APPLICATION OF THE	§	**BEFORE THE**
LOWER COLORADO RIVER	§	
AUTHORITY FOR EMERGENCY	§	**TEXAS COMMISSION ON**
AUTHORIZATION RELATED TO	§	
WATER MANAGEMENT PLAN	§	**ENVIRONMENTAL QUALITY**

AFFIDAVIT OF NORA MULLARKEY MILLER

THE STATE OF TEXAS	§
	§
COUNTY OF TRAVIS	§

Before me, the undersigned authority, personally appeared Nora Mullarkey Miller, a person known by me to be competent and qualified in all respects to make this affidavit, who being by me first duly sworn, deposed as follows:

1. I am over 21 years of age, of sound mind, and have never been convicted of a felony or crime of moral turpitude. I am fully competent and qualified in all respects to make this affidavit.

2. The facts stated in this affidavit are within my personal knowledge and are true and correct.

3. I, Nora Mullarkey Miller, am an individual residing in Austin, Texas.

4. I have a Bachelor of Arts degree in Sociology from the University of Texas at Austin and a Master of Public Health degree from the University of Texas Health Science Center in Houston.

5. I have worked for the Lower Colorado River Authority (LCRA) for over 26 years. My current title is Water Conservation Supervisor. My experience is further detailed in the attached resume, attached under Tab 1.

6. As part of my duties at the LCRA, I am responsible for helping to prepare and implement LCRA water conservation plans and drought contingency plans.

7. I have had experience implementing mandatory water restrictions for the City of Austin, as well as for the LCRA water utilities.

8. The Drought Contingency Plan (DCP) for LCRA's firm water customers establishes what measures the LCRA will take during times of drought. (The DCP is included in Chapter 4 of LCRA's Water Management Plan. *See* 2010 Water Management Plan at 4-32.) Those measures are as follows: 1) when combined storage in lakes Travis and Buchanan is at or below 1.4 million acre-feet, LCRA encourages all of its customers to implement voluntary water conservation measures; 2) when combined storage in lakes Travis and Buchanan is at or below 900,000 acre-feet of water, LCRA asks its firm water customers to implement

mandatory water restrictions, with a goal of decreasing water use by 10-20%; and 3) when combined storage in lakes Travis and Buchanan reach 600,000 acre-feet of water, and upon a declaration of a Drought Worse than Drought of Record (DWDR) by the LCRA Board of Directors, LCRA will implement pro rata curtailment of its firm customers' water use, with a goal of reducing water use by 20% initially. If combined storage continues to drop below 600,000 acre-feet, the Board may implement further mandatory reductions. LCRA's rules provide for a temporary variance from these requirements only in the limited circumstance where a customer can demonstrate that the public health, welfare or safety is threatened. (*See* LCRA Water Contract Rules, Article 11, rule 11.14 available at: http://www.lcra.org/water/water-supply/water-supply-contracts/Documents/ water_Water_Sale_Contract_Administrative.pdf.)

9. Further, in November 2013, the LCRA Board of Directors temporarily amended the firm customer Drought Contingency Plan to require that firm customers limit outdoor landscape irrigation to no more than once per week if on March 1, 2014 the combined storage in lakes Buchanan and Travis is below 1.1 million acre-feet and if interruptible stored water supply to customers in LCRA's Gulf Coast and Lakeside divisions and Pierce Ranch is cut off. This drought response measure will not require that customers achieve a specific percentage savings. As of March 1, 2014, the combined storage was below 1.1 million acre-feet and interruptible stored water supply to customers in LCRA's Gulf Coast and Lakeside divisions and Pierce Ranch was cut off. As a result, the no more than once per week landcscape irrigation restriction is in effect.

10. To conserve water, LCRA has engaged in extensive water conservation efforts since 1989. Attached under Tab 2 is LCRA's Ongoing Water Conservation Initiatives and Drought Response Efforts Report, which provides more details about LCRA's water conservation and drought contingency planning and response efforts. Additional information can also be found in the 2009 LCRA Raw Water Conservation Plan, which is available electronically on LCRA's website at: http://www.lcra.org/water/save-water/Documents /2009_LCRA_Water_Conservation.pdf.

11. All of LCRA's firm customers that currently divert and purchase water from LCRA are required to have a drought contingency plan. As of July 1, 2014, 100% of those customers (other than those with "temporary" contracts of up to three years and up to 10 acre-feet per year) have plans on file. LCRA has implemented a separate drought contingency plan for its domestic use and irrigation customers which fall under the temporary contract category. (*See* http://www.lcra.org/water/water-supply/water-supply-contracts/Documents/DU-Temp-DCP-with-Amendment.pdf.) Further, LCRA has a drought contingency plan that applies to its irrigation operations. (*See* 2010 WMP pp. 4-23 to 4-31.)

12. On August 23, 2011, combined storage in lakes Travis and Buchanan dropped below 900,000 acre-feet. LCRA has asked firm customers to implement their mandatory drought measures with a goal of reducing water use by 10-20%, as required by LCRA's DCP. The response of these customers is summarized under Tab 2, attached to my affidavit.

13. In the summer of 2008, the City of Austin, the LCRA West Travis County System, and Travis County Water Control and Improvement District No. 17 began requiring their retail

customers to limit outdoor watering to twice a week. The City of Austin moved to require limits on landscape watering to once per week during the fall of 2009, when LCRA asked customers to implement mandatory water restrictions as a result of reaching the 900,000 acre-feet combined storage trigger. Once the 2009 drought eased, the City of Austin decided to move back to the required twice weekly limit on landscape irrigation, but continued this on a year-round basis. In September of 2011, the City of Austin once again implemented the limitation on landscape irrigation to once per week for its retail customers due to hitting the 900,000 acre-feet combined storage trigger. Except for about a six week period in the summer of 2012, City of Austin customers have stayed in once a week restrictions for the past two years.

14. If a Drought Worse than Drought of Record is declared, LCRA's 2010 Water Management Plan provides that the firm customers' supply be curtailed on a pro rata basis, consistent with state law. In December 2010, LCRA obtained approval from the Texas Commission of Environmental Quality of its Water Curtailment Plan for Firm Customers. As of July 1, 2014, LCRA has pending or final pro rata plans for all of its firm water customers who are actively diverting water. LCRA is continuing to work with some of these customers to finalize the plans.

15. In evaluating potential water savings from drought response measures, I have reviewed a 2009 study by the Texas Water Development Board, "Drought Management in the Texas Regional and State Water Process." (Available at: http://www.twdb.state.tx.us/publications/reports/contracted_reports/doc/0804830819_DroughtMgmt.pdf.) The report estimates that implementation of the drought of record stage in the drought contingency plans of all municipal providers across Texas would reduce annual water demands by between 15 and 20 percent (based on information in the drought plans). According to the TWDB study, the measures required to achieve this level of savings would have some onerous effects on customers and would affect customers' quality of life and local economic conditions. The study team stated that some of the goals listed in the water suppliers' drought contingency plans were unrealistic and most were untested. For most providers in Texas who have implemented their drought contingency plans, there is limited or no data available regarding actual water savings during drought conditions.

