APPENDIX G: WATER CONSERVATION SUMMARY

This appendix summarizes the history of the City of Austin's watering restrictions and other water conservation measures. A more high-level summary is provided in the main report in **Section 6**.

[Appendix G attachments to be added in subsequent version]

G.1 History of the City of Austin's Watering Restrictions

During the summer months of 1984-1986, the City limited landscape irrigation to a five-day schedule during the drought based on the 1983 Emergency Water Conservation Ordinance; the ordinance was enforced by issuing fines of up to $500 per watering violation. Restrictions were imposed again during the summer months in 1984-1986 to reduce outdoor watering. However, the City experienced explosive population growth that impacted the capacity of the water treatment infrastructure towards the late 1990s. As a result, the drought in the summer of 2000 caused the City to impose watering restrictions for the first time since 1986.

During the following years, the City enforced watering restrictions from 2000-2016. The watering schedules during 2000 were implemented on both a voluntary and mandatory basis due to water treatment capacity concerns. The watering restrictions implemented during 2007 through 2016 were in response to severe drought conditions. A chronology of the City's annual watering requirements is provided below:

- **Early June – July 15, 2000**: Stage 1 – Voluntary basis; all sectors requested to water once every five days (time restrictions only for commercial irrigation between 12am-10am or 7pm-12am). The drought in the summer of 2000 caused the City to **call for voluntary compliance with** watering **schedules** due to water treatment capacity concerns.
- **July 16 – September 21, 2000**: Stage 2 – Mandatory; all sectors allowed to water once every five days (no watering between 10am-7pm); restrictions on car washes, pools and fountains. The drought in the summer of 2000 caused the City to impose watering restrictions due to water treatment capacity concerns.
- **September 22 – October 1, 2000:** Stage 1 – Voluntary basis; all sectors requested to water once every five days (time restrictions only for commercial irrigation between 12am-10am or 7pm-12am). The drought in the summer of 2000 caused the City to call for voluntary compliance with watering schedules due to water treatment capacity concerns.
- **Year 2001 – 2006:** None – Watering restrictions lifted; Year 2004 – year marked with heavy rains.
- **October 1, 2007 – April 30, 2008:** Permanent; Mandatory for commercial and multi-family – allowed to water twice a week (watering prohibited with automatic sprinklers during 10am-7pm; no water waste) & voluntary for residential.
- **May 1 – September 30, 2008:** Stage 1 – Mandatory restrictions per code; all sectors allowed to water twice a week (watering by hand permitted during 10am-7pm; no water waste).

- **October 1, 2008 – April 30, 2009:** Permanent; Mandatory for commercial and multi-family – allowed to water twice a week (watering prohibited with automatic sprinklers during 10am-7pm; no water waste) & voluntary for residential.
- **May 1 – August 23, 2009:** Stage 1 – Mandatory restrictions per code; all sectors allowed to water twice a week (watering by hand permitted during 10am-7pm; no water waste).
- **August 24 – November 20, 2009**: Stage 2 – Mandatory; all sectors allowed to water one day per week (no automatic or hose-end watering between 10am-7pm/hand watering allowed any time); efficiency restrictions on car washes, no warnings for fines, no fountains, pressure washing of surfaces, or auto-fill valves on pools, water served only by request in restaurants.
- **November 21, 2009 – September 5, 2011:** Stage 1 – Mandatory restrictions per code; all sectors allowed to water twice a week (watering by hand permitted during 10am-7pm; no water waste).
- **September 6, 2011 – July 15, 2012:** Stage 2 – Mandatory; all sectors allowed to water one day per week (no watering between 10am-7pm except with a hand-held hose or bucket); efficiency restrictions on car washes, no warnings for fines, no fountains or auto-fill valves on pools, water served only by request in restaurants.
- **July 16 – September 3, 2012:** Stage 1 – Mandatory restrictions per code; all sectors allowed to water twice a week (time restrictions for automatic sprinklers between 12am-5am or 7pm-12am; watering by hand permitted during 10am-7pm).
- **September 4, 2012 – May 17, 2016:** Stage 2 – Mandatory; all sectors allowed to water one day per week (time restrictions for automatic sprinklers between 12am-5am or 7pm-12am; hose-end sprinklers permitted during 12am-10am or 7pm-12am); efficiency restrictions on car washes, no warnings for fines, no fountains or auto-fill valves on pools, water served only by request in restaurants.

On May 18, 2016, the City lifted drought conditions but established a Conservation Stage containing year-round water conservation measures that apply to its retail water customers. These measures include a schedule that gives more efficient irrigation methods more time to water. During Conservation Stage, the following requirements are in place:

- Residential and commercial facilities may irrigate either before 10:00 a.m. or after 7:00 p.m. only on a designated outdoor water use day;
- Automatic irrigation systems are limited to no more than one designated outdoor water use day per week, which allows up to fifteen hours of irrigation;
- Hose-end sprinklers are allowed up to two designated outdoor water use days per week, for a total of thirty hours of irrigation; and,
- Car washing is allowed with the use of a bucket and/or hose containing a manual shut-off nozzle or at a car wash facility that has completed an annual efficiency inspection.

