City of Thornton

Water Conservation Plan

JANUARY 2009

H2 WATER DRIVE THORNTON a little goes a long way

EPA WaterSense PARTNER

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Executive Summary

Introduction

The City of Thornton has historically maintained one of the lowest residential daily per capita water consumption rates among cities in the Front Range. This is a result of numerous efforts that Thornton has pursued to create and instill solid water conservation ethics throughout the community. The dominant desire of the City of Thornton is to create a legacy of strong water conservation ethics for the benefit of current and future generations. The Water Conservation Plan outlined in this document builds upon the successes of the past by aggressively pursuing strategies to help change customer belief systems and behaviors over the long-term. In addition, this Water Conservation Plan will provide assistance to customers in the form of education and incentives designed to promote increased water use efficiencies.

The dominant desire of the City of Thornton is to create a legacy of strong water conservation ethics for the benefit of current and future generations.

This Water Conservation Plan establishes long-term water conservation goals that encourage efficient use of available water resources and reduce the amount of additional water needed to serve existing and future customers, while maintaining a high-quality urban environment. The Water Conservation Plan will provide guidance in planning conservation programs consistent with the City's water resources management strategy and with community values. This plan is also intended to replace the September 2001 Water Conservation Plan that was approved by the Colorado Water Conservation Board (CWCB) and fulfill the requirements of the State of Colorado Water Conservation Act of 2004 (HB 1365) by following the guidelines provided by the CWCB. A copy of the Water Conservation Act of 2004 can be found in Appendix A.

Requirements/Participation

The Water Conservation Plan lays out a vision of how Thornton will achieve greater water use efficiency. As such, high expectations are placed on each department, division, and employee to help implement the plan and achieve greater water savings. One key to the success of this plan is cross departmental cooperation in helping to make improved water use efficiency a priority and a reality. The second key to the success of this plan is the continued support of the community to embrace the City's water use efficiency program as they have historically done.

Sustainability Connections with Water Conservation

While the focus of this plan is on water conservation, it is important to point out the larger connection that water conservation in the City of Thornton has with sustainability and climate change that will help make our planet a better place for future generations. For every gallon of water that is saved the benefits are leveraged into other areas that ultimately help reduce our community's greenhouse gas emissions and combat climate change. Examples include: **1) Saving water saves energy.** Conserving water leads to less energy being used to treat and pump water through the water treatment plant and throughout the water distribution system to the customers. On the wastewater side of the equation, reducing the amount of water that is sent down the drain and to the wastewater treatment plant has the potential to save energy by reducing the flows that has to be pumped throughout the wastewater system for treatment. **2) Saving energy saves water.** Most of the nation's electric power plants use water for cooling purposes in the power generation process. By increasing energy efficiency customers can help conserve water that would otherwise be needed for cooling purposes at power plants.[1]

> Conservation, whether it be water, energy, or re-cycling are all connected...

Other connections with water conservation include a reduction in many of the things associated with the water treatment process, including less fuel being used in the transportation process of products, and less water and energy being used to manufacture these products. Conservation, whether it be water, energy, or re-cycling are all connected and if everyone is willing to do their small part, then collectively everyone can make a difference and help make our community and world a better place for future generations.

Sustainable Development

Water efficiency measures will play an important role in sustainable development. Installation of ultra-efficient plumbing fixtures and low-water use landscapes during the construction phase is a cost-effective way to achieve water savings in commercial and residential developments. The City plans to investigate incentives to encourage sustainable development.

Foster Partnerships

Developing partnerships will be a very valuable component of the City's water conservation efforts. After all, the success of this program ultimately hinges on the partnerships the City is cultivating with

[1] Gary Klein, "Water, Energy, and Greenhouse-Gases", Water Efficiency 3, no. 3 (2008): 36-37.

the citizens of our community to help achieve the goals set out in this plan. In addition to partnering with our individual citizens, exploring partnerships with corporate, non-profit, governmental and community organizations to help leverage awareness of water use efficiency can assist with the effectiveness of the water conservation programs. The intent is to form long-term partnerships with organizations that share common or related goals. City staff will continue to seek out and develop relationships such as those in the successful examples highlighted below.

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Corporate

City staff worked closely with Home Depot to host a radio remote event. The event publicized the **2007 Water Drive** marketing campaign with radio advertising on KOOL 105 and utilized high visibility signage to draw attention to the water-saving devices on Home Depot's shelves. Home Depot donated a patio set and a water-efficient toilet for a drawing at the event. The goal is to organize a similar event with Home Depot or other corporate partner's annually.

Non-Profit

Since 2005, the City has partnered with the Center for Resource Conservation to provide the Landscape Irrigation Inspection program. The Landscape Irrigation Inspection program is so well received by Thornton residents that there have been waiting lists each irrigation season.

City staff is actively involved with the Colorado WaterWise Council, whose mission is to promote the efficient use of Colorado's water. The Colorado WaterWise Council provides important educational and networking opportunities for water conservation professionals throughout the State.

Government

The Environmental Protection Agency's (EPA) WaterSense program was created to provide consumers with a nationally recognized water efficiency brand for products and services. The City was eager to join the EPA WaterSense Program as a Promotional Partner in 2007 and staff actively participates in associated committees.

Thornton partners with the Cities of Northglenn and Westminster to coordinate and fund the Water Festival, an annual event designed to educate fourth and fifth grade students about water conservation and other water-related disciplines.

Community

The City has fostered relationships with the Girl Scouts and Cub Scouts of America. Girl Scout and Cub Scout groups have distributed City sponsored water conservation kits and Water Drive pledge cards in Thornton neighborhoods. Water Resources and Engineering staff coordinate to provide storm water and conservation related presentations and resources for these groups.

Water Efficiency Marketing Campaign

The City of Thornton believes that one of the keys to a successful water conservation plan hinges on the voluntary willingness of its customers to change water use habits and practices to enhance water use efficiency to higher levels. Since 2007 Thornton has carried out an award winning marketing campaign designed to show customers the benefits of using water in a more sustainable manner. The campaign is based in social science research that has shown people are more willing to implement behavioral change when barriers to change are identified and benefits of adopting change are demonstrated. Thornton wants to encourage and make it easier for its customers to voluntarily move towards more sustainable water use practices rather than seeking to achieve change solely through mandate and regulation. The marketing campaign sends a consistent message to the community about the importance of water use efficiency and is the centerpiece of the City's overall water conservation plan because it effectively markets the numerous programs and efforts being offered and pursued.

Since 2007 Thornton has carried out an award winning marketing campaign designed to show customers the benefits of using water in a more sustainable manner.

Existing System and Demands

The City of Thornton is located approximately 10 miles north of downtown Denver and is adjacent to Interstate 25. The service area is comprised mostly of single-family residential homes with a mix of multi-family dwelling units and commercial development. At the beginning of 2008 the City provided water and sewer service to an estimated 134,700 residents and also provided bulk treated water deliveries to the City of Westminster. The City's service area for the beginning of 2008 was comprised of 117,870 people residing inside the City's corporate boundaries and 16,830 people residing within the City's extended service area.

Thornton's raw water supply originates primarily from mountain snowpack in the South Platte River and Clear Creek basins. City-owned reservoirs have a combined capacity of 32,064 acre-feet. Raw water is treated at two drinking water treatment plants, the Wes Brown Water Treatment Plant (WBTP) and the Thornton Water Treatment Plant (TWTP). The newly renovated WBTP uses advanced water treatment processes including state-of-the-art ultra filtration membranes to remove suspended solids in the source water and ultraviolet (UV) disinfection technologies to provide high-quality drinking water. In addition, the City also operates the TWTP which is a conventional plant utilizing UV disinfection.

The single-family residential customer class is the largest customer class followed by multi-family residential, commercial, and irrigation accounts. Additionally, the City of Thornton also provides treated water to the City of Westminster per contract through one connection point. Residential customers are by far the largest consumer of the City's total annual treated water demand. The remaining treated water demand, in descending order by volume used, is irrigation customers, commercial customers, treated water deliveries to the City of Westminster, and non-account water. Approximately one-half of Thornton's treated water is used for landscape irrigation purposes.

Conservation Goals

The City possesses adequate water supplies to meet demand over the 20-year planning horizon used in this plan. The planning horizon identified with this plan is 2008 through 2027, although the plan will not be adopted until 2009. Notwithstanding, the City recognizes that water conservation is an essential component of the City's long-term water supply planning strategy. Through water conservation, Thornton can reduce the amount of water that the City must ultimately acquire or develop in order to meet its build-out demand. The water conservation goals were established with this in mind and are intended to benefit both the City and its customers.

New programs will be brought on-line at an aggressive pace with one new program being implemented each year through 2015. These initiatives will ultimately target all customer classes to achieve savings from all water customers. Thornton's goals look forward at 5-year, 10-year, and 20-year periods with this Water Conservation Plan to set specific acre-foot goals that the City can attain. This plan will achieve up to 900 AF of savings annually by 2012, up to 1,500 AF annually by 2017, and up to 2,800 AF annually by 2027. To put these water savings in perspective, the City can supply 2,150, 3,590 and 6,700 typical single-family residences, respectively, with these water savings.

The City possesses adequate water supplies to meet demand over the 20-year planning horizon used in this plan.

Due to the residential class being the single largest customer class within the City's water service area, the City of Thornton has set a goal of establishing its residential water use at 85 gallons per capita day (gpcd) or less, based upon a five-year rolling average, by 2016. Achieving 85 gpcd represents a 20% decrease when compared to 106.2 gpcd usage during the pre-drought year of 2001 and prior to the enactment of water use restrictions. The 2003-2007 average, which includes periods when mandatory and voluntary water restrictions were in effect, is 88.7 gpcd. The residential water use goal has been demonstrated to be achievable in Thornton during periods of water use restrictions when customers were allowed to water their landscaping no more than three times per week. During these periods water restrictions were not extreme and most customers realized their landscaping could be maintained adequately on a three-day watering schedule. The City recognizes that a simple comparison of per-capita water use from year to year will be difficult due to climate conditions and changes in the service area and population profiles. The use of a five-year rolling average to track gpcd recognizes this inherent annual volatility in water use and will help the City track its on-going water conservation progress in the residential customer class.

Other customer classes are addressed with this conservation plan; however, it will be necessary to develop additional data associated with the other customer classes to set and monitor meaningful and quantifiable goals. Examples of data that will be developed include: irrigated areas for the irrigation customer class; types of businesses, square footage of commercial space, and number of employees for the commercial customer class; and the number of multi-family units and population estimates for the multi-family customer class. Goals will be set for other customer classes as the City develops additional data to allow the establishment of quantitative water conservation goals.

Current Water Conservation Activities

The City of Thornton has had conservation measures and programs in place for many years. The following list includes Thornton's current water conservation activities.

Currently Implemented:

- Thornton Water Efficiency Marketing Campaign
- Residential Washing Machine Rebates
- Water Conservation Plan
- Public Outreach, Festivals, Presentations, etc.
- Residential Toilet Rebates
- Water Restrictions (as needed)
- City Code, includes Conservation of Water Resources (Water waste is always prohibited)
- Tiered Rate Billing Structure
- Residential Showerhead Exchanges
- Landscape Codes Incorporating Water Wise Principles
- Annual 4th & 5th Grade Water Festival
- Automatic Irrigation System Inspections
- Industrial, Commercial, & Institutional Benchmarking Workgroup
- Colorado Water Wise Council Participation
- Leak Repair on Distribution System
- Reusable Water Rights Operations
- Water Line Replacement Program

The City of Thornton estimates the City's current conservation efforts result in approximately 41 acre-feet in demand reduction each year. The demand reduction is attributed to the pipeline replacement program, toilet and clothes washer rebates, showerhead exchanges, and irrigation system inspections. The water saved by these efforts is equivalent to the annual amount of water that the City uses to supply 98 single-family residences.

Evaluation and Selection of Conservation Measures and Programs

Eighteen measures and programs were initially screened based on three criteria, and were selected for evaluation to estimate the cost and benefit of each program. The screening criteria are listed below.

1) **Authority of the City of Thornton to implement measure/program.**
2) **Ability to sustain the water savings over the long-term.**
3) **Ability to defer or avoid costs by implementing the measure or program.**

The measures and programs that met the initial screening criteria were then compared based on cost, water savings and net benefit. The net benefit was calculated in terms of cost of water saved over the life of the estimated water savings compared to the cost of developing future water supplies. The evaluation process showed a high net benefit of continuation of current programs. Some of the new measures and programs that were identified in the evaluation and selection process include:

- Implementation of a campaign encouraging all customers to irrigate their landscaping during the cooler times of the day. Convincing customers to avoid irrigating their landscaping during the daytime hours of 10:00 AM and 6:00 PM when higher temperatures increase evaporation rates can save significant amounts of water.
- Rebates for multi-family toilet replacements;
- Rebates for commercial urinal and toilet replacements;
- Increased rebate amounts for toilets meeting EPA WaterSense program standards;
- Rebates for weather-based evapotranspiration controllers that automatically adjust the amount of water applied to a landscape based on weather conditions;
- Free residential indoor audits.

Implementation Plan, Monitoring, Evaluation, and Revision

The new measures and programs discussed in this plan will be implemented over the next seven years. The measures and programs will be monitored and evaluated to determine water savings and costs. Implementation of the Water Conservation Plan is a long-term endeavor that will require continuous monitoring and evaluation. The City of Thornton intends to update the plan, at a minimum, every seven years as required by the Water Conservation Act of 2004.

While this plan is intended to layout the strategies that the City will pursue over the next several years to enhance water use efficiency, in order for water conservation planning to be successful the plan needs to be flexible enough to allow for modifications in strategies. As technological advancements are made and brought onto the market and as further research indicates greater promise with other focuses, this plan needs to have the ability to alter course when appropriate. As the measures and programs set out in this plan are monitored for progress it might be necessary to amend certain aspects of the plan to more effectively accomplish the City's overall goal.

Section 1: Profile of Existing Water System

This section summarizes the key characteristics of the City of Thornton's water system as it exists in 2008. Included are descriptions of the geographic area served, population, connections served, key facilities, customer water demand, water costs and pricing, a review of current policies and planning initiatives, and current water conservation activities.

1.1: Characteristics of the Existing Water Supply System

Service Area and Population

The City of Thornton water service area is approximately 35 square miles, within which the City provides water and wastewater services. The City serves an estimated population of 134,700 as of the beginning of 2008. This includes an estimated population of 117,870 with the City's corporate boundaries and 16,830 in the extended service area. In addition, the City provides 2.0 mgd of treated water to the City of Westminster. The City also provides water service to commercial, industrial, and institutional customers. The service area includes portions of unincorporated Adams County consisting of the Western Hills, Sherrelwood, Welby, Holly Crossing, and Wright Farms neighborhoods. The service area extends roughly from the Boulder Turnpike on the south to 168th Avenue on the north, from roughly Zuni Street on the west to Yosemite Street on the east. A map of the 2008 water service area is provided in Figure 1 and a map of the 2008 sanitary sewer system is provided in Figure 2.

The City serves an estimated population of 134,700 as of the beginning of 2008.

The service area includes residences, businesses, schools, parks and open space. The majority of the existing service area consists of residential development; however, commercial development has begun to increase in the area of I-25 and E-470 in the northwest portion of the service area. There are significant areas within the service area that remain undeveloped. It is estimated that the Thornton business sector provided jobs to approximately 18,856 people as of the end of 2005.

Treated Water Customers

There are 34,537 metered connections to Thornton's treated water system. All connections to the treated water system are metered. Residential customers are the single largest customer class connected to the City's treated water system. Residential customers make up 96.4% of the water connections and account for 62.7% of the City's treated water use. The second largest customer class connected to the system is irrigation customers making up 1.9% of the connections and accounts for 12.3% of the City's water use. The third largest customer is the City of Westminster which has a single connection point to Thornton's system which accounts for 9.6% of the City's water use. The fourth largest customer class is commercial making up 1.7% of the connections and 8.5% of the water use.

Treated Water Facilities

Thornton operates two water treatment plants that have a combined capacity of 70 million gallons per day (mgd). The Wes Brown Water Treatment Plant located at 3651 East 86th Avenue has a capacity of 50 mgd. The Thornton Water Treatment Plant located at 9420 Ellen Court has a capacity of 20 mgd. The service area contains approximately 521 miles of water lines that distribute treated water to customers. Thornton shares interconnections with the treated water systems of Denver Water, City of Northglenn, and the City of Westminster. The interconnections with Denver Water and the City of Northglenn are for emergency situations. The City of Westminster is a Thornton treated water customer and the interconnection serves as the single delivery point to Westminster.

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1.2: Sources of Water

Surface Water Supplies

The City maintains a significant portfolio of water rights associated with its ownership of stock in several ditch and reservoir companies. The City also owns several water rights it has developed since the 1970's. The priorities of the water rights that Thornton relies upon for its water supplies range from the early 1860's to 2006. The water associated with these water rights is delivered into storage at several reservoirs owned by the City and into reservoirs where the City shares ownership with other entities. Thornton's raw water supply originates primarily in the form of melting snow high in the mountains of the South Platte River and Clear Creek basins.

Thornton has acquired and developed substantial reservoir storage capacity to store water diverted from its water rights. As of October 2008 Thornton has 36,346 acre-feet of storage capacity that is on-line within its system. A summary of Thornton reservoir storage capacity can be found in Table 1.

Table 1: Thornton Reservoir Storage Capacity (As of October 2008)

Reservoir	Storage Capacity (acre-feet)
Standley Lake	11,550
West Gravel Lake No. 1	503
West Gravel Lake No. 2	1,723
West Gravel Lake No. 3	614
Brannan West	360
Brannan East	528
South Tani	7,241
East Gravel Lake No. 4	2,807
South Dahlia	1,777
North Dahlia	2,568
Cooley West	4,282
Duck Lake	412
Wellington	1,981
TOTAL	**36,346**

East Sprat Platte Reservoir is an additional reservoir that is near completion and it will ultimately be connected to the system of reservoirs that feed the Wes Brown Water Treatment Plant. The storage capacity of East Sprat Platte Reservoir is estimated to total 1,500 acre-feet.

For Thornton's operational purposes, the Clear Creek basin is divided into upper and lower systems. Water from the upper system is delivered into storage at Standley Lake from the Church Ditch, the Farmers' High Line Canal, the Croke Canal, and the Kinnear Ditch. The water stored in Standley Lake is conveyed to the Thornton Water Treatment Plant through an eleven-mile pipeline.

Water from the lower system is delivered into storage at Brannan Lakes and at the West Gravel Lakes from the Lower Clear Creek Canal and the Colorado Agricultural Canal. The water stored in Brannan Lakes can be pumped back to the Lower Clear Creek Canal and conveyed to the West Gravel Lakes for storage. The water stored in the West Gravel Lakes is pumped to the Wes Brown Water Treatment Plant. Cooley West Reservoir is filled from tributary groundwater wells and can return water to the South Platte River to operate exchanges.

Thornton's South Platte River basin system consists of a series of reservoirs located along the Burlington Canal which store water delivered from the canal. Thornton's reservoirs that take delivery of water conveyed through the Burlington Canal are South Tani Reservoir, East Gravel Lake No. 4, South Dahlia Reservoir and North Dahlia Reservoir. These reservoirs are all connected through a series of pipes. The water stored in these reservoirs is pumped to the Wes Brown Water Treatment Plant from East Gravel Lake No. 4.

Additional components of the South Platte River basin system are Duck Lake and Wellington Reservoir, both of which are located high in the mountains. Duck Lake is on Geneva Creek and Wellington Reservoir is on Buffalo Creek. Water stored in these reservoirs is then released and conveyed down the South Platte River where Thornton recaptures it at the Burlington Canal. A map of Thornton's raw water system can be found in Figure 3.

Water stored in Standley Lake can be delivered to the West Gravel Lakes through a pipeline from the Thornton Water Treatment Plant. Water stored in East Gravel Lake No. 4 can be pumped through a pipeline to the Thornton Water Treatment Plant.

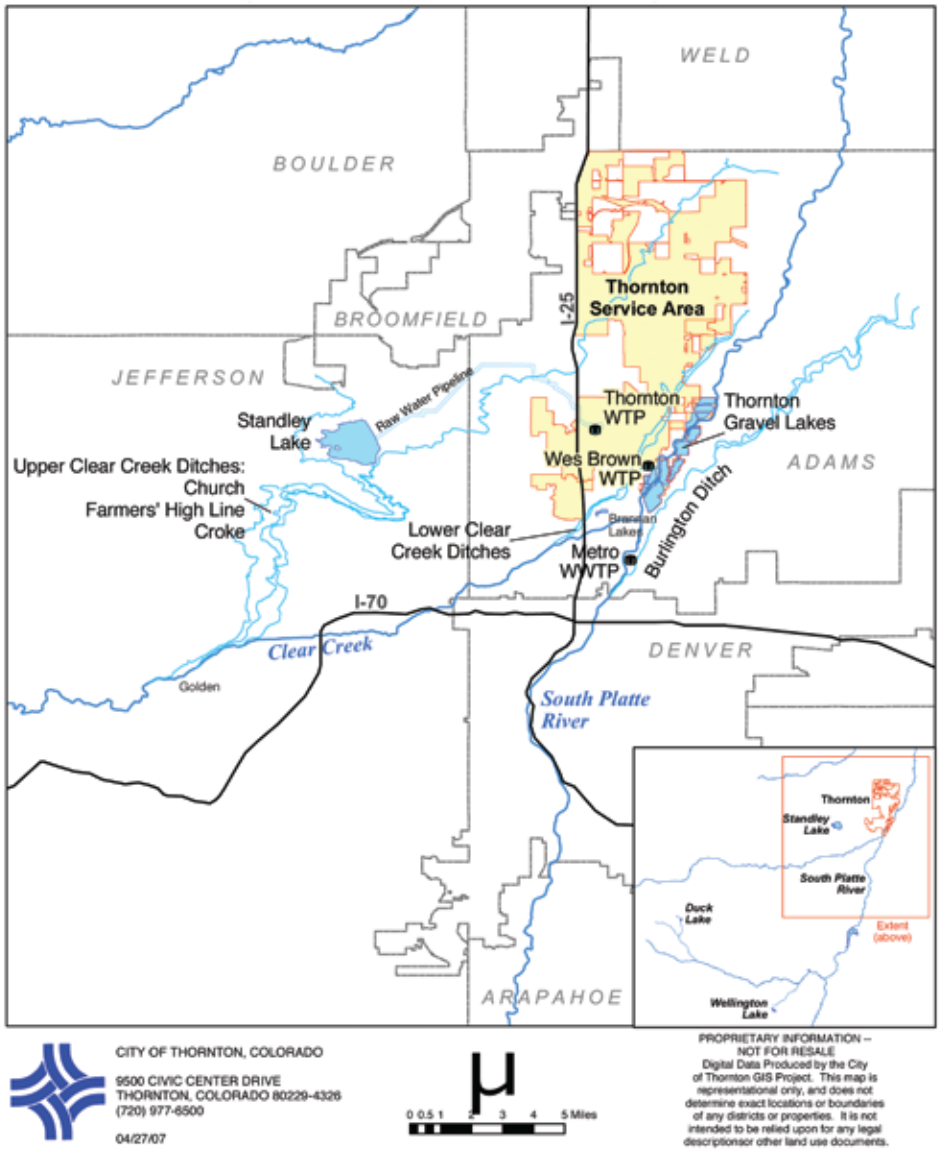
Thornton also provides the City-owned Thorncreek Golf Course with raw water delivered from Big Dry Creek.

Groundwater Supplies

Thornton has developed a series of alluvial wells adjacent to the South Platte River. There are 11 wells that pump groundwater into South Dahlia Reservoir, and one well that pumps groundwater into East Gravel Lake No. 4. There is also one horizontal well that captures high groundwater levels and conveys the water by gravity into East Gravel Lake No. 4.

Thornton has constructed six nontributary groundwater wells that supply water for park irrigation at Community Park, Grange Creek Park, and the City's sports fields at the Margaret W. Carpenter Recreation Center.

Figure 3: City of Thornton – Raw Water System



1.3: System Limitations

Designated Critical Water Supply Areas

The entire South Platte basin where Thornton's water supplies originate has been identified as a "gap" area by the Statewide Water Supply Initiative, meaning that even with all the water supply projects identified there will still be a significant shortage of regional water supplies by the year 2030. Thornton has acquired sufficient water supplies to meet anticipated demands beyond the year 2030; however, the City still needs to construct the infrastructure to deliver the water to Thornton. The City will continue its water supply development efforts in order to meet future demands beyond 2030.

Shortages and Supply Emergencies

At the onset of the severe drought experienced throughout the State in 2002, Thornton followed the steps and options outlined in its Drought Management Plan to efficiently and wisely manage its water supplies. A mix of voluntary and mandatory water restrictions were enacted between 2003 and 2006 to ensure an adequate amount of water remains in storage to meet the critical needs of the City in subsequent years. During the period when water restrictions were in effect Thornton water customers responded well and reduced their water usage thereby avoiding the need to enact a stricter program. Thornton also implemented a new landscape code that emphasized water wise landscaping principles. The City also successfully secured the use of additional short-term water supplies through various cooperative arrangements.

Unaccounted For and Lost Water

The City follows procedures outlined by the American Water Works Association to monitor distribution system water loss. Distribution system loss is a measure of the percentage of produced water that fails to reach customers and cannot otherwise be accounted for though authorized usage. System loss under 10% is generally considered acceptable. Thornton's system loss has historically averaged approximately 5%. The system loss in 2007 was approximately 9.5%. Due to an increasing trend in water line breaks being experienced primarily in the older sections of Thornton distribution system, the City has developed a Maintenance Improvement Program (MIP) that will be implemented on an annual basis to replace pipelines. Under the MIP the City expects to replace approximately 2,400 linear feet of old pipe each year.

Population Growth

The 2000 United States Census estimated Thornton's population to be 82,384 and as of the beginning of 2008 Thornton estimates the City's population to be 117,870. The City estimates that its extended service area population is 16,830. The rate of growth in Thornton, as shown in Table 2, has slowed during the period 2002 through 2007.

Table 2: Yearly Rate of Growth 2002 through 2007

Year	Growth Rate
2002	5.00%
2003	4.30%
2004	3.80%
2005	3.50%
2006	2.60%
2007	0.60%

Source: City of Thornton, Commmunity Development Department

The population projections used in this plan are based on the projections used in the City's Long Range Water Plan. The current extended service area is essentially fully developed and the City expects the population in these areas to remain relatively constant through 2027. The City's anticipated water service area population, including areas outside the City's corporate boundaries, is projected be 167,354 in 2027.

1.4: Water Costs and Pricing

Thornton utilizes an increasing tiered rate structure (a.k.a. increasing block rate structure) that was implemented in May 2003 to help promote efficient water use. The tiered rate structure is designed to encourage and reward water conservation efforts, particularly regarding outdoor irrigation, while discouraging misuse of the City's water supply. The tiered rate structure recognizes that customers come in different sizes and that indoor water usage varies from home to home and business to business.

The tiered rate structure is designed to encourage and reward water conservation efforts, particularly regarding outdoor irrigation, while discouraging misuse of the City's water supply.

Thornton's increasing tiered rate structure charges an increased unit price for water as the volume of water consumed increases. Customers who use low or average volumes of water are charged a more modest unit price and rewarded for conservation; those using significantly higher volumes of water pay higher unit prices. There is also a standard customer monthly service charge applied to all customer classes, regardless of the amount of water consumed. This tiered rate structure sets an indoor monthly allocation called the Average Winter Consumption (AWC) and it is based on the customer's average monthly usage for the previous November through February. All water usage above the indoor allocation is attributed to outdoor use. Irrigation customers are charged based on this tiered rate structure; however, the AWC is not applicable to irrigation customers, their outdoor watering allocation is based on customer classification and meter size. A complete listing for 2008 Thornton water rates and charges can be found in Appendix C, Ordinance 3084. Table 3 provides a summary of Thornton's current rate structure for domestic customers residing inside the City's corporate boundaries.

Table 3: 2008 Tiered Rate Structure Summary for Domestic Inside the City Quantity Charges		
Tier	**Charge**	**Explanation**
N/A	$2.61	Cost of monthly service charge, regardless of the amount of water consumed by the customer.
1	$3.28	Cost per 1,000 gallons for customer's AWC = average monthly usage for the previous November through February.
2	$3.28	Cost per 1,000 gallons for customer's Outdoor Allocation: up to 21,000 gallons per month over AWC.
3	$4.92	Cost per 1,000 gallons over the combined total of customer's AWC + the outdoor allocation of 21,000 gallons per month.
4	$9.84	Cost per 1,000 gallons when usage goes over the AWC + 42,000 gallons per month (double the outdoor allocation of 21,000 gallons).

1.5: Review of Current Planning Initiatives

In 2006 the City of Thornton initiated the process of updating the Comprehensive Plan and it was adopted by City Council on September 11, 2007. Thornton's Comprehensive Plan provides a broad overview of how the City will grow and where future development and redevelopment will occur. The updated Comprehensive Plan examined a wide range of issues related to future land uses, character of development, transportation systems, utility systems, and social and economic dynamics. The Comprehensive Plan provides strategic direction for the future of the City and projections to the year 2030.

A major planning effort recently completed by the City of Thornton is the development of the Long Range Water Plan. This study was performed to determine the City's water and wastewater utility needs through build-out, currently anticipated to be in approximately 2065. The study identified annual treated and raw water demands through build-out. In order to plan for the future costs associated with developing the City's raw water, treated water, and wastewater systems, City staff developed an itemized list of capital projects and operations and maintenance items necessary to accommodate Thornton's anticipated growth over the next sixty years. These projects include new raw water storage facilities, upgrades to existing water treatment plants, installation of new pipelines, replacement of existing pipelines, and non-potable irrigation projects, as well as new facilities, staffing requirements, fuel costs, and vehicle needs. The information developed in this study was utilized in the development of this updated Water Conservation Plan.

Thornton is actively pursuing development of additional raw water storage reservoirs. A large component of the development of additional raw water storage reservoirs involves the recapture of Thornton's reusable water supplies that will be used to effectuate water rights exchanges that will provide additional yield to the City's raw water system. These efforts will reduce the amount of water that the City would ultimately need to acquire or develop in order to meet demand at build-out.

The City owns a significant block of water that was purchased in the 1980's in Larimer and Weld counties. This water is a portion of the City's future water supply. Thornton is actively pursuing the most economical means available to transport and deliver this existing water supply to the City.

1.6: Summary of Current Water Conservation Activities

City Code

Major policies that are designed to affect water use under normal conditions include provisions of the City Code. The landscape code was revised in 2003 to incorporate additional water-wise landscaping principals associated with new development. The Conservation of Water Resources section of the City Code prohibits water waste. Additionally, the City's tiered water rate structure is designed to encourage wise water use.

Water Efficiency Marketing Campaign/Public Outreach

Current public outreach efforts also involve a Water Efficiency Marketing Campaign. The campaign debuted the spring of 2007 and focused on encouraging the enhancement of voluntary wise water use practices throughout the community. It is the City's desire to display to the community that the City is an advocate of wise water use because it is the right thing do for our community and environment. The City wishes to become less of a regulator on this issue by encouraging voluntary change for the benefit of the entire community. The City is also involved with efforts to implement a similar campaign on a statewide basis through the cooperation of other similarly focused entities.

In support of the City's goal of instilling a water conservation ethic throughout the community, public outreach efforts are pursued as a component of the overall water conservation strategy. The City regularly provides information to the public to increase community support for wise water use practices and programs. Thornton undertakes these efforts to help create an increased recognition throughout the community of the value of water and its role in our community and society. Information about water saving practices and programs are disseminated to the community through a wide host of avenues including: use of the City's "Inside Thornton" magazine; the City's government access KTTV Cable Channel 8; the City's internet web page; press releases; bus shelter advertisements; mass mailings to customers; mailings to specifically targeted customers; placement of flyers and brochures in public areas of City buildings; and purchasing advertising space in the local "Sentinel" and "Thornton Frontier" newspapers.