16. In 2011 and 2013, LCRA conducted benchmarking research throughout the United States as well as Australia, to assess the effectiveness of drought response measures. The water providers interviewed stated that water savings between 15 to 40 percent were realized from implementation of mandatory drought restrictions. The timeframe for savings varied from six months to three years for wholesale providers and less for smaller, mainly retail providers. For some water suppliers such as the City of Atlanta, East Bay Municipal Utility District, and North Texas Municipal Water District water savings were below 15 percent for the first year of implementation. Atlanta had an initial reduction of 10 percent during the first year of drought restrictions but was able to receive an additional 14 percent when the state of Georgia declared a statewide drought emergency. A 40 percent savings was achieved in Australia after an extended period and included a ban on outdoor watering. Information obtained during the benchmarking effort can be found under Tab 3 and Tab 4.

17. Some LCRA customers have reported their estimated savings from drought restrictions imposed over the past two years. Those customers implementing the once per week limit on landscape irrigation are estimating savings of 15% or greater on an annual basis. This savings estimate is consistent with calculations performed by LCRA using 2007-08 winter water use compared with 2008 summer water use to develop a proxy of how much water might be used outdoors. Many municipal customers DCPs eliminate all outdoor spray irrigation under pro rata curtailment. Assuming winter use represents only indoor use for municipal customers, eliminating all outdoor water use might save somewhere between 15% to 25% on an annual basis. Completely eliminating outdoor water use is expected to create significant financial hardship for the landscape and irrigation community.

18. LCRA's TCEQ-approved Water Curtailment Plan for Firm Customers considers the extent to which customers have already implemented conservation and drought contingency measures in determining their effective required pro rata curtailment. Many of LCRA's customers sought and obtained modifications to their required curtailment based on a variety of factors, including conservation savings. In addition, some of the customers, including the City of Austin, have already implemented drought response measures that may bring them close to meeting the initial required reduction. However if water supplies continue to decline, the LCRA Board could adopt more stringent water reductions, thus requiring customers to implement additional measures.

19. LCRA continues to work with its firm customers in preparation for the possible implementation of pro rata curtailment.

Further affiant sayeth not.

Nora Mullarkey Miller
NORA MULLARKEY MILLER, AFFIANT

SWORN TO AND SUBSCRIBED before me on the 2nd day of July, 2014.

TABETHA JASKE
Notary Public, State of Texas
My Commission Expires
January 11, 2018

Tabetha Jaske
Notary Public in and for the State of Texas

My Commission Expires: 1-11-2018

Tab 1

Nora Mullarkey Resume

Nora Mullarkey has 30 years of experience in water conservation. She began her work as a conservation coordinator at the City of Austin, where she oversaw water conservation plumbing retrofit programs and evaluated programs for water savings and cost effectiveness. For the past 26 years, Nora has been with the Lower Colorado River Authority (LCRA), and currently manages its water conservation program. In this capacity, Nora oversees the planning and implementation of conservation programs for LCRA firm and interruptible raw water customers, and provides planning and policy oversight on conservation issues affecting the LCRA and its customers. During this historic drought, Nora has managed the pro rata curtailment process for firm water in anticipation of reaching a drought worse than the drought of record.

While at the LCRA, Nora has also been responsible for environmental education programs and special community events such as volunteer water quality monitoring, household hazardous waste collections and river and lake cleanups. Before joining the LCRA, Nora worked as a water conservation specialist for the City of Austin and as a socioeconomic and land use specialist for Espey, Huston and Associates.

Nora is or has been involved in the following local, state and national water conservation professional activities:

- TCEQ Irrigation Advisory Council member
- TWDB Water Conservation Advisory Council, alternate
- Texas AWWA Water Conservation and Reuse Division Past Chair and current Water Conservation Subcommittee Chair
- Texas Legislative Task Force on Rainwater Harvesting member
- American Rainwater Catchment Systems Association Board member
- City of Austin Citizen's Water Conservation Advisory Committee

Nora received a Bachelor of Arts degree in Sociology and a Master of Public Health degree- both from the University of Texas.

Tab 2
Lower Colorado River Authority
On-going Water Conservation Initiatives and Drought Response Efforts Report

LCRA Water Conservation Overview

LCRA believes that water conservation will benefit its customers and is necessary for the long-term quality and sustainability of the lower Colorado River basin's water supply. LCRA has coordinated, and will continue to coordinate, with its customers and the public to implement innovative, effective and cost-efficient water conservation practices. LCRA has focused its conservation efforts on reducing the water used for irrigated agriculture, providing public awareness through outreach and education, and providing technical assistance and incentives to wholesale customers.

Municipal customers in the lower Colorado River basin also have been leaders in water conservation. As LCRA's largest municipal customer serving more than 80 percent of the population in the basin, the City of Austin has maintained one of the most comprehensive water conservation programs in the state for more than two decades. Austin's conservation efforts combine incentive programs with customer education, conservation ordinances and rules. In recent years, additional municipal customers in the LCRA basin such as Travis County Water Control and Improvement District (WCID) No. 17 have implemented irrigation evaluation programs and other water conservation efforts to effectively lower water use in their service areas.

Ongoing LCRA Water Conservation Efforts

Agricultural water conservation strategies

As the largest user of water from the lower Colorado River system, irrigated agriculture has provided one the best opportunities for LCRA to reduce the overall water demand through conservation programs. Beginning in 1986, LCRA initiated a major program to increase irrigation water use efficiency in rice irrigation systems. Between 1989 and 1997, the introduction of volumetric pricing and canal rehabilitation are estimated to have saved approximately 13 percent or about 41,500 acre-feet annually, of the projected water use that would have occurred without conservation practices in place.

House Bill 1437, passed by the Texas Legislature in 1999, authorizes LCRA to provide funds for the development of water resources or other water-use strategies to replace or offset up to 25,000 acre-feet per year of surface water transferrable to Williamson County. Guided by the HB 1437 implementation plan, a grant program was initiated in 2006 to help finance agricultural water conservation strategies both for structural improvements within LCRA irrigation divisions and for grants to agriculture producers. One of the main priorities on the list of conservation strategies to implement has been precision laser land leveling. Between 2006 and 2013, LCRA provided up to 30 percent of the costs to the farmers to land level over 30,000 acres of land on 365 fields.

In late 2009, LCRA began implementation of a $1 million Garwood volumetric measurement project. Through this project, over 400 standardized water delivery and flow management structures were installed in the Garwood canal system, and 85 miles of canal laterals have been cleaned or rehabilitated. In addition, 139 miles of existing canals formerly managed by land owners are now managed by LCRA. Installation of 36 walk bridges and measurement piers at every delivery structure allow staff to collect accurate daily water measurements. Volumetric pricing was implemented for the first time in the 2012 irrigation season after two test seasons of daily water measurement throughout the Garwood canal system. A $100,000 grant was secured from TWDB in 2009 to assist with the Garwood measurement project.

