STATE OF COLORADO

Colorado Water Conservation Board
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TO: Colorado Water Conservation Board Members

FROM: Deborah Burrell, Water Efficiency Grant Coordinator
Veva Deheza, Section Chief
Office of Water Conservation & Drought Planning

DATE: May 4, 2011

SUBJECT: **Agenda Item # 21, May 17-18, 2011 Board Meeting**
Water Efficiency Grant Application for the City of Aurora -
Water Use Inefficiency Mapping and Identification Integrated with the System Incentive Program (SIP) Project

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Staff Recommendation

The Office of Water Conservation & Drought Planning (OWCDP) recommends that the CWCB Board award a Water Efficiency Grant to the City of Aurora in the amount of $117,741 to develop and implement the Water Use Inefficiency Mapping & Identification Integrated with the System Incentive Program Project (SIP). This project will aid the City in proactive water conservation management.

The primary features of the project will include a water use map of every tax parcel within the City of Aurora, a database that will allow City staff to analyze water use and to effectively and easily update parcel information and water bill information at the tax parcel level, and a system incentive program in lieu of the current limited rebate options. This system can serve as a pilot for other water providers as a best practice model in customer classification.

Background

The total project cost is $167,071. The requested grant amount is $117,741. The City of Aurora has committed to a 30% match on the total project cost - $17,250 in cash and $32,080 in in-kind.

In 2007, CWCB approved Aurora's Water Conservation Plan. Over the last three years, the City's Water Conservation Division has implemented water conservation programs to reach goals identified in the Plan. Rather than focus on a gallons per capita per day (GPCD) value as a goal, the City seeks to change how water conservation is perceived, implemented, and measured. The information gained from this project will be used to identify customers, based on inefficiency, for participation in conservation programs.

Attachments: 2011 City of Aurora Grant Application
Grant Application Staff Evaluation

Water Use Inefficiency Mapping and Identification Integrated with the System Incentive Program (SIP) Project

CWCB Grant Application
March 2011

City of Aurora

Contents

Contact information of entity applying for grant:

Aurora Water Conservation
Attn: Lyle Whitney
15151 E. Alameda Pkwy
Suite 3600
Aurora, CO 80012

(720) 859-4372
gwhitney@auroragov.org

1. Selected organizations and individuals that will assist in implementing the project:

AMEC Earth & Environmental
2000 S Colorado Blvd
#2-1000
Denver, CO 80222
(303) 935-6505

AMEC will classify the City of Aurora into different vegetation types based on vigor. They will link tax parcel data to water bill histories and link this information to the classification layer. Once completed, they will also develop a database for water conservation staff to use to accurately identify highly inefficient water users throughout the city. AMEC staff involved in the project include Carrie McCrea and Ian Hanou.

Carrie McCrea is a water resources GIS analyst and AMEC Earth & Environmental project manager. She will be the main contact between AMEC and the City of Aurora. She will be managing the analysis and database construction for AMEC.

Ian Hanou is the GIS Group Manager for AMEC Earth & Environmental in Denver. Ian will provide advice to AMEC staff and will assist Carrie in creating the geodatabase containing the analysis and water bill information.

Dr. Graeme Aggett is the Sr. GIS/Remote Sensing Scientist/Sr. Project Manager for AMEC Earth & Environmental in Denver. Dr. Aggett will provide technical direction on the project.

City of Aurora
Aurora Water
15151 E Alameda Pkwy
Suite 3600
Aurora, CO 80012

City of Aurora staff will provide AMEC the pertinent data to classify the city. Staff will also assist in the database creation. Finally, staff will target 200 test customers using the map and work with them to retrofit their system and provide incentives to these customers.

2. Identification of retail water delivery of the covered entity for the past five years:

i. Billed Water Consumption by Class (acre-feet) and source information.

Type	2006	2007	2008	2009	2010
Commercial	9,078.39	9,093.81	9,388.12	8,269.72	9,369.24
Irrigation	4,510.25	4,691.82	4,879.95	3,393.80	4,440.76
Multi-family	11,421.98	11,473.52	11,369.10	10,463.71	11,399.17
Residential	22,208.17	21,334.48	21,253.27	18,674.31	20,975.34
Total	47,218.79	46,593.63	46,890.44	40,801.54	46,184.51

Water Source	2006	2007	2008	2009	2010
Transbasin	45.86%	46.57%	41.83%	52.06%	51.27%
South Platte	52.81%	53.23%	58.17%	47.94%	48.72%
Ground H_2O	1.33%	0.20%	0.00%	0.00%	0.01%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

ii. Background of covered water utility

a. Per capita water use 2006-2010 and basis for the calculation

Year	Population	Treatment	Consumption*	Treatment (gpcd)	Consumption (gpcd)
2006	306,908	51,918	49,110	151	143
2007	309,416	50,515	47,834	146	138
2008	313,144	51,206	48,201	146	137
2009	314,326	45,364	42,445	129	121
2010	316,841	49,893	47,331	141	133

*This consumption is overall consumption, which accounts for water use other than billed accounts, such as construction, hydrants, etc.

The table above shows the annual Treatment and Consumption numbers by year. These numbers show acre-feet. By converting to gallons and dividing by population, an annual per capita value was determined. A GPCD value was quickly calculated from that value.

b. Population 2005-2009, 2010 population and 10 year projection (City of Aurora, Planning Department)

Year	Population
2005	303,833
2006	306,908
2007	309,416
2008	313,795
2009	314,326
2010	**316,841***
2011	320,009
2012	323,209
2013	327,599
2014	331,884
2015	335,976
2016	340,436
2017	344,941
2018	349,432
2019	353,867
2020	358,331

*Prior to 2010 Census results

c. Estimated Water Savings from project (acre-ft and as a percentage)

The goal of the project is to create a map of the entire city, grading each parcel in their water use ranging from very high water use to very low water use. These grades will be determined by comparing pervious surface to outdoor water use and average household size to that parcel's winter quarterly average water use. Once the city is mapped, a database will be created to link water bill history to the mapped irrigated square footage in each tax parcel. Also, 2010 U.S. Census data will be used to estimate average household size by block. The household sizes will be linked with the Winter Quarter Average (WQA) to determine indoor water use at each parcel. Combining the outdoor water use (extrapolated by removing the WQA in gallons per square foot) with the indoor water use will help us target 200 of the most highly inefficient water users. Water Conservation staff will work with these customers to retrofit any inefficient fixtures and to assist in changing their behavior if necessary. The results of this project will be used as a pilot to guide a city-wide conservation effort in the future.

Currently Aurora Water Conservation staff (AWC) offers all of our programs upon request, regardless of whether the programs are the most useful options for the customers. These programs currently include indoor and outdoor water audits, toilet, washer, irrigation, and Xeriscape rebates. AWC believes that by becoming more proactive in targeting highly

inefficient water users and working with them to change their entire system, greater water savings for a lower cost will be achieved by both the customer and the utility.

As a precursor to this study, AWC looked at over 350 indoor water audits. Looking at possible retrofit options, staff identified and analyzed the top 200 water users. An estimated 8.8 acre-feet per year could be conserved just with indoor changes if all possible retrofits were completed. This equals a 33% reduction in indoor water use. AWC also found that by switching to a system-wide approach, the cost to the utility would be reduced while saving more water. More importantly, customers would be required to invest in much smaller up-front costs while saving themselves water, resulting in quicker return on investments.

Prior to this project, AWC worked with AMEC to map a 3 square mile area of Aurora to analyze outdoor water use. 1.5 square miles were in northwest Aurora and 1.5 square miles were in southeast Aurora in order to include a variety of demographics. Staff analyzed outdoor water use and looked at the top 200 inefficient water users in these study areas (Figure 1) area. By changing behavior (i.e. clock times, correct water amounts), an estimated 35.7 acre-feet per year could be conserved. This equals a 59% reduction in outdoor water use.

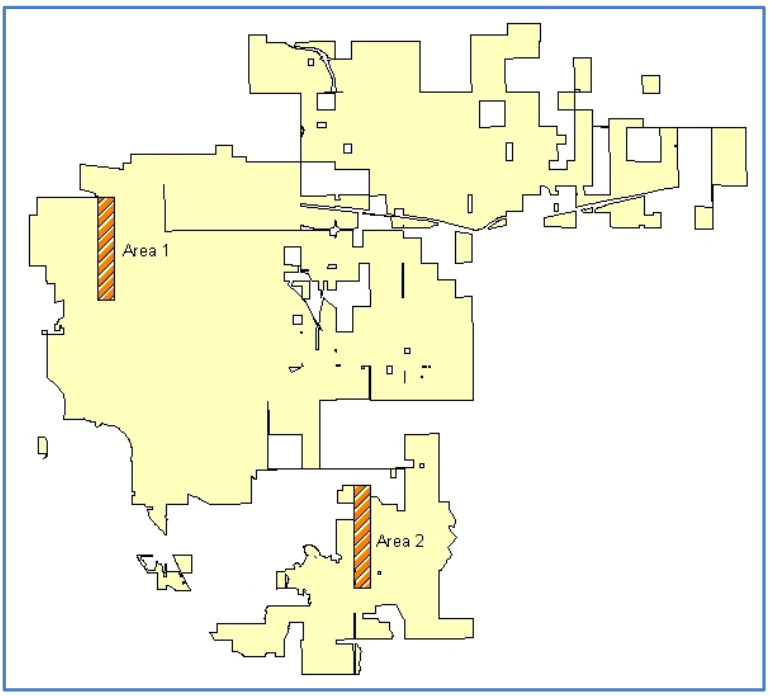


Figure 1: 2009 Pilot Study Areas, mapping pervious areas in two 1.5 square mile areas.

By looking at our indoor and outdoor samples, we estimate that we can save around 44 acre feet per year by targeting the top 200 most inefficient water users. However, these water conservation estimates are based on small study samples. These savings may be hard to realize given several factors, including GIS accuracy, response rates, necessary retrofits and customer behaviors.

