MEMORANDUM

To: Mayor and City Council Members

From: Rudy Garza, Assistant City Manager

Date: July 22, 2009

Subject: Response to WTP4 Questions

Recently, Council Members Spelman and Morrison requested information regarding Water Treatment Plant 4 (WTP4). Below are responses to a number of question they raised for your review. In addition, Austin Water Utility staff will provide an update on WTP4 during this week's regularly scheduled City Council Meeting. Should you require additional information prior to tomorrow's presentation, please let me know.

The Council Members offered the opportunity to make suggestions on the appropriate balance of conservation, reliability and cost. AWU water conservation programs have made it possible to delay the opening date of the plant until 2014 and due to recent successes in water conservation the Utility is confident that if there were to be delays during construction that demand would not exceed capacity.

The issue is far broader, however, than simply demand and capacity. AWU believes that the least expensive and most reliable approach is to proceed with WTP4 at this time. On cost, recent bids on AWU projects are consistently coming in at up to one-third less than engineering estimates. These lower prices will likely not continue; to take advantage of this historic bid environment AWU's recommendation is to move forward now with construction of WTP4.

With regard to reliability, a new treatment plant would ease the burden on aging plants. WTP4 would also increase system redundancy by adding Lake Travis as a water source. Currently all City of Austin water is drawn from Lake Austin -- the Davis plant in north Austin and the Ullrich plant in South Austin near Westlake. The Green plant on Town Lake ceased operations last year.

Another important reason to build WTP4 is its role in reducing AWU's greenhouse gas emissions. Conservative calculations estimate that from the beginning AWU greenhouse gas emissions from water operations will decrease by 13.5%. The savings will increase as WTP4 serves areas in the far northern Desired Development Zone like the Robinson Ranch and the Burnet-Gateway area.

Below is a more detailed response to the specific questions posed by the Council Members:

1. **Use less – conserve more.**

   a. **What are the costs of our current conservation programs? What are the costs associated with any proposed or potential conservation efforts? Are they cost-effective?**
   A 5-year history of the water conservation budget is shown below. The table also shows the water conservation division's budget as a percentage of AWU's total O&M budget and of water revenue. Program funding was increased to implement the Council approved recommendations of the Water Conservation Task Force. The Water Conservation Division of AWU has implemented a number of efficiency measures to reduce administrative costs so more funding can be focused on the actual conservation programs. Prior to implementing each new proposed program, a cost benefit analysis is performed to ensure the effectiveness of the program. Additionally, the division is conducting a thorough review of existing programs to verify water savings and identify programs that should be discontinued due to ineffectiveness or unfavorable cost-benefit ratios.

Austin Water Utility
Water Conservation Five Year History

Water Conservation Division	Actual 2005-06	Actual 2006-07	Actual 2007-08	Estimated 2008-09	Proposed 2009-10
Water Conservation	$2,585,462	$3,150,668	$5,080,392	$6,223,718	$6,679,999
Reclaimed Water	$82,133	$85,007	$87,983	$91,062	$91,062
Total	$2,667,595	$3,235,675	$5,168,375	$6,314,780	$6,771,061
Total AWU Operating and Other Requirements	$133,959,464	$ 137,848,713	$ 151,374,528	$ 169,802,278	$175,554,442
Conservation as % of Total AWU Operating & Other Requirements	1.99%	2.35%	3.41%	3.72%	3.86%
Total Water Service Revenue	$163,934,088	$ 136,423,073	$ 178,265,788	$ 195,497,547	$ 206,124,796
Conservation as % of total Water Service Revenues	1.63%	2.37%	2.90%	3.23%	3.28%

In addition to the operating costs shown above, the Utility has spent $38.3 million in the capital improvement budget on reclaimed water projects since 1996. We have included an additional $28.9 million in projected spending on reclaimed water projects in our 5-year CIP spending plan through 2014.

The table below shows the amount of water saved including the staff cost broken down by peak day gallon saved. Note that the table includes only measurable savings for conservation programs such as toilet retrofits, irrigation audits, and rebate programs and does not include savings from mandatory watering restrictions because they are more difficult to quantify. Savings were more than double previous years, higher than budget increases.

Year gallon saved	Yearly reduction through conservation/reuse (AF)	Yearly reduction through conservation/reuse (MG)	Staff cost per peak day gallon saved
FY07	1,113	363 MG	$1.15
FY08	2,352	766 MG	$1.09

b. If Austin were to pursue such goals for reducing average gpcd reductions, are there any reasons that peak day demands could not similarly be reduced in tandem? If so, please explain.

AWU has a mix of conservation efforts that affect both average day and peak day demands. In general, indoor conservation measures will show a uniform effect on water demand while outdoor conservation measures have a greater impact on peak day demand. Conservation efforts are linked, so that although the recommendations of the Water Conservation Task Force were aimed at reducing peak day demand, they will reduce average day demand as well.

c. If Austin engages in more aggressive water conservation, can we then predict wastewater rate savings (and total amounts) based on predicted lower water use? Our understanding is that San Antonio has done this, and estimated over a billion dollars in savings. Is this true? If so, does the same line of reasoning apply here for Austin or is there some reason we would not enjoy similar savings on the wastewater side? Would our savings be even greater because we treat our wastewater to higher standards?

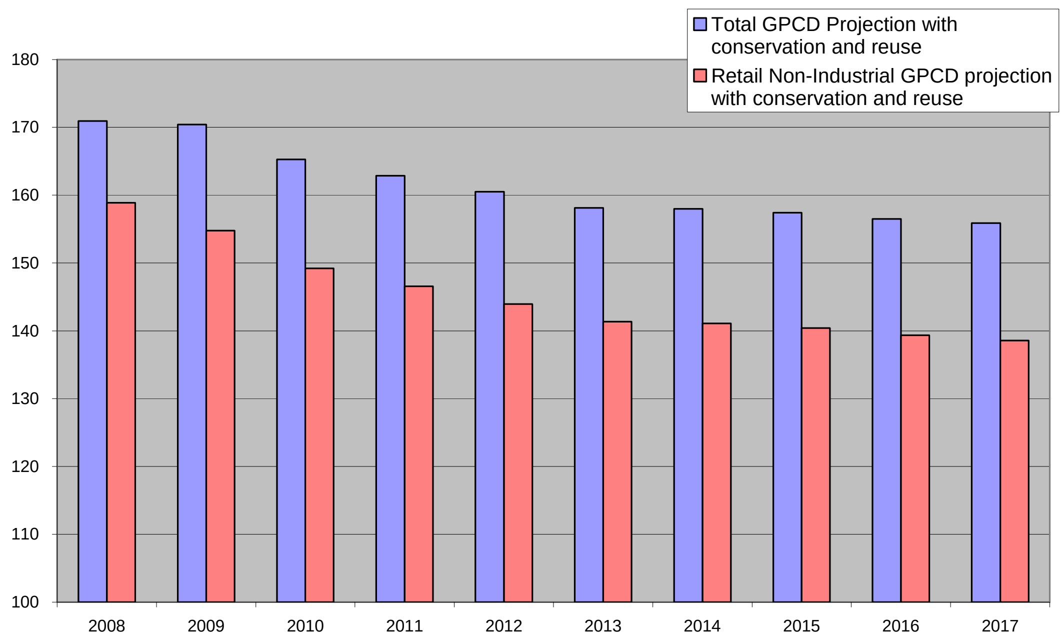
Yes – reduction in water use sectors that contribute to wastewater collection system flows, such as low flow plumbing fixtures, can be expected to continue to result in reduced flows to the wastewater treatment plants. Also, contributing to plant flow reductions is the City's recently completed Austin Clean Water Program (ACWP) resulting in reduced inflow and infiltration of water into the wastewater collection system. Austin is predicting savings, and benefitting from conservation efforts. Similar to the water demand projections, AWU routinely updates its projections of demand based on historical use and trends. Over time, these savings result in lower flows to the plants which in turn guide the analysis of timing of future capacity upgrades. Even more aggressive conservation will be evaluated as additional technology and methods are developed.

At this time we cannot specifically substantiate the large magnitude of savings San Antonio references on the wastewater-side. AWU has contacted SAWS to discuss their wastewater savings. However, Austin has and will continue to pursue savings due to deferred infrastructure timing. In order to compare the cost savings, the Utilities would have to use the same methodology for performing the calculations. Austin is expected to see savings due to similar impacts, but caution should be used in making comparisons due to the potential for distinct differences between the two cities' situations. Note that Austin is not planning major wastewater capacity improvements at its plants (see also response to Question 4. g. below) within the near-term Capital Improvement Program (CIP) spending plan horizon. Both major plants were recently upgraded to 75 MGD. AWU is committed to treating Austin's wastewater to the highest standards, and are confident that San Antonio is also committed to these high standards.

d. **The city's current water conservation policies are in the middle of their second summer. How persuasive will our usage rates for this second summer be in determining projected water usage for the future? If they will not be very persuasive, why not?**
While the watering ordinance and plumbing code changes appear to have had an impact, it is too early to predict with confidence how they will affect long-term demand. A preliminary analysis indicates that watering restrictions may have reduced peak day demand by 5 to 9 MGD; this is within range of the estimates from the Water Conservation Task Force, though realized more quickly than projected. However, AWU projects system demand on a rolling 20-year basis, and it would not be prudent to draw conclusions about long-term trends from one year of data. AWU's peak day demand projections are updated annually so as time progresses, each summer's actual demand is incorporated into the projection. The projections are based on the more recent 20-year data set. This method ensures that the projections are based on a proven track record of needs aimed at prudent planning.

e. If AWU were to continue to pursue an aggressive conservation program, based on the best of current practice, how would this affect demand projections for the next few years?
The following graph shows the impact on demand of the aggressive measures recommended by the Water Conservation Task Force and the effect of reclaimed water system expansion. The graph shows the projected decreases in water demand on a per capita basis. The blue bars show the estimated total per capita demand subtracting planned conservation and reuse. The red bars show the estimated retail only (not including wholesale and industrial) gallons per capita per day (GPCD) projection subtracting planned conservation and reuse.

Austin GPCD Projections



f. On other successful cities, including San Antonio's water conservation program:

i. What do they do and how?

San Antonio has been at 1-day per week watering since April 10, 2009, and reduced allowable watering hours as of June 15, 2009. They offer similar rebate programs to Austin's, though they have more extensive programs to reduce water use in targeted commercial sectors (hotels, schools, etc.)

AWU is working on new programs that mirror some of SAWS most successful efforts, including a Direct Install toilet replacement contract on the July 23rd Council agenda. Attachment 1 shows a comparison between AWU and several comparable utilities. AWU's implemented programs meet all but two of the requirements defined as best practices for water conservation programs by the Texas Water Development Board (TWDB). Attachment 2 provides additional information on TWDB's Best Management Practices.

Both AWU and SAWS have comprehensive water conservation programs, but it is important to note that they are two very different water systems. A surface water system is operated differently than an aquifer system and vice versa. Aquifer systems such as San Antonio, typically do not feature large treatment infrastructure, but instead have multiple small treatment facilities at numerous locations along the aquifer. Infrastructure redundancy is planned differently since water comes from so many different points in the system.

SAWS is also different in that the SAWS aquifer water supply is limited. SAWS is at present seeking new and more reliable water supplies. SAWS is investigating desalination, surface water options, and other costly options to increase their water supplies.

ii. **What has been effect over time on water demand? How long did San Antonio's conservation measures take to affect demand? Were the effects permanent or temporary?**

San Antonio, like Austin, has a long history of conservation that begins with the drought of the early 1980s. However, San Antonio has faced greater water supply constraints longer than Austin. Their water pumpage shows a sharp drop (nearly 40 GPCD) from 1988 to 1991, leveling off for the next ten years (about 10 GPCD reduction). Beginning in the late 1990s, pumpage is reduced more rapidly, though it is still heavily influenced by weather. Although not confirmed, it is believed there are many private well users within the SAWS system that are not counted toward the City's GPCD.

Like Austin, SAWS relies on a three-prong approach for conservation: Incentives, Education and Regulation. In a 2008 presentation by SAWS Conservation Director Karen Guz, emphasizes that enforcement of regulations is critical (and difficult) and that seemingly intuitive programs are not necessarily effective. They recommend thorough cost-benefit analysis and the discontinuing of inefficient programs, a program mix that allows participation from all customer sectors, and priorities that shift with drought status. This mirrors Austin's current approach to conservation.

iii. **Are there reasons to believe a similar program would work better or less worse in Austin? What are they?**

Many similar programs exist between the two utilities (toilet rebates, free toilet distributions), and others have been offered in the past (rebates for landscape conversion and hot water on demand systems) but were discontinued due to low participation and water savings.

The most significant difference between Austin and San Antonio is landscape watering restrictions. Moving from a twice weekly watering schedule to a once-per-week schedule like San Antonio is possible, but would represent a dramatic policy shift for Austin. It would require increased enforcement and education, and a lifestyle change for many residents.

iv. **What would it cost Austin to operate a program similar to San Antonio's?**

As previously mentioned, both AWU and SAWS have comprehensive water conservation programs, but it is important to note that they are two very different water systems. A surface water system is operated differently than an aquifer system and vice versa. Aquifer systems such as San Antonio, typically do not large treatment infrastructure, but instead have multiple small treatment facilities at numerous locations along the aquifer. Infrastructure redundancy is planned differently since water comes from so many different points in the system.

A 2006 report by Alan Plummer and Associates, commissioned by AWU, compared AWU's water conservation and reclamation programs with those of the San Antonio Water System (SAWS), El Paso Water Utilities (EPWU) and Dallas Water Utilities (DWU). The report found that "Based on the number and types of programs, AWU and SAWS have comprehensive programs that address most types of water users and water uses." The Plummer report also compared program budgets:

Utility	Budget 2002	Budget 2003	Budget 2004	Budget 2005	Budget 2006	Staff 2006	Budget 2007	Budget 2008	Budget 2009	Budget 2010 (proposed)
AWU	$3.4 M	$3.1 M	$2.7 M	$2.8 M	$3.6 M	13 (20 for FY09)	$3.2M	$5.2M	$6.3M	$6.7M
SAWS	$4.6 M	$5.18 M	$6.16 M	$4.89 M	$5.38 M	31				
EPWU	$1.5 M	$2.82 M	$5.4 M	$4.09 M	N/A	10				
DWU	$2.2 M	$2.2 M	$2.4 M	$2.4 M	$2.7 M	7				

Recent budget information for the other utilities has been requested, but is not yet available.

v. **Do other cities (Phoenix, San Francisco, or El Paso, for example) provide better or different models for conservation than San Antonio?** Among the preliminary findings of research on other cities is that, not surprisingly, some of the American cities which are the most aggressive and successful in water conservation tend to be in the desert or dry lands of the western United States.

Attachment 1 is a chart showing a staff comparison for several cities comparable to Austin. The chart shows that Austin has a relatively comprehensive package of programs as compared to other cities.

vi. **There has been a recent report (*SAWS Conservation Efforts Helping*, Trevor Zickgraf, KSAT.com) that San Antonio's June 2009 usage declined 23% from last year. Specifically, what measures led to this decline?**

It is difficult for AWU to say with any certainty what led to the usage decline in San Antonio. San Antonio relies primarily on ground water from the Edwards Aquifer and has a strong water conservation program. At least one factor in the decline in usage is likely the one day per week watering schedule, and only between the hours of 3-8 am or 8-10 pm, imposed due to the drought and its impact on aquifer levels.

g. On alternative conservation methods:

i. Austin Energy is introducing smart meters and demand pricing to reduce and smooth out electric power consumption. Can we do something similar with water? How (and how well) would it work? What would this cost?

The Austin Water Utility plans to conduct a feasibility study on the implementation of Automated Meter Reader (AMR) meters that would utilize a cell network for obtaining the monthly reads. These meters have some of the capabilities of Austin Energy's smart meters, however are generally not designed for demand pricing. In addition to streamlining the meter reading process, AMR technology will give us the ability to provide customers with more real time data on their water use in order for them to make informed decisions on their usage. The feasibility study will answer many of the questions about these types of meters, such as cost, benefits, and implementation issues. Although we will not have a final cost estimate before the feasibility study is completed, it is expected that a comprehensive AMR program will be at least $50 million.

The hourly demands for water are much different than electric usage. Many of our peak demands for water are at night when many irrigation systems are operating and the Utility is filling reservoirs. There would be no advantage to demand pricing at night. This is when our customers are encouraged to water. However, there might be some opportunity for demand pricing during the hours of 10:00 am and 7:00 pm, when our customers should not be watering. If demand pricing is determined to be feasible in any AMR system, it might be possible to increase rates for daytime watering when there are restrictions on watering. We do plan to examine such options in our upcoming AMR feasibility study.

Austin Water does however, structure rates based on demand. Below is a table showing the current block demand rates and the FY10 Proposed Demand Rates. AWU is proposing to add a fifth tier to the block rate schedule to encourage water conservation. AWU has also implemented demand rate pricing for non-residential customers based upon seasonal rates, where peak season rates (June 1st though October 31st) are higher than off season rates.

	2009 Existing Volume Rates	2010 Proposed Volume Rates

Residential Water Rates	($/1,000 Gals)	($/1,000 Gals)
Block 1: 0 – 2,000 Gals	$0.98	$1.00
Block 2: 2,001 – 9,000 Gals	$2.59	$2.62
Block 3: 9,001 – 15,000 Gals	$4.75	$6.71
Block 4: 15,001 – 25,000 Gals	$8.50	$9.00
Block 5: 25,001 – over Gals	$8.50	$10.00

ii. **Different customers use water differently. Could we use billing information to educate them about their usage patterns and help them to reduce usage? Are we conducting (or have we considered) water usage audits? How well would they work? What would this cost?**
The Austin Water Utility is currently working with Austin Energy to program the billing system to include a 12-month historical graph of each customer's water usage and wastewater billed flows. AWU is working to get the graphs on the bill prior to the beginning of the wastewater averaging period in November. These graphs should be useful to the customer in analyzing their usage patterns and hopefully reduce their overall and peak day usage.

AWU offers free irrigation system audits to residential and commercial customers to help reduce outdoor water use. The program is popular, and has helped some customers reduce water use by 30% or more. AWU's Water Conservation Division is also developing a scope of work for an interactive online water audit tool that would help customers analyze their water use patterns and identify opportunities for conservation and participation in incentive programs.

iii. **What would be the probable effect of increasing water rates for those residential customers who use the most water ("block 5")?**
The probable effect of increasing water rates for those residential customers who use the most water will be additional water conservation by those customers based upon the increased price incentive to conserve.

Our current block rate system is one of the most aggressive in the nation. Attachment 3 is a graph comparing our block rate system to utilities comparable to AWU. The highest water user, those that use more than 50,000 gallons per month, will pay almost 40% more in Austin than the next highest charging utility.

The current 4-block system charges customers using more than 15,000 gallons a 4th block rate of $8.50 per 1,000 gallons. The proposed new rate structure for FY 2009-10 will include a 4th block from 15k to 25k gallons and a new 5th block for water usage above 25k gallons. The proposed rate for the 4th block will be $9.00 per 1,000 gallons. The proposed rate for the new 5th block will be $10.00 per 1,000 gallons.

2. **Waste less – fix the leaky pipes.**
   a. **How much potable water is lost due to leaks in the distribution system? How does this compare to other cities around the country, or to best practice standards?**
   The Office of the City Auditor recently completed an audit of Austin Water Utility's Water Loss for FY07 (the most recent year final data is available). According to the Audit, AWU experienced 9.85 million gallons per day (MGD), or 7.68%, in real loss; both due to reported and unreported leaks. With the FY07 Real Loss figure of 9.85 MGD, the calculated Infrastructure Leakage Index (ILI) is 2.619. The American Water Works Association (AWWA) considers an ILI below 3 to be in the top tier of performance with regards to leak control.

   AWU has implemented a comprehensive lost water management program, including increased staffing and contracting out for emergency leak repair, that is based on industry best standards as outlined by the Texas Water Development Board (TWDB) and AWWA. Although the Texas Water Development Board requires reporting only once every 5 years, AWU is committed to producing annual water loss reports with an emphasis on improving data quality and recommending cost-effective ways to reduce lost water. Reducing water loss is a key component of the recommendations from the Water Conservation Taskforce.

   b. **Leaks in Austin's sewage system were highly concentrated in a few, bad sections of pipe. Is this true for leaks in the water system, too? How much of the leakage is concentrated in the worst, say, 10% of pipe?**
   The total length AWU's water distribution lines in the system equal approximately 3,600 miles. The total length of deteriorated lines (any pipe with a diameter of 6-inches or less, is cast iron, and is maintained by the City of Austin) is approximately 900 miles. Of the 900 miles of deteriorated lines, there are approximately 250 miles of high priority deteriorated lines. The majority of leaks in the system are located on the 250 miles of high priority deteriorated pipe.

   c. **What would it cost – and how many losses could we avoid – by fixing the worst sections of pipe?**
   Based on the assumption of $250/LF of line, the cost to replace the 250 miles of high priority deteriorated pipe is approximately $330 million. AWU is addressing the most critical lines first, over the next five years, and then addressing the rest of the deteriorated pipe, based on criticality, over the next 10-15 years.

   The below table shows the proposed spending for water main replacements over the 5 year CIP:

Water Main Replacement 5 –Year CIP Spending	
FY 2010	$24.1 M
FY 2011	$17.0 M
FY 2012	$12.9 M
FY 2013	$12.9 M
FY 2014	$14.9 M
Total	$81.8 M

d. **If AWU were to continue to pursue an aggressive but fiscally efficient distribution maintenance program, how would this affect demand projections for the next few years?**
The recommendations and projects proposed by the Water Conservation Taskforce, and adopted by City Council, include estimates for reducing water loss resulting in leaks. AWU's current deteriorated pipe replacement masterplan is an aggressive program to meet the demand projections established by the Water Conservation Taskforce

3. **Reuse more – "reclamation"**
   a. **Where, exactly, do our current reclamation pipes run? Who are our current customers?**
   The attached map entitled (Attachment 4) "Reclaimed Water System," dated July 2009, is a master plan for the reclaimed water system and shows its planned extent. Lines are color coded by pressure zone, with existing lines shown solid, and planned lines being dashed.

   Also attached (attachment 5) is a list of the 29 reclaimed water customers as of July 20, 2009.

   b. **Do we have unused capacity in the current system? If so, to whom could we reasonably extend reused water service?**
   Yes, we do have unused capacity in the current reclaimed water system.

   The issue of system extension was the subject of deliberation by the Council appointed Water Conservation Task Force (WCTF). Based on the WCTF's seven recommended projects, which were ultimately adopted by Council, the Utility has established a reclaimed water master plan outlining the future of the system. AWU is currently in the process of planning, designing, and constructing the recommended seven projects plus two additional ones (51^{st} Street Main and 51^{st} Street Tank which are critical to providing reclaimed service to UT) as part of its Capital Improvement Plan. AWU will continue to evaluate the system and look for additional expansion opportunities as the utility works to complete the masterplan, which is estimated to be completed in FY 2011.

c. **What would it cost the city to increase capacity to the most convenient set of new users, what would it cost these new users to hook up, and how much demand would there be for this service?**

In 2003, there were six reclaimed water customers. Currently there are twenty-nine. In addition to building a customer base, it is important to focus on system redundancy so that customers reliably have reclaimed water when needed. To accomplish those goals, a series of mains is needed to link the University of Texas through the Capital area, downtown, and south Austin to mains, a tank, and pump station in the Montopolis area. As any new projects are planned, the utility identifies potential customers to connect to the line.