In 2010, LCRA received a nationally competitive grant from the U.S. Bureau of Reclamation (USBR) to fund $257,000 or almost half of the Gulf Coast Gate Rehabilitation and Control project. This project replaced and automated eleven canal check structure sites (22 gates) within the eastern canal system of the Gulf Coast Irrigation Division. The grant funds allowed LCRA to pursue the installation of a supervisory control and data acquisition (SCADA) system to remotely monitor and control canal water levels at the gates. Three spill monitoring sites will also be monitored to quantify water loss from the canal system. The project construction, SCADA software interface, and radio communications testing have been completed and the new gates are ready to be fully utilized in the next irrigation season.

In June 2013, TWDB awarded LCRA $101,700 to assist with additional gate structures in the Gulf Coast Irrigation Division. LCRA is currently expanding the gate project to include the western canal system in the Gulf Coast.

Due to curtailment of irrigation operations in two of LCRA's three irrigation divisions, actual savings from these conservation measures is estimated to be 6,200 acre-feet per year at the end of 2013. However, if curtailment had not been in place, LCRA estimates that savings would be about 9,800 acre-feet per year.

Municipal and Industrial Water Conservation Strategies

As a major water rights holder, the Lower Colorado River Authority (LCRA) is required to develop and implement a water conservation plan. In 1989, prior to the Texas Administrative Code, Chapter 288 rules, LCRA developed Rules for Water Conservation and Drought Contingency and required all new firm water customers applying for a new or modified water supply contract to develop plans in accordance with these rules.
As a wholesale provider of water, LCRA must work through its wholesale customers to save water at the end-user level. LCRA offers a variety of strategies to save water such as incentive programs through which LCRA partners with its customers to offer water-saving fixtures such as high-efficiency toilets or other technologies; requirements that new or updated contracts include conservation best management practices; and an expansion of LCRA's education outreach efforts to provide useful information to consumers.

Beginning in 2010, several new incentives programs were implemented, including a

residential indoor plumbing fixture replacement program; a firm water customer cost-share program; rebates for irrigation technologies and other commercial measures, and irrigation evaluation training. All of these programs are available to water users that directly or indirectly receive water from LCRA. A summary of the program results include:

- Partnered with 14 firm water customers:
  - 5,000 high-efficiency toilets
  - 2,700 low-flow showerheads
- Awarded rebates to retrofit plumbing fixtures in 22 schools and four hotels
- Performed about 750 irrigation evaluations

LCRA estimates that approximately 2,700 acre-feet (450 million gallons) of water is saved annually from implementation of firm water strategies since 2009. These savings do not include those associated with temporary water restrictions that are in affect due to the current drought. Municipal customer mandatory requirements such as irrigation standards and permanent landscape watering schedules account for nearly 50 percent of the savings.

LCRA received several awards for its firm water conservation incentives programs. In 2013, LCRA was selected as a finalist for the Texas Commission on Environmental Quality (TCEQ) Texas Environmental Excellence Awards, and was awarded a Blue Legacy Award by the Water Conservation Advisory Council in the river authority category.

Finally, LCRA has been educating customers in its service area about water conservation through its public awareness efforts. Monthly conservation articles with supporting how-to videos are made available through LCRA WaterSmart Web site. In addition, the LCRA conservation team regularly staffs events and gives presentations with water conservation tips and other information throughout LCRA's service area.

LCRA administers an annual progress report survey to its customers and uses the Alliance for Water Efficiency water savings tracking tool to determine the progress of the conservation programs.

In April 2014, the LCRA Board approved the 2014 LCRA Water Conservation Plan which was submitted to the TCEQ on May 1, 2014. Most conservation and strategies will remain the same. However, LCRA will be launching a new outreach program later this year called "Water My Yard" developed by Texas Agrilife. A website will be available that provides a weekly schedule for how much water to use on the landscape, based on a once a week water schedule. It will use weather based data, and will utilize the LCRA's existing Hydromet stations.

Drought Response Efforts

As a wholesale water supplier, LCRA requires all of its firm municipal, industrial and irrigation water customers (with the exception of customers with temporary contracts) to prepare and submit drought contingency plans. (LCRA has implemented a separate drought contingency plan for its domestic and irrigation customers with temporary contracts.) The drought contingency plans are designed to reduce water demands through supply and demand management measures as a result of water supply conditions. Since it began requiring drought plans as part of its contract rules, LCRA has provided technical assistance and other relevant information to its wholesale customers during the planning process. In November 2010, LCRA staff began actively working with customers to update their drought contingency plans to be consistent with the LCRA drought plan. As of July 2014, 100 percent of customers who are actively diverting water have plans on file with LCRA.

Some measures thought of as drought response measures have the potential to become permanent water demand management measures. Four wholesale customers – Travis County WCID #17, Lakeway Municipal Utility District, West Travis County Public Utility Authority, and the City of Pflugerville – have adopted permanent landscape water restrictions from May through September each year. Their end users must follow a mandatory water schedule that limits outdoor landscape irrigation to no more than twice weekly and are prohibited from irrigating between the hours of 10 a.m. and 7 p.m. except with a hand-held hose. The City of Austin implemented a mandatory schedule in 2008 that corresponds to the same landscape restrictions, but is in effect year-round.

LCRA Drought Response—Customer Communications and Support

LCRA strives to maintain open lines of communication with all of its water customers. During the 2009 drought, LCRA hosted several work sessions with its firm water customers, particularly in the fall and winter of 2009 and in January 2010. The goals of the work sessions were for customers to share information on their mandatory drought response efforts and learn from each others' experiences and challenges, and for LCRA staff to introduce pro rata curtailment. Customers provided feedback on proposed pro rata curtailment rules, some of which were incorporated into the final pro rata contract rules.

As drought conditions worsened in 2011, LCRA focused on providing up-to-date, clear information to its customers and assistance with drought restriction implementation through sharing of resources and technical information. LCRA has held four customer meetings with its customers since July of 2011 to keep them updated regarding drought conditions.

July 2011 meeting
This meeting between LCRA and water customers focused on the seriousness of drought conditions, importance of water conservation, and timeframe for potential mandatory water restrictions. LCRA staff met with more than 60 people who represent many of

LCRA's municipal and industrial raw water customers. Presentations included updates on the ongoing drought conditions throughout the lower Colorado River watershed, water storage projections, water conservation, and measures that LCRA has taken and will take under its state-approved plan if drought conditions worsen. LCRA informed its customers of what actions will occur when water storage levels fall below set triggers, including reducing releases for environmental needs, cutting back water for agricultural customers, and working with its wholesale municipal and industrial customers to implement mandatory water-use restrictions.

October 2011 meeting

The primary purpose of this meeting was to prepare customers for the possibility of pro rata curtailment in 2012. LCRA shared information on the current drought and water supply, explained the history and reasons for pro rata curtailment, and reviewed the process and procedures for implementing pro rata curtailment, and. Customers had the opportunity to express their challenges and issues with implementing pro rata curtailment.

January 2012 meeting

Almost 90 customers attended this customer meeting and were updated on a number of issues, including the drought, the weather outlook, the Water Management Plan and a new conservation incentive program. Those that attended also took part in a roundtable discussion on topics including: 1) the need to coordinate drought messages; 2) the importance of conservation education; 3) the challenges of enforcing drought measures; and 4) the benefits and challenges of having a uniform watering schedule throughout the region.