As stated above, another benefit of moving towards the idea of retrofitting any fixtures and/or irrigated areas based on water savings is that more often than not, the customer will have to make a much smaller investment while still realizing significant water savings. In looking at our Conservation Calculator data, AWC staff realized that the current rebate programs may not be the most effective for either the customer or the utility in both water savings and Return on Investment (for the customer) (See Tables 3 and 4, pg. 9).

d. Estimates of water savings through conservation in past 5 years

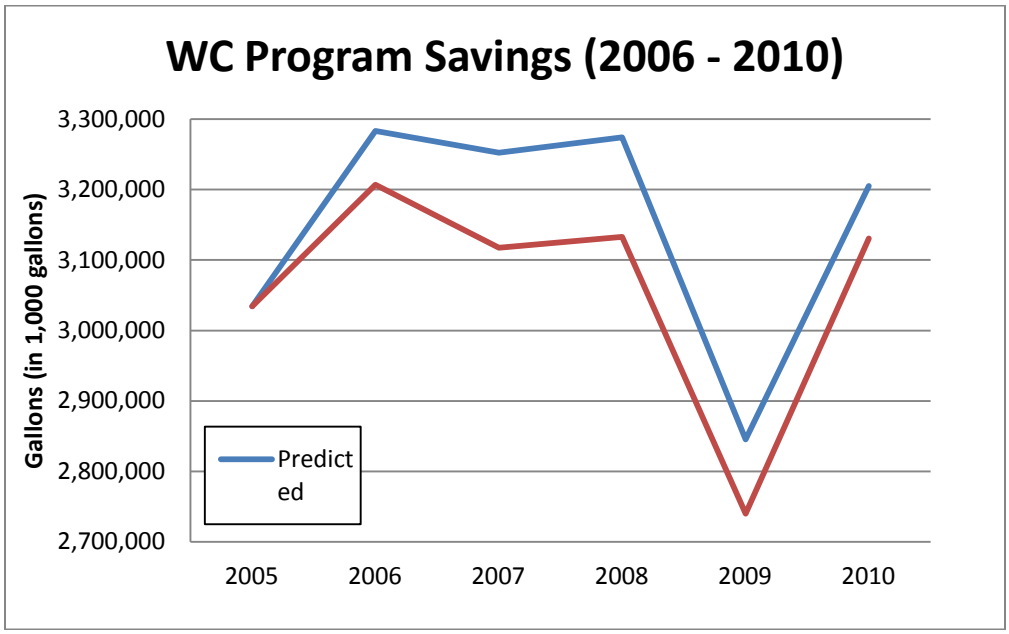


Figure 2: Actual vs. predicted water use for customers who have either completed a rebate or participated in a water conservation program.*

Water use from 2006 through 2010 was analyzed for both non-participant customers and participant customers. Non-participant customers included all water accounts that have not utilized any of our programs including, rebates, classes, and audits. Participants included all customers who have participated in one or more of our programs. Percent changes in water use over time for the non-participants was calculated and used to create a consumption trend line for participants. This trend line is the predicted water use over time for the participants. This trend line shows the natural increase or decrease in water use over time without conservation programs. Changes in water use can be correlated to other parameters such as rate changes, economy, or weather. The actual water use for the participants was graphed next to the predicted line and a considerable decrease in water use over time can be seen (Fig. 2). This difference in water use can be directly correlated with conservation programs. The numbers below summarize our water conservation program's effect on water use (Table 2).

Total Savings (2006-2010): 532,616,444 gallons / 1,635 acre-feet	
2006	233 acre feet
2007	414 acre feet
2008	434 acre feet
2009	324 acre feet
2010	229 acre feet

Table 1: Annual water savings from Aurora Water Conservation Programs.*

However, a small percentage of this reduced water use may be attributed to the fact that many of the customers who participate in water conservation programs may be more conscientious about their water use to begin with. Also, these numbers do not account for the effect that our education program has on Aurora's water use.

e. Adequacy, stability and reliability of the entity's water system

Aurora Water provides drinking water to more than 314,000 people throughout a service area of 151 square miles. The system has more than 155,000 acre feet of water storage, which is enough to supply the city water for approximately three years when filled to capacity (Table 2). Aurora receives 95 percent of its water supplies from snowmelt runoff. The City's water supply is predominantly surface water diversions from the South Platte, Arkansas and Colorado River Basins. Renewable water sources are the backbone of the water system. Limited amounts of non-renewable, deep ground water are also used to supplement the renewable surface water supplies during drought periods or as an interim water service for developing areas before connection with the city's core water system. Aurora's current water rights portfolio and infrastructure including the Prairie Waters Project, serve the city's current water demand under average and wet year conditions.

Aurora Water built the Prairie Waters Project to help supplement current water supplies. By early 2011, Prairie Waters will deliver up to 10,000 acre-feet of water to Aurora from the South Platte River. Prairie Waters is an innovative project that uses a sustainable water supply by recapturing river water to provide drought insurance and the cornerstone of a water supply plan that will help meet Aurora's needs for decades. At full build out, the system can deliver 50,000 acre-feet.

Aurora Water is one of only 34 other water utilities in the nation to receive recognition from the U.S. Environmental Protection Agency for greatly exceeding federal drinking water standards. The city has three drinking water purification facilities and one reuse facility.

Reservoir	Capacity (Approx.) (A.F.)
Homestake	21,441
Turquoise	20,000
Twin Lakes	2,724
Pueblo	Leased 10,000
Henry/Meredith	9,117
Spinney Mountain	53,651
Jefferson Lake	2,167
Strontia Springs	700
Rampart Reservoir	1,295
Quincy Reservoir	2,698
Aurora Reservoir	31,679

Table 2: Portfolio of Aurora's reservoirs.

See Appendices B and C for detailed information on Aurora's water system.

iii. How the grant monies will be used to address the entity's stated water savings goals

In 2007, Aurora Water created their Water Conservation Plan which was submitted to the State. In this plan, it was determined that the conservation potential for single-family indoor water use was 5,800 acre feet if all fixtures were retrofitted.[1] In looking at the overall conservation goals in all sectors, the plan stipulates a 10% reduction in per capita demand over the next 25 years (from 2007), saving a targeted 100 – 150 acre-feet per year. In 2007, Aurora Water conserved 83 acre-feet of water leading to a goal of 2,450 acre-feet saved by 2030.[2]

Over the last three years, water conservation has worked to define the goal and the mission of the division. Rather than focus on a GPCD number as a goal, the division seeks to change how water conservation is perceived and implemented. Typically, water conservation has been a reactive program helping customers as they contact staff for assistance. In the next several years, staff will work to move toward becoming a proactive demand management division.

Currently, Aurora Water offers toilet, washer, irrigation and Xeriscape rebates. This program will allow staff to utilize a system-wide incentive program to include any necessary retrofit rebate such as showerheads, aerators, etc. based on the most effective changes. The money from this grant will be used directly toward changing the current paradigm to a more proactive program by allowing Aurora Water to map the entire city and effectively target highly inefficient water users throughout the city. Aurora Water will contract AMEC Earth & Environmental to map vegetation types and impervious surfaces throughout the city. The data from the mapping project will be incorporated into a database that will link landscape information to water bill histories for every customer in Aurora (Appendix A). This will allow Aurora Water Conservation staff to compare the predicted water use with the actual water use for each customer. This

[1] Meyer, P. and K. Reidy. 2007. Water Conservation Plan, Aurora Water, City of Aurora, Colorado. Boulder, CO: Aquacraft, Inc.
[2] Ibid

information will be used to identify customers based on inefficiency for participation in conservation programs.

Once the mapping and database is complete, staff will target customers until a 200-member pilot group is achieved (via voluntary participation). Staff will work with these customers to audit, make recommendations and retrofit inefficient fixtures and behaviors at their home, both indoors and outdoors. This will be achieved through Aurora Water's Conservation Calculator which gives customers a prioritized list of actions based on money saved for the customer. This process will allow customers to realize the most savings for the least cost.

The Water Conservation Division will use this pilot study to determine the most effective way to utilize the city-wide water use analysis to help customers save water.

Water Conservation predicts (through previous small pilot studies mentioned in Sections 2(ii)(c) and 2(ii)(d)) that more water will be conserved for less money to both the customer and the utility allowing Aurora Water Conservation to become more efficient while increasing the benefits to the customer. Since the pilot studies, AWC analyzed data collected from 657 indoor water audits for potential water savings. AWC compared customer water savings for all fixtures which could be retrofitted to the most efficient levels. Staff looked at Costs, Water Savings per Year, and Return on Investment (ROI). Outdoor retrofits were excluded from this analysis as all data was solely from indoor water audits.

Fixture	Cost	Water Savings/Year (gallons)	Return on Investment (Year)
1st Other Sink	$5.05	2,954	0.21
1st Bath Sink	$4.87	2,714	0.22
2nd Bath Sink	$4.85	1,931	0.31
Kitchen Sink	$10.38	3,467	0.37
3rd Bath Sink	$4.72	1,495	0.39
1st Shower	$29.69	6,020	0.61
2nd Other Sink	$5.00	996	0.62
4th Bath Sink	$5.00	593	1.04
2nd Shower	$29.65	3,103	1.18
3rd Shower	$30.65	1,630	2.32
4th Shower	$30.00	769	4.81
1st Toilet	$197.74	3,515	6.94
2nd Toilet	$196.27	2,689	9.00
Washing Machine	$590.41	8,016	9.08
3rd Toilet	$212.51	1,591	16.47
4th Toilet	$219.58	454	59.68
Dishwasher	$600.30	669	110.59

Table 3: Values indicate the averages for each fixture calculated from the 657 indoor water audits. Return on investment indicates the time it would take to recoup costs calculated by dividing the savings multiplied by the water rate into the cost of making the retrofit.

AWC staff compared current rebate options to the proposed ROI rebate structure which would be available to customers identified in this grant project. Staff found that not only would the upfront costs for a customer drop dramatically but that the customer would also end up saving more water per year looking at only rebates with an ROI of less than one year.