The City also takes advantage of opportunities to reach out to the public by maintaining a presence at City sponsored festivals that large numbers of citizens attend each year. The City's annual Thorntonfest and Harvest Fest events are opportunities to promote the City's water conservation programs and educate citizens. At each festival the City provides water conservation related information and items such as water efficient fixtures, low-flow faucet aerators, long lasting toilet flappers, rain gauges, Xeriscape booklets, etc. Water conservation program information is also distributed at these events. Staff is available at these events to answer questions.

Irrigation System Inspections

The City has offered free irrigation system inspections to customers with automatic sprinkler systems each summer since 2005. Significant quantities of water savings can be achieved with the efficient operation of automatic sprinkler systems. Customers utilizing automatic sprinkler systems can tend to have a "set it and forget it" mode of operation. Irrigation controllers get set permanently for the amount of water a landscape requires during the hottest part of the summer and end up using more water than necessary during months when the weather isn't as hot and dry. Thornton's free irrigation system inspection program provides customers with information about the uniformity of water distributed by their automatic sprinkler system and the water pressure of their system. Customers also receive information about their soil type, root depth of their lawn, improvements that can be made to their system, and a customized watering scheduled developed for their landscape.

Clothes Washing Machine Rebates

Thornton has offered a high efficiency clothes washing machine rebate program since 2003. The City provides a $125 rebate in the form of a credit on the customer's water bill for purchasing a new qualifying front load water-efficient washing machine. Through this popular program Thornton customers have purchased 2,740 front load clothes washing machines during the period May 2003 through December 2008.

Toilet Rebates

Since 2003 the City has also offered water customers the opportunity to receive a $100 rebate for replacing water-wasting toilets with a 3.5 gallon per flush (gpf) or greater with a new water conserving 1.6 gpf toilet. Thornton customers have installed 1,374 water efficient toilets during the period May 2003 through December 2008.

Showerhead Exchanges

Thornton has offered water customers an opportunity to exchange old water-wasting showerheads for new water conserving showerheads since May 2003. Customers are required to remove their old water-wasting showerheads and exchange them for new water efficient showerheads (2.0 gallons per minute). There is no cost to the customer. By requiring customers to bring in their old showerheads the City can be confident that nearly all the new showerheads distributed will be installed.

A maximum of two showerheads per household may be exchanged. During the period May 2003 through December 2008 Thornton water customers have exchanged 1,121 showerheads.

WaterSense

In 2007, the City partnered with the EPA on their WaterSense program. The mission of the program is to protect the future of our nation's water supply by promoting and enhancing the market for water-efficient products and services. Through this program products will be labeled with a WaterSense logo to enable consumers to identify water efficient fixtures and services. In order for products and services to qualify for a WaterSense label they must be independently certified by a licensed certification body to confirm that the products and services meet EPA criteria for efficiency and performance. By choosing products and services labeled through the WaterSense program, consumers will know that they will be saving water for future generations.

Through WaterSense, EPA is creating a nationwide ethic of water efficiency—a symbol that represents the importance of protecting water resources in the United States. WaterSense is partnering with manufacturers, retailers and distributors, promotional partners, and other organizations to help make water-efficient products and practices commonplace. Participation in this program will strengthen the City's water efficiency outreach efforts with a credible, national brand and a strong, consistent message. This program will also reduce staff time spent on product research and increase confidence in promoting water-efficient products that meet or exceed WaterSense specifications.

School Education

The City of Thornton has partnered with the cities of Northglenn and Westminster each year since 2004 to conduct an annual Water Festival for local 4th and 5th grade students in each of the cities. The Water Festival offers local students a day of fun educational workshops. This event is attended by approximately 1,000 students each year and provides active learning and hands-on applications, teaching students about water conservation, water chemistry, the water cycle, local watersheds, water treatment, Colorado water law, aquatic wildlife, and ecology. Over 40 professional volunteers from local, state, federal, non-profit, and private organizations donate their time and expertise to present water related topics to students.

Presenters from well known organizations, such as WB2 News, Ocean Journey, Denver Zoo, Butterfly Pavilion, Colorado Division of Wildlife, Colorado Foundation for Agriculture, and Metro Wastewater Reclamation District have volunteered for previous Water Festivals. Some presenters, such as The National Theatre for Children and the University of Colorado Science Discovery Program are hired to entertain and educate students.

The City of Thornton understands the need to provide water resource education to youth and take advantage of the opportunity to instill a wise water-use ethic which will benefit the community over the long-term. Because the three cities share Standley Lake as a water supply it makes sense to combine resources on this large educational effort. The goal is to convey an ongoing message of the value of water in nature and society in order to preserve water resources for future generations. The Water Festival immerses a large number of youth with this message each year. This helps students learn about the importance of water in their lives and become empowered with ideas on how to use water responsibly. The Water Festival supports this mission by bringing real-world science to area students in a memorable event.

The City provides staff for presentations on water conservation and other water related topics if requested by local teachers. Education Brochures that list City resources are mailed to Thornton schools each year. The availability of these resources is posted on the City's web site to inform the public.

Annual Water Line Replacement Program

The City has analyzed water line breaks and repairs within the distribution system. This analysis identified areas, primarily in the oldest part of the system that showed an increasing trend in the number of breaks. As a result of the analysis the City developed a strategy for replacing approximately 2,400 linear feet of pipe each year to reduce the number of breaks and leaks in the distribution system.

Participation in Professional Organizations

Participation in water conservation and educational organizations offer the City opportunities to become involved with local, regional, and statewide water conservation efforts that benefit the City and community.

Colorado Water Wise Council (CWWC)

Staff participates on the CWWC which is a non-profit organization of water conservation professionals representing water utilities, business interests, and water conservation advocates. The goal of the CWWC is to promote the efficient use of Colorado's water. CWWC provides a forum for water conservation program

development, information exchange and training. CWWC partnered with the Metro Mayors Caucus to draft Water Conservation Best Management Practices in which Thornton was actively involved. The City of Thornton has one staff member on the CWWC Board who also participates with CWWC committees. Additionally, two of Thornton's staff attended and completed "Conservation Training for Water Professionals" provided by CWWC.

Industrial, Commercial and Institutional (ICI) Water Conservation Workgroup

Since 2005 Thornton has participated with several Front Range water providers focused on water conservation in the ICI sector. The efforts of this workgroup involve development of benchmark studies of the ICI sector in order to assist with development of effective water conservation strategies that can be focused on this sector. This work has been performed with the support of two Pollution Prevention Advisory Board grants. This is a collaborative effort amongst Thornton, Aurora, Boulder, Denver Water, Fort Collins, Greeley, Longmont, Loveland, Westminster, Northern Colorado Water Conservancy District, South Adams County Water and Sanitation District, and the Town of Superior.

Colorado Foundation for Water Education (CFWE)

The City of Thornton is a member of the CFWE that was created in 2002. Participation and membership in this organization allows the City to increase its level of knowledge about water education activities and strategies throughout the State. CFWE is a statewide non-profit, non-advocacy organization providing water resource information and education. Membership includes a subscription to Headwaters quarterly magazine, which features interviews, legal updates, and in-depth articles on fundamental water resource topics.

Section 2: Water Use & Forecast Demand

This section describes current water use and estimated future water demands. The information in this section relied largely on the Long Range Water Plan study conducted by City of Thornton staff.

2.1: Current Water Use

Current water use in Thornton is based on different factors including population and customer class. Customer demand can be influenced significantly by climate conditions and rate charges. Depending on whether irrigation season temperatures and precipitation are hotter and dryer or cooler and wetter has a significant influence on customer water demands. This section discusses Thornton water use by customer class.

Thornton provides potable and nonpotable water. Potable water is water that has been treated, to meet or exceed Safe Drinking Water Act standards, by the City's water treatment plants before being sent out to homes and businesses. In Thornton's system, nonpotable water is raw water that has not been treated and this water is used only for irrigation purposes.

Customer Class

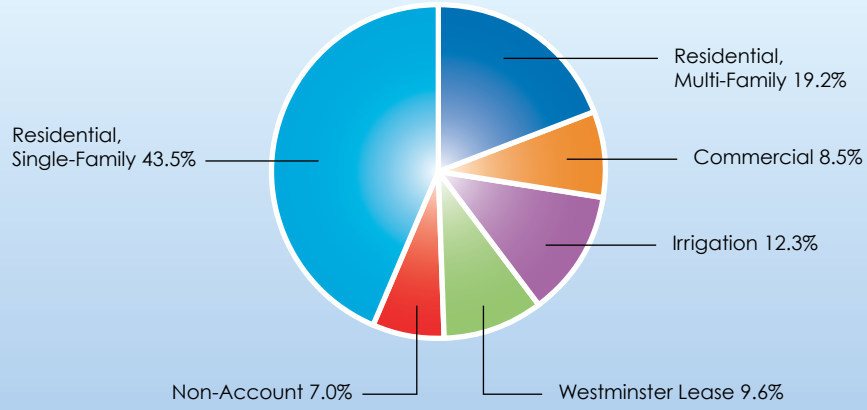
Water requirements for Thornton's service area depend upon both the size of the area served as well as how the land is used. Customer classes have been grouped to correspond with the water requirements of the land uses served. Customer classes include:

- **Single-Family Residential.** Low-, medium-, and high-density residential, residential estates, and rural areas.
- **Multi-Family and Mobile Home.** High-density residential development and a portion of mixed-use categories.
- **Irrigation.** Parks, Home Owner Association common areas, medians, and other landscaped areas in large commercial developments.
- **City of Westminster.** Treated water delivered to the City of Westminster.
- **Industrial/Commercial/Institutional.** All other uses.

Treated Water Demands by Customer Class

Figure 4 below shows the amount of water delivered to each customer class in 2005. This particular year was chosen for analysis since it was considered a relatively average year in precipitation and water use. Thornton was not under mandatory water restrictions in 2005, although voluntary water restrictions were in effect. The year 2005 percent of water deliveries by customer class were not significantly different from those shown in the City's 2001 Water Conservation Plan approved by the Colorado Water Conservation Board.

Figure 4: Summary of 2005 – Percent of Water Deliveries by Customer Class



Single-Family Demands

Single-family residences use more water than any other customer class in Thornton's service area. In 2005, single-family accounts received 43.5% of the total metered deliveries by Thornton. The annual water consumption for the single-family class in 2005 was 9,086 acre-feet.

Multi-Family and Mobile Home Demands

The City's water billing database combines water deliveries to multi-family residences and mobile homes. Water use patterns for these two types of water customers appear to be similar. This group of customers is second to single-family residences in terms of overall annual water use. In 2005, multi-family and mobile homes received 19.2% of the total metered deliveries by Thornton. The annual water consumption for the multi-family and mobile home class in 2005 was 4,006 acre-feet.

Irrigation Account Demands

Irrigation accounts deliver water only to large irrigation systems for multi-family common spaces, city parks, medians, and commercial irrigated areas. In 2005, irrigation accounts received 12.3% of the total metered water deliveries by Thornton. The annual water

consumption for the irrigation class in 2005 was 2,575 acre-feet. All irrigation water is delivered seasonally, from April to October.

City of Westminster Demand

Water is delivered to the City of Westminster under the terms of a supply contract. Thornton typically supplies Westminster with approximately 1.8 million gallons of water per day. Westminster used 1,997 acre-feet of treated water in 2005 totaling 9.6% of Thornton's total metered deliveries. A provision in the lease allows for restricted deliveries to Westminster if rationing is imposed on Thornton's customers. Restricted deliveries are required to be in the same proportion as restrictions imposed within Thornton.

Industrial, Commercial & Institutional Demands

The ICI category comprises a diverse group of customers. Office buildings, hotels, schools, retail stores, restaurants, car washes and manufacturing facilities all fall within its limits. ICI accounts received 8.5% of the total metered deliveries by Thornton in 2005. The annual water consumption for the ICI class in 2005 was 1,779 acre-feet.

Non-Account Water

Thornton's non-account water totaled 7.0% in 2005. The annual non-account water for 2005 totaled 1,458 acre-feet. Non-account water includes system losses due to leaks, fire hydrant flushing, and disinfection of new water lines. This is a measure of the percentage of produced water that fails to reach customers and cannot otherwise be accounted for through authorized usage. System loss under 10% is generally considered acceptable by the American Water Works Association.

Nonpotable Demands

Thornton provides nonpotable water to the City's Thorncreek Golf Course and select parks. Thorncreek Golf Course is provided with nonpotable water diverted from Big Dry Creek. In 2006 the irrigation system at Civic Center Park was taken off the potable water system to allow the park to be irrigated with water stored in Croke Lake. This lake is filled with water diverted from Clear Creek. The nonpotable water demand totaled 250 acre-feet in 2005.

The City provides nonpotable water delivered from the Lower Clear Creek Ditch to a nursery and landscape business owned by Urban Farmer. The water is used to irrigate the company's nursery stock. The nonpotable water demand by Urban Farmer totaled 11.4 acre-feet in 2005.

As of 2006 the City started using nontributary groundwater to irrigate Community Park and Grange Creek Park. There are two wells at Community Park and one well at Grange Creek Park. In 2007 the City began irrigating Cherry Park with nonpotable surface water. In 2008 the City began irrigating Woodglenn/Brookshire Park and the Multi-Purpose Fields at the Margaret W. Carpenter Recreation Center.

Seasonality of Water Use

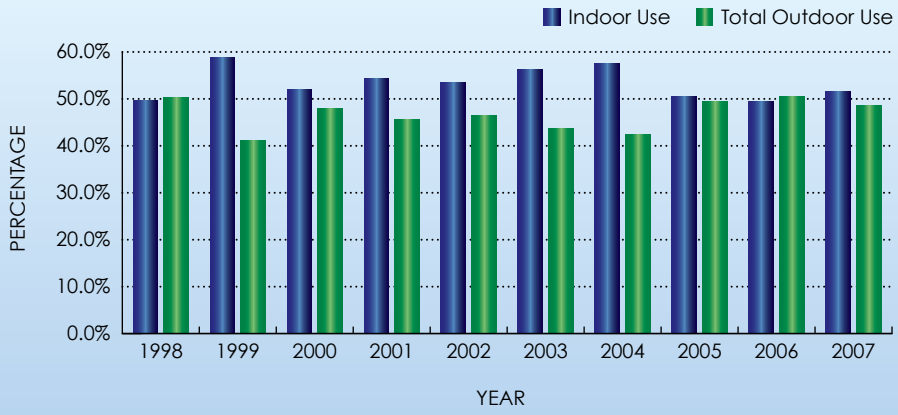
Water demand varies with the seasons and is influenced by climate conditions. The landscape irrigation season is generally May through October; however, during the recent drought years Thornton experienced significant increases in April demands. This was attributed to warmer winters with less than average precipitation that prompted customers to begin watering their landscaping earlier than normal.

Indoor and Outdoor Water Use

During 2005, as a percentage of total water treatment plant production, indoor water use was estimated to be 50.6% and outdoor water use was estimated to be 49.4%. The City of Westminster treated water deliveries are not included in this estimate. This estimate was developed by using the assumption that water use during the months of December through February is used indoors; thereby, providing a reasonable estimate of monthly indoor use. The indoor use was then subtracted from the total annual volume of water produced by the City's water treatment plants to estimate outdoor water use. Figure 5 shows estimated percentage of indoor and outdoor water use, treated water deliveries to the City of Westminster are excluded.

Figure 5: Estimated Percentage of Indoor/Outdoor Water Use 1998 - 2007

(Westminster Deliveries Not Included)



Trends in Water Use

The current trends in percent of total water use by customer class are not expected to shift significantly over the study period, 2008 through 2027, used in this report. In terms of the overall water demand pattern, the most significant change that is expected is with the deliveries to the City of Westminster. As annual water demands increase due to development within Thornton's water service area the fixed contract delivery rate to Westminster will remain constant, thus, reducing Westminster's percentage compared to the overall annual water demand. Figures 6 and 7 depict Thornton's daily per capita demands for the period 2002 through 2007.

2.2: Forecasting Method

Future water demands were estimated using Worksheet 2-1 (Appendix C). Water use from 2005 was used as the baseline year for future demand projections. As mentioned previously, this particular year was chosen for analysis since it was considered a relatively average year in precipitation and water use. Thornton was not under mandatory water restrictions in 2005, although voluntary water restrictions were in effect. Using 2005 as the base year for future water demand projections inherently includes active conservation measures that were in place at the time, including drought awareness campaigns and incentive based programs offered by the City.

2.3: Demand Forecast

Using the methodology shown in Worksheet 2-1 (Appendix C) along with population estimates used in the Long Range Water Plan, 2005 water use was broken down by customer class to calculate an annual per capita water use value. These per capita water use values were then applied to the population projections to develop baseline demand forecasts for 5-, 10-, and 20-year horizons. The preliminary treated water baseline demand forecast indicates 27,912 acre-feet of water will be needed to meet customer demand in 2027. Adding a 10% safety factor puts the 2027 treated water demand at 30,703 acre-feet. It is important to note that this baseline treated water demand forecast does not include Thornton's raw water system demands. The baseline demand forecasts have not included adjustments for future water conservation activities contemplated by this plan. Figures 6 and 7 show estimates of the residential sector per capita day demands and the combined per capita day demands of the residential, commercial, and irrigation classes.

Figure 6: Daily Per Capita Demand – Residential

(Includes Single Family & Multi-Family – Mobile Homes Excluded)

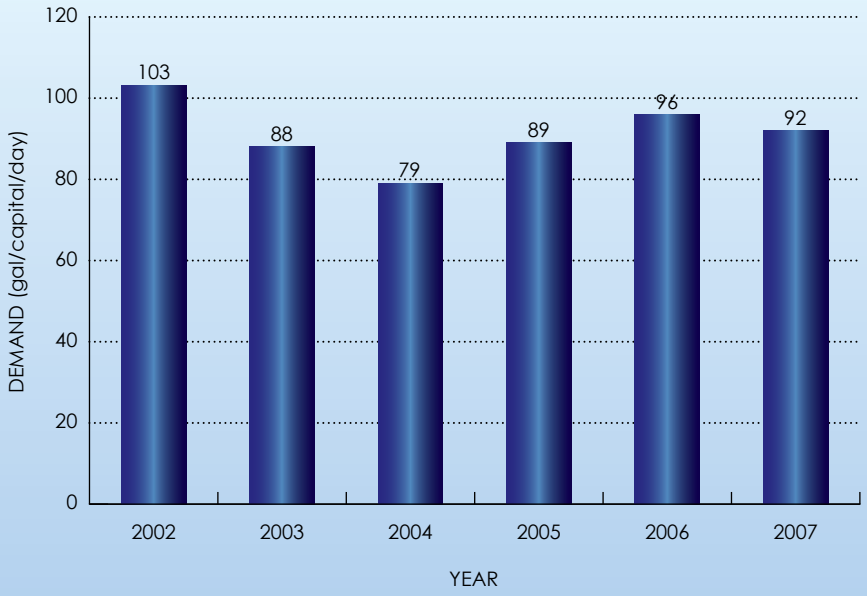
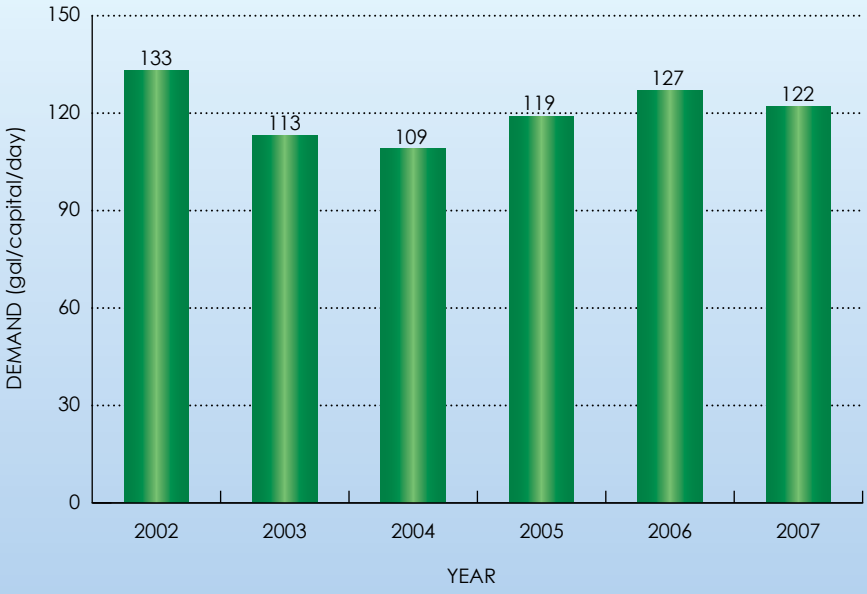
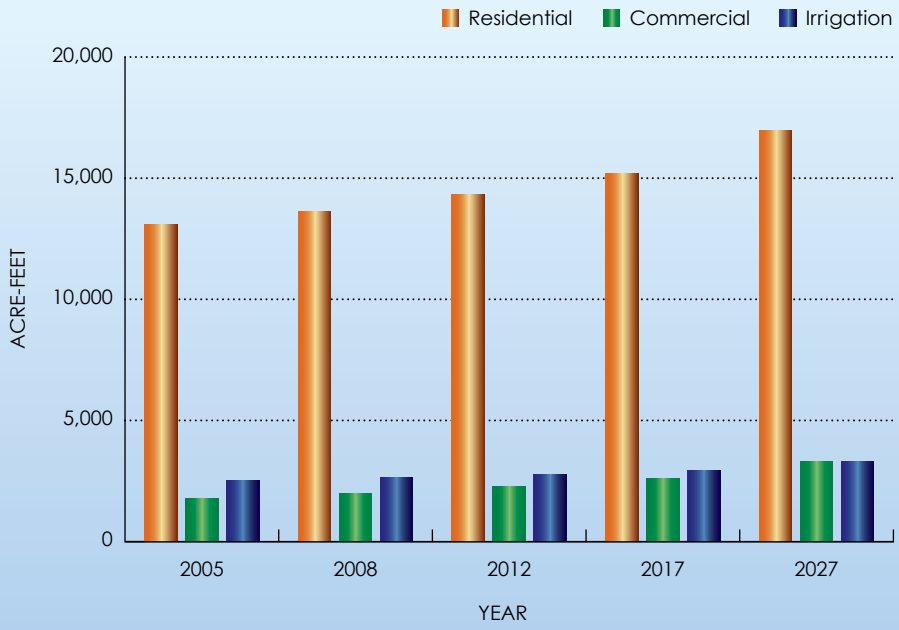


Figure 7: Daily Per Capita Demand – Residential, Commercial & Irrigation



The residential sector will continue to be the single largest group of water users in Thornton with a projected annual demand of 16,967 acre-feet in 2027. The 2027 annual demands for the ICI and irrigation sectors are projected to be 3,301 acre-feet and 3,294 acre-feet respectively. These projections do not include a safety factor. Figure 8 shows Thornton's preliminary demand forecast for the residential, commercial and irrigation classes.

Figure 8: Preliminary Demand Forecasts – Residential, ICI & Irrigation



Section 3: Proposed Facilities

Section 3 describes the improvements planned for Thornton's system and the anticipated costs associated with the improvements. As previously discussed, the information in this section relies largely on the Long Range Water Plan (LRWP) developed by City of Thornton staff. The proposed facility needs are limited to those improvements identified by the LRWP over the 20-year planning horizon used for this Water Conservation Plan.

3.1: Potential Facility Needs

In order to plan for the future costs associated with developing the City's raw water, treated water, and wastewater systems, City staff developed an itemized list of capital projects and operations and maintenance items necessary to accommodate Thornton's projected growth over the next 20 years. These projects include new raw water storage facilities, upgrades to existing water treatment plants, installation of new pipelines, replacement of existing pipelines, and non-potable irrigation projects, as well as new facilities, staffing requirements, fuel costs, and vehicle needs. A general summary of the projected costs associated with these potential facilities have been categorized by type of system project and are shown at the end of Section 3.1 in Table 4. The major projects and facility improvements forecasted through 2027 are identified below.

Northern Project Water Deliveries

Delivery methods for the water associated with the Thornton Northern Project (Northern Project) are being investigated as of the writing of this Water Conservation Plan. The Northern Project involves a substantial block of water that the City of Thornton acquired for future water supplies. The water is derived from Thornton's share ownership in the Water Supply and Storage Company which currently supplies water to agricultural interests located in Larimer and Weld Counties. Possible methods for delivering the Northern Project water include by exchange or by pipeline. For the purposes of this Plan, costs associated with delivering the water by exchange have been used. Costs include design, permitting and construction of recharge and return flow facilities, and ditch improvements to ensure continued delivery to non-Thornton Water Supply and Storage Company shareholders.

Water Share Acquisition

Additional local senior water rights on Upper and Lower Clear Creek will be pursued when available to increase the drought reliability of the City's Clear Creek water supply system. Additional shares in South Platte ditch companies will also be pursued to provide additional yield to Thornton's system, and act as a buffer to address changing river conditions (more reuse of water by Denver and others) or administration (no more out of priority storage in off-stream reservoirs) that might impact the amount of water available to Thornton's system.

Raw Water Storage

There are several projects underway or planned that will increase the City's raw water storage capacity. The City's storage projects are intended to meet one of the following functions:

1) operational storage that can supply water directly to the treatment plants;

2) storage that is used for regulation and exchange of reusable effluent; or

3) storage that is needed to operate the Northern Project by exchange. Costs for facilities to move raw water into and out of gravel pit storage are included with the gravel pit storage project costs.

Raw Water Transmission Facilities

Additional facilities to move raw water from one location to another are needed to effectively operate the raw water system. Raw water transmission projects include the Cooley West Raw Water Return Line project that consists of a pump station and pipeline to move water from Cooley West to Tani #4 or the WBTP, and development of a pipeline and associated facilities to operate a ditch exchange with the Burlington Ditch.

Water Quality and Treatment Facilities

Due to declining water quality in the form of increased nitrate levels in the South Platte River supply as well as the Lower Clear Creek supply, biological pretreatment will be constructed at the East Gravel Lakes. Biological pretreatment will serve as a mechanism to remove excess nitrates from the raw water supplied from these two sources prior to treatment at the WBTP.

The TWTP currently treats raw water using conventional treatment methods. Due to the age of the TWTP, several upgrades will be required between now and 2027. These upgrades include the chlorine system replacement, chemical system replacement, filter rehabilitation, Supervisory Control and Data Acquisition system upgrade, and chemical feed equipment replacement.

The WBTP recently underwent an expansion that increased the capacity of the plant from 30 mgd of conventional treatment to 50 mgd using ultra filtration treatment technology. No additional expansions are planned for this facility; however, it is anticipated that the existing chemical storage tanks and membranes will need to be replaced every ten years based on the manufacturer's recommendations.

Treatment plant operations and maintenance (O&M) costs include chemicals and power required to deliver the treated water from the plant and throughout the distribution system. The Long Range Water Plan depicts the incremental increase in treatment costs starting in 2006.

Waterline Over-Sizing

All future treated water distribution pipelines greater than 16-inches in diameter were identified based on the projected build-out of the extended service area. For the purposes of this study it was assumed that developers would be responsible for installing all pipelines and be reimbursed by Thornton for the difference in costs of installing any pipelines greater than 16-inch diameter.

Treated Water Storage Tanks

The following new treated water storage tanks will be required due to increased demand, and emergency and fire flow needs:

1) Zone 1, 5 million gallon storage tank was constructed in 2007 and has been placed into service.

2) Zone 1, 5 million gallon storage tank to be constructed in 2024.

Treated Water Pipeline Replacement Program

The pipeline replacement program will focus on asbestos cement (AC) and cast iron (CI) pipe. AC and CI pipe are typically the oldest pipelines in the distribution system and have contributed to the majority of the pipeline breaks occurring over the past ten years. The criteria for the pipeline replacement program was developed to minimize the overall costs required to replace aging AC and CI pipe in the distribution system while also ensuring reliable service and minimizing the costs associated with emergency repairs. For 2006 through 2020, replacement criteria has been developed which prioritizes the pipes needing repairs and ensures that pipes in fair condition are not needlessly replaced.

Standley Lake Pipeline Replacement

Thornton and the City of Northglenn share approximately 40,000 lineal feet of a 48-inch diameter pipeline that conveys water from Standley Lake to each of the cities. Costs have been estimated for the replacement of Thornton's portion of the pipeline. Thornton is the sole owner of the 36-inch diameter pipeline extending approximately 21,100 lineal feet from the bifurcation at the 48-inch pipeline to the Thornton Water Treatment Plant. The replacement costs in the plan assume that portions of the pipeline will be replaced from 2020 through 2022 for the 48-inch section of the pipeline.

Non-potable Irrigation Analysis for Future Parks

Community Services provided a list of proposed park sites planned over the next 20 years. It might be feasible to implement additional non-potable irrigation systems by utilizing existing raw water conveyance facilities already in place throughout the City. The parks identified include the following:

1) 136th Avenue and Holly Street Sports Complex - 50 acre multi-purpose fields at the southwest corner;

2) Baseball Complex at Aylor property near 136th Avenue and Quebec Street - roughly the same size as the Thornton Sports Complex at 104th Avenue and McKay Road;

3) Additional Multi-purpose field space - roughly 20 acres;

4) Baseball/Softball Complex - location not determined; likely to be sized similar to Thornton Sports Complex at 104th Avenue and McKay Road;

5) Community Level Park - location and amenities not yet determined;

6) Additional Multi-purpose field space - roughly 20 acres; site not determined.

Sewer Fund Capital Projects

The capital projects identified in the sewer fund portion of the LRWP study include all facilities and upgrades that will be required to support a build-out extended service area. The major facilities include the Big Dry Creek parallel interceptor and the Big Dry Creek lift station replacement.

Yearly capital improvement projects include the Wastewater O&M projects which consists of the rehabilitation and/or replacement of deteriorating 50 year old sanitary sewer lines on a priority basis. This is a maintenance project to rehabilitate concrete sewer mains throughout the system, but primarily in Original Thornton and the Western Hills Subdivision. The Wastewater O&M project also consists of rehabilitating deteriorated concrete manholes with a spray-on concrete lining application and then finishing each manhole with a waterproofing epoxy coating.

Operations and Maintenance Costs

Operations and maintenance costs were determined and itemized by year based on equipment and staffing needs, fuel costs, and vehicles. The items identified in the operations and maintenance needs include only additional items required based on the expected population growth and the associated growth of the utilities system.

Table 4: City of Thornton Summary of System Improvements/O&M Necessary to Meet Demand

Category	2008-2012 Total	2013-2017 Total	2018-2027 Total	2008-2027 Total
Source of Supply	$100,752,944	$34,353,600	$86,746,000	$221,852,544
Water Treatment Facilities	$10,400,000	$8,580,000	$4,500,000	$23,480,000
Treated Water Storage	$0	$0	$6,010,000	$6,010,000
Major Transmission Lines	$22,446,000	$9,851,000	$17,229,000	$49,526,000
Wastewater System	$3,861,000	$2,800,000	$750,000	$7,411,000
Water System Facilities	$1,073,750	$0	$798,000	$1,871,750
Wastewater System Facilities	$773,100	$0	$400,000	$1,173,100
Water System Operations & Maintenance	$4,587,586	$8,161,041	$24,223,120	$36,971,748
Wastewater System Operations & Maintenance	$721,890	$1,701,852	$3,037,147	$5,460,889
Grand Total	**$144,616,270**	**$65,447,493**	**$143,693,267**	**$353,757,030**

3.2: Incremental Cost Analysis

An incremental cost analysis was performed to estimate the cost of each additional gallon of new capacity associated with the anticipated water supply facilities and wastewater facilities necessary by 2027 to accommodate the City's projected demands. Worksheet 3-2 (Appendix C) was used to develop the estimates for the incremental cost analysis. Incremental costs were separated into six categories: source of supply, water treatment facilities, treated water storage, major transmission lines, water purchases, and wastewater facilities. These six categories include anticipated projects such as:

- Source of supply projects include costs for raw water operational facilities such as pipelines and pump stations, reservoirs, and canal conveyance improvements.
- Water treatment facilities include chemical storage tanks, biological pre-treatment processes, and ultra-violet treatment equipment.
- Treated water storage facilities include treated water storage tanks throughout the service area.
- Major transmission lines include waterlines for the treated water system, booster pump stations, and nonpotable systems.
- Water purchases include costs for water rights acquisitions, water rights transfers and water rights protection.
- Wastewater facilities include lift station improvements and sanitary sewer lines.