August 2012 meeting

The drought was again on the agenda for this customer meeting. LCRA staff provided an update on the current drought and water supply situation, gave an update on the pro rata curtailment plan review process, and gathered customer feedback on the pro rata curtailment process. Over sixty customers attended this meeting.

Meetings in 2013

LCRA has held firm customer meetings on May 2, June 28, August 29 and November 15 of this year. The May meeting focused on customer curtailment plans and the possibility of mandatory pro rata curtailment later this year. At the June meeting, LCRA and its customers shared and discussed lessons learned from drought response benchmarking, approaches taken by various LCRA customers to implement drought response measures, and the additional steps that may be taken if pro rata is triggered and conditions continue to worsen. The August meeting continued the discussion of pro rata curtailment, including clarification that customers could modify current pro rata plans on file to add demand growth in 2012. Finally, at the November meeting, the 2014 emergency relief proposal as well as proposed changes to LCRA drought contingency plan rules for customers were discussed.

Meetings in 2014

Two meetings have been held this year, on January 31 and June 5th. The meetings included continuing discussions of the water supply outlook and drought response measures. Other topics included a discussion on the update of the LCRA water conservation plan and possible rate increases. Those customers that received a growth modification in the reference year were notified of the opportunity to update their pro rata plans to include 2013 growth.

Other communication efforts

Combined storage of lakes Travis and Buchanan, two reservoirs constructed to store water supply, reached the milestone storage volume trigger of 900,000 acre-feet on August 24, 2011 under LCRA's Water Management Plan. As a result, the following day LCRA called on its wholesale firm water customers to implement mandatory water use restrictions under their individual drought contingency plans to reduce their water use by 10 to 20 percent. Information was sent out via a direct e-mail newsletter to customers, and certified letters. LCRA created a section titled "Water Use Restrictions" on the LCRA Web site that provides links to individual customers' water restrictions, including restrictions for LCRA water utility customers.

LCRA sent out a notice to customers on April 26, 2012 stating that while the combined storage levels had risen to over 1.0 million acre-feet, LCRA was requesting that customers continue implementing mandatory water restrictions until the combined storage increased to at least 1.1 million acre feet. When the combined storage dropped once more to less than 900,000 acre-feet on September 3, 2012, LCRA sent out a reminder to customers to implement mandatory restrictions. LCRA continues to update the Water Use Restrictions page on the LCRA web site. The page shows which customers are in various stages of restrictions. LCRA has a speaker's bureau that provides updates on the drought as well as tips on saving water. In 2014 staff has provided drought presentation to 26 community events with approximately 900 people attending the event.

Customer drought response efforts

In September of 2011, 21 LCRA municipal customers and LCRA's retail water utilities began implementing mandatory water restrictions. Currently, all major municipal water customers are in mandatory restrictions, and in February 2014, customers representing nearly 95% of the total population served by the LCRA were limiting outdoor water use with a hose-end sprinkler or automatic system, not including drip irrigation, to no more than once per week. Other non-essential uses have also been curtailed. Major customers in once per week watering drought restrictions include Austin, Cedar Park, Pflugerville, Travis County WCID 17, Lakeway MUD and the West Travis County Public Utility Authority. Except for about a six week period in 2012, the City of Austin has been under once per week water restrictions since the fall of 2011. Most of the other municipal customers have been under mandatory restrictions of at least no more than twice per week watering since that time as well.

Many irrigation and recreation customers also informed LCRA of the water reduction measures they implemented to cut back their water use by 10 to 20 percent. Most golf courses reduced their overall water budget, while others scaled back on ornamental beds, area of irrigated roughs (areas not essential to the playability of a course), or other high water using areas.

LCRA industrial customers, who consist of power plants and a few large industries along the Gulf Coast, cut back on non-essential water uses, such as outdoor watering. However, these cutbacks likely have resulted in a very minimal savings. Any further cutbacks for industrial customers could result in a decrease in production.

Firm water customers were notified in February of the LCRA Board resolution that required a limit on ornamental landscape spray irrigation to once per week, beginning March 1, 2014. Customers were required to notify LCRA that they are implementing this restriction if they are not already implementing a once a week watering schedule. All customers have notified LCRA that they have adopted this drought restriction.

Pro rata curtailment preparation

The LCRA Water Management Plan requires LCRA to begin working with customers to develop pro rata curtailment plans once the 900,000 acre-feet combined storage trigger has been reached. As stated earlier, a customer meeting was held in October 2011 to begin this process and provide the customers with an opportunity to ask questions.

Customers were sent letters with their proposed water allotment, assuming a 20% curtailment, and given a deadline of February 15, 2012 to submit their plans. Those that did not submit plans by that time were automatically assigned a 20% pro rata allotment.

LCRA water conservation staff met with customers in person as well over the phone, and also responded to hundreds of emails to answer questions and assist customers in the development of their plans. Customers were allowed to modify their water demand baseline for conservation, reuse, growth, outage, and alternative water supply.

LCRA met with its firm water customers in May, June, August and November of 2013, and in January and June of 2014 in further preparation for the possibility of the implementation of pro rata curtailment as discussed above.

Tab 3

Benchmarking Research on Drought Restrictions implemented in other Communities (Compiled in 2011)

	Atlanta, Georgia	Georgia (state-wide)	Aurora Water, Colorado	Denver Water, Colorado	Corpus Christi, Texas	North Texas Municipal Water District, Texas	East Bay MUD, California
Timeframe drought response measures implemented	2006-2009	9/1/2007 -2009	2002-2003	2002-2003	1984-1986, 1996, 2001	2005 -2006	1977, Late 1990s, Summer 2008-2009
Water Savings							
Percent Reduction Goal (overall)	10%	10%	Undefined ("as much as possible")	30% by Stage 3 (10%-20% previous stages)	Current goals (1%-5%-10%-15%) 1996 plan (10-5-10%) for stages 1-3	5%	15% Overall (Mandatory savings goals varied depending on customer class)
Percent Reduction Achieved (overall)	14-24% (water use remains at 17% below pre-drought)	~10%	32%	29%	30% (off of peak summer usage in 1980s) 11% savings in 1996 (although the goal at that time was 25%)	10-15%	12%
Tracking Water Savings	Monthly comparison to pre-drought for savings	Reports required of water providers	Monthly comparison to pre-drought for savings	Annual comparison to pre-drought for savings	Monthly	Monthly tracking of water use & reduction goal was emailed out to all member cities	Savings triggers were based off of expected production for that timeframe
Drought Response Measures							
Mandatory Watering Schedule	No Outdoor Watering (with exceptions)	No Outdoor Watering (with exceptions)	Twice weekly, no more than 15 minutes per zone	Twice weekly	Once every 5-day or 14-day schedule (depending on stage)	Varied depending on Member City	Recommended Schedule (no more than 3 days/week)
New Landscapes	Allowed if installed by professional & green industry certification received	Allowed (green industry represents significant jobs and impact on the economy)	Not allowed	Allowed (soil restrictions added)	Allowed, landscape plan must be submitted in advance	Member Cities Allowed	Allowed (New connections limited sod & required efficient irrigation systems)
Restrictions on Golf Courses	Tees and Greens exempt	Stage 4 – greens only (95% curtailment)	No more than twice weekly watering allowed	Difficulty with compliance	Time of day and day of the week restrictions	Tees and Greens exempt	30% Reduction Goal

