	All water goes to creek, exchange WWTP effluent for C-BT water upstream.		On-going
8. Reduce Commercial/Industrial Process Water	Conservation of ICI process water		-	Potential for regional ICI Study
	Replace water fixtures in restaurants	Partners for Clean Environment, faucets installed for them, Mary Paterniti (x8667)		Complete for 20 restaurants.

APPENDIX B
Summary of Demand Forecasting Methodology

Appendix B - Demand Forecasting Procedure

PREPARED FOR: City of Longmont Water Conservation Master Plan

PREPARED BY:

COPIES:

DATE: April 23, 2008

The following technical memorandum (TM) describes the methodology for forecasting treated water demand for the separate water use segments for the City of Longmont's Water Conservation Master Plan Update. Forecasting water demand is important for a variety of reasons including estimating future treated and raw water demands. The City has regularly updated the Treated Water Master Plan (TWMP), last updated in 1990, and the Raw Water Master Plan (RWMP), last updated in 2004. The RWMP used population growth rates from the 1990 TWMP, but adjusted the population projections based on more recent census data and estimated buildout populations. Water demands in the 2004 RWMP were based on the 1990 TWMP with modifications to account for the adjusted population and input from large industrial customers. Since the RWMP update in 2004, trends in water use and development continue to change. Treated water demand forecasts, for the purposes of this Water Conservation Plan, were revised based on metered water usage through 2006.

Future treated water use forecasts were developed to estimate total annual water use and peak daily and monthly treated water demands for the City and all its customers. Annual water demand is used to evaluate the availability of water within the City's water rights portfolio, whereas peak daily and monthly water demand is used to evaluate current and future water treatment and delivery capacity.

The following TM provides a more detailed description of the forecasting methodology and is a supporting document to the Water Conservation Plan. Forecasting methodology is described for each metered water use segment: residential, multifamily, small commercial, industrial, irrigation, and City.

Raw water irrigation, which is currently used by the City to maintain various parks, school grounds, arterials, golf courses and other City facilities, is not consistently metered. Therefore, there is not an estimate of current raw water use, let alone future raw water use. The best current estimate of raw water use on the 27 parks, two golf courses, 13 schools, and other City facilities, which cover about 580 irrigated acres is about 1,450 acre-feet per year, assuming about 30 inches of water is applied each year. Since an increase in raw water use would be offset by a reduction of treated water use, future forecasts do not included increases in future raw water irrigation, per se. Additional raw water irrigation that will be implemented by the City in the future will be offset by a reduction in treated water demand with a net effect of reducing unaccounted for water and water use at the treatment plant (totaling about 13.7% of total treated water demand). As previously indicated, forecasting

under current water conservation practices does not include an increase in the amount of raw water being used for irrigation through 2017.

Residential and Multifamily

The City has separate billing categories for residential (single family homes and duplexes) and multifamily (three or more attached living units) connections. There are two basic approaches to forecasting residential and multifamily water use: forecast each category separately, or forecast the combined residential and multifamily usage. For purposes of this Plan the residential and multifamily categories were combined and forecasted as one category. Using this methodology it is not required to determine the number of multifamily dwelling units and the occupants per unit. If these billing categories were separated the per capita water use for the multifamily units would be less since there is typically less irrigation. Combining the residential and multifamily water use is a reliable forecasting method.

The forecast is based on population projections and historical population and residential per capita water use from 1997 to 2006.

The forecasting procedure for residential and multifamily is outlined below:

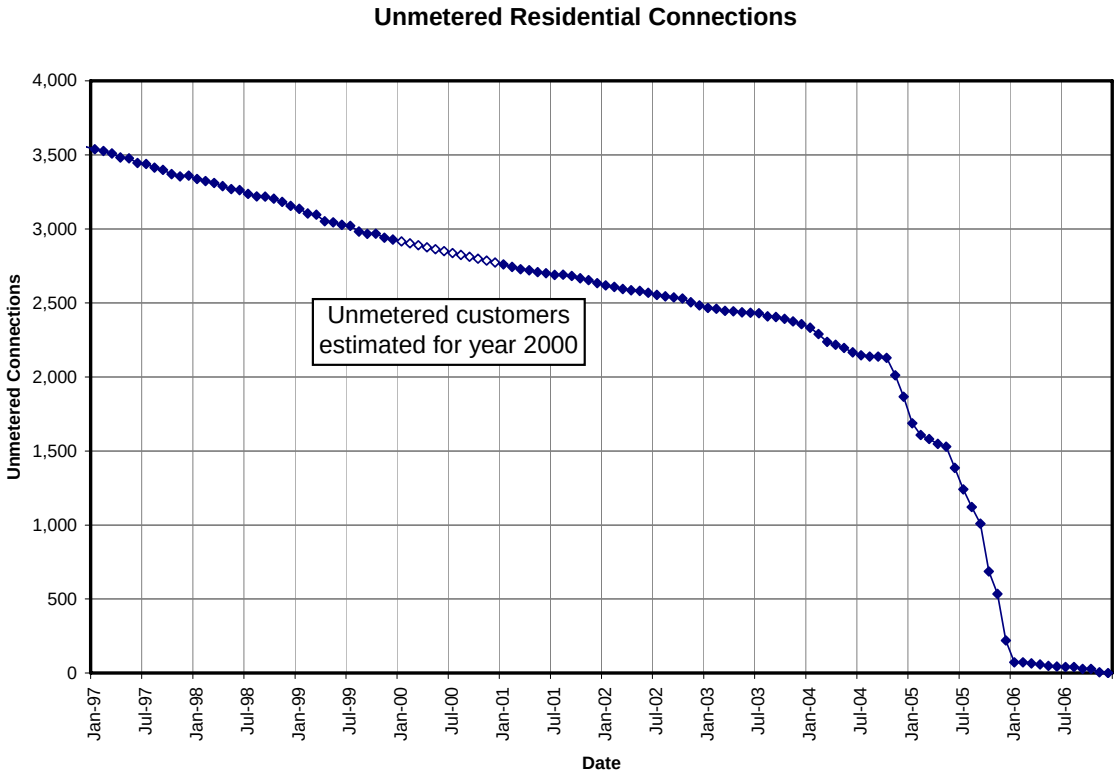
1. Confirm service area population projections through 2017.

TABLE
Population Projections (from 2004 Raw Water Master Plan Update)

Year	Population
2007	86,060
2008	86,723
2009	87,387
2010	88,050
2011	89,030
2012	90,202
2013	91,000
2014	91,980
2015	92,970
2016	93,950
2017	94,940

2. Establish a per capita water use value that accounts for residential and multifamily water use.

a. ***Correct residential water use for unmetered connections.*** For 1997 to 2006 sum the metered residential and multifamily water use, including usage inside and outside City limits. Multifamily units have always been metered, but residential single family units were not fully metered until 2006. Water usage in the residential category was adjusted to account for the percent of unmetered residential connections.



b. ***Sum the water use for all relevant categories.*** Once the residential water use has been corrected to account for these unmetered customers the total residential and multifamily water use data for each year from 1997 to 2006 is calculated by summing the corrected residential water use and the multifamily water use.

c. ***Calculate per capita water use.*** The total water use for residential and multifamily categories is divided by the service population from 1997 to 2006 to calculate the residential per capita water use for each year.

SUMMARY TABLE

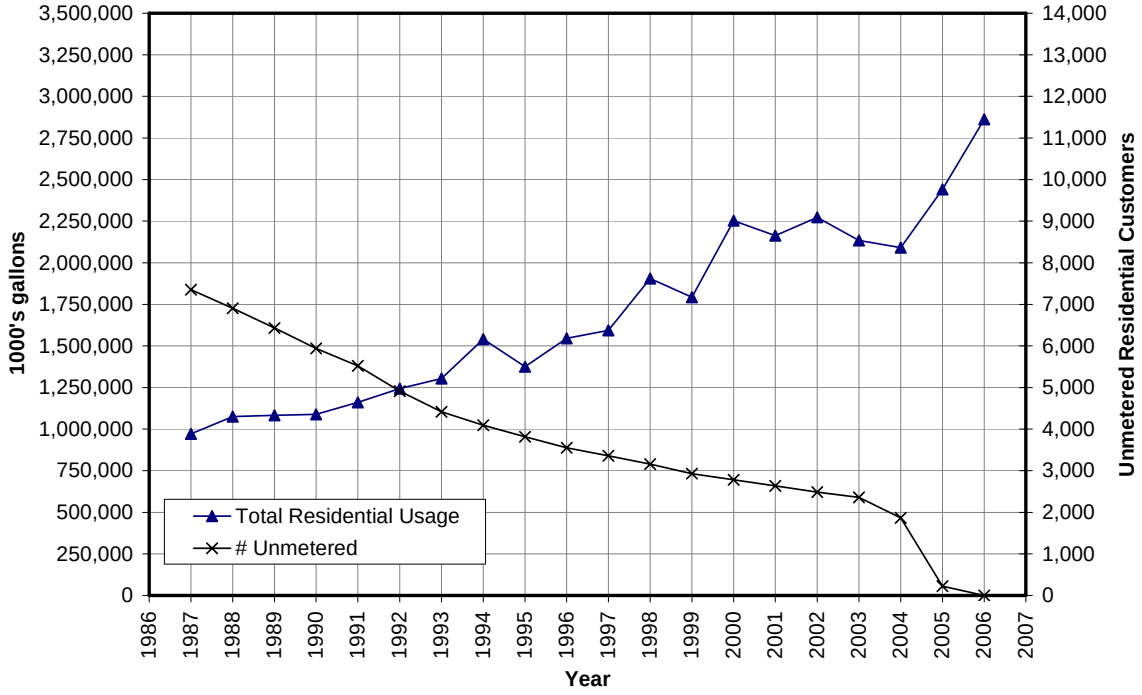
Year	Res (1000s gallons)	Multifamily (1000s gal)	Res + Multifamily (MG)	Service Population	Residential Per Capita Water Use (gpcd)
1997	2,096,119	383,265	2479.4	60,837	111.7
1998	2,406,633	414,532	2821.2	63,581	121.6
1999	2,194,068	417,081	2611.1	66,119	108.2
2000	2,684,425	482,311	3166.7	74,145	117.0
2001	2,528,262	511,265	3039.5	76,967	108.2
2002	2,612,445	511,026	3123.5	78,202	109.4
2003	2,420,654	497,988	2918.6	80,195	99.7
2004	2,296,001	475,709	2771.7	82,035	92.6
2005	2,464,859	496,260	2961.1	83,558	97.1
2006	2,862,999	527,105	3390.1	85,396	108.8
			Avg (gpcd)	1997-2006	107.4
			Avg (gpcd)	2001-2002, 2004-2006	103.1

The analysis of residential per capita water use includes data from the 2002-2003 drought, and the impact on water use was evaluated. The overall average residential per capita water use from 1997 to 2006 was 107 gallons per capita per day (gpcd). Beginning with the year 2001, which is the year inclining block rates structures were implemented for residential accounts, and excluding the drought year of 2003 the average residential per capita water use was 103 gpcd. The per capita use of 103 gpcd was used for forecasting the residential and multifamily water use for the Water Conservation Plan.

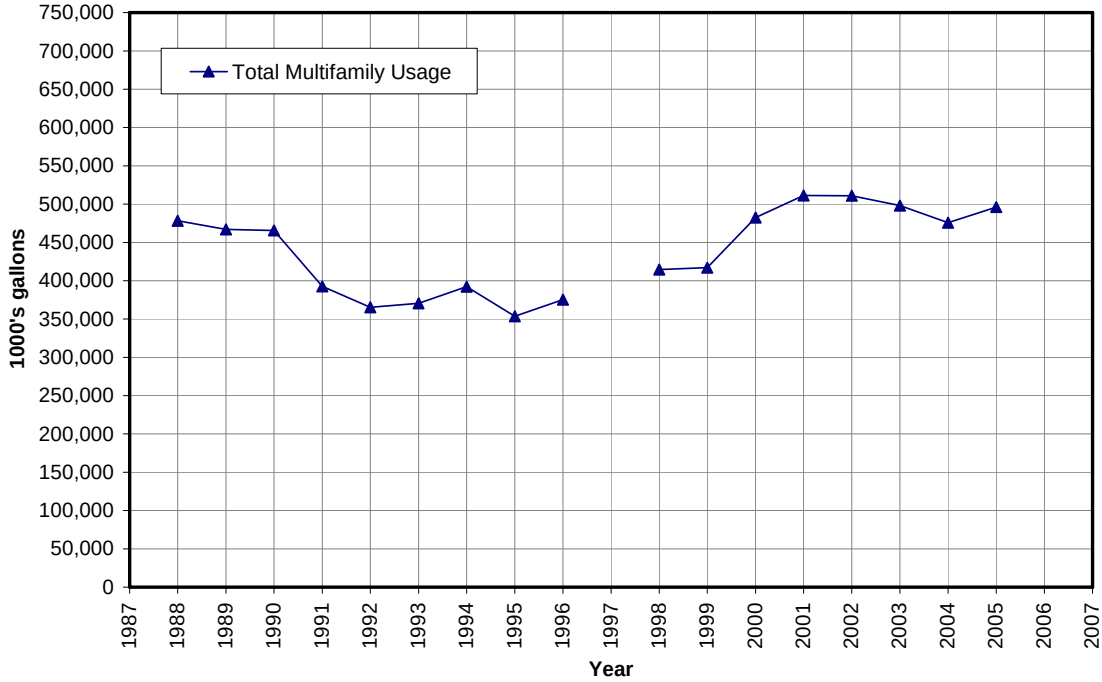
d. ***Forecast based on per capita water use and chance in population.*** Multiply the residential per capita water use (103 gpcd) to the population projections for 2007 to 2017.

Graphs summarizing residential and multifamily supporting data are provided below.

Historical Residential Metered Usage (1987-2006)
Gaps indicate incomplete data for that year.



Historical Multifamily Metered Usage (1987-2006)
Gaps indicate incomplete data for that year.



Small Commercial

Treated water use forecast for small commercial was based on the growth rate of non-residential building permit square footage. The process to calculate the growth rate is described below.

a. ***Determine small commercial building square footage from previous years.*** The City's Department of Community Development Planning and Development Services Division (Planning Division) provided information on the actual small commercial square footage from 1998 to 2006.