According to a study done for AWU by Alan Plummer Associates, San Antonio has considerably more employees dedicated to reclaimed water than does Austin. AWU has recently ramped up it water reclamation program by hiring an additional Project Manager for reclaimed water projects, realigning current engineering staff, and creating a distribution engineering group that can provide assistance to the program. With the additional staff, the proposed projects could be online sooner than anticipated. AWU is currently on schedule in implementing the WCTF recommendations for reclaimed water. Below is a table showing CIP spending from FY96 and through the projected 5-year CIP period:

Austin Water Utility
Investment in Water Reclamation Initiative by Fiscal Year
As of July 21, 2009

Actual Expenses		
FY 1996	$	378,076
FY 1997		97,118
FY 1998		308,357
FY 1999		415,158
FY 2000		2,050,512
FY 2001		12,265,662
FY 2002		3,480,166
FY 2003		1,113,065
FY 2004		6,086,412
Sub-total		26,194,525
FY 2005	$	2,606,556
FY 2006		886,365
FY 2007		803,646
FY 2008		3,529,363
YTD 2009*		4,285,091
Last five years		12,111,022
Total Expense	$	38,305,547
Proposed		
FY 2010	$	10,600,000
FY 2011		8,050,000
FY 2012		1,550,000
FY 2013		1,500,000
FY 2014		7,240,000
Total proposed	$	28,940,000

* year to date expense as of July 21, 2009

d. In a longer run, what are the barriers to reusing as much treated sewage as we can produce? Could we reasonably build out a system as complete as St Petersburg's or San Antonio's? Would it make economic sense to do so?
The largest impediment to reclaimed water system growth is funding and the need to not over extend the system. A reclaimed water system grows out from the wastewater plants, both of which are located in South East Austin. Extending the system to North West Austin would take a considerable investment and time. The current reclaimed system masterplan goes after the known potential large customers as well as establishing redundancy and reliability for future growth of the system.

The attached master plan map describes a reclaimed water system similar in scope to that of St. Petersburg's. The system of pipes linking UT to Montopolis will make AWU's system physically comparable to San Antonio's. In one important measurement, volume supplied to customers, Austin is already competitive with San Antonio. According to a presentation by a San Antonio Water System (SAWS) official at the 23rd Annual Water Reuse Symposium in Dallas last year, a significant portion of San Antonio's reclaimed water use is for stream flow augmentation such as in the Riverwalk. Whereas most of AWU delivered reclaimed water goes to irrigation, cooling, and manufacturing, this is a much smaller component of the SAWS reclaimed program.

e. **If AWU were to continue to pursue an aggressive but fiscally efficient reclamation program, how would this affect demand projections for the next few years?**
Reclaimed water use grows through system expansion, which relies on construction projects to extend mains to new customers. Even if funding and authorization were available today for a project, it takes 3-6 months to hire a design engineer, 12-14 months to design the project (allowing time to obtain any necessary easements, which can significantly increase project time), 6 months to bid the project and have Council award it, and 12 months to build it. It can take several more years for all potential customers to connect. Considering this, reclaimed water system demand in the next few years is dependent on projects already in design or under construction. The projects already designed or under construction are those recommended by the Water Conservation Task Force two years ago. AWU is on schedule in implementing the WCTF recommendations on reclaimed water.

f. **What would the cost be of a system that would supply treated sewage to raw land likely to be developed in the next few years?**
While it is possible to build a reclaimed water system on speculation, the Utility traditionally has focused system growth on the conversion of existing high-volume water customers that could use a lower quality water to meet a large portion of their water demand. A reclaimed water system grows out from the wastewater plants, both of which are located in South East Austin. Extending the system to North West Austin would take a considerable investment and time. An alternative approach to building a reclaimed water system to future developments is to use the Service Extension Request process when developers and land owners seek a determination of infrastructure improvements required to serve new developments or redevelopment. At this time it is not possible to estimate the costs to extend reclaimed water service to future developments because there are many significant unknowns such as development location, size, demand, and pattern of water use.

4. Make more – build WTP 4

a. What are projected capital costs of the first (50 mgd) section of WTP4? On what schedule would we need to incur these costs, presuming we build WTP4 under the current plan?

The current projected cost of the first 50 MGD phase of WTP4 is $508.0 million. This includes $465.1 million for engineering, environmental commissioning, and construction of raw water facilities, plant facilities, associated finished water transmission mains, and inflation, and $42.9 million for site acquisitions already expended.

Under the current plan of constructing WTP4 by 2014, the projected cash flow is shown below:

FY 2008	$8.2 M	2.0%
FY 2009	$33.6 M	8.0%
FY 2010	$52.3 M	12.0%
FY 2011	$99.7 M	22.0%
FY 2012	$117.8 M	25.0%
FY 2013	$103.0 M	21.0%
FY 2014	$50.5 M	10.0%
Total	$465.1 M	
Land	$42.9 M	
Total WTP4 Cost	$508.0 M	

b. What are projected operations and maintenance costs of WTP4, per unit of water? How do these compare to the O&M costs at Ullrich and Davis? If they are different, why? If we had 50 mgd available from WTP4, would we use it all or only some of it immediately?

A final analysis of the costs to operate WTP4 have not yet been completed, but based on the current personnel and operating requirements of Ullrich and Davis, projected operations and maintenance costs for WTP4 are as follows:

1. Non-variable costs include personnel, operations, maintenance, and other costs. The projected WTP4 non-variable cost is $3,080,000 per fiscal year. This projection was based on the average of the non-variable costs at Ullrich and Davis.
2. Variable costs include electrical and chemical costs which vary depending on the volume of water pumped. The projected variable costs for WTP4 is $275.20 per million gallons pumped. This projection was based on the average of the variable costs at Ullrich and Davis.

The above assumptions do not take into account the greater efficiencies WTP4 will experience. Newer technology and the plant's higher elevation will significantly reduce the plant's O&M costs. The comparison of the two plants is only a benchmark to determine the cost to operate WTP4.

Although WTP4 will initially only average 31 mgd over an entire year of operations, it is anticipated that it will operate at the full 50 mgd during the summer months.

c. **How much less electric power will we need, if we build WTP4 and run it as efficiently as we can? What effect will this have on total demand for electric power? On greenhouse gas emissions? Could this have an impact on power production costs and electric rates?**
Net Present Value comparisons were run on each process system to determine the most cost effective alternatives. Overall O&M costs are not finalized for WTP 4, but power costs associated with pumping will be much less due to the higher elevation of WTP 4 relative to the AWU water system, but power costs will be more for the on-site chlorination system (unique to WTP 4) in which we will be generating disinfection on-site rather than trucking it in. It is anticipated there will be a $1.7 million/year reduction in electricity costs at WTP4 due to advanced, more efficient technologies and the higher elevation of the plant. Attachment 6 provides further detail on the reduction in greenhouse gas emissions.

d. **One argument for WTP4 is that it provides a parallel system, increasing flexibility and reliability. How are we likely to use this increased flexibility and reliability? Would it lead to improved maintenance at other plants, for example? How likely is it that we would need to shut down any plant in our system?**
Currently Austin's potable water supply is delivered to customers through two centrally located water treatment plants, which both draw their water from Lake Austin. These plants pump water into the distribution system through large diameter transmission mains. Davis WTP was completed in 1954 and Ullrich was completed in 1969. Over the years, the system and service area has extended further north, south, east, and west from these locations. Bringing WTP 4 into the system accomplishes several improvements to the system reliability and flexibility:

- WTP 4 will draw water from a second water reservoir, Lake Travis, which is a separate and upstream from Lake Austin
- WTP 4 will add diversity to the water supply. Currently both plants feed from Lake Austin, and in fact both intake structures are not very far from each other.
- Approximately one third of the WTP 4 project are the potable water transmission mains, which deliver the water to the distribution system. These mains in conjunction with WTP 4's water supply add reliability to service in the north and northwest portions of the water system by adding additional supply lines.

- Similarly, WTP 4 and its transmission mains will allow operators to have additional system supply flexibility in the event of an emergency (main break, power outage, etc.) or in the case of an unexpected demand load, for example.

While typically the main goal is to reduce the likelihood of a disaster (natural or intentional) ever happening, the utility has to be prepared. Having all of the water supply centrally located is not only a risk, but also does not make beneficial use of Austin's supply and terrain. Using the WTP 4 elevation advantage, AWU will be able to supply some of Austin's fastest growing and established areas with a substantial reduction in pumping.

The aging infrastructure at Davis WTP, now 55 years old, is in need of major rehabilitation work to maintain reliability. Scheduling of rehab work is challenging due to the considerable reliance there is on this facility, particularly in the summer peak demand season.

Currently AWU is constrained in its ability to perform maintenance and rehabilitation work at the existing plant facilities due to the level of dependence on the two existing plants to supply water "24/7", especially during the summer. Additionally, there are some components that require extensive work that cannot be offline for the time required, and thus they continue to deteriorate. It is unlikely to shut down an entire plant, since the plants are designed to be shut down in parts to always allow some water to be treated.

e. **What is the shelf life of our current design? Can it be dusted off and used, as is, if we decide to postpone construction for a year or two? If not, why not? Presuming the site does not change, how much of the design (if any) would need to be reworked one year, two years, or further out?**
Yes, if project construction were to be postponed for a year or two, the design could still be utilized with some updating. Updates would need to address best-available technology and any changes to permitting requirements and environmental issues (new regulations may require changes in design or new designations to endangered species listings may impact design elements). The longer construction is delayed, the more re-work will be required; eventually to the point where we start again from scratch (current situation from the mid-80s design). Also, permits already obtained have shelf-lives that may expire, depending on the length of delay. Design may also have to be updated to recent mechanical, structural, fire, etc. codes, as well.

Although the majority of the design is salvageable if construction were to be postponed for a year or two, it is important to note that the inflation impacts of deferring WTP4 between 2 and 5 years is an increase in the cost between $37 and $201 million at 4% or 6% inflation rate, respectively

f. The environmental community points to the proposed AWU budget as laying out $1.4 billion of CIP projects over the next 5 years, and of WTP4 being 65 percent of this amount. Is this correct? If so, how do we get to this amount from the $400 to $500 million price tag we have heard in the past? How much of remaining CIP is going to Items 2 and 3 above?

This is not correct. Of the $1.4 billion proposed 5-year CIP spending plan for FY 2010-2014, the WTP4 proposed total is $422.7 million, or about 30.2%.

Of the $1.4 billion proposed 5-year CIP spending plan, $28.9 million, or about 2.1% is for water reclamation projects while $81.8 million or about 5.8% is for Water line rehabilitation projects including $6 million for condition assessments of our water transmission mains.

g. Is AWU currently planning any wastewater treatment plant expansions based on projected increases in wastewater flows? If so, when and at what costs?

Austin is not planning major wastewater capacity improvements at its existing plants within the near-term Capital Improvement Program (CIP) spending plan horizon. Both major plants were recently upgraded to 75 MGD. However, over time, AWU will continue to track historical use patterns and project demands into the future to determine when the next plant upgrades will need to be triggered.

h. What is the formula and/or methodology for predicting future wastewater treatment flows and capacity needs? When was this developed? When was it last updated? When will it be updated again? How does the total wastewater production in each of the last 3 years compared to what was predicted for these years in 2000? Predicted in 1995?

The wastewater treatment methodology is similar to the water treatment projection methodology in that the projection is based on historical trends of treatment flows and population. The basic methodology has changed little over the last ten years. The projections for determining capacity needs is based on the average annual flow amount (which syncs with the plant permits).

Based on average annual effluent data, the trend line is determined using linear regression based on historical average annual flow and population. Next the upper 95% confidence limit line is added to the curve to provide an upper boundary to encompass the fluctuations around the trend due to rainfall (inflow and infiltration) and other factors influencing the average annual flow. The projections are updated routinely similarly to the water projections.

Total Wastewater Combined Treated Effluent (last three years)

Fiscal Year	Combined Treated Effluent (AF/yr)
05/06	87,153
06/07	109,323

07/08	92,860
3-year Average	96,445

1994 Projection

Fiscal Year	Combined Treated Effluent (AF/yr)
05/06	105,294
06/07	106,414
07/08	107,534
3-year Average	106,414

2003 Projection

Fiscal Year	Combined Treated Effluent (AF/yr)
05/06	125,456
06/07	127,696
07/08	131,057
3-year Average	128,070

This higher projection than actual is likely attributable to a number of factors, including:

- Significant reductions in inflow and infiltration (rain or groundwater flowing unintentionally into the collection system pipes through pipe cracks and open manholes) resulting from the completion of the Austin Clean Water Program (ACWP)
- Impacts of water conservation (use of low-flow toilets and showerhead, for example)
- Increased reclaimed water use

AWU will continue to monitor wastewater flows to determine impacts of inflow and infiltration reduction efforts, water conservation, and other trends. AWU will also review its methodology to determine if refinements can be made to incorporate changing trends.

i. The environmental community argues that even with the plant moved out of the Bull Creek Preserve, there is still considerable risk that tunneling for the intake tunnel and the transmissions mains will still penetrate thru and pass under the Edwards Aquifer and Bull Creek springs, and pose a significant risk to disrupting spring flows. Have these risks been fully assessed? If so, please provide the assessment document. If not, when will it be done? When will it be completed?

The entire WTP4 project, including the transmission mains, is participating in an Environmental Commissioning process, led by Watershed Protection

Development Review Department (WPDRD). As part of that process the stated goal and number one priority of the project is no disruption of existing groundwater hydrology, this includes groundwater and springs that may be Jollyville Plateau Salamander (JPS) habitat.

Initial data gathering for the assessment of the threat to groundwater is underway. Environmental Commissioning team members (WPDRD staff and consultants) will be participating directly in that assessment. The transmission main design will incorporate the assessment results with the goal of not impacting groundwater hydrology. AWU does not have an estimated completion date, but that can be provided to Council once it is known.

Recognizing the potential for impacts due to these activities, the project team is engaged in planning, environmental commissioning, permitting, design, and review activities to reduce and minimize the effects of construction and operations on the environment. The following list identifies key actions that are being taken to reduce and minimize possible impacts from the work activities listed above:

1) Federal Agency Permitting: US Fish and Wildlife has reviewed and approved a minor amendment for the work being performed in the areas formerly within the Comanche Canyon Development. The US Corps of Engineers has reviewed and approved the work proposed in Lake Travis for the raw water intake and tunnel connection.
2) State and Local Permitting: Ongoing meetings with Neighborhood Planning and Zoning Department Land Use Review personnel are occurring to review proposed activities and establish protection criteria and strategies to comply with local codes. Submittals and review meetings with Travis County, LCRA, and other jurisdictional agencies are also part of the permitting process.
3) BCP Coordination: Meetings with BCP representatives are part of the design and permitting process. An alternatives report for activities within the Bullick Hollow Roadway (a portion being a BCP corridor) is being developed to address potential impacts within the corridor.
4) Field Surveys: The RWPS and WTP sites have been fully surveyed to identify critical environmental features (CEFs), archeological sites, vegetative and water features, and species habitat.
5) Environmental Assessments: An Environmental Assessment has been prepared for both the WTP and RWPS sites to evaluate existing conditions, identify critical environmental features and setbacks, and present protective measures for those features.
6) Environmental Commissioning: The EC process is being used to review proposed activities and develop approaches to reduce, minimize, and avoid potential impacts to environmental features. This process is led by the Watershed Protection and Development Review Department and includes an EC consultant that reports directly to WPDRD.

7) Mitigation Plan: A mitigation plan that clearly outlines the City's environmental goals and mitigation strategies is in place for the WTP and RWPS and is being developed for the transmission mains. This document guides the EC process.
8) Stormwater Controls: Permanent stormwater control features are being constructed in advance of the major construction contracts to provide robust stormwater treatment prior to major earth-moving activities.
9) Variance Requests & Mitigation: Cut and fill activities are being reviewed through the administrative variance process established under Ordinance No. 20080515-035, including the use of the Variance Request Matrix used by the Environmental Board to review and evaluate construction activities and develop appropriate mitigation strategies.

j. **How severe must a drought become that WTP4 would be unable to draw water at built capacity from Lake Travis? Do Lake Travis levels affect the potential for suspended solids, algae, and other dissolved constituents? What effect does this have on the costs of treatment at WTP4?**
The lower intake will be installed at 565 mean sea level (MSL). The plant could still operate down to this level. The historic low for Lake Travis is 614.2 MSL (in 1951); much higher than our lowest intake point. Fluctuating lake levels are one reason for having three intake levels at which to withdraw water from. To some extent lake levels can affect the potential for suspended solids, algae and other dissolved constituents. We have been sampling and analyzing raw water in the area of the intake to be prepared for any changes in water quality related to this issue. Test results have shown that the water quality will not be a significant issue, thus no additional processing costs are anticipated.

5. Revise growth projections, perhaps reducing population growth in service area.

a. **What is the formula and/or methodology for predicting future peak day demands? When was this developed? Please provide a copy of this formula and any documentation that supports it.**
In 2005 Austin Water Utility contracted with Alan Plummer Associates, Inc. to review Austin's peak day demand forecasting methodology as part of its water supply planning efforts. The memo outlining the methodology and the associated method analysis is attached (attachment 7).

b. **Similarly, what is the formula and/or methodology for predicting future total water needs? When was this developed? When will it be updated? How does the total water use in each of the last 3 years compared to what was predicted for these years in 2000? Predicted in 1995? Predicted in 1990?**
As with the peak day demand projection method review and analysis, in 2005 Austin Water Utility contracted with Alan Plummer Associates, Inc. to review Austin's annual demand forecasting methodology as part of its water supply planning efforts. The memo outlining the methodology and the associated method analysis is attached.

These projections are updated on a routine basis over time as more data becomes available. The total water use for the last three years is as follows:

- FY 07/08: 162,853 AF/yr (145 MGD)
- Highest fiscal year: 173,707 AF/yr (FY 05/06)
- Most recent 3-year average: 159,108 AF/yr

Fiscal Year	Demand (AF/yr)
05/06	173,707
06/07	140,763
07/08	162,853
3-year Average	159,108

Prior year predictions of total water use are as follows:

1994 Projection

Fiscal Year	"Current Trends" Demand (AF/yr)	"Water Conservation Scenario A" (AF/yr)	"Water Conservation Scenario B" (AF/yr)
05/06	162,421	154,580	148,979
06/07	164,661	156,820	150,099
07/08	169,142	162,421	154,580
3-year Average	165,408	157,940	151,219

2003 Projection

Fiscal Year	"Current Trends" Demand (AF/yr)	Water Conservation Scenario Projection (AF/yr)
05/06	173,062	160,000
06/07	176,447	164,000
07/08	179,898	167,000
3-year Average	176,469	163,667

c. What effect, if any, does the economic recession have on water usage rates? If there is an effect, should this be factored into the projections?

Water tends to be a recession proof commodity, or at least it is a commodity not first to be hit by a failing economy. It is also difficult to extrapolate whether a decline in water usage is a direct result of the economy, the stricter water conservation measures, or a combination of both. However, it is important to note that despite the economic downturn, the population in the region is still growing and is anticipated to continue to grow in the future.

d. To what extent is the current reduction in water usage due to reductions in the number and activity of industrial plants that use large amounts of water?

From FY 1997 through FY 2009 many of the large volume customers have reduced their water consumption due to changes in technology, internal reclaimed water systems, water conservation, and changes in the economy.

From FY 1997 through FY 2009 the seven (7) large volume customers (>85 million gallons (MG) of water per year) used a combined 4.0 billion gallons (BG) per year, or nearly 10% of the total projected water sales during those same fiscal years. Now, those same seven (7) customers are projected to use 3.0 BG per fiscal year, or only 5.4% of projected water sales. Only Samsung has projected growth. When their plant went online in 1996, their initial projections were to eventually expand to 15 MGD, or 5.5 BGY. Samsung used 1.1 BG last fiscal year.

In March 2009 the AWU asked Large Volume customers to provide information on their anticipated water use for the remainder of this fiscal year as compared to last fiscal year's usage. The responses received from each company were as follows:

1. Applied Materials: ~30% below last year's volume anticipated.
2. Hospira: No reduction in use anticipated.
3. Samsung: On pace to use about the same amount as last year. Samsung anticipates that their usage may increase if they pick up market share as other companies close overseas plants.
4. Sematech: No reduction in usage anticipated.
5. Spansion: ~15% to ~20% below last year's volume anticipated.
6. Freescale: No response received from Freescale. Water usage as of June 2009 was ~6.6% lower than FY 07/08.
7. UT Austin: The greatest large volume customer impact may come when UT Austin begins to receive reclaimed water in the next few years. They currently use about 500 MGY of large volume water and 500 MGY of commercial customer water. They may replace up to 400 MGY of their potable water (40%) with reclaimed water.

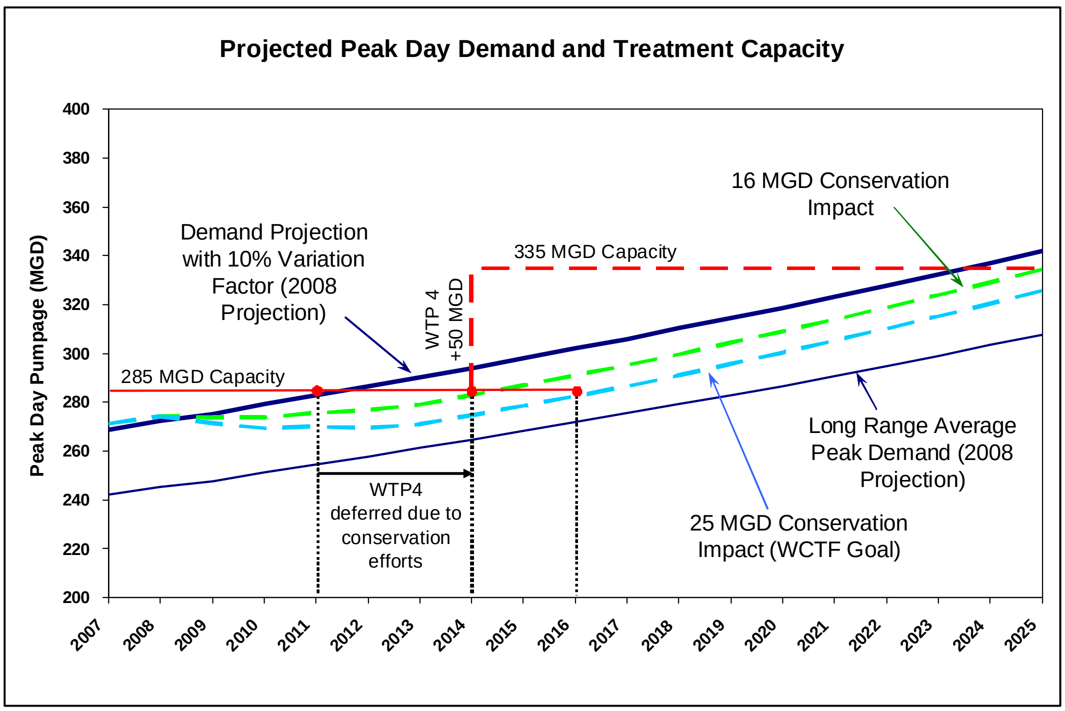
e. In what areas outside the city limits does AWU currently provide water service? Are there areas that we've promised service to, or expect to provide service to in the near future? How much water do we expect these areas to demand?