	Atlanta, Georgia	Georgia (state-wide)	Aurora Water, Colorado	Denver Water, Colorado	Corpus Christi, Texas	North Texas Municipal Water District, Texas	East Bay MUD, California
Restrictions on Industrial Customers	10% reduction goal included industrial (large success from customers such as Delta Airlines, Georgia Aquarium)	10% reduction goal included industrial	Outdoor water use restrictions (Surcharges likely prompted conservation)	Surcharges & aggressive attempts to get reductions (plus rebates) led to process improvements for customers including Pepsi & Frito Lay	Surcharges for industrial customers if use is in excess of baseline minus a pre-defined percentage reduction goal	Only on outdoor water use	Industrial 5% Reduction Goal
Enforcement							
Enforcement Actions (for violations)	Fines (surcharges) on water bills	NA	Fines (surcharges) on water bills	Fines (surcharges) on water bills and flow restrictors	Citations	NA	EBMUD investigates customers who have not saved and installed flow restrictors
Surcharges as a Result of Excess Use	No	NA	Surcharges were added to bills (30% reduction applied to outdoor historical use)	Surcharges were added to bills for Denver retail (flat gallon amount applied)	Surcharges added to bills (for residential, commercial, industrial customers)	Some member cities added surcharges to bills	Drought rate structure took effect in 2008
Additional Staff Needed	5 inspectors plus hotline staff added	NA	Aurora: 8 hotline and 15 patrol staff added	Denver added ~10 staff for enforcement	Staff were pulled from other areas and deputized by the court	Many member cities added staff for enforcement	Staff shifted responsibilities to add enforcement
Public Information							
Marketing Campaign	Relied heavily on free media and state-wide campaign	Georgia "Water Smart Campaign: Save Water, Save Time, Save Money"	"Use Only What You Need" Regional Campaign	"It's a Drought…Do Something!" Campaign	"Have You Saved Water Today?" and "If We All Save a Little, We Save A Lot"	"Water IQ: Know Your Water Campaign"	"Save Water. Beat the Drought. This is a job for everyone: be a water saving hero" (Bay Area Water Savings Partnership)
Stakeholder meetings	Yes	Yes	Yes	Golf Course associations, etc.	Yes	Water IQ helped facilitate & organize	Yes

	Atlanta, Georgia	Georgia (state-wide)	Aurora Water, Colorado	Denver Water, Colorado	Corpus Christi, Texas	North Texas Municipal Water District, Texas	East Bay MUD, California
Customer Council/ Advisory Group	Yes	No response	12-person Customer Advisory formed during drought (appointments by City Council)	Customer Advisory Council in place since 1970s	Water Use Allocation Committee formed (of Council/ Mayoral appointees) to assist with industrial reduction	NTMWD held monthly meetings with member cities to provide drought updates and exchange of information	
Technical Presentations given to End-use Customers	Top 50 Customer Workshop held to help encourage water use reduction for these high water use customers	Throughout the state, particularly with industrial customers	Yes	Yes	Yes	NTMWD gave presentations throughout member cities' service areas	Speakers Bureau available

Benchmarking Conclusions

Drought conditions and the implementation of mandatory, rather than voluntary, drought response measures can result in water savings. The water providers interviewed stated that water savings between 10 to 30 percent were realized once mandatory drought restrictions were put in place. All programs were supported by large-scale public awareness efforts, and most water suppliers implemented a surcharge system in addition to outdoor restrictions to help achieve water savings.

Aurora Water Supply, Denver Water Supply, East Bay Municipal Utility District (EBMUD), Corpus Christi and a number of member cities served by North Texas Municipal Water District (NTMWD)implemented a water use allocation system that charged customers for additional water use above and beyond a specified amount. EBMUD allocated a monthly water use amount based on historical use minus the percent reduction goal; for residential, the goal was 19 percent. Residential customers using less than 100 gallons per capita per day were not penalized for their low-water use habits and were exempt from the drought charges.

All water providers interviewed stated that water savings had a significant impact on revenue in the short term. In addition to water savings achieved during the time of drought restrictions, a "drought-shadow" effect also occurred for nearly all of the water providers, where water use remained low after restrictions were lifted. Nearly all the water providers interviewed stated that some level of water use reduction remained after the drought as a result of changed behaviors, new programs implemented, and greater public awareness. For EBMUD, water use restrictions were lifted in late 1977 after a multi-year drought; however, water use levels by the mid-1980s had not returned to pre-drought levels despite a steadily growing population.

A number of the water suppliers interviewed provided water directly to industrial customers. For these large industrial customers, limitations on outdoor water use alone could not achieve the water savings goals set by the water suppliers. In addition, the possibility of surcharges forced some industrial customers to threaten relocation. By offering technical expertise and significant rebates for water saving initiatives, Denver and Atlanta were able to partner with their industrial customers such as Pepsi, Frito Lay, Xcel Energy, the Georgia Aquarium, and others to evaluate the way they used water and help the customers put in place process changes that often resulted in substantial water savings with no negative impact to production.

Individual Water Providers' Drought Response Overview

Corpus Christi, Texas

Corpus Christi implemented drought response measures in 1984-1986, in 1996, and again in 2001. In 1986, as a result of the multi-year drought where the City was faced with less than a one-year water supply, the water supplier developed its first drought contingency

plan. The plan currently includes four stages that correspond to the percentage of combined reservoir levels. The following triggers and drought response measures are included in the latest version of the drought plan:

- 50% capacity triggers City-wide voluntary water conservation (1% reduction goal)
  - ✓ Municipal operations on mandatory conservation
- 40% capacity triggers community-wide mandatory conservation (5% reduction goal)
  - ✓ No lawn or vegetation watering between 10 am to 6 pm
  - ✓ Large parcels of land must obtain approval for watering plan
  - ✓ Commercial nurseries must use hand-held, drip or sprinkler system to irrigate stock
  - ✓ Use of wastewater effluent permitted; sign must be posted on property
- 30% capacity triggers the five-day outdoor watering schedule (10% reduction goal)
  - ✓ Irrigation of golf courses permitted at a minimum rate
  - ✓ Suspend targeted inflows when reservoir below 30% of capacity
  - ✓ Violations punishable by $500 per day
- 20% capacity triggers the monthly residential household water allocation (15% reduction goal)
  - ✓ Each household is allotted 6,000 gallons/month (unless a customer can verify that she or he has more than 2 people living there). Water use in excess of this amount is charged at an aggressive increasing rate per 1,000 gallons (with additional use being charged $5-$8-$13-$40 per each 1,000 gallons above the customers' water use allotment).