The estimated incremental costs are in 2006 dollars and annualized over the useful life of the anticipated projects. A summary of the incremental cost per gallon for these five categories can be found in Table 5.

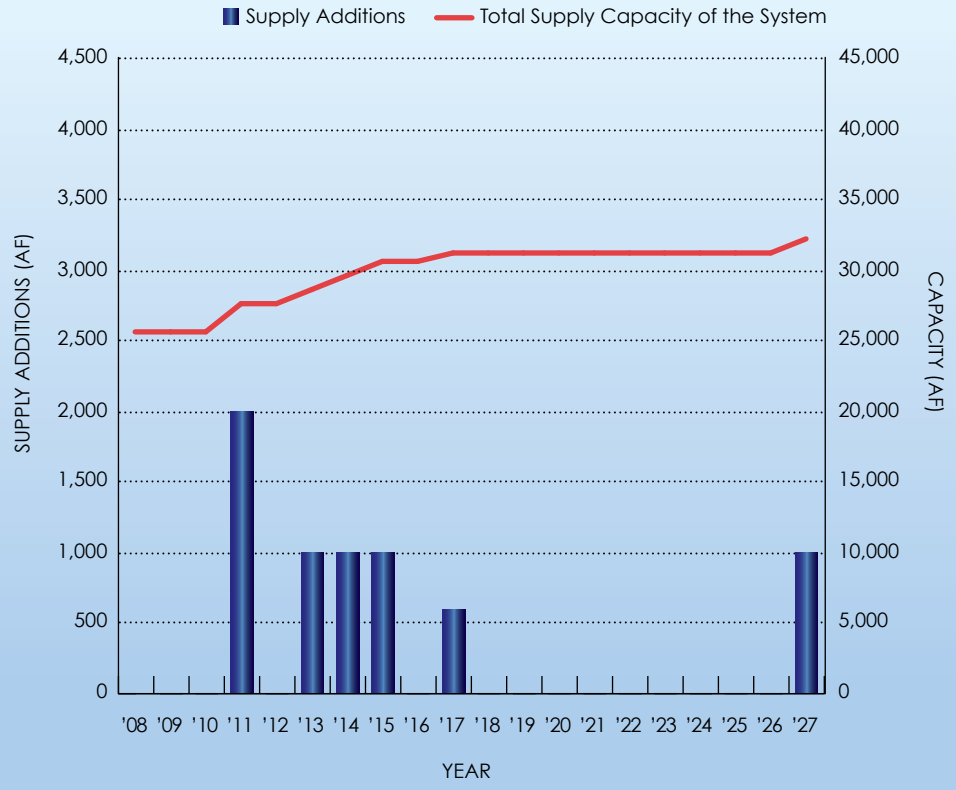
Table 5: Incremental Supply Costs

Category	Incremental Costs (per gallon)
Source of Supply	$0.00154
Water Treatment Facilities	$0.00113
Treated Water Storage	$0.00216
Major Transmission Lines	$0.00056
Water Purchases	$0.00383
Wastewater System	$0.00606
Total Simple Incremental Supply Cost	**$0.01528**

3.3: Preliminary Capacity Forecasts

The City of Thornton has acquired sufficient water supplies to serve anticipated service area demands beyond 2027; however, there are substantial infrastructure requirements that are necessary in order to allow delivery of this water to Thornton. Worksheet 3-4 (Appendix C) was used to summarize the preliminary annual supply-capacity additions to Thornton's raw water system. Figure 9 illustrates the anticipated volumes of water supply additions and timing of these additions.

Figure 9: Preliminary Annual Supply-Capacity Forecast – 2008 through 2027



Section 4: Conservation Goals

This section identifies the water conservation goals developed by the City of Thornton.

4.1: Water Conservation Goals

The City possesses adequate water supplies to meet demand through and beyond 2027, the planning horizon used in this plan. The planning horizon identified in this plan is 2008 through 2027, although the plan will not be adopted until 2009. Notwithstanding, the City recognizes that water conservation is an essential component of the City's long-term water supply planning strategy. Through water conservation Thornton will reduce the amount of water that the City must ultimately acquire or develop in order to meet its build-out demand. The water conservation goals were established with this in mind and are intended to benefit both the City and its customers.

Through water conservation Thornton will reduce the amount of water that the City must ultimately acquire or develop in order to meet its build-out demand.

The efforts outlined in this Water Conservation Plan are estimated to achieve significant water savings for the City of Thornton when compared to projected demands absent new water conservation efforts. New programs will be brought on-line at an aggressive pace with one new program being implemented each year through 2015. These initiatives will ultimately target all customer classes to achieve savings from all water customers. Thornton's goals look forward at 5-year, 10-year, and 20-year periods with this Water Conservation Plan to set specific acre-foot goals that the City can attain. This plan will achieve up to 900 AF of savings annually by 2012, up to 1,500 AF annually by 2017, and up to 2,800 AF annually by 2027. To put these water savings in perspective, the City can supply 2,150, 3,590 and 6,700 typical single-family residences, respectively, with these water savings.

Due to the residential class being the single largest customer class within the City's water service area, the City of Thornton has set a goal of establishing its residential water use at 85 gpcd or less, based upon a five-year rolling average, by 2016. Achieving 85 gpcd represents a 20% decrease when compared to 106.2 gpcd usage during the pre-drought year of 2001 and prior to the enactment of water use restrictions. The 2003-2007 average, which includes periods when mandatory and

voluntary water restrictions were in effect, is 88.7 gpcd. The residential water use goal has been demonstrated to be achievable in Thornton during periods of water use restrictions when customers were allowed to water their landscaping no more than three times per week. During these periods water restrictions were not extreme and most customers realized their landscaping could be maintained adequately on a three-day watering schedule. The City recognizes that a simple comparison of per-capita water use from year to year will be difficult due to climate conditions and changes in the service area and population profiles. The use of a 5-year rolling average to track gpcd recognizes this inherent annual volatility in water use and will help the City track its on-going water conservation progress in the residential customer class.

Other customer classes will be addressed with this conservation plan; however, it will be necessary to develop additional data associated with the other customer classes to set and monitor meaningful and quantifiable goals. Examples of data that will be developed include: irrigated areas for the irrigation customer class; types of businesses, square footage of commercial space, and number of employees for the commercial customer class; and the number of multi-family units and population estimates for the multi-family customer class. Goals will be set for other customer classes as the City develops additional data to allow the establishment of quantitative water conservation goals.

4.2: Goal Development Process

The process with setting the City of Thornton's water conservation goals involved a comprehensive look at existing water supplies, existing customers and associated water demands, existing indoor and outdoor water use trends, projected demands for water, and anticipated water system improvements and planning level costs for the improvements necessary to meet demand by year 2027. Analysis of current and projected water demands identified areas of water use that the City will target in order to achieve its water conservation goal.

Section 5: Identification of Conservation Measures & Programs

This section identifies measures and programs that will be considered by the City of Thornton for implementation as a part of the City's water conservation strategy. A conservation measure is a technology or practice that directly reduces water use. A conservation program is an action or policy that encourages, requires, or otherwise leads to implementation of water-saving measures.

5.1: Identification of Measures and Programs

A comprehensive list of conservation measures and programs were identified for consideration, including those required to be considered under Colorado's water conservation planning statute (C.R.S. §37-60-126). Staff identified numerous measures and programs by conducting research on the available literature and other successful water provider programs. Many of the measures and programs are currently implemented at the City of Thornton.

The list of identified demand-side measures includes water-efficient fixtures and appliances, efficient landscape technologies and efficient industrial and commercial processes. Identified supply-side measures include water re-use systems, distribution system efficiency, and source optimization. Both demand and supply side measures are detailed in Worksheet 5-1 (Appendix C).

The list of conservation demand-side programs includes public education, technical assistance, rate structures, regulations and incentives. Various supply-side programs which increase distribution system efficiency were also identified. Worksheet 5-2 (Appendix C) lists these programs in detail.

5.2: Screening of Measures and Programs

The identified measures and programs were screened based on the degree to which the measures and programs match the City's conservation goals. The screening criteria developed and used to evaluate whether to implement specific measures and programs are:

- Authority of the City of Thornton to implement measure/program. If the City does not have the legal authority to implement the measure/program it was excluded from consideration.

- Ability to sustain the water savings over the long-term. If a measure or program could not provide sustainable water savings over the long-term it was generally excluded from consideration.

- Ability to defer or avoid costs by implementing the measure or program. If implementing a measure or program demonstrated an increased potential for deferring or avoiding additional water purchases it was granted additional weight for consideration.

Section 6: Evaluation & Selection of Conservation Measures & Programs

This section provides a summary of measures and programs that were analyzed, considered, and selected by Thornton. An explanation of why certain measures and programs were not selected is also provided.

6.1: Identification of Conservation Measures and Programs

Table 6 provides a list of the conservation measures and programs that were identified to be considered for the development of this water conservation plan.

6.2: Evaluation Method

A series of Worksheets 6-1 (Appendix C) were developed to estimate the costs and water savings anticipated to be achieved over the life-span of each measure or program where it was applicable. The net benefit was calculated in terms of cost of water saved over the life of the estimated water savings compared to the cost of developing future water supplies as envisioned in the City's Long Range Water Plan. For example, toilet replacements are estimated to have a life-span of 20-years; therefore, the net benefit of a toilet replacement program is based on cost of the estimated water savings over a 20-year period (toilet replacement program) and what it costs the City to supply that same amount of water if it was not saved with the program.

Supply and demand-side conservation measures and programs were initially evaluated by estimating water savings, implementation costs, cost-effectiveness and net benefits. Conservative water savings estimates were used in these analyses.

6.3: Comparison of Benefits and Costs

Table 7 provides a summary of the benefits and costs of the measures and programs evaluated. This comparison is on a one-year basis and shows the estimated cost of the measure/program, anticipated water savings, cost per gallon of water saved, and the net benefit. The measures and programs have been ranked in descending order of net benefit.

6.4: Evaluation Criteria

The measures and programs were evaluated based on estimated reductions in average day, maximum day and annual demand. The criteria used to evaluate the measures and programs are based on cost and the screening criteria listed in Section 5.2.

6.5: Measure/Program Selection

The measures and programs showing the highest net benefit of water saved are likely candidates for implementation. In order to help achieve the City's goal of reducing future water development needs, programs from the top ten in the list showing the highest net benefit in reducing annual demand were generally selected. All of the City's existing programs are in the top ten, except the showerhead exchange program. However, the showerhead exchange program has been accepted under the screening criteria due to the program's compatibility with the community. Residential audit kits may also be considered as a low-cost service to the residential community with the potential to save water if customers follow the audit procedures and perform repairs as needed. Table 7 summarizes the measures/programs selected and those that were eliminated.

Table 6: Water Conservation Measures and Programs			
Measure/Program	**Already Implemented**	**Evaluated In Plan**	**Comments**
DEMAND-SIDE MEASURES			
Water-efficient Fixtures and Appliances			
Toilets - Rebates for replacement of 3.5 gpf or greater	Yes	Yes	Continue to offer $100 rebates
Toilets - Increased rebates for EPA WaterSense toilets	No	Yes	Will be offering $125 rebates
Urinals: Ultra-low flush	No	Yes	Commercial accounts
Showerheads	Yes	Yes	Free showerhead exchange program
Faucets	No	Yes	
Washing machines	Yes	Yes	Continue to offer $125 rebates
Free faucet aerator giveaways	Yes	Yes	ECOBA study determined these types of device giveaways do not produce statistically significant water savings. Won't pursue any further
Landscape Efficiency			
Low water use landscapes	Yes	No	City landscape codes revised June 1, 2003
Drought-resistant vegetation	Yes	No	City landscape codes revised June 1, 2003
Artificial turf	No	No	Artificial turf is prohibited by City Code except as allowed through Development Permit process for designated sports fields on public property. Use of artificial turf on City property for a sports field must be approved by City Council
Efficient irrigation	Yes	No	City landscape codes revised June 1, 2003
Rain sensor shutoff devices	Yes	Yes	Section 18-495 of the City code requires rain sensor shutoff devices; applies to nonresidential districts; and multifamily, single-family attached properties and manufactured home park common areas
ET-based controllers	No	Yes	Will be offering rebates for installation of these devices. Details still need to be developed
Scheduling	Yes	Yes	Thornton provides free irrigations system inspections & develops customized irrigation system scheduling for participants
Industrial and Commercial Efficiency			
Water-efficient processes	No	No	Will be evaluated in the future
Cooling equipment efficiency	No	No	Will be evaluated in the future
Northern Colorado Utilities ICI Workgroup	Yes	No	Participation in group studying strategies for the ICI sector

Table 6: Water Conservation Measures and Programs (continued)

Measure/Program	Already Implemented	Evaluated In Plan	Comments
SUPPLY-SIDE MEASURES			
Water Reuse Systems			
Management of reusable effluent	Yes	Yes	Thornton utilizes its reusable water rights by exchange and to pay historic return flow obligations per decree requirements
Management of reusable lawn irrigation return flows	Yes	Yes	Thornton utilizes its reusable water rights by exchange and to pay historic return flow obligations per decree requirements
Distribution System Efficiency			
Leak repair	Yes	Yes	Continuous program to check for leaks and replace older water lines
Removal of phreatophytes	No	No	Phreatophytes not a significant issue in Thornton. Phreatophytes located next to ditches and trails are considered to be a community asset
Temporary Transfers from Agriculture			
Dry year leasing	Yes	No	Implemented as necessary and available
Rotational fallowing	No	No	Not allowed by decrees
Water salvage	No	No	Not allowed by decrees
Source Optimization			
Conjunctive use	No	No	Thornton has a surface water based water supplies
System integration with other utilities	Yes	No	Inter-connects with Denver, Northglenn, and Westminster for emergency situations
Standing agreements with several entities	Yes	No	Several agreements already exist. Opportunities evaluated as they become apparent or are presented
Temporary raw water leases	Yes	No	Implemented as necessary and available

Table 6: Water Conservation Measures and Programs (continued)

Measure/Program	Already Implemented	Evaluated In Plan	Comments
DEMAND-SIDE PROGRAMS			
Education/Information Dissemination			
Public education	Yes	No	Cannot quantify water savings due to these efforts. Currently use City magazine, web site, mass mailings, newspaper advertising, flyers, City festivals, and active participation on the Colorado Water Wise Council
Water-saving demonstrations	Yes	No	Provided at City festivals
XeriscapeTM Demonstration Garden	Yes	No	Located at Margaret Carpenter Recreation Center
XeriscapeTM Seminars	No	No	Will be evaluated in the future
School programs	Yes	No	5th Grade Water Festival. City staff available upon request for presentations
Informative & understandable water bill	Yes	No	
Water bill inserts	No	No	City has opted to forego further use of inserts because not all citizens receive a water bill from the City
Social marketing campaign	Yes	Yes	Implemented in May 2007
System for Billing to flag high water users and notify water conservation staff	No	No	Will be evaluated in the future
Water efficiency E-newsletter education programs in the future.	No	No	Cannot quantify water savings. Will be evaluated as a component of public ECOBA study determined these types of device giveaways do not produce statistically significant water savings. Won't pursue any further
Technical Assistance			
Free Irrigation System Inspections - Targeted at large residential landscapes	Yes	Yes	Residential customers targeted since 2005
Free Irrigation System Inspections - Targeted at large HOA/Commercial landscapes	Yes	Yes	HOA/Commercial customers targeted since 2006
Free Residential Indoor Audits/Kit Distribution	No	Yes	Free residential indoor audits and distribution of free "do it youself" audit kits for customers who don't want people in their home
Water conservation expert available	Yes	No	Two staff members available

Table 6: Water Conservation Measures and Programs (continued)

Measure/Program	Already Implemented	Evaluated In Plan	Comments
DEMAND-SIDE PROGRAMS (continued)			
Rate Structures and Billing Systems Designed to Encourage Efficiency			
Volume billing	Yes	No	Based on customer water usage
Conservation (tiered) rate structure	Yes	No	Implemented in May 2003
Increased (monthly) billing frequency	Yes	No	Already billed on a monthly basis
Commercial tap fee rebate for ultra-low volume toilets/urinals	No	No	Will be evaluated in the future
Commercial tap fee adjustment according to ICI benchmarks	No	No	Will be evaluated when benchmarks are developed by the ICI workgroup
Incentive to reduce water usage (credit on water bill)	No	No	Rejected: May be interpreted as unfair to customers already using low amounts of water
Regulations/Ordinances			
Addressing fixtures & appliances			
Standards for fixtures & appliances	No	No	Rebate incentives are already offered. Voluntary approach is more compatible with the community rather than a regulatory approach
Time of sale upgrades	No	No	Rebate incentives are already offered. Voluntary approach is more compatible with the community rather than a regulatory approach
Addressing landscapes			
Turf restrictions	Yes	No	New developments, varying levels of maximum limits allowed depending on land use
Landscape design/layout	Yes	No	Requires all new developments to follow water-wise landscaping principles
Soil preparation	Yes	No	Landscape Code
Irrigation equipment	Yes	Yes	Rain sensors required on automatic irrigation systems for nonresidential districts; and multifamily, single-family attached properties and manufactured home park common areas
Efficient Landscape Irrigation Campaign (No watering between 10 am and 6 pm)	No	Yes	Voluntary rule limiting landscape watering to cooler hours of the day
Irrigation audit required for new developments	No	No	May require additional City Development staff. Will be evaluated in the future
Separate irrigation tap requirement	No	No	Will be evaluated in the future

Table 6: Water Conservation Measures and Programs (continued)			
Measure/Program	**Already Implemented**	**Evaluated In Plan**	**Comments**
DEMAND-SIDE PROGRAMS (continued)			
Regulations/Ordinances (continued)			
Irrigation tap sizing requirement to meet "no watering between 10 am and 6 pm rule"	No	No	May require additional City Development staff. Will be evaluated in the future
Homeowner Association Irrigation Efficiency Program	No	No	Will be evaluated in the future
Water waste prohibition	Yes	No	Already enforced
Incentives			
High efficiency clothes washing machine rebates - $125	Yes	Yes	Ongoing
Increased rebates for EPA WaterSense toilet rebates	No	Yes	Will be offering $125 rebates
Replacement of toilets with 3.5 gpf or > - $100 rebate	Yes	Yes	Ongoing
Showerhead exchanges for 3.0 gpm or >	Yes	Yes	Ongoing showerhead exchange program offering 2.0 gpm showerheads
ET based irrigation controllers	No	Yes	Will be offering rebates for installation of these devices. Details still need to be developed
Soil amendment rebate	No	No	Will be evaluated in the future
Give-aways	Yes	No	Provided at City festivals – water conservation related items such as faucet aerators, soil moisture probes, irrigation controllers, xeric seeds, and water conservation information
Homeowner Association Irrigation Efficiency Incentive Program	No	No	Will be evaluated in the future
SUPPLY-SIDE PROGRAMS			
Distribution System Efficiency			
Leak identification	Yes	Yes	Ongoing
Meter source water	Yes	No	All source water is measured
Meter service connections	Yes	No	All service connections are measured
Meter testing and replacement	Yes	No	Ongoing standard program
Improved water accounting	Yes	No	Detailed water accounting already in place
Analysis of non-account water	Yes	Yes	Already monitored
Water line replacement program	Yes	Yes	Standard program to replace old water lines annually

Table 7: Comparison of Benefits and Costs

Line	Conservation Measure/Program [a]	Annual Cost for the Measure/ Program [b]	Anticipated Annual Water Savings in (gallon) [c]	Cost of Water Saved by the Measure ($/gallon) [d]	Net Benefit of Implementing the Measure/ Program [e]	Selected Program	Primary Criteria for Selecting or Rejecting the Conservation Measure/Program for Implementation
1	Efficient Landscape Irrigation Campaign (Voluntary No watering 10am to 6pm)	$13,458	72,954,364	$0.00001	$22,285,690	Selected	Potential to reduce overall water demand and to sustain the water savings over the long-term.
2	Pipeline Replacement Program	$333,586	5,192,129	$0.00128	$3,633,965	Selected	Potential to reduce overall water demand and to sustain the water savings over the long-term.
3	Social Marketing Campaign	$96,458	21,330,141	$0.00045	$3,163,415	Selected	Cost of implementation versus the amount of water saved.
4	Multi-Family Submetering	$1,400	5,336,000	$0.00001	$1,629,596	Rejected	Cost of implementation versus the amount of water saved.
5	Toilet Rebates	$36,525	2,374,920	$0.00077	$689,390	Selected	Cost of implementation versus the amount of water saved.
6	Clothes Washing Machine Rebates	$103,640	4,117,236	$0.00210	$651,442	Selected	Cost of implementation versus the amount of water saved.
7	Multi-Family WaterSense Toilet Rebates	$18,420	2,199,000	$0.00042	$562,187	Selected	Potential to reduce overall water demand and to sustain the water savings over the long-term.
8	ULF Urinals	$28,445	1,029,600	$0.00138	$286,261	Selected	Cost of implementation versus the amount of water saved.
9	Residential WaterSense Toilet Rebates	$16,570	549,750	$0.00151	$168,036	Selected	Cost of implementation versus the amount of water saved.
10	Commercial WaterSense Toilet Rebates	$13,445	584,000	$0.00115	$165,060	Selected	Potential to reduce overall water demand and to sustain the water savings over the long-term.
11	Flapperless Toilet Rebates	$16,570	549,750	$0.00151	$151,466	Rejected	Potential to reduce overall water demand and to sustain the water savings over the long-term.
12	ET Controller Rebates	$11,334	400,050	$0.00142	$110,945	Selected	Potential to reduce overall water demand and to sustain the water savings over the long-term.

Table 7: Comparison of Benefits and Costs (continued)

Line	Conservation Measure/Program [a]	Annual Cost for the Measure/ Program [b]	Anticipated Annual Water Savings in (gallon) [c]	Cost of Water Saved by the Measure ($/gallon) [d]	Net Benefit of Implementing the Measure/ Program [e]	Selected Program	Primary Criteria for Selecting or Rejecting the Conservation Measure/Program for Implementation
13	Irrigation System Inspections	$24,107	1,680,000	$0.00287	$104,270	Selected	Cost of implementation versus the amount of water saved.
14	Rain Sensor Rebates	$2,435	144,000	$0.00169	$19,572	Selected	Potential to reduce overall water demand and to sustain the water savings over the long-term.
15	Residential Audit Kits	$1,855	150,000	$0.00247	$9,607	Selected	Potential to reduce overall water demand and to sustain the water savings over the long-term.
16	Hot water recirculation systems	$7,185	100,000	$0.00719	$8,098	Selected	Cost of implementation versus the amount of water saved.
17	Residential Indoor Audits	$7,285	150,000	$0.00971	$4,177	Selected	Cost of implementation versus the amount of water saved.
18	Showerhead Exchanges	$1,473	20,220	$0.01457	$72	Selected	Cost of implementation versus the amount of water saved.
19	Commercial Indoor Audits	$4,785	50,000	$0.01914	-$964	Rejected	Cost of implementation versus the amount of water saved.
20	Faucets-Aerator Giveaways	$1,200	0	$0.00000	-$1,200	Rejected	Potential to reduce overall water demand and to sustain the water savings over the long-term.
21	Residential Turf Replacement Rebates	$22,285	100,000	$0.02229	-$7,002	Rejected	Potential to reduce overall water demand and to sustain the water savings over the long-term.

[a] = Combined measures and programs that produce joint conservation savings should be treated as one measure/program to avoid duplicate counting.

[b] = From Worksheet 6-1, line 8.

[c] = From Worksheet 6-1, line 11.

[d] = From Worksheet 6-1, line 14.

[e] = From Worksheet 6-1, line 18. Note: This estimate of net benefit does not consider societal benefits and costs. New monetary benefit is not the only legitimate criterion for ranking and selection of measures/programs. See the text.

6.5.1: Additional Water Conservation Efforts

While this plan is intended to layout the strategies that the City will pursue over the next several years to enhance water use efficiency, in order for water conservation planning to be successful the plan needs to be flexible enough to allow for modifications in strategies. As technological advancements are made and brought onto the market and further research indicates greater promise with other focuses this plan needs to be able to alter course when appropriate. As the measures and programs set out in this plan are monitored for progress it might be necessary to amend certain aspects of the plan to more effectively accomplish the City's overall goal.

In addition to the measures and programs selected in this plan for implementation staff will also devote efforts on developing new methods to enhance the City's water conservation program. This includes refining the City's ability to further break down customer class categories to allow the City to track water use of sub-categories and investigating possible City Code revisions that could potentially increase water savings. These concepts are discussed in greater detail below.

Water Consumption Data

In the process of compiling water consumption data for this plan, the need to develop a well-defined customer class of categories became evident. The categories have been developed for billing purposes and should be refined for accurate water consumption analyses by customer class. For example, City Development land use categories could be incorporated to break the commercial water customer class into sub-categories. This would enable analysis of water consumption by commercial customer class. This would be useful for benchmarking and projecting water savings more accurately when developing commercial water conservation programs. Developing consistent definitions for each customer class will assist in the creation of internal monthly and annual water consumption reports. The project will also be useful for water demand modeling when incorporating water conservation factors. This project may require staff time from multiple areas, including Water Resources, Information Technology, GIS, City Development, and Utility Billing.

Related Data Collection

Benchmarking water use for each commercial class requires information specific to each class. For example, nursing homes can be benchmarked according to water consumption per room or bed. Office buildings are typically benchmarked using building square footage. This type of information could be collected when the water account is established and entered into the database.

Landscaped area is an important factor in estimating outdoor water demand by parcel. This information can be used to analyze water use and help to effectively target programs where they can be most beneficial. Calculating water consumption per square foot of landscaped area allows for a more accurate comparison of accounts. An account that appears to be a high water user may actually be

on a large parcel and using water efficiently. By developing a system to collect and record landscaped area for each new development by parcel, outdoor water demand per square foot can be calculated. For existing parcels, some water providers have used Geographic Information System software designed to calculate landscaped area using current aerial photography. Customized educational materials for commercial and residential customers could be developed using this information, indicating appropriate water use for each parcel. The Water Resources Division will investigate this application for the feasibility of future implementation.

Multi-Family Submetering

A potential source of water savings is in the multi-family sector where the owner is billed through one master meter and the residents pay for their water and wastewater as part of their monthly rent. This situation does not provide an incentive to the end water user to reduce water usage because a price signal is not sent directly to the multi-family unit resident. A 2004 study found that multi-family units that are submetered achieved a water savings of 7,957 gallons per year per dwelling unit when compared to units that are not submetered.[2] As of the end of the year 2006, there are approximately 5,040 multi-family units and 3,360 mobile home units in Thornton that are not billed based on an individual water meter for each unit. The Water Resources Division will investigate the feasibility and implications of requiring sub-metering in these sectors.

Automatic Irrigation Systems

The City's free irrigation system inspection program has revealed that a high percentage of the automatic irrigation systems inspected are not designed or installed adequately. Results from the inspections conducted in 2005 and 2006 indicate that a large percentage of the irrigation zones inspected were deemed to be below irrigation industry standards. Notable conclusions from 2005 and 2006 Thornton inspections include:

- 2005 - 83%; 2006 - 76%; irrigation zones below irrigation industry standards for the uniformity of water distributed on the landscape.

- 2005 - 76%; 2006 – 70%; irrigation zones with spray heads with water pressures that were too high. This causes misting and the water tends to evaporate and float away from the intended target. Most residential settings tend to use spray heads because they are designed to irrigate smaller areas.

A requirement that each new automatic irrigation system in new developments must pass an irrigation system inspection could help save water by ensuring the systems are designed to be efficient and are installed correctly. A useful requirement for property owners/managers would be to have a copy of the irrigation system inspection, an irrigation schedule developed from the inspection and an as-built irrigation plan posted at each time clock controller. The Water Resources Division will investigate the feasibility and implications of requiring sprinkler system inspections for new development.

[2] Mayer, P.W., et al National Multiple Family Submetering and Allocation Billing Program Study. Aquacraft, Inc. and the East Bay Municipal Utility District, 2004.

Soil Amendments

After participating in discussions with the Code Enforcement Division of the City about issues related to poorly maintained yards, particularly in the older sections of town, it became evident that part of the problem is related to poor soils on these properties. The soils in Thornton are typically high in clay content and tend to cause water to runoff landscapes and into the street. The City's current landscape code addresses soil amendments with new development; however, providing an incentive program that would assist existing customers to properly amend their soils could potentially be an additional water saving strategy. The Water Resources Division will investigate the feasibility of offering an incentive program targeting these properties.

Water Rate Structure

As previously described, Thornton utilizes an increasing tiered rate structure (a.k.a. increasing block rate structure) to help promote efficient water use. The tiered rate structure is designed to encourage and reward water conservation efforts, particularly regarding outdoor irrigation, while discouraging misuse of the City's water supply. Tier 1 is the customer's indoor use which is generally associated with cooking, bathing, and cleaning. Tier 2 is the customer's outdoor water use allotment which is largely used on landscape irrigation. Tiers 1 and 2 are charged at the same unit price. Tiers 3 and 4 have larger volumes of water associated with them and the unit prices increase aggressively to signal the customer that they have crossed the threshold and are using excessive volumes of water.

The water rate structure used by the City of Thornton has strong pricing signals that increase aggressively with the volume of water use when moving into Tier 3 and Tier 4. There might be some additional water use efficiencies to be gained by adjusting downward the volumes of water allocated to the outdoor water use tiers. For example, the existing outdoor volume of water for Tier 2 is 21,000 gallons of water per month which might be very generous. An analysis of the water use patterns in the service area might find that it is possible to reduce the monthly tier threshold to send a pricing signal sooner to customers who might be using more water than their landscape actually requires. An analysis would need to be conducted to determine whether a lower monthly tier threshold would be appropriate.

Water Budgets[3]

A strategy associated with water rate structures is to investigate the feasibility of developing a water budget rate structure. A water budget involves developing individually customized water allocations that meet the needs of each individual customer. To develop the individually customized water allocation a number of items need to be taken into consideration, including: lot size; irrigable area, type of landscaping, and number of person residing in the household. A properly designed water budget (monthly allotment) provides enough water for each customer's inside water use needs as well as basic landscape irrigation needs. If a

[3] Western Resource Advocates, Water Rate Structures in Colorado: How Colorado Cities Compare in Using this important Water Use Efficiency Tool, September 2004.

customer exceeds their monthly water budget, the excess amount of water used over their budget is charged at a higher rate. Thornton's existing water rate structure is a hybrid of a true water budget rate structure because it allows customer's an indoor budget based on actual water use during the winter and allows a separate allocation of up to 20,000 gallons per month for outdoor use. Outdoor use above the 21,000 gallons per month is charged at a higher rate to discourage excessive water use.