The attached map (attachment 8) shows the current city limits area compared to the current served water area. The map also shows Austin's wholesale water customers in yellow. AWU currently provides both retail and wholesale water service outside of the city limits (both full and limited purpose). Not including the wholesale customer areas, the total current served water area is 277 sq. miles. Of this amount, there are approximately 54 sq. miles (or approximately 20%) of retail served area outside of the city limits. The majority of this area is in southeast Travis County. The map also shows Austin's Certificate of

Convenience and Necessity (CCN), which are areas Austin plans to serve, and Impact Fee Service Area boundary, which is the area in which Austin may serve in the future and charge impact fees. The areas that are served outside the city limits are typically areas that we will annex in the future or areas that would have established MUDs had we not provided service.

AWU has a number of currently approved Service Extension Requests (SERs) and SERs in process both inside and outside of the city limits. Approved SERs represent a commitment to service. A large portion of the major SERs either approved or in process are in the city's Desired Development Zone. Typically over ¾ of total annual SERs are in the Desired Development Zone.

The expected growth in system demand is shown in the projected demand curve (below). Some of this growth will occur within the city limits and some will occur outside of the city limits.



f. **What is the basis for current population and business projections within the AWU service area? Is this basis similar to those used in other city departments, Travis County, and CAMPO? If not, how do they differ and why? Has the currently used projection method proved accurate in the past?** The population and employment projections used by AWU were developed by the City of Austin Planning Department (in conjunction with City Demographer Ryan Robinson). The projections are based on the City's "smart growth" initiatives and associated policies. AWU routinely makes comparisons to projections developed by other entities including CAMPO, Texas Water Development Board, LCRA, and others to confirm the projections are continuing to be relatively similar.

The population projection figures for Austin's water served area are as follows (includes areas inside and outside of the city limits and the estimated wholesale customer population):

	AWU Served Area	Annualized Growth Rate
2009	0.86 million	
2014	0.94 million	1.80%
2020	1.05 million	1.80%
2030	1.26 million	1.80%

The past projections of population have proved reasonably accurate. For comparison, the past and current estimates of served area population for 2010 is in the range of approximately 0.88 to 0.89 million. This is on track with the estimated actual served population for 2008 of 0.85 million.

Note that the pre-2000 census adjusted estimates for the 2010 served population estimate (projection made in 1994) was 0.81 million.

Annual estimates of the current served customer population are done in coordination with Ryan Robinson's annual population estimate update. The latest "Austin Area Population Histories and Forecasts" summary is attached (attachment 9). Note that for 2009, Mr. Robinson reports an annual growth rate for 2009 of 3.13%. Accordingly, it is anticipated that during this year's annual projection update process, the AWU served area population figure used for 2009 will likely increase.

g. **What is the effect, if any, of tight water supply on growth within the AWU service area? Does the current controversy affect development patterns, and if so, how?**

In order to be able to provide service to the growing population, including large undeveloped areas of the Desired Development Zone, Austin needs to continue to invest as planned in system infrastructure and capacity to support the anticipated growth. The WTP 4 project is a major component in the system that not only provides water treatment capacity but includes large transmission system improvements (approximately 1/3 of the project) to provide supply to the growing north and northwest portions of the system, including North Burnet Gateway, Pearson Ranch, Robinson Ranch, and others. These improvements also allow capacity in the two existing plants Ullrich and Davis to be used to serve other parts of the growing service area. The current plan is in sync with current and projected demand and will allow the City to be able to provide water and wastewater services when needed.

What is the effect of increasing conservation (and reducing water usage and sales) on AWU's long-term fiscal sustainability? If so, what can be done to ensure sustainability in the face of conservation?

Water conservation has a net cost in the short term (as costs are increased to provide some conservation incentives, and sales revenue is decreased), and a long term net benefit (as the need for future capital and operating expenditures is reduced). For the short term, increased conservation resulting in lower revenues can result in slightly higher rate increases. However, this impact is mitigated over time as the longer term benefits of water conservation are realized.

Additionally, the AWU has some of the most aggressive conservation rates in the nation. Austin's residential block rates recover a significant portion of the Utility's costs from customers who use large amounts of water. The downside of this strategy is increased weather-related revenue volatility, thus making revenue projections much less reliable.

Sustainability may be enhanced through:

1. Weighting a larger percentage of future rate increases towards the minimum charge and lower rate blocks to reduce revenue volatility. Attachment 10 discusses this in more detail.
2. Increasing working capital reserves.

Is there a plan for coordinating the comprehensive planning efforts, and the recently released federal report on global climate change, into the city's water planning?

AWU has been, and is continuing, to coordinate with the comprehensive planning efforts. The relevant sections of the comprehensive plan are a reflection of the detailed plans developed by the Utility. Additionally, the Utility is involved at the federal and state levels. WTP4 is in alignment with the current comprehensive plan and the work City Council had done into the developing the desired development zone over the last 10 to 15 years. WTP4 will serve the North and Northwest Desired Development Zone, including areas like Pearson and Robinson Ranch, both of which already have development agreements and the North Burnet/Gateway area.

Acknowledging the high energy intensity of water and wastewater treatment and conveyance, AWU began a climate protection initiative in 2007. First AWU staff compiled a greenhouse gas emissions inventory and then began a three pronged program aimed at reducing emissions in line with the City's Climate Protection Program. The three prongs are water conservation, energy conservation, and alternative energy production.

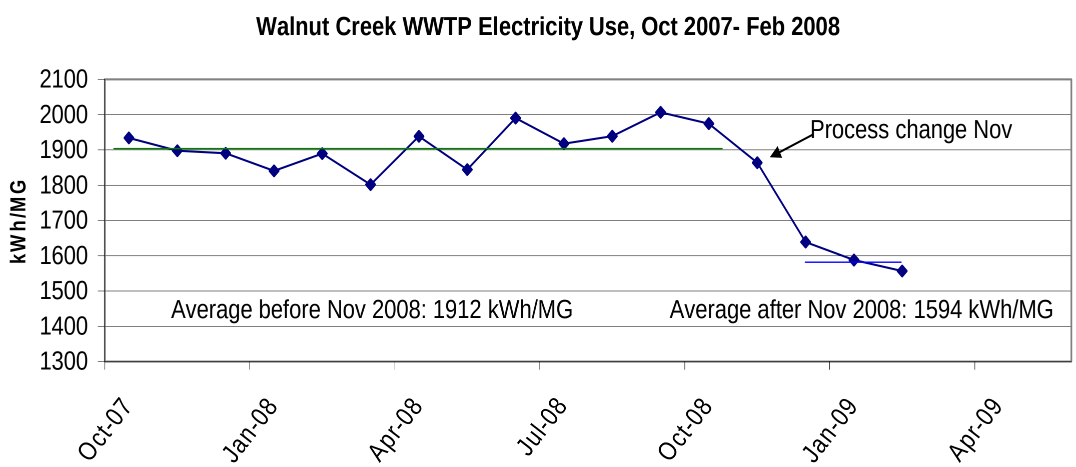
Water Conservation is the most direct way to reduce greenhouse gas emissions resulting from AWU operations. It is also a way that citizens can work with City government to reduce their individual carbon footprints.

Reducing energy use in utility operations, several examples of which are included below, is a major component of AWU's climate protection strategy. AWU has sought to, where possible, achieve reductions in energy use without capital investment while also including consideration of energy use in its CIP project selection process. AWU front line employees have implemented several energy savings initiatives that are already reducing AWU's carbon footprint. A few examples which will be addressed in a forthcoming memo are included below.

Energy-Saving Process Changes at AWU Plants

Walnut Creek Wastewater Treatment Plant

In November 2008, the Walnut Creek Wastewater Treatment Plant made a seasonal process change that allows operation with one of two blowers off during cooler winter months. These 2000-horsepower electric blowers aerate wastewater basins, activating beneficial microorganisms to consume organic matter. The change has resulted in savings of 2,500 MWh/year and 1,250 $MTCO_2e$/year as shown in the figure below. The savings are equivalent to 1% of the utility's overall emissions and also save AWU $200,000 in energy costs at current rates.



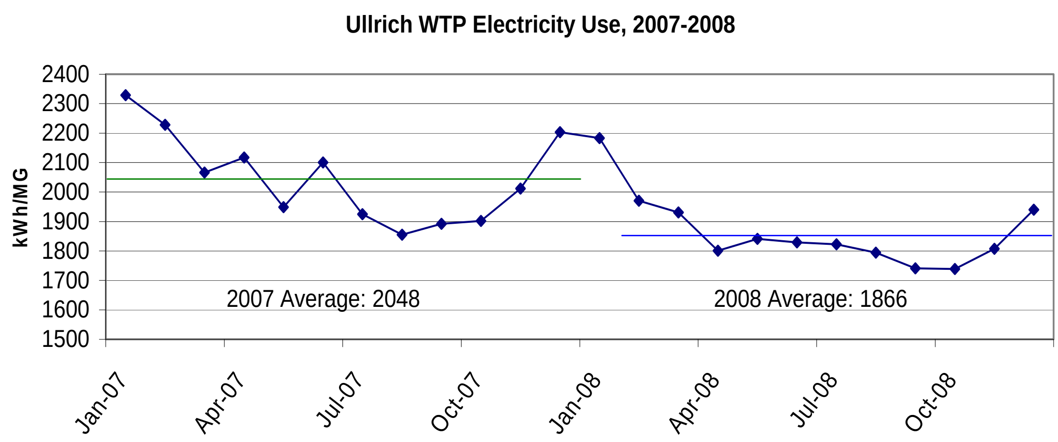
Part of a plantwide electrical upgrade capital improvement project underway will provide additional energy savings by automating the process air system utilizing dissolved oxygen for blower controls and revamping two of the existing blowers to improve their efficiency. Work will continue into 2010, and is expected to reduce electricity use by an additional 5,000 MWh/year and GHG emissions by 2,500 $MTCO_2e$/year.

These two projects at Walnut Creek WWTP are estimated to reduce AWU's overall greenhouse gas emissions by 3% and overall electric use by as much as almost 4%, a cost savings of nearly $700,000 per year.

Ullrich Water Treatment Plant

In CY 2008, Ullrich Water Treatment Plant staff developed an operations protocol to improve raw water pumping efficiency. By optimizing pump switches and minimizing "throttling" – inefficiently controlling the flow of water with valves rather than pumps – the operations staff is saving approximately 5,000 MWh/year and 2,500 $MTCO_2e$/year.

The resulting change in the amount of electricity used per million gallons treated is shown in the figure below.



Finally, the third prong of AWU's climate initiative is to install renewable energy generation at AWU facilities. Examples include installation of solar panels which are under contract for the Glen Bell Service Center and intensive planning to utilize the methane at Hornsby Bend to power the plant. AWU is also working with Austin Energy to place solar panels in all possible locations at AWU facilities. These renewable energy projects also work to improve Austin Energy's fuel mix which is a critical component of AWU and the entire City's climate initiative.

Rudy Garza
Assistant City Manager

Cc: Marc A. Ott, City Manager
Greg Meszaros, Director, Austin Water Utility

Attachment 1

Utility	Austin Water Utility	SAWS	El Paso Water Utility	Dallas Water	SNWA	Albuquerque	City of Santa Fe	City of Tampa	EBMUD
Toilets -- Rebates	✔	✖	✖	✔	✔	✔	✖	⦸	✔
Toilets -- Free Distribution	✔	✔	✖	✔	✖	✖	✔	✖	✖
Toilets -- Direct Installation	✖	✔	✖	✖	✖	✖	✔	✖	✖
Plumbing Repair Assistance	ⓘ	✔	✖	✔	✖	✖	✖	□	✖
Clothes Washer Rebates	✔	✔	⦸	✖	✖	✔	✔	□	✔
Showerhead -- Free Distribution	⦸	✔	✖	✖	✖	✖	✖	✔	✔
Faucet Aerators -- Free Distribution	⦸	✔	✖	✖	✔	✖	✖	✔	✔
Irrigation Audits	✔	✔	✖	✔	✖	✔	✖	?	✔
Irrigation Upgrade Rebates	✔	✖	✖	✖	✖	✖	✖	?	✔
Irrigation -- Free Rain Sensor	⦸	✖	✖	✖	✔	✔	✖	✔	✖
Irrigation -- Smart Controller Rebates	✔	✖	✖	✖	✔	✔	✖	?	✔
Landscape Conversion Rebates	⦸	✔	✖	✖	✔	✔	✖	?	✔
Landscape Design Restrictions	✔	✔	✖	?	✔	✖	✔	?	?
Hot Water on Demand Rebates	⦸	✔	✖	✖	✖	✔	✔	?	✖
Whole House Audits	✖	✔	✖	✖	✖	✖	✖	?	✔
Rainwater Harvesting Incentives	✔	✖	✖	✖	✖	✔	⦸	✔	✖
Watering Restrictions	✔	✔	✔	✔	✔	✔	✔	✔	✔
Water Waste Regulations	✔	✔	✔	✔	✔	✔	✔	?	✖
Commercial Facility Audits	✔	✔	✖	✖	✖	✖	✖	✔	✔
Commercial Process / Large Scale Rebates	✔	✔	✖	✖	✖	✖	✖	✖	✔
Air-Cooled Ice Machine	✖	✔	✖	✖	✔	✖	✔	?	✔
Commercial Dishwasher	✖	✖	✖	✖	✖	✖	✔	?	✔
Pre-Rinse Spray Nozzle	⦸	✔	✖	✖	✖	✖	✔	?	✔
Garbage Grinder rebate	⦸	✖	✖	✖	✖	✖	✖	?	✔
Medical/Dental Dry Vacuum Rebate	⦸	✖	✖	✖	✖	✖	✖	?	✔
Restaurant water-serving restrictions	✔	✔	✔	?	✔	✖	✔	?	✖
Signage Requirements	✖	✖	✖	✖	✖	✖	✔	?	✖
Hotel/Motel Restrictions	✖	✔	✔	✖	✔	✖	✔	?	✖
Conservation Rate Structure	✔	✔	✔	✔	✔	✖	✖	✔	✔
Neighborhood Saving Challenges	✖	✔	✖	✖	✖	✖	✖	?	✖
Golf Course Program	✖	✔	✖	✖	✔	✖	✖	?	✖
Reclaimed Water Program	✔	✔	✔	?	✔	?	✖	✔	✔
Elementary Education	✔	✔	✔	✔	✔	✔	✔	?	✔
Secondary Education	✖	✔	✔	✖	✔	✔	✔	?	✔
Adult Education	✔	✔	✔	✔	✔	✔	✔	?	✔

in planning	ⓘ
discontinued	⦸
program in place	✔
no program in place	✖
no information	?

Texas Water Development Board Best Management Practices

The following section examines how AWU's water conservation strategies reflect the Best Management Practices (BMPs) recommended by Report 362 of the Texas Water Development Board. It should be noted that these BMPs were developed with assistance of conservation staff when the BMPs were released in 2004.

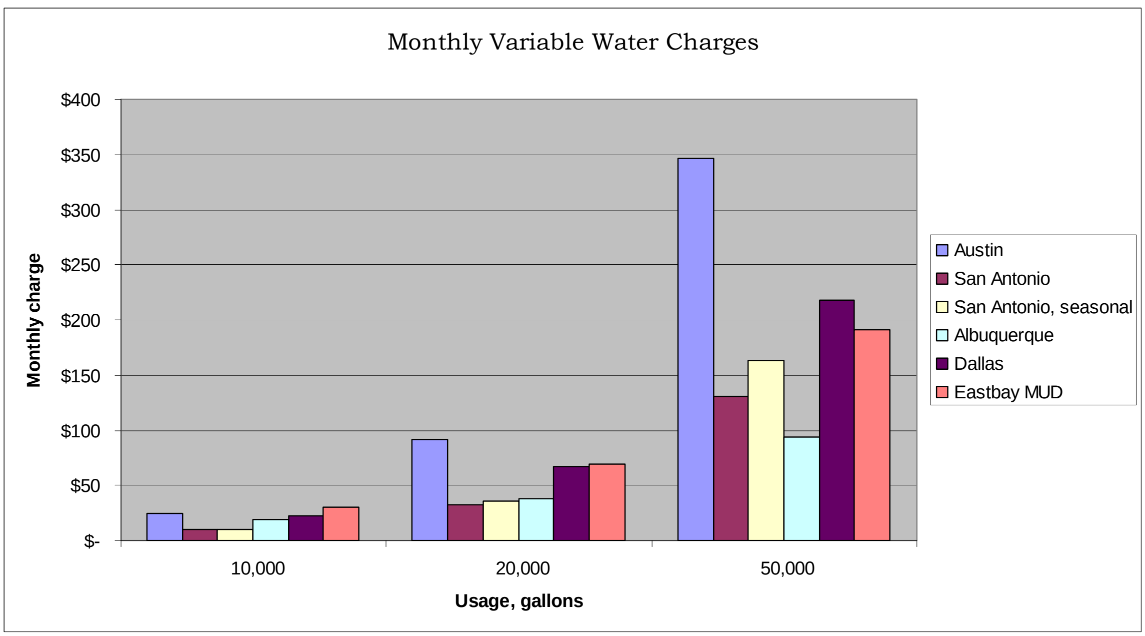
BMPs for Municipal Water Users

2.1 System Water Audit and Water Loss

AWU implemented this measure following the audit recommendations. The Utility scored in the highest performance range on the recent FY07 water loss analysis. Although the Texas Water Development Board requires reporting only once every 5 years, AWU is committed to producing annual water loss reports with an emphasis on improving data quality and recommending cost-effective ways to reduce lost water.

2.2 Water Conservation Pricing

AWU's current inclined block rate structure has been in place since FY 2001-02. Austin is a national leader in conservation pricing. The figure below shows monthly variable water charges at three levels of monthly consumption in Austin versus selected utilities across the U.S.



2.3 Watering Restrictions and Prohibition of Wasting Water

Austin enacted its first water use management ordinance in 1983, permitting watering restrictions in response to supply constraints. Austin enacted a permanent water waste prohibition in 2001, making it a Class C misdemeanor to waste water through poorly designed irrigation systems or by failing to repair leaks. In 2007, Austin revised its ordinance to institute mandatory watering restrictions, allowing watering only twice per week for commercial customers at any time during the year, and to limit residential watering to two days per week during the summer months. The ordinance also restricts daytime watering, and contains additional restrictions triggered by supply and demand conditions.

2.4 Showerhead, Aerator, and Toilet Flapper Retrofit

In 1985, the Water Conservation Division teamed with the electric utility's Residential Energy Efficiency audit program to install low-flow showerheads. The program resulted in the distribution of 37,903 low-flow showerheads between 1984 and 1990. Between 1986 and 1990, the Water Conservation Division expanded the retrofit effort to residential customers offering door-to-door installation of low-flow showerheads and faucet aerators. After the implementation of the Free Toilet Program in 1993, showerheads were distributed to all free toilet participants, and aerators were available upon request. However, since installation of and savings from the devices could not be verified, AWU stopped distributing showerheads and aerators in 2008.

2.5 Residential Toilet Replacement Programs

Since FY92-93, Austin has helped replace over 130,000 toilets through a combination of free toilet distributions and toilet rebates. The BMP recommends that toilet programs continue until 50% of eligible toilets have been replaced with efficient models; Austin is nearing that mark based on the estimated number of inefficient toilets in 1991. The BMP also indicates that "free ridership" is an issue with toilet rebate programs. While AWU toilet programs have been successful, further evaluation is needed to determine cost-effectiveness, rates of free-ridership, and possible diminishing returns.

2.6 Residential Clothes Washer Incentive Program

AWU has issued rebates for over 28,000 clothes washers since 1992. Participation has increased over the years, with 2,490 rebates during the current fiscal year alone. This popular program conforms to TWDB guidelines; however, additional cost-efficiency analyses are needed. BMP guidelines warn against free ridership, yet surveys indicate that the majority of AWU's rebate recipients (around 60%) would have bought a high efficiency washer anyway. The marginal impact of the program has also not been reevaluated following the higher federal efficiency standards that took effect in 2007 and the incorporation of a water factor into EnergyStar labeling for clothes washers.

2.7 School Education

For over 14 years, AWU operated an award-winning education program ("Dowser Dan") targeting 1st through 4th graders, complimented by curriculum-based programs for 5th and 6th grades ('Water in Our World' and 'Down the Drain'). In 2008, AWU altered its educational programming to more closely match the BMP, focusing resources on more cost-effective curriculum-based programs and hiring one FTE, a former teacher, dedicated to community educational programs and the development of a curriculum for secondary grades.

2.8 Water Survey for Single-Family and Multi-Family Customers

AWU is preparing a scope of work for an online water audit tool that will help customers analyze their water use, identify conservation opportunities and take action to save water, energy and money. The information collected will allow AWU to focus conservation programs to more precisely meet customer needs.

2.9 Landscape Irrigation Conservation and Incentives

Three licensed irrigators conduct irrigation audits for residential and commercial customers, resulting in substantial water savings. So far this year 468 residential and 63 commercial audits were conducted, for a total of more than 7,700 audits over the life of the program.

2.10 Water Wise Landscape Design and Conversion Programs

Austin has used several programs to encourage native landscapes, beginning with the "Xeriscape It" education program launched in 1984. By 1994, it was evident that outreach efforts were not very successful, with most residential and commercial landscapes comprised of thirsty turfgrass. In response, two new initiatives were introduced: a residential rebate program for installing water-wise landscapes and an ordinance requiring native or adapted plants in all new commercial landscapes and establishing standards for commercial irrigation systems.

Both of these initiatives met with mixed success. The landscape conversion rebate had minimal participation (on average, only 50 customers per year) and attracted customers with already-low water use. In 2004, the program was modified to limit participation to customers with above average water use, and make rebates contingent on measured water savings. Interest in the program dropped off completely following this change, and the program ended in 2006.

The commercial landscape ordinance was a compromise, as it was based on an existing ordinance intended to promote beautification. The revised ordinance retained most of these beautification elements, even though they sometimes conflicted with water-wise management practices. For example, the ordinance required irrigation systems for all landscapes whether or not the plants needed irrigation, and required raised islands for landscape areas in parking lots although ground-level plants could have taken advantage of water draining from the pavement. The WCTF recommended additional changes to the commercial landscape requirements that have not yet been implemented.