In Corpus Christi, a multi-stage conservation program was imposed during the 1984 drought to extend dwindling supplies. Water use restrictions were first implemented during the summer of 1984 and remained in effect through the rest of 1984 and into 1985. During this time, three separate stages, or conditions, of water use restrictions were implemented: (1) condition 1 called for voluntary limitations on outdoor water use; (2) condition 2 restrictions put mandatory limits on allowable watering hours and limited watering to a designated day, once every ten days; and, (3) condition 3 restrictions implemented water rationing on a monthly basis; also, during 1984, under condition 3 a total ban on outdoor water use was implemented.

Corpus Christi Drought Trigger	**Date Initiated**	**Effect on Water Use**
Voluntary Conservation (Stage 1)	May 17, 1984	Little to no effect
Mandatory Conservation (Stage 2)	July 1, 1984	28.6 MGD daily reduction
Mandatory Water Rationing (Stage 3)	August 25, 1984	25.4 MGD daily reduction
Some Condition 3 Restrictions Lifted	October 30, 1984	----
Mandatory Water Rationing Lifted	September 24, 1984	----
Return to Condition 2 Restrictions	January 22, 1985	----

When mandatory drought restrictions were implemented in 1984 and 1985, the restrictions reduced water use in Corpus by approximately 30 percent of peak summer usage, according to a study by David Maidment and D.T. Shaw. The study's analysis also showed there to be an average reduction of 27.2 MGD during the period of July through November 1984. Lastly, the analysis showed that the voluntary restrictions, implemented during the early stages of the drought, had little effect in the city.

More than 40 percent of the annual water use in the City of Corpus Christi is for industrial purposes. City staff has worked closely in the past with the large industrial customers to help them determine ways to reduce their water use and a number of industrial representatives are included on the City's Water Resources Advisory Committee. Industrial customers have made significant strides in reducing their water use—with some refineries averaging 50 gallons of water use per barrel of crude oil refined compared to refineries in California who use from 90-100 gallons of water per barrel on average.

During times of serious drought, the City creates a Water Use Allocation and Review Committee, comprised of mayoral and city council appointees who are charged with the task of granting variances and evaluating industrial, commercial, and institutional (ICI) water needs, among other tasks. Similar to residential customers, the ICI customers are limited to water use allocations when the combined reservoir storage drops to 20 percent or below. The committee helps to determine those allocations and reviews variances to the allocation amounts. New services are also prohibited during this stage, unless approved by the Allocation and Review Committee.

Lastly, to help set an example during drought times, the City developed a water diverter to be used in the field during line flushing to divert water to landscaped areas rather than run it down the storm drains.

City of Atlanta, Georgia

The City of Atlanta implemented drought response measures in 2006. The state of Georgia implemented its drought response plan, finally declaring a Stage IV Drought Emergency in September 2007. The City of Atlanta restrictions mirrored the state restrictions, with the greatest emphasis on outdoor water use reduction.

Stage IV of the Georgia Drought Emergency Plan called for a ban on most outdoor watering with a few exceptions. According to City of Atlanta staff, there was some reluctance on the part of the state to declare a Stage IV Drought Emergency until absolutely and completely necessary, due to the projected impact on the landscaping industry, which is estimated to employ more than 75,000 Georgians.

Stage IV set a statewide goal of 10 percent reduction in overall water use by water providers. Savings amounts varied between regions, with nearly 15 percent monthly savings for northern Georgia. For the City of Atlanta, although the drought restrictions

were officially lifted in January 2009, the current water use remains below 17 percent of 2006 use—which savings are thought to be a result of awareness, an increase in alternative water use, conservation initiatives, and the downturn in the economy.

The City of Atlanta brought together its top 100 largest customers, a group that included hotels, hospitals, office complexes, a federal prison, Pepsi bottling company, airline corporate headquarters and others, for a workshop on the potential impact of the drought measures and ways to reduce water use. Nearly 90 percent of the customers attended the meeting where case studies and other information were presented. The state also offered support by performing audits on large Industrial Commercial and Institutional (ICI) customers. According to the City of Atlanta, all of its high water use customers saved water.

New landscape installations were allowed under the restrictions; however, a partnership was formed with the Metro Atlanta Lawn and Turf Association (MALTA) to help increase water use efficiency for new landscape installations. In order to be issued the variance by the City of Atlanta to water outdoors, a landscaper had to first take a course on proper watering and design administered by MALTA.

Denver Water, Colorado

Denver's Drought Response Plan called for percentage reductions based on reservoir levels; however, it quickly found itself in a drought worse than the drought of record in 2002 after significant snowfall reductions. Denver Water's Board of Directors changed Denver's Drought Response Plan regularly as the drought became more severe—as a planning document, it had never been implemented and so much of what came up, according to staff, was unexpected and unplanned.

The public awareness campaign, "It's a Drought. Do Something!" used humor to help increase awareness of the drought. Advertisements included sayings like "no need to wash your clothes, just don't wear any" or "don't wash your dishes, just get a dog." Denver Water staff stated that while funny and entertaining, there might not have been enough of an emphasis on the importance of saving water and other messages that needed to be communicated during the drought.

A lot of the challenges faced by Denver Water included managing public expectations. Significant backlash was received from the public concerning what was perceived to be a lack of planning on Denver Water's part that resulted in the implementation of restrictions. Some neighboring communities who relied on groundwater supplies were not as heavily impacted during the 2002-2003 drought, adding to the lack of public understanding about water resource planning and availability. Other challenges included budget reductions as a result of the drought having an impact on CIP funding.

Aurora Water Supply, Colorado

Aurora Water Supply provides water to a primarily residential community. With the first in time, first in right priority water right system in Colorado, Aurora's water supply reservoirs were nearly 26 percent full as a result of severely reduced snowfall from 2002-

2004. Mandatory restrictions were put in place with a no more than twice weekly watering schedule and limits on the times that individual irrigation zones could run (no more than 15 minutes per zone). The installation of new landscaping was not allowed, which resulted in significant push-back from home builders and the landscaping industry. Other drought restriction requirements included restrictions on car washes that mandated recycling or ceasing operation, prohibiting the use of all fountains (unless supporting aquatic habitat), and limiting golf courses and parks to the mandatory watering schedule. While some of these measures were not thought to achieve significant water savings, the issue of public perception was linked to the individual measures and provided as the reason for implementation.

As a result of the drought, long-term changes to outdoor landscape codes for new development were put in place such as minimum soil requirements, limitations on turf grass, and an efficient irrigation system design requirement.

East Bay Municipal Utility District

Rebates, incentives, and regulations have been a part of East Bay Municipal Utility District's (EBMUD) conservation program for years to help encourage efficient water use practices. EBMUD has put in place mandatory drought response measures a number of times since the 1970s. In August 2008, EBMUD declared a severe water shortage emergency as a result of consecutive dry years. The District implemented drought response measures designed to achieve an overall water savings goal of 15 percent.

A number of water efficiency measures were required of customers during this time including a provision on prohibiting water waste (allowing water to run off a property), and requiring shut-off nozzles on all hoses. The main focus of the drought response measures in 2008, however, was a water use customer allocation. Baseline water use for customers was calculated using monthly billing information from the previous three years. Customer allocations were then calculated according to the percentage reduction goals included in Table 2. Surcharges for water use in excess of the allocated amounts were charged at an increasing rate for single family residential customers and a flat rate for all others. Customers using less than 100 GPCD were not penalized for their low-water use habits and were exempt from the drought charges.