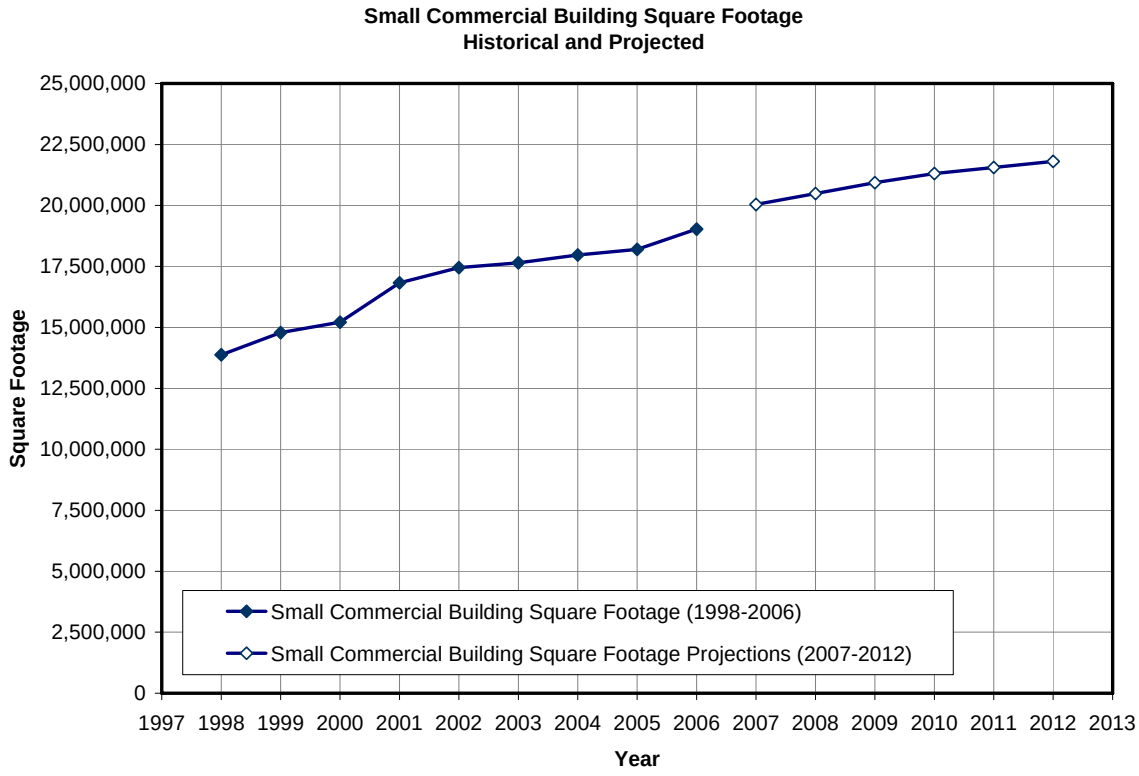
b. ***Estimate small commercial growth for next 5 years.*** The Planning Division also provided estimated square footage of non-residential building permits for 2007 to 2012. The projected non-residential building permit square footage is shown in the table below.

NON-RESIDENTIAL BUILDING PERMIT

Year	Building Permit (sf)
2006	620,642
2007	765,000
2008	450,000
2009	450,000
2010	375,000
2011	250,000
2012	250,000

Source: Memorandum (May 1, 2007) from Erin Fosdick, Department of Community Development Planning and Development Services Division.

Small commercial square footage from 1998 through 2006 is shown in the figure below, as well as the estimated square footage from 2007 to 2012.

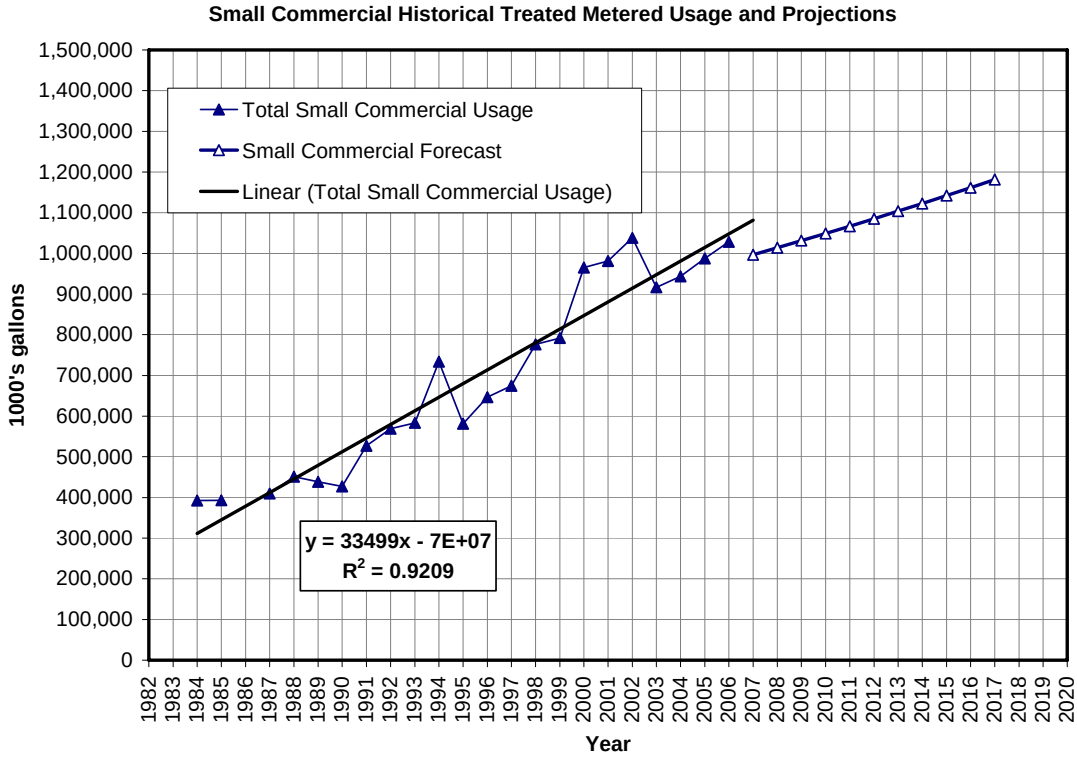


c. ***Correlate building square footage to annual small commercial growth rate.*** The growth rate for building square footage was calculated for 2008 to 2012, as summarized in the table below. The average annual growth rate for 2008 to 2012 was 1.7 percent, which was applied to the treated water use forecasts through 2017.

SMALL COMMERCIAL ANNUAL GROWTH RATE

Year	Annual Growth Rate
2008	2.2 %
2009	2.2 %
2010	1.8 %
2011	1.2 %
2012	1.2 %
Average	**1.7 %**

Graphs summarizing small commercial supporting data are provided below.



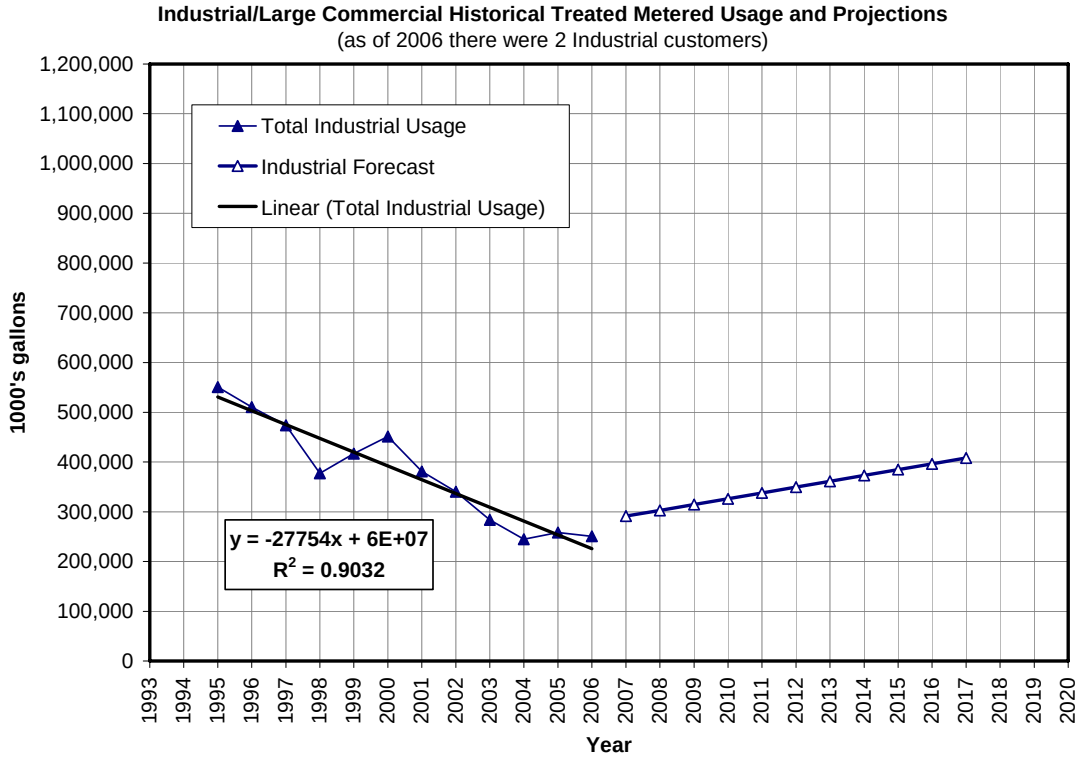
The rate of small commercial growth, based on the anticipated permits from 2007 to 2012, is expected to slow down in the upcoming years.

Industrial

The City of Longmont has two industrial (large commercial) customers, a food processing plant and a pharmaceutical company. Treated water use was forecasted for each customer based on historical water use patterns and growth information provided by the company. Actual annual water use was estimated for each separate industrial customer for the year 2006. Water use of the food processing plant has been relatively constant from 2002 to 2006 at an average of 217 million gallons annually, or approximately 0.59 million gallons per day. Water use for the food processing plant was assumed to be constant for forecasting purposes at 217 million gallons annually.

Water use for the pharmaceutical company was forecasted based on growth information provided from the company to the City from 2007 to 2011. The growth trend for the next five years was linear. This linear pattern was applied to subsequent years out to 2017 to complete the industrial forecast. Forecasting was based on a starting value of 59 million gallons annually for 2006 or approximately 0.22 million gallons per day.

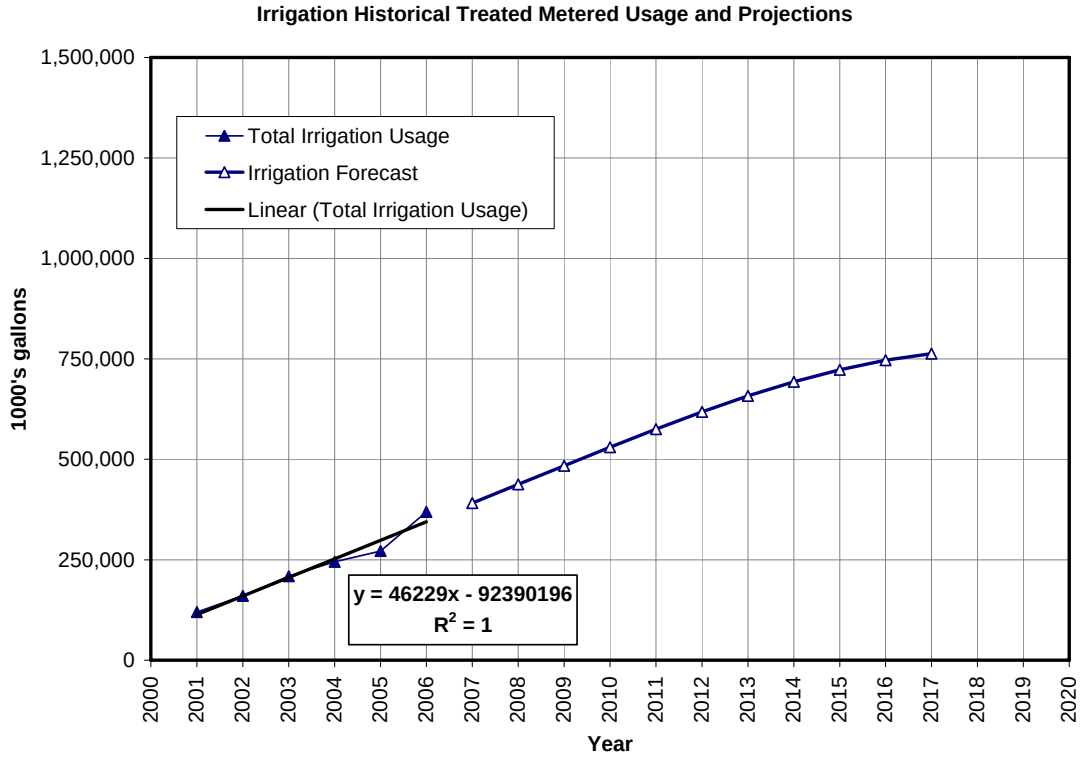
Graphs summarizing industrial supporting data are provided below. Industrial use has been decreasing in the past partially due to a decrease in the number of accounts. The two remaining industrial clients anticipate growth in future years, and this must be accounted for in the treated water forecast.



Irrigation

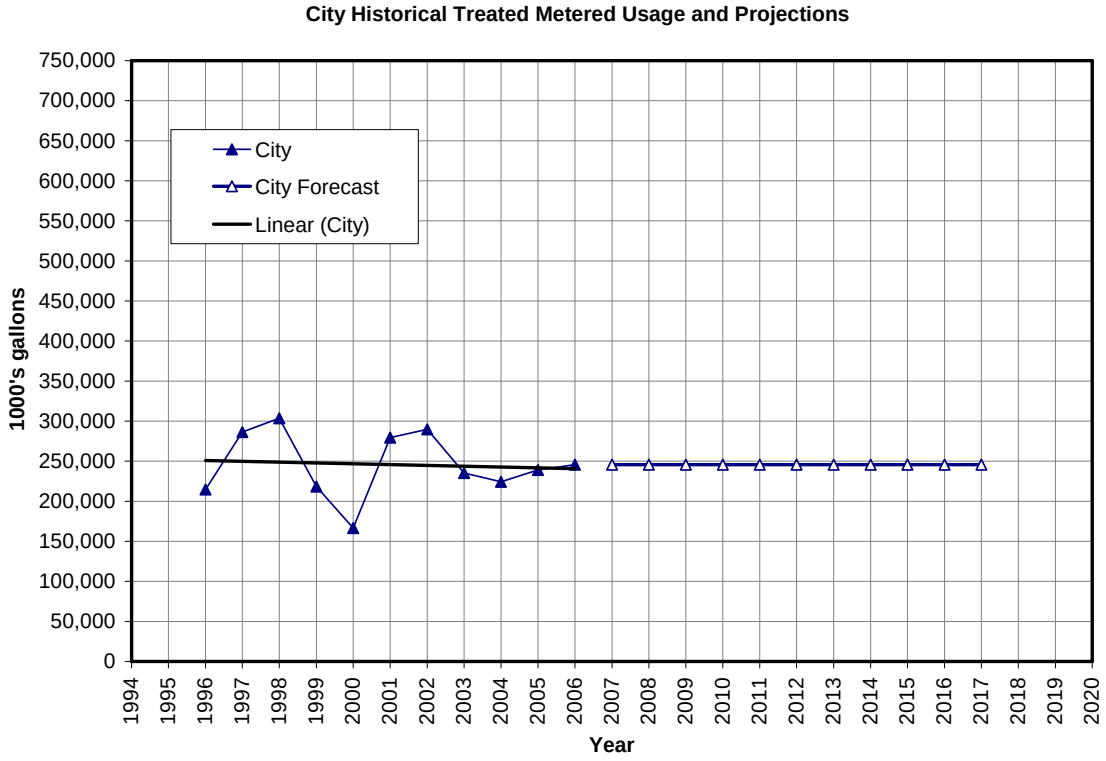
The irrigation billing category for treated water was implemented in 2001 and represents taps designate for irrigation. These taps are typically associated with small commercial landscaping and home owner association (HOA) areas and pocket parks. Since this is a new billing category the water use trend since 2001 has been a continuous increase as new taps are continually added with development. It is difficult to estimate what year this increasing pattern will start to level. For forecasting purposes the increasing trend in treated water use, from 2001 to 2006, was continued through 2010. Then between 2011 and 2017 it was assumed the rate of increase of treated water use would begin to decrease and eventually achieve a level similar to the rate of growth for small commercial and residential, approximately 1.2 percent. From 2011 to 2017 the annual percent growth decreased from 9.6 percent to 1.2 percent.