While there are few water providers in the Western United States that utilize a true water budget rate structure, there are a few existing examples in the Front Range. The Centennial Water and Sanitation District in Highlands Ranch and the City of Boulder have each implemented water budget rate structures. Implementing a true water budget rate structure would require a very significant amount of research to properly tailor a budget to adequately meet each customer's indoor and outdoor water needs.

Tap Fee Structure/Sizing Research

There might be water use efficiencies to be gained that are associated with tap fee structures and tap sizing requirements. Perhaps by offering an incentive in the form of a reduced tap fee for new development where the most efficient fixtures and irrigation systems are installed the City could achieve water savings. Additionally, it might be possible to offer a tap fee incentive to irrigation only customers that utilize state of the art irrigation systems. Some commercial and irrigation class customers might opt out of installing an additional or separate irrigation tap to avoid the additional fee. In these situations it might be impossible for customers to avoid irrigating their landscaping during the daytime when evaporation losses are the highest because they need to run their irrigation system longer to irrigate their entire property. From a long-term water efficiency standpoint, it is beneficial to separately meter indoor and outdoor water use. It would assist customers with monitoring their water use if they could track their indoor and outdoor water use separately. It would also assist the City with evaluating water efficiency measures. The Water Resources Division will research the potential for water savings and the implications of irrigation tap requirements and incentives.

Section 7: Modified Demand Forecast

This section addresses anticipated water conservation effects on the demand projections developed in Section 2.

7.1: Revised Demand Forecast

The demand forecasts shown in Worksheet 2-1 (Appendix C) were modified by incorporating the water conservation measures and programs selected in Section 6. As previously mentioned, the City of Thornton possesses adequate water supplies and capacity within its existing system to meet demand over the planning horizon used in this plan. Table 8 shows the projected daily demands with and without water conservation. The effects are shown at 5-, 10-, and 20-years.

Table 8: Modified Demand Forecast

Item	Current Year (2008)	Year 5 (2012)	Year 10 (2017)	Year 20 (2027)
Average-day demand before conservation (gal/day)	19,741,000	20,842,000	22,201,000	24,918,000
Average-day demand after conservation (gal/day)		20,642,000	21,767,000	24,000,000
Reduction in average-day demand (gal/day)		200,000	433,000	918,000
Maximum-day demand before conservation (gal/day)	47,821,000	50,488,000	53,779,000	60,363,000
Maximum-day demand after conservation (gal/day)		49,399,000	52,114,000	57,537,000
Reduction in maximum-day demand (gal/day)		1,089,000	1,666,000	2,826,000

7.2: Identification of Project Specific Water Savings

While the most accurate water savings estimates were used in the development of this Plan, achieving these results for the measures and programs identified are highly dependent on the level of public participation. The measures and programs identified with this planning effort will not enable the elimination of future capital improvement projects necessary to meet the City's projected demands.

The water conservation savings contemplated with this planning effort are envisioned to help reduce the amount of water that the City must ultimately acquire or develop in order to meet demands at build-out. Worksheet 7-2 (Appendix C) provides an estimate of potential water savings that could be achieved by 2027. Water savings have been estimated based on the data available and the use of prudent assumptions, there is not enough certainty in the data to support water capacity design decisions. As additional data becomes available, the estimated water savings in this Water Conservation Plan may need to be revised.

7.3: Revised Supply Capacity Forecast

Table 9 summarizes projected annual treated water system demands taken from Section 2 (Worksheet 2-1, Appendix C), and compares potential reductions in system demand due to conservation savings.

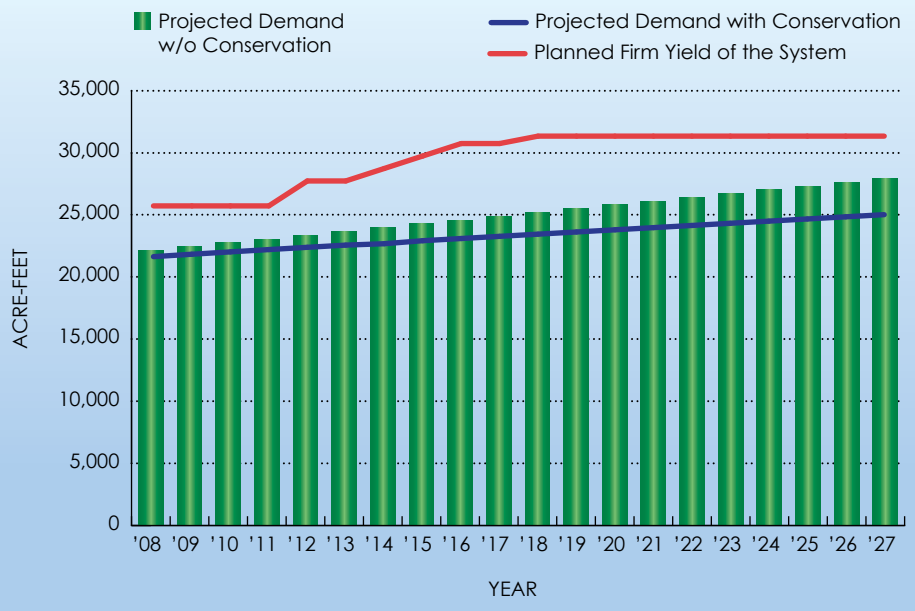
Table 9: Revised Annual Supply-Capacity Forecast

Year	Projected Demand w/o Conservation (annual AF)	Planned Firm Yield of the System (annual AF)	Projected Conservation Water Savings (annual AF)	Projected Demand with Conservation (annual AF)
2005	20,862			
2012	23,346	27,775	891	22,455
2017	24,868	30,775	1,533	23,335
2027	27,912	31,370	2,838	25,074

7.4: Forecast Modifications and Benefits of Conservation

Potential conservation savings shown in 2027 are not certain enough to eliminate continued development of the City's existing water supplies to ensure adequate supplies at build-out. Water supply planning and development requires years of planning to ensure adequate water supplies are available when they are needed. Due to the uncertainty of conservation savings it would not be prudent on the City's part to rely on estimated water savings as a justification for delaying or eliminating planned and needed system development. In the future, as conservation savings become evident, conservation savings may well reduce the amount of water that the City must ultimately acquire or develop in order to meet demand at build-out. Figure 10 illustrates Thornton's projected demands and the estimated effects of water conservation.

Figure 10: Supply & Projected Demands With & Without Conservation



7.5: Revenue Effects

The selected water conservation measures and programs will potentially have an impact on revenue, should the assumptions used to estimate water savings associated with the identified measures and programs prove to be on target. Water rates and charges are studied by the City on a regular basis. Conservation effects on revenue will be addressed by the City as necessary.

Section 8: Implementation Plan

This section provides a schedule for when the selected measures and programs are to be implemented. Included in this section is a summary of the estimated cost of implementing the Water Conservation Plan as it is presented. It also defines when the Plan will be updated to reflect on-going efforts and to incorporate new approaches for the City's overall water conservation strategy.

8.1: Implementation Schedule

The implementation of the measures and programs are anticipated to follow the schedule shown in Table 10. Implementation of measures and programs will be subject to available funding.

Table 10: Implementation Schedule for Measures and Programs

Measure/Program	Required Action	Beginning Date	Completion Date
Social Marketing Campaign	Currently Implemented	2007	On-going
Pipeline Replacement Program	Currently Implemented	2008	On-going
Clothes Washing Machine Rebates	Currently Implemented	2008	On-going
Toilet Rebates	Currently Implemented	2008	On-going
Irrigation System Inspections	Currently Implemented	2008	On-going
Showerhead Exchanges	Currently Implemented	2008	On-going
Residential WaterSense Toilet Rebates	Advertise availability	2008	On-going
Efficient Landscape Irrigation Campaign (Voluntary No Watering 10am to 6pm)	Market with existing social marketing campaign	2009	On-going
Residential Audits/Kits	Advertise audits and purchase kits	2009	On-going
Multi-Family Toilet Rebates	Develop program details	2010	On-going
ULF Urinals	Develop program details	2011	On-going
Toilets - Commercial	Develop program details	2012	On-going
ET Controller Rebates	Develop program details	2013	On-going
Rain Sensor Rebates	Develop program details	2014	On-going
Update Water Conservation Plan	Plan evaluation and update as required by statute	2014	2014
Hot Water Re-Circulation Systems	Develop program details	2015	On-going

8.2: Implementation Plan

The implementation plans for the new measures and programs shown in Table 10 are more thoroughly described below.

Efficient Landscape Irrigation Campaign (Voluntary Lawn Watering Program) 2008 Implementation

Program Description

Implementation of an enhanced campaign to encourage customers to voluntarily follow the City's recommended watering program. This program will remain consistent with the program the City began promoting in 2007. The program consists of a two day per week watering schedule with an optional third day added to the schedule during the hottest weeks of the summer. Watering between the hours of 10:00 AM and 6:00 PM will be discouraged. The voluntary irrigation efficiency program will be wrapped into the existing marketing campaign that was implemented in 2007. In order to provide flexibility to the City's customers for their irrigation scheduling the program will not dictate the days of the week that irrigation can occur.

Benefits

This program will allow the City to remain consistent with the voluntary program rolled out in 2007 and offers potentially significant water savings as more customers follow the recommended program. Promoting this program will allow the City to continue to build momentum with the efforts started in 2007. This voluntary program will allow the City to continue to be seen as more of a partner with customers rather than a regulator. Mandating the number of days and the time of day that watering is allowed can increase resentment amongst the City's water customers. This dictate could lead to increased water use by some customers because they might think they have to water their grass on their designated day whether their grass needs it or not. Once a customer understands the benefits of following the City's voluntary program then they might be more apt to change their practices on a permanent basis allowing the City to realize consistent water savings. Successfully changing customer habits of watering during the daytime alone has the potential to save an estimated 292 acre-feet of water per year in evaporation savings.

Limiting irrigation to the cooler hours of the day is not a new concept as it has been required in Thornton during temporary water restrictions in the past. Continuing to the program and building participation on a permanent basis will enhance water conservation effectiveness by saving an estimated 15% to 30% of evaporation loss when irrigation of landscaping occurs during the hottest hours of the day.

Challenges

The largest challenge anticipated with promoting the program is motivating customers to change their existing habits by communicating the benefits of following the City's recommended program. An additional challenge faced by the City is public perception about how City owned properties are managed. Some customers will be less likely to follow the recommended program if they perceive the City is not following their own recommendations. The City, where they can, will need to lead by example when irrigating City owned properties. Anticipated issues that the City faces are related to irrigation operations at heavily used sports fields. The City's sports fields require different level of care than a lawn at a typical single-family residence due to the high impact uses and number of citizens utilizing the fields. During hot weather conditions the grass requires a brief application of water (syringing) during the mid-day to cool the grass and prevent damage. Safe conditions must be maintained with sports turf to minimize injuries due to fields that are either too hard or too soft. Safety of citizens utilizing City sports fields is a concern and requires different water management practices than a typical single-family residential lawn. The City's sports fields are also used by the public well into the evening hours of the day during the summer which reduces the amount of time available to irrigate within the recommended watering window. Additional challenges faced by owner's of large properties, including the City and some HOA properties, is due to irrigation systems with a high number of irrigation zones that might not be able to irrigate every zone within the 16 hour watering window.

The City, where they can, will need to lead by example when irrigating City owned properties.

Staff will need to be prepared to respond to questions, concerns, complaints, and reported violations.

Staffing and Budget Implications

Will require approximately 1,040 staff hours per year during the irrigation season to respond to questions, concerns, complaints, reported water waste violations, and to educate customers.

Program Details

- Customers will be encouraged to select two days per week for their watering schedule with an optional third day added to the schedule during the hottest weeks of the summer. Customers can select the days of the week that fit best with their personal schedules.

- Spray irrigation between the hours of 10 AM and 6 PM will be discouraged.

- Customers will be encouraged to:
  - participate in the City's irrigation inspection program.
  - install smart irrigation technology, such as ET controllers and rain sensor shutoff devices.
  - Utilize the services of certified WaterSense landscape irrigation professionals.

- New Turf Seed/Sod Installation: The City will educate customers about the benefits of installing new turf seed or sod in the spring and fall rather than in the heat of the summer. There will be no restrictions on watering new seed or sod.

Implementation

The Efficient Landscape Irrigation Campaign will be publicized and wrapped into the City's existing marketing campaign beginning in 2008.

WaterSense Residential Toilet Rebate Implementation Plan 2008 Implementation

Program Description

The WaterSense Toilet Rebate program will offer a $125 rebate incentive for the replacement of 3.5 gallon per flush or greater toilet with a WaterSense labeled toilet. This program will be offered to qualifying residential customers.

Benefits

The City of Thornton has partnered with the EPA on their new WaterSense program. The mission of the program is to protect the future of our nation's water supply by enhancing the market for water-efficient products and services. Certified products are labeled with the WaterSense logo to enable customers to identify water efficient fixtures.

WaterSense labeled toilets have been certified by the EPA for performance and efficiency. These toilets do not exceed 1.28 gpf and therefore are more water efficient than the standard 1.6 gpf toilet.

Challenges

The availability of WaterSense toilets is limited in the Denver Metro area because the program is so new. As more products are certified by the EPA and are made available on the market, the rebates for standard 1.6 gpf toilets will be phased out.

WaterSense toilets on the market in the Denver-metro area are currently priced higher than some of the standard 1.6 gpf models. The City will offer an increased rebate of $125 as an incentive for customers to purchase WaterSense labeled toilets.

Staffing and Budget Implications

Increased rebate amounts will be paid from the existing rebate budget.

Program Details

WaterSense toilet rebates will be offered to residential water customers as an additional component of the existing rebate programs. The current rebate application and rules will be modified to include WaterSense toilet rebates. The benefits of WaterSense toilets will be marketed to the community.

The Water Resources Division will work with Administrative and Utility Billing staff to facilitate a smooth transition to the new program. Rebate participant data will be entered in the City's database and reported along with the high-efficiency clothes washer, standard 1.6 gpf toilet and showerhead exchange programs.

Rebate requirements will be as follows:

- The WaterSense toilet must replace a 3.5 gpf or greater toilet.
- Entire toilet must be replaced.
- The rebate is limited to 2 toilets per household.
- A copy of the receipt must be attached to the application.
- A photograph of the removed, broken toilet must be attached to the application.

Implementation

The WaterSense Toilet Rebate program will be implemented in 2008.

Residential Indoor Audits/Kit Distribution Implementation Plan
2009 Implementation

Program Description

The City will offer free indoor audits and distribute free kits upon request to residential customers within the water service area. An indoor audit involves checking for plumbing leaks and inefficient fixtures such as faucet aerators, toilets, showerheads, and providing the customer with recommendations to improve their water use efficiency. Audits kits will also be provided to customers who wish to perform their own audit and will include directions on how to perform an indoor audit, tools to perform the audit, and educational resources.

An indoor audit involves checking for plumbing leaks and inefficient fixtures such as faucet aerators, toilets, showerheads, and providing the customer with recommendations to improve their water use efficiency.

Benefits

Providing audits will allow for one-on-one educational opportunities with customers. Some customers might want to perform their own audit and providing free kits are not only a useful tool for residential customers to improve their indoor water efficiency, but also an educational tool to raise awareness. Customers who call the City for plumbing leak checks may especially benefit from this program.

If the City performs/distributes 50 kits per year, the Residential Audit/Kit program has the potential to save 0.5 acre-feet per year. Considering the reasonable cost of an estimated $3,165 per acre-foot saved, this program will be a valuable benefit to both the residential customer and the City.

Challenges

Offering the audits/kits may not be enough to motivate customers to perform indoor audits. This program will be incorporated into the existing marketing campaign in order to raise awareness of the benefits of indoor audits.

Actual water savings from this program may be difficult to quantify. Monthly water consumption is recorded in thousands of gallons in the City's database. Savings less than 1,000 gallons per month may not register in the participant's monthly usage data.

Staffing and Budget Implications

Audits are estimated to cost $100 each and kits cost $5 per kit. Assuming the City performs a combination 50 audits/kit distributions per year, the annual cost will be $5,000 per year. This will require approximately 100 staff hours per year.

Program Details

Residential Audits/Kits will be available to residential customers upon request at the Utility Billing and Water Resources Division offices.

Implementation

The Residential Audits/Kit program will be implemented in 2009.

Multi-Family Toilet Rebate Implementation Plan
2010 Implementation

Program Description

The Multi-Family Toilet Rebate program will offer a $50 rebate incentive for the replacement of 3.5 gpf or greater toilet with a WaterSense labeled toilet. This program will be offered to qualifying water customers in the multi-family sector.

Benefits

The City of Thornton has partnered with the EPA on their new WaterSense program. The mission of the program is to protect the future of our nation's water supply by enhancing the market for water-efficient products and services. Certified products are labeled with the WaterSense logo to enable customers to identify water efficient fixtures.

WaterSense labeled toilets have been certified by the EPA for performance and efficiency. These toilets do not exceed 1.28 gpf and therefore are more water efficient than the standard 1.6 gpf toilet. When implemented according to the Water Conservation Plan, the Multi-Family Toilet Rebate program has the potential to save 6.75 acre-feet per year.

Challenges

This will be the first water conservation incentive program offered to the multi-family sector. The rebate program and the benefits of WaterSense toilets will need to be marketed to property owners and managers.

Staffing and Budget Implications

Rebate amounts will be paid from the annual rebate budget. Rebates will be subject to the availability of funding. An estimated 100 hours of additional staff time will be required for inspection of rebated toilet installations (200 toilet limit per year ÷ 4 toilets per account x 2 hour inspection = 100 hours).

Program Details

A new Multi-Family Toilet Rebate application will be developed for this program. Marketing materials targeting multi-family building owners and managers will also be developed.

The Water Resources Division will work with Administrative and Utility Billing staff to facilitate a smooth transition to the new program. Rebate participant data will be entered in the City's database and reported along with the residential rebate programs.

Rebate requirements will be as follows:

- The WaterSense toilet must replace a 3.5 gpf or greater toilet.
- Entire toilet must be replaced.
- The rebate is limited to a total of 200 toilet replacements in the multi-family account sector per year.
- Copies of the receipts must be attached to the application.
- Toilet installations must be inspected by a City of Thornton representative.

Implementation

The Multi-Family Toilet Rebate program will be implemented in 2010.

Commercial Urinal Rebate Implementation Plan
2011 Implementation

Program Description

The Commercial Urinal Rebate program will offer a $100 rebate incentive for the replacement of a 1.5 gpf or greater urinal with an ultra-low flow (0.5 gpf) or waterless urinal. Urinals are not currently being certified by the EPA WaterSense program. If WaterSense labeled urinals are available in 2011, rebates will apply to them. This program will be offered to qualifying water customers in the commercial sector.

Benefits

When implemented according to the Water Conservation Plan, the Commercial Urinal Rebate program has the potential to save 3.2 acre-feet per year. These savings are based on 0.5 gpf urinals. The savings estimates will be greater if waterless urinals are installed.

Challenges

This will be the first incentive program offered to water customers in the commercial sector. The urinal rebate program and the benefits of ultra-low flow and waterless urinals will need to be marketed to business owners and managers. The amount of the rebate offered might have to be re-evaluated to ensure the incentive is adequate to encourage replacement of these old urinals.

It may not be feasible to track actual water savings of rebate participants that share a master meter with other businesses. Water savings attributed to this program will need to be estimated through other means, such as data collection on the rebate application (i.e. number of employees, number of customers, type of urinal that was replaced, etc.).

Staffing and Budget Implications

Assuming that 50 participants each install four urinals, the annual budget will be $20,000. An estimated 100 hours of staff time will be required for the inspection of rebated urinal installations (50 participants per year x 2 hour inspection = 100 hours).

Program Details

The Commercial Urinal Rebate program will offer a $100 rebate incentive for the replacement of a 1.5 gpf or greater urinal with an ultra-low flow (0.5 gpf) or waterless urinal. A new Commercial Urinal Rebate application will be developed for this program. Marketing materials targeting business owners and managers will also be developed.

The Water Resources Division will work with Administrative and Utility Billing staff to facilitate a smooth transition to the new program. Rebate participant data will be entered in the City's database and reported along with the residential rebate programs.

Rebate requirements will be as follows:

- The ultra-low flow urinal must replace a 1.5 gpf or greater urinal.
- Rebates are subject to the availability of funding.
- Copies of the receipts must be attached to the application.
- Urinal installations must be inspected by a City of Thornton representative.

Implementation

The Commercial Toilet Rebate program will be implemented in 2011.

Commercial Toilet Rebate Implementation Plan
2012 Implementation

Program Description

The Commercial Toilet Rebate program will offer a $100 rebate incentive for the replacement of a 3.5 gpf or greater toilet with a WaterSense labeled toilet. This program will be offered to qualifying water customers in the commercial sector.

Benefits

The City of Thornton has partnered with the EPA on their new WaterSense program. The mission of the program is to protect the future of our nation's water supply by enhancing the market for water-efficient products and services. Certified products are labeled with the WaterSense logo to enable customers to identify water efficient fixtures.

The City of Thornton has partnered with the EPA on their new WaterSense program.

WaterSense labeled toilets have been certified by the EPA for performance and efficiency. These toilets do not exceed 1.28 gpf and therefore are more water efficient than the standard 1.6 gpf toilet. When implemented according to the Water Conservation Plan, the Commercial Toilet Rebate program has the potential to save 1.8 acre-feet per year.

Challenges

The toilet rebate program and the benefits of WaterSense toilets will need to be marketed to business owners and managers. It may not be feasible to track actual water savings of rebate participants that share a master meter with other businesses. Water savings attributed to this program will need to be estimated through other means, such as data collection on the rebate application (i.e. number of employees, number of customers, type of toilet that was replaced, etc.).

Staffing and Budget Implications

Assuming that 50 toilets will be rebated per year, the annual budget will be $5,000. An estimated 25 hours of additional staff time will be required for inspection of rebated toilet installations (50 toilets installed per year ÷ 4 toilets per account x 2 hour inspection = 25 hours).

Program Details

A new Commercial Toilet Rebate application will be developed for this program. Marketing materials targeting business owners and managers will also be developed.

The Water Resources Division will work with Administrative and Utility Billing staff to facilitate a smooth transition to the new program. Rebate participant data will be entered in the City's database and reported along with the residential rebate programs.

Rebate requirements will be as follows:

- The WaterSense toilet must replace a 3.5 gpf or greater toilet.
- Entire toilet must be replaced.
- Rebates are subject to the availability of funding.
- Copies of the receipts must be attached to the application.
- Toilet installations must be inspected by a City of Thornton representative.

Implementation

The Commercial Toilet Rebate program will be implemented in 2012.

ET Controller Rebate Program Implementation Plan
2013 Implementation

Program Description

Evapotranspiration (ET) is the combined process of soil evaporation and plant transpiration, which is influenced by the weather. ET-based irrigation controllers estimate lawn water requirements and automatically regulate irrigation based on local weather factors.

The ET Controller Rebate Program will provide an incentive to replace a time-based irrigation controller with a qualifying ET controller or install an ET controller with a new irrigation system. The program will offer the lesser of $200 or 50 percent off the purchase price of an ET controller to residential, commercial and irrigation water customers.

Benefits

The ET controller offers a convenient alternative to time-based irrigation. This technology eliminates the need for the homeowner or landscape manager to make regular scheduling adjustments because the controller adjusts the schedule automatically as weather changes. Assuming there are 50 participants per year, this program, when implemented in 2013, has the potential to save 1.2 acre-feet of water per year.

Challenges

The challenge with this program is conveying to the water customer the benefits of the ET controller technology over the time-based irrigation controller. One ET controller was given away at the 2006 Thorntonfest and it was clear that many people didn't understand the technology. The ET controller rebate program will need to be incorporated into the existing social marketing campaign with a strong educational component.

Staffing and Budget Implications

An estimated 200 staff hours per year are expected for program implementation and maintenance. Assuming an average rebate amount of $100 for 50 ET controllers per year, the annual budget estimate is $5,000.

Program Details

The ET Controller Rebate Program will offer the lesser of $200 or 50 percent off the purchase price of a qualifying ET controller to residential, commercial and irrigation water customers. Annual rebate numbers and participant water consumption will be tracked to monitor the effectiveness of the program.

The program requirements will be as follows:

- The City will provide a list of ET controllers that qualify for the rebate.
- The rebate will be limited to one ET controller per water customer.
- The customer will be required to perform a simple irrigation system check to ensure that the system is working properly. The customer must sign an affidavit that the system was checked.
- The irrigation system and installed ET controller will be subject to inspection by City staff.

Implementation

The ET Controller Rebate Program will be implemented in 2013.

Rain Sensor Rebate Program Implementation Plan
2014 Implementation

Program Description

A rain sensor is an inexpensive device that can be easily installed with most automatic irrigation systems. The sensor is designed to interrupt the normal irrigation cycle when natural rainfall is detected. The Rain Sensor Rebate Program will provide a $25 incentive to install a qualifying rain sensor shut-off device on an automatic irrigation system. The rebate will be offered to residential, commercial, and irrigation customers.

Benefits

Rain sensor shut-off devices limit irrigation system over-watering during natural rainfall events, thereby reducing water waste. Because rain sensors are inexpensive and easy to install, this may be a well received incentive program for the community. Assuming there will be 50 participants per year; this program has the potential to save 0.5 acre-foot of water per year.

Challenges

Water savings attributed to this program may be challenging to accurately track due to the variability of rain events in the Thornton area.

Staffing and Budget Implications

An estimated 200 staff hours per year are expected for program implementation and maintenance. Assuming an average of 50 participants per year at $25 per rebate, the annual budget estimate is $1,250.

Program Details

The Rain Sensor Rebate Program will offer $25 for the purchase of a qualifying rain sensor to residential, commercial and irrigation water customers. Annual rebate numbers and participant water consumption will be tracked to monitor the effectiveness of the program.

The program requirements will be as follows:

- The City will provide a list of rain sensors that qualify for the rebate.
- The rebate will be limited to one rain sensor per water customer.
- The customer will be required to perform a simple irrigation system check to ensure that the system is working properly. The customer must sign an affidavit that the system was checked.
- The irrigation system and installed rain sensor will be subject to inspection by City staff.

Implementation

The Rain Sensor Rebate Program will be implemented in 2014.

Hot Water Recirculation System Rebate Implementation Plan 2015 Implementation

Program Description

The City will offer a $100 rebate for the installation of a qualifying hot water recirculation system. A hot water recirculation system consists of pipes with a motor driven pump that recirculates water between the water heater and hot water fixtures. This rebate will be offered to single-family residential water customers.

Benefits

Hot water recirculation systems deliver hot water to fixtures quickly without having to wait for the water to get hot, helping to reduce water waste in the home. If 50 systems are installed per year, this program has the potential to save 0.3 acre-feet per year.

Challenges

Actual water savings from this program may be difficult to quantify. Monthly water consumption is recorded in thousands of gallons in the City's database. Savings less than 1,000 gallons per month may not register in the participant's monthly usage data.

Staffing and Budget Implications

Assuming the City provides 50 rebates per year, the annual budget will be $5,000. An estimated 100 hours of staff time will be required for inspection of installed systems.

Program Details

The Hot Water Recirculation Rebate program will offer a $100 rebate to single family residential water customers for the installation of a qualifying system. Rebate participant data will be entered in the City's database and reported along with the residential rebate programs.

Rebate requirements will be as follows:

- Hot water recirculation system must be demand-actuated, not timer-actuated. Demand-actuated systems provide both water and energy savings.
- Hot water recirculation systems must be installed by a licensed plumber.
- One rebate per household.
- Installed system must be inspected by a City of Thornton representative.

Implementation

The Hot Water Recirculation System Rebate program will be implemented in 2015.

8.3: Implementation Plan Costs

The estimated costs of the implementation of this Water Conservation Plan for the period 2008 through 2015 as presented are summarized in Table 11.

Table 11: Estimated Costs of the Implementation Plan – 2008 through 2015

Measure/Program	Existing/New	Year	O&M/CIP	2008	2009	2010	2011	2012	2013	2014	2015
Efficient Landscape Irrigation Campaign (Voluntary No Watering 10am to 6pm)	New - wrapped into existing social marketing campaign	2008	O&M	$61,942	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000	$75,000
Social Marketing Campaign	Existing	2008	O&M								
Pipeline Replacement Program	Existing	2008	CIP	$520,000	$340,000	$340,000	$350,000	$526,000	$510,000	$510,000	$538,000
School Education Programs	Existing	2008	O&M	$3,259	$3,259	$3,259	$3,259	$3,259	$3,259	$3,259	$3,259
Public Outreach Festivals/Seminars	Existing	2008	O&M	$4,402	$4,402	$4,402	$4,402	$4,402	$4,402	$4,402	$4,402
Clothes Washing Machine Rebates	Existing	2008	O&M	$73,250	$73,250	$73,250	$73,250	$73,250	$73,250	$73,250	$73,250
Residential Toilet Rebates with Phased in WaterSense Toilet Program	Existing	2008	O&M	$27,200	$27,200	$27,200	$27,200	$27,200	$27,200	$27,200	$27,200
Irrigation System Inspections	Existing	2008	O&M	$10,815	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000	$11,000
Showerhead Exchanges	Existing	2008	O&M		$576	$576	$576	$576	$576	$576	$576
Residential Indoor Audits/Kits	New	2009	O&M		$6,250	$6,250	$6,250	$6,250	$6,250	$6,250	$6,250
Multi-Family Toilet Rebates	New	2010	O&M			$11,075	$11,075	$11,075	$11,075	$11,075	$11,075
ULF Urinals	New	2011	O&M				$21,100	$21,100	$21,100	$21,100	$21,100
Toilets - Commercial	New	2012	O&M					$6,100	$6,100	$6,100	$6,100
ET Controller Rebates	New	2013	O&M						$6,100	$6,100	$6,100
Rain Sensor Rebates	New	2014	O&M							$1,250	$1,250
Hot Water Re-Circulation Systems	New	2015	O&M								$6,000
Total				**$700,868**	**$540,937**	**$552,012**	**$583,112**	**$765,212**	**$755,312**	**$756,562**	**$790,562**
Total CIP				**$520,000**	**$340,000**	**$340,000**	**$350,000**	**$526,000**	**$510,000**	**$510,000**	**$538,000**
Total O&M				**$180,868**	**$200,937**	**$212,012**	**$233,112**	**$239,212**	**$245,312**	**$246,562**	**$252,562**

Notes:
Cost estimates do not include adjustments for inflation.
Cost estimates do not include staff salaries and benefits.

8.4: Staffing Implications

The measures, programs, data development, various research efforts, and increased levels of customer education are estimated to require one additional full time employee hired in 2008. A summary of the estimated additional staffing requirements to assist with new water conservation efforts discussed in this plan are shown in Table 12.

Table 12: Estimated Staffing Implications Due to New Programs, Monitoring, & Research

Program	Year Implemented	Estimated Staff Time (hours/year)	Comment
Tap Fee Structure/Sizing Research	N/A	1,040	one time
Multi-Family Submetering Research	N/A	1,040	one time
Efficient Landscape Irrigation Campaign	2008	1,040	ongoing
Data Collection, Analyses, Research, and Program Monitoring	2009	1,040	ongoing
Automatic Irrigation Systems Inspections	2009	160	ongoing
Soil Amendments	2009	160	ongoing
Residential Indoor Audits and Kits	2009	100	ongoing
Multi-Family Toilet Rebates	2010	100	ongoing
Commercial Urinal Rebates	2011	100	ongoing
Commercial Toilet Rebates	2012	25	ongoing
ET Controller Rebates	2013	200	ongoing
Rain Sensor Rebates	2014	200	ongoing
Hot Water Re-Circulation System Rebates	2015	100	ongoing
Total Estimate Annual Staff Hours By 2015		**5,305**	
Total One Time Staff Hours		**2,080**	
Total Annual Ongoing Staff Hours		**3,225**	

8.5: Public Participation in the Process of Plan Review and Comment

The Water Conservation Act of 2004 requires that the Draft Water Conservation Plan be made available to the public for review and comment. The City of Thornton will comply with this requirement by placing the Draft Water Conservation Plan on the City Council meeting agenda, providing public notice of the plan as an agenda item, allowing time for public review and comment, and adoption of the plan after it is approved by the Colorado Water Conservation Board. This process complies with City of Thornton Charter requirements which include provisions for public advertisement, review, comment, and adoption by the City Council.