EBMUD Customers' Water Use Reduction Goals

Customer Group	**Water Use Reduction Goal**
Single Family Residential	19%
Multi-family Residential	11%
Irrigation	30%
Commercial	12%
Institutional	9%
Industrial	5%
Overall Goal	**15%**

In addition to the surcharges, flow restrictors were used for customers who were found to be wasting water. A regional public awareness campaign also complimented these measures. The implementation of drought response and conservation measures were estimated to reduce water use by 12 percent or nearly 26,000 acre-feet of water.

North Texas Municipal Water District

The North Texas Municipal Water District (NTMWD) implemented drought restrictions in 2005. Stage 1 voluntary restrictions began in October 2005 and the stages implemented increased in severity until mandatory restrictions were lifted in 2007. Stage 3, the first stage that required mandatory measures, set a 5 percent overall reduction goal for its member cities. Savings numbers were tracked on a monthly basis—with NTMWD setting the 5% goal off of previous water use prior to the drought. Water use by the member cities was e-mailed to the cities every month along with information on what was being saved and whether or not the savings exceeded or fell short of the 5 percent savings goal.

Member cities implemented various drought contingency measures, including mandatory watering schedules with time of day and day of the week water restrictions, limitations on ornamental fountains, prohibiting car washes without shut-off nozzles, and adding surcharges to water bills if water use exceeded a pre-determined amount. The watering schedule varied between the member cities depending on their specific system needs—for instance, the City of Frisco implemented a restriction on outdoor water use between 5am and 8am due to capacity and pumping issues when indoor use was at its highest, while others promoted a schedule that allowed watering on your trash day to make it easy for customers to remember. Nearly all the member cities' schedules did not allow outdoor watering to occur between the hours of 10 am and 6 pm, which consistency aided regional messaging efforts.

A representative from NTMWD stated that the system was able to shave off approximately 200 MGD during the summer when drought restrictions were in place. Overall, water savings were an average of 10-15 percent. Moreover, some level of water savings has continued despite restrictions being lifted. The NTMWD representative said this is thought to be in part due to increased awareness in addition to member cities implementing conservation incentive programs and keeping the watering schedule in place on a permanent basis.

NTMWD played an active role in helping its customers with their drought response efforts. Staff served as a technical resource, and they made themselves available to give presentations and other talks throughout the member cities' service areas. In addition, NTMWD brought together its member cities on a monthly basis to give them an update on the drought situation, Water IQ efforts, the likelihood of advancing to the next drought emergency stage, and to provide a forum for members to voice questions and concerns. Member cities were made aware of the change in drought stages (from Stage I to Stage II to Stage III) 30 days in advance of it being declared.

Stakeholder meetings were held with the help of Enviromedia, who assisted in advanced outreach to stakeholder groups, securing locations, and coordinating the meetings for groups of irrigators, landscapers, pool maintenance specialists and others. Member cities were always informed in advance of any presentation, speaking event, or stakeholder meeting if it was to be held in their service area.

After the drought ended, NTMWD revised its model drought contingency plan to reduce the number of voluntary stages to one rather than two and to add a restriction on cool season rye grass.

Tab 4

Benchmarking Research on Mandatory Drought Restrictions implemented in other Communities (Compiled in 2013)

	Barton Springs Edwards Aquifer Authority	San Antonio Water System	Melbourne Water, Australia	Seqwater, Queensland, Australia	Metropolitan Water District, CA	Sonoma County Water Authority, CA	Southern Nevada Water Authority, NV
Timeframe drought response measures implemented	2011-2012	2012-2013	Nov 2002-Feb 2005 and Sept 2006- Nov 2012	2005-2009	July 2009- June 2010	2009	2002-2003, 8 of last 11 years dry
Type of Water Use Provider	Wholesale and Retail	Mostly retail, some wholesale ~1.6 million end users	Wholesale to 3 large municipal retailers ~4 million end-users	Wholesale- State Govt owned entity responsible for managing regional water supply	Wholesale only, 26 member cities/districts, 19 million end-users	Wholesale only to 9 retail cities/districts 600,000 end-users	Wholesale only to 7 member cities/districts ~2 million end-users
Water Savings							
Percent Reduction Goal (overall)	20% - 6 months 30% - 4 months	26-36% (varies based on aquifer level)	18% Stage 4 (outdoor water bans) 25% over ~10 years by 2015	Targets in per capita use instead of % reduction	15% wholesale 10% retail	25%	Mandatory 10% first year
Percent Reduction Achieved (overall)	10-38% monthly	25% off permitted volume, required reduction 22%, normal year use 80-85% of permit	44% since 1997	41-43% achieved by 2009	15%	25%	16% first year, 34% by 2011
Baseline used to cut back from	Permitted volume	Permitted volume	None specified- recent use, changed over time	2004-2005 (pre-restriction average rainfall year)	Past three years of pre-drought water sales (2004-2006)	2004 baseline (state mandate)	N/A
Driver of Water Use Reduction Efforts	Edwards Aquifer Authority mandated reduction permitted volume	Edwards Aquifer Authority mandated reduction permitted volume	Yearly supply available, State regulatory entity required specific mandatory retail restrictions	State Govt required mandatory specific water use restriction measures	Yearly April 1st Board declaration of available water supply/need for allocation	State regulatory entity mandated cutback of 25%	Supply allocation capped at 300,000 acft
Timeframe reduction goal achieved	2 months for 20% 1 months for 30%	Ongoing, met target aquifer levels	Target 155 goal lcd (41 gpcd) achieved in 1 yr (7% decrease)	3 years	One year	6 months	One year

	Barton Springs Edwards Aquifer Authority	San Antonio Water System	Melbourne Water, Australia	Seqwater, Queensland, Australia	Metropolitan Water District, CA	Sonoma County Water Authority, CA	Southern Nevada Water Authority, NV
Tracking Water Savings	Monthly tracking of goals, high level management meetings if goal exceeded	Weekly meetings/internal projection updates	Responsibility on retail side, yearly outlook issued forecasting supply capacity zone and action plan	Weekly, retail customers supplied water use weekly,	Monthly reports given to each member agency during allocation, Local ordinance database compiled	Collected reports from retailers bi-weekly, Monthly tracking of water use & reduction goal	No formal process
Modification credits	N/A	N/A	Time/volume offsets w/ water use plan for some large community use like sports fields, one/one w/ industries	N/A	Conservation (only equipment change outs), Reuse, Growth, Local supply	No	N/A
Before/after per capita use, residual effect of drought		N/A- complicated by merger with Bexar Met	423 lcd in 1990s (112 gpcd) to 240 lcd (63 gpcd) in 2010	475 lcd in 2004 (126 gpcd), 225 lcd (59 gpcd) in 2008	1990- 205 gpcd 2008-185 gpcd	2007- 139 avg gpcd 2012- 119 avg gpcd (high 160 gpcd)	2002- 314 gpcd 2013- 219 gpcd
Drought Response Measures							
Mandatory Watering Schedule	20% 5 day schedule 7pm-10am 30%- hand-hold only irrigation	Once every other week in Stage 3 (640 msl), Stage 2 once weekly w/ restricted hours (650 msl)	Critical (Stage 4) bans outdoor water use except for food gardens w/ water use plan	Stage 4- outdoor bucket watering only, 4 hrs, 3x/wk, Stage 5, gardens only, Stage 6, gardens, 3 hrs, 1x/week	None mandated at wholesale level, request 1 day/wk reduction	Varied depending on Member City	Recommended Schedule (no more than 3 days/week)
New Landscapes	30%- all outdoor use except with hand held hose banned	Max 10,000 sq ft irrigated area, 4 in soil, Variance permitted Stage 2- for 5 wks Stage 3- less than 50% turf	Not allowed	Stages 4-6- hand held only 1 hr/day for 2 wks	No restrictions at wholesale level	Member Cities decide	New homes turf not allowed in front yards