2.11 Athletic Field Conservation

AWU does not have a specific program to address conservation on athletic fields; however, athletic fields are subject to the twice-weekly watering schedule all year unless a variance has been approved.

2.12 Golf Course Conservation

Several area golf courses receive reclaimed water from AWU, reducing potable demand. As noted earlier in this report, the UT reclaimed transmission line will bring reclaimed water to the City's Hancock Golf Course.

2.13 Metering of All New Connections and Retrofit of Existing Connections

Austin currently meters all customer connections.

2.14 Wholesale Agency Assistance Programs

AWU requires its wholesale customers to implement conservation measures, and allows customers of wholesale districts supplied by Austin to participate in AWU conservation incentives. AWU eagerly shares information with and provides assistance to its wholesale customers who are interested in implementing new conservation programs.

2.15 Conservation Coordinator

AWU has 20 full-time staff dedicated to conservation programs.

2.16 Water Reuse

As suggested by TWDB, AWU has an extensive water reclamation and reuse program focusing on industrial and commercial customers. Additional resources were allocated to the program in 2009 through a Utility reorganization, and development continues on several pipeline and storage projects to expand reclaimed water capacity, though efforts remain focused on commercial and industrial customers.

2.17 Public Information

As suggested by TWDB, AWU educates the public on the importance and practices of water conservation through TV, radio, and print advertising, a well-designed Web site, press releases and other public outreach efforts. AWU partners with LCRA and Cedar Park to promote the TWDB-developed Water IQ campaign.

2.18 Rainwater Harvesting and Condensate Reuse

AWU provides rainwater harvesting rebates on large capacity systems. An expert on rainwater harvesting speaks to community groups as part of the water conservation speakers bureau. AWU distributed over 13,000 rainbarrels over five years before ending the program due to a poor cost-benefit ratio, the increased availability of rain barrels at retail outlets, and an out of proportion carbon impact caused both in production of the barrels and by delivery and transport of the rain barrels.

2.19 New Construction Graywater

Currently staff is reviewing programs in other cities. The potential savings from graywater reuse is unknown. Preliminary research indicates that savings would not be of a large magnitude, at least not in early years. A report is forthcoming for management review.

2.20 Park Conservation

Several of Austin's most visible parks, including Zilker Park, use raw water from Lady Bird Lake to irrigate, reducing potable water demand. AWU has also helped convert wading pools into water-efficient playscapes and partially funded improved irrigation systems for park facilities.

2.21 Conservation Programs for Industrial, Commercial, and Institutional Accounts

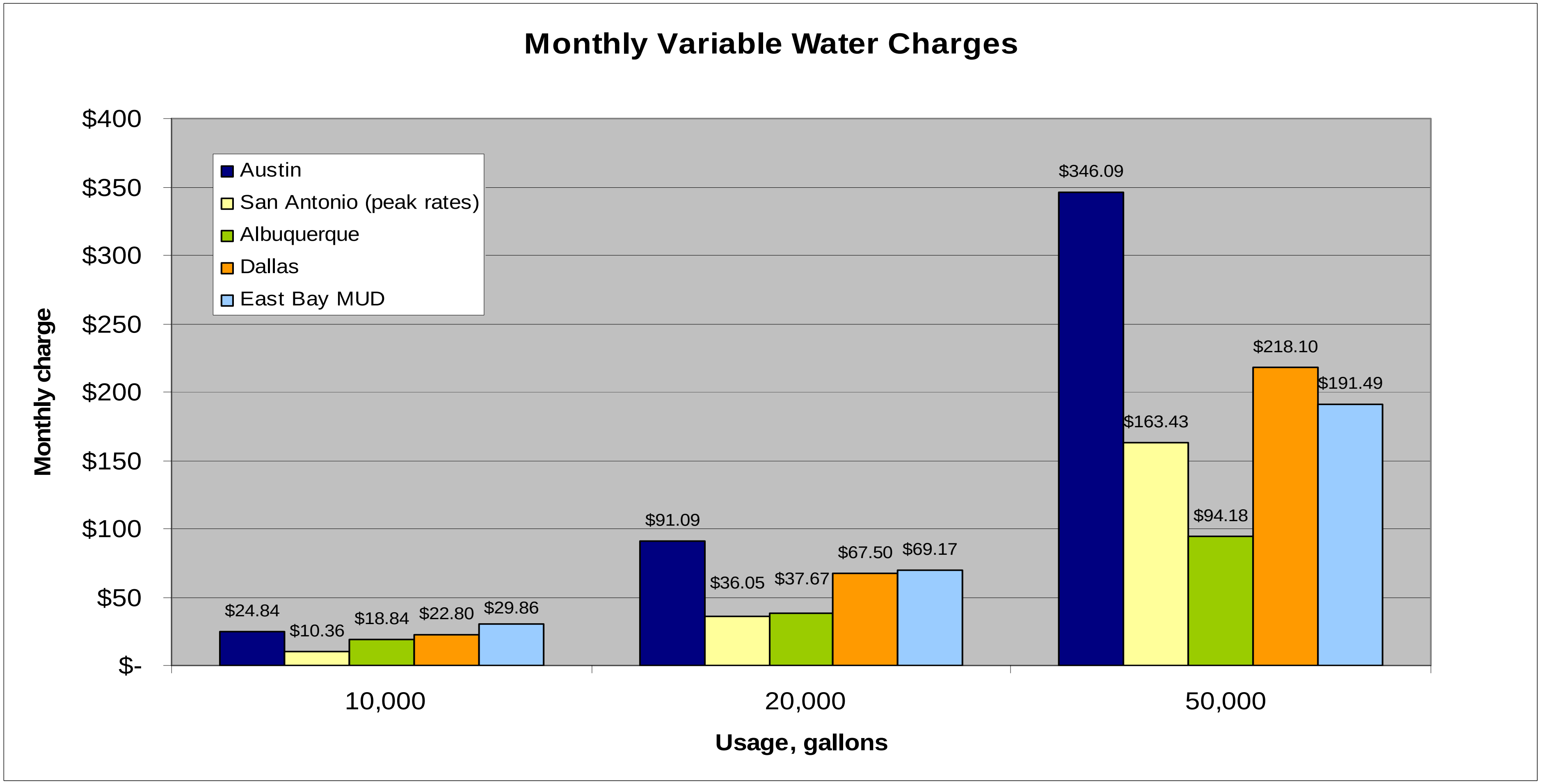
The majority of Austin's residential conservation programs are also available to institutional, industrial and commercial customers, including toilet retrofit incentives and free irrigation audits. AWU has offered rebates for specific equipment upgrades such as dental vacuum pumps, although those rebates have been discontinued due to lack of participation.

2.22 Cost- Effectiveness Analysis for Municipal Water Users

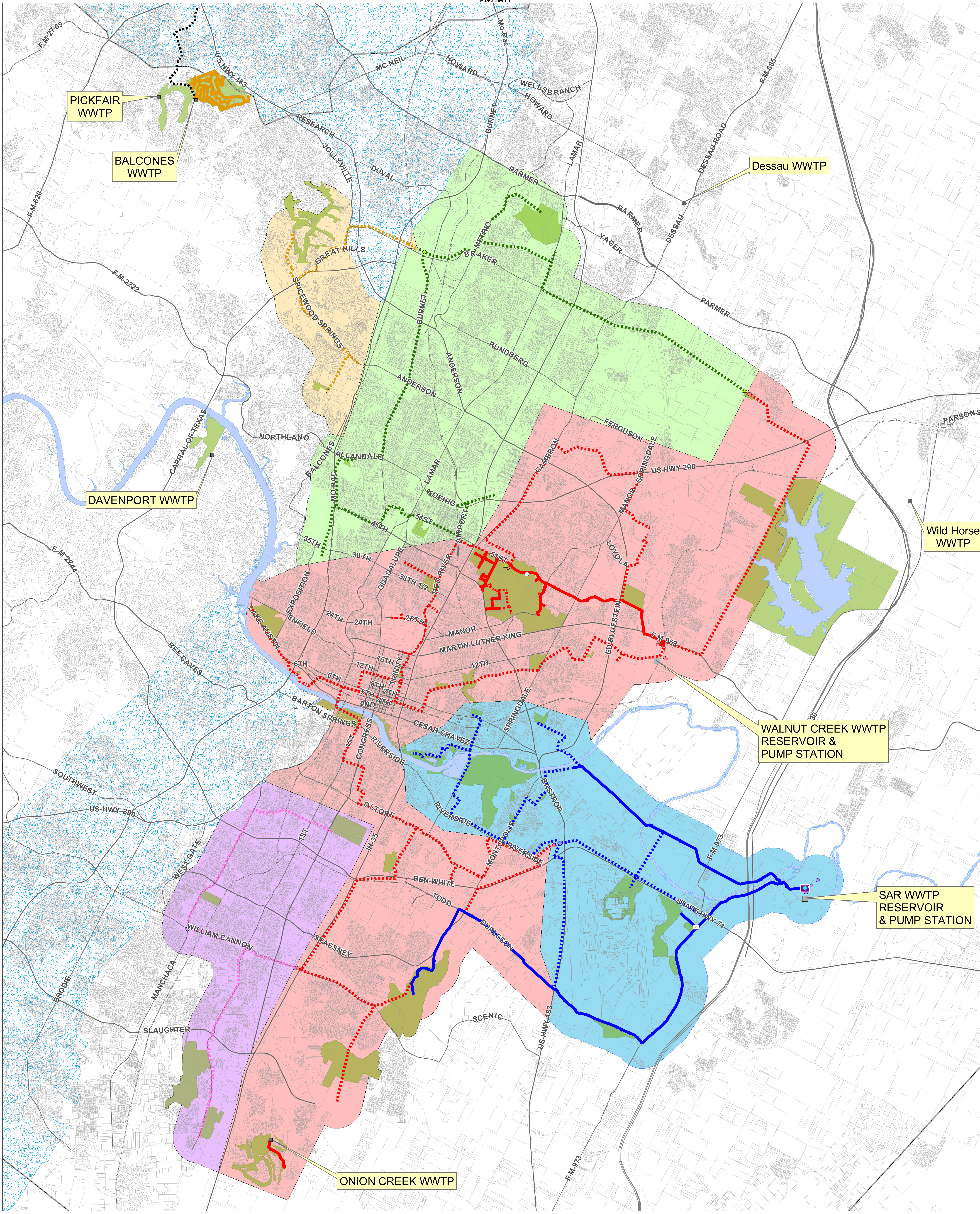
Though cost-benefit analyses were likely performed for most conservation programs the original research was not well documented, and AWU cannot determine whether cost and savings assumptions are still valid. AWU has recently hired a research analyst with a background in statistics and finance to help complete savings analyses and cost-benefit calculations for all conservation programs.

Industry-specific BMPs

TWDB recommends BMPs specific to commercial and agricultural water users. Austin does not have an agricultural rate, and so cannot identify which customers may be using water for agricultural needs. Most of AWU's conservation programs are open to commercial users (including toilet replacement programs and free irrigation audits), and commercial customers may apply for up to $100,000 per project to install water-saving equipment or to complete reuse projects for water from manufacturing or cooling processes.



Monthly Variable Water Charges
$400
$350
$300
$250
$200
$150
$100
$50
$-
Monthly charge
Austin
San Antonio (peak rates)
Albuquerque
Dallas
East Bay MUD
$24.84
$10.36
$18.84
$22.80
$29.86
$91.09
$36.05
$37.67
$67.50
$69.17
$346.09
$163.43
$94.18
$218.10
$191.49
10,000
20,000
50,000
Usage, gallons



EXISTING REUSE FACILITY
- Sampling Port
- Reservoir
- Hydro Tank
- Booster Station
- Pump Station
- SCADA Sensor
- Treatment Plant

PROPOSED AND EXISTING PIPES
- North High Service Area
- North High Service Area (Existing)
- Central Low Service Area
- Central Low Service Area (Existing)
- South Service Area
- North Service Area
- Central Service Area
- Central Service Area (Existing)
- Satellite

PROPOSED & EXISTING FACILITIES
- Tank, North Service Area
- Tank, North High Service Area
- Tank, Central Service Area
- Tank, South Service Area
- Tank, Central Low Service Area
- Pump, South Service Area
- Pump, North Service Area
- Pump, North High Service Area
- Pump, Central Service Area
- Pump, Central Low Service Area
- CoA Major WWTP
- CoA Satellite WWTP

RECLAIMED WATER PRESSURE ZONES
- North Service Area
- North High Service Area
- Central Service Area
- South Service Area
- Central Low Service Area

- Open Spaces and Irrigation Areas
- TCEQ Edwards Aquifer Recharge Zone

N

0 0.5 1
Miles

City of Austin
Austin Water Utility
July 2009

Austin WATER

Reclaimed Water System

Produced by GIS Services

AUSTIN ENERGY Customer Care Applications & Reports

COMMON	REPORTS	APPS	LINKS

User: Dan Pedersen Logout

New Online Project Request Site! - Submit Report or Project Request. Click Here!

Active Reclaimed Water Accounts

Rates: ('RPARD', 'RAESH', 'RZC01', 'RSYST')
Records: 25

query

	ACCT	ACCTNAME	METER	RATE
1	5363736	COA-5010-1100-2217-5482 (K7)	216961	RAESH
2	5701967	MUELLER MASTER COMMUNITY INC	239267	RSYST
3	5701965	MUELLER MASTER COMMUNITY INC	239268	RSYST
4	5777943	MUELLER MASTER COMMUNITY INC	239642	RSYST
5	5759879	MUELLER MASTER COMMUNITY INC	245916	RSYST
6	5517950	SOUTHWEST EDUCATIONAL DEVELOPM	262137	RSYST
7	5923756	RONALD MCDONALD HOUSE CHARITIE	262126	RSYST
8	5542984	CATELLUS AUSTIN LLC	239637	RSYST
9	6073846	UT/DELL PEDIATRICS RSCH (K1)	239634	RSYST
10	6073846	UT/DELL PEDIATRICS RSCH (K1)	239635	RSYST
11	5580879	CATELLUS AUSTIN LLC	239636	RSYST
12	5614684	SETON DELL CHILDRENS HOSP (K4)	230394	RSYST
13	5614755	CATELLUS AUSTIN RETAIL II	239639	RSYST
14	5614755	CATELLUS AUSTIN RETAIL II	239641	RSYST
15	5764026	MUELLER MASTER COMMUNITY INC	239640	RSYST
16	5693140	GREATER AUSTIN FIRST TEE	258584	RSYST
17	5693131	COA-5080-8600-7103 (K7)	20022323	RSYST
18	5693068	COA-5080-8600-7104 (K7)	177259	RPARD
19	5764033	MUELLER MASTER COMMUNITY INC	262136	RSYST
20	5848276	MUELLER MASTER COMMUNITY INC	262127	RSYST
21	5820024	CATELLUS AUSTIN LLC	RW000006	RSYST
22	5982643	MUELLER MASTER COMMUNITY INC	RW000011	RSYST
23	5982656	MUELLER MASTER COMMUNITY INC	RW000004	RSYST
24	6056675	HOME DEPOT USA (K1)	RW000007	RSYST
25	6061218	FROST NATIONAL BANK	246779	RSYST

Non CIS Customers

26 Hornsby Bend
27 Balcones Country Club
28 Onion Creek Country Club
29 Lost Creek

FUSEBOX Inside Send all comments, suggestions, or problems to the site administrator. powered by COLDFUSION MX

WATER TREATMENT PLANT NO. 4
GREENHOUSE GAS (GHG) REDUCTION SUMMARY

BACKGROUND

The Austin Water Utility (AWU) currently supplies water to the Northwest A (NWA) pressure zone from Lake Austin primarily via the Davis WTP and a booster pump station. From the NWA zone, water is pumped to the even higher elevation Northwest B (NWB) and Northwest C (NWC) zones. Construction of Water Treatment Plant No. 4 (WTP 4) will allow the NWA pressure zone to be supplied by Lake Travis water through the WTP 4 facilities. Figure 1 schematically illustrates the two supply scenarios.

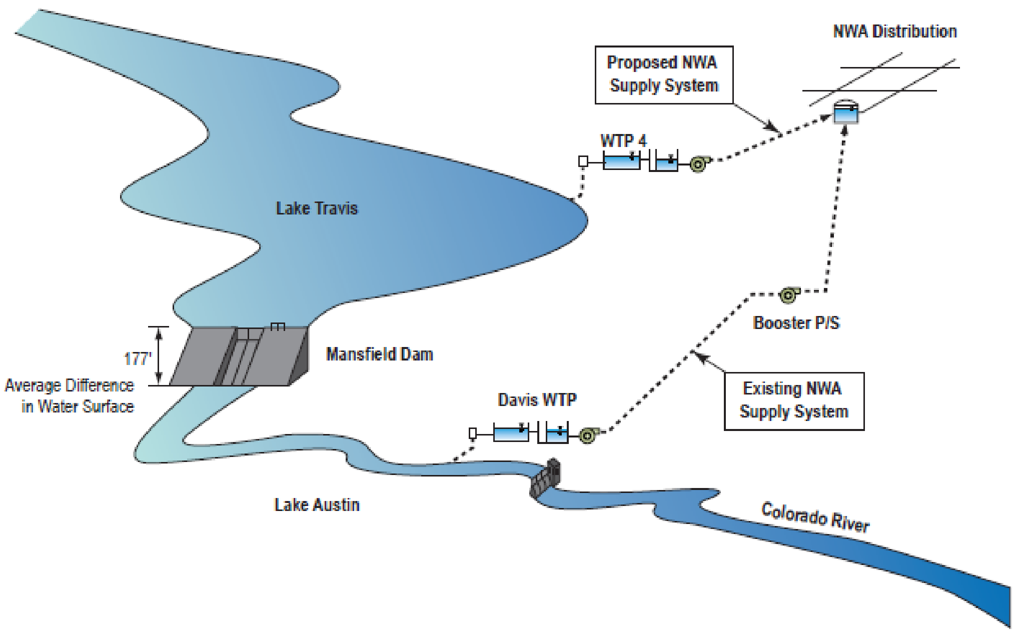


Figure 1
System Supply Schematic
WTP 4 PROJECT

The use of WTP 4 to supply water to the NWA pressure zone (and indirectly to the NWB and NWC zones) reduces GHG emissions since it draws water from a higher elevation water source and it is closer to the points of distribution. Additional reductions in GHG emissions would be achieved in the future when WTP 4 is expanded and begins supplying water directly into the Northwest B pressure zone as well as the North pressure zone (involving energy recovery).

The WTP 4 project plays a key role in helping AWU achieve system-wide energy savings and associated reductions in GHG emissions. In turn, Austin's goals for the Climate Protection Plan are supported.

PROJECT COMPARISONS

The following table presents relevant measures of the AWU water system for 2014/2015, the first expected year of operation for WTP4, with an assumed average daily system production of 156 MGD.

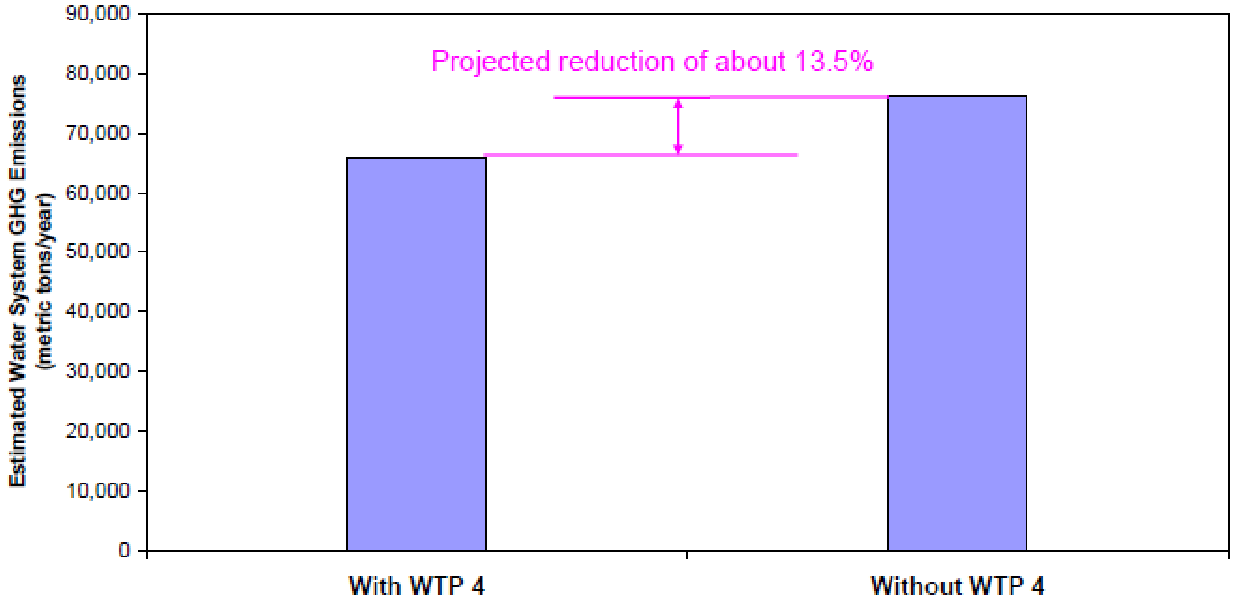
Item	**Status quo (Without WTP4)**	**Proposed (With WTP4 at 'low' average 31.5 MGD)**	**Savings/reductions**
Water system MWh electricity use	151,144	130,753	20,391 MWh/yr
Water system cost of electricity at $0.085/kWh	$12.8 million/yr	$11.1 million/yr	$1.7 million/yr
Water system greenhouse gas emissions (metric tons CO2-equivalent, MTCO2e)	76,176 tons	65,900 tons	10,277 tons
Linear ft. of pipeline from source to Jollyville Reservoir (NWA supply)	60,070 ft	40,279 ft	19,791 ft
Pumped elevation change from source, through treatment plants, to Jollyville Reservoir (NWA supply)	541 ft	395 ft	146 ft

WTP 4 IMPACTS ON GHG EMISSIONS

WTP 4 is projected to reduce GHG emissions for the AWU water system by at least 13 percent for the first phase of the project, which equates to about 10,000 metric tons of carbon dioxide emissions per year. For perspective, this reduction equates to:

- Removing about 2000 cars each driving 12,500 miles per year at 25 mpg, or
- Conserving over 8 billion gallons of outdoor water use, or roughly a 25 gpcd reduction in use

Figure 2 compares the projected emissions for supplying the NWA pressure zone from the Davis WTP versus WTP 4. These projections were developed for a low average production rate of 31.5 million gallons per day (mgd), and the GHG savings amount to just under one ton per MG. A higher average production rate of 40 mgd for this first phase would likely realize increased GHG emission savings of just over one ton per MG. Additionally, future expansions to the WTP 4 facilities will increase the volume of water supplied from the higher elevation water source and further reduce GHG emissions. At a projected average future production rate of 190 mgd from WTP 4 (in the projected 2050 to 2060 time-frame), the estimated yearly reduction in GHG emissions exceeds 25,000 metric tons per year accounting only for the average difference in water elevation between Lake Travis and Lake Austin. The actual savings could be higher depending upon flow distribution and how much energy could be recovered when water is transferred from the higher elevation NWA pressure zone to the lower elevation North pressure zone.