A graph summarizing irrigation supporting data is provided below.

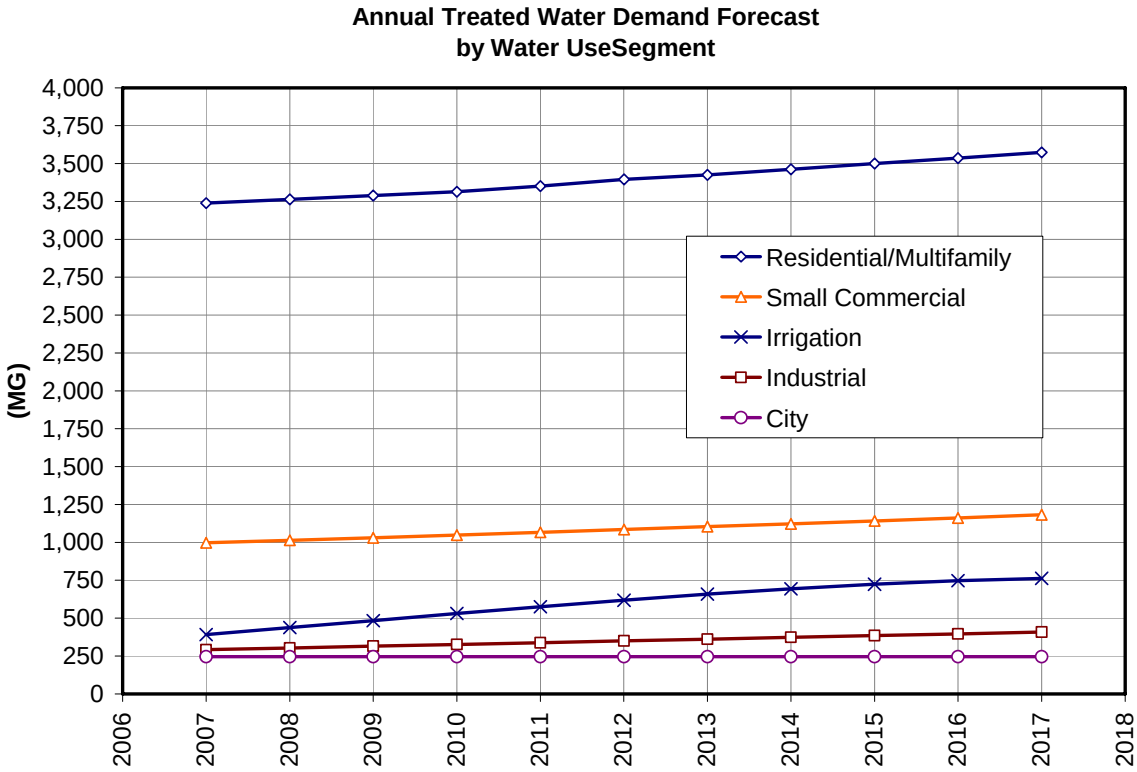


City

City treated water usage is metered, but not billed and is non-revenue water. Water usage from 1996 to 2006 for the City has averaged 246 million gallons annually or 0.67 million gallons per day. No increase in City water usage was reflected in the forecast based on the historical pattern of use and input from City staff. As new treated water demands are added to the City other treated water demands will be removed, such as converting of parks and other grounds from treated water to raw water for irrigation.



The above sections summarize the methodology for forecasting each water segment for purposes of the Water Conservation Master Plan. A summary of all water segments is shown in the following figure.



Peak Monthly Treated Water Demands

The following is a summary of the methodology used to predict daily peak treated water demands.

a. ***Calculate annual average production in mgd.*** Annual total treated water demand forecasted (in million gallons) from the metered water data presented above were converted to annual average production rates in million gallons per day.

b. ***Calculated peak-day for each month.*** Daily water treatment plant production was evaluated from 2002 to 2006, and the peak-day values for each month were identified. The historical annual average in million gallons per day (mgd) was also calculated.

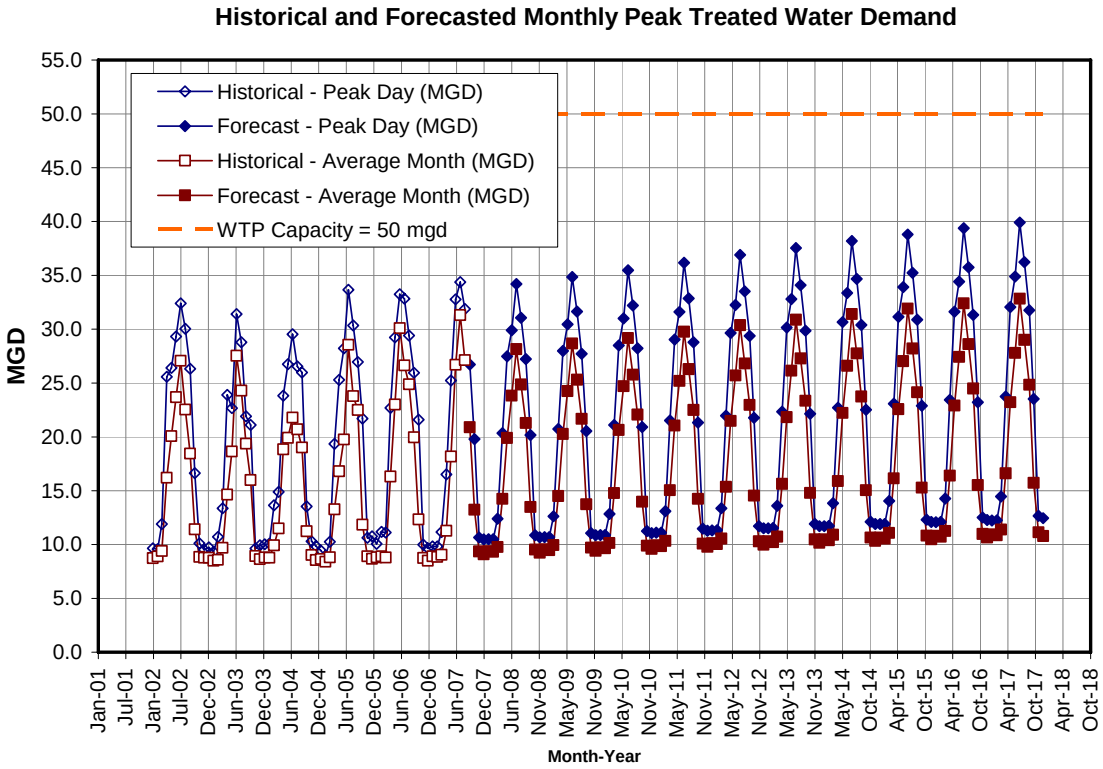
c. ***Calculate a peak-day to annual average factor for each month.*** The peak-day to annual average ratio was calculated for each month, and for each month the average of this value from 2002 to 2006 was the peak-day to annual average factor. The peak-day to annual average factors for 2002 to 2006 are summarized in the table below.

PEAK-DAY TO ANNUAL AVERAGE RATIO SUMMARY 2002-2006

	Peak Day/Annual Average					
	2002	**2003**	**2004**	**2005**	**2006**	**Avg**
January	0.628	0.670	0.715	0.629	0.611	0.651
February	0.622	0.642	0.719	0.594	0.679	0.651
March	0.774	0.738	0.972	0.682	0.676	0.769
April	1.663	0.921	1.062	1.287	1.379	1.262
May	1.717	1.646	1.699	1.681	1.777	1.704
June	1.907	1.561	1.907	1.875	2.020	1.854
July	2.107	2.163	2.106	2.237	1.995	2.122
August	1.954	1.982	1.892	2.017	1.788	1.926
September	1.712	1.509	1.851	1.791	1.578	1.688
October	1.081	1.454	0.966	1.441	1.313	1.251
November	0.657	0.664	0.734	0.706	0.606	0.673
December	0.619	0.684	0.702	0.716	0.586	0.662

d. ***Forecast peak-day for each month to 2017***. The forecasted peak-day value for each month through 2017 was calculated by applying the peak-day to annual average factor to the forecasted annual treated water demand.

The result is a peak-daily treated water demand forecasted for each month through 2017, as shown in the following figure.



Calculating the total monthly treated water production uses a procedure similar to the one used for peak monthly treated water demands. However, instead of peak-month the average month treated water demand needs to be calculated. The procedure is outline below.

a. ***Calculate annual average production in mgd.*** Annual total treated water demand forecasted (in million gallons) from the metered water data presented above were converted to annual average production rates in million gallons per day. (This is the same first step from the previous section).

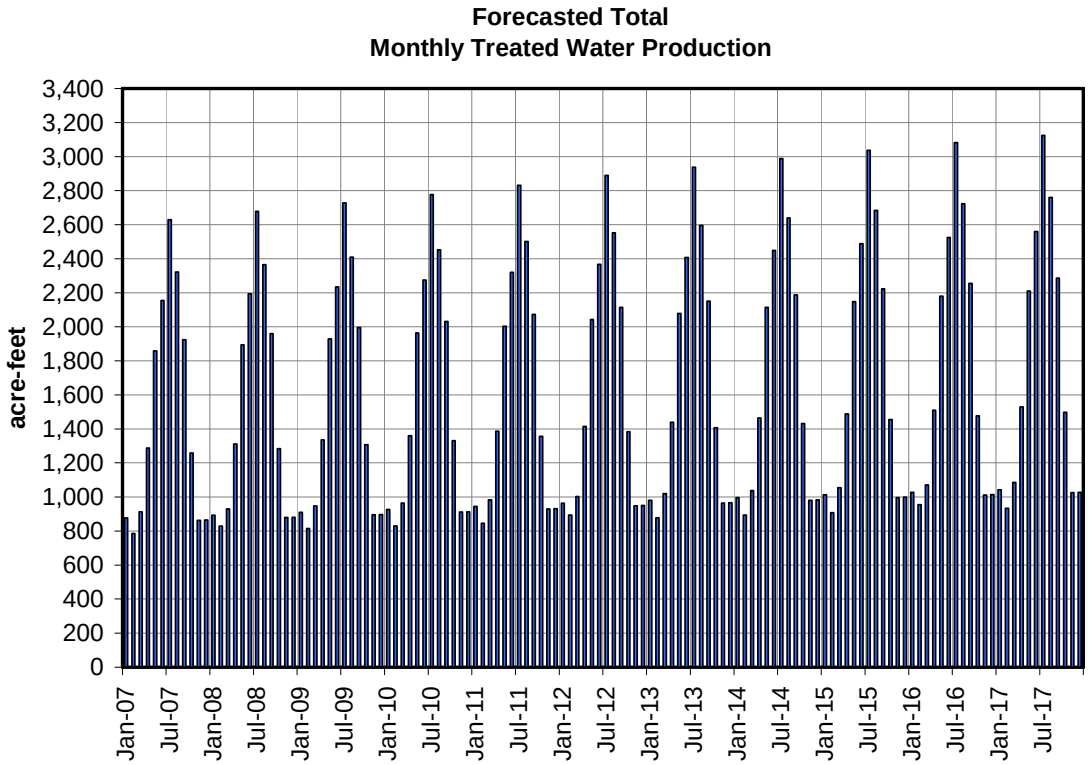
b. ***Calculated average for each month.*** Daily water treatment plant production was evaluated from 2002 to 2006, and the average for each month was calculated. The historical annual average in million gallons per day (mgd) is also required.

c. ***Calculate an average month to annual average factor for each month.*** The average month to annual average ratio was calculated for each month, and for each month the average of this value from 2002 to 2006 was the average month to annual average factor. The average month to annual average factors for 2002 to 2006 are summarized in the table below.

AVERAGE MONTH TO ANNUAL AVERAGE RATIO SUMMARY 2002-2006

	Average Month/Annual Average					
	2002	**2003**	**2004**	**2005**	**2006**	**Avg**
January	0.568	0.605	0.627	0.575	0.536	0.582
February	0.578	0.585	0.625	0.559	0.541	0.578
March	0.612	0.591	0.707	0.586	0.534	0.606
April	1.053	0.668	0.820	0.883	0.992	0.883
May	1.306	1.008	1.343	1.118	1.398	1.234
June	1.541	1.284	1.420	1.314	1.829	1.478
July	1.760	1.897	1.554	1.897	1.619	1.746
August	1.465	1.674	1.475	1.581	1.512	1.542
September	1.200	1.334	1.356	1.495	1.213	1.320
October	0.742	1.101	0.802	0.787	0.749	0.836
November	0.576	0.616	0.643	0.593	0.532	0.592
December	0.570	0.594	0.611	0.577	0.517	0.574

d. ***Forecast average for each month to 2017***. The forecasted average month value for each month through 2017 was calculated by applying the average month to annual average factor to the forecasted annual treated water demand. The result is a monthly water production forecasted through 2017, as shown in the following figure.


Forecasted Total
Monthly Treated Water Production
acre-feet
3,400
3,200
3,000
2,800
2,600
2,400
2,200
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10
Jan-11
Jul-11
Jan-12
Jul-12
Jan-13
Jul-13
Jan-14
Jul-14
Jan-15
Jul-15
Jan-16
Jul-16
Jan-17
Jul-17

APPENDIX C
Summary of Identified and Screened Conservation Measures and Programs

Appendix C
Summary of Identified and Screened Conservation Measures and Programs

	Screening Criteria			
Water Conservation Measures and Programs	**Additional Effort/Data Needed Prior to Implementation**	**Measureable Outcomes**	**Other Considerations**	**Carried to Evaluations**
RESIDENTIAL				
Indoor				
Bath				
Bath Water BMP	*No*	*No*	*Organic efforts are effective - no other action needed*	*No*
Tooth Brush BMP	*No*	*No*	*Organic efforts are effective - no other action needed*	*No*
Faucet Aerators	*No*	*Yes*	*Will be linked to K-12 education*	*No*
Dual Flush Toilet Rebate	*No*	*Yes*	*Ongoing program*	**Yes**
Ultra Low Flow Toilets Rebate	*No*	*Yes*	*Ongoing program*	**Yes**
Waterless Toilets Rebate	*No*	*Yes*	*Challenges building codes and customer sensitivities*	*No*
Low-Flow Shower Heads Giveaway	*No*	*Yes*	*Requires proof of installation to verify savings*	*No*
Warm Up Water Capture and Reuse	*No*	*No*	*Is typically inconvenient and can be physically challenging*	*No*
In Shower Warm-up Water Storage	*Yes*	*Yes*	*New technology that is best for new construction*	*No*
Hot Water on Demand	*No*	*No*	*No evidence that having on demand hot water reduces use*	*No*
Greywater Reuse	*Yes*	*No*	*State regulation limits greywater use in home*	*No*
Kitchen/Laundry				
Faucet Aerators	*No*	*Yes*	*Will be linked to K-12 education*	*No*
High Efficiency Dishwashing Machine	*No*	*Yes*	*Ongoing program*	**Yes**
High Efficiency Clothes Washer	*No*	*Yes*	*Ongoing program*	**Yes**
Warm Up Water Capture and Reuse	*No*	*No*	*Organic efforts are effective - no other action needed*	*No*
Hot Water on Demand	*No*	*Yes*	*No evidence that having on demand hot water reduces use*	*No*
Other				
Whole House Audits	*No*	*Yes*	*Good way to collect data needed to expand current program*	**Yes**
Leak Detection and Repair	*Yes*	*Yes*	*Follows whole house audits*	*No*
Swamp Coolers	*Yes*	*Yes*	*Follows whole house audits*	*No*
AMR Water Meters	*No*	*Yes*	*Cost prohibitive for wide use, could be part of new construction ordinance*	*No*
Greywater Reuse	*No*	*Yes*	*State regulation limits greywater use in home*	*No*
Outdoor				
Irrigation				
Irrigation Audits	*No*	*Yes*	*Excellent way to educate customer and collect information on individual water use*	**Yes**
Rainfall/Moisture Sensors	*No*	*Yes*	*Technology improving with new applications*	**Yes**
Soil Moisture Probes	*No*	*No*	*Corrosion of probes limits useful life*	*No*
ET Controllers	*No*	*Yes*	*Technology improving with new applications*	**Yes**
Installation of Alternative Irrigation (subsurface, drip, etc.)	*No*	*Yes*	*Costs to City/customers generally prohibitive at this time*	*No*
Rainwater Harvesting	*Yes*	*No*	*State regulations limit use*	*No*
Landscape Irrigator Certification	*Yes*	*Yes*	*Would require new ordinance*	*No*
Water Waste Ordinance	*No*	*Yes*	*Ordinance already on City books, needs improved inspections/enforcement*	**Yes**