8.6: Monitoring and Evaluation Processes

The measures and programs outlined in this Plan will be monitored to determine their effectiveness in achieving the long-term water savings goals of the City. Measures and programs determined not to be significantly effective will be discontinued.

8.7: Plan for Updating and Revising the Conservation Plan

The City of Thornton intends to update the Plan, at minimum every seven-years, as required by Colorado's water conservation planning statute. The City will continue to collect and analyze data on a regular basis. Future revisions of the Plan will incorporate updated and new data sources.

8.8: Plan Adoption, Completion, and Approval

The City of Thornton Water Conservation Plan was adopted by City Council May 12, 2009.

HOUSE BILL 04-1365

BY REPRESENTATIVE(S) Harvey, Frangas, May M., McFadyen, Plant, Rippy, Weissmann, and Wiens;
also SENATOR(S) Kester, Groff, Grossman, Hillman, and Tapia.

CONCERNING WATER PLANNING BY RETAIL WATER PROVIDERS.

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. Legislative declaration. (1) The general assembly hereby finds and declares that:

(a) Colorado was the first western state to enact statewide water conservation legislation;

(b) Water conservation and drought mitigation planning will benefit all citizens of the state of Colorado;

(c) The "Water Conservation Act of 1991", which fostered a statewide policy of improved urban water use efficiency and conservation, provides the foundation that can now be enhanced to provide new technical and financial opportunities for Colorado's communities regarding water

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Capital letters indicate new material added to existing statutes; dashes through words indicate deletions from existing statutes and such material not part of act.

conservation and drought mitigation planning.

(2) It is therefore the purpose and intent of this act and the policy of this state to:

(a) Encourage wise water use and conservation and drought planning by those privately and publicly owned water agencies, utilities, and others with the legal obligation to supply, distribute, or otherwise provide water through technical assistance, information dissemination, and where appropriate, financial support;

(b) Encourage the state, the Colorado water conservation board, and water providers with knowledge of water conservation and drought mitigation planning to work with other water providers in developing and implementing water conservation and water use efficiencies and managing water supplies during periods of drought;

(c) Encourage smaller water providers to take advantage of state-provided resources to support local planning efforts; and

(d) Encourage and support implementation of this act, in particular those components of this act that relate to the development and implementation of a statewide water supply initiative.

SECTION 2. 37-60-124, Colorado Revised Statutes, is amended to read:

37-60-124. Office of water conservation and drought planning - creation - powers and duties. (1) There is hereby created as an office under the Colorado water conservation board the office of water conservation AND DROUGHT PLANNING. The office shall have such staff as are necessary and appropriate to carry out the duties established for the office.

(2) The office of water conservation AND DROUGHT PLANNING shall promote water ~~use efficiency~~ CONSERVATION AND DROUGHT MITIGATION PLANNING by performing, to the degree feasible, duties including, but not limited to, the following:

(a) PARTICIPATING AS A MEMBER OR CHAIRPERSON OF ANY STATE

WATER AVAILABILITY TASK FORCES ESTABLISHED TO MONITOR, FORECAST, MITIGATE, OR PREPARE FOR DROUGHT;

~~(a)~~ (b) Acting as a repository for water ~~use efficiency~~ CONSERVATION AND DROUGHT MITIGATION PLANNING information;

(c) DISSEMINATING WATER CONSERVATION, DROUGHT MITIGATION PLANNING, AND RELATED INFORMATION TO WATER PROVIDERS AND THE GENERAL PUBLIC;

~~(b)~~ (d) ~~Provision of~~ PROVIDING technical assistance to and working with municipal, ~~and other urban~~ INDUSTRIAL, AGRICULTURAL, AND OTHER water providers and state agencies as they plan for, evaluate, and implement water ~~use efficiency measures to provide necessary water services~~ CONSERVATION PLANS AND PROGRAMS, DROUGHT MITIGATION PLANS, OR BOTH;

~~(c)~~ (e) Coordination of the planning for and assistance in the implementation of water ~~use efficiency~~ CONSERVATION plans by state agencies pursuant to section 37-96-103 (4);

~~(d)~~ (f) Administration of financial assistance for water ~~use efficiency~~ CONSERVATION AND DROUGHT MITIGATION PLANNING AND IMPLEMENTATION measures and ~~water use efficiency~~ programs; ~~as authorized in section 37-60-125;~~ and

~~(e)~~ (g) ~~Preparation for review and approval by the board for transmittal to the general assembly such information and recommendations concerning water use efficiency projects and proposed water use efficiency measures by state and local governments, including the analysis of water use efficiency programs already in place.~~ EVALUATING WATER CONSERVATION AND DROUGHT MITIGATION PLANS RELATED TO THE USE OF SUCH PLANS BY WATER PROVIDERS TO ADDRESS WATER NEEDS AND TO PREPARE FOR WATER-RELATED EMERGENCIES BASED UPON POLICIES AND GUIDELINES ADOPTED BY THE BOARD PURSUANT TO SECTION 37-60-126.

(3) The personal services, operating, travel and subsistence, capital, and legal services expenses of administering the office of water conservation AND DROUGHT PLANNING and the programs and activities authorized by subsection (2) of this section may be paid from such moneys as are appropriated, allocated, or otherwise credited to the Colorado water

conservation board construction fund.

(4) Repealed.

SECTION 3. 37-60-126, Colorado Revised Statutes, is amended to read:

37-60-126. Water conservation and drought mitigation planning - programs - relationship to state assistance for water facilities - guidelines. (1) As used in this section AND IN SECTION 37-60-126.5, unless the context otherwise requires:

(a) "Covered entity" means each municipality, agency, utility, including any privately owned utility, or other publicly owned entity with a legal obligation to supply, distribute, or otherwise provide water at retail to domestic, commercial, industrial, or public facility customers, and ~~which~~ THAT has a total demand for such customers of two thousand acre-feet or more. ~~in calendar years 1989 or thereafter.~~

(b) "OFFICE" MEANS THE OFFICE OF WATER CONSERVATION AND DROUGHT PLANNING CREATED IN SECTION 37-60-124.

(c) "PLAN ELEMENTS" MEANS THOSE COMPONENTS OF WATER CONSERVATION PLANS THAT ADDRESS WATER-SAVING MEASURES AND PROGRAMS, IMPLEMENTATION REVIEW, WATER-SAVING GOALS, AND THE ACTIONS A COVERED ENTITY SHALL TAKE TO DEVELOP, IMPLEMENT, MONITOR, REVIEW, AND REVISE ITS WATER CONSERVATION PLAN.

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

(e) "WATER CONSERVATION" MEANS WATER USE EFFICIENCY, WISE WATER USE, WATER TRANSMISSION AND DISTRIBUTION SYSTEM EFFICIENCY, AND SUPPLY SUBSTITUTION. THE OBJECTIVE OF WATER CONSERVATION IS A LONG-TERM INCREASE IN THE PRODUCTIVE USE OF WATER SUPPLY IN ORDER TO SATISFY WATER SUPPLY NEEDS WITHOUT COMPROMISING DESIRED WATER SERVICES.

(f) "WATER-SAVING MEASURES AND PROGRAMS" INCLUDES A DEVICE, PRACTICE, HARDWARE, OR EQUIPMENT THAT REDUCES WATER DEMANDS AND A PROGRAM THAT USES A COMBINATION OF MEASURES AND INCENTIVES THAT ALLOW FOR AN INCREASE IN THE PRODUCTIVE USE OF A LOCAL WATER SUPPLY.

(2) (a) Within five years after June 4, 1991, each covered entity ~~which~~ THAT does not have a water use efficiency plan satisfying the provisions of ~~subsections~~ SUBSECTION (4) ~~and (5)~~ of this section shall, subject to section 37-60-127, develop, adopt, make publicly available, and implement a plan pursuant to which such covered entity shall encourage its domestic, commercial, industrial, and public facility customers to use water more efficiently. Any covered entity that makes an initial determination that it has satisfied ~~subsections~~ SUBSECTION (4) ~~and (5)~~ of this section shall, within five years ~~of~~ AFTER June 4, 1991, give public notice of such determination at an official meeting of the appropriate governing body of the covered entity.

(b) THE OFFICE SHALL REVIEW PREVIOUSLY SUBMITTED CONSERVATION PLANS TO EVALUATE THEIR CONSISTENCY WITH THE PROVISIONS OF THIS SECTION AND THE GUIDELINES ESTABLISHED PURSUANT TO SUBSECTION (7) OF THIS SECTION.

(c) ON AND AFTER JULY 1, 2006, A COVERED ENTITY THAT SEEKS FINANCIAL ASSISTANCE FROM EITHER THE BOARD OR THE COLORADO WATER RESOURCES AND POWER DEVELOPMENT AUTHORITY SHALL SUBMIT TO THE BOARD A NEW OR REVISED PLAN TO MEET WATER CONSERVATION GOALS ADOPTED BY THE COVERED ENTITY, IN ACCORDANCE WITH THIS SECTION, FOR THE BOARD'S APPROVAL PRIOR TO THE RELEASE OF NEW LOAN PROCEEDS.

(3) The manner in which the covered entity develops, adopts, makes publicly available, and implements a plan established pursuant to subsection (2) of this section shall be determined by the covered entity IN ACCORDANCE WITH THIS SECTION. The plan shall be accompanied by a ~~program~~ SCHEDULE for its implementation. THE PLANS AND SCHEDULES SHALL BE PROVIDED TO THE OFFICE WITHIN NINETY DAYS AFTER THEIR ADOPTION. FOR THOSE ENTITIES SEEKING FINANCIAL ASSISTANCE, THE OFFICE SHALL THEN NOTIFY THE COVERED ENTITY AND THE APPROPRIATE FINANCING AUTHORITY THAT THE PLAN HAS BEEN REVIEWED AND WHETHER THE PLAN HAS BEEN APPROVED IN ACCORDANCE WITH THIS SECTION.

(4) ~~In developing~~ A plan DEVELOPED BY A COVERED ENTITY pursuant to subsection (2) of this section ~~each covered entity~~ shall, ~~consider at least the following water-saving measures~~ AT A MINIMUM, CONSIDER THE FOLLOWING PLAN ELEMENTS:

(a) THE WATER-SAVING MEASURES AND PROGRAMS TO BE USED BY THE COVERED ENTITY FOR WATER CONSERVATION. IN DEVELOPING THESE MEASURES AND PROGRAMS, EACH COVERED ENTITY SHALL, AT A MINIMUM, CONSIDER THE FOLLOWING:

(I) Water-efficient fixtures and appliances, including toilets, urinals, showerheads, and faucets;

~~(b)~~ (II) Low water use landscapes, DROUGHT-RESISTANT VEGETATION, REMOVAL OF PHREATOPHYTES, and efficient irrigation;

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

~~(d)~~ (IV) Water reuse systems; ~~both potable and nonpotable;~~

~~(e)~~ (V) Distribution system leak IDENTIFICATION AND repair;

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

~~(g) (I)~~ (VII) Water rate structures and billing systems designed to encourage water use efficiency in a fiscally responsible manner;

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

~~(h)~~ (IX) Regulatory measures ~~including standards for the use of water use efficiency fixtures and landscapes, and ordinances, codes, or other law~~ designed to encourage water ~~use efficiency~~ CONSERVATION;

~~(i)~~ (X) Incentives to implement water ~~use efficiency~~ CONSERVATION techniques, including rebates to customers ~~or others~~ to encourage the

installation of water ~~use efficiency~~ CONSERVATION measures;

~~(5)~~ (b) ~~The plan to be adopted under subsection (2) of this section shall contain~~ A section stating the covered entity's best judgment of the role of water ~~use efficiency~~ CONSERVATION plans in the covered entity's water supply planning;

(c) THE STEPS THE COVERED ENTITY USED TO DEVELOP, AND WILL USE TO IMPLEMENT, MONITOR, REVIEW, AND REVISE, ITS WATER CONSERVATION PLAN;

(d) THE TIME PERIOD, NOT TO EXCEED SEVEN YEARS, AFTER WHICH THE COVERED ENTITY WILL REVIEW AND UPDATE ITS ADOPTED PLAN; AND

(e) EITHER AS A PERCENTAGE OR IN ACRE-FOOT INCREMENTS, AN ESTIMATE OF THE AMOUNT OF WATER THAT HAS BEEN SAVED THROUGH A PREVIOUSLY IMPLEMENTED CONSERVATION PLAN AND AN ESTIMATE OF THE AMOUNT OF WATER THAT WILL BE SAVED THROUGH CONSERVATION WHEN THE PLAN IS IMPLEMENTED.

~~(6) Except for the elements of a water use efficiency plan which a covered entity has already implemented prior to June 4, 1991, the plan required under subsection (2) of this section shall set forth results of the consideration of the water-efficient measures and techniques set forth in subsection (4) of this section and adopted by the covered entity after June 4, 1991.~~

~~(7)~~ (5) ~~Except for the elements of a water use efficiency plan which a covered entity has already implemented prior to June 4, 1991, before adopting any other major elements of a plan under subsections (2) and (4) of this section,~~ EACH COVERED ENTITY SHALL FOLLOW THE COVERED ENTITY'S RULES, CODES, OR ORDINANCES TO MAKE THE DRAFT PLAN AVAILABLE FOR PUBLIC REVIEW AND COMMENT. IF THERE ARE NO RULES, CODES, OR ORDINANCES GOVERNING THE COVERED ENTITY'S PUBLIC PLANNING PROCESS, THEN each covered entity shall publish a draft plan, give public notice of the plan, make such plan publicly available, and solicit comments from the public for a period of not less than sixty days after the date on which the draft plan is made publicly available. Reference shall be made in the public notice to the elements of a plan that has already been implemented.

(6) THE BOARD IS HEREBY AUTHORIZED TO RECOMMEND THE APPROPRIATION AND EXPENDITURE OF SUCH REVENUES AS ARE NECESSARY FROM THE UNOBLIGATED BALANCE OF THE FIVE PERCENT SHARE OF THE OPERATIONAL ACCOUNT OF THE SEVERANCE TAX TRUST FUND DESIGNATED FOR USE BY THE BOARD FOR THE PURPOSE OF THE OFFICE PROVIDING ASSISTANCE TO COVERED ENTITIES TO DEVELOP WATER CONSERVATION PLANS THAT MEET THE PROVISIONS OF THIS SECTION.

(7) BY JULY 1, 2005, THE BOARD SHALL ADOPT GUIDELINES FOR THE OFFICE TO REVIEW WATER CONSERVATION PLANS SUBMITTED BY COVERED ENTITIES. THE GUIDELINES SHALL DEFINE THE METHOD FOR SUBMITTING PLANS TO THE OFFICE, HOW THE OFFICE WILL PRIORITIZE THE DISTRIBUTION OF MONEYS, AND THE INTEREST RATE SURCHARGE PROVIDED FOR IN PARAGRAPH (d) OF SUBSECTION (9) OF THIS SECTION.

(8) A covered entity may at any time adopt changes to ~~the~~ AN APPROVED plan IN ACCORDANCE WITH THIS SECTION AFTER NOTIFYING AND RECEIVING CONCURRENCE FROM THE OFFICE. If the proposed changes are major, the covered entity shall give public notice of the changes, make the changes available in draft form, and provide the public an opportunity to comment on such changes before adopting them IN ACCORDANCE WITH SUBSECTION (5) OF THIS SECTION.

(9) (a) ~~After five years following June 4, 1991,~~ Neither the board nor the Colorado water resources and power development authority shall ~~accept an application from~~ RELEASE LOAN PROCEEDS TO a covered entity ~~for financial assistance in the construction of any water diversion, storage, conveyance, water treatment, or wastewater treatment facility~~ unless such covered entity ~~includes~~ PROVIDES a copy of the water ~~use efficiency~~ CONSERVATION plan adopted pursuant to this section; ~~and a copy of other such plans, if any, otherwise adopted by the covered entity.~~ EXCEPT THAT THE BOARD OR THE AUTHORITY MAY RELEASE SUCH LOAN PROCEEDS IF THE BOARD OR THE AUTHORITY, AS APPLICABLE, DETERMINES THAT AN UNFORSEEN EMERGENCY EXISTS IN RELATION TO THE COVERED ENTITY'S LOAN APPLICATION, IN WHICH CASE THE BOARD OR THE AUTHORITY, AS APPLICABLE, MAY IMPOSE A LOAN SURCHARGE UPON THE COVERED ENTITY THAT MAY BE REBATED OR REDUCED IF THE COVERED ENTITY SUBMITS AND ADOPTS A PLAN IN COMPLIANCE WITH THIS SECTION IN A TIMELY MANNER AS DETERMINED BY THE BOARD OR THE AUTHORITY, AS APPLICABLE.

(b) ~~After five years from June 4, 1991,~~ The board and the Colorado

water resources and power development authority, to which any covered entity has applied for financial assistance for the construction of a water diversion, storage, conveyance, water treatment, or wastewater treatment facility, shall consider any water ~~use efficiency~~ CONSERVATION plan filed pursuant to ~~paragraph (a) of~~ this ~~subsection (9)~~ SECTION in determining whether to render financial assistance to such entity. Such consideration shall be carried out within the discretion accorded the board and the Colorado water resources and power development authority pursuant to which such board and authority render such financial assistance to such covered entity.

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

(10) Repealed.

(11) (a) ~~On and after April 25, 2003,~~ Any new restrictive covenant that prohibits or limits the installation or use of drought-tolerant vegetative landscapes is prohibited.

(b) As used in this subsection (11), "restrictive covenant" means any covenant, restriction, or condition applicable to real property for the purpose of controlling land use, but does not include any covenant, restriction, or condition imposed on such real property by any governmental entity.

SECTION 4. Article 60 of title 37, Colorado Revised Statutes, is amended BY THE ADDITION OF A NEW SECTION to read:

37-60-126.5. Drought mitigation planning - programs - relationship to state assistance. (1) AS USED IN THIS SECTION, UNLESS THE CONTEXT OTHERWISE REQUIRES, "DROUGHT MITIGATION" MEANS THE PLANNING AND IMPLEMENTATION OF ACTIONS AND PROGRAMS USED IN PERIODS OF UNUSUAL WATER SCARCITY, WITH A COMBINATION OF ACTIONS AND PROGRAMS TAKEN BEFORE A DROUGHT TO REDUCE THE OCCURRENCE AND SEVERITY OF WATER SUPPLY SHORTAGES, AND ACTIONS AND PROGRAMS

TAKEN DURING A DROUGHT TO MANAGE WATER SUPPLIES AND WATER DEMAND APPROPRIATELY.

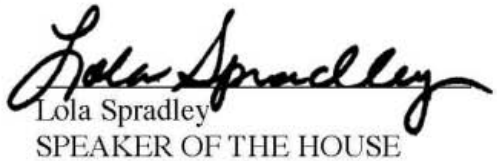
(2) THE OFFICE SHALL DEVELOP PROGRAMS TO PROVIDE TECHNICAL ASSISTANCE TO COVERED ENTITIES AND OTHER STATE OR LOCAL GOVERNMENTAL ENTITIES IN THE DEVELOPMENT OF DROUGHT MITIGATION PLANS.

(3) THE BOARD IS HEREBY AUTHORIZED TO RECOMMEND THE APPROPRIATION AND EXPENDITURE OF SUCH REVENUES AS IS NECESSARY FROM THE UNOBLIGATED BALANCE OF THE FIVE PERCENT SHARE OF THE OPERATIONAL ACCOUNT OF THE SEVERANCE TAX TRUST FUND DESIGNATED FOR USE BY THE BOARD FOR THE PURPOSE OF ASSISTING COVERED ENTITIES AND OTHER STATE AND LOCAL GOVERNMENTAL ENTITIES TO DEVELOP DROUGHT MITIGATION PLANS IDENTIFIED AS SUFFICIENT BY THE OFFICE.

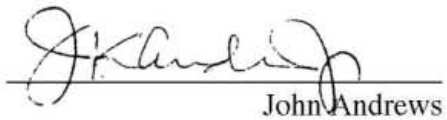
(4) BY JULY 1, 2005, THE BOARD SHALL ADOPT GUIDELINES FOR THE OFFICE TO USE IN REVIEWING AND EVALUATING DROUGHT MITIGATION PLANS SUBMITTED BY COVERED ENTITIES IN ACCORDANCE WITH THIS SECTION. THE GUIDELINES SHALL DEFINE THE METHOD FOR SUBMITTING PLANS TO THE OFFICE AND SHALL SPECIFY HOW THE OFFICE WILL PRIORITIZE THE DISTRIBUTION OF MONEYS.

SECTION 5. Effective date. This act shall take effect at 12:01 a.m. on the day following the expiration of the ninety-day period after final adjournment of the general assembly that is allowed for submitting a referendum petition pursuant to article V, section 1 (3) of the state constitution (August 4, 2004, if adjournment sine die is on May 5, 2004); except that, if a referendum petition is filed against this act or an item, section, or part of this act within such period, then the act, item, section, or

part, if approved by the people, shall take effect on the date of the official declaration of the vote thereon by proclamation of the governor.



Lola Spradley
SPEAKER OF THE HOUSE
OF REPRESENTATIVES



John Andrews
PRESIDENT OF
THE SENATE

Judith Rodrigue
CHIEF CLERK OF THE HOUSE
OF REPRESENTATIVES

Mona Heustis
SECRETARY OF
THE SENATE

APPROVED 6/4/2004 at 11:05 A.

Bill Owens
GOVERNOR OF THE STATE OF COLORADO

ORD

C.D. No. 2008-207

ORDINANCE NO.: 3084
INTRODUCED BY: Henry

AN ORDINANCE REPEALING ORDINANCE NUMBER 3008 AND REENACTING AN ORDINANCE REVISING AND PRESCRIBING WATER RATES AND CHARGES, SEWER RATES AND CHARGES, AND SOLID WASTE CHARGES FOR THE OPERATION AND MAINTENANCE OF THE WATER, SEWER AND SOLID WASTE SYSTEMS FOR THE CITY OF THORNTON, COLORADO.

WHEREAS, the City of Thornton (City) owns and operates municipal water, wastewater and solid waste systems; and

WHEREAS, Chapter 74 of the Thornton City Code requires rates and charges to be established by Ordinance; and

WHEREAS, on August 28, 2007, the City adopted Ordinance Number 3008 which revised and prescribed water rates and charges, sewer rates and charges and solid waste charges; and

WHEREAS, an increase in rates and charges is necessary to cover the operating costs, debt service payments and construction project costs associated with water and sewer services; and

WHEREAS, Metro Wastewater Reclamation District (Metro) owns and operates the wastewater treatment facility that the City utilizes and establishes such rates that the City must pay; and

WHEREAS, the Single-Family Residential Equivalent (SFRE) fee established by Metro has increased and the City's rates must be increased accordingly; and

WHEREAS, the reactivation charge fee established by Metro has increased and the City's rates must be increased accordingly.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF THORNTON, COLORADO, AS FOLLOWS:

1. Ordinance Number 3008 is hereby repealed in its entirety and reenacted to read as follows:

Section 1. Definitions.

For purposes of this ordinance, the following definitions shall apply unless the context of the use of the words and phrases clearly require otherwise:

1.1 "Average Winter Consumption" or "AWC" means the average of monthly water meter readings for the billing periods representing November through February (the winter period). The AWC is calculated as winter period consumption divided by the winter period number of days multiplied by 30.42. The process of determining the AWC shall be repeated once each year. In the event that an AWC cannot be established or is not representative of actual use, then the class average for the same meter size shall be used until an AWC can be established.

1.2 "Building" means a structure for the support or shelter of any use or occupancy.

1.3 "Commercial" service means service to any non-profit (excluding churches) or for-profit business, establishment, or activity, or any other service not specifically mentioned in this ordinance.

1.4 "Customer" means the person shown on City records as being responsible for payment on the water and/or sewer and/or solid waste account.

1.5 "Domestic" or "residential" service means service to a single-family residence, a multifamily residence, a duplex, a manufactured home, and to churches.

1.6 "Duplex" means two dwelling units situated on one lot, and sharing a wall or other interconnections with no additional dwelling unit.

1.7 "Dwelling unit" means one or more rooms designed to accommodate one family and containing only one kitchen plus living, sanitary, and sleeping facilities.

1.8 "Inactive Connection" means a connection through which no measurable flow of water has registered on the assigned water meter in any billing period for 10 consecutive years or more, regardless of whether any payment for water or sewer was made during or after the 10 years. Measurable flow means at least 1,000 gallons of water.

1.9 "Industrial" service means any use which introduces water-carried wastes into the sewer system from industrial manufacturing or processing as distinct from or in addition to sanitary sewage, which discharge does, or is likely to, require pre-treatment and/or a substantial increased level of treatment or handling.

1.10 "Irrigation" service means any separately metered connections for vegetation irrigation with no discharge into the sanitary sewer system.

1.11 "Manufactured home" means a factory-assembled structure without permanent foundations and designed to be transported on its own wheels, arriving at the site as a complete dwelling unit. Removal of the wheels and placement on a foundation does not change its classification. The term "manufactured home" includes half units that are transported to the site on their own wheels and assembled. It does not include travel trailers, campers, camper buses, motor homes, or modular houses.

1.12 "Metro Wastewater Reclamation District" is referred to herein as Metro.

1.13 "Monthly Outdoor Allowance" means the amount of water allotted to each customer, based on customer classification and meter size, for outdoor usage. The Monthly Outdoor Allowance may be adjusted administratively as necessary by the Utilities Director based on water supply projections to meet the stated water conservation goals of the City.

1.14 "Multifamily Residence" means any apartment, condominium, or townhouse having three or more dwelling units within such building.

1.15 "Owner" means the fee owner of real property identified in the County property records.

1.16 "Property" means the real property that is served by the City's water and sewer system.

1.17 "Sewer Connection" means the point where an individual sanitary sewer service line attaches to the City's sewer system, thereby allowing the discharge of a individual sewage waste stream to the sewer collection main.

1.18 "Single-Family Residence" means any building situated on one lot with a single dwelling, and sharing no common wall, foundation, or other interconnection with another dwelling unit or other structure or use.

1.19 "Single-Family Residential Equivalent" or "SFRE" means the capacity of sewer service or water service required for a single family residence.

1.20 "Tampering" mean any unauthorized opening of the meter pit that results in removal or any adjustment of the meter, Encoded Receiver Transmitter (ERT), or ERT wiring, or the turning on or off of any valves; installation of any water by-passing device in lieu of the City water meter; and any damage to the meter, meter pit, meter pit lid, ERT or dome.

1.21 "Tap" or "Tapping" means the physical point of connection of a service line to the City's potable water distribution or sanitary sewer systems.

1.22 "Water Connection" means the point where a water service line attaches to a water main, thereby allowing water to flow from the City's water system to an individual customer.

Section 2. Domestic, Commercial, Irrigation and Industrial Water Rates and Charges.

2.1 Budget Billing: The Utilities Director shall have the authority to promulgate, by administrative regulation, a budget billing program that operates to equalize the monthly water service charges by averaging seasonal use variations. Any such program will be available to those residential customers who qualify under the guidelines established by the programs on an elective basis.

2.2 Domestic Water Service Charge: The following monthly charges are established for domestic water service, regardless of the amount of water consumed:

Meter Size Inches	Domestic Inside the City Monthly Service Charge	Domestic Outside the City Monthly Service Charge
5/8 x ¾	$ 2.61	$ 3.92
¾	3.15	4.73
1	3.98	5.97
1-1/2	6.86	10.29
2	8.24	12.36
3	17.84	26.76
4	31.57	47.36
6	61.77	92.66

2.3 Domestic Water Quantity Charge: The following monthly charges per 1,000 gallons are established for domestic service:

Tier	Allowed Monthly Usage per Tier (in 1,000s of Gallons)	Domestic Inside the City Quantity Charge (Per 1,000 Gallons)	Domestic Outside the City Quantity Charge (Per 1,000 Gallons)
1	0 – AWC*	$3.28	$4.92
2	> AWC up to AWC + Monthly Outdoor Allowance*	3.28	4.92
3	> AWC + Monthly Outdoor Allowance up to AWC + 2x Monthly Outdoor Allowance	4.92	7.38
4	All Usage above AWC + 2x Monthly Outdoor Allowance	9.84	14.76

2.4 Commercial Water Service Charge: The following monthly charges are established for commercial water service, regardless of the amount of water consumed:

Meter Size Inches	Commercial Inside the City Monthly Service Charge	Commercial Outside the City Monthly Service Charge
5/8 x ¾	$ 2.61	$ 3.92
¾	3.15	4.73
1	3.98	5.97
1-1/2	6.86	10.29
2	8.24	12.36
3	17.84	26.76
4	31.57	47.36
6	61.77	92.66

2.5 Commercial Water Quantity Charge: The following monthly charges per 1,000 gallons are established for commercial service:

Tier	Allowed Monthly Usage per Tier (in 1,000s of Gallons)	Commercial Inside the City Quantity Charge (Per 1,000 Gallons)	Commercial Outside the City Quantity Charge (Per 1,000 Gallons)
1	0 – AWC*	$ 3.61	$ 5.42
2	> AWC up to AWC + Monthly Outdoor Allowance*	3.61	5.42
3	> AWC + Monthly Outdoor Allowance up to AWC + 2x Monthly Outdoor Allowance	5.41	8.12
4	All Usage above AWC + 2x Monthly Outdoor Allowance	10.83	16.25

2.6 Irrigation Water Service Charge: The following monthly charges are established for irrigation service, regardless of the amount of water consumed:

Meter Size Inches	Irrigation Inside the City Monthly Service Charge	Irrigation Outside the City Monthly Service Charge
5/8 x ¾	$ 2.61	$ 3.92
¾	3.15	4.73
1	3.98	5.97
1-1/2	6.86	10.29
2	8.24	12.36
3	17.84	26.76
4	31.57	47.36
6	61.77	92.66

2.7 Irrigation Water Quantity Charge: The following monthly charges per 1,000 gallons are established for irrigation service:

Tier	Allowed Monthly Usage per Tier (in 1,000s of Gallons)	Irrigation Inside the City Quantity Charge (Per 1,000 Gallons)	Irrigation Outside the City Quantity Charge (Per 1,000 Gallons)
1	N/A		
2	Monthly Outdoor Allowance*	$ 4.92	$ 7.38
3	> Monthly Outdoor Allowance up to 2x Monthly Allowance	7.39	11.09
4	All Usage above 2x Monthly Outdoor Allowance	14.76	22.14

2.8 Industrial Charges: Monthly charges to industrial customers shall be the subject of a contract reflecting the additional burden caused by the treatment and handling of wastes introduced into the sanitary sewer system.