	Cost	Water Savings/Year	ROI
Current Rebates	$984.42	14,220	8.54
ROI Rebates	$64.57	19,577	0.41

Table 4: Cost and Savings comparison between Aurora's current rebate programs and Aurora's proposed ROI based rebate programs. The ROI in the third column supports the idea that customers would benefit greatly from the new options.

Aurora will realize several peripheral benefits from this project outside of implementing the System Incentive Program. Aurora Water could use the irrigated area data collected from AMEC to create an accurate model to predict summertime demand, which would allow a more effective implementation of Aurora's Water Management Plan. This information could help Water Resources to match their water portfolio more closely to the demand. Aurora Water would potentially be able to use the irrigated areas data to work with Homeowner Associations and other large properties to predict water use more accurately and to reevaluate water budgets for these customers.

iv. Activities to be monitored to estimate actual water savings during project implementation

Once the mapping and database are complete, staff will work with 200 study participants (Aurora Water customers) to audit their system (indoors and outdoors) via the use of the Conservation Calculator. Once each participant has had their system audited, staff will work to rebate retrofits according to the most important actions as outlined on the Conservation Calculator. Data from the calculator will be transmitted to Aurora Water Conservation staff and analyzed in a database to determine the cumulative savings and costs to both the utility and the participant. The analysis will cover one year, five year and ten year savings to the customer including both water savings and cost savings over each time period.

3. Grant Outline

a. Groups, Individuals, Organizations and/or Institutions included within the outreach efforts to be proposed as the Project.

Aurora Water Conservation Staff will be responsible for contacting targeted customers for the pilot study via phone calls and/or letters.

b. Specific goals of the Project with respect to promoting the benefits of water resource conservation and water efficiency.

i. Target audience: Highly inefficient water customers (200 as a pilot study)

ii. Policy Change: Rather than offer and promote limited rebates, this project will change Aurora Water Conservation's rebate program to a System Incentive Program (SIP) which will address rebate possibilities for the most efficient options for changes. Staff will become proactive in managing water conservation instead of reacting to customer calls.
iii. The city-wide mapping project and SIP program will help educate people on all of the possibilities for optimizing water use throughout the home (indoors and outdoors), which until now has not been apparent to customers.

c. Specific activities and tasks to be funded by the Water Efficiency Grant

i. City-wide GIS mapping of surface types (2011) – AMEC will analyze and map out impervious surfaces and pervious surfaces (High water vegetation, Moderate/Low water vegetation, Non-irrigated surfaces [dirt, etc.]).
ii. Average household size Census block data will be added to the GIS geodatabase to get an estimated Winter Quarterly Average. This data will be used to compare households' actual indoor water use with their predicted use.
iii. Creation of a database linking tax parcels, surface types and billing history (2011) – Aurora Water Conservation staff and AMEC will create an easily updatable database linking tax parcel information to water bill histories to compare predicted water use to actual water use.
iv. Targeting specific customers based on their level of inefficiency. This information is derived from the GIS map created in the above step. The top 200 most inefficient indoor and outdoor water users will be identified and recruited to participate in the study. If not all 200 customers want to participate in the study, the next level of inefficient users will be identified. Each level will be determined on a descending scale of inefficiency until 200 participants are entered into the study.
v. Phone calls and letter mailing to potential participants.
    1. 200 letters/calls (June 2012) – Aurora Water Conservation staff will send out letters and make phone calls to contact the first 200 participants (based on level of inefficiency).
    2. 100 letters/calls (July 2012 and out as needed to reach 200 actual participants) – Aurora Water Conservation staff will continue to do outreach until the 200 participants are enrolled in the pilot study.
    3. Assisting customers with Conservation Calculator (2012) – Aurora Water Conservation staff will work with customers to fill in the correct information for the Conservation Calculator through indoor water audits (a current program) and phone calls.
    4. Assisting customers with retrofit options (2012) – Aurora Water Conservation staff will work with customers to provide recommendations and rebate information to customers making changes to their systems.
    5. Analyzing water savings (2nd quarter 2013) – Beginning in the 1st quarter of 2012 and ending in the 2nd quarter of 2013, Aurora Water Conservation staff will analyze the water savings and the cost/benefit of implementing those savings.
    6. Customer feedback (2012) – Throughout the project Aurora Water Conservation staff will provide feedback to each customer, not only during the audit and retrofit period, but also after the customer has completed the

recommended changes. Staff will continuously educate customers on the benefits of the program.

4. Scope of work

a. The purpose of the project is to create a proactive way to promote and develop water conservation throughout the City of Aurora, benefitting both the customer and the utility's efforts through a more efficient approach to water conservation.
b. The primary features of the project will include a water use map of every tax parcel within the City of Aurora, a database that will allow staff to analyze water use and to effectively and easily update parcel information and water bill information at the tax parcel level, and a system incentive program in lieu of the current limited rebate options. The result of this project will allow Aurora Water Conservation staff to create an effective proactive water conservation effort moving forward into the future.
c. Timeline:
    i. June 2011 – December 2011 – The creation of GIS data, mapping water use throughout the city (Appendix A) will be performed by AMEC.
        1. Responsible Party: AMEC
        2. Funding: Grant, cash contribution from Aurora
    ii. September 2011 – April 2012 – A database will be built by AMEC working with Aurora Water Conservation staff that will link the GIS layers to Aurora Water billing history for each customer and tax parcel (Appendix A)
        1. Responsible Party: AMEC, Aurora
        2. Funding: Grant, cash contribution and in-kind contribution from Aurora
    iii. May 2012 – A 50% progress report will be written and delivered to CWCB detailing the progress of the project as well as where the project is in accordance to the original timeline.
        1. Responsible Party: Aurora
        2. Funding: In-kind from Aurora
    iv. June 2012 – Aurora Water Conservation staff will develop a template and mail letters to the 200 most highly inefficient water customers to try and enroll them into the system incentive program (SIP).
        1. Responsible Party: Aurora
        2. Funding: In-kind from Aurora
    v. July 2012 – February 2013 – Staff will continue to mail letters to customers until the required 200 participants are enrolled in the SIP program.
        1. Responsible Party: Aurora
        2. Funding: In-kind from Aurora
    vi. July 2012 – March 2013 – Staff will work with 200 customers to enter data into the online Conservation Calculator, to audit each customer's system, and to help each customer make necessary changes based on the recommendations from the Conservation Calculator. After each customer has performed the recommended changes, Aurora Water will provide rebates according to the guidelines of the program.
        1. Responsible Party: Aurora
        2. Funding: In-kind from Aurora

vii. December 2012 – A 75% progress report will be provided to CWCB outlining the progress of the project as well as highlighting initial analysis of any completed SIP rebates (water savings, cost/benefit analysis).
    1. Responsible Party: Aurora
    2. Funding: In-kind from Aurora
viii. March – May 2013 – Staff will analyze the results of the 200 participant pilot study to show the water savings and the cost/benefit analysis.
    1. Responsible Party: Aurora
    2. Funding: In-kind from Aurora
ix. June 2013 – A final report will be submitted to CWCB outlining the analysis mentioned in viii, as well as providing an extrapolation analysis of the potential of the SIP program for the entire city, along with projected water savings. An analysis of the Conservation Calculator and database will be provided illustrating the viability of these tools as effective measurement tools to be used in line with the State's tracking standards of water conservation.
    1. Responsible Party: Aurora
    2. Funding: In-kind from Aurora

See **Appendix B** for a Gantt Chart of the Project milestones and timeline

5. Project Budget Summary

Task	AMEC Hours	Aurora Water-Hours	Grant ($)	Aurora ($)	Aurora Water In-Kind	Total Cost
Project Setup	60	8	$5,401	$1,500	$296	$7,197
Landcover Analysis	793	13	$57,813	$13,000	$481	$71,294
Database Dev/Geoproc.	384	79	$35,802	$2,750	$2,923	$41,475
Project Implementation	0	620	$0	$0	$23,940	$23,940
Landcover Maintenance	133	0	$9,969	$0	$0	$9,969
Project Administration	72	0	$8,756	$0	$0	$8,756
Reporting and Analysis	0	120	$0	$0	$4,440	$4,440
TOTAL	**1,442**	**840**	**$117,741**	**$17,250**	**$32,080**	**$167,071**

Cash	$17,250
In-Kind	$32,080
CWCB Grant Monies Requested	$117,741
TOTAL	**$167,071**

* See **Appendix C** for a detailed breakdown of the project budget.

6. Signatures

Greg Baker
Manager, Aurora Water Public Relations

3/18/11
Date

Mark Pifher
Director, Aurora Water

3/18/11
Date

Nancy Freed
Deputy City Manager

3/18/11
Date

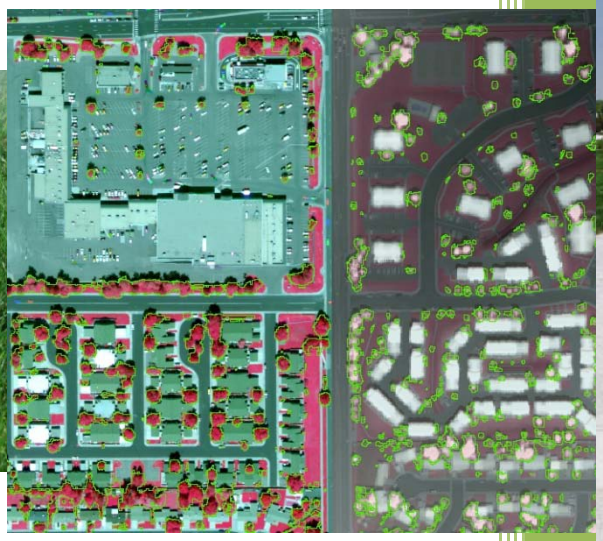
Skip Noe
City Manager

3/20/11
Date

APPENDIX A – AMEC Scope of Work

Appendix A

AMEC Scope of Work



AMEC Earth & Environmental
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Suite 2-1000
Denver, CO 80222

Project Introduction

AMEC has worked closely with Aurora Water Conservation (AWC) over the past several years to help develop background information and support for water-use estimation concepts and for the water conservation project goals. We are honored and extremely pleased to have this opportunity to actively promote *meaningful* water conservation, and to help the City of Aurora improve the nature and breadth of local water conservation management practices.