Appendix C
Summary of Identified and Screened Conservation Measures and Programs

Water Conservation Measures and Programs	Additional Effort/Data Needed Prior to Implementation	Measureable Outcomes	Other Considerations	Carried to Evaluations
Watering Restrictions - Hours	*No*	*Yes*	*Tie ordinance to water waste ordinance*	**Yes**
Watering Restrictions - Days	*No*	*Yes*	*Daily restrictions saved for drought response*	*No*
Greywater Reuse	*Yes*	*Yes*	*State regulation limits greywater use in home*	*No*
Landscape Options				
Turf Replacement Rebate	*No*	*Yes*	*Costs to City/customers generally prohibitive at this time*	*No*
Xeriscape Incentives	*No*	*Yes*	*Costs to City/customers generally prohibitive at this time*	*No*
COMMERCIAL/INDUSTRIAL/INSTITUTIONAL				
Indoor				
Ultra Low Flow Toilets	*No*	*Yes*		**Yes**
Waterless Toilets	*No*	*Yes*	*City prefers ultra low flow toilets at this time*	*No*
Ultra Low Flow Urinals	*No*	*Yes*		**Yes**
Waterless Urinals	*No*	*Yes*	*City prefers ultra low flow urinals at this time*	*No*
Pre-Rinse Spray Valves	*No*	*Yes*	*Excellent way to reduce kitchen water use, requires staff to verify installation*	**Yes**
Commerical/Industrial/Institutional (CII) Audits	*No*	*Yes*	*Excellent way to educate customer and collect information on individual water use*	**Yes**
Cooling Water Tower Improvements	*Yes*	*Yes*	*Follows CII audit*	*No*
Process Water Improvements	*Yes*	*Yes*	*Follows CII audit*	*No*
Indoor Swimming Pool Improvements	*Yes*	*Yes*	*Follows CII audit*	*No*
Leak Detection and Repair	*Yes*	*Yes*	*Follows CII audit*	*No*
AMR Metering and Submetering	*Yes*	*Yes*	*Follows CII audit*	*No*
Car Wash Efficiency Assessements and Improvements	*Yes*	*Yes*	*Follows CII audit*	*No*
Cleaning and Sanitation Improvements	*Yes*	*Yes*	*Follows CII audit*	*No*
Commerical Kitchens and Restaurant Improvements	*Yes*	*Yes*	*Follows CII audit*	*No*
Laundries and Laundromats	*Yes*	*Yes*	*Follows CII audit*	*No*
Swamp Cooler Improvements	*Yes*	*Yes*	*Follows CII audit*	*No*
Boiler and Heating System Improvements	*Yes*	*Yes*	*Follows CII audit*	*No*
Outdoor				
Irrigation Audits	*No*	*Yes*	*Excellent way to educate customer and collect information on individual water use*	**Yes**
Rainfall/Moisture Sensors	*No*	*Yes*	*Technology improving with new applications*	**Yes**
Soil Moisture Probes	*No*	*No*	*Corrosion of probes limits useful life*	*No*
ET Controllers	*No*	*Yes*	*Technology improving with new applications*	**Yes**
Installation of Alternative Irrigation (subsurface, drip, etc.)	*No*	*Yes*	*Costs to City/customers generally prohibitive at this time*	*No*
Rainwater Harvesting	*Yes*	*Yes*	*State regulations limit use*	*No*
Landscape Irrigator Certification	*Yes*	*Yes*	*Would require new ordinance*	*No*
Water Waste Ordinance	*Yes*	*Yes*	*Ordinance already on City books, needs improved inspections/enforcement*	**Yes**
Watering Restrictions - Hours	*No*	*Yes*	*Tie ordinance to water waste ordinance*	**Yes**

Appendix C
Summary of Identified and Screened Conservation Measures and Programs

Water Conservation Measures and Programs	Additional Effort/Data Needed Prior to Implementation	Measureable Outcomes	Other Considerations	Carried to Evaluations
Watering Restrictions - Days	*No*	*Yes*	*Daily restrictions saved for drought response*	*No*
Greywater Reuse	*Yes*	*Yes*	*State regulation limits greywater use in home*	*No*
NEW CONSTRUCTION				
Indoor				
Low Water Use and Appliance Codes	*Yes*	*Yes*	*Requires new ordinance with inspections and follow-up*	*No*
Outdoor				
Landscape Irrigator Certification	*Yes*	*Yes*	*Requires new ordinance with inspections and follow-up*	*No*
Soil Amendment Requirements/Rebates	*No*	*Yes*	*Ordinance already on City books, needs improved inspections/enforcement*	**Yes**
Turf and Landscape Restrictions	*Yes*	*Yes*	*Requires new ordinance with inspections and follow-up*	*No*
Irrigation System Requirements	*Yes*	*Yes*	*Requires new ordinance with inspections and follow-up*	*No*
EDUCATION				
Water Fairs		*n/a*	*Popular ongoing program*	**Yes**
K-12 Education		*n/a*	*K-12 education will occur as a result of Project WET Teacher Training*	**Yes**
K-12 Teacher Education and Training		*n/a*	*Teacher Training available in Colorado through Project WET*	**Yes**
Customer Surveys and Focus Groups		*n/a*	*To be developed as part of Public Relationship Campaign Development*	**Yes**
Bill Stuffers		*n/a*	*Lacks return based on work by others*	*No*
Newletters		*n/a*	*To be developed as part of Public Relationship Campaign Development*	**Yes**
Messaging Campaigns (multi-media)		*n/a*	*To be developed as part of Public Relationship Campaign Development*	**Yes**
Homeowner Education and Training		*n/a*	*To be developed as part of Public Relationship Campaign Development*	**Yes**
Commercial/Irrigator Education and Training		*n/a*	*To be developed as part of Public Relationship Campaign Development*	**Yes**
Xeriscape Demostration Gardens		*n/a*	*Popular ongoing program*	**Yes**
Educational Kits (e.g., Garden in a Box)		*n/a*	*Popular ongoing program*	**Yes**
OTHER PROGRAMS				
Water Rate Increases	*Yes*	*Yes*	*Ongoing program, needs additional evaluations*	**Yes**
System Wide Leak Detection	*Yes*	*Yes*	*Ongoing program, needs additional evaluations*	**Yes**
Raw Water Conversions	*Yes*	*Yes*	*Ongoing program, needs additional evaluations*	**Yes**
Reuse	*Yes*	*Yes*	*Ongoing program, needs additional evaluations*	**Yes**

APPENDIX D
Cost-Benefit Analysis for Measures and Programs

Residential ULF Toilet Rebates

Cost Assumptions	
cost per unit*	180
rebate per unit	50
cost of water per 1000 gallons from City	2.53

Estimated savings per unit	
persons per unit (2006 taps/2006 population)	3.55
uses per person per day	4
gallons per unit, before	3.61
gallons per unit, after	1.54
days/year of use	365
gallons saved per year/unit	10,719
AF saved per year/unit	0.033
customer payback period w/o incentive, years**	7
customer payback period w/ incentive, years**	5

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
ULF Toilets in use	23,382	24,216	24,755	25,294	25,833	26,534	27,333	27,940	28,641	29,347	30,048	30,754
new units during year, rebate	62	100	100	100	100	100	100	100	100	100	100	100
new units during year, organic	200	100	100	100	100	100	100	100	100	100	100	100
new units during year, new construction	600	634	339	339	339	501	599	408	501	506	501	506
City residential population	85,396	86,060	86,723	87,387	88,050	89,030	90,202	91,000	91,980	92,970	93,950	94,940
total toilets in use***	43,339	43,973	44,312	44,651	44,990	45,491	46,090	46,497	46,998	47,504	48,005	48,510
total water use for residential toilets, gallons/yr****	553,418,645	554,805,589	553,837,724	552,869,859	551,901,994	552,223,775	553,327,900	552,908,084	553,229,865	553,592,393	553,914,174	554,276,701
per capita water use for all toilets, gallons/yr	6,481	6,447	6,386	6,327	6,268	6,203	6,134	6,076	6,015	5,955	5,896	5,838
total water savings with rebated ULF Toilets, gallo	664,587	1,071,914	1,071,914	1,071,914	1,071,914	1,071,914	1,071,914	1,071,914	1,071,914	1,071,914	1,071,914	1,071,914
total water savings with rebated ULF Toilets, AF	2.04	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
cumulative savings post-2006, AF		3.29	6.58	9.87	13.16	16.45	19.73	23.02	26.31	29.60	32.89	36.18
total cost to utility	$ 3,100	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
total cost to utility per AF of saved water	$ 1,520	$ 1,520	$ 1,520	$ 1,520	$ 1,520	$ 1,520	$ 1,520	$ 1,520	$ 1,520	$ 1,520	$ 1,520	$ 1,520
cumulative cost to utility post-2006		$ 5,000	$ 10,000	$ 15,000	$ 20,000	$ 25,000	$ 30,000	$ 35,000	$ 40,000	$ 45,000	$ 50,000	$ 55,000

Other Assumptions:

Ultra Low Flow (ULF)Toilets are defined as those toilets that use no more than 1.6 gallons per flush

Estimated water savings have been developed based on studies presented by H2ouse.com; California Urban Water Conservation Council, "BMP Costs and Savings Study", July 2000; and Amy Vicker, "Water Use and Conservation", June 2002

* cost per unit estimated from equipment cost plus installation

**Customer payback period is based on the current cost of 1000 gallons of water in the lowest tier

*** estimated as 1.8 per residential and multifamily tap

**** adjusted for both ULF Toilets and DF Toilets

Residential Dual Flush Toilet Rebates

Cost Assumptions	
cost per unit*	320
rebate per unit	100
cost of water per 1000 gallons from City	2.53

Estimated savings per unit	
persons per unit (2006 population/2006 taps)	3.55
uses per person	4
gallons per unit, before	3.61
gallons per unit, after	1.25
days/year of use	365
gallons saved per year/unit	12,221
AF saved per year/unit	0.037
customer payback period w/o incentive, years**	10
customer payback period w/ incentive, years**	7

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Dual Flush Toilets in use	500	625	750	875	1,000	1,125	1,250	1,375	1,500	1,625	1,750	1,875
new units during year, rebate	7	25	25	25	25	25	25	25	25	25	25	25
new units during year, organic	50	50	50	50	50	50	50	50	50	50	50	50
new units during year, new construction	50	50	50	50	50	50	50	50	50	50	50	50
City residential population	85,396	86,060	86,723	87,387	88,050	89,030	90,202	91,000	91,980	92,970	93,950	94,940
total toilets in use***	43,339	43,973	44,312	44,651	44,990	45,491	46,090	46,497	46,998	47,504	48,005	48,510
total water use for residential toilets, gallons/yr****	553,418,645	554,805,589	553,837,724	552,869,859	551,901,994	552,223,775	553,327,900	552,908,084	553,229,865	553,592,393	553,914,174	554,276,701
per capita water use for all toilets, gallons/yr	6,481	6,447	6,386	6,327	6,268	6,203	6,134	6,076	6,015	5,955	5,896	5,838
total water savings with rebated DF Toilets, gallon	85,546	305,521	305,521	305,521	305,521	305,521	305,521	305,521	305,521	305,521	305,521	305,521
total water savings with rebated DF Toilets, AF	0.26	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
cumulative savings post-2006, AF		0.94	1.87	2.81	3.75	4.69	5.62	6.56	7.50	8.44	9.37	10.31
total cost to utility	$ 700	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500
total cost to utility per AF of saved water	$ 2,667	$ 2,667	$ 2,667	$ 2,667	$ 2,667	$ 2,667	$ 2,667	$ 2,667	$ 2,667	$ 2,667	$ 2,667	$ 2,667
cumulative cost to utility post-2006		$ 2,500	$ 5,000	$ 7,500	$ 10,000	$ 12,500	$ 15,000	$ 17,500	$ 20,000	$ 22,500	$ 25,000	$ 27,500

Other Assumptions:

Dual Flush (DF)Toilets are defined as those toilets that use no more than 1.6 gallons per flush for solids and 0.9 for liquids

Estimated water savings have been developed based on studies presented by H2ouse.com; California Urban Water Conservation Council, "BMP Costs and Savings Study", July 2000; and Amy Vicker, "Water Use and Conservation", June 2002

* cost per unit estimated from equipment cost plus installation

**Customer payback period is based on the current cost of 1000 gallons of water in the lowest tier

*** estimated as 1.8 per residential and multifamily tap

**** adjusted for both ULF Toilets and DF Toilets

Residential Washing Machine Rebates

Cost Assumptions	
cost per unit*	750
rebate per unit	50
cost of water per 1000 gallons from City	2.53
Estimated savings per unit	
Loads per capita per day	0.37
people per machine	3.55
gallons per load, before	39
gallons per load, after	27
days/year of use	365
gallons saved per year/unit	5,748
AF saved per year/unit	0.018
customer payback period w/o incentive, years**	52
customer payback period w/ incentive, years**	48

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
HE Washing Machines in Place	1,000	1,125	1,375	1,625	1,875	2,125	2,375	2,625	2,875	3,125	3,375	3,625
new units during year, rebate	237	-	125	125	125	125	125	125	125	125	125	125
new units during year, organic	25	25	25	25	25	25	25	25	25	25	25	25
new units during year, new construction	100	100	100	100	100	100	100	100	100	100	100	100
City residential population	85,396	86,060	86,723	87,387	88,050	89,030	90,202	91,000	91,980	92,970	93,950	94,940
Total Washing Machines in Use	24,077	24,429	24,618	24,806	24,994	25,273	25,605	25,832	26,110	26,391	26,669	26,950
total water use for washing machines gallons/year	444,030,202	449,894,719	451,976,178	454,057,637	456,139,096	459,898,909	464,676,870	467,471,563	471,231,376	475,044,217	478,804,030	482,616,871
per capita water use for washing machines gallons/year	5,200	5,228	5,212	5,196	5,180	5,166	5,152	5,137	5,123	5,110	5,096	5,083
total water savings with rebated HE Washing Machines, gallons		-	718,493	718,493	718,493	718,493	718,493	718,493	718,493	718,493	718,493	718,493
total water savings with rebated HE Washing Machines, AF		-	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
cumulative savings post-2006, AF		-	2.20	4.41	6.61	8.82	11.02	13.23	15.43	17.64	19.84	22.05
total cost to utility		$ -	$ 6,250	$ 6,250	$ 6,250	$ 6,250	$ 6,250	$ 6,250	$ 6,250	$ 6,250	$ 6,250	$ 6,250
total cost to utility per AF of saved water		#DIV/0!	$ 2,835	$ 2,835	$ 2,835	$ 2,835	$ 2,835	$ 2,835	$ 2,835	$ 2,835	$ 2,835	$ 2,835
cumulative cost to utility post-2006		$ -	$ 6,250	$ 12,500	$ 18,750	$ 25,000	$ 31,250	$ 37,500	$ 43,750	$ 50,000	$ 56,250	$ 62,500