Section 3: Domestic, Commercial, and Industrial Sewer Charges:

3.1 Domestic Sewer Service Charge: The following monthly charges are established for domestic sewer service, regardless of the amount of water consumed:

Water Meter Size Inches	Domestic Inside the City Monthly Service Charge	Domestic Outside the City Monthly Service Charge
5/8 x ¾	$ 4.73	$ 7.10
¾	5.61	8.42
1	6.68	10.02
1-1/2	8.17	12.26
2	10.77	16.16
3	17.19	25.79
4	30.11	45.17
6	55.88	83.82

3.2 Domestic Sewer Quantity Charge: The quantity charge is based on the Average Winter Consumption (AWC).

A. Monthly Billing: The following charges shall apply for each 1,000 gallons of Average Winter Consumption (AWC) for the most recent winter period:

Domestic Inside the City Quantity Charge	Domestic Outside the City Quantity Charge
$ 2.13	$ 3.20

3.3 Commercial Sewer Service Charge: The following monthly charges are established for commercial sewer service, regardless of the amount of water consumed:

Water Meter Size Inches	Commercial Inside the City Monthly Service Charge	Commercial Outside the City Monthly Service Charge
5/8 x ¾	$ 4.73	$ 7.10
¾	5.61	8.42
1	6.68	10.02
1-1/2	8.17	12.26
2	10.77	16.16
3	17.19	25.79
4	30.11	45.17
6	55.88	83.82

3.4 Commercial Sewer Quantity Charge: The quantity charge is based on the Average Winter Consumption (AWC).

A. Monthly Billing: The following charges shall apply for each 1,000 gallons of Average Winter Consumption (AWC) for the most recent winter period:

Commercial Inside the City Quantity Charge	Commercial Outside the City Quantity Charge
$ 2.33	$ 3.50

3.5 Excessive Strength Surcharge: The following excessive strength surcharge is established:

S=Vs x 8.345 [Metro 1 x (BOD – 240) + Metro 2 (SS – 255)]. Where S equals excessive strength surcharge in dollars, where Vs equals monthly sewage volume in million gallons, where 8.345 equals pounds per gallons of water, where Metro 1 equals the Metro Wastewater Reclamation District's annual charge for BOD expressed in dollars per pound, where BOD equals biochemical oxygen demand strength indexes in milligrams per liter, where 240 equals allowed BOD strength in milligrams per liter, where Metro 2 equals the Metro Wastewater Reclamation District's annual charge for Suspended Solids expressed in dollars per pound, where SS equals Suspended Solids Index in milligrams per liter, and where 255 equals allowed SS strength in milligrams per liter.

3.6 Metro Wastewater Reclamation District Sewer Connection Charge: Where consistent with the terms of any contractual agreement that may otherwise apply to the area to be provided with water or sewer service, the City is obligated to pay Metro Wastewater Reclamation District sewer connection charges to the Metro Wastewater Reclamation District pursuant to a contractual agreement between the City and the Metro Wastewater Reclamation District. The City shall collect such sewer connection charges before any sewer connection shall be authorized on the City municipal wastewater system.

The amount due shall be based upon the number of Single-Family Residential Equivalents (SFRE's) attributable to each connection. The number of SFRE's shall be determined as follows:

A. Single-Family Residential Equivalent is equal to one (1) Single-Family Unit which for purposes of this Section 3.6, means a building or structure used or designed to be used as only one residential unit (including a detached dwelling [single-family house] and a mobile home); each residential unit in a duplex; and each residential unit having water service separately connected to the water main or private water distribution system in a building or structure with three or more residential units.
"Residential Unit" means a room or group of rooms which includes or is designed to include kitchen and bathroom facilities and in which one or more persons could reasonably reside on a permanent and nontransient

basis. (Kitchen facilities include any or all of the following: sink, range, stove, conventional oven, microwave oven. Bathroom facilities include any or all of the following: toilet, bath, shower.) Notwithstanding the above, a room or group of rooms shall not be considered a residential unit if it contains wastewater-generating fixtures other than or in addition to those used or intended to be used in normal residential activities. For example, a group of rooms that includes a residence and a doctor's office, or a residence and a restaurant, in which separate fixtures serve the non-residential uses, will be considered an "Other than Single-Family Residential Property."

B. Other Than Single-Family Residential Property: The following table determines the SFRE's for Other Than Single-Family Residential Property for each water service connection size.

Water Service Connection Size, Inches	Number of SFREs
5/8 x ¾	1.9
¾	1.9
1	4.5
1-1/2	11
2	20
3	42
4	76

C. Water connections specifically made for fire protection purposes such as fire hydrant branches, fire sprinkler systems, stand pipes, irrigation, or other purposes not discharging to the Thornton sewer system, shall be exempt from the foregoing Metro Wastewater Reclamation District sewer connection charge.

D. Metro Wastewater Reclamation District sewer connection charges shall be collected pursuant to such rules and regulations and procedures as may be established from time to time by The Metro Wastewater Reclamation District.

Section 4. Miscellaneous Billing Charges.

4.1 Fire Hydrant Meter Rental Charge. A $1,400 refundable deposit shall be paid to the City upon rental of a fire hydrant meter. The City shall charge a monthly rental fee and a quantity charge per 1,000 gallons of water for rental of a fire hydrant meter. The rental charge and the quantity charge shall apply based on the rates defined in the Ordinance when the hydrant meter is returned to, and read by, City staff. The charge for the monthly rental fee is $40. The charge for quantity charge per 1,000 gallons of water is as follows:

Commercial Inside City	Commercial Outside City
$3.61	$5.42

The renter shall be charged for loss of, or failure to return a fire hydrant meter at current replacement cost for the type of hydrant meter rented. Such charges as well as charges for damages to the meter, actual or estimated quantity charges, and rental charges will be deducted from the deposit. When the charges exceed the deposit the renter will be billed for the balance due. If the charges are less than the deposit, the renter will receive a refund for the difference.

4.2 Late Charge. A late charge of $10.00 shall be added each month to any account on which all charges are not paid by the due date as stated on the monthly bill.

4.3 Master Meter and Meter Accuracy Testing Charge. The Utilities Operations Division performs master meter testing and meter accuracy testing at the customer's request. If the test results prove that the meter is functioning properly, then the customer shall be charged for the accuracy test based on the size of meter being tested. For meters 1" or smaller the charge is established as $50.00. For meters 1-1/2" and larger the charge is established as $145.00. If the meter is found to be operating outside acceptable American Water Works Association (AWWA) tolerances, then there shall be no charge to the customer.

4.4 New Account Charge. When a request is made by a customer to have water service provided, or to change a name on any account, a new account charge of $20.00 will be added. Exceptions to this charge include: 1) name changes on an account due to marriage, dissolution of marriage, and inheritance; and 2) changes to the forwarding address of the owner.

4.5 Non-Commercial Recreational Vehicle Dump Station Charge. A $25.00 fee shall be collected for the use of the recreational vehicle dump station located at the Infrastructure Maintenance Center. The fee of $25.00 covers the time period from when the fee is paid through December 31 of that year. The site is secured and is available only to Thornton residents with the use of an access card which is not transferable. A window sticker provided by the City shall be displayed in the lower right-hand corner of the vehicle's windshield. Only sewage from non-commercial recreational vehicles is allowed to be dumped at this station. Violation of these provisions will result in deactivation of the access card.

4.6 Nonpayment (Turn-off/Turn-on) Charge and Water Restoration.

A. Turn-off/Turn-on Charge. When water is turned off due to delinquency, a charge of $40.00 will be imposed and added to the customer's account. Water shall be turned off at the meter box; provided, however, if water is turned on, caused to be turned on, or is being used by the customer

without authorization by the City; or if the meter pit and valve controlling the service are not readily accessible, the service may be turned off at the main by the City.

B. Water Restoration. Before water service is restored, all Nonpayment Charges, Late Charges, Tampering Charges, and all delinquent charges must be paid.

4.7 Reinspection Charge for Meter and/or Vault Installation. A reinspection charge of $35.00 shall apply for each inspection after initial installation inspection. The fee shall be paid prior to any additional inspection being performed by the City.

4.8 Returned Check Charge. An $18.00 service charge shall apply for returned and dishonored checks received by the City.

4.9.1 Tampering Charges. When tampering has occurred, as defined in Section 1.20, the following charges will be added to the account where the meter is located, plus any additional cost incurred in identifying and correcting the tampering problem.

1st Occurrence	$100
2nd Occurrence	$200
3rd Occurrence	$300

Water will not be restored until all delinquent and tampering charges have been paid.

Section 5. Fire Protection.

5.1 Private Fire Line Charge: The following monthly charges shall apply for each private fire line:

Size of Connection, Inches	Charge
4	$ 32.59
6	80.82
8 and larger	170.78

5.2 Public Fire Protection for Outside City: The following monthly charges are established for public fire protection connections outside the City limits:

A. Single-Family: The monthly charge shall be $ 6.12.

B. Multifamily and Commercial: The following monthly charges shall apply:

Meter Size, Inches	Charge
5/8 x 3/4	$ 6.12
¾	9.79
1	14.61
1-1/2	26.10
2	37.81
3	92.58
4	157.73
6	315.49

Section 6. Tapping

6.1 Water Tapping: All taps to water mains shall be performed by a licensed City contractor at the expense of the applicant.

6.2 Sewer Tapping: All taps to sewer mains shall be performed by a licensed City contractor at the expense of the applicant.

Section 7. Water and Sewer Service Connection Fees.

The following categories of fees are water and sewer service fees, referred to herein as connection fees. Connection fees shall be paid in addition to any other applicable fees otherwise established herein. The City is exempt from payment of connection fees for irrigation sprinkler systems installed to serve any public parks, rights-of-way, open space, or medians, or for irrigation of landscaping for any City owned facility so long as a separate irrigation connection for landscaping is established. The City shall not be exempt from payment of the meter fee as specified in Sections 7.2.D and 7.3.D.

7.1 Time of Payment:

A. Connection fees for buildings, other than individually metered mobile homes, located within the City cannot be paid until after the building has passed the City's inspection of the rough-in-plumbing but shall be fully paid before the City will issue a Certificate of Occupancy for such building.

B. Connection fees for buildings, other than individually metered mobile homes, outside the City limits cannot be paid until after the City has received the certification from a Professional Engineer licensed in the State of Colorado that the yard sewer is installed in accordance with the current version of the City's "Standards and Specifications for the Design and Construction of Public Improvements".

C. Connection fees for individually metered mobile homes cannot be paid until anytime after the date of the building permit approving the set-up of the mobile home from the City or Adams County.

D. Connection fees for irrigation connections shall be paid at the time the meter is requested to be set and prior to initial acceptance of improvement by City. Such fees shall be calculated in accordance with the fees in effect at the time the City receives full payment of the fees. For irrigation connections that are to serve lands owned by, or to be dedicated to the City, the owner or developer shall pay the connection fees for any irrigation connections required at the time designated in this ordinance or as established in a Developer's Agreement, Annexation Agreement, or other agreement, but in no event later than when the meter is requested to be set and prior to initial acceptance of the improvement by the City.

7.2 General Fees

A. Domestic 5/8" x 3/4" Connection (Individually Metered Unit):

Each Individual Living Unit	Water Meter	Water Conn. Per Unit	Water Resource Per Unit	Constr. Water	Metro Sewer	Sewer Conn. Per Unit	* Total
Single-Family	$181	$4,165	$16,350	$39	$2,320	$1,603	$24,658
Duplex	181	2,814	12,507	39	2,320	1,154	19,015
Manufactured Home	181	3,009	13,429	39	2,320	1,205	20,183
Multifamily	181	2,202	11,339	39	2,320	1,125	17,206

Fees for larger meter sizes are available upon request.

B. Multifamily (Master Meter) Connection:

Meter Size	Water Meter	Water Conn. Per Unit	Water Resource Per Unit	Constr. Water	Metro Sewer	Sewer Conn. Per Unit	* Total
5/8 x 3/4"	$181	$2,320	$11,365	$39	$4,408	$1,254	19,567
3/4"	242	2,320	11,365	39	4,408	1,254	19,628
1"	297	2,320	11,365	99	10,440	1,254	25,775
1-1/2"	408	2,320	11,365	99	25,520	1,254	40,966
2"	1,838	2,320	11,365	99	46,400	1,254	63,276

3"	2,059	2,320	11,365	246	97,440	1,254	114,684
4"	2,841	2,320	11,365	246	176,320	1,254	194,346

Fees for larger meter sizes are available upon request.

* Varies depending on number of units.

C. Commercial Connection:

Meter Size	Water Meter	Water Conn. Per Unit	Water Resource Per Unit	Constr. Water	Metro Sewer	Sewer Conn. Per Unit	* Total
5/8 x 3/4"	$181	$4,165	$16,350	$39	$4,408	$3,045	$28,188
3/4"	242	6,248	24,525	39	4,408	3,045	38,507
1"	297	10,413	40,875	99	10,440	7,212	69,336
1-1/2"	408	20,825	81,750	99	25,520	17,630	146,232
2"	1,838	33,320	130,800	99	46,400	32,054	244,511
3"	2,059	66,640	261,600	246	97,440	67,314	495,299
4"	2,841	104,125	408,750	246	176,320	121,807	814,089

D. Irrigation Connection:

Meter Size	Water Meter	Water Conn.	Water Resource	Total
5/8 x 3/4"	$181	$4,165	$16,350	$ 20,696
3/4"	242	6,248	24,525	31,015
1"	297	10,413	40,875	51,585
1-1/2"	716	20,825	81,750	103,291
2"	786	33,320	130,800	164,906
3"	894	66,640	261,600	329,134
4"	1,131	104,125	408,750	514,006

E. Industrial Use Sewer Connection: Sewer service for industrial use shall be provided only on an individual contract basis reflecting the additional

burden caused by the treatment and handling of wastes introduced into the sanitary sewer system.

7.3 Fees within the Big Dry Creek Area Basin

Any and all water and sewer connections within the area depicted in Exhibit A shall be paid at the time of connection. Any provisions in Annexation Agreements related to reimbursing the City for water and sewer lines constructed by the City within the Big Dry Creek Area Basin as denoted in Exhibit A are amended by the water and sewer rates contained herein.

A. Domestic 5/8" x 3/4" Connection (Individually Metered Unit):

Each Individual Living Unit	Water Meter	Water Conn.	Water Resource	Constr. Water	Metro Sewer	Sewer Conn.	Big Dry	Total
Single-Family	$181	$4,165	$16,350	$39	$2,320	$1,603	$492	$25,150
Duplex	181	2,814	12,507	39	2,320	1,154	492	19,507
Manufactured Home	181	3,009	13,429	39	2,320	1,205	492	20,675
Multifamily	181	2,202	11,339	39	2,320	1,125	492	17,698

Fees for larger meter sizes are available upon request.

B. Multifamily (Master Meter) Connection:

Meter Size	Water Meter	Water Conn. Per Unit	Water Resource Per Unit	Constr. Water	Metro Sewer	Sewer Conn. Per Unit	Big Dry Per Unit	* Total
5/8 x 3/4"	$181	$2,320	$11,365	$39	$4,408	$1,254	$492	20,059
3/4"	242	2,320	11,365	39	4,408	1,254	492	20,120
1"	297	2,320	11,365	99	10,440	1,254	492	26,267
1-1/2"	408	2,320	11,365	99	25,520	1,254	492	41,458
2"	1,838	2,320	11,365	99	46,400	1,254	492	63,768
3"	2,059	2,320	11,365	246	97,440	1,254	492	115,176
4"	2,841	2,320	11,365	246	176,320	1,254	492	194,838

Fees for larger meter sizes are available upon request.

* Varies depending on number of units.

C. Commercial Connection:

Meter Size	Water Meter	Water Conn.	Water Resource	Constr. Water	Metro Sewer	Sewer Conn.	Big Dry	Total
5/8 x 3/4"	$181	$4,165	16,350	$39	$4,408	$3,045	$ 1,230	$29,418
3/4"	242	6,248	24,525	39	4,408	3,045	1,230	39,737
1"	297	10,413	40,875	99	10,440	7,212	2,509	71,845
1-1/2"	408	20,825	81,750	99	25,520	17,630	5,904	152,136
2"	1,838	33,320	130,800	99	46,400	32,054	9,348	253,859
3"	2,059	66,640	261,600	246	97,440	67,314	20,172	515,471
4"	2,841	104,125	408,750	246	176,320	121,807	38,376	852,465

Fees for larger meter sizes are available upon request.

D. Irrigation Connection:

Meter Size	Water Meter	Water Conn.	Water Resource	Big Dry	Total
5/8 x 3/4"	$181	$ 4,165	$16,350	$ 1,230	$ 21,926
3/4"	242	6,248	24,525	1,230	32,245
1"	297	10,413	40,875	2,509	54,094
1-1/2"	716	20,825	81,750	5,904	109,195
2"	786	33,320	130,800	9,348	174,254
3"	894	66,640	261,600	20,172	349,306
4"	1,131	104,125	408,750	38,376	552,382

7.4 Connection fees for redeveloped property.

When a lot, tract or unplatted real property (hereafter "Parcel"), currently served by water and/or sewer connections, is to be redeveloped for any purpose that requires enlargement, relocation or replacement of the existing connections, connection fees will be as follows:

7.4.1 For a connection serving a Parcel to be redeveloped without subdivision of such Parcel, the connection fee shall be the difference between fees

applicable to the current size of the connection and use and fees for the increased size of the connection for the redeveloped use.

7.4.2 For a connection serving a Parcel where a subdivision is occurring thereby increasing or decreasing in the size of the Parcel currently served by the connection, the value of the current size connection may be used as a credit to serve any of the newly created lots constituting the subdivided property. If more than one connection and multiple Parcels are being subdivided as one plat, credit shall only be given for connections that are used to serve the subdivision plat.

7.4.3 The difference between connection charges shall be calculated using the fees establish in the City Rate Ordinance in effect at the time of the request. The City will not refund money for connection fees paid or allow a future credit for connection fees except as specifically stated in a development or redevelopment agreement.

7.5 Decreased Connection or Connections: The City will not refund any money or allow a future credit for a connection decreased in size or for connections decreased in total number when the property currently served by such connections is redeveloped.

7.6 Inactive Connection: Upon reactivation, an inactive connection shall be considered a new connection and connection fees in effect shall apply for the Water Connection, Water Resource, Water Meter, Construction Water, Big Dry Basin, and Sewer Connection fees. A Metropolitan Wastewater Reclamation District sewer fee of $90.00 per SFRE each year a connection has been inactive will also apply. The City will not refund any money or allow a future credit.

7.7 Eastlake Customer Service Charge: In addition to charges paid for water consumption, each individual customer within the Eastlake Service Area (as defined in Exhibit A of that certain intergovernmental agreement ("IGA") between the Eastlake Water and Sanitation District and the City of Thornton, dated April 27, 2004) that has elected to pay the Connection Cost for connection to the City's water system in installments, pursuant to the IGA, shall pay an additional monthly charge of $49.78 until such time as the entire balance of such customer's individual total Connection Cost of $7,543 has been paid in full.

Section 8. Wastewater Contribution Permit Fees for Industrial Users.

For the purposes of calculating Industrial Pre-Treatment permit fees, the following definitions shall apply; provided, however, that the Utilities Director or a designee shall, in the exercise of reasonable discretion and based on a finding of designation of an appropriate Class as herein below defined, have the right to determine into what class a particular user falls.

Outside City fees shall be calculated by increasing the corresponding inside City fees by 50 percent.

8.1 Class I. Significant Contributor: Industries which are classified as categorical industries and due to the nature of their wastewater discharge are subject to National Categorical Pre-Treatment Standards or otherwise designated as significant industrial users. This includes, but is not limited to, electroplating and chemical milling and etching.

8.2 Class II. Potential Contributor: Industries which may be classified as categorical industries and the nature of their processes are such that priority pollutants are not discharged under normal operations. This includes, but is not limited to, finishing processes such as anodizing, coating, and chemical etching and milling.

8.3 Class III. Potential Contributor: Industries which may be classified as categorical industries and the nature of their processes are such that priority pollutants are not discharged under normal operations. This includes, but is not limited to, vapor degreasers and petroleum product degreasers.

8.4 Class IV. Potential Contributor: Industries which may be classified as categorical industries and the nature of their processes are such that priority pollutants are not discharged under normal operations. This includes, but is not limited to, non-chemical, detergent cleaning processes which are discharged directly into the sewer system, such as metal deburring and vat cleaning.

8.5 Class V. Potential Contributor: Industries which may be classified as categorical industries and the nature of their processes are such that priority pollutants are not discharged under normal operations. This includes, but is not limited to, storage of oil, gasoline or any chemical or substance in amounts over 100 gallons which could violate any of the provisions of the City's Pre-treatment Program. Examples include, but are not limited to, warehouses and gasoline stations.

8.6 Permit Fees: In accordance with engineering recommendations as to the cost to administer permit fees for each class of industrial user, there are hereby imposed annual permit fees to include administrative costs associated with permit review monitoring by the City as herein set forth:

Class	Inside City Permit Fees (Per Year)	Outside City Permit Fees (Per Year)
Class I	$1,000	$1,500
Class II	500	750
Class III	300	450
Class IV	200	300
Class V	100	150

Section 9. Solid Waste Collection Services.

"Automated or semi-automated integrated solid waste collection service" shall be defined as the refuse removal system provided by the City whereby two containers are supplied to each residential unit in the City, one for ordinary residential refuse and one for recyclable materials, and the contents of each container are removed by the City and transported to a landfill or a materials recovery facility on a regularly scheduled basis. The term Residential Unit shall mean the same as that term is defined in Chapter 58 of the Thornton City Code for this Section 9 and Sections 10 through 12 of this ordinance.

Section 10. Automated or Semi-automated Integrated Solid Waste Collection Basic Customer Fee.

A $13.50 monthly automated or semi-automated integrated solid waste collection basic customer fee for each residential unit receiving City automated or semi-automated integrated solid waste collection service shall be payable to the City at the time the owner/customer of the property receives the City's automated or semi-automated integrated solid waste collection service.

Section 11. Additional Automated or Semi-automated Integrated Solid Waste Collection Service Customer Fees.

11.1 The fee associated with ordinary residential refuse containers shall be as follows:

Number of refuse containers (not including container for recyclable materials)	Monthly Charge
1	$13.50
2	16.00
3	25.20
4	34.40

No more than four (4) ordinary residential refuse containers will be allowed at each residence; unless Subsection (11.2) below stated, is applicable.

11.2 A residential unit requesting additional container(s) for disposal of recyclable materials, as specified in Chapter 58, Article III, Section 58-59 of the Thornton City Code, shall not be assessed additional fees for such containers. Any additional recycling containers supplied by the City to any customer which are utilized for purposes other than those stated in Chapter 58 shall be in violation of said Chapter and subject to those penalties therein.

11.3 Container replacement costs shall be assessed to the residential unit in accordance with current costs associated with replacement of said container including an additional $30.00 service fee per container replaced.

11.4 Container repair charges shall be assessed to the residential unit and shall include all parts and/or labor costs associated with said repair in addition to a $30.00 service fee per container repaired.

11.5 Container repair or replacement costs shall be assessed to the residential unit if it is determined by the City that said replacements and/or repairs were necessitated by reasons including, but not limited to, abuse, misplacement and/or neglect of containers.

11.6 Special and additional solid waste or recyclable material collection requests shall be assessed to the customer in accordance with the current costs associated with: acquisition, operation and maintenance of equipment, labor, and landfill expenditures incurred by the City in providing this service;

11.7 An administrative fee of $30.00 shall be assessed to the residential unit, pursuant to Chapter 58 of the Thornton City Code for the following:

A. Any owner/customer may request one change in service options without the assessment of an administrative fee. Any subsequent requested change in solid waste collection services options shall be assessed applicable administrative fees. These options shall include, but, are not limited to, suspension in service pursuant to Chapter 58, Section 58-65 alley collection versus street collection, or changes in container size from those provided by the City at the time of service inception;

B. Initial owner/customer requests and delivery of additional containers for purpose of solid waste disposal shall not be assessed an administrative fee. However, any subsequent delivery of additional containers for the disposal of solid waste shall be assessed an administrative fee for each occurrence;

C. Any reinstatement of solid waste collection services terminated at the request of any customer, or the City, within the same calendar year.

Section 12. Occupation of Residential Unit.

A residential unit will be deemed to be occupied and receiving City automated or semi-automated integrated solid waste collection service for any given month if one of the following conditions are met:

12.1 Solid waste and/or recyclable materials have been collected by the City at least once during the given month;

12.2 The City has delivered for use at least one automated or semi-automated solid waste and/or recyclable materials container to a residential unit and the opportunity to utilize this change in service has been made available.

Section 13. Payment Cycle.

The payment of the automated or semi-automated integrated solid waste collection user fee will cover service received for the previous billing cycle.

Section 14. Unpaid Fees a Lien.

Unpaid fees imposed by this ordinance shall become a continuing and perpetual lien and charge upon each lot or tract of land receiving automated or semi-automated integrated solid waste collection service and shall have priority over all other liens except general taxes. Said unpaid fees may be collected and the lien herein authorized may be enforced in the same manner as water and sewer charges are collected and enforced in Chapter 74 of the Thornton City Code.

Section 15. Thornton Resident Participation.

Participation by Thornton residents in the City's automated or semi-automated integrated solid waste collection service is voluntary. Additionally, the City reserves the right to refuse service to anyone who fails to comply with any City ordinances or regulations concerning this service, including but not limited to the following: 1) failure to pay fees; or 2) abuse, misplacement and/or neglect of containers.

Section 16. Adjustments by Utilities Director.

The Utilities Director shall have the authority to determine that the public interest is best served by:

16.1 Making determinations regarding the placement of customers within the most appropriate rate classification (domestic, commercial, irrigation or industrial) in keeping with the intent of this Ordinance;

16.2 Adjusting the AWC or Monthly Outdoor Allowance for specific accounts where the prescribed calculations provide amounts that are significantly different than the customer's actual and reasonable usage;

16.3 Adjusting the water quantity charge to a Tier 2 rate due to a specific non-recurring failure of a customer's water line or other loss where the evidence indicates the loss was neither intentional nor due to negligence and corrected within a reasonable period of time;

16.4 Waive charges contained in Section 4 when deemed appropriate.

Section 17. Severability of Invalid Provision.

If any portion of this ordinance is held to be unconstitutional or invalid for any reason, such decision shall not affect the constitutionality or validity of the remaining portions of this ordinance. City Council hereby declares that it would have passed this ordinance and each part hereof irrespective of the fact that any one part be declared unconstitutional or invalid.

Section 18. Repealing Clause.

Ordinance Number 3008 of the City of Thornton, Colorado, is hereby repealed effective as set forth herein. All other ordinances or portions thereof inconsistent or conflicting with this ordinance or any portion hereof are hereby repealed to the extent of such inconsistency or conflict.

Section 19. Saving Clause.

The repeal or amendment of any provision of the Code by this ordinance shall not release, extinguish, alter, modify, or change in whole or in part any penalty, forfeiture, or liability, either civil or criminal, which shall have been incurred under such provision, and each provision shall be treated and held as still remaining in force for the purpose of sustaining any and all proper actions, suits, proceedings, and prosecutions for the enforcement of the penalty, forfeiture, or liability, as well as for the purpose of sustaining any judgment, decree, or order which can or may be rendered, entered, or made in such actions, suits, proceedings, or prosecutions.

Section 20. Effective Date.

This ordinance shall take effect on January 1, 2009, except that Sections 4.2 and 4.6.B shall not apply until notification of utility customers on their billing statement and will then become applicable for the customers' next billing cycle. The rates set forth in Sections 2.3, 2.5 and 2.7 shall remain in effect for one year unless earlier revised as a result of City Council changing the Declared Drought Stage.

Any developer of a multifamily residential project where Special Merit Designation was approved by the City Council on or before October 17, 2002 shall be allowed to pay the 2002 City water and sewer development fees set forth in Ordinance Number 2698 for that project until the Special Merit Designation expires, except for Metro Wastewater Reclamation District fees and Water Meter fees which are effective on or after January 1, 2009.

Section 21.

City Council shall be required to review and change as necessary all rates and Monthly Outdoor Allowances at such time that the City Council or Utilities Director revises the declared drought stage.

INTRODUCED, READ, PASSED on first reading, ordered posted in full, and title ordered published by the City Council of the City of Thornton, Colorado, on December 2, 2008.

PASSED AND ADOPTED on second and final reading on December 16, 2008.

CITY OF THORNTON, COLORADO

Erik Hansen, Mayor

ATTEST:

Nancy A. Vincent, City Clerk

THIS ORDINANCE IS ON FILE IN THE CITY CLERK'S OFFICE FOR PUBLIC INSPECTION.
APPROVED AS TO LEGAL FORM:

Margaret Emerich, City Attorney

PUBLICATION:

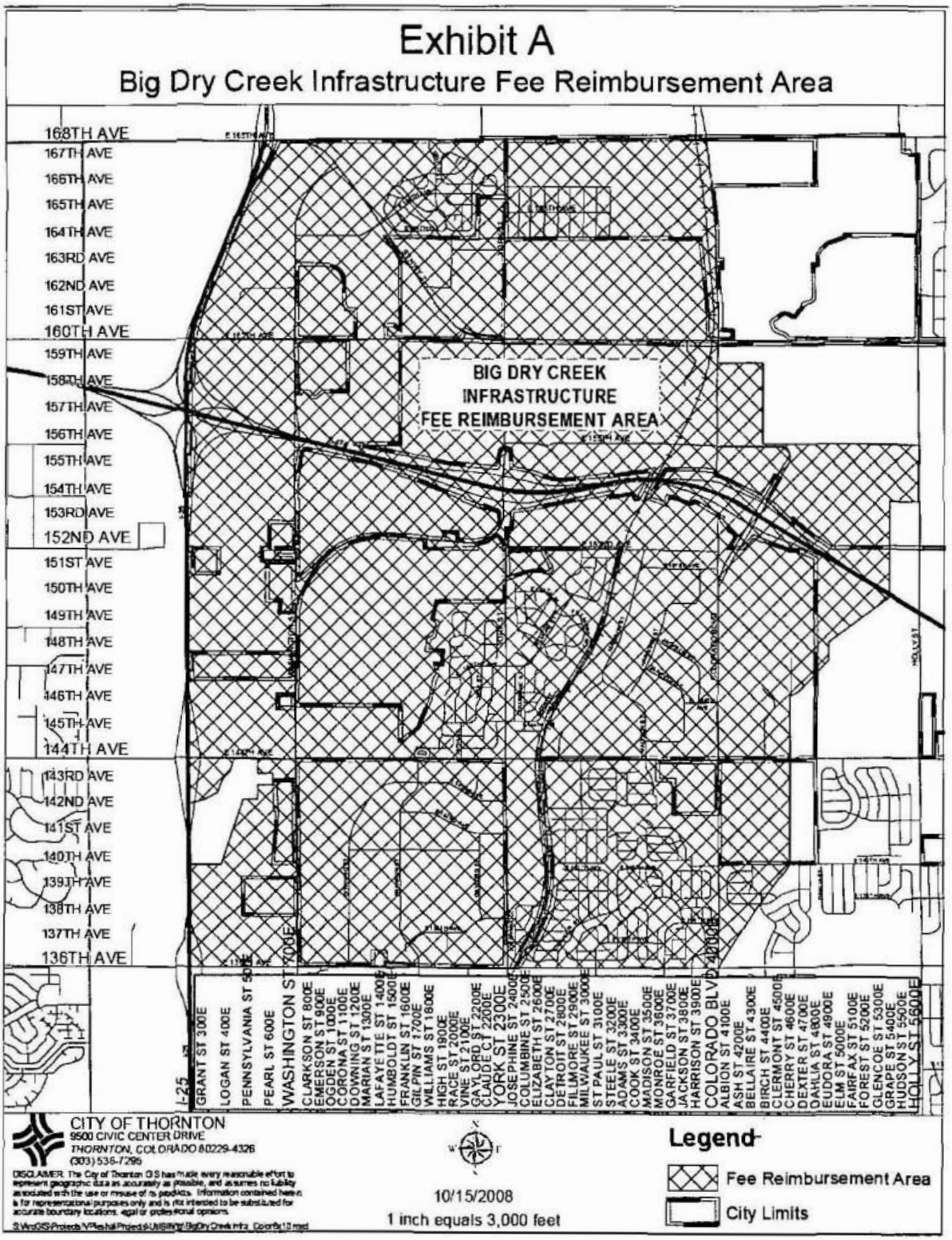
Posted in six (6) public places after first and second readings.