In order to successfully estimate appropriate water use goals, and to accurately estimate actual water savings, it will be necessary to have a highly accurate knowledge of land cover and watering practices throughout the City. AMEC will map this information and provide it in a meaningful and usable format to AWC staff so that it can be used to help Aurora's citizens plan their water conservation efforts. The ability to target resources and directly demonstrate the benefits of water efficiency will be a powerful tool for the City's water conservation program.

AMEC is uniquely qualified to assist AWC with this project. We have established in-depth knowledge of the City (data, needs, policies, characteristics), and a trusted working relationship with staff, through numerous City and regional projects. Our project manager worked for Aurora Water prior to joining AMEC, and is an Aurora resident with a vested interest in the success of this project. Most importantly, we have unmatched experience with land cover assessments for water analysis, and providing innovative solutions for complex water database efforts.

The AMEC team has developed, managed and executed numerous urban land cover classification projects in the Front Range using high-resolution multispectral imagery and object-based image analysis (OBIA). Projects have been successfully completed in Thornton, Castle Rock and Aurora for water conservation / water use analysis, and in Longmont and Denver for urban tree canopy assessment. AMEC team members have also supported the Colorado Water Conservation Board (CWCB) in classification of crop types and irrigated areas in certain Colorado basins through utilization of classification algorithms (energy balance equations and vegetation indices) applied to thermal and multispectral satellite imagery.

The AMEC team also offers a distinctive expertise with the kind of database development required for this project – one that combines customer info, land cover data, water meters, parcels, and other factors to make calculations. We have specific experience solving the complex spatial relationships between meters, parcels, and customer accounts, and with development of innovative solutions for non-standard customer or data circumstances (pro-rated meter groups, for instance).

We are confident in the AWC/AMEC project team's ability to build highly successful conservation tools through this project for the benefit of Aurora and the state of Colorado. We envision a powerful tool that, once developed and tested in Aurora, could someday act as a model for other water conservation efforts. AMEC is proud to support such an innovative, forward-thinking conservation effort that we know will benefit so many Colorado citizens.

Tasks and Timelines

Project Setup and Administration

Upon notification that the grant has been approved, AMEC will work with the City to develop a formal contract. Once we are authorized to proceed, we will work closely with AWC staff to determine specific work plans and timelines, define critical parameters and criteria, and obtain necessary datasets from the City.

Throughout the project, the project manager will carefully monitor project schedules, tasks and budgets. AMEC will provide the necessary project oversight and review to ensure that work is performed to the highest quality standards. AMEC will interact with AWC and other City staff as necessary to effectively facilitate the tasks described within this scope.

It is anticipated that AMEC's work on this project would begin in mid-2011 (June) and will be completed by the end of the year. Specific tasks we are prepared to perform in support of the water conservation effort are described in the following sections.

Vegetated Landover Analysis

AMEC will classify high-resolution aerial photography (DRCOG's 6-inch, 4-band, 2010 DRAPP product) using specialized imagery analysis and geoprocessing tools to map land cover for the entire City. The output product will be designed for stability and ease of use, and will undergo iterative acceptance testing with the City of Aurora prior to final delivery. A detailed description of the expected deliverables from this analysis is provided in the "Deliverables" section of this document. The timeline for this task is expected to be approximately 4 to 6 months, and will begin upon receipt of the imagery and ancillary datasets from the City.

Step 1: Data Preparation

AMEC will begin by obtaining imagery, GIS layers, and other supporting data from the City. We will provide a list of necessary information (created in conjunction with AWC staff) and arrange the collection and evaluation of requested files. Upon receipt, AMEC will prepare the data for use in the land cover analysis, setup the analysis environment, and develop the analysis workflow.

Data layers that will be used to mask or refine the land cover classification will be the focus of this preparation effort. Any available existing coverages (buildings, mapped impervious, streets, trees, parks, etc.) will be evaluated and utilized if possible, some may require modification or cleanup. Streets and extended parcels, for example, are expected to be a major component of this step. Streets data will be manipulated to more accurately represent the edge of pavement so that vegetation and impervious can be more cleanly mapped, and so that parcels extended to capture irrigated areas can be clipped appropriately. Once streets are completed, AWC and AMEC will test the extended-parcels process and attempt to solve for anomalies.

Step 2: Fully-automated NDVI classification and rendering

AMEC will apply a normalized difference vegetation index (NDVI) calculation to the 4-band imagery and render the values into basic classes. This initial unsupervised classification is basically a measure of "greenness" within each pixel and is based purely on a ratio of spectral bands. This step helps to separate vegetation from other land cover materials and will be useful during the iterative supervised classification process.

Step 3: Object-Based Imagery Analysis (OBIA) including a comprehensive manual QA/QC
AMEC will perform a supervised "wall-to-wall" segmentation classification in an iterative process, where multiple pixels will be analyzed using training samples for specific patterns, spectral values, and textures. Multiple classifications may be used to capture particular features (shadows or vegetation overhanging a road) and once satisfactory, batched to all imagery tiles. Landover will be mapped into high-vigor, lo/med-vigor, non-veg/bare earth, and impervious categories.

AMEC will then perform a visual QA/QC to manually remove large, obvious misclassifications and manually digitize areas that are difficult to capture via automation. Ancillary data layers (such as streets) layers will be utilized where possible to improve or 'clean' the classification results. The QC will be performed at a scale of 1":2,000' to provide accuracy sufficient for the City's intended use. Limitations and constraints associated with mapping accuracy and manual clean-up are described in a later section of this document.

Step 4: Create Digital Water-Use Map
Once land cover has been classified, the resulting data layers and reference datasets will be assembled and displayed over imagery in an ArcMap document (.mxd) for ease of use by Aurora Water Conservation staff.

Database Development and Geoprocessing

With assistance from Aurora Water Conservation staff, AMEC will create a spatial database linking tax parcel and land cover information to water bill histories so that comparisons can be made between predicted and actual water use. The project team will also develop a process and tools that allow for easy editing and effective database updates. The bulk of the work for this task will occur simultaneously with the image-processing effort, and will be finalized in 2011 after the land cover classification is completed.

In order to tie vegetated area from the imagery classification to customer and water use information, it will be associated with both parcel and water meter data. To accomplish this, vegetation data will be linked with parcel data, and meters will be associated with those parcels. Within the resulting master account spatial database, all calculations for the factors that will be inputs to the 'water use calculator' will be easily performed and visualized within the GIS environment.

Database preparation will include schema development, preparation and integration of extended parcel dataset, removal of street area, and parcel classification. It will be necessary to test and calibrate calculations based on extended parcels.

The meter-to-parcel assignment process will likely be the most labor-intensive portion of the database effort. Because of the existence of both *many:one* and *one:many* relationships, an estimated 10% of meters requiring geo-location, and some known address-matching issues, it is expected that this task will involve rather intense analysis and require both consultant and City staff involvement.

Geoprocessing steps will be documented (with graphic models where possible) for ease of replication or modification. During the process of associating vegetated area with parcels, basic manual quality control measures will be employed to ensure that anomalies are evaluated to minimize error.

Maintenance

Updates to the vegetation database will be necessary to incorporate new development or changes to existing landscapes. A two-year frequency would likely provide adequate snapshots of ground conditions for water conservation purposes. It also coincides with the availability of DRCOG's DRAPP imagery. New imagery would be quickly classified by applying an NDVI calculation and then compared with existing vegetation data to detect change. A quick-pass manual review would provide quality control for the updates. Known areas of change would be targeted to maximize resources. Water Conservation staff can assist with manual review and updates to keep costs low. The expected cost of AMEC's imagery analysis for the first update is $10,000 given current information. If using DRAPP imagery, the update would occur upon availability of the 2012 imagery in early 2013.

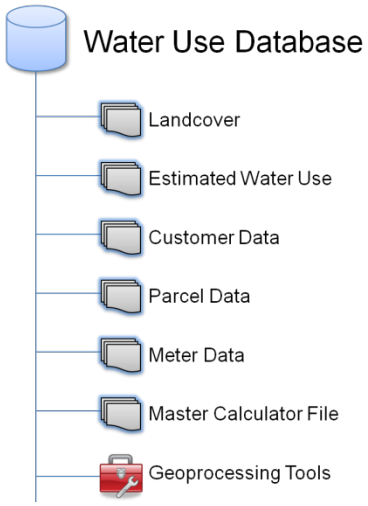
Parcel and meter data change more dynamically than do landscapes. The related databases developed will be designed to be easily updated or based on relational links to live databases. This initial setup is an investment, but will allow for water calculator information to remain current and accurate beyond the first year. The maintenance requirements will be determined by (and outlined following) the final database design, but it is expected that Water Conservation staff will perform this function on an as-needed basis.

Deliverables

AMEC will provide three final deliverables to Aurora Water Conservation upon completion of the project tasks. Prior to delivery, the AWC staff will have the opportunity to review and approve final drafts. We understand the importance of this project's success, and AMEC will ensure satisfaction with high quality deliverables.

Deliverable 1: Water Use Geodatabase

All GIS data modified or created by AMEC during the project will be assembled into a single file-geodatabase structure, organized into feature datasets as shown on the right. The geodatabase will be designed to meet all City data standards and will be easily integrated with other City data.



The 'Landover' dataset will contain the mapped land cover, separated by type into separate feature classes. The vegetation will be isolated and classified by level of water application (high and low-medium) within the 'Estimated Water Use' dataset. The layers in both of these feature datasets will be divided up for optimal display and utilization using the City's standard tiling scheme.