NOTES:
1. Estimated total water system emissions based on treatment and pumping facilities, not including wastewater facility emissions.
2. Comparison based on both facilities pumping equivalent volumes to Jollyville Reservoir (31.5 mgd average production for 365 days).
3. GHG production calculated using Austin Energy factor of 0.5036 kg CO_2/kWh.
4. Based on assumed system-wide average production of 156 mgd for FY 2014/2015 (1st full year of projected WTP 4 operation).

FIGURE 2
AUSTIN WATER UTILITY
ESTIMATED WATER SYSTEM GREENHOUSE GAS (GHG) EMISSIONS IN FY 2014/15 WITH AND WITHOUT WTP 4

ASSUMPTIONS

The GHG estimates were prepared using the following conditions and assumptions:

1. Austin Energy (AE) is the sole energy supplier for both WTP 4 and the Davis WTP.
2. AE's rate of GHG emission is 1.11 pounds of CO_2 per kilowatt-hour of electricity delivered.
3. The facilities were compared on the basis of equivalent pumping to Jollyville Reservoir, which was assumed to be operating at the maximum operational level of 1013 feet.
4. The comparison is based solely on the estimated energy usage required for raw water and finished water pumping at each facility. Additional electrical requirements at each facility (lighting, HVAC, process equipment, etc.) were not included in the analyses.
5. GHG emissions from construction activities were not included in the analysis; for possible comparison, the projected savings of 10,000 tonnes CO2e are more than twice the annual emissions of the entire AWU service fleet.
6. Pumps were estimated to operate at an assumed efficiency of 77 percent.
7. Intermediate pumping is required to lift water from the Davis WTP into the Northwest A pressure zone. The assumed efficiency for the additional pumping was 77 percent.
8. The water level in Lake Travis, the source of raw water for WTP 4, was assumed to be at elevation 669 feet, which is the historic mean monthly pool elevation.
9. The water level in Lake Austin, the source of raw water for the Davis WTP, was assumed to be at elevation 492 feet.
10. The assumed clearwell water level elevation for WTP 4 was 1021 feet, while the assumed clearwell water level elevation for the Davis WTP was 580.
11. Flow from WTP 4 was assumed to flow through the Jollyville Transmission Main (84 inch diameter). Flow from the Davis WTP was assumed to be routed through existing piping.
12. The energy used to overcome friction losses in the pipelines was calculated by using a Hazen Williams "C" factor to calculate friction headloss. Minor losses were assumed to equal ten percent of the friction losses.

DRAFT TECHNICAL MEMORANDUM ALAN PLUMMER ASSOCIATES, INC.

Projection Methodology Evaluation

PROJECT: 382-1701

DATE: June 20, 2006

PREPARED FOR: Austin Water Utility

PREPARED BY: Stephen J. Coonan, Texas P.E. 65516 Alan Plummer Associates, Inc. (APAI)

1.0 INTRODUCTION

The Austin Water Utility (AWU) is responsible for providing a safe and reliable supply of potable water to customers within its service area. In order to fulfill this responsibility, AWU must plan for both future water supplies and the ability to treat and distribute water to customers in accordance with their demands. To aid in this effort, AWU retained the services of Alan Plummer Associates, Inc. (APAI) to conduct a Water Resources Planning Study. One component of that study was to review and evaluate the projected water demands in terms of annual average and peak day demands. This memorandum contains the results of that evaluation.

2.0 EXISTING PROJECTION METHODOLOGY

AWU Planning staff indicated that future demand projections have been based on historical trends for both average annual and peak day demands. Historical data dating back to 1966 have been used to develop historical trends. Specifically, annual average and peak day demand data have been plotted against population served for previous years. A linear regression analysis was conducted to develop a relationship between population and the historic demands. This relationship was then used to project future demands based on future population projections.

Table 1 contains historic data concerning demands and populations. These data are plotted on Figures 1 and 2 for average annual and peak day demands, respectively. The results of the regression analysis are also plotted on these graphs. These data are plotted against the year of occurrence in Figures 3 and 4.

Population projections for the AWU service area have been provided by the City of Austin Planning Department. The population projections are shown on Table 2 and plotted on Figure 5. These projections were then utilized by AWU Planning staff, in conjunction with the relationship to demand to project future demands. These demand projections are shown on Figures 6 and 7.

The projections are then used to make decisions concerning the timing of future water supplies and treatment capacity needs. As can be seen in the various figures, annual average and peak day water demands vary significantly from year to year. When planning for future plant expansions, it is important to recognize that the linear regression approach results in a long-term average peak day demand projection. However, in any given year, the Utility must be prepared to meet the demands generated by unusually hot and dry conditions. To accommodate the year to year variance, the Utility had adopted the procedure of calculating the 95 percent confidence interval based on the historical variance. Basing future treatment plant capacity needs on the upper 95 percent confidence interval results in limiting the probability that the peak day demand will exceed the available capacity to 5 percent.

Table 1

City of Austin
Historic Water Demands

Year	Population	Annual Population Growth	Average Annual Demand (MGD)	Peak Day Demand (MGD)
1966	239,400	N/A	36	88
1967	245,500	2.55%	44	96
1968	257,600	4.93%	38	91
1969	268,900	4.39%	46	118
1970	277,900	3.35%	48	104
1971	289,300	4.10%	55	125
1972	304,700	5.32%	54	92
1973	319,100	4.73%	53	110
1974	330,900	3.70%	58	126
1975	342,100	3.38%	52	96
1976	357,800	4.59%	55	104
1977	372,600	4.14%	64	131
1978	385,200	3.38%	68	144
1979	398,300	3.40%	63	141
1980	408,700	2.61%	76	153
1981	422,200	3.30%	72	133
1982	435,400	3.13%	82	154
1983	449,550	3.25%	77	134
1984	466,100	3.68%	96	154
1985	485,000	4.05%	97	168
1986	503,750	3.87%	100	179
1987	521,400	3.50%	93	177
1988	534,150	2.45%	99	162
1989	541,350	1.35%	105	178
1990	545,421	0.75%	105	177
1991	561,553	2.96%	99	161
1992	578,163	2.96%	101	169
1993	595,263	2.96%	109	189
1994	612,870	2.96%	109	199
1995	630,997	2.96%	108	192
1996	649,660	2.96%	125	205
1997	668,876	2.96%	117	195
1998	688,660	2.96%	127	211
1999	709,029	2.96%	127	216
2000	738,229	4.12%	143	227
2001	754,470	2.20%	137	243
2002	767,296	1.70%	139	214
2003	774,969	1.00%	140	232
2004	786,594	1.50%	133	197
2005	799,966	1.70%	140	247

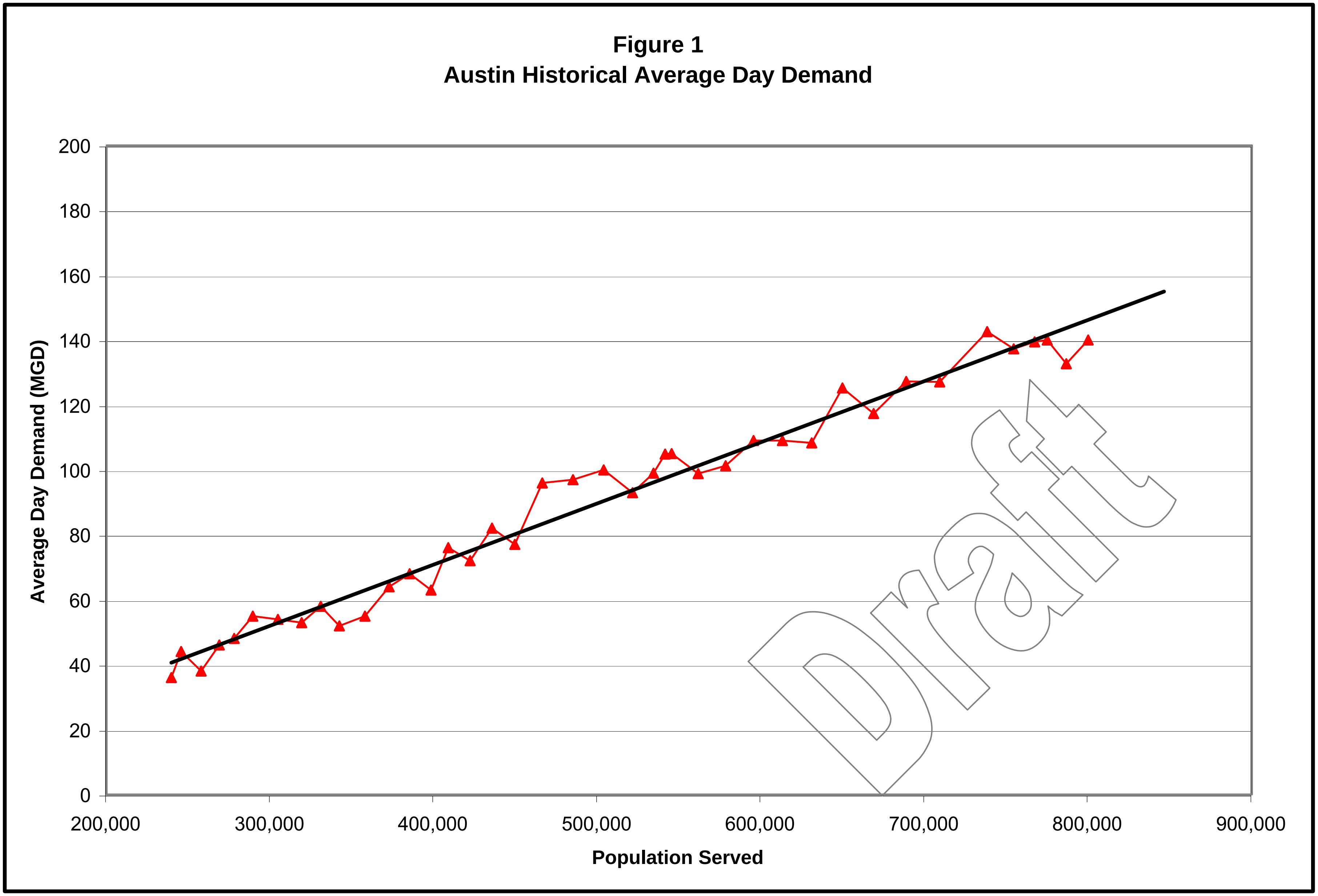


Figure 1
Austin Historical Average Day Demand
Average Day Demand (MGD)
0
20
40
60
80
100
120
140
160
180
200
200,000
300,000
400,000
500,000
600,000
700,000
800,000
900,000
Population Served
Draft

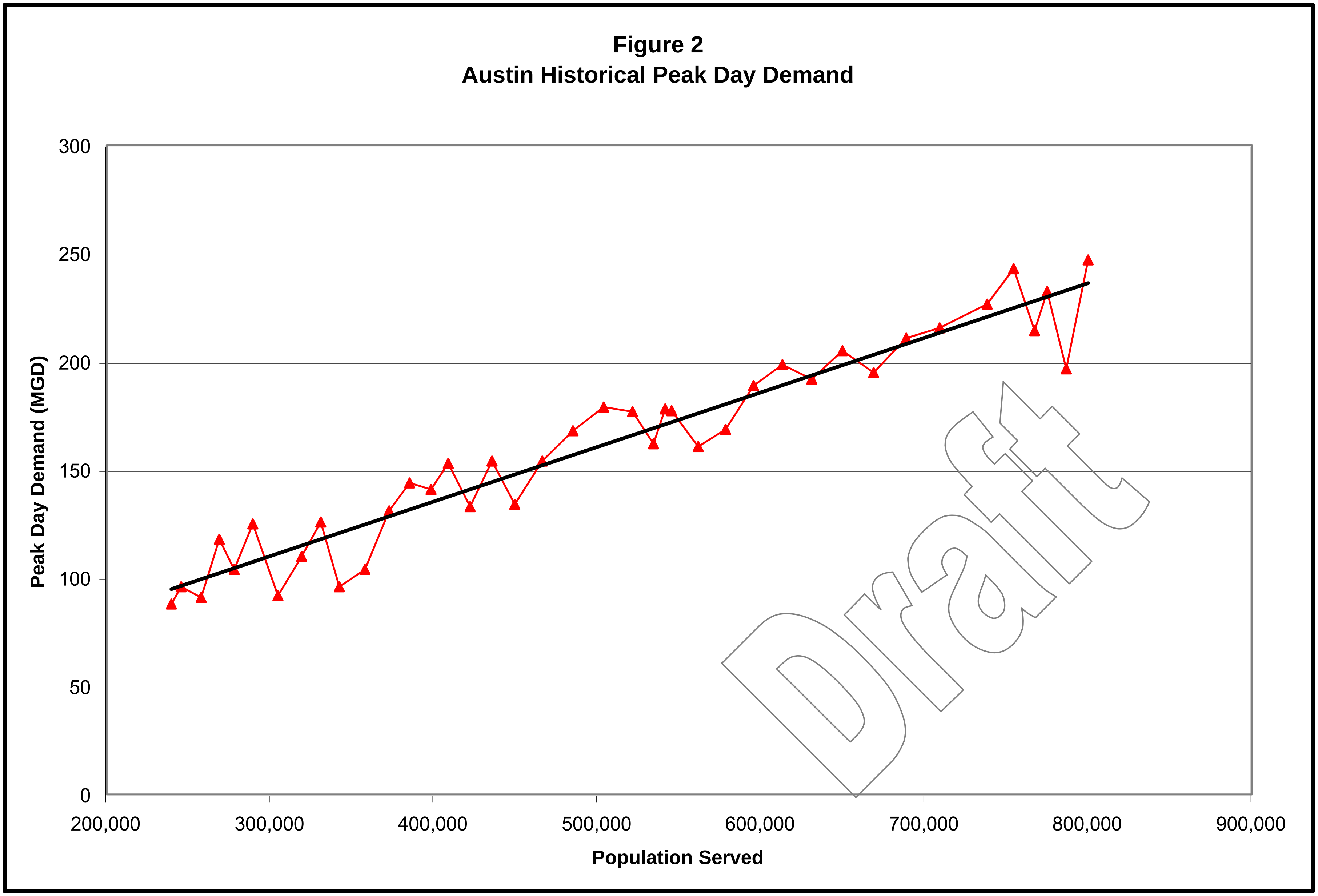


Figure 2
Austin Historical Peak Day Demand
300
250
200
150
100
50
0
Peak Day Demand (MGD)
200,000
300,000
400,000
500,000
600,000
700,000
800,000
900,000
Population Served
Draft

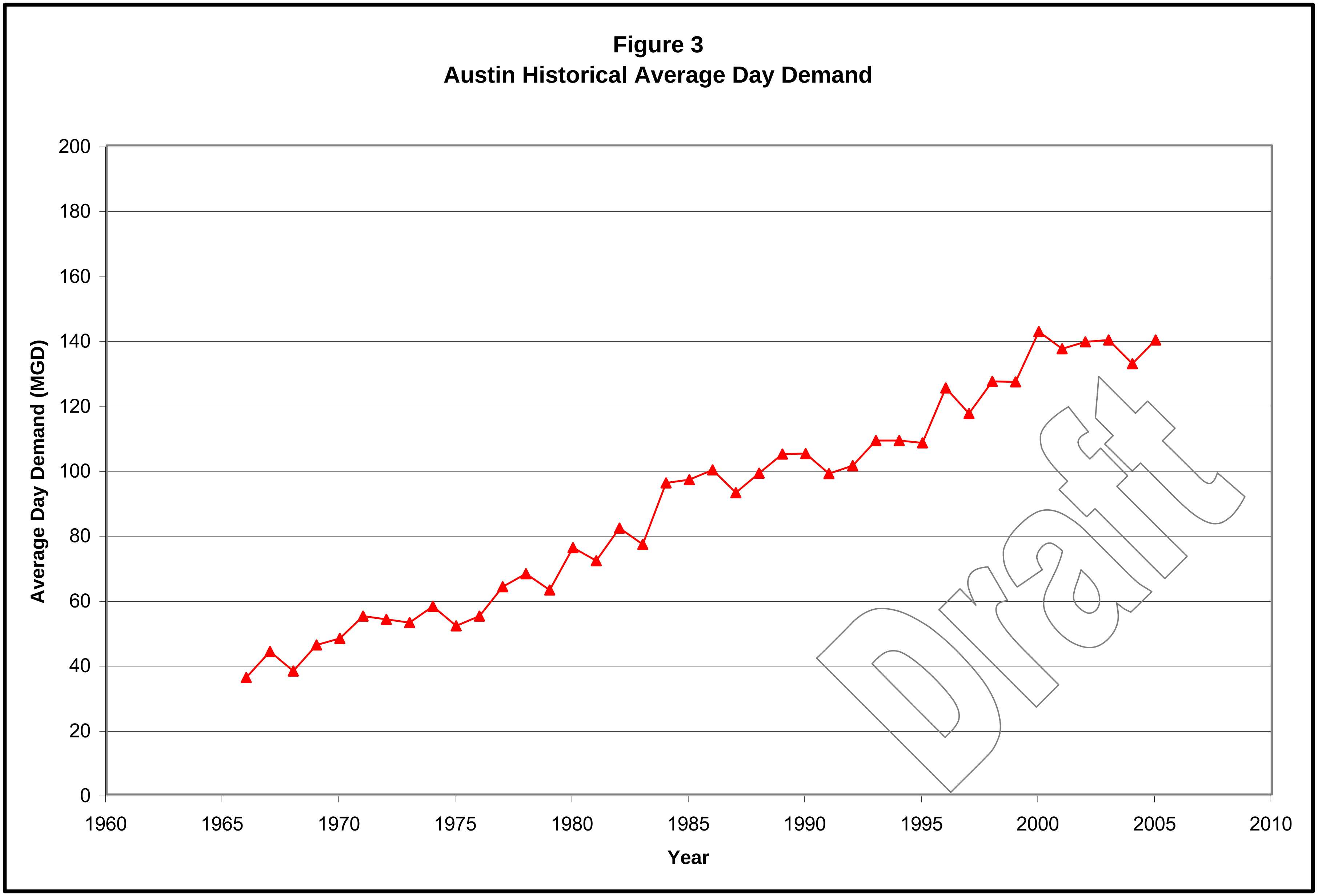


Figure 3
Austin Historical Average Day Demand
Average Day Demand (MGD)
0
20
40
60
80
100
120
140
160
180
200
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year
Draft

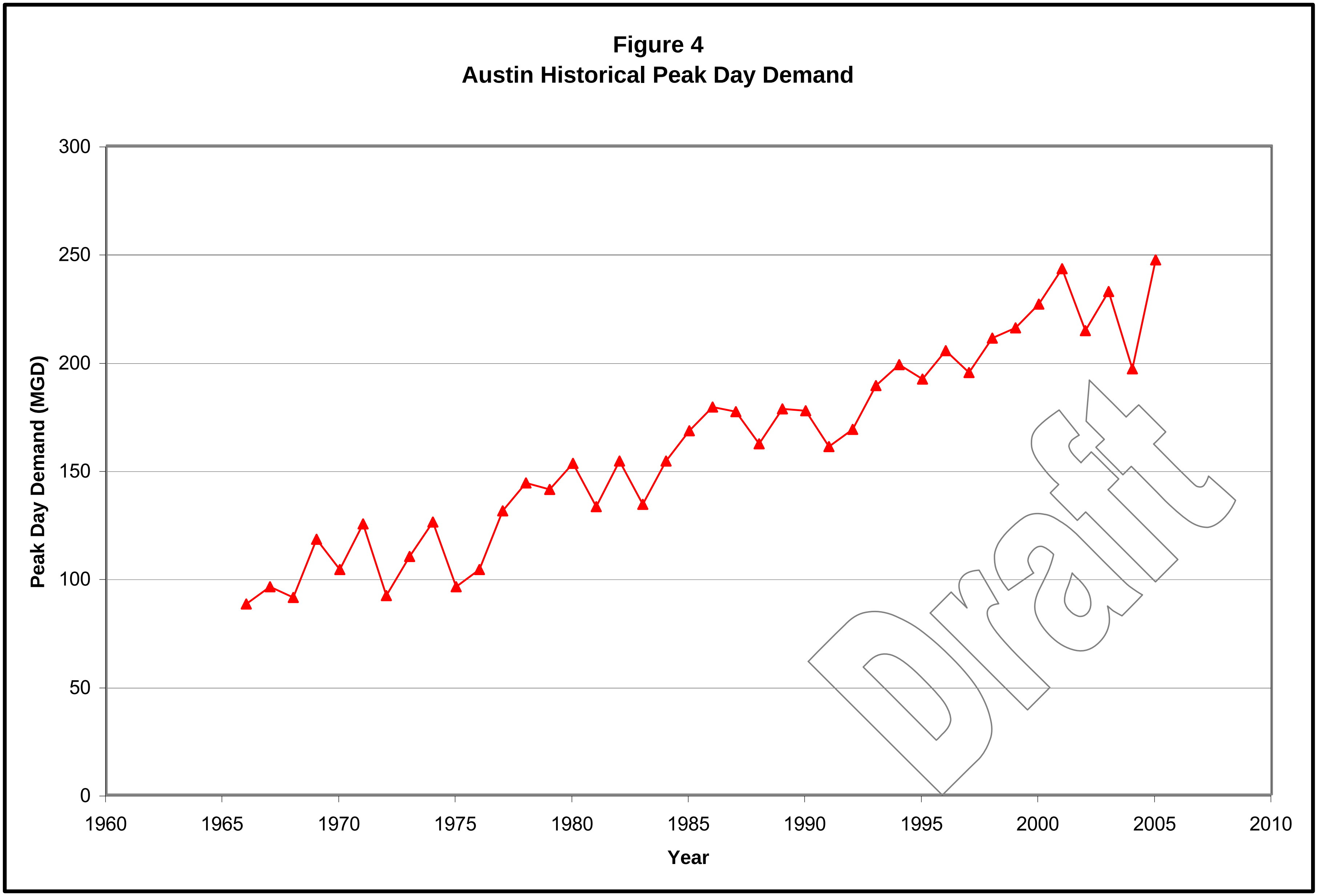


Figure 4
Austin Historical Peak Day Demand
300
250
200
150
100
50
0
Peak Day Demand (MGD)
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year
Draft