Other Assumptions:

Estimated water savings have been developed based on studies presented by H2ouse.com; California Urban Water Conservation Council, "BMP Costs and Savings Study", July 2000; and Amy Vicker, "Water Use and Conservation", June 2002

* cost per unit estimated from equipment cost plus installation

**Customer payback period is based on the current cost of 1000 gallons of water in the lowest tier

*** estimated as 1.8 per residential and multifamily tap

Residential Dish Washing Machine Rebates

Cost Assumptions	
cost per unit*	325
rebate per unit	50
cost of water per 1000 gallons from City	2.53
Estimated savings per unit	
persons per unit	3.55
Loads per capita per day	0.88
gallons per unit, before	12
gallons per unit, after	7
days/year of use	365
gallons saved per year/unit	1,610
AF saved per year/unit	0.005
customer payback period w/o incentive, years**	80
customer payback period w/ incentive, years**	68

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
HE Dishwashers in use	250	400	1,388	2,365	3,343	4,732	6,370	7,508	8,882	10,269	11,643	13,030
new units during year, rebate	48	25	25	15	15	15	15	-	-	-	-	-
new units during year, organic	25	100	100	100	100	100	100	100	100	100	100	100
new units during year, new construction	25	25	863	863	863	1,274	1,524	1,037	1,274	1,287	1,274	1,287
City residential population	85,396	86,060	86,723	87,387	88,050	89,030	90,202	91,000	91,980	92,970	93,950	94,940
total dishwashers in use***	20,465	21,129	21,792	22,456	23,119	24,099	25,271	26,069	27,049	28,039	29,019	30,009
total water use for residential dishwashers, gallons/year	78,675,999	80,997,026	81,970,835	82,960,743	83,950,652	85,501,082	87,391,544	88,643,802	90,218,382	91,810,672	93,385,252	94,977,542
per capita water use for dishwashers, gallons/year	921	941	945	949	953	960	969	974	981	988	994	1,000
total water savings with rebated dishwashers, gallons		40,250	40,250	24,150	24,150	24,150	24,150	-	-	-	-	-
total water savings with rebated dishwashers, AF		0.12	0.12	0.07	0.07	0.07	0.07	-	-	-	-	-
cumulative savings post-2006, AF		0.12	0.25	0.32	0.40	0.47	0.54	0.54	0.54	0.54	0.54	0.54
total cost to utility		$ 1,250	$ 1,250	$ 750	$ 750	$ 750	$ 750	$ -	$ -	$ -	$ -	$ -
total cost to utility per AF of saved water		$ 10,121	$ 10,121	$ 10,121	$ 10,121	$ 10,121	$ 10,121	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
cumulative cost to utility post-2006		$ 1,250	$ 2,500	$ 3,250	$ 4,000	$ 4,750	$ 5,500	$ 5,500	$ 5,500	$ 5,500	$ 5,500	$ 5,500

Other Assumptions:

Estimated water savings have been developed based on studies presented by H2ouse.com; and Amy Vicker, "Water Use and Conservation", June 2002

* cost per unit estimated from equipment cost plus installation

**Customer payback period is based on the current cost of 1000 gallons of water in the lowest tier

*** estimated as 85% of taps in 2006, with all new construction with 100% dishwashers installed

Residential Rain Sensor Rebates

Cost Assumptions	
cost per unit*	$ 35
rebate per unit	$ 25
cost of water per 1000 gallons from City	$ 2.53
Estimated savings per unit	
outdoor water use per irrigator**	58,153
watering days per year, before rebate	75
watering days per year, after rebate (7.5% fewer water days)	69
efficiency	0.6
gallons saved per year/unit	4,361
AF saved per year/unit	0.01
customer payback period w/o incentive, years***	3.17
customer payback period w/ incentive, years***	0.91

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
units in use	20	80	140	175	235	295	355	415	475	535	595	650
new units during year, rebate	-	25	25	25	25	25	25	25	25	25	25	20
new units during year, organic	-	-	-	-	-	-	-	-	-	-	-	-
new units during year, new construction	-	35	35	10	35	35	35	35	35	35	35	35
City residential population	85,396	86,060	86,723	87,387	88,050	89,030	90,202	91,000	91,980	92,970	93,950	94,940
total residential irrigation systems****	19,728	20,765	20,925	21,085	21,245	21,482	21,765	21,957	22,194	22,432	22,669	22,908
total water use for outdoor irrigation, gallons/year*****	1,147,038,397	1,205,913,847	1,213,327,485	1,220,850,159	1,227,816,469	1,238,210,085	1,250,506,861	1,258,225,082	1,268,171,369	1,278,240,078	1,288,186,366	1,298,276,882
residential outdoor irrigation per tap, gallons/year*****	49,422	51,246	51,167	51,093	50,998	50,863	50,701	50,567	50,423	50,282	50,145	50,011
total water savings with rain sensors, gallons		109,036	109,036	109,036	109,036	109,036	109,036	109,036	109,036	109,036	109,036	87,229
total water savings with rain sensors, AF		0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.27
cumulative savings post-2006, AF		0.33	0.67	1.00	1.34	1.67	2.01	2.34	2.68	3.01	3.35	3.61
total cost to utility		$ 875	$ 875	$ 875	$ 875	$ 875	$ 875	$ 875	$ 875	$ 875	$ 875	$ 700
total cost to utility per AF of saved water		$ 2,615	$ 2,615	$ 2,615	$ 2,615	$ 2,615	$ 2,615	$ 2,615	$ 2,615	$ 2,615	$ 2,615	$ 2,615
cumulative cost to utility post-2006		$ 875	$ 1,750	$ 2,625	$ 3,500	$ 4,375	$ 5,250	$ 6,125	$ 7,000	$ 7,875	$ 8,750	$ 9,450

Other Assumptions:

Estimated water savings have been developed based on studies presented by H2ouse.com; and Amy Vicker, "Water Use and Conservation", June 2002; and calculations via WeatherTRAK

* cost per unit estimated from equipment cost plus installation

** outdoor water use estimated as average per residential tap during 2005 and 2006

***Customer payback period is based on the current cost of 1000 gallons of water in the lowest tier

**** estimated as 85% of taps in 2006, with all new construction with 100% irrigation systems installed

***** total water use for outdoor irrigation includes accounting for changes in both rainfall sensors and ET controllers

Residential ET Controller Rebates

Cost Assumptions	
cost per unit*	$ 375
rebate per unit	$ 150
cost of water per 1000 gallons from City	$ 2.53
Estimated savings per unit	
outdoor water use per irrigator**	58,153
watering days per year, before rebate	75
watering days per year, after rebate (20% fewer water days)	60
original efficiency	0.5
improved efficiency	0.85
gallons saved per year/unit	17,893
AF saved per year/unit	0.055
customer payback period w/o incentive, years***	8.28
customer payback period w/ incentive, years***	4.97

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
units in use	5	71	163	254	370	543	761	940	1,138	1,337	1,535	1,734
new units during year, rebate	-	-	25	25	50	75	100	100	100	100	100	100
new units during year, organic	-	-	-	-	-	-	-	-	-	-	-	-
new units during year, new construction	-	66	66	66	66	98	117	80	98	99	98	99
City residential population	85,396	86,060	86,723	87,387	88,050	89,030	90,202	91,000	91,980	92,970	93,950	94,940
total residential irrigation systems****	20,465	21,129	21,792	22,456	23,119	24,099	25,271	26,069	27,049	28,039	29,019	30,009
total water use for outdoor irrigation, gallons/year*****	1,147,038,397	1,205,913,847	1,213,327,485	1,220,850,159	1,227,816,469	1,238,210,085	1,250,506,861	1,258,225,082	1,268,171,369	1,278,240,078	1,288,186,366	1,298,276,882
residential outdoor irrigation per tap, gallons/year*****	49,422	51,246	51,167	51,093	50,998	50,863	50,701	50,567	50,423	50,282	50,145	50,011
total water savings with ET controllers, gallons		-	447,328	447,328	894,656	1,341,984	1,789,312	1,789,312	1,789,312	1,789,312	1,789,312	1,789,312
total water savings with ET controllers, AF		-	1.37	1.37	2.75	4.12	5.49	5.49	5.49	5.49	5.49	5.49
cumulative savings post-2006, AF		-	1.37	2.75	5.49	9.61	15.10	20.59	26.08	31.57	37.06	42.55
total cost to utility		$ -	$ 3,750	$ 3,750	$ 7,500	$ 11,250	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000
total cost to utility per AF of saved water		#DIV/0!	$ 2,732	$ 2,732	$ 2,732	$ 2,732	$ 2,732	$ 2,732	$ 2,732	$ 2,732	$ 2,732	$ 2,732
cumulative cost to utility post-2006		$ -	$ 3,750	$ 7,500	$ 15,000	$ 26,250	$ 41,250	$ 56,250	$ 71,250	$ 86,250	$ 101,250	$ 116,250

Other Assumptions:

Estimated water savings have been developed based on studies presented by H2ouse.com; and Amy Vicker, "Water Use and Conservation", June 2002; and calculations via WeatherTRAK

* cost per unit estimated from equipment cost plus installation

** outdoor water use estimated as average per residential tap during 2005 and 2006

***Customer payback period is based on the current cost of 1000 gallons of water in the lowest tier

**** estimated as 85% of taps in 2006, with all new construction with 100% irrigation systems installed

***** total water use for outdoor irrigation includes accounting for changes in both rainfall sensors and ET controllers

Residential Whole House Audits

Cost Assumptions	
cost per audit*	$ 100
cost to utility per audit	$ 100

Estimated savings per audit	
indoor water use per customer**	77,615
gallons saved per audit***	9,125
AF saved per audit	0.03

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
units in use	-	-	35	70	105	140	175	210	245	280	315	350
audit performed during year, rebated	-	35	35	35	35	35	35	35	35	35	35	35
new units during year, organic	-	-	-	-	-	-	-	-	-	-	-	-
new units during year, new construction	-	-	-	-	-	-	-	-	-	-	-	-
City residential population	85,396	86,060	86,723	87,387	88,050	89,030	90,202	91,000	91,980	92,970	93,950	94,940
total residential taps	23,209	21,129	21,792	22,456	23,119	24,099	25,271	26,069	27,049	28,039	29,019	30,009
total water savings with whole house audits, gallons		319,375	319,375	319,375	319,375	319,375	319,375	319,375	319,375	319,375	319,375	319,375
total water savings with whole house audits, AF		0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
cumulative savings post-2006, AF		0.98	1.96	2.94	3.92	4.90	5.88	6.86	7.84	8.82	9.80	10.78
total cost to utility		$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500	$ 3,500
total cost to utility per AF of saved water		$ 3,571	$ 3,571	$ 3,571	$ 3,571	$ 3,571	$ 3,571	$ 3,571	$ 3,571	$ 3,571	$ 3,571	$ 3,571
cumulative cost to utility post-2006		$ 3,500	$ 7,000	$ 10,500	$ 14,000	$ 17,500	$ 21,000	$ 24,500	$ 28,000	$ 31,500	$ 35,000	$ 38,500

Other Assumptions:

Estimated water savings have been developed based on studies presented by Amy Vicker, "Water Use and Conservation", June 2002

* cost per unit estimated from Amy Vicker, "Water Use and Conservation"

** indoor water use estimated as average per residential tap during 2005 and 2006

*** estimated as 25 gallons per day per audit (including indoor and outdoor water use)

Residential Outdoor Irrigation Audits

Cost Assumptions	
cost per audit*	$ 125
cost to utility per audit	$ 125

Estimated savings per audit	
outdoor water use per irrigator**	58,153
watering days per year, before audit	75
watering days per year, after	68.0
original efficiency	0.6
improved efficiency	0.75
gallons saved per audit***	5,475
AF saved per audit	0.02

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
units in use	-	-	70	140	210	280	350	420	490	560	630	700
audit performed during year, rebated	-	70	70	70	70	70	70	70	70	70	70	70
new units during year, organic	-	-	-	-	-	-	-	-	-	-	-	-
new units during year, new construction	-	-	-	-	-	-	-	-	-	-	-	-
City residential population	85,396	86,060	86,723	87,387	88,050	89,030	90,202	91,000	91,980	92,970	93,950	94,940
total residential irrigation systems****	20,465	21,129	21,792	22,456	23,119	24,099	25,271	26,069	27,049	28,039	29,019	30,009
total water savings with irrigation audits, gallons		383,250	383,250	383,250	383,250	383,250	383,250	383,250	383,250	383,250	383,250	383,250
total water savings with irrigation audits, AF		1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18
cumulative savings post-2006, AF		1.18	2.35	3.53	4.70	5.88	7.06	8.23	9.41	10.58	11.76	12.94
total cost to utility		$ 8,750	$ 8,750	$ 8,750	$ 8,750	$ 8,750	$ 8,750	$ 8,750	$ 8,750	$ 8,750	$ 8,750	$ 8,750
total cost to utility per AF of saved water		$ 7,441	$ 7,441	$ 7,441	$ 7,441	$ 7,441	$ 7,441	$ 7,441	$ 7,441	$ 7,441	$ 7,441	$ 7,441
cumulative cost to utility post-2006		$ 8,750	$ 17,500	$ 26,250	$ 35,000	$ 43,750	$ 52,500	$ 61,250	$ 70,000	$ 78,750	$ 87,500	$ 96,250

Other Assumptions:

Estimated water savings have been developed based on studies presented by H2ouse.com; and Amy Vicker, "Water Use and Conservation", June 2002; and calculations via WeatherTRAK

* cost per unit estimated as CRC labor to do "Slow the Flow" audits

** outdoor water use estimated as average per residential tap during 2005 and 2006

*** estimated water savings based on Amy Vicker, "Water Use nd Conservation" (estimated as 15 gpd)

**** estimated as 85% of taps in 2006, with all new construction with 100% irrigation systems installed

Commercial Facility Audits

Cost Assumptions	
cost per audit	$ 1,500
cost to utility per audit	$ 1,500
Estimated savings per audit	
Average water use per commercial tap	747,142
Average savings per customer (4% per year for 5 years)	20%

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
total audits conducted	-	-	10	25	40	55	70	85	100	115	130	145
commerical audits in year	-	-	10	15	15	15	15	15	15	15	15	15
Commerical taps	1,376	1,459	1,471	1,482	1,493	1,510	1,530	1,543	1,560	1,576	1,593	1,610
water saved from years audits, gallons			298,857	448,285	448,285	448,285	448,285	448,285	448,285	448,285	448,285	448,285
water saved from past audits, gallons			-	298,857	747,142	1,195,427	1,643,711	1,793,140	1,793,140	1,793,140	1,793,140	1,793,140
water saved in year, gallons			298,857	747,142	1,195,427	1,643,711	2,091,996	2,241,425	2,241,425	2,241,425	2,241,425	2,241,425
water saved, AF			0.9	2.3	3.7	5.0	6.4	6.9	6.9	6.9	6.9	6.9
cumulative savings post-2006, AF			0.9	3.2	6.9	11.9	18.3	25.2	32.1	39.0	45.9	52.7
total cost to utility			$ 15,000	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500
total cost to utility per AF of saved water			$ 3,271	$ 3,271	$ 3,271	$ 3,271	$ 3,271	$ 3,271	$ 3,271	$ 3,271	$ 3,271	$ 3,271