Deliverable 2: Digital Water Use Map

The digital map will be an ArcGIS map document (.mxd file) that contains the layers within the Water Use Geodatabase, displayed over imagery. The digital map will provide for easy visualization and powerful analysis capabilities, ready for use by AWC staff.

Deliverable 3: Summary Documentation

A summary-level document will describe the process methodology; provide a data-dictionary and metadata; record data issues or other observations pertinent to future improvements; provide basic recommendations for additional data applications (LIRF quantification, stormwater billing, hydrologic

analysis, tree canopy assessment, change/trend detection, etc.); and outline a basic data maintenance plan.

Assumptions and Limitations

Scope and costs developed for this proposal were necessarily based on assumptions formed from both known and best-available information. Many factors, such as access to and condition of available data, or complexity of database requirements, will help define actual timelines, logical work-sharing on tasks, the extent of manual land cover refinement, and the development of the water use calculation database. Upon project initiation, and throughout the project, the scope and work-share will be actively managed for maximum City benefit within the available budget.

Once the project has been approved and initiated, AMEC will work closely with the City to make any necessary scope refinements and develop specific data accuracy expectations.

Any software, business processes or files developed by AMEC for the City as a result of this project, whether electronic or otherwise, shall become the sole property of the City.

APPENDIX B – Gantt Chart of Project Timeline

	Water Use Inefficiency Mapping and Identification Integrated with the System Incentive Program (SIP) Project Gantt Chart	2011							2012												2013					
		June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June
A	**Project Setup and Initiation**																									
1	Contract negotiation and setup																									
2	Project kickoff meeting																									
3	Collect data from City; assess condition, completeness																									
4	Work with AWC staff to refine specifications based on actual data																									
5	Internal kick-off / project-team meeting																									
B	**Landcover Analysis**																									
1	Data and imagery preparations																									
2	Landcover Mapping																									
3	Digital Water Use Map																									
C	**Database Development and Geoprocessing**																									
1	Database Preparations																									
2	Geoprocessing																									
3	Summary Documentation																									
4	Conservation Database Creation																									
D	**Project Implementation**																									
1	Mailings																									
2	Customer Contact (Phone Calls)																									
3	Customer Audits																									
4	Rebate Form Creation																									
5	Conservation Calculator																									
6	Rebate Processing																									
7	Customer Follow-up (survey)																									
E	**Landcover Maintenance**																									
1	Prep new imagery																									
2	NDVI, OBIA prep																									
3	Change detection, OBIA mapping																									
4	Manual review, incorporate landcover changes																									
5	Prep and deliver updated data																									
F	**Project Administration**																									
1	Contract Setup and Management																									
2	Financial Mgmt, Budget Review & Documentation, Invoicing																									
3	Required Internal Project Reviews (2)																									
G	**Reporting and Analysis**																									
1	Progress Reports (50% and 75%)																									
2	Final Report																									
3	Project Analysis																									

APPENDIX C – Detailed Project Budget

City of Aurora, Water Conservation - Water Use Mapping and Calculation Database Development

		AMEC Earth & Environmental									*City of Aurora*				*Total Project Costs*			
	Staff Type	Technical Director / Senior Reviewer	Senior IM Analyst	**PM** / Analyst	GIS/RS Specialist	GIS/RS Tech.	Admin Support	**Total Labor ($)**	**Standard Expenses (6%)***	**AMEC Total Cost**	Aurora Staff	**Total Labor ($)**	**COA Vehicle Use ($)**	**COA Total Cost**	**Total ($)**	**COA Cash ($)**	**COA In-Kind**	**CWCB Grant ($)**
Task	**(tasks may be concurrent)**	$ 145.00	$ 135.00	$ 125.00	$ 75.00	$ 65.00	$ 50.00				$ 37.00							
A	**Project Setup and Initiation**																	
1	Contract negotiation and setup	1		4				$ 645	$ 39	$ 684	2	$ 74		$ 74	$ 758	$ -	$ 74	$ 684
2	Project kickoff meeting	4	4	4				$ 1,620	$ 97	$ 1,717	2	$ 74		$ 74	$ 1,791	$ 1,500	$ 74	$ 217
3	Collect data from City, inventory and assess condition, completeness			8	12	4		$ 2,160	$ 130	$ 2,290	2	$ 74		$ 74	$ 2,364	$ -	$ 74	$ 2,290
4	Work with AWC staff to refine scope specifications based on actual data	1		4				$ 645	$ 39	$ 684	2	$ 74		$ 74	$ 758	$ -	$ 74	$ 684
5	Internal kick-off / project-team meeting	2	2	4	2	2	2	$ 1,440	$ 86	$ 1,526		$ -		$ -	$ 1,526	$ -	$ -	$ 1,526
	Task Total	**8**	**6**	**24**	**14**	**6**	**2**	**$ 6,510**	**$ 391**	**$ 6,901**	**8**	**$ 296**	**$ -**	**$ 296**	**$ 7,197**	**$ 1,500**	**$ 296**	**$ 5,401**
B	**Landcover Analysis**																	
1	Data and imagery preparations	4	10	28	70	45	0	$ 13,605	$ 816	$ 14,421	4	$ 148		$ 148	$ 14,569	$ 3,000	$ 148	$ 11,421
1.1	Test file sizes and develop tiling scheme		4	4	16													
1.2	Resample imagery, tile resampled imagery				8													
1.3	Setup analysis environment				4	5												
1.4	Develop analysis workflow	4	4	4	2													
1.5	Work with AWC staff to prepare Streets and Extended-Parcels datasets		2	20	40	40					4							
2	Landcover Mapping	10	52	72	278	208	0	$ 51,840	$ 3,110	$ 54,950	8	$ 296		$ 296	$ 55,246	$ 10,000	$ 296	$ 44,950
2.01	NDVI classification and rendering	2	6	8	24	12												
2.02	Work with AWC staff to determine 'class' threshholds		2	6	4						2							
2.03	Iterative Object-Based (OBIA) classification - training and batch processing	2	24	12	120	24												
2.04	Ancillary data 'masking' for classification cleanup				16	12												
2.05	Initial QA/QC, create appropriate QC workplan	2	2	4	2													
2.06	Manual corrective review of landcover data (QA/QC)		12	24	60	100												
2.07	Initial review/approval by AWC staff			4	4						4							
2.08	Final data adjustments, aggregate LC data		4	4	12	24												
2.09	Data management (topology, raster/vector conversions, data tiling, performance testing)			2	24	24												
2.10	Final formatting and metadata documentation			4	12	12												
2.11	Internal review, delivery and AWC acceptance	4	2	4							2							
3	Digital Water Use Map	0	0	4	8	4	0	$ 1,360	$ 82	$ 1,442	1	$ 37		$ 37	$ 1,479	$ -	$ 37	$ 1,442
3.1	Work with AWC staff to determine water-use classification thresholds			2							1							
3.2	Translate vegetated landcover to estimated water-use data				4													
3.3	Assemble landcover layers and reference datasets into ArcMap document			2	4	4												
	Task Total	**14**	**62**	**104**	**356**	**257**	**0**	**$ 66,805**	**$ 4,008**	**$ 70,813**	**13**	**$ 481**	**$ -**	**$ 481**	**$ 71,294**	**$ 13,000**	**$ 481**	**$ 57,813**
C	**Database Development and Geoprocessing**																	
1	Database Preparations	2	0	62	84	48	0	$ 17,460	$ 1,048	$ 18,508	4	$ 148		$ 148	$ 18,656	$ 2,000	$ 148	$ 16,508
1.1	Work with AWC staff to determine final water-use calculation factors	2		4							2							
1.2	Database schema development			8	8													
1.3	Preparation and integration of extended-parcels dataset			8	16	12												
1.4	Removal of street area from extended parcels			8														
1.5	Test and calibrate extended-parcel calculations			8	16						2							
1.6	Evaluate water-meter data for condition, completeness; identify necessary modifications			8	12	12												
1.7	Geolocate missing water meters			2	8	12												
1.8	Setup water-meter / parcel relationships; develop pro-rated meter-groups where necessary			16	24	12												
1.9	Evaluate customer database, determine link to parcels database																	
2	Geoprocessing	4	0	50	58	18	0	$ 12,350	$ 741	$ 13,091	14	$ 518		$ 518	$ 13,609	$ 750	$ 518	$ 12,341
2.1	Workflow / analysis setup			8	6													
2.2	Geoprocessing to link landcover data with parcels			12	24	12												
2.3	QC values associated to parcels (topology, totals verification)			8	4													
2.4	Combine customer, parcel, and meter information in master calculation file			2	8	2					4							
2.5	Water-use calculator testing, QC			12	16	4					8							
2.6	Internal peer-review	4		4														
2.7	Delivery, discussion with AWC staff, acceptance			4							2							
3	Summary Documentation	7	8	26	11	6	0	$ 6,560	$ 394	$ 6,954	2	$ 74		$ 74	$ 7,028	$ -	$ 74	$ 6,954
3.1	Process methodology	2	4	8	4	2												
3.2	Data dictionary and metadata				4	4												
3.3	Issues and future-improvements documentation	1	1	4	2													
3.4	Recommendations for additional data applications	1	1	4	1													
3.5	Develop basic maintenance plan	1	2	4														
3.6	Internal peer-review	2		2														
3.7	Delivery, discussion with AWC staff, acceptance			4							2							
4	Conservation Database Creation										59	$ 2,183		$ 2,183	$ 2,183	$ -	$ 2,183	$ -
4.1	Access Database Process Outline										8							
4.2	Access Database Platform Creation										33							
4.3	Link between Geodatabase and Access Database Created										8							
4.4	Database Testing										10							
	Task Total	**13**	**8**	**138**	**153**	**72**	**0**	**$ 36,370**	**$ 2,182**	**$ 38,552**	**79**	**$ 2,923**	**$ -**	**$ 2,923**	**$ 41,475**	**$ 2,750**	**$ 2,923**	**$ 35,802**
D	**Project Implementation**																	
1	Mailings										20	$ 740		$ 740	$ 740	$ -	$ 740	$ -
2	Customer Contact (Phone Calls)										40	$ 1,480		$ 1,480	$ 1,480	$ -	$ 1,480	$ -
3	Customer Audits										200	$ 7,400	$ 1,000	$ 8,400	$ 8,400	$ -	$ 8,400	$ -
4	Rebate Form Creation										25	$ 925		$ 925	$ 925	$ -	$ 925	$ -
5	Conservation Calculator										135	$ 4,995		$ 4,995	$ 4,995	$ -	$ 4,995	$ -
5.1	Customer Technical Assistance										100							
5.2	Conservation Calculator Customer Entry Review										35							
6	Rebate Processing										140	$ 5,180		$ 5,180	$ 5,180	$ -	$ 5,180	$ -
6.1	Database Entry										50							
6.2	Customer Callbacks (for missing information)										35							
6.3	Rebate Approvals										50							
7	Customer Follow-up (survey)										60	$ 2,220		$ 2,220	$ 2,220	$ -	$ 2,220	$ -
7.1	Survey Creation										20							
7.2	Survey Distribution										20							
7.3	Surevey Analysis										20							
	Task Total	**0**	**0**	**0**	**0**	**0**	**0**	**$ -**	**$ -**	**$ -**	**620**	**$ 22,940**	**$ 1,000**	**$ 23,940**	**$ 23,940**	**$ -**	**$ 23,940**	**$ -**
E	**Landcover Maintenance**																	
1	Prep new imagery					6		$ 390	$ 23	$ 413				$ -	$ 413	$ -	$ -	$ 413
2	NDVI, OBIA prep		2		8	20		$ 2,170	$ 130	$ 2,300				$ -	$ 2,300	$ -	$ -	$ 2,300
3	Change detection, OBIA mapping		2		8	40		$ 3,470	$ 208	$ 3,678				$ -	$ 3,678	$ -	$ -	$ 3,678
4	Manual review, incorporate landcover changes			2	4	23		$ 2,045	$ 123	$ 2,168				$ -	$ 2,168	$ -	$ -	$ 2,168
5	Prep and deliver updated data			2	4	12		$ 1,330	$ 80	$ 1,410				$ -	$ 1,410	$ -	$ -	$ 1,410
	Task Total	**0**	**4**	**4**	**24**	**101**	**0**	**$ 9,405**	**$ 564**	**$ 9,969**	**0**	**$ -**	**$ -**	**$ -**	**$ 9,969**	**$ -**	**$ -**	**$ 9,969**
F	**Project Administration**																	
1	Contract Setup and Management			12			4	$ 1,700	$ 102	$ 1,802				$ -	$ 1,802	$ -	$ -	$ 1,802
2	Financial Management, Budget Review & Work Documentation, Invoicing			32			8	$ 4,400	$ 264	$ 4,664				$ -	$ 4,664	$ -	$ -	$ 4,664
3	Required Internal Project Reviews (2)	8		8				$ 2,160	$ 130	$ 2,290				$ -	$ 2,290	$ -	$ -	$ 2,290
	Task Total	**8**	**0**	**52**	**0**	**0**	**12**	**$ 8,260**	**$ 496**	**$ 8,756**	**0**	**$ -**	**$ -**	**$ -**	**$ 8,756**	**$ -**	**$ -**	**$ 8,756**
G	**Reporting and Analysis**																	
1	Progress Reports (50% and 75%)							$ -	$ -	$ -	20	$ 740		$ 740	$ 740	$ -	$ 740	$ -
2	Final Report							$ -	$ -	$ -	20	$ 740		$ 740	$ 740	$ -	$ 740	$ -
3	Project Analysis							$ -	$ -	$ -	80	$ 2,960		$ 2,960	$ 2,960	$ -	$ 2,960	$ -
	Task Total	**0**	**0**	**0**	**0**	**0**	**0**	**$ -**	**$ -**	**$ -**	**120**	**$ 4,440**	**$ -**	**$ 4,440**	**$ 4,440**	**$ -**	**$ 4,440**	**$ -**
	PROJECT TOTAL	**43**	**80**	**322**	**547**	**436**	**14**	**$ 127,350**	**$ 7,641**	**$ 134,991**	**840**	**$ 31,080**	**$ 1,000**	**$ 32,080**	**$ 167,071**	**$ 17,250**	**$ 32,080**	**$ 117,741**