Table 2

City of Austin
Population Projections

Year	Population	Annual Population Growth
2006	815,124	1.89%
2007	830,569	1.89%
2008	846,306	1.89%
2009	862,342	1.89%
2010	878,670	1.89%
2011	894,547	1.81%
2012	910,711	1.81%
2013	927,167	1.81%
2014	943,920	1.81%
2015	960,976	1.81%
2016	978,340	1.81%
2017	996,018	1.81%
2018	1,014,015	1.81%
2019	1,032,337	1.81%
2020	1,050,991	1.81%
2021	1,070,504	1.86%
2022	1,090,379	1.86%
2023	1,110,623	1.86%
2024	1,131,242	1.86%
2025	1,152,245	1.86%
2026	1,173,638	1.86%
2027	1,195,427	1.86%
2028	1,217,622	1.86%
2029	1,240,228	1.86%
2030	1,263,254	1.86%
2031	1,283,138	1.57%
2032	1,303,334	1.57%
2033	1,323,849	1.57%
2034	1,344,687	1.57%
2035	1,365,852	1.57%
2036	1,387,351	1.57%
2037	1,409,188	1.57%
2038	1,431,369	1.57%
2039	1,453,898	1.57%
2040	1,476,783	1.57%
2041	1,500,028	1.57%
2042	1,523,638	1.57%
2043	1,547,621	1.57%
2044	1,571,980	1.57%
2045	1,596,723	1.57%
2046	1,621,856	1.57%
2047	1,647,384	1.57%
2048	1,673,314	1.57%
2049	1,699,652	1.57%
2050	1,726,405	1.57%
2051	1,753,579	1.57%
2052	1,781,180	1.57%
2053	1,809,216	1.57%
2054	1,837,694	1.57%
2055	1,866,619	1.57%
2056	1,896,000	1.57%
2057	1,925,843	1.57%
2058	1,956,156	1.57%
2059	1,986,946	1.57%
2060	2,018,221	1.57%

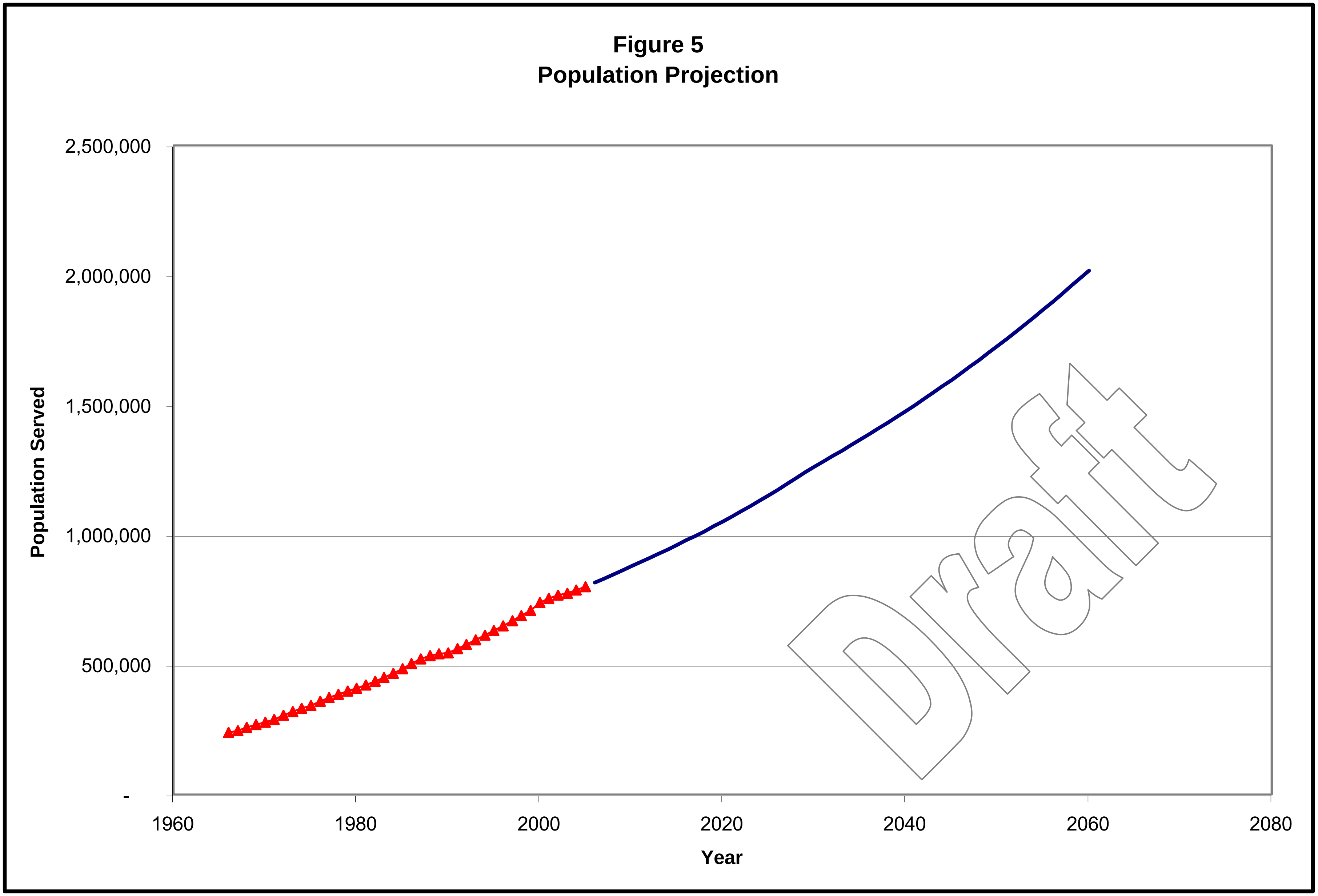
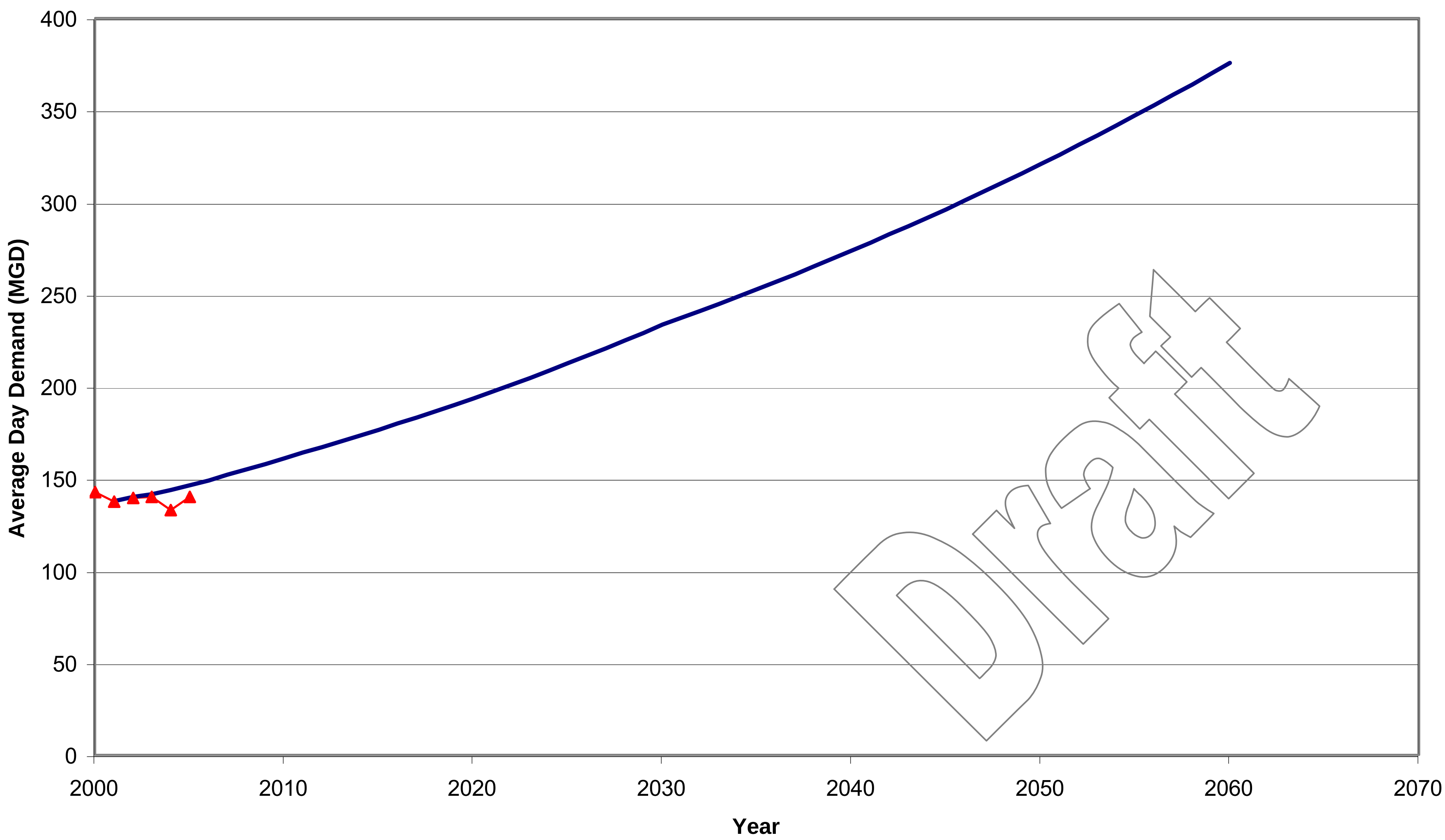


Figure 5
Population Projection
2,500,000
2,000,000
1,500,000
1,000,000
500,000
-
Population Served
1960
1980
2000
2020
2040
2060
2080
Year
Draft

Figure 6
Austin Original Average Day Demand Projections



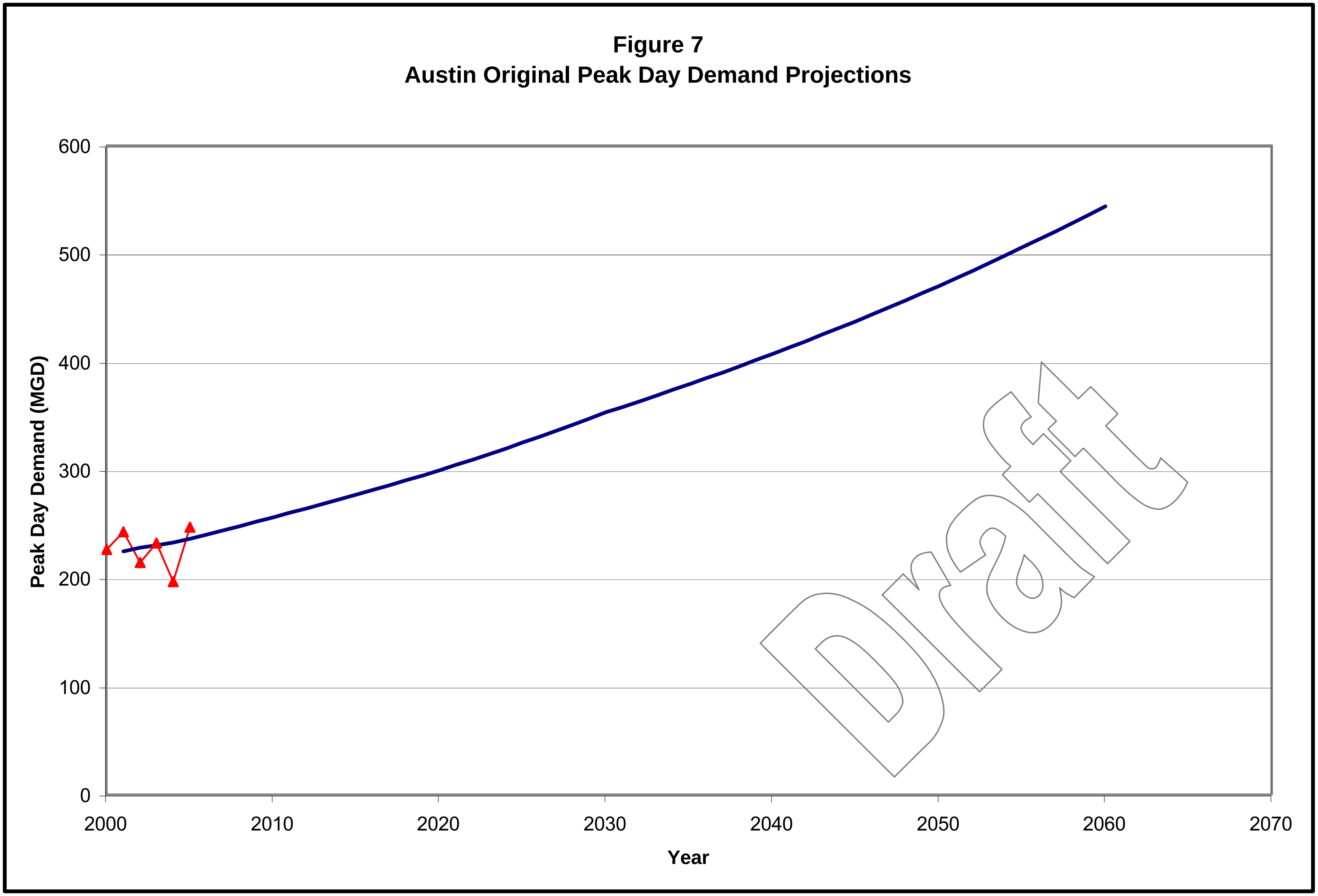


Figure 7
Austin Original Peak Day Demand Projections
Peak Day Demand (MGD)
600
500
400
300
200
100
0
2000
2010
2020
2030
2040
2050
2060
2070
Year
Draft

3.0 METHODOLOGY EVALUATION

The methodology used by AWU is consistent with other methods used by other utilities. However, in looking at Figure 1, there appears to be a change in the slope of the data points as the population exceeds 465,000 This corresponds to the mid 1980s, which coincides with the period when AWU initially started its water conservation program. The data were broken into two sets, 1966-1983 and 1984-2005. Independent regression analyses were conducted on the two data sets. Figure 8 contains the results of the independent regressions. A pooled variance test was conducted to determine that the slopes of the two regression lines are statistically different. Detailed calculations concerning this determination are presented in the Appendix.

In evaluating Figure 2, the differences in the dataset are not as apparent graphically. However, the pooled variance test was similarly conducted on this dataset. The results of the calculations shown in the Appendix indicate that the slope of the line for this regression also changed in the mid 1980s. These regressions are shown on Figure 9.

4.0 RECOMMENDED METHODOLOGY CHANGES

Historical data is frequently used as the basis to extrapolate future projections in the water utility industry. Typically, when extrapolating data, the more data that is available the better the extrapolation. However, in this instance, using very old data skews the future projections as the water demand characteristics have changed over time. The changes in demand characteristics have resulted from changes in plumbing fixtures used, changes in industrial uses, and the City's water conservation programs.

In order to have the future demand projections reflect the latest trends in water demand characteristics, it is recommended that only the last 20 years of data be used in developing the relationship between population and demand. However, using fewer data points means that each data point has a bigger impact on the regression. As can be seen in Figures 3and 4, there is a significant variance in water demand from year to year. This variance is generally dependent on differences in weather from one year to the next, specifically the amount of rainfall and the average temperature during the summer months. An unusually dry or wet summer would have a significant impact on the regression analysis. As a result, it is recommended that data for years in which the summer rainfall (June, July, and August) was less than the 10th percentile or greater than the 90th percentile historic rainfall for these months.

Utilizing this methodology, the annual average and peak day demand projections were revised. The revised projections are shown graphically on Figures 10 and 11. The revised methodology results in decreases in the projected demands of approximately 5 percent over a 50 year horizon.

With the revised methodology and the use of fewer historic data points, using the 95th percentile confidence limit to establish the timing of future water treatment plant expansions is no longer practical. Reducing the number of data points greatly increases the band of the confidence limits. In order to establish the timing of future expansions while accommodating the continued variation in demand from year to year, it is recommended that treatment capacity be maintained such that the projected demand does not exceed 90 percent of available capacity. This condition is represented by an upper variation line shown on Figure 12. This 10 percent capacity for annual variations is used by other utilities and is similar to the reserve capacity required by the Texas Commission on Environmental Quality (TCEQ) at wastewater treatment plants.

Figure 8
Austin Historical Average Day Demand Differences

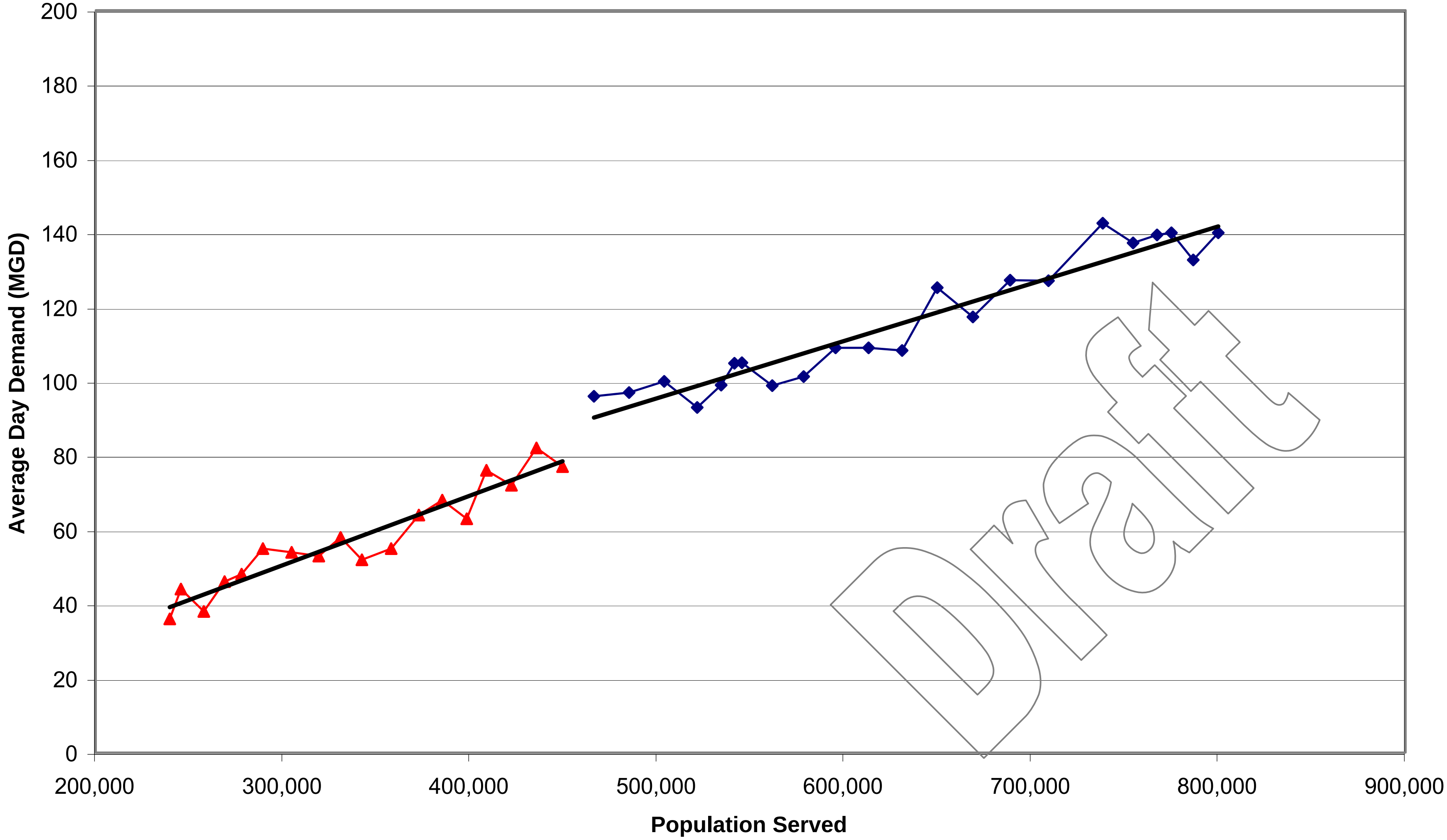
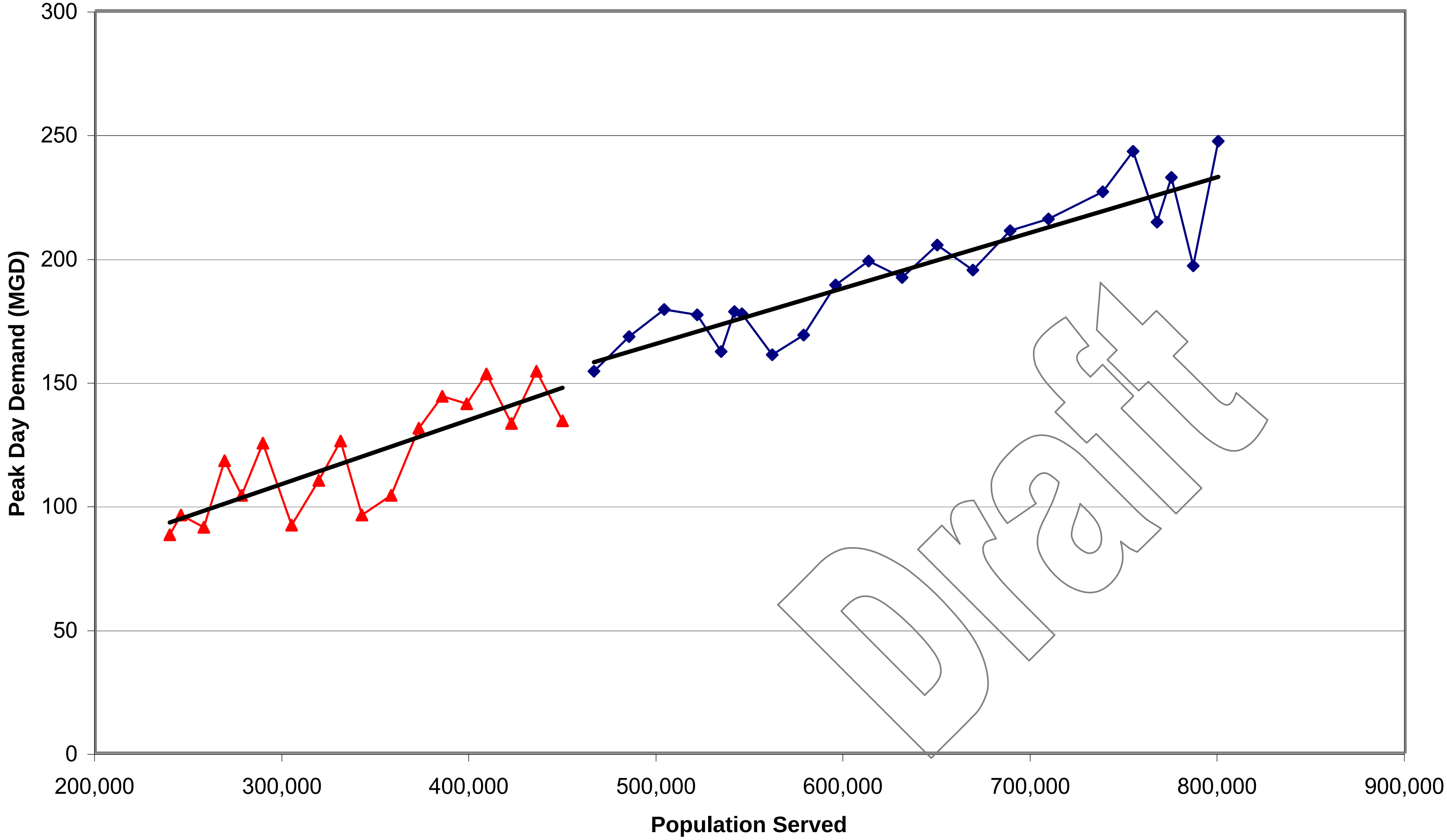