Published in the Northglenn-Thornton Sentinel after first reading on December 11, 2008, and after second and final reading on December 25, 2008.

C.D. NO. 2008 - 207

Exhibit A

Big Dry Creek Infrastructure Fee Reimbursement Area



City of Thornton

Worksheet 1-1: Water System Profile

(As of December 2005)

A	SERVICE CHARACTERISTICS - 2005	Inside City	Outside City	Total
1	Estimated service population	112,300	16,830	129,130
2	Estimated service area (square miles)			35
3	Miles of mains			521
4	Number of treatment plants	2	0	2
5	Number of separate water systems			0
6	Interconnection with other systems			3

B	ANNUAL WATER SUPPLY - 2005	Annual Volume	Number of Intakes or Source Points	Percent Metered
7	Groundwater	305	20	100%
8	Surface water	23,500	8	100%
9	Purchases: raw	0	0	N/A
10	Purchases: treated	0	0	N/A
11	Total annual water supply	23,805	28	100%

C	SERVICE CONNECTIONS - 2005	Connections	Water Sales	Percent Metered
12	Residential, single-family	30,081	$15,532,275	100%
13	Residential, multi-family	3,224		100%
14	Commercial	658	$2,326,980	100%
15	Irrigation	574	$4,303,092	100%
16	Westminster Lease	1	$2,010,825	100%
19	Total connections	34,538	$24,173,172	100%

D	TREATED WATER DEMAND - 2005	Annual Volume	Percent of Total	AF Per Connection
20	Residential, single-family	9,086	43.5%	0.3
21	Residential, multi-family	4,006	19.2%	1.2
22	Commercial	1,779	8.5%	2.7
23	Irrigation	2,575	12.3%	4.4
24	Westminster Lease	1,997	9.6%	
25	Non-account	1,458	7.0%	
26	Total treated water demand	20,901	100.0%	

E	AVERAGE & PEAK DEMAND - 2005	Volume (mgd)	Total Treatment Capacity (mgd)	Percent of Treatment Capacity
27	Average-day demand	21.3	70.0	30.4%
28	Maximum-day demand	45.1	70.0	64.4%
29	Maximum-hour demand	94.7	70.0	135.3%

F	PLANNING	Prepared Plan	Date	Filed with State
30	Adequate water supplies	Long Range Water Plan	September 2006	No
31	Response to drought emergency	Drought Management Plan	August 2002	No
32	Water conservation plan	Water Conservation Plan	September 2001	Yes

City of Thornton

Worksheet 1-2: Summary of System Conditions

PLANNING QUESTIONS	Yes	No	Comment
Is the system in a designated critical water supply area as determined by SWSI?	X		Thornton water supply originates in the South Platte River Basin.
Does the system experience frequent shortages or supply emergencies?		X	Since the drought of 2002 Thornton has taken actions to ensure critical use water supplies remain in storage for use in subsequent years. These actions have included implementation of lawn watering restrictions.
Does the system have substantial unaccounted-for and lost water?		X	Average system loss is 5% 1991-2002, there is an increasing trend.
Is the system experiencing a high rate of population and/or demand growth?		X	2002-5%; 2003-4.3%; 2004-3.8%; 2005-3.5%
Is the system planning substantial improvements or additions?	X		Continued reservoir storage development, water acquisitions and Thornton Northern Project delivery facilities.
Are increases to wastewater system capacity anticipated within the planning horizon?	X		Construction of the Big Dry Creek parallel interceptor sewer and lift station replacement. Wastewater service provided by Metro Wastewater Reclaimation District.

City of Thornton
Worksheet 1-3: Summary of Current Conservation Activities

No.	Water Conservation Measures and Programs	Approximate New Annual Water Savings for 2006 (AF) [if known]	Cumulative Annual Savings Since Inception (AF) [if known]	Implemented Since (date)	Continued Implementation Planned?
1	Washing Machine Rebates	8.8	29.6	May 1, 2003	Yes
2	Toilet Rebates	7.4	29.1	May 1, 2003	Yes
3	Water Restrictions As Needed			May 8, 2003	As Needed
4	City Code, Chapter 74 Utilities, Article III, Conservation of Water Resources (Water waste always a violation)			May 13, 2003	Yes
5	Implementation of Tiered Rate Billing Structure - Ordinance No. 2772			May 15, 2003	Yes
6	Showerhead Exchanges	0.2	0.9	May 17, 2003	Yes
7	Public Outreach, Festivals, Presentations, etc.			May 2003	Yes
8	Revised Landscape Codes Incorporating Water Wise Principles			June 1, 2003	Yes
9	Annual 5th Grade Water Festival			May 1, 2004	Yes
10	Irrigation System Inspections	5.3	8.9	June 1, 2005	Yes
11	Enhanced Toilet Rebates for Flapperless Toilets			N/A	Yes
12	Thornton Community Based Social Marketing Campaign			N/A	Yes
13	Statewide Social Marketing Campaign Participation				
14	Irrigation Controller Rebates			N/A	Yes
15	Water Smart Reader Technology Research				
16	Indoor Water Audit Program Research				
17	ICI Benchmarking Workgroup				
18	Colorado Water Wise Council Participation				
19	Updated Water Conservation Plan				Yes
20	Leak Repair on Distribution System			Since Inception of System	Yes
21	Annual Water Line Replacement Program			N/A	Yes
22	Reusable Effluent & LIRF Operations			Since Decrees for Various Water Rights Obtained	Yes
	Total	21.7	68.5		

Note: Water savings estimates for programs not yet implemented shown on Worksheet 6-1.

City of Thornton

Worksheet 2-1: Preliminary Potable Water Demand Forecast

(values in Acre-Feet)

Line	Item	Base Year (2005)	Current Year Forecast (2008)	5-Year Forecast (2012)	10-Year Forecast (2017)	20-Year Forecast (2027)	Comments
A	**RESIDENTIAL DEMAND**						
1	Current annual water residential sales (AF)	13,092					From Utility Billing
2	Current population served	129,130					From LRWP
3	Residential sales per capita (line 1 divided by line 2)	0.1014					
4	Projected population		134,342	141,292	149,980	167,354	From LRWP
5	Projected annual residential water demand (line 3 multiplied by line 4)		13,620	14,325	15,206	16,967	
B	**COMMERCIAL DEMAND**						
6	Current annual water commercial water sales (AF)	1,779					From Utility Billing
7	Current number of employees or jobs	20,410					From Private Business Sector Report-2nd Quarter 2005 plus estimated ESA employees
8	Water use per employee or job (line 6 divided by line 7)	0.0872					
9	Projected number of employees or jobs		22,791	25,967	29,936	37,875	Used LRWP % water demand increase for commercial and applied that % increase to employee increase
10	Projected annual commercial water demand (line 8 multiplied by line 9)		1,987	2,263	2,609	3,301	
C	**Irrigation Demand**						
11	Current annual irrigation account water sales (AF)	2,536					From Utility Billing
12	Current number of irrigation accounts served	574					
13	Irrigation account water sales per account (line 11 divided by line 12)	4.4181					
14	Projected number of irrigation accounts		597	629	668	746	Used LRWP % water demand increase for irrigation account and applied that % increase to irrigation account increase
15	Projected annual irrigation account demand (line 13 multiplied by line 14)		2,639	2,777	2,949	3,294	
D	**Westminster Contract**						
16	Current and forecast amount (AF)	1,997	2,240	2,240	2,240	2,240	Assumed Westminster will take full contract ammount in the future
E	**NONACCOUNT WATER (WATER NOT SOLD TO CUSTOMERS)**						
17	Current and forecast amount (AF)	1,458	1,626	1,740	1,863	2,109	From LRWP - assumed system loss % remains unchanged.
F	**POTABLE WATER SYSTEM TOTAL DEMAND**						
18	Current total annual water demand (add lines 1, 6, 11, 16 and 17)	20,862					
19	Projected total annual water demand (add lines 5, 10, 15, 16, and 17)		22,113	23,346	24,868	27,912	
20	Adjustments to forecast (+ or -)		0	0	0	0	No adjustments made.
21	Current (line 18) and adjusted total annual water demand forecast (add lines 19 and 20)	20,862	22,113	23,346	24,868	27,912	
22	Current and projected annual supply capacity [f] (current and projected supply is limited by firm yield of water rights)	23,500	27,775	27,775	31,370	32,370	From Water Supply Development Schedule
23	Difference between total use and total supply capacity (+ or -) (subtract line 21 from line 22)	2,638	5,662	4,429	6,502	4,458	
G	**AVERAGE-DAY AND MAXIMUM-DAY DEMAND**						
24	Average-day demand (line 21 divided by 365)	57.16	60.58	63.96	68.13	76.47	
25	Current maximum-day demand (AF)	138.46					From worksheet 1-1
26	Maximum-day to average-day demand ratio (line 25 divided by line 24)	2.42					
27	Projected maximum-day demand (line 24 multiplied by line 26 for all forecast years)		146.76	154.94	165.04	185.25	
28	Adjustment to maximum-day demand forecast		0.00	0.00	0.00	0.00	
29	Current (line 25) and adjusted maximum-day demand forecast (add lines 27 and 28)	138.46	146.76	154.94	165.04	185.25	
30	Daily supply capacity (limited by physical capacity of 70 mgd treatment and distribution system)	214.90	214.90	214.90	214.90	214.90	
31	Ratio of maximum-day demand to daily supply capacity (divide line 29 by line 30)	0.64	0.68	0.72	0.77	0.86	

City of Thornton

Worksheet 3-1: Anticipated Improvements and Additions – 2008 through 2027

(values in 2006 Dollars)

Type(s) of Project(s) [a]	Improvement	New Capacity	Start Date	End Date
Water Acquisition	☑	☑	2008	2027
Reservoirs & Raw Water Projects	☑	☑	2008	2027
Water Treatment Plant Upgrades	☑	☐	2008	2027
Distribution System	☑	☑	2008	2027
Waterline Oversizing	☑	☑	2008	2027
Water Quality Projects	☑	☐	2008	2027
Sanitary Sewer Systems	☑	☑	2008	2027
Other:	☐			

Need(s) for Project(s) (Check all that apply)		**Notes**
Enhance compliance with regulations	☑	
Replace older equipment or facilities	☑	
Meet average-day demand	☑	
Meet maximum-day demand	☑	
Meet future growth needs	☑	
Other:	☐	

Category	2008-2012 Total	2013-2017 Total	2018-2027 Total	2008-2027 Total
Source of Supply	$100,752,944	$34,353,600	$86,746,000	$221,852,544
Water Acquisition	$23,514,175	$17,892,100	$15,220,000	$56,626,275
Reservoirs & Raw Water Projects	$77,238,769	$16,461,500	$71,526,000	$165,226,269
Water Treatment Facilities	$10,400,000	$8,580,000	$4,500,000	$23,480,000
Treated Water Storage	$0	$0	$6,010,000	$6,010,000
Major Transmission Lines	$22,446,000	$9,851,000	$17,229,000	$49,526,000
Distribution System Projects	$20,491,000	$9,551,000	$16,629,000	$46,671,000
Waterline Oversizing Projects	$1,955,000	$300,000	$600,000	$2,855,000
Wastewater System	$3,861,000	$2,800,000	$750,000	$7,411,000
Water Facilities (buildings/offices, etc.)	$1,073,750	$0	$798,000	$1,871,750
Wastewater Facilities (buildings/offices, etc.)	$773,100	$0	$400,000	$1,173,100
Water System O&M	$4,587,586	$8,161,041	$24,223,120	$36,971,748
Wastewater System O&M	$4,587,586	$8,161,041	$24,223,120	$36,971,748
Grand Total	$148,481,966	$71,906,683	$164,879,240	$385,267,889

Water purchases		
Anticipated future firm yield additions through 2026:	6,670	(acre-feet)
	2,173,419,500	(gallons)
Cost of future firm yield additions through 2026:	$33,261	(dollars per acre-foot)
(Includes Acquistion, Reservoirs, & Raw Water Projects because they contribute to firm yield additions)	$0.1021	(dollars per gallon)

[a] Plans include wastewater facilities.

City of Thornton

Worksheet 3-2: Cost of Supply-Side Facilities – 2008 through 2027

Line	Item	Facilities for Meeting Average-Day Demand	Facilities for Meeting Maximum-Day Demand [a]			Water Purchases Needed to Meet Demand [b]	Wastewater Systems	Estimate of Simple Incremental Supply Cost ($/gallon)
		Source of Supply	Water Treatment Facilities	Treated Water Storage	Major Transmission Lines			
A	**SUPPLY CAPACITY IN ANNUAL GALLONS**							
1	Current installed capacity or water purchases	10,378,322,500	25,550,000,000	9,891,500,000	25,550,000,000	0	11,680,000,000	
2	Planned improvements and additions	6,125,980,000	7,300,000,000	3,650,000,000	15,751,210,000	2,173,511,294	6,314,500,000	
3	Planned retirements	0.0	0.0	0.0	0.0	0.0	0.0	
4	Future installed capacity or purchases (line 1 plus line 2 less line 3)	16,504,302,500	32,850,000,000	13,541,500,000	41,301,210,000	2,173,511,294	17,994,500,000	
B	**COST OF PLANNED IMPROVEMENTS AND ADDITIONS**							
5	Approximate total cost of planned improvements and additions identified in line 2 (including financing costs)	$165,226,269	$23,480,000	$6,010,000	$49,526,000	$56,626,275	$7,411,000	
6	Expected life of new facilities (years)	100	50	50	50	100	50	
7	Estimated annual capital costs (line 5 divided by line 6)	$1,652,263	$469,600	$120,200	$990,520	$566,263	$148,220	
8	Estimated annual operating costs [d]	$7,768,700	$7,768,700	$7,768,700	$7,768,700	$7,768,700	$38,144,848	
9	Estimated total annual costs (line 7 plus line 8) [e]	$9,420,962	$8,238,300	$7,888,900	$8,759,220	$8,334,962	$38,293,068	
10	Per unit cost of new facilities (line 9 divided by line 2)	$0.00154	$0.00113	$0.00216	$0.00056	$0.00383	$0.00606	
11	Simple incremental supply cost (add all entries from line 10)							$0.01528

[a] Additional facilities or capital equipment can be included as appropriate.

[b] The plan should indicate whether purchases are needed to meet average-day or maximum-day demand or both.

[c] Planners should select a reasonable planning horizon for supply facilities and use the same time frame for all facilities.

[d] Annual variable operating cost (including energy, chemicals, and water purchases).

City of Thornton

Worksheet 3-4: Preliminary Annual Supply-Capacity Forecast

(Values in Acre-Feet)

Year	Supply Additions (+)	Retirements (-)	Total Supply Capacity of the System (annual AF)	Comments
2006			24,700	South Tani & Cooley West Resevoirs
2007	1,075	0	25,775	Change of ditch company shares
2008	2,000	0	27,775	Ditch exchange
2009	0	0	27,775	
2010	0	0	27,775	
2011	0	0	27,775	
2012	0	0	27,775	
2013	1,000	0	28,775	TNP by exchange
2014	1,000	0	29,775	TNP by exchange
2015	1,000	0	30,775	TNP by exchange
2016	0	0	30,775	
2017	595	0	31,370	Change of ditch company shares
2018	0	0	31,370	
2019	0	0	31,370	
2020	0	0	31,370	
2021	0	0	31,370	
2022	0	0	31,370	
2023	0	0	31,370	
2024	0	0	31,370	
2025	0	0	31,370	Increased use of Upper Clear Creek with TNP
2026	0	0	31,370	
2027	1,000	0	32,370	TNP by pipeline

City of Thornton

Worksheet 5-1: Conservation Measures Identified in the Planning Process

Measure [a]	Already Implemented?	Evaluated in this Plan (Step 6)?	Comments [b]
DEMAND-SIDE MEASURES			
Water-efficient fixtures and appliances			
Toilets			
Rebates for replacemnt of 3.5 gpf or greater	Yes	Yes	Continue to offer $100 rebates
Increased rebates for flapperless toilets	Yes	Yes	Began offering $125 rebates as of 2007
Urinals	No	Yes	
Showerheads	Yes	Yes	Free showerhead exchange program
Faucets	No	Yes	
Washing machines	Yes	Yes	Continue to offer $125 rebates
Other:			
Free faucet aerator giveaways	Yes	Yes	ECOBA study determined these types of device giveaways do not produce statistically significant water savings. Won't pursue any further.
Landscape efficiency			
Low water use landscapes	Yes	No	City landscape codes revised June 1, 2003.
Drought-resistant vegetation	Yes	No	City landscape codes revised June 1, 2003.
Efficient irrigation	Yes	No	City landscape codes revised June 1, 2003.
Equipment - rain sensor shutoff devices	Yes	Yes	City code already applies to nonresidential districts; and multifamily, single-family attached properties and manufactured home park common areas.
Equipment - ET based controllers	No	Yes	Will be offering rebates for installation of these devices. Details still need to be developed.
Scheduling	Yes	No	
Other:			
Industrial and commercial efficiency			
Water-efficient processes	No	No	Will be evaluated in the future.
Cooling equipment efficiency	No	No	Will be evaluated in the future.
Other:			
Northern Colorado Utilities ICI Workgroup	Yes	No	Participation in group studying strategies for the ICI sector.
SUPPLY-SIDE MEASURES			
Water reuse systems			
Management of reusable effluent	Yes	No	
Management of reusable lawn irrigation return flows	Yes	No	
Distribution system efficiency			
Leak repair	Yes	Yes	Continuous program to check for leaks and replace older water lines.
Removal of phreatophytes	No	No	Phreatophytes not a significant issue in Thornton. Phreatophytes located next to ditches and trails are considered to be a community asset.
Other [specify]			
Temporary transfers from agriculture			
Dry year leasing	Yes	No	Implemented as necessary and available.
Rotational fallowing	No	No	
Water salvage	No	No	
Other:			
Source optimization			
Conjunctive use	No	No	Thornton has a surface water based water supplies.
System integration with other utilities	Yes	No	Inter-connects with Denver, Northglenn, and Westminster for emergency situations.
Other:			
Standing agreements with several entities	Yes	No	Several agreements already exist. Opportunities evaluated as they become apparent or are presented.
Temporary raw water leases	Yes	No	Implemented as necessary and available.

[a] To meet the requirements of §37-60-126, C.R.S., measures in shaded rows must be considered.

[b] Use this column to indicate the chief reason(s) a listed measure is not given further evaluation (Planning Step 6) in this plan. Include other comments as appropriate to the planning process.

City of Thornton
Worksheet 5-2: Conservation Programs Identified in the Planning Process

Program [a]	Already Implemented?	Evaluated in this Plan (Step 6)?	Comments [b]
DEMAND-SIDE PROGRAMS			
Education/information dissemination			
Public education	Yes	No	Cannot quantify water savings due to these efforts. Currently use City magazine, web site, mass mailings, newspaper advertising, flyers, City festivals, and active participation on the Colorado Water Wise Council.
Water-saving demonstrations	Yes	No	Provided at City festivals.
Xeriscape™ Demonstration Garden	Yes	No	Located at Margaret Carpenter Recreation Center.
Xeriscape™ Seminars	No	No	Will be evaluated in the future.
School programs	Yes	No	5th Grade Water Festival. City staff available upon request for presentations.
Informative & understandable water bill	Yes	No	
Water bill inserts	No	No	City Council has opted to forego further use of inserts because not all citizens receive a water bill from the City.
Other:			
Social marketing campaign	No	Yes	Implemented in May 2007.
System for Billing to flag high water users and notify water conservation staff	No	No	Will be evaluated in the future.
Water efficiency E-newsletter	No	No	Cannot quantify water savings. Will be evaluated as a component of public education programs in the future.
Technical Assistance			
Customer water use audits - Free Irrigation System Inspections			
Targeted at large residential landscapes	Yes	Yes	Residential customers targeted since 2005.
Targeted at large HOA/Commercial landscapes	Yes	Yes	HOA/Commercial customers targeted since 2006.
Water conservation expert available	Yes	No	Two staff members available.
Other:			
Rate structures & billing systems designed to encourage efficiency			
Volume billing	Yes	No	Based on customer water usage.
Conservation (tiered) rate structure	Yes	No	Implemented in May 2003.
Increased (monthly) billing frequency	Yes	No	Already billed on a monthly basis.
Commercial tap fee rebate for ultra-low volume toilets/urinals	No	No	Will be evaluated in the future.
Commercial tap fee adjustment according to ICI benchmarks	No	No	Will be evaluated when benchmarks are developed by the ICI workgroup.
Incentive to reduce water usage (credit on water bill)	No	No	Rejected: May be seen as unfair by low water use customers.
Regulations/Ordinances			
Addressing fixtures & appliances			
Standards for fixtures & appliances	No	No	Rebate incentives are already offered. Voluntary approach is more compatible with the community rather than a regulatory approach.
Time of sale upgrades	No	No	Rebate incentives are already offered. Voluntary approach is more compatible with the community rather than a regulatory approach.
Other:			
Addressing landscapes			
Turf restrictions	Yes	No	New developments, varying levels of maximum limits allowed depending on land use.
Landscape design/layout	Yes	No	Requires all new developments to follow water-wise landscaping principals.
Soil preparation	Yes	No	Landscape Code.
Irrigation equipment	Yes	Yes	Rain sensors required on automatic irrigation systems for nonresidential districts; and multifamily, single-family attached properties and manufactured home park common areas.
Rule: No watering between 10 am and 6 pm	No	Yes	Permanent rule restricting landscape watering to cooler hours of the day.
Irrigation audit required for new developments	No	No	May require additional City Development staff. Will be evaluated in the future.
Separate irrigation tap requirement	No	No	Will be evaluated in the future.
Irrigation tap sizing requirement to meet "no watering between 10 am and 6 pm rule"	No	No	May require additional City Development staff. Will be evaluated in the future.
Homeowner Association Irrigation Efficiency Program	No	No	Will be evaluated in the future.
Water waste prohibition	Yes	No	Already enforced.
Other:			
Incentives			
Rebates			
High efficiency clothes washing machines - $125	Yes	Yes	Ongoing.
Increased rebates for flapperless toilets	No	Yes	Began offering $125 rebates as of 2007.
Replacement of toilets with 3.5 gpf or > - $100	Yes	Yes	Ongoing.
Showerhead exchanges for 3.0 gpm or >	Yes	Yes	Considering phasing out this program.
ET based irrigation controllers	No	Yes	Will be offering rebates for installation of these devices. Details still need to be developed.
Soil amendment rebate	No	No	Will be evaluated in the future.
Give-aways	Yes	No	Provided at City festivals - water conservation related items such as faucet aerators, soil moisture probes, irrigation controllers, xeric seeds, and water conservation information.
Homeowner Association Irrigation Efficiency Incentive Program	No	No	Will be evaluated in the future.
SUPPLY-SIDE PROGRAMS			
Distribution system efficiency			
Leak identification	Yes	Yes	Ongoing.
Meter source water	Yes	No	All source water is measured.
Meter service connections	Yes	No	All service connections are measured.
Meter testing and replacement	Yes	No	Ongoing standard program.
Improved water accounting	Yes	No	Detailed water accounting already in place.
Analysis of non-account water	Yes	Yes	Already monitored.
Other:			
Water line replacement program	Yes	Yes	Standard program to replace old water lines annually.

[a] To meet the requirements of §37-60-126, C.R.S., programs in shaded rows must be considered.

[b] Use this column to indicate chief reason(s) a listed program is not given further evaluation (Planning Step 6) in this plan. Include other comments as appropriate to the planning process.

City of Thornton

Worksheet 6-1(1): Analysis of Each Conservation Measure/Program

Toilet Rebate Program

Describe measure/program: Incentive program offering $100 rebates for the replacement of water wasting 3.5 gpf or greater toilets with the replacement of ultra low flush toilets with 1.6 gpf or less. Old toilets must be destroyed to ensure they do not remain in use. Limited to two toilets per household.			
Typical measure/program water savings:	10,995	gal per	year for each participating household
Estimated number of participating households:	216	per	year
Anticipated life span of the savings	20	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		□	Max. Day Demand
		□	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$100.00
2	Labor		$0.00
3	Rebates or other payments	$100 each	$28,080.00
4	Marketing and advertising		$1,000.00
5	Administration		$7,345.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$36,525.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		216
10	Estimated annual water savings per unit in gallons [e]		10,995
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		2,374,920
12	Expected life span for the savings in years		20
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		47,498,400
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00077 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01451 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$725,915.36
18	Net value of water saved by the measure/program (line 17 less line 8)		$689,390.36

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

Residential WaterSense Toilet Rebate Program

Describe measure/program:			
Incentive program offering $125 rebates for the replacement of water wasting 3.5 gpf or greater toilets with EPA WaterSense labeled toilets. Old toilets must be destroyed to ensure they do not remain in use. Limited to two toilets per household.			
Typical measure/program water savings:	10,995	gal per	year for each participating household
Number of planned participants	50	per	year
Anticipated life span of the savings	20	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		☐	Max. Day Demand
		☐	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$100.00
2	Labor		$0.00
3	Rebates or other payments	$125 each	$8,125.00
4	Marketing and advertising		$1,000.00
5	Administration		$7,345.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$16,570.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		50
10	Estimated annual water savings per unit in gallons [e]		10,995
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		549,750
12	Expected life span for the savings in years		20
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		10,995,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00151 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01378 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$168,035.96
18	Net value of water saved by the measure/program (line 17 less line 8)		$151,465.96

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(3): Analysis of Each Conservation Measure/Program

Flapperless Toilet Rebate Program

Describe measure/program: Incentive program offering $125 rebates for the replacement of water wasting 3.5 gpf or greater toilets with the replacement of ultra low flush toilets flapperless toilets with 1.6 gpf or less. Old toilets must be destroyed to ensure they do not remain in use. Limited to two toilets per household.			
Typical measure/program water savings:	10,995	gal per	year for each participating household
Number of planned participants	50	per	year
Anticipated life span of the savings	20	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		☐	Max. Day Demand
		☐	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$100.00
2	Labor		$0.00
3	Rebates or other payments	$125 each	$8,125.00
4	Marketing and advertising		$1,000.00
5	Administration		$7,345.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$16,570.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		50
10	Estimated annual water savings per unit in gallons [e]		10,995
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		549,750
12	Expected life span for the savings in years		20
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		10,995,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00151 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01378 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$168,035.96
18	Net value of water saved by the measure/program (line 17 less line 8)		$151,465.96

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(4): Analysis of Each Conservation Measure/Program

Clothes Washer Rebate Program

Describe measure/program: Incentive program offering $125 rebates for customers that install high efficiency front load washing machines that are on the list maintained by the Consortium for Energy Efficiency (CEE).			
Typical measure/program water savings:	7,026	gal per	year for each participating household
Number of planned installations:	586	per	year
Anticipated life span of the savings	12	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		☐	Max. Day Demand
		☐	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$70.00
2	Labor		$0.00
3	Rebates or other payments	$125 each	$95,225.00
4	Marketing and advertising		$1,000.00
5	Administration		$7,345.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$103,640.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		586
10	Estimated annual water savings per unit in gallons [e]		7,026
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		4,117,236
12	Expected life span for the savings in years		12
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		49,406,832
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00210 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01319 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$755,081.82
18	Net value of water saved by the measure/program (line 17 less line 8)		$651,441.82

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(5): Analysis of Each Conservation Measure/Program

Irrigation System Evaluations

Describe measure/program:
Provide free automatic irrigation system evaluations to customers. Inspectors evaluate system application rate, uniformity, pressure, soil type and root depth. Customers are provided with recommendations to improve their systems and a customized watering schedule.