*Standard direct expenses have been added to labor costs in order to cover expenditures for mileage, color copies and printing, maps and other documents, presentation materials, etc. Budget not consumed by expenses will be utilized for additional labor up to the total project cost.

APPENDIX D – 2010 Water Resources Annual Report

AURORA WATER
2010 WATER REPORT

Aurora Water' Water Resources Division is pleased to present this summary of the Aurora Water system during Water Year 2010 (November 1, 2009 - October 31, 2010). This report presents information on the content of our reservoir system, the City's water right yields, water consumption and treatment, and total effluent commitments.

Summary

Water Year 2010 can be characterized as an average year when compared to the last 5-year period (2005-2009).

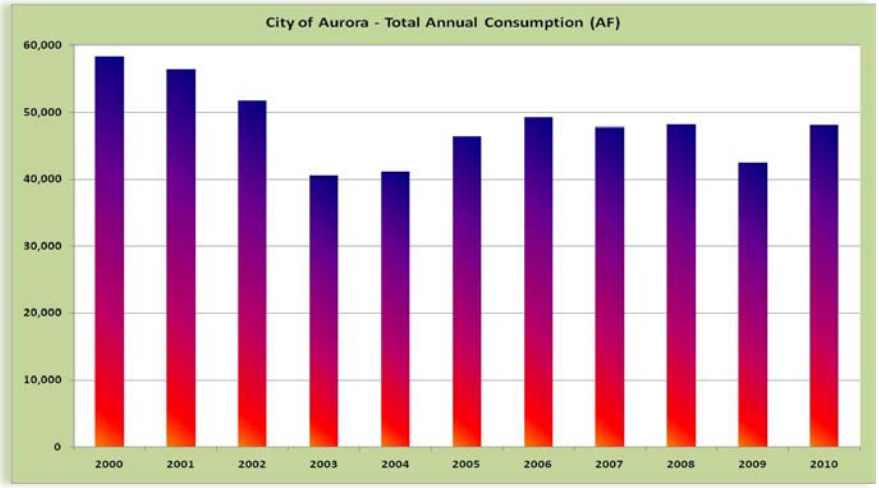


FIGURE 1 - AURORA WATER 2000-2010 WATER CONSUMPTION

Since 2000, the City's overall annual water consumption has declined. During the last 5-year period, total water consumption has remained fairly constant, while the overall per-capita consumption has significantly declined from approximately 188 gallons per person per day in 2000, to 122 gallons per person per day in 2010.

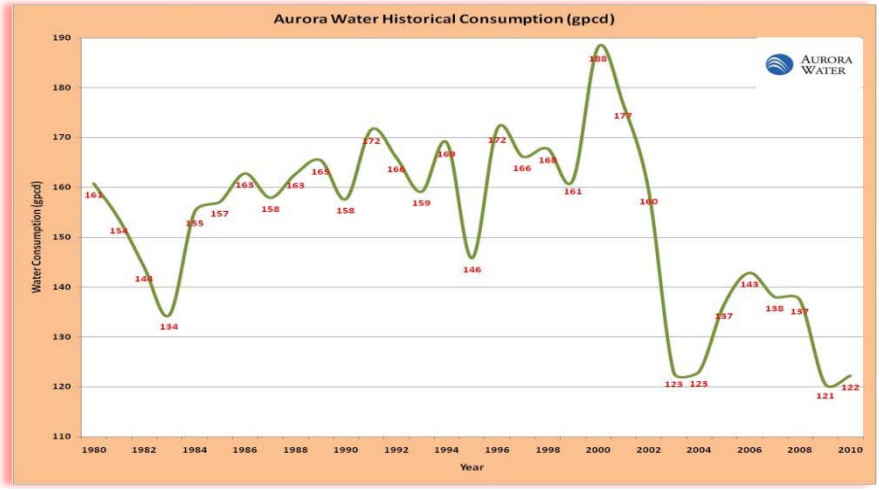


FIGURE 2 - AVERAGE ANNUAL PER CAPITA PER DAY CONSUMPTION

The variability shown in Figure 2 can be attributed to a variety of factors including our customers continuing water conservation efforts, watering restrictions and overall weather patterns (i.e. dry or wet year).

Since the drought of 2002-2003, the City has seen a decline in water consumption from that which occurred during the 1990's where, as seen in Figure 2, there was a gradual increase. Since then, the city has implemented voluntary conservation measures, implemented education programs and imposed some water use restrictions that resulted in a significant reduction in overall consumption.

Also, since the year 2002, the City has experienced a storage content decline (due to the drought) and a gradual recovery in its reservoir content. During this period, the minimum reservoir content occurred on February 28, 2003, with 39,577 acre-feet (25% full) and a maximum content of 149,915 acre-feet (96% full) which was reached on July 13, 2007, as depicted in Figure 3. An acre-foot ("AF") is the most common measure of water volume; one acre-foot of water supplies approximately 2 households a year.