Figure 9
Austin Historical Peak Day Demand Differences



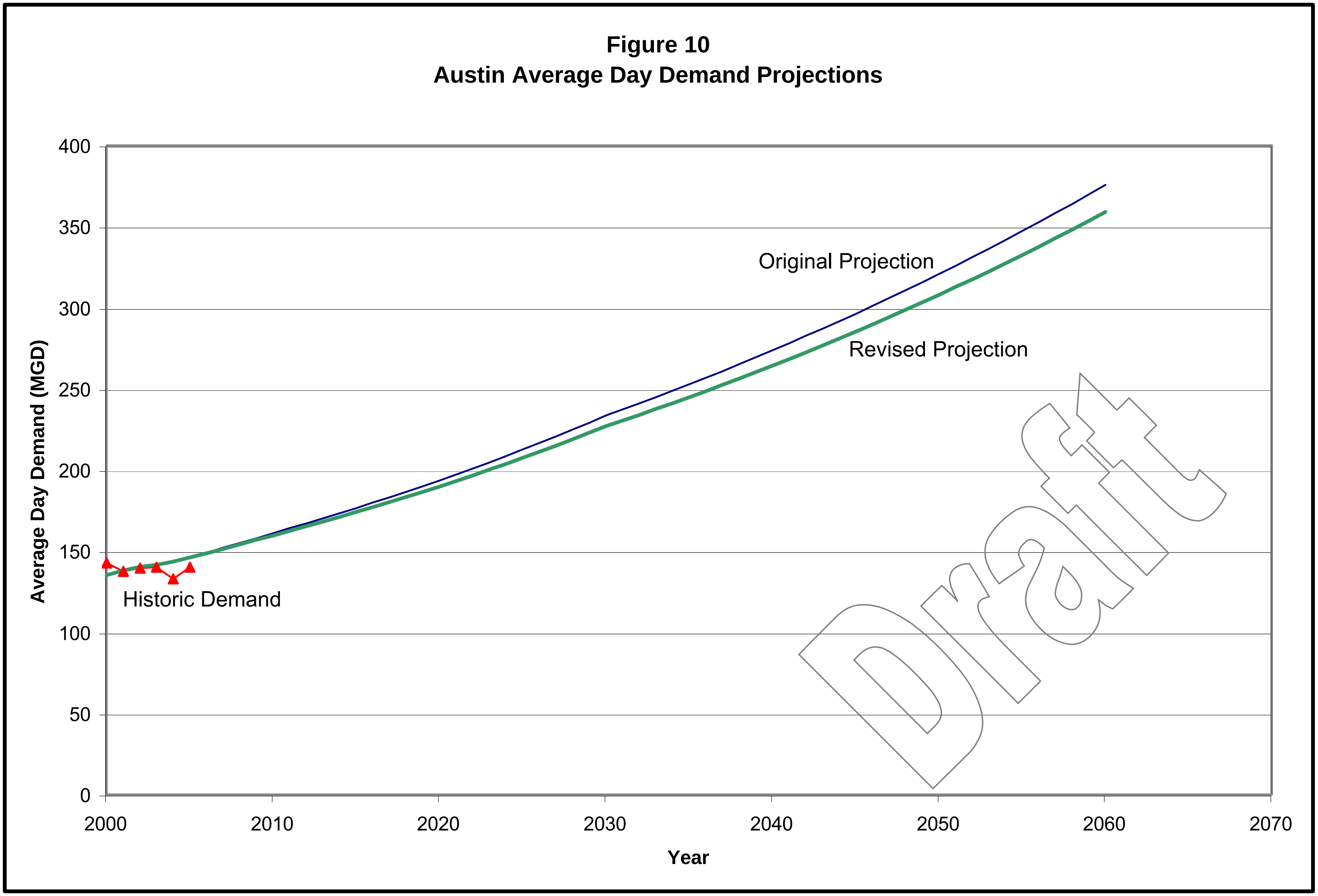


Figure 10
Austin Average Day Demand Projections
Average Day Demand (MGD)
400
350
300
250
200
150
100
50
0
2000
2010
2020
2030
2040
2050
2060
2070
Year
Original Projection
Revised Projection
Historic Demand
Draft

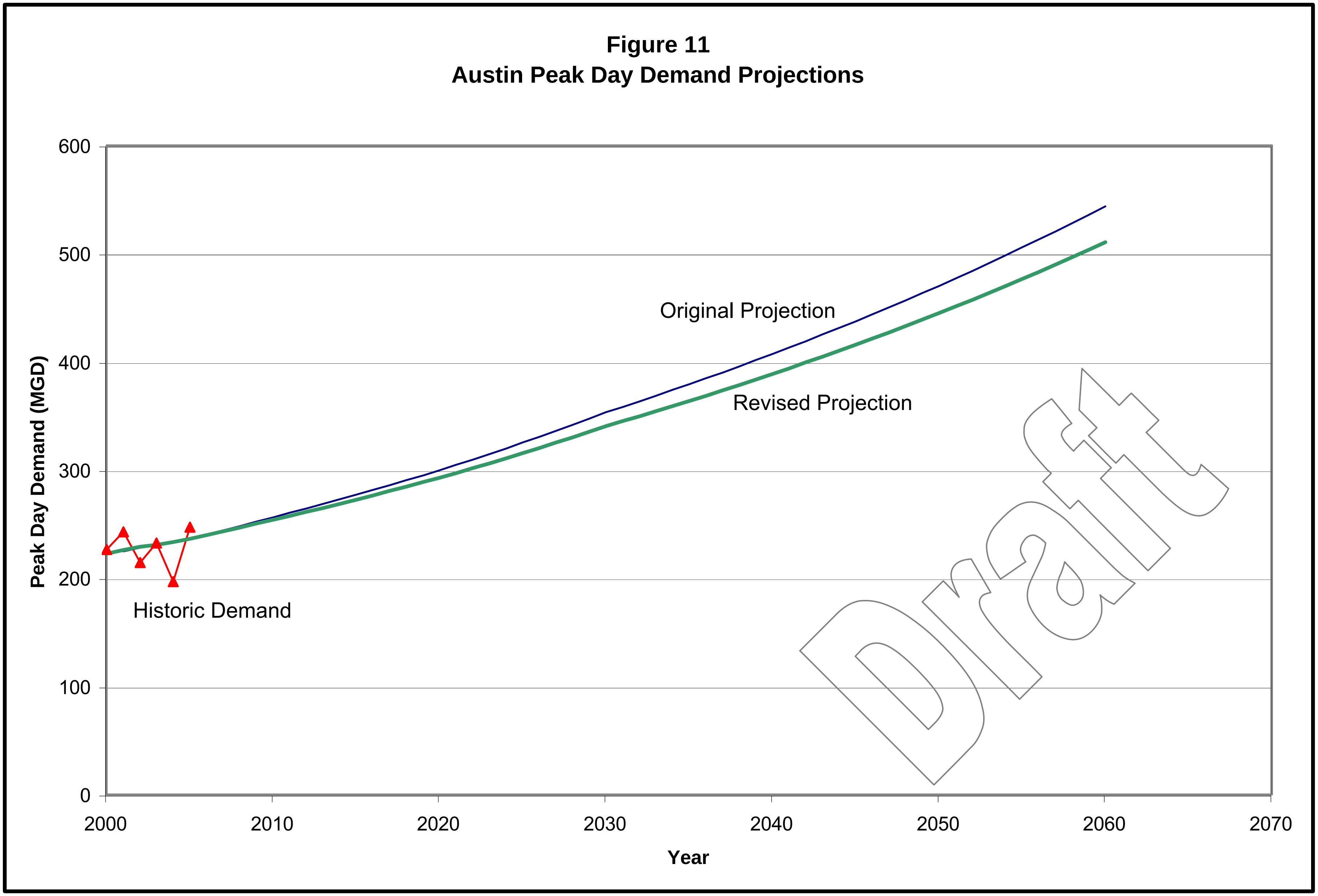


Figure 11
Austin Peak Day Demand Projections
Peak Day Demand (MGD)
600
500
400
300
200
100
0
2000
2010
2020
2030
2040
2050
2060
2070
Year
Original Projection
Revised Projection
Historic Demand
Draft

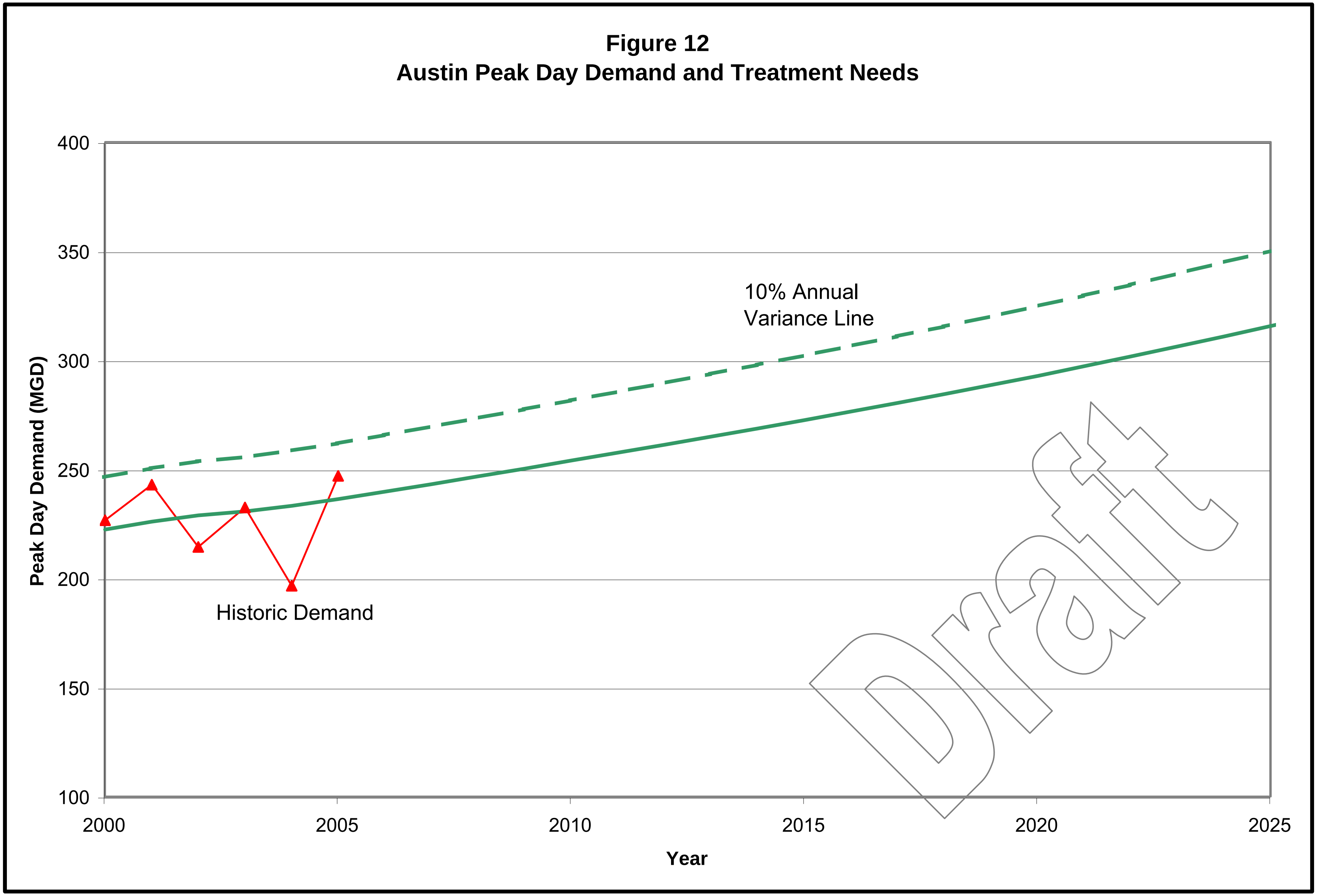


Figure 12
Austin Peak Day Demand and Treatment Needs
400
350
300
250
200
150
100
Peak Day Demand (MGD)
2000
2005
2010
2015
2020
2025
Year
10% Annual
Variance Line
Historic Demand
Draft

APPENDIX

ALAN PLUMMER ASSOCIATES, INC.

ENVIRONMENTAL ENGINEERS - DESIGNERS - SCIENTISTS

apaienv.com

JOB NAME [redacted]OA WATER SUPPLY STUDY

JOB NO. ______ PAGE 1 OF 1

CALCULATED BY KDP DATE 8/11/05

VERIFIED BY ______ DATE ______

AVERAGE DAY – TOTAL CONSUMPTION

$H_o: s_1 = s_2$ $\quad s_1 = 1.52\text{E-}05$ (SE FOR $\hat{\beta}_1$ w/o CONS) $\quad m = 18$

$H_a: s_1 \neq s_2$ $\quad s_2 = 1.13\text{E-}05$ (SE FOR $\hat{\beta}_1$ w/ CONS) $\quad n = 21$

$$f_{test} = \frac{s_1^2}{s_2^2} = \frac{(1.52\text{E-}05)^2}{(1.13\text{E-}05)^2} = 1.81 \checkmark$$

REJECT H_o IF $f_{test} \geq f_{\alpha/2, m-1, n-1}$

$f_{0.01, 17, 20} \hat{=} 3.03$

$$f_{test} = 1.81 \ngeq f_{0.01, 17, 20} = 3.03$$

∴ VARIANCES ARE EQUIVALENT, USE POOLED VARIANCE ESTIMATE

$$S_p^2 = \frac{(m-1)s_1^2 + (n-1)s_2^2}{m+n-2} = \frac{(18-1)(1.52\text{E-}05)^2 + (21-1)(1.13\text{E-}05)^2}{18+21-2}$$

$$= 1.75\text{E-}10$$

$S_p = 1.3\text{E-}05 \checkmark$ $\quad$ DEG OF FREEDOM $= m+n-2 = 18+21-2 = 37$

$H_o: \hat{\beta}_{1,1} = \hat{\beta}_{1,2}$ $\quad \hat{\beta}_{1,1} = 0.000187$ ($\hat{\beta}_1$ w/o CONS)

$H_a: \hat{\beta}_{1,1} \neq \hat{\beta}_{1,2}$ $\quad \hat{\beta}_{1,2} = 0.000155$ ($\hat{\beta}_1$ w/ CONS)

$$t_{test} = \frac{\hat{\beta}_{1,1} - \hat{\beta}_{1,2}}{S_p\sqrt{\frac{1}{m} + \frac{1}{n}}} = \frac{0.000187 - 0.000155}{1.3\text{E-}05\sqrt{\frac{1}{18} + \frac{1}{21}}} = 7.53$$

REJECT H_o IF $|t_{test}| \geq t_{\alpha/2, v}$, $\quad t_{0.05/2, 37} \hat{=} 2.027$

$$|t_{test}| = 7.53 \checkmark \geq t_{0.025, 37} = 2.027$$

∴ REJECT H_o, SLOPES OF TWO EQUATIONS ARE NOT EQUIVALENT

SUMMARY OUTPUT

Avg Day Demands vs Population
(pre conservation policy period of record, 1966-1983)

Regression Statistics	
Multiple R	0.951292
R Square	0.904956
Adjusted R	0.899016
Standard E	4.247059
Observatio	18

m

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	2747.9	2747.9	152.3437	1.37E-09
Residual	16	288.6001	18.03751		
Total	17	3036.5			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Ipper 95.0%*
Intercept	-5.63289	5.238516	-1.07528	0.298196	-16.738	5.472266	-16.738	5.472266
X Variable	0.000187	1.52E-05	12.34276	1.37E-09	0.000155	0.000219	0.000155	0.000219

$\hat{\beta}_{1,1}$ s_1

SUMMARY OUTPUT

Avg Day Demands vs Population
(post conservation policy period of record, 1984-2004)

Regression Statistics	
Multiple R	0.953547
R Square	0.909251
Adjusted R	0.904475
Standard E	5.181206
Observatio	21

n

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	5110.431	5110.431	190.3688	2.37E-11
Residual	19	510.053	26.84489		
Total	20	5620.484			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Ipper 95.0%*
Intercept	17.82043	7.118445	2.503416	0.021584	2.921349	32.71951	2.921349	32.71951
X Variable	0.000155	1.13E-05	13.79742	2.37E-11	0.000132	0.000179	0.000132	0.000179

s_2

$\hat{\beta}_{1,2}$

ALAN PLUMMER ASSOCIATES, INC.

apaienv.com

ENVIRONMENTAL ENGINEERS - DESIGNERS - SCIENTISTS

JOB NAME: COA WATER SUPPLY STUDY

JOB NO. ______ PAGE 1 OF 1

CALCULATED BY: KDP DATE: 8/11/05

VERIFIED BY: ______ DATE: ______

HISTORICAL PEAK DAY - TOTAL CONSUMPTION

$H_0: S_1 = S_2$ $\quad S_1 = 4.84\ E-5$ (SE FOR $\hat{\beta}_1$ W/O CONS) $m = 18$

$H_a: S_1 \neq S_2$ $\quad S_2 = 2.66\ E-5$ (SE FOR $\hat{\beta}_1$ W/ CONS) $n = 21$

$$f_{TEST} = \frac{S_1^2}{S_2^2} = \frac{(4.84\ E-5)^2}{(2.66\ E-5)^2} = 3.31 \checkmark$$

REJECT H_0 IF $f_{TEST} \geq f_{\alpha/2, m-1, n-1}$, $\quad f_{0.01, 17, 20} \approx 3.03$

$$f_{TEST} = 3.31 \geq f_{0.01,17,20} = 3.03$$

REJECT H_0, VARIANCES NOT EQUAL.

COMPUTE DEG. OF FREEDOM $= \nu = \dfrac{\left[\left(\frac{S_1^2}{m}\right) + \left(\frac{S_2^2}{n}\right)\right]^2}{\frac{(S_1^2/m)^2}{m-1} + \frac{(S_2^2/n)^2}{n-1}}$

$$= \frac{\left[\frac{(4.84\ E-5)^2}{18} + \frac{(2.66\ E-5)^2}{21}\right]^2}{\frac{\left((4.84\ E-5)^2/18\right)^2}{17} + \frac{\left((2.66\ E-5)^2/21\right)^2}{20}} = \frac{2.68\ E-20}{1.05\ E-21} \checkmark$$

$= 25.5 \sim 26$ DEG FREE

$H_0: \hat{\beta}_{1,1} = \hat{\beta}_{1,2}$ $\quad \hat{\beta}_{1,1} = 0.000259$ ($\hat{\beta}_1$ W/O CONSERVATION)

$H_a: \hat{\beta}_{1,1} \neq \hat{\beta}_{1,2}$ $\quad \hat{\beta}_{1,2} = 0.000211$ ($\hat{\beta}_1$ W/ CONSERVATION)

$$t_{TEST} = \frac{\hat{\beta}_{1,1} - \hat{\beta}_{1,2}}{\sqrt{\frac{S_1^2}{m} + \frac{S_2^2}{n}}} = \frac{0.000259 - 0.000211}{\left[\frac{(4.84\ E-5)^2}{18} + \frac{(2.66\ E-5)^2}{21}\right]^{1/2}} = 3.75 \checkmark$$

REJECT H_0 IF $|t_{TEST}| \geq t_{\alpha/2, \nu}$, $\quad t_{0.05/2, 26} = 2.056$

$$|t_{TEST}| = 3.75 \geq 2.056 = t_{0.025, 26}$$

$\therefore$ REJECT H_0, SLOPES OF 2 EQUATIONS ARE NOT EQUIVALENT

SUMMARY OUTPUT

Peak Demand Total vs Population
(pre conservation policy period of record, 1966-1983)

Regression Statistics	
Multiple R	0.80125
R Square	0.642002
Adjusted R	0.619627
Standard E	13.54839
Observatio	18

m

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	5266.838	5266.838	28.69293	6.42E-05
Residual	16	2936.94	183.5587		
Total	17	8203.778			

	Coefficients	*'andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Ipper 95.0%*
Intercept	31.02363	16.7112	1.856458	0.081899	-4.40251	66.44978	-4.40251	66.44978
X Variable	0.000259	4.84E-05	5.356578	6.42E-05	0.000157	0.000362	0.000157	0.000362

$\beta_{1,1}$ S_1

SUMMARY OUTPUT

Peak Demand Total vs Population
(post conservation policy period of record, 1984-2004)

Regression Statistics	
Multiple R	0.876846
R Square	0.768859
Adjusted R	0.756694
Standard E	12.24145
Observatio	21

n

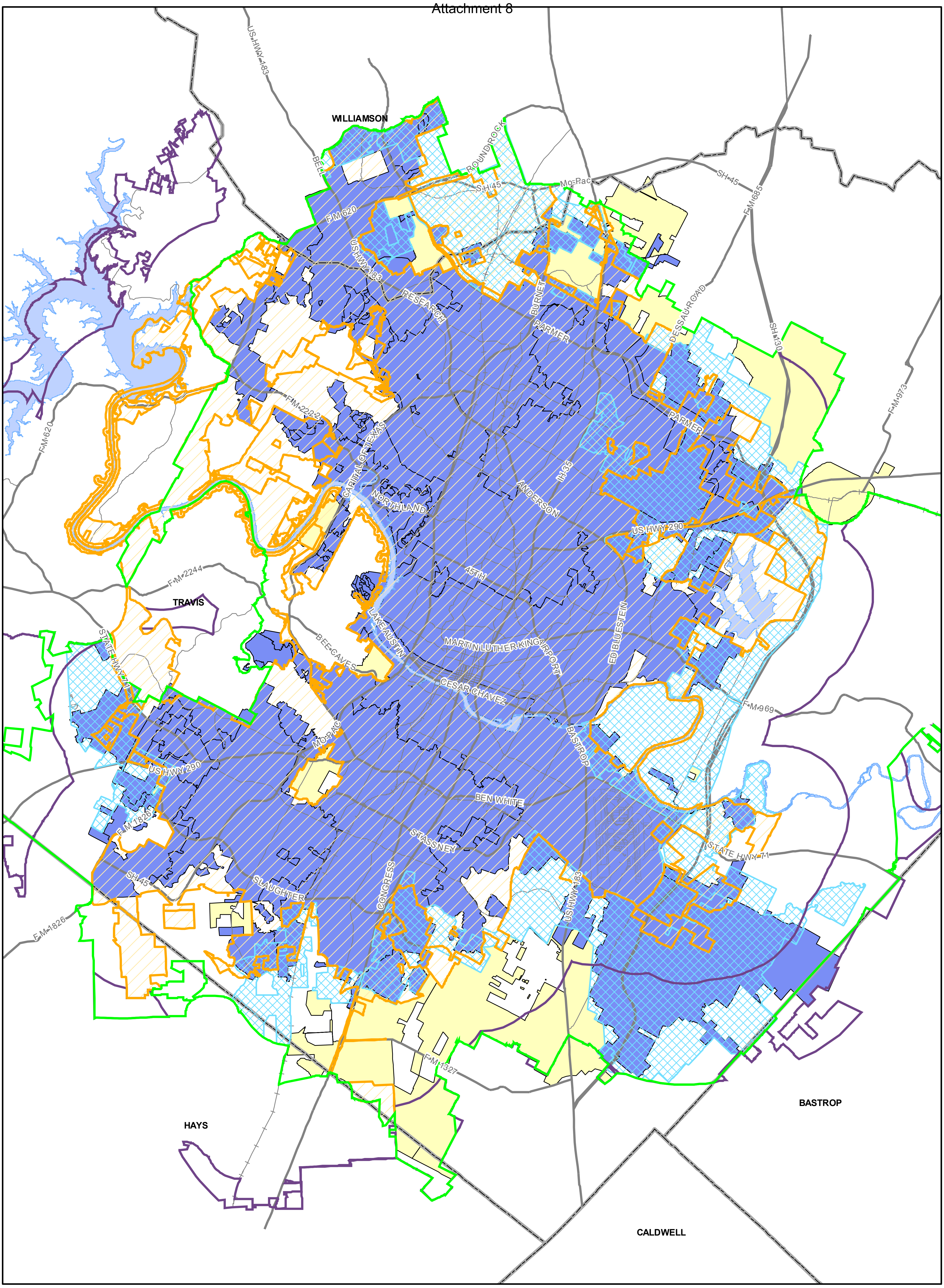
ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regressior	1	9470.876	9470.876	63.20103	1.84E-07
Residual	19	2847.211	149.8532		
Total	20	12318.09			