Other Assumptions:

Estimated water savings have been developed based on studies presented by Amy Vicker, "Water Use and Conservation", June 2002

Outdoor Irrigator Audits (including separate taps for commercial and institutional customers)

Cost Assumptions	
cost per audit*	$ 500
cost to utility per audit	$ 500

Estimated savings per audit	
outdoor water use per irrigator**	410,368
watering days per year, before audit	75
watering days per year, after	69.375
original efficiency	0.6
improved efficiency (from reduction of leaks)	0.7
gallons saved per audit	34,197
AF saved per audit	0.10

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
total audits conducted		-	15	30	45	55	65	75	85	95	105	115
audits in the year	-	-	15	15	15	10	10	10	10	10	10	10
irrigation taps	231	259	281	303	325	346	368	390	412	433	455	477
total water savings with audits, gallons		-	512,961	512,961	512,961	341,974	341,974	341,974	341,974	341,974	341,974	341,974
total water savings with audits, AF		-	1.57	1.57	1.57	1.05	1.05	1.05	1.05	1.05	1.05	1.05
cumulative savings post-2006, AF		-	1.57	3.15	4.72	5.77	6.82	7.87	8.92	9.97	11.02	12.07
total cost to utility		$ -	$ 7,500	$ 7,500	$ 7,500	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
total cost to utility per AF of saved water		#DIV/0!	$ 4,765	$ 4,765	$ 4,765	$ 4,765	$ 4,765	$ 4,765	$ 4,765	$ 4,765	$ 4,765	$ 4,765
cumulative cost to utility post-2006		$ -	$ 7,500	$ 15,000	$ 22,500	$ 27,500	$ 32,500	$ 37,500	$ 42,500	$ 47,500	$ 52,500	$ 57,500

Other Assumptions:
Estimated water savings have been developed based on studies presented by Amy Vicker, "Water Use and Conservation", June 2002

Commercial HE Toilet Rebate

Cost Assumptions	
cost per unit*	$ 225
rebate per unit	$ 100
cost of water per 1000 gallons from City	$ 2.39

Estimated savings per unit	
persons per unit	30
uses per person	1
gallons per unit, before	3.61
gallons per unit, after	1.2
days/year of use	235
gallons saved per year/unit	16,991
AF saved per year/unit	0.05
customer payback period w/o incentive, years**	5.5
customer payback period w/ incentive, years**	3.1

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
HET in use	20	363	444	526	609	715	834	929	1,038	1,148	1,258	1,370
new units during year, give away/municipal use	-	-	-	-	-	-	-	-	-	-	-	-
new units during year, rebate	-	-	25	25	25	25	25	25	25	25	25	25
new units during year, organic	-	10	11	12	13	14	15	16	17	18	19	20
new units during year, new construction	-	333	45	45	45	66	79	54	66	67	66	67
Commerical taps	1,376	1,459	1,471	1,482	1,493	1,510	1,530	1,543	1,560	1,576	1,593	1,610
total commerical toilets in use***	5,504	5,837	5,882	5,927	5,972	6,039	6,118	6,172	6,239	6,306	6,372	6,439
total water use for commerical toilets, gallons/yr	139,739,742	142,387,575	142,156,638	141,908,711	141,643,793	141,543,495	141,536,377	141,297,665	141,146,395	140,983,873	140,798,622	140,602,119
per commercial toilet water use, gallons/yr	25,389	24,394	24,168	23,942	23,718	23,440	23,134	22,893	22,625	22,358	22,096	21,835
total water savings with rebated + giveaway HET, gallons		-	424,763	424,763	424,763	424,763	424,763	424,763	424,763	424,763	424,763	424,763
total water savings with rebated + giveaway HET, AF		-	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
cumulative savings post-2006, AF		-	1.30	2.61	3.91	5.21	6.52	7.82	9.12	10.43	11.73	13.03
total cost to utility		$ -	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500
total cost to utility per AF of saved water		#DIV/0!	$ 1,918	$ 1,918	$ 1,918	$ 1,918	$ 1,918	$ 1,918	$ 1,918	$ 1,918	$ 1,918	$ 1,918
cumulative cost to utility post-2006		$ -	$ 2,500	$ 5,000	$ 7,500	$ 10,000	$ 12,500	$ 15,000	$ 17,500	$ 20,000	$ 22,500	$ 25,000

Other Assumptions:

High Efficiency (HE) Toilets are defined as those commercial toilets that use no more than 1.2 gallons per flush

Estimated water savings have been developed based on studies presented by H2ouse.com; California Urban Water Conservation Council, "BMP Costs and Savings Study", July 2000; and Amy Vicker, "Water Use and Conservation", June 2002

* cost per unit estimated from equipment cost plus installation

**Customer payback period is based on the current cost of 1000 gallons of water

*** estimated as 4 toilets per commercial tap

Commercial Low Flow Urinal Rebate

Cost Assumptions	
cost per unit*	$ 100
rebate per unit	$ 50
cost of water per 1000 gallons from City	$ 2.39

Estimated savings per unit	
persons per unit	20
uses per person	1.5
gallons per unit, before	1.75
gallons per unit, after	0.75
days/year of use	235
gallons saved per year/unit	7,050
AF saved per year/unit	0.02
customer payback period w/o incentive, years**	5.9
customer payback period w/ incentive, years**	3.0

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
LF Urinials in use	20	238	302	367	559	764	979	1,179	1,387	1,597	1,808	2,020
new units during year, give away/municipal use	-	-	-	-	-	-	-	-	-	-	-	-
new units during year, rebate	-	-	25	25	150	150	150	150	150	150	150	150
new units during year, organic	-	10	11	12	13	14	15	16	17	18	19	20
new units during year, new construction	-	208	28	28	28	42	50	34	42	42	42	42
Commerical taps	1,376	1,459	1,471	1,482	1,493	1,510	1,530	1,543	1,560	1,576	1,593	1,610
total commerical urinals in use***	3,440	3,648	3,676	3,704	3,733	3,774	3,824	3,858	3,899	3,941	3,983	4,025
total water use for commercial urinals, gallons/year	42,300,000	43,330,179	43,225,098	43,112,967	42,112,537	41,175,997	40,275,443	39,284,010	38,326,321	37,363,823	36,392,033	35,415,435
per commercial urinal water use, gallons/year	30,741	29,693	29,394	29,096	28,206	27,275	26,332	25,459	24,574	23,701	22,844	21,999
total water savings with rebated + giveaway LFU, gallons		-	176,250	176,250	1,057,500	1,057,500	1,057,500	1,057,500	1,057,500	1,057,500	1,057,500	1,057,500
total water savings with rebated + giveaway LFU, AF		-	0.54	0.54	3.24	3.24	3.24	3.24	3.24	3.24	3.24	3.24
cumulative savings post-2006, AF		-	0.54	1.08	4.33	7.57	10.82	14.06	17.31	20.55	23.80	27.04
total cost to utility		$ -	$ 1,250	$ 1,250	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500
total cost to utility per AF of saved water		#DIV/0!	$ 2,311	$ 2,311	$ 2,311	$ 2,311	$ 2,311	$ 2,311	$ 2,311	$ 2,311	$ 2,311	$ 2,311
cumulative cost to utility post-2006		$ -	$ 1,250	$ 2,500	$ 10,000	$ 17,500	$ 25,000	$ 32,500	$ 40,000	$ 47,500	$ 55,000	$ 62,500

Other Assumptions:

Low Flow (LF) Urinals are defined as those commercial toilets that use no more than 0.75 gallons per flush

Estimated water savings have been developed based on studies presented by H2ouse.com; California Urban Water Conservation Council, "BMP Costs and Savings Study", July 2000; and Amy Vicker, "Water Use and Conservation", June 2002

* cost per unit estimated from equipment cost plus installation

**Customer payback period is based on the current cost of 1000 gallons of water

*** estimated as 2.5 urinals per commercial tap

Commercial Pre-Rinse Spray Valves Giveaway

Cost Assumptions	
cost per unit*	$ 75
rebate per unit	$ 75
cost of water per 1000 gallons from City	$ 2.39

Estimated savings per unit	
Number of units per location	1
minutes per unit	240
gallons per minute per unit, before	5
gallons per minute per unit, after	1.24
days/year of use	275
gallons saved per year/unit	248,160
AF saved per year/unit	0.76
customer payback period w/o incentive, years**	0.13
customer payback period w/ incentive, years**	0.00

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
units in use	150	150	175	200	225	250	275	300	325	350	375	400
new units during year, give away	-	-	25	25	25	25	25	25	25	25	25	25
new units during year, organic	-	-	-	-	-	-	-	-	-	-	-	-
new units during year, new construction	-	-	-	-	-	-	-	-	-	-	-	-
Commerical taps	1,376	1,459	1,471	1,482	1,493	1,510	1,530	1,543	1,560	1,576	1,593	1,610
total prewash sprayers in use***	454	482	485	489	493	498	505	509	515	520	526	531
total water use for pre-rinse sprayers, gallons/year	112,622,400	121,690,121	116,711,314	111,732,507	106,753,700	102,359,330	98,319,500	93,589,056	89,194,685	84,818,781	80,424,411	76,048,506
per tap water use for pre-rinse sprayers, gallons/year	248,023	252,701	240,508	228,500	216,673	205,467	194,793	183,795	173,299	163,042	152,982	143,150
total water savings with pre-rinse sprayers, gallons		-	6,204,000	6,204,000	6,204,000	6,204,000	6,204,000	6,204,000	6,204,000	6,204,000	6,204,000	6,204,000
total water savings with pre-rinse sprayers, AF		-	19.04	19.04	19.04	19.04	19.04	19.04	19.04	19.04	19.04	19.04
cumulative savings post-2006, AF		-	19.04	38.07	57.11	76.15	95.18	114.22	133.26	152.29	171.33	190.37
total cost to utility		$ -	$ 1,875	$ 1,875	$ 1,875	$ 1,875	$ 1,875	$ 1,875	$ 1,875	$ 1,875	$ 1,875	$ 1,875
total cost to utility per AF of saved water		#DIV/0!	$ 98	$ 98	$ 98	$ 98	$ 98	$ 98	$ 98	$ 98	$ 98	$ 98
cumulative cost to utility post-2006		$ -	$ 1,875	$ 3,750	$ 5,625	$ 7,500	$ 9,375	$ 11,250	$ 13,125	$ 15,000	$ 16,875	$ 18,750

Other Assumptions:

prewash spray rinsing reduces flow while increasing spray pressure to reduce water use while improving cleaning efficiency

Estimated water savings have been developed based on studies presented by Amy Vicker, "Water Use and Conservation", June 2002, www.WEBstaurant.com

* cost per unit estimated from equipment cost plus installation

**Customer payback period is based on the current cost of 1000 gallons of water

*** estimated as 1/3 of the commercial taps

Commercial Rain Sensor Rebate

Cost Assumptions	
cost per unit*	$ 150
rebate per unit	$ 50
cost of water per 1000 gallons from City	$ 2.39

Estimated savings per unit	
outdoor water use per irrigator**	410,368
watering days per year, before rebate	75
watering days per year, after rebate (7.5% fewer water days)	69.375
efficiency	0.6
gallons saved per year/unit	30,778
AF saved per year/unit	0.09
customer payback period w/o incentive, years***	2.04
customer payback period w/ incentive, years***	1.36

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
units in use	5	40	61	81	101	128	172	218	265	312	359	406
new units during year, rebate	-	-	10	10	10	15	30	35	35	35	35	35
new units during year, organic	-	-	-	-	-	-	-	-	-	-	-	-
new units during year, new construction	-	35	10	10	10	12	13	11	12	12	12	12
Commercial and irrigation taps	1,607	1,718	1,752	1,785	1,818	1,856	1,898	1,933	1,972	2,009	2,048	2,087
total commercial and irrigation systems****	1,446	1,546	1,576	1,606	1,636	1,670	1,708	1,740	1,774	1,808	1,843	1,878
total water use for outdoor irrigation, gallons/year*****	592,906,049	628,355,532	637,273,504	646,191,477	655,109,449	665,264,771	676,314,277	684,277,492	690,944,107	697,346,145	704,012,760	710,733,399
residential outdoor irrigation per tap, gallons/year*****	409,947	406,324	404,268	402,288	400,381	398,345	396,025	393,323	389,376	385,594	381,940	378,419
total water savings with rain sensors, gallons		-	307,776	307,776	307,776	461,665	923,329	1,077,217	1,077,217	1,077,217	1,077,217	1,077,217
total water savings with rain sensors, AF		-	0.94	0.94	0.94	1.42	2.83	3.31	3.31	3.31	3.31	3.31
cumulative savings post-2006, AF		-	0.94	1.89	2.83	4.25	7.08	10.39	13.69	17.00	20.30	23.61
total cost to utility		$ -	$ 1,500	$ 1,500	$ 1,500	$ 2,250	$ 4,500	$ 5,250	$ 5,250	$ 5,250	$ 5,250	$ 5,250
total cost to utility per AF of saved water		#DIV/0!	$ 1,588	$ 1,588	$ 1,588	$ 1,588	$ 1,588	$ 1,588	$ 1,588	$ 1,588	$ 1,588	$ 1,588
cumulative cost to utility post-2006		$ -	$ 1,500	$ 3,000	$ 4,500	$ 6,750	$ 11,250	$ 16,500	$ 21,750	$ 27,000	$ 32,250	$ 37,500

Other Assumptions:

Estimated water savings have been developed based on studies presented by H2ouse.com; and Amy Vicker, "Water Use and Conservation", June 2002; and calculations via WeatherTRAK

* cost per unit estimated from equipment cost plus installation

** outdoor water use estimated as average per commercial/irrigation tap during 2005 and 2006

***Customer payback period is based on the current cost of 1000 gallons of water

**** estimated as 90% of taps

***** total water use for outdoor irrigation includes accounting for changes in both rainfall sensors and ET controllers

Commercial ET Controller Rebate

Cost Assumptions	
cost per unit*	$ 1,000
rebate per unit	$ 250
cost of water per 1000 gallons from City	$ 2.39

Estimated savings per unit	
outdoor water use per irrigator, gallons**	410,368
watering days per year, before rebate	75
watering days per year, after rebate (20% fewer water days)	60
original efficiency	0.6
improved efficiency	0.7
gallons saved per year/unit	91,193
AF saved per year/unit	0.280
customer payback period w/o incentive, years***	4.59
customer payback period w/ incentive, years***	3.44