Typical measure/program water savings:	12,000	gal per	year for each participating household
Number of planned installations:	140	per	year
Anticipated life span of the savings	5	years	
The measure(s)/program(s) is(are) designed to reduce:		☐	Avg. Day Demand
		☐	Max. Day Demand
		☑	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$962.00
2	Labor		$0.00
3	Rebates or other payments	$75 each	$10,500.00
4	Marketing and advertising		$960.00
5	Administration		$1,185.00
6	Consulting or contracting		$10,500.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$24,107.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		140
10	Estimated annual water savings per unit in gallons [e]		12,000
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		1,680,000
12	Expected life span for the savings in years		5
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		8,400,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00287 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01241 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$128,376.73
18	Net value of water saved by the measure/program (line 17 less line 8)		$104,269.73

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(6): Analysis of Each Conservation Measure/Program

ET-based Irrigation System Controller Rebate Program

Describe measure/program: Installation of ET based irrigation system controllers at homes within the City's service area. Incentive program offering $200 or 50 percent off the purchase price of a qualifying product, whichever is less. Installation of the controller needs to be verified.			
Typical measure/program water savings:	8,001	gal per	year for each participating household
Number of planned installations:	50	per	year
Anticipated life span of the savings	20	years	
The measure(s)/program(s) is(are) designed to reduce:		☐	Avg. Day Demand
		☐	Max. Day Demand
		☑	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$100.00
2	Labor		$0.00
3	Rebates or other payments	$100	$5,000.00
4	Marketing and advertising		$1,000.00
5	Administration		$5,234.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$11,334.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		50
10	Estimated annual water savings per installed controller in gallons [e]		8,001
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		400,050
12	Expected life span for the savings in years		20
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		8,001,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00142 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01387 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$122,278.83
18	Net value of water saved by the measure/program (line 17 less line 8)		$110,944.83

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(7): Analysis of Each Conservation Measure/Program

Multi-Family WaterSense Toilet Rebate Program

Describe measure/program:			
Incentive program offering $50 rebates for the replacement of water wasting 3.5 gpf or greater toilets with EPA WaterSense labeled toilets. Limited to 200 multi-family toilets per year.			
Typical measure/program water savings:	10,995	gal per	year per unit
Number of toilet replacements:	200	per	year
Anticipated life span of the savings	20	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		☐	Max. Day Demand
		☐	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$75.00
2	Labor		$0.00
3	Rebates or other payments	$50 each	$10,000.00
4	Marketing and advertising		$1,000.00
5	Administration		$7,345.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$18,420.00
B	**ESTIMATED SAVINGS**		
9	Number of toilets replaced [d]		200
10	Estimated annual water savings per unit in gallons [e]		10,995
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		2,199,000
12	Expected life span for the savings in years		20
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		43,980,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00042 /gallon
15	Simple incremental cost of water supply [f]		$0.01320 /gallon
16	Cost comparison (line 15 less line 14)		$0.01278 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$580,606.58
18	Net value of water saved by the measure/program (line 17 less line 8)		$562,186.58

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

Multi-Family Submetering Ordinance

Describe measure/program:			
Multi-Family submetering ordinance to require submetering for each dwelling unit.			
Typical measure/program water savings:	8,000	gal per	dwelling unit per year
Number of planned installations:			
Anticipated life span of the savings	20	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		☐	Max. Day Demand
		☐	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		
2	Labor		
3	Rebates or other payments		
4	Marketing and advertising		
5	Administration		$1,400
6	Consulting or contracting		
7	Other		
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$1,400
B	**ESTIMATED SAVINGS**		
9	Number of units to be installed [d]		667
10	Estimated annual water savings per unit in gallons [e]		8,000
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		5,336,000
12	Expected life span for the savings in years		20
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		106,720,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		0.0000 /gallon
15	Simple incremental cost of water supply [f]		0.0153 /gallon
16	Cost comparison (line 15 less line 14)		0.0153 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$1,630,995.73
18	Net value of water saved by the measure/program (line 17 less line 8)		$1,629,595.73

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(9): Analysis of Each Conservation Measure/Program

Showerhead Exchange Program

Describe measure/program: Showerhead exchange program. Customers are allowed to bring in their old water wasting showerhead and exchange it for a 2.0 gpm showerhead. Limited to two showerheads per household.			
Typical measure/program water savings:	337	gal per	participant per year
Number of planned participants (average number of installations since program inception = 1.6 showerheads per participant):	60	per	year for each participating household
Number of planned installations:	96	per	year
Anticipated life span of the savings	5	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		□	Max. Day Demand
		□	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$0.00
2	Labor		$0.00
3	Rebates or other payments	$6 each	$576.00
4	Marketing and advertising		$0.00
5	Administration		$897.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$1,473.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		60
10	Estimated annual water savings per participating household in gallons [e]		337
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		20,220
12	Expected life span for the savings in years		5
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		101,100
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.01457 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.00071 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$1,545.11
18	Net value of water saved by the measure/program (line 17 less line 8)		$72.11

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(10): Analysis of Each Conservation Measure/Program

Indoor Residential Audit Kits

Describe measure/program:			
Provide free indoor residential audit kits upon request to customers within the City's service area.			
Typical measure/program water savings:	3,000	gal per	participant per year
Number of planned participants:	50	per	year for each participating household
Number of planned installations:	50	per	year
Anticipated life span of the savings	5	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		☐	Max. Day Demand
		☐	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$100.00
2	Labor		$0.00
3	Rebates or other payments	$5 each	$250.00
4	Marketing and advertising		$0.00
5	Administration		$1,505.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$1,855.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		50
10	Estimated annual water savings per participating household in gallons [e]		3,000
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		150,000
12	Expected life span for the savings in years		5
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		750,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00247 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01281 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$11,462.21
18	Net value of water saved by the measure/program (line 17 less line 8)		$9,607.21

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(11): Analysis of Each Conservation Measure/Program

Indoor Residential Audits

Describe measure/program: Provide free indoor residential audits, customer pays for any repairs. Target largest indoor water using customers within the City's service area.			
Typical measure/program water savings:	3,000	gal per	participant per year
Number of planned participants:	50	per	year for each participating household
Number of planned installations:	10	per	year
Anticipated life span of the savings	5	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		☐	Max. Day Demand
		☐	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$100.00
2	Labor		$0.00
3	Rebates or other payments	$100 each	$5,000.00
4	Marketing and advertising		$1,000.00
5	Administration		$1,185.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$7,285.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		50
10	Estimated annual water savings per participating household in gallons [e]		3,000
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		150,000
12	Expected life span for the savings in years		5
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		750,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00971 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.00557 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$11,462.21
18	Net value of water saved by the measure/program (line 17 less line 8)		$4,177.21

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

Commercial – Indoor Audits

Describe measure/program: Provide free indoor commercial audits, customer pays for any repairs. Target largest indoor commercial water using customers within the City's service area.			
Typical measure/program water savings:	10,000	gal per	participant per year
Number of planned participants:	5	per	year for each participating household
Number of planned installations:	5	per	year
Anticipated life span of the savings	5	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		☐	Max. Day Demand
		☐	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$100.00
2	Labor		$0.00
3	Rebates or other payments	$500 each	$2,500.00
4	Marketing and advertising		$1,000.00
5	Administration		$1,185.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$4,785.00
B	**ESTIMATED SAVINGS**		
9	Number of participating businesses [d]		5
10	Estimated annual water savings per participating business in gallons [e]		10,000
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		50,000
12	Expected life span for the savings in years		5
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		250,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.01914 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		-$0.00386 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$3,820.74
18	Net value of water saved by the measure/program (line 17 less line 8)		-$964.26

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(13): Analysis of Each Conservation Measure/Program

Turf Replacement

Describe measure/program: Provide rebates for the replacement of High Water-Demand landscaping with Low-Water Demand Landscaping at single family homes. Target customers with largest yards that are more than 60% turf within the City's service area.			
Typical measure/program water savings:	10,000	gal per	year for each participating household
Number of planned participants:	10	per	year for each participating household
Square foot of planned installations (assumes avg. of 1,000 s.f converted):	10,000	s.f. per	year
Anticipated life span of the savings	10	years	
The measure(s)/program(s) is(are) designed to reduce		☐	Avg. Day Demand
		☐	Max. Day Demand
		☑	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$100.00
2	Labor		$0.00
3	Rebates or other payments	$2 per s.f.	$20,000.00
4	Marketing and advertising		$1,000.00
5	Administration		$1,185.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$22,285.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		10
10	Estimated annual water savings per participating household in gallons [e]		10,000
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		100,000
12	Expected life span for the savings in years		10
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		1,000,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.02229 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		-$0.00700 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$15,282.94
18	Net value of water saved by the measure/program (line 17 less line 8)		-$7,002.06

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(14): Analysis of Each Conservation Measure/Program

Faucet Aerator Program

Describe measure/program:			
Kitchen and bathroom aerator giveaway program. Provide free kitchen and bathroom aerators to customers at City festivals and on a walk-in basis. Note: the Evaluation and Cost Benefits Analysis of Municipal Water Conservation Programs (ECOBA) found that these types of programs that were studied yielded statistically insignifcant water savings.			
Typical measure/program water savings:	0	per	participant per year
Number of planned participants:	100	per	year for each participating household
Number of planned installations:	100	per	year
Anticipated life span of the savings	5	years	
The measure(s)/program(s) is(are) designed to reduce		☑	Avg. Day Demand
		□	Max. Day Demand
		□	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$0.00
2	Labor		$0.00
3	Rebates or other payments	$7.50 each	$750.00
4	Marketing and advertising		$0.00
5	Administration		$450.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$1,200.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		100
10	Estimated annual water savings per participating household in gallons [e]		0
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		0
12	Expected life span for the savings in years		5
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		0
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00000 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01528 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$0.00
18	Net value of water saved by the measure/program (line 17 less line 8)		-$1,200.00

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(15): Analysis of Each Conservation Measure/Program

Commercial WaterSense Toilet Rebate Program

Describe measure/program:			
Incentive program offering $100 rebates for the replacement of water wasting 3.5 gpf or greater toilets with EPA WaterSense labeled toilets.			
Typical measure/program water savings:	11,680	gal per	year for each toilet replaced
Number of toilets replaced:	50	per	year
Anticipated life span of the savings	20	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		☐	Max. Day Demand
		☐	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$100.00
2	Labor		$0.00
3	Rebates or other payments	$100 each	$5,000.00
4	Marketing and advertising		$1,000.00
5	Administration		$7,345.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$13,445.00
B	**ESTIMATED SAVINGS**		
9	Number of toilets replaced [d]		50
10	Estimated annual water savings per unit in gallons [e]		11,680
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		584,000
12	Expected life span for the savings in years		20
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		11,680,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00115 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01413 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$178,504.78
18	Net value of water saved by the measure/program (line 17 less line 8)		$165,059.78

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

Commercial Ultra-low Flush Urinal Rebate Program

Describe measure/program:			
Incentive program offering $100 rebates for the replacement of water wasting 1.5 gpf or greater urinals with ultra-low flush urinals (0.5 gpf).			
Typical measure/program water savings:	20,592	gal per	year for each participating account
Number of planned participants:	50	per	year
Anticipated life span of the savings	20	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		□	Max. Day Demand
		□	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$100.00
2	Labor		$0.00
3	Rebates or other payments	$400 each	$20,000.00
4	Marketing and advertising		$1,000.00
5	Administration		$7,345.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$28,445.00
B	**ESTIMATED SAVINGS**		
9	Number of participating accounts [d]		50
10	Estimated annual water savings per unit in gallons [e]		20,592
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		1,029,600
12	Expected life span for the savings in years		20
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		20,592,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00138 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01390 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$314,706.37
18	Net value of water saved by the measure/program (line 17 less line 8)		$286,261.37

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

Social Marketing Campaign

Describe measure/program:			
Develop and implement a social marketing campaign that is designed to identify barriers that inhibit individuals from engaging in water efficient practices and tailor messages in a manner that they illustrate the benefits to individuals by engaging in water efficient practices. [Note: Not able to quantify water savings.]			
Typical measure/program water savings:	0.5%		of annual demand for single family
Number of planned participants:	0	per	year for each participating household
Number of planned installations:	Cannot Quantify	per	year
Anticipated life span of the savings	10	years	
The measure(s)/program(s) is(are) designed to reduce		□ □ ☑	Avg. Day Demand Max. Day Demand Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$0.00
2	Labor		$0.00
3	Rebates or other payments	$0.00 each	$0.00
4	Marketing and advertising		$50,000.00
5	Administration		$1,458.00
6	Consulting or contracting		$45,000.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$96,458.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		0
10	Estimated annual water savings per participating household in gallons [e]		Cannot Quantify
11	Total estimated annual savings for the measure/program in gallons - based on projected savings of 0.5% of estimated annual demand for SFR		21,330,141
12	Expected life span for the savings in years		10
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		213,301,410
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00045 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01483 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$3,259,873.39
18	Net value of water saved by the measure/program (line 17 less line 8)		$3,163,415.39

Note: Unable to quantify expected savings from a campaign of this type.

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

Leak Detection and Repair

Describe measure/program:
The City of Thornton has implemented a systematic pipeline replacement program in an effort to improve water distribution system performance while controlling costs. All water breaks/repairs have been analyzed the years 1999 through 2005. The analysis led to the development of this systematic pipeline replacement program focused primarily on the oldest pipelines in the distribution system.

Typical measure/program water savings:	1.0%	per	year
Number of planned participants:	1	per	year
Number of planned installations:	1	per	year
Anticipated life span of the savings	50	years	
The measure(s)/program(s) is(are) designed to reduce:		☐	Avg. Day Demand
		☐	Max. Day Demand
		☑	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$0.00
2	Labor		$3,586.00
3	Rebates or other payments	$330,000.00 each	$330,000.00
4	Marketing and advertising		$0.00
5	Administration		$0.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$333,586.00
B	**ESTIMATED SAVINGS**		
9	Number of repairs [d]		1
10	Estimated annual water savings per repair in gallons [e]		5,192,129
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		5,192,129
12	Expected life span for the savings in years		50
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		259,606,467
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00128 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01400 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$3,967,550.97
18	Net value of water saved by the measure/program (line 17 less line 8)		$3,633,964.97

Note:

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(19): Analysis of Each Conservation Measure/Program

Rain Sensor Rebate Program

Describe measure/program: Incentive program offering $25 rebates for customers that install rain sensor shutoff devices on their automatic sprinkler systems.			
Typical measure/program water savings:	2,880	gal per	year for each participating household
Number of planned participants:	50	per	year
Number of planned installations:	50	per	year
Anticipated life span of the savings	10	years	
The measure(s)/program(s) is(are) designed to reduce:		☐	Avg. Day Demand
		☐	Max. Day Demand
		☑	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$0.00
2	Labor		$0.00
3	Rebates or other payments	$25.00 each	$1,250.00
4	Marketing and advertising		$0.00
5	Administration		$1,185.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$2,435.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		50
10	Estimated annual water savings per unit in gallons [e]		2,880
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		144,000
12	Expected life span for the savings in years		10
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		1,440,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00169 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01359 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$22,007.44
18	Net value of water saved by the measure/program (line 17 less line 8)		$19,572.44

Note:

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(20): Analysis of Each Conservation Measure/Program

Hot Water Recirculation System Rebate Program

Describe measure/program: Incentive program offering $100 rebates for customers that install hot water recirculation systems in single family homes within the City's service area.			
Typical measure/program water savings:	2,000	gal per	year for each participating household
Number of planned participants:	50	per	year
Number of planned installations:	50	per	year
Anticipated life span of the savings	10	years	
The measure(s)/program(s) is(are) designed to reduce:		☑	Avg. Day Demand
		☐	Max. Day Demand
		☐	Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	**COST OF THE MEASURE(S)/PROGRAM(S) [a]**	**Per unit [b]**	**Total cost of the measure/program**
1	Materials		$0.00
2	Labor		$0.00
3	Rebates or other payments	$100.00 each	$5,000.00
4	Marketing and advertising		$1,000.00
5	Administration		$1,185.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$7,185.00
B	**ESTIMATED SAVINGS**		
9	Number of participating homes [d]		50
10	Estimated annual water savings per unit in gallons [e]		2,000
11	Total estimated annual savings for the measure/program in gallons (multiply line 9 by line 10)		100,000
12	Expected life span for the savings in years		10
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		1,000,000
C	**ANALYSIS OF COST EFFECTIVENESS**		**Amount**
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00719 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.00810 /gallon
D	**NET BENEFIT OF CONSERVATION**		**Amount**
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$15,282.94
18	Net value of water saved by the measure/program (line 17 less line 8)		$8,097.94

Note:

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-1(21): Analysis of Each Conservation Measure/Program

Efficient Landscape Irrigation Campaign: Promote No Watering Between 10 am and 6 pm

Describe measure/program: Voluntary rule established to reduce irrigation water loss via evaporation. Irrigation discouraged between the hours of 10 am and 6 pm.			
Typical measure/program water savings:	72,954,364	gal per	year
Number of planned participants:	0	per	year for each participating household
Number of planned installations:	0	per	year
Anticipated life span of the savings	20	years	
The measure(s)/program(s) is(are) designed to reduce:		☐ ☐ ☑	Avg. Day Demand Max. Day Demand Both Avg. & Max day Demand

Line	Item	Amount	Amount
A	COST OF THE MEASURE(S)/PROGRAM(S) [a]	Per unit [b]	Total cost of the measure/program
1	Materials		$0.00
2	Labor	$12,000 per year	$12,000.00
3	Rebates or other payments	each	$0.00
4	Marketing and advertising		$0.00
5	Administration		$1,458.00
6	Consulting or contracting		$0.00
7	Other		$0.00
8	Total program costs for the life of the measure/program (add lines 1 through 7) [c]		$13,458.00
B	ESTIMATED SAVINGS		
9	Number of participating homes [d]		Cannot Quantify
10	Estimated annual water savings per participating household in gallons [e]		Cannot Quantify
11	Total estimated annual savings for the measure/program in gallons		72,954,364
12	Expected life span for the savings in years		20
13	Total life span estimated savings for the measure/program in gallons (multiply line 11 by line 12)		1,459,087,285
C	ANALYSIS OF COST EFFECTIVENESS		Amount
14	Cost of water saved by the measure (line 8 divided by line 13)		$0.00001 /gallon
15	Simple incremental cost of water supply [f]		$0.01528 /gallon
16	Cost comparison (line 15 less line 14)		$0.01527 /gallon
D	NET BENEFIT OF CONSERVATION		Amount
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		$22,299,148.49
18	Net value of water saved by the measure/program (line 17 less line 8)		$22,285,690.49

[a] This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure or program, but measures/programs can be combined if they jointly produce water savings.

[b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure/program, in which case total measure/program water savings and costs can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure/program.

[d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e] For example, water savings per retrofit. Leave blank if unit values do not apply.

[f] From Worksheet 3-2, line 11.

City of Thornton

Worksheet 6-2: Comparison of Benefits & Costs of the Conservation Measures & Programs

Line	Conservation Measure/Program [a]	Annual Cost for the Measure/ Program [b]	Anticipated Annual Water Savings in gallons [c]	Cost of Water Saved by the Measure ($/gallon) [d]	Net Benefit of Implementing the Measure/ Program [e]	Selected Program
1	Efficient Landscape Irrigation Campaign (Voluntary No watering 10am to 6pm)	$13,458	72,954,364	$0.00001	$22,285,690	Selected
4	Pipeline Replacement Program	$333,586	5,192,129	$0.00128	$3,633,965	Selected
2	Social Marketing Campaign	$96,458	21,330,141	$0.00045	$3,163,415	Selected
3	Multi-Family Submetering	$1,400	5,336,000	$0.00001	$1,629,596	Rejected
6	Toilet Rebates	$36,525	2,374,920	$0.00077	$689,390	Selected
5	Clothes Washing Machine Rebates	$103,640	4,117,236	$0.00210	$651,442	Selected
7	Multi-Family WaterSense Toilet Rebates	$18,420	2,199,000	$0.00042	$562,187	Selected
9	ULF Urinals	$28,445	1,029,600	$0.00138	$286,261	Selected
11	Residential WaterSense Toilet Rebates	$16,570	549,750	$0.00151	$168,036	Selected
10	Commercial WaterSense Toilet Rebates	$13,445	584,000	$0.00115	$165,060	Selected
12	Flapperless Toilet Rebates	$16,570	549,750	$0.00151	$151,466	Rejected
13	ET Controller Rebates	$11,334	400,050	$0.00142	$110,945	Selected
8	Irrigation System Inspections	$24,107	1,680,000	$0.00287	$104,270	Selected
15	Rain Sensor Rebates	$2,435	144,000	$0.00169	$19,572	Selected
14	Residential Audit Kits	$1,855	150,000	$0.00247	$9,607	Selected
16	Hot water recirculation systems	$7,185	100,000	$0.00719	$8,098	Selected
19	Residential Indoor Audits	$7,285	150,000	$0.00971	$4,177	Selected
20	Showerhead Exchanges	$1,473	20,220	$0.01457	$72	Selected
18	Commercial Indoor Audits	$4,785	50,000	$0.01914	-$964	Rejected
21	Faucets-Aerator Giveaways	$1,200	0	$0.00000	-$1,200	Rejected
17	Residential Turf Replacement Rebates	$22,285	100,000	$0.02229	-$7,002	Rejected

[a] = Combined measures and programs that produce joint conservation savings should be treated as one measure/program to avoid duplicate counting.
[b] = From Worksheet 6-1, line 8.
[c] = From Worksheet 6-1, line 11.
[d] = From Worksheet 6-1, line 14.
[e] = From Worksheet 6-1, line 18. Note: This estimate of net benefit does not consider societal benefits and costs. Net monetary benefit is not the only legitimate criterion for ranking and selection of measures/programs. See the text.

Note: Approaches that address cost escalation and natural cost profiles over disparate project lifespans are available. These methods incorporate discounting to account for the time value of money. Planners are encouraged to use such approaches.

City of Thornton

Worksheet 6-3: Selection of Conservation Measures/Programs and Estimate of Water Savings

Line	Measure/Program	Estimated Reduction in Demand for Selected Measures/Programs (gallons) [a]		
		Avg. Day Demand (gpd)	Max. Day Demand (gpd)	Annual Demand (gal)
1	Clothes Washing Machine Rebates	11,280		4,117,236
2	Toilet Rebates	6,507		2,374,920
3	Showerhead Exchanges	55		20,220
4	Irrigation System Inspections		9,333	1,680,000
5	Pipeline Replacement Program	14,225		5,192,129
6	Flapperless Toilet Rebates	1,506		549,750
7	ET Controller Rebates		2,223	400,050
8	Residential Indoor Audits	411		150,000
9	Residential Audit Kits	411		150,000
10	Commercial Indoor Audits	137		50,000
11	Residential Turf Replacement Rebates		556	100,000
12	Hot water recirculation systems	274		100,000
13	Rain Sensor Rebates		800	144,000
14	ULF Urinals	2,821		1,029,600
15	Social Marketing Campaign (split savings 80% Max Day 20% Avg. Day)	11,688	46,751	21,330,141
16	Multi-Family Submetering	14,619		5,336,000
17	Multi-Family WaterSense Toilet Rebates	6,025		2,199,000
18	Toilets-Commercial	1,600		584,000
19	Efficient Landscape Irrigation Campaign (Voluntary No watering 10am to 6pm)		405,302	72,954,364
20	Residential WaterSense Toilet Rebates	1,506		549,750
Total		73,065	464,964	119,011,161

[a] Based on Worksheet 6-1, line 11. Planners will need to convert estimates of annual water savings to estimates of reductions in average-day and maximum-day demand for each measure or group of measures/programs.

City of Thornton

Worksheet 6-4: **Selection of Conservation Measures/Programs and Estimate of Cumulative Water Savings (AF)**

Line	Measure/Program	Year Started	Estimated Cumulative Reduction in Demand for Selected Measures/Programs (gallons per day) [a]																			Comments
			2008 Annual Savings	2009 Annual Savings	2010 Annual Savings	2011 Annual Savings	2012 Annual Savings	2013 Annual Savings	2014 Annual Savings	2015 Annual Savings	2016 Annual Savings	2017 Annual Savings	2018 Annual Savings	2019 Annual Savings	2020 Annual Savings	2021 Annual Savings	2022 Annual Savings	2023 Annual Savings	2024 Annual Savings	2025 Annual Savings	2026 Annual Savings	Annual Savings	
1	Efficient Landscape Irrigation Campaign (Voluntary No watering 10am to 6pm)	2008	298.52	302.68	306.84	311.01	315.17	319.28	323.39	327.50	331.61	335.72	339.83	343.94	348.05	352.16	356.27	360.38	364.49	368.60	372.71	376.82	
2	Social Marketing Campaign (split savings 80% Max Day 20% Avg. Day)	2008	65.46	130.92	196.38	261.84	327.30	392.76	523.68	523.68	589.14	654.60	720.06	785.52	850.98	916.44	981.90	1047.36	1112.82	1178.28	1243.74	1309.20	
4	Pipeline Replacement Program	2008	15.93	32.52	49.43	66.58	83.98	101.63	119.52	137.66	156.04	174.68	193.55	212.68	232.05	251.67	271.53	291.64	311.99	332.60	353.44	374.54	
5	Clothes Washing Machine Rebates	2008	12.64	25.27	37.91	50.54	63.18	75.81	88.45	101.08	113.72	126.35	138.99	151.62	164.26	176.90	189.53	202.17	214.80	227.44	240.07	252.71	Assumed program is phased out after 2011 due to popularity of these washers not requiring an incentive
6	Toilet Rebates	2008	7.29	14.58	21.87	29.15	36.44	43.73	51.02	58.31	65.60	72.88	80.17	87.46	94.75	102.04	109.33	116.61	123.90	131.19	138.48	145.77	
7	Multi-Family Toilet Rebates	2010	0.00	0.00	6.75	13.50	20.25	26.99	33.74	40.49	47.24	53.99	60.74	67.49	74.23	80.98	87.73	94.48	101.23	107.98	114.72	121.47	
8	Irrigation System Inspections	2008	5.16	10.31	15.47	20.62	25.78	30.93	36.09	41.25	46.40	51.56	56.71	61.87	67.02	72.18	77.34	82.49	87.65	92.80	97.96	103.11	
9	Urinals	2011	0.00	0.00	0.00	3.16	6.32	9.48	12.64	15.80	18.96	22.12	25.28	28.44	31.60	34.76	37.92	41.08	44.24	47.40	50.56	53.72	
10	Toilets - Commercial	2012	0.00	0.00	0.00	0.00	1.79	3.58	5.38	7.17	8.96	10.75	12.55	14.34	16.13	17.92	19.71	21.51	23.30	25.09	26.88	28.68	
11	Residential WaterSense Toilet Rebates	2008	1.69	3.37	5.06	6.75	8.44	10.12	11.81	13.50	15.18	16.87	18.56	20.25	21.93	23.62	25.31	26.99	28.68	30.37	32.06	33.74	
12	ET Controller Rebates	2013	0.00	0.00	0.00	0.00	0.00	1.23	2.46	3.68	4.91	6.14	7.37	8.59	9.82	11.05	12.28	13.50	14.73	15.96	17.19	18.42	
13	Residential Audit Kits	2008	0.46	0.46	0.92	1.38	1.84	2.30	2.76	3.22	3.68	4.14	4.60	5.06	5.52	5.98	6.44	6.91	7.37	7.83	8.29	8.75	
14	Rain Sensor Rebates	2014	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.88	1.33	1.77	2.21	2.65	3.09	3.54	3.98	4.42	4.86	5.30	5.74	6.19	
15	Hot water recirculation systems	2015	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.61	0.92	1.23	1.53	1.84	2.15	2.46	2.76	3.07	3.38	3.68	3.99	
19	Showerhead Exchanges	2008	0.06	0.12	0.19	0.25	0.31	0.37	0.43	0.50	0.56	0.62	0.68	0.74	0.81	0.87	0.93	0.99	1.05	1.12	1.18	1.24	
Total (AF)			407.20	520.24	640.81	764.78	890.79	1018.23	1211.81	1275.02	1403.94	1533.11	1662.52	1792.18	1922.09	2052.24	2182.64	2313.29	2444.18	2575.32	2706.70	2838.33	

City of Thornton

Worksheet 7-1: Modified Demand Forecast

(gallons)

Line	Item	Current Year (2008)	Year 5 (2012)	Year 10 (2017)	Year 20 (2027)
1	Average-day demand before conservation [a]	19,740,738	20,841,807	22,200,656	24,918,354
2	Average-day demand after conservation [b]		20,642,121	21,767,492	24,000,100
3	Reduction in average-day demand (line 1 less line 2)		199,685	433,164	918,254
4	Maximum-day demand before conservation [a]	47,820,520	50,487,781	53,779,495	60,362,924
5	Maximum-day demand after conservation [b]		49,398,662	52,113,864	57,536,851
6	Reduction in maximum-day demand (line 4 less line 5)		1,089,119	1,665,631	2,826,072
7	Ratio maximum-day to average-day demand before conservation (line 4 divided by line 1)	2.42	2.42	2.42	2.42
8	Ratio maximum-day to average-day demand after conservation (line 5 divided by line 2)		2.39	2.39	2.40

[a] From Worksheet 2-1.
[b] Based on Worksheet 6-3.

City of Thornton
Worksheet 7-2: Project-Specific Savings

DESCRIPTION OF PROJECT [a]		
Describe the project: Water Acquisition		
Project was scheduled to begin: Incrementally over the period 2007 through 2026		
Purpose of the project:	□ Improvement	□ Addition
This project is designed to meet:	□ Avg. Day Deman	□ Max. Day Demand
Type of project:	☑ Source of supply □ Water treatment facilities □ Treated water storage □ Major transmission lines □ Purchased water □ Wastewater facility □ Other _____	

CHANGES TO PROJECT [b]

Line	Item	Project Capacity (Daily)	Project Costs	
			Total Capital Costs ($)	Annual Operating Costs ($)
A	**CAPITAL PROJECT IS ELIMINATED**			
1	Original project	N/A	N/A	N/A
2	Savings from elimination (equals line 1)	N/A	N/A	N/A
B	**CAPITAL PROJECT IS DOWNSIZED**			
3	Original project - Firm Yield Water Supply (Acre-Feet)	10,670	$221,852,544	N/A
4	Downsized project - Firm Yield Water Supply (Acre-Feet)	7,963	$165,574,348	N/A
5	Savings from downsizing (line 3 less line 4)	2,707	$56,278,196	N/A
C	**CAPITAL PROJECT IS POSTPONED**			
6	Present value of original project		N/A	N/A
7	Present value of postponed project		N/A	N/A
8	Savings from postponement (line 6 less line 7)		N/A	N/A
D	**NEED FOR PURCHASED WATER IS REDUCED [c]**			
9	Original estimate of purchases	N/A		N/A
10	Revised estimate of purchases (can be "0")	N/A		N/A
11	Savings from reduced purchases (line 9 less line 10)	N/A		N/A

[a] Comprehensive plans can include wastewater facilities.

[b] Based on Worksheet 7-1 estimates of reductions in demand.

[c] For purchased water, report only annual operating costs and include costs associated with take-or-pay contract provisions. Transmission facilities needed to transport purchased water should include capital and operating costs associated with such facilities and reported as a capital project.

City of Thornton

Worksheet 7-3: Modified Supply Forecast and Estimated Total Savings

MODIFIED SUPPLY FORECAST					
Line	Item	Current Year	Year 5 (2012)	Year 10 (2017)	Year 20 (2027)
A	**Forecast Supply Capacity (Daily)**				
1	Supply capacity before conservation program [a]	214.90	214.90	214.90	214.90
2	Planned reduction in supply capacity [b]		0	0	0
3	Supply capacity after conservation (line 1 less line 2)		214.90	214.90	214.90
B	**Capacity Reserve**				
4	Supply capacity less demand (line 3 less line 2 on Worksheet 7-1)		151.55	148.09782	141.24617

ESTIMATED TOTAL SAVINGS				
			Project Costs	
Line	Item	Supply capacity (daily)	Total Capital Costs ($)	Annual Operating Costs ($)
C	**Total Estimated Savings from Changes to Supply Projects [c]**			
1	Cost of supply projects before conservation			
2	Cost of supply projects after conservation			
3	Savings (line 1 less line 2)			
D	**Total Estimated Savings from Reduced Operating Costs at Existing Facilities [d]**			
4	Operating costs before conservation			
5	Operating costs after conservation			
6	Savings (line 4 less line 5)			
E	**Conservation Program Costs**			Total Program Costs ($)
7	Total cost of implementing selected conservation measures [e]			

[a] From Worksheet 2-1.
[b] Based on Worksheet(s) 7-2.
[c] Based on Worksheet(s) 7-2.
[d] Based on annual variable operating cost (including energy, chemicals, and water purchases).
[e] Based on Worksheet 6-2.

City of Thornton

Worksheet 8-1: Implementation Schedule for Measures and Programs

Line	Measure/Program	Required Action	Beginning Date	Completion Date
1	Efficient Landscape Irrigation Campaign (Voluntary No Watering 10am to 6pm)	Market with existing social marketing campaign	2008	On-going
2	Social Marketing Campaign	Currently Implemented	2008	On-going
3	Pipeline Replacement Program	Currently Implemented	2008	On-going
4	Clothes Washing Machine Rebates	Currently Implemented	2008	On-going
5	Toilet Rebates	Currently Implemented	2008	On-going
6	Irrigation System Inspections	Currently Implemented	2008	On-going
7	Showerhead Exchanges	Currently Implemented	2008	On-going
8	Residential WaterSense Toilet Rebates	Advertise availability	2008	On-going
9	Residential Audits/Kits	Advertise audits and purchase kits	2009	On-going
10	Multi-Family Toilet Rebates	Develop program details	2010	On-going
11	ULF Urinals	Develop program details	2011	On-going
12	Toilets - Commercial	Develop program details	2012	On-going
13	ET Controller Rebates	Develop program details	2013	On-going
14	Rain Sensor Rebates	Develop program details	2014	On-going
15	Update Water Conservation Plan	Plan evaluation and update as required by statute	2014	2014
16	Hot Water Re-Circulation Systems	Develop program details	2015	On-going

Addendum to the 2009 City of Thornton Water Conservation Plan

Distribution System Leak Identification and Repair

The City of Thornton has conducted a full evaluation of its distribution system and has identified sections that are prone to leaks. Distribution system leaks are repaired by the City's Infrastructure Department. The Utilities Operations Manager and/or the Lines Maintenance Supervisor trains field staff to recognize the signs of leaking water lines and report them to the Lines Maintenance Supervisor. Staff utilizes sonic leak detection equipment on a case by case basis to pinpoint leaks for repair. When staff requires assistance, a leak detection contractor is employed. Funds for the leak detection contractor are maintained in the Infrastructure Department, Operations and Maintenance budget. Efficient identification and repair of system leaks results in savings of water, labor and equipment.

The following factors were considered in the distribution system evaluation and the development of a program to minimize system leaks:

- Quarterly tracking of unaccounted water indicates a low percentage of water loss attributed to leaks, compared to industry system loss standards.
- Over sixty percent of the distribution system is less than thirty years old.
- The most cost effective method of preventing water line leaks in the distribution system was determined to be the implementation of a proactive Pipeline Replacement Program. Pipelines are evaluated by age of pipe, condition of pipe, type of pipe material and water break history.

As noted in Worksheet 6-1 (18) of the 2009 Water Conservation Plan, an analysis of water line breaks and repairs from 1999 to 2005 led to the development of a systematic Pipeline Replacement Program, which is funded annually through the City's Capital Improvement Project budget. Approximately 2,400 linear feet of pipe are replaced each year to reduce the number of leaks in the distribution system. The Pipeline Replacement Program is estimated to save approximately 5.2 million gallons (16 acre-feet) of water per year.