	Coefficients	*'andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Ipper 95.0%*
Intercept	60.58605	16.8185	3.602346	0.001898	25.38451	95.78759	25.38451	95.78759
X Variable	0.000211	2.66E-05	7.949908	1.84E-07	0.000156	0.000267	0.000156	0.000267

$\hat{\beta}_{1,2}$ S_2

Attachment 8



- Water Service Area
- Wholesale Water Customer
- Austin City Limit (Full and Limited Purpose)
- City of Austin 5 Mile ETJ
- Austin Water CCN
- Impact Fee - Service Area Bndry 2007

N

0 1 2
Miles

City of Austin
Austin Water Utility
July 2009

Austin Water Utility Water Service Area

Produced by GIS Services

Attachment 9

Austin Area Population Histories and Forecasts

Year	City of Austin Total Area Population	Annualized Growth Rate	City of Austin Full Purpose Population	City of Austin Limited Purpose Population	Travis County	Annualized Growth Rate	Five County MSA(1)	Annualized Growth Rate
1940	87,930				111,053		214,603	
1950	132,459	4.2%			160,980	3.8%	256,645	1.8%
1960	186,545	3.5%			212,136	2.8%	301,261	1.6%
1970	251,808	3.0%			295,516	3.4%	398,938	2.8%
1980	345,890	3.2%			419,573	3.6%	585,051	3.9%
1990	465,622	3.0%			576,407	3.2%	846,227	3.8%
2000	**656,562**	**3.5%**	**639,185**	**17,377**	**812,280**	**3.5%**	**1,249,763**	**4.0%**
2001	669,693	2.0%	654,019	15,674	830,150	2.2%	1,314,344	5.2%
2002	680,899	1.7%	667,705	13,194	844,263	1.7%	1,353,122	3.0%
2003	687,708	1.0%	674,382	13,326	856,927	1.5%	1,382,675	2.2%
2004	692,102	0.64%	678,769	13,333	874,065	2.00%	1,419,137	2.6%
2005	700,407	1.20%	687,061	13,346	893,295	2.20%	1,464,563	3.2%
2006	718,912	2.64%	707,952	10,960	920,544	3.05%	1,527,040	4.3%
2007	735,088	2.25%	724,117	10,971	948,160	3.00%	1,592,590	4.3%
2008	750,525	2.10%	739,543	10,982	978,976	3.25%	1,648,331	3.5%
2009	**774,037**	**3.13%**	**765,957**	**8,080**	**1,008,345**	**3.00%**	**1,706,022**	**3.50%**
2010	785,647	1.50%	777,559	8,088	1,038,595	3.00%	1,761,468	3.25%
2011	799,396	1.75%	791,300	8,096	1,069,753	3.00%	1,818,716	3.25%
2012	815,384	2.00%	807,280	8,104	1,099,171	2.75%	1,877,824	3.25%
2013	831,692	2.00%	823,580	8,112	1,129,398	2.75%	1,938,853	3.25%
2014	848,326	2.00%	840,205	8,120	1,160,457	2.75%	2,001,866	3.25%
2015	865,292	2.00%	857,180	8,112	1,192,369	2.75%	2,061,922	3.00%
2020	955,353	2.00%	947,232	8,120	1,365,589	2.75%	2,390,333	3.00%
2025	1,041,923	1.75%	1,033,795	8,129	1,563,973	2.75%	2,771,051	3.00%
2030	1,136,339	1.75%	1,128,202	8,137	1,769,491	2.50%	3,173,610	2.75%
2035	1,224,160	1.50%	1,216,015	8,145	1,977,721	2.25%	3,590,649	2.50%
2039	1,286,525	1.25%	1,278,347	8,177	2,140,749	2.00%	3,924,878	2.25%
2040	1,302,606	1.25%	1,294,421	8,186	2,183,564	2.00%	4,013,188	2.25%

SOURCE: Ryan Robinson, City Demographer, Department of Planning, City of Austin. January 2009.

NOTES: 1) The Five County Austin MSA wholly includes these counties: Bastrop, Caldwell, Hays, Travis and Williamson
2) Population figures are as of April 1 of each year.
3) Historical and current period population figures for the City of Austin take into account annexations that have occurred
4) Forecasted population figures for the City of Austin do not assume any future annexation activity

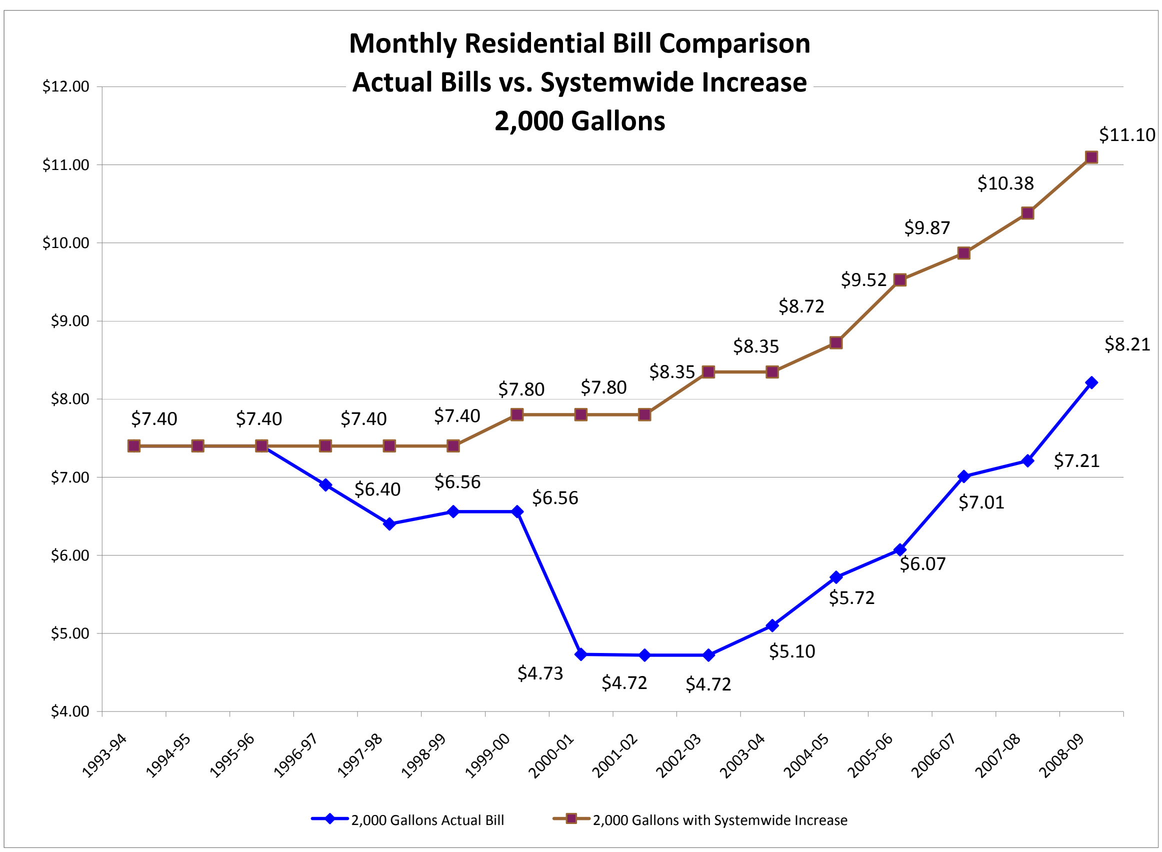
Appendix A

Conservation Incentive – Residential Water Rate Structure

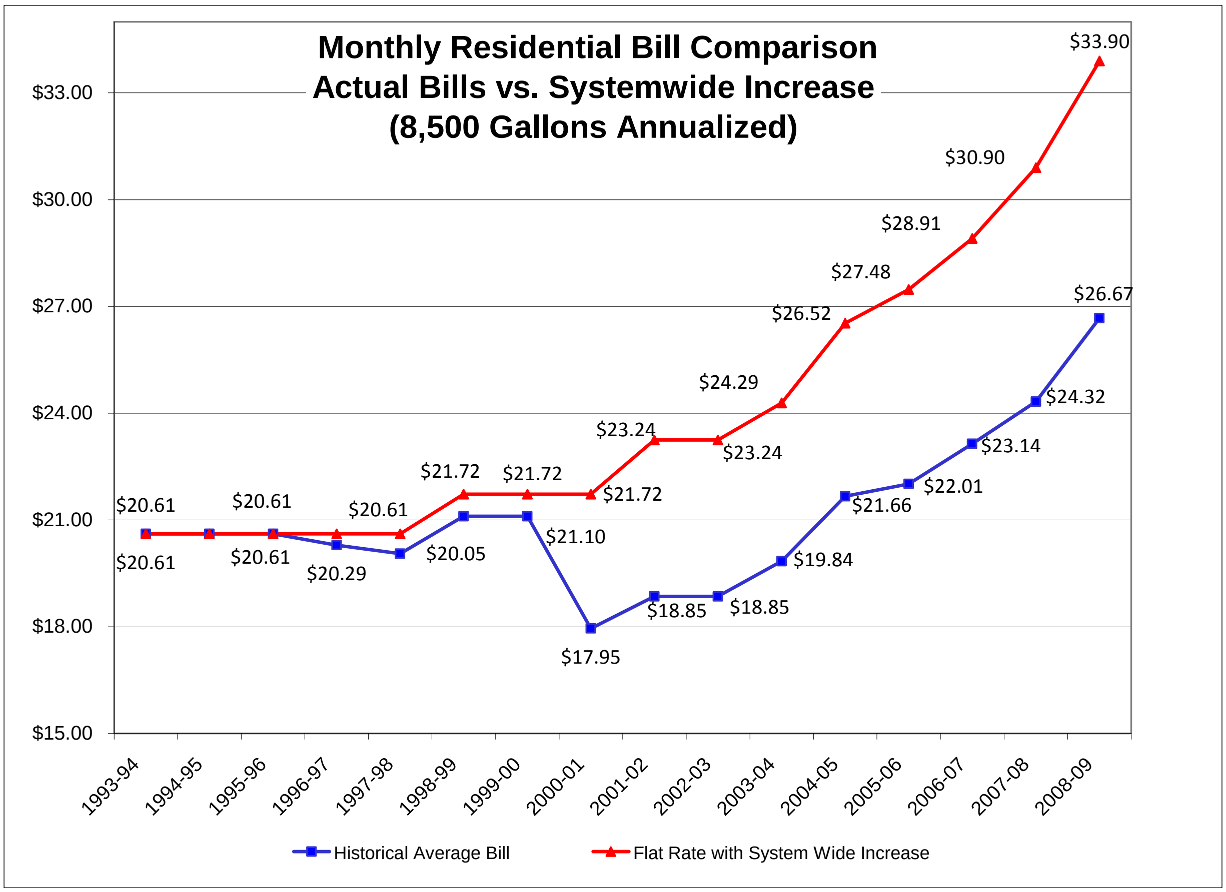
Prior to April 1994, the Austin Water Utility had uniform rates for its residential customers. The cost of all water consumed was the same price per 1,000 gallons, whether a customer used 8,000 gallons a month or 100,000 gallons a month. In April 1994, the AWU implemented its first inclining rate blocks for residential water rates. This rate structure provides for a higher cost of water as a customer uses more water. This change was intended to provide significant price incentives for customers to conserve water. Over the years, AWU has successfully implemented multiple adjustments to its inclining block residential rate structure that has further enhanced our water conservation incentives.

While an inclining rate structure provides an incentive for high water users to conserve, it also provides a mechanism to reduce the bills for customers that are at or below the average water users. AWU has consistently structured rates to provide a significant incentive to high water users to conserve water while benefiting low water users with lower than average water bill increases.

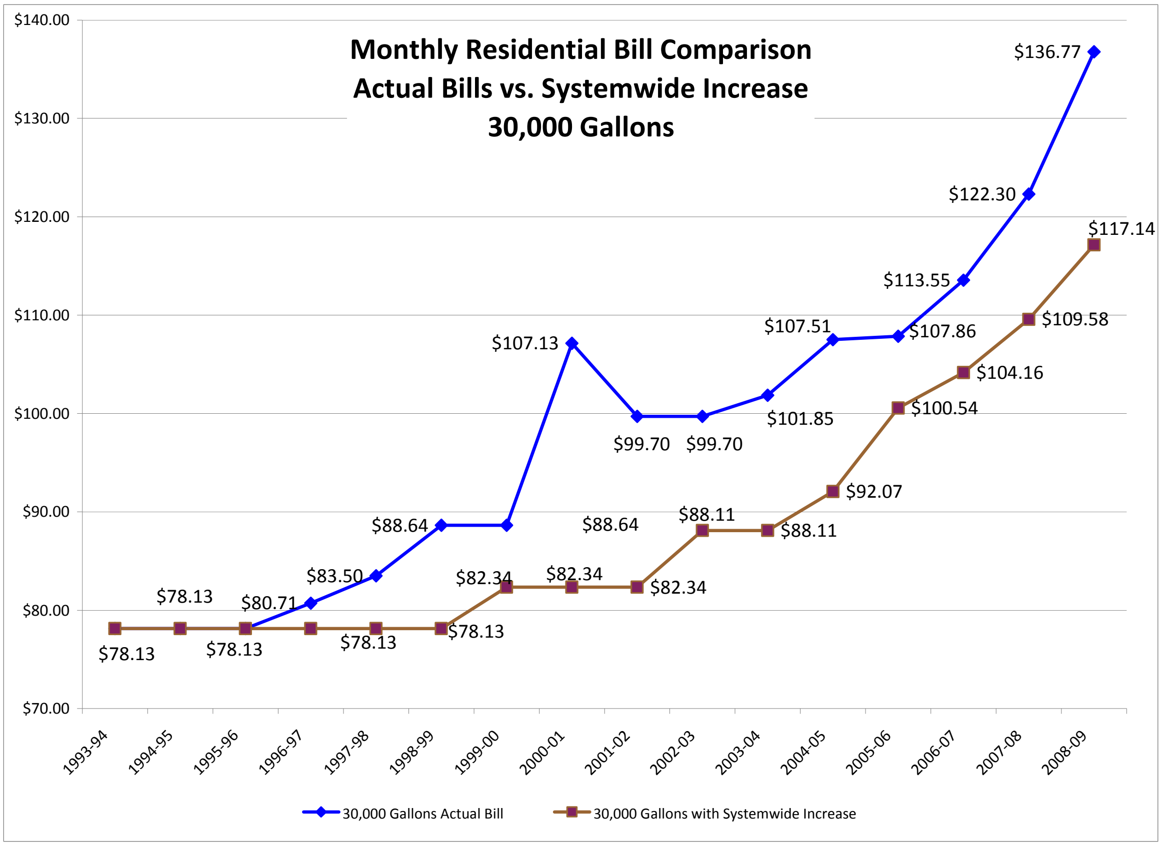
The following graphs illustrate AWU's history of residential water bills at varying water consumption levels.



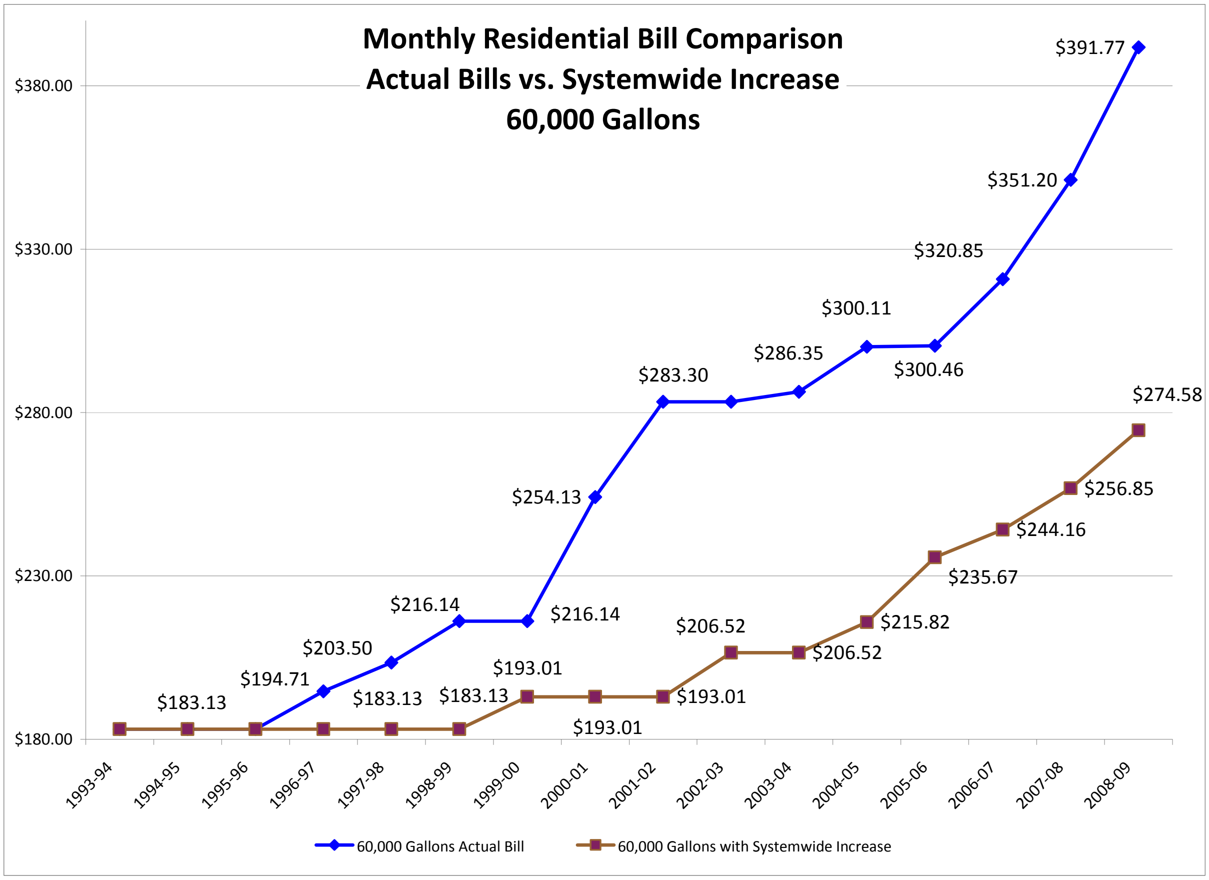
The above graph shows a comparison of historical monthly residential bills for a customer that uses 2,000 gallons per month. Based on actual rates from 1993 to the present, the blue line illustrates actual monthly bills at 2,000 gallons. The red line illustrates what the monthly bills would have been for 2,000 gallons if AWU had increased the residential block rates at the system-wide rate increase levels. Since the actual bills are lower than what would have been at the system-wide levels, this shows that AWU has used the inclining block rate structure to benefit the lower water consumption customers.



The above graph shows a comparison of historical monthly residential bills for AWU average residential customer that uses an average of 8,500 gallons per month. This graph annualizes 12 months of consumption in which some months are lower, while other months during the summer are higher. Based on actual rates from 1993 to present, the blue line illustrates actual monthly bills at the annualized 8,500 gallons per month. The red line illustrates what the monthly bills would have been for this same consumption pattern if AWU had increased the residential block rates at the system-wide rate increase levels. Since the actual bills are lower than what would have been at the system-wide levels, this shows that AWU has used the inclining block rate structure to benefit the average water consumption customers.



When the same graphic analysis is used for the higher water users, the results are much different. The above graph shows a comparison of historical monthly residential bills for a customer that uses 30,000 gallons per month. Based on actual rates from 1993 to present, the blue line illustrates actual monthly bills at 30,000 gallons. The red line illustrates what the monthly bills would have been for 30,000 gallons if AWU had increased the residential block rates at the system-wide rate increase levels. Since the actual bills are much higher than what would have been at the system-wide levels, this shows that the AWU has used the inclining block rate structure to provide a water conservation incentive for higher water consumption customers. AWU has set its inclining block rates over the years so as to increase rates at higher than the system-wide rates for the higher water use blocks above 15,000 gallons. The resulting higher bills for high water use customers provides the financial incentive to conserve water.



As the volume of use grows, the financial incentive for high water users to use less is even greater. When you complete the same graphic comparison for even higher water users, the financial incentive for the high water users is even greater. The above graph shows a comparison of historical monthly residential bills for a customer that uses 60,000 gallons per month. Based on actual rates from 1993 to present, the blue line illustrates actual monthly bills at 60,000 gallons. The red line illustrates what the monthly bills would have been for 60,000 gallons if the AWU had increased the residential block rates at the system-wide rate increase levels. Since the actual bills are much higher than what would have been at the system-wide levels, this shows that AWU has used the inclining block rate structure to provide a water conservation incentive for higher water consumption customers. AWU has set its inclining block rates over the years so as to increase rates at higher than the system-wide rates for the higher water use blocks above 15,000 gallons. The resulting higher bills for high water use customers provides the financial incentive to conserve water.

With this analysis, AWU could also estimate the water conservation impacts of the rate structure changes over the years based on price elasticities. The total estimated gallons of conserved water and estimated peak day demand reductions could be calculated. This analysis is currently ongoing.