	Barton Springs Edwards Aquifer Authority	San Antonio Water System	Melbourne Water, Australia	Seqwater, Queensland, Australia	Metropolitan Water District, CA	Sonoma County Water Authority, CA	Southern Nevada Water Authority, NV
Restrictions on Commercial Outdoor Irrigation		Golf courses- Stage 2- 20% less than ET rates or <= 1.6x base usage, Stage 3, 30% less than ET rates or <=1.4x base usage	Same as residential, exemptions for public gardens or sports fields at discretion of retail provider	25% reduction in water use from baseline, potable water not allowed for parks in later restriction levels	No restrictions at wholesale level	50% reduction required on all commercial irrigation by 2014	Water budgets imposed for golf courses- 10% reduction goal 1st year
Enforcement							
Enforcement Actions (for violations)	$250-$500/day, 2x during critical stage (30%), board order/hearing, ultimately law suit	Strict, consistent enforcement, off-duty police officer patrol all hours, 75-200 citations per month year round	Retail only: Fines, daily penalties, disconnection, imprisonment	$150K wholesale non-compliance, Retail level fines ranged from $90-$200	Fines (surcharges) <10% over – 2-3x base rate >10% over – 4-5x base rate	Enforced by state water resources control board	Fines for commercial users for exceeding budget, individual retail agency fine structures
Allotment	20%- max use/mo 12,000 gal/conn 30%- max use/mo 9,000 gal/conn		N/A		Level 2 of 10 levels Regional shortage 10%, wholesale <=15%		No formal allotment process at wholesale level
Surcharges as a Result of Excess Use	Has not been needed, high level meetings effective deterrent	In the plan, not implemented since 1996	N/A	Surcharges added to bills	Surcharges added to bills	Member cities discretion	No formal surcharge process at wholesale level
Additional Staff Needed	No additional staff, enforcement mostly rests on retailers to achieve reduction	NA	Not at wholesale level	Not substantial, but some at wholesale level due to formation of new regulatory entity	No, staff resources reallocated to drought activities	Member cities discretion	N/A

	Barton Springs Edwards Aquifer Authority	San Antonio Water System	Melbourne Water, Australia	Seqwater, Queensland, Australia	Metropolitan Water District, CA	Sonoma County Water Authority, CA	Southern Nevada Water Authority, NV
Public Information							
Public Awareness outreach	Supplied retailers with flags, road signs (and require use in DCP), car magnets, bill inserts, relatively small service area	Media partnership critical (weather people, local news), scorecard for media	Weekly reports to mass media, Newspaper, radio, TV, billboards etc, public forum & surveys, phone hotline, social media, website		Bill boards, radio, local news spots, partnership campaigns w/ member agencies	High profile regional water awareness campaign	Contact public information division for more info
Communication efforts/ challenges	Streamlined messaging, repeatable messaging	Messaging confusion w/ Edwards Aquifer Authority, Ongoing, high level of awareness		Consistent messaging over a broad area initially a challenge	Participation in rebate programs increased to 3x more than budgeted	Working through state mandated commercial use reduction	
Lessons Learned	Ask for evidence of letters sent to violators, ask for list of top users		Rapid Climate Shift created uncharted territory. Need flexibility of stages within state mandated DCP	Critical need for consistency, community must be engaged & understand severity of situation to achieve targets	Have a robust appeals process that is defined well, plan ahead for refinement process after drought ends	Effectively engaged landscape community through landscaper training, landscape water advisory group	Avoid outright bans that affect economic interests-can still achieve target water savings. Public perception about small volume but highly visible water uses matters.

2013 Benchmarking Conclusions

Drought conditions and the implementation of mandatory drought response measures during severe droughts can result in substantial water savings. The water providers interviewed stated that water savings between 15 to 40 percent were realized from implementation of mandatory drought restrictions. The timeframe for savings varied from six months to three years for wholesale providers and less for smaller, mainly retail providers. However, several wholesale water providers did not have the actual percent reduction achieved, just that the goals were met. The driving force behind the mandated water use reductions was either imposed by a regulatory authority or self-driven due to a water shortage or system constraint. The baseline water use varied from a permitted annual water volume, to a recent period of use where weather conditions were average and mandatory restrictions were not in place.

Most programs required a specific percent reduction goal and gave retail providers the latitude to determine specific drought response measures. The exception was in Australia, where template retail drought plans were mandated by the state, in some cases with minimal options. A few wholesale providers had different goals by customer class, with a per capita use goal for the municipal sector.

All wholesale programs included three key components: large-scale public awareness efforts, significant effort to partner with customers; and supported the compilation and sharing of information regionally. Regional awareness campaigns were a cornerstone of successful plan implementation for most water providers surveyed, and for all with service over a large geographic area. Those campaigns helped achieve water savings faster as drought conditions worsened, provided consistent messaging, and drove increased participation in conservation programs. Most water suppliers implemented a surcharge system in addition to outdoor restrictions to help achieve water savings.

Lessons learned from the implementation of mandatory drought response measures to achieve significant water use reduction included having consistent regional messaging, using a variety of approaches to achieve desired water use reductions, using outright bans on specific types of water use as a last resort, partnering closely with retail customers, and assisting with information sharing among customers. Most wholesale water providers interviewed did not significantly increase staff but reallocated staff time and other resources to fund awareness campaigns.

In addition to water savings achieved during the time of drought restrictions, a "drought-shadow" effect also occurred for nearly all of the water providers, where water use remained low after restrictions were lifted. Nearly all the water providers interviewed stated that some level of water use reduction remained after the drought as a result of changed behaviors, new programs implemented, and greater public awareness.

Allocation systems were not utilized by many of the wholesale providers interviewed, although Metropolitan Water District of Southern California (MWD) required its

wholesale customers to cut back purchases from a growth-adjusted pre-drought baseline. Metropolitan's Water Supply Allocation Plan formula, which accounted for local alternative supplies and included credits for conservation and reuse. MWD went through an extensive revision process of its allocation plan after the first time it was fully implemented in 2009-2010. One of the changes was to allow for a minimum per capital threshold of 100 total gpcd and 55 indoor gpcd to address significant variation in per capita use among its customers.