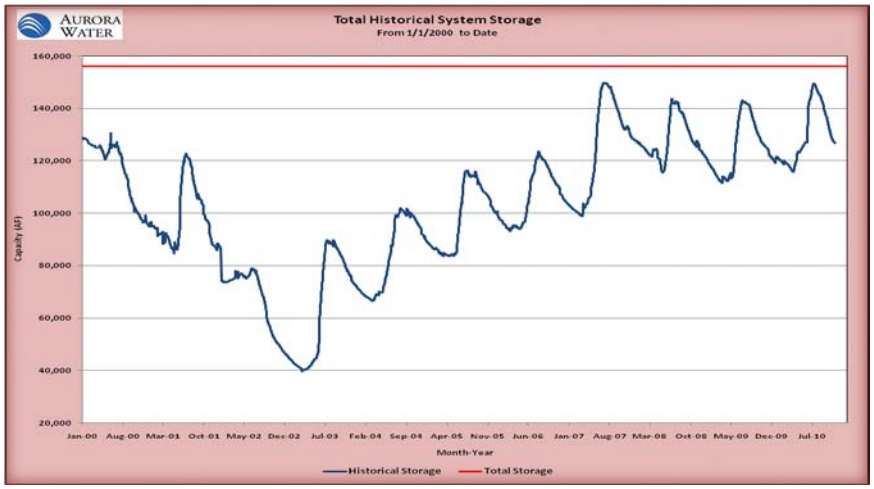


FIGURE 3 - AURORA WATER TOTAL HISTOTICAL RESERVOIR SYSTEM CONTENT

System Water Yields

A total of 75,415 AF of water were yielded from our water rights in the Colorado, Arkansas, and South Platte basins in 2010, representing 98% of average annual yield over the last five years. These yields were either stored in the reservoirs or sent to the City for treatment and distribution. Of that total annual yield, 34,449 AF were from our South Platte system, and the remaining 40,966 AF were from the Arkansas/Colorado system. Over 25,000 AF of the supplies from the Arkansas/Colorado system were diverted into the South Platte basin through the Otero Pump station.

During the previous five years (2005-2009), Aurora Water yielded an annual average of 76,874 AF. Figure 4 shows the comparison of monthly water yields that occurred during 2010 and the corresponding monthly average of the previous 5-year record.

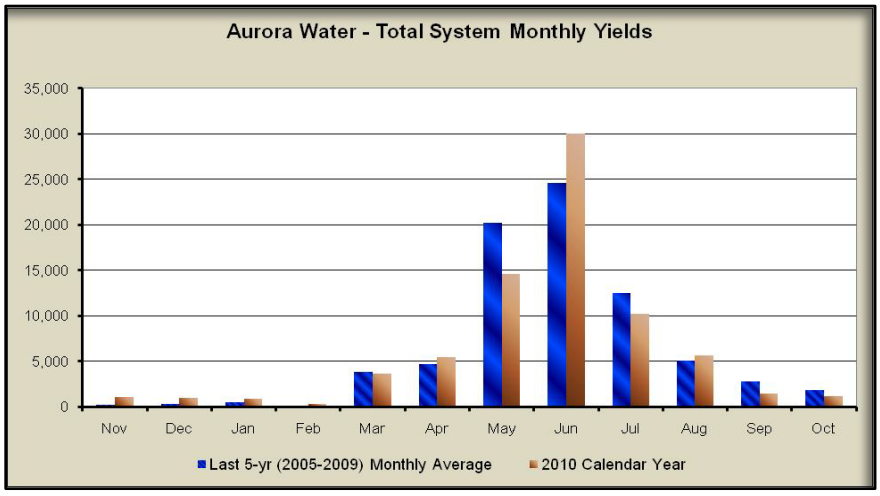


FIGURE 4 - TOTAL SYSTEM YIELDS BY MONTH

Water Consumption

Total consumption during Water Year 2010 totaled 48,058 AF. In comparison, the previous 5-year average was 46,820 AF. Figure 5 shows the monthly consumption for the 2010 water year,

with the previous 5-year monthly averages. Although the amounts differ somewhat, the trend is very consistent with the highest consumption occurring during the May through October "outdoor use" period.

The maximum daily amount of water used in the City during 2010 was 81.4 million gallons on July 14, 2010, with a minimum of 22 million gallons on February 24, 2010. The average daily consumption was 42.3 million gallons during Water Year 2010.

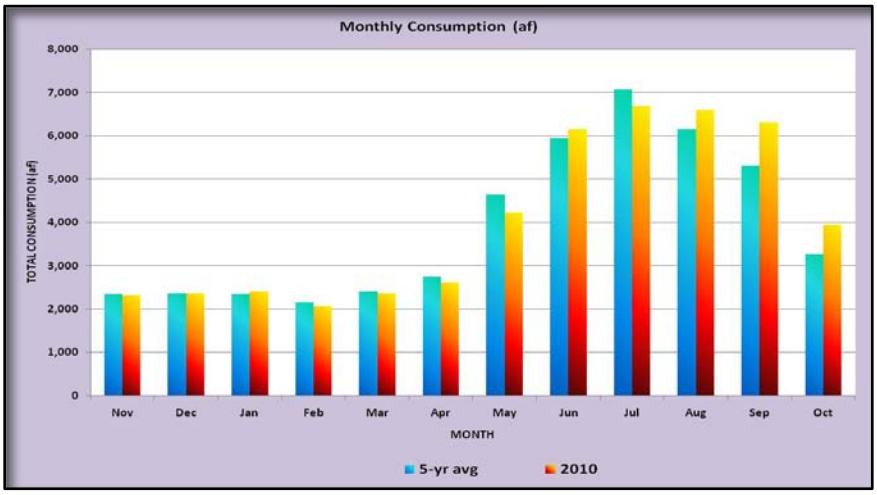


FIGURE 5 - TOTAL MONTHLY COMSUMPTION

Water Treatment

During the 2010 Water Year, the three City water treatment plants, Wemlinger, Griswold, and Binney treated a total of 50,041 AF (16,456 million gallons). The previous 5-year average was 49,157 AF (16,165 Million Gallons). Monthly values for both the 2010 Water Year as well as the previous 5-year period are depicted in Figure 6. The maximum amount of water treated during 2010 was 85.4 million gallons on July 19, 2010, with a minimum of 20.6 million gallons on November 28, 2009. Average daily treatment amounted to 45.1 million gallons during Water Year 2010.

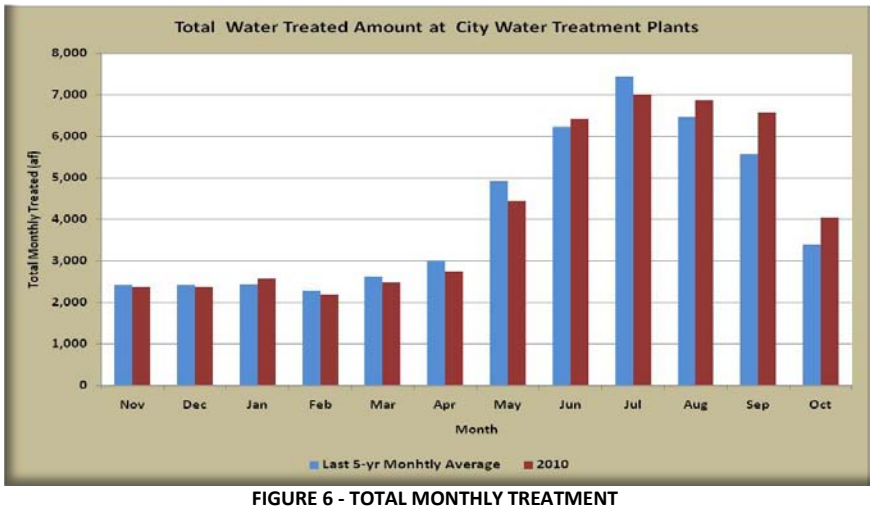


FIGURE 6 - TOTAL MONTHLY TREATMENT

Reservoir System Content

The reservoir system started the 2010 water year with a total content of 125,268 AF (80% of the total maximum capacity of 156,249 AF) and ended at 126,888 AF (81%), a net gain of 1,620 AF. This gain was realized after water rights yields and diversions, treatment, and consumption by the city. The minimum content during this period occurred on March 25th, 2010 at 115,866 AF (74%) and the maximum of 149,542 AF (96%) occurred on July 8, 2010. This is a fairly typical pattern for an average year.

In comparing this year's content with the historical daily average over the previous 5-year period (11/1/2005 – 10/31/2009), we find that the content was consistently higher in 2010 as shown in Figure 7, continuing to reflect the reservoir capacity recovery the City has realized post-drought.

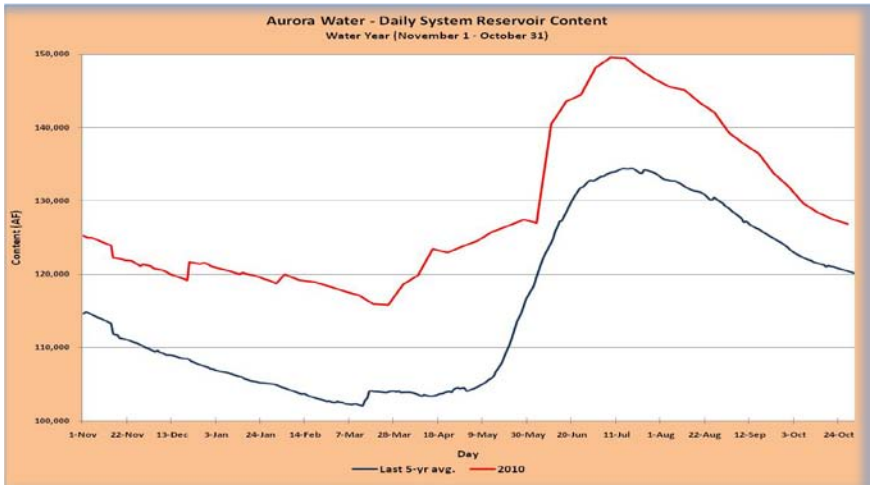


FIGURE 7 - SYSTEM RESERVOIR CONTENT

Effluent Commitments

Aurora Water has contractual agreements to provide leased water to other water users below the Metro Wastewater Reclamation District, also known as "Metro", using its reusable supplies. These users include the Central Colorado Water Conservancy District ("Central"), the Rocky Mountain Energy Company, the City of Thornton and other minor users. Figure 8 depicts the total monthly amount of leased water provided during the 2010 Water Year, along with data on the last 5-year monthly average periods. The reduced monthly amounts can be attributed to a contractual reduction commitment to Central from 8,800 AF/yr in calendar year 2009 to 7,000 AF/yr in calendar year 2010. During the 2010 water year, Aurora provided a total of 19,462 AF of reusable water. The previous 5-yr average amounted to 25,360 AF.