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
units in use	5	55	85	115	145	177	211	252	319	386	453	521
new units during year, rebate	-	-	15	15	15	15	15	25	50	50	50	50
new units during year, organic	-	-	-	-	-	-	-	-	-	-	-	-
new units during year, new construction	-	50	15	15	15	17	19	16	17	17	17	17
City residential population	1,607	1,718	1,752	1,785	1,818	1,856	1,898	1,933	1,972	2,009	2,048	2,087
total residential irrigation systems****	1,446	1,546	1,576	1,606	1,636	1,670	1,708	1,740	1,774	1,808	1,843	1,878
total water use for outdoor irrigation, gallons/year*****	592,906,049	628,355,532	637,273,504	646,191,477	655,109,449	665,264,771	676,314,277	684,277,492	690,944,107	697,346,145	704,012,760	710,733,399
residential outdoor irrigation per tap, gallons/year*****	409,947	406,324	404,268	402,288	400,381	398,345	396,025	393,323	389,376	385,594	381,940	378,419
total water savings with ET controllers, gallons		-	1,367,895	1,367,895	1,367,895	1,367,895	1,367,895	2,279,825	4,559,650	4,559,650	4,559,650	4,559,650
total water savings with ET controllers, AF		-	4.20	4.20	4.20	4.20	4.20	7.00	13.99	13.99	13.99	13.99
cumulative savings post-2006, AF		-	4.20	8.39	12.59	16.79	20.99	27.98	41.97	55.96	69.96	83.95
total cost to utility		$ -	$ 3,750	$ 3,750	$ 3,750	$ 3,750	$ 3,750	$ 6,250	$ 12,500	$ 12,500	$ 12,500	$ 12,500
total cost to utility per AF of saved water		#DIV/0!	$ 893	$ 893	$ 893	$ 893	$ 893	$ 893	$ 893	$ 893	$ 893	$ 893
cumulative cost to utility post-2006		$ -	$ 3,750	$ 7,500	$ 11,250	$ 15,000	$ 18,750	$ 25,000	$ 37,500	$ 50,000	$ 62,500	$ 75,000

Other Assumptions:

Estimated water savings have been developed based on studies presented by H2ouse.com; and Amy Vicker, "Water Use and Conservation", June 2002; and calculations via WeatherTRAK

* cost per unit estimated from equipment cost plus installation

** outdoor water use estimated as average per residential tap during 2005 and 2006

***Customer payback period is based on the current cost of 1000 gallons of water

**** estimated as 85% of taps in 2006, with all new construction with 100% irrigation systems installed

***** total water use for outdoor irrigation includes accounting for changes in both rainfall sensors and ET controllers

Commercial AMR Meter Install

Cost Assumptions	
cost per unit (including labor to replace and test old meter)	$ 1,519
rebate per unit	$ 1,519
cost of water per 1000 gallons from City	$ 2.39

Estimated savings per meter	
Average number of meter replacements per year	10
Water use per large commercial customers*	1,344,855
Unmetered water use for combined customers, gallons	672,427
Unmetered water use for combined customers, AF	2
Percent customers with leaks	20%
Percent of water use as leak	10%
Quantity of saved water from reduced leaks, gallons	268,971
Quantity of saved water from reduced leaks, AF	0.83
Cost of unbilled water per year	$ 1,607
Utility payback period, years	0.11

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
units in use	-	-	10	26	70	96	124	152	182	211	240	270
new units during year, give away	-	-	10	15	15	15	15	15	15	15	15	15
new units during year, organic	-	-	-	-	-	-	-	-	-	-	-	-
new units during year, new construction	-	-	-	1	29	11	13	13	15	14	14	15
total commerical taps	1,376	1,459	1,471	1,482	1,493	1,510	1,530	1,543	1,560	1,576	1,593	1,610
total commercial water use of cumulative audited entities, gallon	-	-	6,724,274	17,483,113	47,069,919	64,553,032	83,380,999	102,208,967	122,381,789	141,882,184	161,382,579	181,555,401
total increased water billings with AMR		-	1,607	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411	2,411
total reduced FTE costs with AMR		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
annual cost to utility		$ -	$ 15,185	$ 22,778	$ 22,778	$ 22,778	$ 22,778	$ 22,778	$ 22,778	$ 22,778	$ 22,778	$ 22,778
cumulative cost to utility		$ -	$ 15,185	$ 37,963	$ 60,741	$ 83,519	$ 106,297	$ 129,075	$ 151,853	$ 174,630	$ 197,408	$ 220,186
Total water saved (through improved leak detection), gallons		-	268,970.97	403,456.45	403,456.45	403,456.45	403,456.45	403,456.45	403,456.45	403,456.45	403,456.45	403,456.45
Total water saved (through improved leak detection), AF		-	0.83	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Total cumulative saved water, AF			0.83	2.06	3.30	4.54	5.78	7.02	8.25	9.49	10.73	11.97
Cost per acre-feet		#DIV/0!	$ 16,452	$ 16,452	$ 16,452	$ 16,452	$ 16,452	$ 16,452	$ 16,452	$ 16,452	$ 16,452	$ 16,452

Other Assumptions:

Estimated water savings have been developed based on studies presented by Amy Vicker, "Water Use and Conservation", June 2002, Neptune Meters quote

* estimated as total 2006 irrigation use divided by number of irrigation taps increased by 80% for 10 largest users

Irrigator AMR Meter Install

Cost Assumptions	
cost per unit (including labor to replace and test old meter)	$ 1,519
rebate per unit	$ 1,519
cost of water per 1000 gallons from City	$ 2.39

Estimated savings per meter	
Average number of meter replacements per year	5
Water use per large irrigation customers*	2,879,189
Unmetered water use for combined customers, gallons	719,797
Unmetered water use for combined customers, AF	2
Percent customers with leaks	15%
Percent of water use as leak	10%
Quantity of saved water from reduced leaks, gallons	215,939
Quantity of saved water from reduced leaks, AF	0.66
Cost of unbilled water per year	$ 1,720
Utility payback period, years	0.23

Estimated Penetration and Savings	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
units in use	-	-	5	11	45	61	79	97	117	136	155	175
new units during year, give away	-	-	5	5	5	5	5	5	5	5	5	5
new units during year, organic	-	-	-	-	-	-	-	-	-	-	-	-
new units during year, new construction	-	-	-	1	29	11	13	13	15	14	14	15
total irrigation taps	231	1,459	1,471	1,482	1,493	1,510	1,530	1,543	1,560	1,576	1,593	1,610
total irrigation water use of cumulative audited entities, gallons	-	-	3,598,986	7,917,770	32,390,876	43,907,632	56,863,982	69,820,333	84,216,278	97,892,426	111,568,573	125,964,518
total increased water billings with AMR		-	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720	1,720
total reduced FTE costs with AMR		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
annual cost to utility		$ -	$ 7,593	$ 7,593	$ 7,593	$ 7,593	$ 7,593	$ 7,593	$ 7,593	$ 7,593	$ 7,593	$ 7,593
cumulative cost to utility		$ -	$ 7,593	$ 15,185	$ 22,778	$ 30,371	$ 37,963	$ 45,556	$ 53,148	$ 60,741	$ 68,334	$ 75,926
Total water saved (through improved leak detection), gallons		-	215,939	215,939	215,939	215,939	215,939	215,939	215,939	215,939	215,939	215,939
Total water saved (through improved leak detection), AF		-	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Total cumulative saved water, AF			0.66	1.33	1.99	2.65	3.31	3.98	4.64	5.30	5.96	6.63
Cost per acre-feet		#DIV/0!	$ 8,863	$ 8,863	$ 8,863	$ 8,863	$ 8,863	$ 8,863	$ 8,863	$ 8,863	$ 8,863	$ 8,863

Other Assumptions:

Estimated water savings have been developed based on studies presented by Amy Vicker, "Water Use and Conservation", June 2002, Neptune Meters quote

* estimated as total 2006 irrigation use divided by number of irrigation taps increased by 80% for 10 largest users

Customer Education, Outreach and Training

Activities	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Local Water Festival/K-12 Ed	$ 1,500	$ 1,500	$ 6,500	$ 6,500	$ 6,500	$ 6,500	$ 6,500	$ 6,500	$ 6,500	$ 6,500
Develop/Implement PR Campaign	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
Web/City TV Broadcast	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
Advertising in Local Paper	$ 2,000	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 3,000	$ 3,000	$ 3,000
Annual Newsletter	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000
Educational Kits/CRC Garden in a Box	$ 3,200	$ 3,200	$ 3,200	$ 3,200	$ 3,200	$ 3,200	$ 3,200	$ 3,200	$ 3,200	$ 3,200
Xeriscape Demo Garden	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,500	$ 1,500	$ 1,500	$ 1,500	$ 1,500	$ 1,500
Homeowner Training/Workshop	$ -	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
Commercial Training/Workshop	$ 5,000	$ 5,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000
Landscaper/Irrigation System Installer Training	$ -	$ -	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000
	$ 20,700	$ 26,200	$ 46,200	$ 46,200	$ 46,700	$ 46,700	$ 46,700	$ 47,200	$ 47,200	$ 47,200

Assumptions

Cost of saved water estimated from Colorado Springs Utilities Water Conservation Plan, December 2007

Water Rate Increases

Estimated Penetration and Savings

	10%	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	w/o education or new restrictions (-.10 price elasticity)												
	5% rate hike estimated water savings, AF*	-	-	-	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	10% rate hike estimated water savings, AF*	-	-	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	20% rate hike estimated water savings, AF*	-	-	-	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07
	30%		-										
	w/ education; w/o new restrictions (-.30 price elasticity)												
0.015	1.5% rate hike estimated water savings, AF*	-	-	48.69	49.06	49.43	49.98	50.64	51.09	51.64	52.20	52.75	53.30
0.02	2% rate hike estimated water savings, AF*			64.92	65.41	65.91	66.65	67.52	68.12	68.85	69.59	70.33	71.07
0.1	10% rate hike estimated water savings, AF*	-	-	324.59	327.07	329.56	333.23	337.61	340.60	344.27	347.97	351.64	355.35
0.2	20% rate hike estimated water savings, AF*	-	-	649.18	654.15	659.11	666.45	675.22	681.20	688.53	695.94	703.28	710.69
	65%												
	w/ education; w/ new restrictions (-.65 price elasticity)												
0.05	5% rate hike estimated water savings, AF*		-	351.64	354.33	357.02	360.99	365.75	368.98	372.96	376.97	380.94	384.96
0.1	10% rate hike estimated water savings, AF*		-	703.28	708.66	714.04	721.99	731.49	737.96	745.91	753.94	761.89	769.92
0.2	20% rate hike estimated water savings, AF*		-	1,406.56	1,417.32	1,428.08	1,443.98	1,462.99	1,475.93	1,491.82	1,507.88	1,523.77	1,539.83

Assumptions

Cost of saved water estimated from "Effectiveness of Residential Water Conservation Price and Non-Price Programs", AWWARF, 1998, "The Simple Analytics of Demand Hardening", C. Howe, C. Goemans, AWWA Journal, Oct. 2007.

* water savings estimated using product of projected treated water sales for the year, percent of rate hike, and price elasticity

Summary of Water Savings and Costs

Measures and Programs		**2008**		**2009**		**2010**		**2011**		**2012**		**2013**		**2014**		**2015**		**2016**		**2017**	
Residential	b/c ratio	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF
Homeowner Education	$ 1,583	$ 9,450	6.0	$ 14,700	9.3	$ 22,200	14.0	$ 22,200	14.0	$ 22,450	14.2	$ 22,450	14.2	$ 22,450	14.2	$ 22,700	14.3	$ 22,700	14.3	$ 22,700	14.3
Ultra Low Flow Toilet Rebate	$ 1,520	$ 5,000	3.3	$ 5,000	3.3	$ 5,000	3.3	$ 5,000	3.3	$ 5,000	3.3	$ 5,000	3.3	$ 5,000	3.3	$ 5,000	3.3	$ 5,000	3.3	$ 5,000	3.3
Dual Flush Toilet Rebate	$ 2,667	$ 2,500	0.9	$ 2,500	0.9	$ 2,500	0.9	$ 2,500	0.9	$ 2,500	0.9	$ 2,500	0.9	$ 2,500	0.9	$ 2,500	0.9	$ 2,500	0.9	$ 2,500	0.9
Washing Machine Rebates	$ 2,835	$ 6,250	2.2	$ 6,250	2.2	$ 6,250	2.2	$ 6,250	2.2	$ 6,250	2.2	$ 6,250	2.2	$ 6,250	2.2	$ 6,250	2.2	$ 6,250	2.2	$ 6,250	2.2
Dish Washing Machine Rebates	$ 10,121	$ 1,250	0.1	$ 750	0.1	$ 750	0.1	$ 750	0.1	$ 750	0.1	$ -	-	$ -	-	$ -	-	$ -	-	$ -	-
Rainfall Sensor Rebates	$ 2,615	$ 875	0.3	$ 875	0.3	$ 875	0.3	$ 875	0.3	$ 875	0.3	$ 875	0.3	$ 875	0.3	$ 875	0.3	$ 875	0.3	$ 700	0.3
ET Controller Rebates	$ 2,732	$ 3,750	1.4	$ 3,750	1.4	$ 7,500	2.7	$ 11,250	4.1	$ 15,000	5.5	$ 15,000	5.5	$ 15,000	5.5	$ 15,000	5.5	$ 15,000	5.5	$ 15,000	5.5
Whole House Audits	$ 3,571	$ 3,500	1.0	$ 3,500	1.0	$ 3,500	1.0	$ 3,500	1.0	$ 3,500	1.0	$ 3,500	1.0	$ 3,500	1.0	$ 3,500	1.0	$ 3,500	1.0	$ 3,500	1.0
Outdoor Irrigation Audits	$ 7,441	$ 8,750	1.2	$ 8,750	1.2	$ 8,750	1.2	$ 8,750	1.2	$ 8,750	1.2	$ 8,750	1.2	$ 8,750	1.2	$ 8,750	1.2	$ 8,750	1.2	$ 8,750	1.2
Monitoring and Verification Costs (includes plan update)		$ 3,500		$ 5,000		$ 5,000		$ 5,000		$ 3,500		$ 3,500		$ 3,500		$ 3,500		$ 3,500		$ 5,000	
sum		$ 44,825	16.4	$ 51,075	19.7	$ 62,325	25.8	$ 66,075	27.1	$ 68,575	28.7	$ 67,825	28.6	$ 67,825	28.6	$ 68,075	28.8	$ 68,075	28.8	$ 69,400	28.7
cummulative costs		$ 44,825		$ 95,900		$ 158,225		$ 224,300		$ 292,875		$ 360,700		$ 428,525		$ 496,600		$ 564,675		$ 634,075	
cummulative water savings			16.4		36.0		61.8		88.9		117.6		146.2		174.8		203.6		232.3		261.0
average cost per acre foot saved	$ 2,429																				