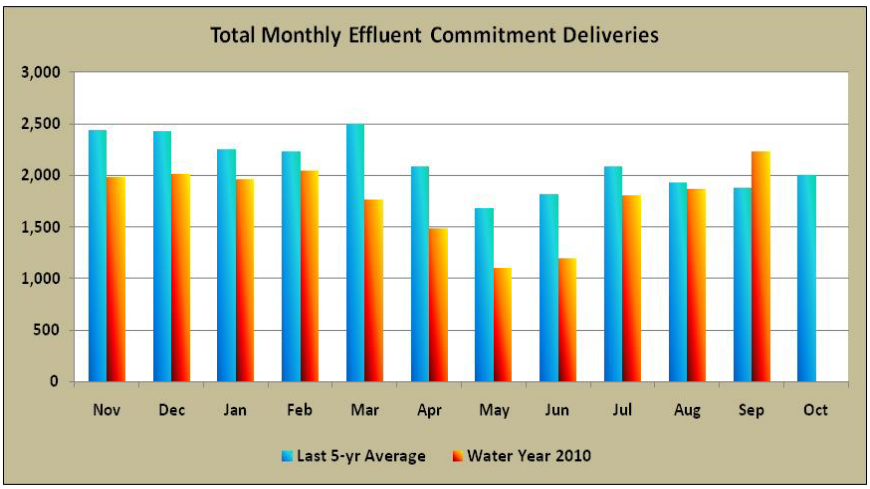


FIGURE 8 - TOTAL MONTHLY EFFLUENT COMMITMENT DELIVERIES

Prairie Waters Project

The City of Aurora has completed construction of the approximately $650 million Prairie Waters Project ("PWP"). PWP brings reusable water from the Brighton-area through three pump stations via a thirty-four mile pipeline into the 50 mgd state-of-the-art Peter D. Binney Water Purification ("Binney") Facility. Starting in August 2010, Aurora has treated and distributed over 1,800 AF of water through the Binney Facility through October 2010. PWP is considered a "drought hardening" project and its continued use will allow the mountain reservoir system to maintain higher storage levels.

APPENDIX E – 2009 Comprehensive Plan, Section IV, Letter G

G. Developing and Protecting Water and Other Natural Resources

VISION

When the goals of the city are achieved…

Water Resources:

- Aurora continues to provide a full-service utility delivering a reliable water supply, and managing wastewater and stormwater to meet the needs of its current and growing population.
- Aurora relies primarily on renewable surface water sources and continues to develop new water sources to meet its future needs and drought harden its supplies for current customers.
- Planning and acquisition continues to provide increased reliability during periods of severe drought.
- The city will continue to take full advantage of its current water resources through irrigation reuse and expanded water recapture through the Prairie Waters Project.
- Utility rates remain competitive with Front Range municipalities.
- Reservoirs, streams, and stormwater ponds are managed to provide multiple uses.
- Water quality is protected in the city's watersheds and especially in the watershed of the Aurora Reservoir.
- Regional or partnership opportunities are fully explored in an effort to maximize water use efficiencies and minimize environmental impacts.
- Aurora maintains a leadership role in the development of water policy in Colorado.

Other Natural Resources:

- Valuable natural features are protected, used and connected throughout the city contributing to quality neighborhoods and activity centers.
- Aurora sets an example for environmental management within the city as well as the source water supply basins throughout the State.
- Airports in and around Aurora contribute to the vitality of the local community without adverse noise impacts.
- Air quality is healthy and views are clear.

DISCUSSION

Water Resources

Urban development requires a full range of services including water, wastewater, and storm drainage in accordance with all state and federal regulations and standards at a level that provides an adequate supply of safe and affordable services. Aurora provides its citizens with a full-service water utility that provides water supply, wastewater management, and stormwater management.

Aurora is a proven leader in the state at developing water conservation and reuse projects. Aurora has one of the most

CITY OF AURORA

Grant Processing Form

Department applying for grant: **Water (Water Conservation)**
Name of project for which request is being made: **Water Use Efficiency Mapping and Identification Integrated with the System Incentive Program (SIP) Project**
Funder's name: **Colorado Water Conservation Board (CWCB)**
Type of funding source: ___ Federal/federal pass through to state: _X_ State: ___ Foundation/corporate
Application deadline: **April 15, 2011** Funding period: **June 2011 through June 2013**
Amount of funding requested: **$117,750.00** Amount of city match: **$17,250.00 (+ in-kind staff time)**
Proposed source of match: **Water Conservation has allocated funds in their Professional assistance budget (52074-62200)**
Grant manager's name: **Greg Baker** Phone: **3-7081**

Project Description: Briefly describe how the funding will be used.

Is there sufficient appropriation in your department / fund budget to cover expenditure of this grant? _X_ Yes or ___ No
Is the match requirement for this project in the department's approved annual budget? _X_ Yes ___ No ___ No match
If this project involves other city departments (particularly IT) do they support it? ___Yes ___ No _X_ not applicable
Is the program expected to continue after grant funding ends? _X_ Yes or ___ No
If Yes, what will it cost to continue the program: **up to $250,000/year** How will the program be funded?
The program will be funded through our rebate program. The grant is for the set-up of the GIS and database portion as well as a pilot study of 200 customers. The program will continue as part of our regular rebate program and will allow us to change our current programs to be more proactive. The program will be funded by that part of our budget.
Will staff be hired with this grant? ___ Yes or _X_ No.

If "yes" will staff be hired as: ___ Permanent or ___ Contractual

Justify your reasons for hiring staff as permanent employees.

Authorizing signatures required to submit grants:

Grant Manager–All requests	3/15/11 Date	Deputy City Manager—All requests*	3/18/11 Date
Department Budget Coordinator–All requests	3/15/11 Date	**OR** City Attorney/Presiding Judge/Court Administrator—All requests*	Date
Department Director–All requests	3/17/11 Date	Grants Development Officer	17 March 11 Date
Office of Budget–Requests of $25,000 or more *[Please allow one week for Budget Office review.]*	NA 17 March 11 Date	City Manager–Requests of $50,000 or more *[Not needed for City Attorney/Presiding Judge/Court Administrator requests.]*	3/18/11 Date

*All requests except continuation requests in which the amount being requested and the project scope are relatively the same as the previous year's. Typical grants that qualify as continuation grants include CDBG, CTF, and HOME grants.

Send copy to Grants Development Officer at time of submission: 17 March 11
Date sent

Notification of Grant Award/Denial: ___ Request denied ___ Request awarded

Amount of grant award $ _____

Mike Hyman in the City Attorney's Office *must review and approve the grant contract* before executing the contract.

Mike Hyman, Assistant City Attorney Date

Who has authority to sign the contract? Up to $25,000 = Department Head, $25,000 to $49,999 = Deputy City Manager; $50,000 or more = City Manager (except awards to city attorney, presiding judge, court administrator).

Send one copy to the Grants Development Officer.

Name of Applicant: City of Aurora
Date Received: February 2011

HB 05-1254: (Implementation) Evaluation for Entities

For Covered Entity Applicant:	**Yes**	**No**	**Comments:**
Is the applicant a covered entity?	x		
Does the covered entity have a state approved water conservation plan in accordance with statutory revision 37-60-126? (HB 04-1365)?	x		2007
(If answered **no** to the above question) then, Does the covered entity have a locally adopted water conservation plan with defined water saving goals?	-	-	
Did the applicant provide a written statement from the entity's governing board, stating the entity's commitment to the project and the entity's commitment to implementing long-term water saving measures and programs (w/authorized signature)?	x		
Did the applicant provide a cover letter with the entity's: name, contact information, and a signature of an individual with the authority to commit the resources of the entity?	x		
Did the applicant provide a list of people and/or organizations that will be involved in assisting with the grant project (list of who will be utilizing the grant money)?	x		Pg. 2
Characterizing Water System:	-----	-----	----------
Did the entity provide their annual retail water demand for the past five years (in acre ft. or million gallons)? *Consumption*	x		Pg. 2
Did the entity identify their retail water delivery for *each* of the past five years (in acre feet or million gallons)?	x		Pg. 2/3
(Not required, but preferred), Did the applicant provide information characterizing past water use by sector, (e.g. residential, commercial, and industrial) and the source (e.g. surface water, groundwater, etc).	x		Pg. 2
Did the entity provide current (and *if available* past) per capita water use for the last five years and the basis for this calculation?	x		Pg. 3
Did the entity provide their past, current, and predicted future population served by the entity, (and the source of this information)?	x		Pg. 3
Did the entity state the water savings that was accomplished in the past five years through water conservation efforts?	x		Pg. 4-6
Did the entity state water savings goals to be achieved through the implementation of the "project"?	x		Pg. 7
Adequacy, Stability, and reliability of the entity's water system *to be measured and examined by staff through analysis	x		Pg. 7
Description of Project:	------	-----	----------
Did the applicant write a paragraph stating the purpose and the primary features of the project?	x		Pg. 4/Pg. 10
Did the applicant provide a **detailed** narrative (description) of tasks to be performed with grant monies (stating how grant money will be used to achieve project goals)? *(a "scope of work" can combine this item with the timeline described below)	x		Pg. 10-12
Did the applicant provide a "project" timeline, stating milestones with dates and end products with dates; also state the estimated dates when progress reports will be submitted to OWCDP staff (50% & 75% completion)?	x		Need a visual format, Gantt chart

Did the applicant present a project budget overview, breaking down tasks by labor hours and costs also including all other direct costs such as travel per diem associated to the tasks? (Preferred in a schedule format)	x		Need budget detailed, consult hrs. Cash cont. in budget items
Does the applicant demonstrate 25% matching funds? Listing all funding sources to complete the "project"? In cash, in-kind services, or through payment of consulting fees or a combination thereof?	x		30% 10% Cash 19% In-Kind