Commercial/Irrigation/Institutional	b/c ratio	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF	Cost	Saved Water AF
Commerical Customer Education	$ 1,583	$ 11,250	7.1	$ 11,500	7.3	$ 24,000	15.2	$ 24,000	15.2	$ 24,250	15.3	$ 24,250	15.3	$ 24,250	15.3	$ 24,500	15.5	$ 24,500	15.5	$ 24,500	15.5
Commercial Audits	$ 2,063	$ 3,271	0.9	$ 3,271	2.3	$ 3,271	3.7	$ 3,271	5.0	$ 3,271	6.4	$ 3,271	6.9	$ 3,271	6.9	$ 3,271	6.9	$ 3,271	6.9	$ 3,271	6.9
High Efficiency Toilet Rebates	$ 1,918	$ 2,500	1.3	$ 2,500	1.3	$ 2,500	1.3	$ 2,500	1.3	$ 2,500	1.3	$ 2,500	1.3	$ 2,500	1.3	$ 2,500	1.3	$ 2,500	1.3	$ 2,500	1.3
Ultra Low Flow Urinal Rebates	$ 2,311	$ 1,250	0.5	$ 1,250	0.5	$ 7,500	3.2	$ 7,500	3.2	$ 7,500	3.2	$ 7,500	3.2	$ 7,500	3.2	$ 7,500	3.2	$ 7,500	3.2	$ 7,500	3.2
Rainfall Sensor Rebates	$ 1,588	$ 1,500	0.9	$ 1,500	0.9	$ 1,500	0.9	$ 2,250	1.4	$ 4,500	2.8	$ 5,250	3.3	$ 5,250	3.3	$ 5,250	3.3	$ 5,250	3.3	$ 5,250	3.3
ET Controller Rebates	$ 893	$ 3,750	4.2	$ 3,750	4.2	$ 3,750	4.2	$ 3,750	4.2	$ 3,750	4.2	$ 6,250	7.0	$ 12,500	14.0	$ 12,500	14.0	$ 12,500	14.0	$ 12,500	14.0
Pre-Rinse Spray Valve Give Aways	$ 98	$ 1,875	19.0	$ 1,875	19.0	$ 1,875	19.0	$ 1,875	19.0	$ 1,875	19.0	$ 1,875	19.0	$ 1,875	19.0	$ 1,875	19.0	$ 1,875	19.0	$ 1,875	19.0
Outdoor Irrigation Audits	$ 4,765	$ 7,500	1.6	$ 7,500	1.6	$ 7,500	1.6	$ 5,000	1.0	$ 5,000	1.0	$ 5,000	1.0	$ 5,000	1.0	$ 5,000	1.0	$ 5,000	1.0	$ 5,000	1.0
AMR - Commercial	$ 18,399	$ 15,185	0.8	$ 22,778	1.2	$ 22,778	1.2	$ 22,778	1.2	$ 22,778	1.2	$ 22,778	1.2	$ 22,778	1.2	$ 22,778	1.2	$ 22,778	1.2	$ 22,778	1.2
AMR - Irrigation	$ 11,459	$ 7,593	0.7	$ 7,593	0.7	$ 7,593	0.7	$ 7,593	0.7	$ 7,593	0.7	$ 7,593	0.7	$ 7,593	0.7	$ 7,593	0.7	$ 7,593	0.7	$ 7,593	0.7
Monitoring and Verification Costs (includes plan update)		$ 5,000		$ 7,500		$ 7,500		$ 7,500		$ 7,500		$ 7,500		$ 7,500		$ 7,500		$ 7,500		$ 10,000	
sum		$ 60,674	37.1	$ 71,017	39.1	$ 89,767	51.0	$ 88,017	52.4	$ 90,517	55.3	$ 93,767	59.0	$ 100,017	66.0	$ 100,267	66.2	$ 100,267	66.2	$ 102,767	66.2
cummulative costs		$ 60,674		$ 131,691		$ 221,458		$ 309,475		$ 399,992		$ 493,759		$ 593,776		$ 694,043		$ 794,310		$ 897,077	
cummulative water savings			37.1		76.2		127.2		179.5		234.8		293.9		359.9		426.1		492.3		558.5
average cost per acre foot saved	$ 1,606																				

Subtotal WC Costs		$ 105,499		$ 122,092		$ 152,092		$ 154,092		$ 159,092		$ 161,592		$ 167,842		$ 168,342		$ 168,342		$ 172,167	
CWCB Grant		$ 25,000		$ 25,000		$ 25,000		$ 25,000		$ -											
total WC costs		$ 80,499		$ 97,092		$ 127,092		$ 129,092		$ 159,092		$ 161,592		$ 167,842		$ 168,342		$ 168,342		$ 172,167	

Water Conservation Budget

$		**$ 100,000**		**$ 103,500**		**$ 125,000**		**$ 129,375**		**$ 160,000**		**$ 162,400**		**$ 164,836**		**$ 167,309**		**$ 169,818**		**$ 172,365**	
FTEs		**0.2**		**0.25**		**0.35**		**0.35**		**0.35**		**0.5**		**0.5**		**0.5**		**0.6**		**0.7**	
saved water			53.50		58.71		76.80		79.49		83.97		87.63		94.62		94.94		94.94		94.87
cummulative water savings			53.50		112.20		189.00		268.49		352.46		440.09		534.71		629.65		724.59		819.46

Other Budgets

Water Waste Code (hotline until 2012, enforcement and hotline thereafter with 3% savings based on San Antonio Water Model)																					
$		$ 1,000		$ 1,000		$ 1,000		$ 1,000		$ 25,000		$ 25,000		$ 25,000		$ 25,000		$ 25,000		$ 25,000	
FTE		0.01		0.01		0.01		0.01		0.5		0.5		0.5		0.5		0.5		0.5	
saved water	$ 20,007		0.08		0.08		0.08		0.08		1.43		1.19		1.19		1.19		1.19		1.19
cummulative water savings			0.08		0.16		0.24		0.32		1.75		2.94		4.13		5.32		6.51		7.70
Meter Testing and Replacement (increasing billing accuracy and leak detection) (0.01 % per year of unaccounted for water for replaced meters)																					
$		$ 25,000		$ 25,000		$ 25,000		$ 25,000		$ 25,000		$ 25,000		$ 25,000		$ 25,000		$ 25,000		$ 25,000	
FTE		0.5		0.5		0.5		0.5		0.5		0.5		0.5		0.5		0.5		0.5	
saved water	$ 16,090		1.43		1.46		1.49		1.51		1.54		1.57		1.60		1.62		1.64		1.67
cummulative water savings			1.43		2.89		4.38		5.89		7.44		9.01		10.60		12.23		13.87		15.54
Water Rate Assessment (1.5 % rate increase every year for six years, 2% for next four)																					
$		$ 75,000		$ -		$ 75,000				$ 75,000				$ 75,000				$ 75,000			
FTE		0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05	
saved water	$ 648		48.7		49.1		49.4		50.0		50.6		51.1		68.9		69.6		70.3		71.1
cummulative water savings			48.7		97.7		147.2		197.2		247.8		298.9		367.8		437.3		507.7		578.7
Non-Potable Project (includes capital cost plus annual operation and maintenance, plus raw water audit at $30K over two years with 5% water savings over 5 years)																					
$		$ 80,000		$ 80,000		$ 75,000		$ 75,000		$ 60,000		$ 40,000		$ 40,000		$ 40,000		$ 40,000		$ 40,000	
FTE		0.5		0.5		0.5		0.5		0.5		0.5		0.5		0.5		0.5		0.5	
saved water	$ 3,864		-		-		27		15		24		15		15		15		27		12
cummulative water savings			-		-		27		42		65		80		94		109		136		148
Ordinance Enforcement (Soil amendment rebate w/ 2% irrigated water savings, water waste enforcement)																					
$		$ 35,000		$ 36,750		$ 38,588		$ 40,517		$ 42,543		$ 44,670		$ 46,903		$ 49,249		$ 51,711		$ 54,296	
FTE		0.1		0.1		0.1		0.1		0.1		0.1		0.1		0.1		0.1		0.1	
saved water	$ 10,890		3		3		4		4		4		4		4		5		5		5
cummulative water savings			3		7		10		14		18		22		26		31		35		40

Total		**2008**		**2009**		**2010**		**2011**		**2012**		**2013**		**2014**		**2015**		**2016**		**2017**	
$		$ 321,499		$ 264,842		$ 366,679		$ 295,609		$ 386,635		$ 296,262		$ 379,745		$ 307,590		$ 385,053		$ 316,463	
FTE		1.36		1.41		1.51		1.51		2.00		2.15		2.15		2.15		2.25		2.35	
saved water			106.91		112.68		158.34		149.29		164.99		160.08		185.07		186.37		199.85		185.78
cummulative water savings			106.91		219.60		377.93		527.22		692.21		852.29		1,037.36		1,223.73		1,423.58		1,609.36
State Funding Needed		$ 25,000		$ 25,000		$ 25,000		$ 25,000		$ -		$ -		$ -		$ -		$ -		$ -	
		$ 321,499		$ 586,341		$ 953,021		$ 1,248,630		$ 1,635,264		$ 1,931,526		$ 2,311,271		$ 2,618,862		$ 3,003,915		$ 3,320,378	

APPENDIX E
Summary of Public Input Comments

Longmont Water Conservation Master Plan Update

zoomerang

Cross Tab Report: user cross-tab

Date: 7/11/2008 4:20 PM PST
Responses: Completes
Filter: No filter applied

Do you agree that conserving water will help preserve the quality of life in Longmont?

	Total*	What type of water user do you represent? (Please click on all that apply below.)				
		Residential	Multifamily	Small Commercial	Industrial	Irrigation
	78	69	3	6	0	0
Yes	53 67.9%	51 73.9%	2 66.7%	0 0.0%	0 0.0%	0 0.0%
No	25 32.1%	18 26.1%	1 33.3%	6 100.0%	0 0.0%	0 0.0%

Have you participated in any water conservation rebate programs offered by the City?

	Total*	What type of water user do you represent? (Please click on all that apply below.)				
		Residential	Multifamily	Small Commercial	Industrial	Irrigation
	78	69	3	6	0	0
Yes	27 34.6%	27 39.1%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
No	51 65.4%	42 60.9%	3 100.0%	6 100.0%	0 0.0%	0 0.0%

If yes, which program(s)?

	Total*	What type of water user do you represent? (Please click on all that apply below.)				
		Residential	Multifamily	Small Commercial	Industrial	Irrigation
	29	29	0	0	0	0
Garden-in-a-Box	4 13.8%	4 13.8%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Free Irrigation Audit	10 34.5%	10 34.5%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Free Waterwise Seminars	3 10.3%	3 10.3%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Rebates for appliances/toilets	14 48.3%	14 48.3%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Other, please specify	4 13.8%	4 13.8%	0 0.0%	0 0.0%	0 0.0%	0 0.0%

Would you be interested in a free water use assessment/audit to show you how to save water at your home or business?

	Total*	What type of water user do you represent? (Please click on all that apply below.)				
		Residential	Multifamily	Small Commercial	Industrial	Irrigation
	77	68	3	6	0	0
Yes	32 41.6%	29 42.6%	1 33.3%	2 33.3%	0 0.0%	0 0.0%
Maybe	19 24.7%	15 22.1%	1 33.3%	3 50.0%	0 0.0%	0 0.0%
Not at this time	26 33.8%	24 35.3%	1 33.3%	1 16.7%	0 0.0%	0 0.0%

*Total = The number of respondents for the entire survey who answered the Row question and, if a filter is applied, meet the filter criteria.

Longmont Water Conservation Master Plan Update

Results Overview

zoomerang

Date: 7/11/2008 4:17 PM PST
Responses: Completes
Filter: No filter applied

Please provide your comments and responses below. Thank You.

1. Do you agree that conserving water will help preserve the quality of life in Longmont?

Yes		53	68%
No		25	32%
	Total	78	100%

2. Have you participated in any water conservation rebate programs offered by the City?

Yes		27	35%
No		51	65%
	Total	78	100%

3. If yes, which program(s)?

Garden-in-a-Box		4	14%
Free Irrigation Audit		10	34%
Free Waterwise Seminars		3	10%
Rebates for appliances/toilets		14	48%
Other, please specify		4	14%

4. What type of water user do you represent? (Please click on all that apply below.)

Residential		69	88%
Multifamily		3	4%
Small Commercial		6	8%
Industrial		0	0%
Irrigation		0	0%

5. Would you be interested in a free water use assessment/audit to show you how to save water at your home or business?

Yes		32	42%
Maybe		19	25%
Not at this time		26	34%
	Total	77	100%

Draft Water Conservation Master Plan

Public Comments (Web Survey July 2008)

	Comment
1	Also, I appreciate Longmont's efforts to secure a good, independent water supply. I think the quality of Longmont's water is good. Keeping Longmont's water access is part of what makes Longmont affordable."
2	We need some help to get the HOA's maintenance contractor to conserve water. (They don't pay the bills!) Sample contract? City helps with enforcement?
3	Check code on height of natural grass areas, to allow HOA's to grow wild grass areas.
4	If anyone is interested, I'd love to show off our native grass turf in the back, or at least share some misconceptions and the facts.
5	I think the idea of a central control computer would be of great help in this regard."
6	I think the sprinkler audits are great, just need to sign up for one.
7	Rebates on under-the-sink tankless water heaters would be nice. We waste a ton of water waiting for it to get hot.
8	Water conservation by decreasing lawn watering is maximized when watering a healthy lawn. I think that it would be a great service for the city to offer soil pH testing so that residential customers can determine the health of their lawn's soil before they pollute runoff with potentially unnecessary applications of fertilizer.
9	I like the concept of centrally controlled watering system. I recommend that the City craft and implement an ordinance that would prohibit residential and commercial automatic sprinkler watering during daylight hours.
10	We think the water conservation services you offer for free are wonderful and we have plans to take advantage of them in the near future especially the xeriscaping seminars, garden in a box and water audits. Keep up the great services!
11	How will you enforce watering restrictions, etc. I see a lot of abuse of watering
12	How about rebates for MP Rotator sprinkler heads? (Boulder has that.) These heads output water at the rate clay soil can absorb it (slowly!)
13	I was not aware of any water conservation rebate programs offered by the City.
14	Provide example wording for HOA's to insert into contracts with landscape contractors.
15	Suggestion for "frog eye" sprinkler into city's news letter. Also explain the ineffectivness of the other watering systems.
16	Mandatory outdoor watering restrictions should be in place every year all year, including no hosing down of hard surfaces (sidewalks, driveways)
17	water restrictions should be mandatory (e.g., watering only between 6pm and 6am., and only 2 or 3 days/week).
18	Irrigation audit was quite useful in determining how to water my lawn efficiently.
19	Eliminating automated watering during the day seems relatively easy and should save significant amounts of water.
20	There are a lot of myths about buffalo grass. Our back yard is exceptionally beautiful right now. (The front needs a bit more water.)
21	I have noticed that the sprinklers along Northshore, and in Dawson and Flanders parks are often spraying mid-morning or mid-afternoon in the heat of the day. Is this schedule necessary?
22	I think Warren Buffett is right - water is the next oil. Please try to work with the CU Extension on the Xeriscape program they had earlier in the Spring - landscape designs and plants for minimal expense. This program should be extensively promoted with the City's help! I have a Xeriscape'd yard - I would like to see how it rates for water use.
23	Could the City purchase (or grow) xeriscaping plants and sell them at no profit to residents, perhaps at Rhythm on the River? Similar to the way that bike helmets are sold at no profit to encourage people to wear helmets. I'd love to replace part of my back lawn with plants that require less water than grass does, but the cost is prohibitive.
24	I know how and what it means to conserve water. I was a military dependent - you conserve - no choice. We lived in Okinawa. They just plan on water shut off. That's how it was!
25	Typically water rebates have come after I've already purchased the item e.g. front loading washer purchased in 1997. Toilets are already low flow, etc...
26	It is important to manage trail corridors
27	I called for a free irrigation audit and was told that there is an "over 100 person" wait list and I can not get the audit until next year! That is an entire year of wasted water.
28	Please let me know how I can initiate this free water use assessment/audit and any information for installing sensors that will turn on my sprinkler systems only when necessary. Thank you
29	I've done the lawn water use assessment designed to determine if one's sprinkler system is efficient, and to set a conserving water schedule.