Additional requirements under Conservation Stage include:

1. Charity car washes are only allowed at a commercial carwash;
2. Outdoor fountains must recirculate the water;

3. Restaurants may not serve water unless requested by a customer;
4. Commercial properties (including restaurants and bars) may only operate patio misters between 4 p.m. and midnight; and,
5. Wasting water is prohibited.

Failure to follow the water restrictions may result in an enforcement action, including fines of up to $500 per violation. The following are allowed at any time on any day of the week:

1. Watering with drip irrigation, a hand-held hose or a refillable container;
2. Watering trees with a Treegator, soaker hose or automatic tree bubbler;
3. Watering vegetable gardens with a soaker hose; and,
4. Pressure washing sidewalk/driveway/deck/patio/paved areas/home siding/fence.

G.2 Current Water Rates and Fee Structure

For more than 100 years, Austin Water has provided water services in a cost-effective manner to its customers. A summary of the history of the city's water rates from 1974 through 2016 is included in Attachment A of this appendix. Austin Water generally uses rate revenues to fund its water conservation programs. Since strict rules apply under state cost-of-service requirements for public utilities (reference Texas Water Code §§13.182, 13.183, and 13.184), Austin Water uses the utility cost-benefit approach when issuing rebates from customer revenues to private individuals; these rebate amounts are based on a quantifiable and comparable benefit to rate payers of the utility.

Due largely to significant impacts of the historic drought and necessary water use cutbacks, in September 2012, a five percent system average water rate increase and updated rate structure was approved by City Council, which became effective in February 2013. At that time, the Council also directed the City Manager to create a Joint Committee of three City Commissions, with input from the public, to develop recommendations for short and long-term financial plans to strengthen the financial stability of Austin Water. After an extensive six-month process, the Council adopted the following recommendations of the Joint Committee:

1. Achieve a goal of 20 percent of total water revenue collected from fixed minimum charges. This will be accomplished by eliminating the current Revenue Stability Fee, and replacing it with:
    a. Residential volume-based tiered minimum charge
    b. Multifamily & Commercial meter-based fixed charge
    c. Large Volume fixed charge
    d. New Residential volumetric rate block intervals
2. Implement a volume-based Reserve Fund Surcharge for all customers to build a reserve to offset revenue losses caused by extreme weather patterns, both wet and dry.
3. Overall impact of new Residential rates and structure
    a. The meter-based Revenue Stability Fee ($4.40 with 5/8-inch meter) was replaced by the new volume-based Tiered Minimum Charge.

b. Volumetric water tiers were modified to better reflect residential usage patterns (see **Table G-1**).

Table G-1. Volumetric Tier Structure for Residential Water Customers

Rate Tiers	Previous (Gallons)	New (Gallons)
1	0 – 2,000	0 – 2,000
2	2,001 – 9,000	2,001 – 6,000
3	9,001 – 15,000	6,001 – 11,000
4	15,001 – 25,000	11,001 – 20,000
5	25,001 – Over	20,001 – Over

c. In 2013, a new volume-based Reserve Fund Surcharge was adopted at $0.12 per 1,000 gallons but was subsequently changed to $0.19 per 1,000 gallons for retail customers and $0.12 per 1,000 gallons for wholesale customers. Once the goal of the reserve fund has been met over a period of five (5) years, the surcharge might be reduced to maintain this goal unless the reserve is needed to offset revenue losses.

4. Overall impact of new Multifamily & Commercial rates and structure

   a. The rate increase impact varied significantly depending on the meter size and water volume registered.

   b. The monthly customer charge structure did not change and included rate changes.

   c. The meter-based Revenue Stability Fee was replaced by a new meter-based fixed charge to achieve the fixed revenue goals set by the Joint Committee.

   d. The volume rate structure remained unchanged with the rates changing to only maintain each customer class' cost of service.

The City Council voted in March 2018 to approve a mid-year water and wastewater rate decrease. All retail customers, including residential, multifamily, commercial and large volume customers of Austin Water experienced rate decreases, which took effect on May 1, 2018; the average residential customer will see a $2.40 reduction to their monthly utility bill. Initiatives that helped keep rates from increasing include: (1) reducing scheduled debt service expenses by over $70 million between 2016-2018; and (2) cost containment including a budget reduction of $30 million from 2014-2015. Austin Water's efforts over the last few years to contain costs and restructure debt allowed the utility to recommend a zero percent rate increase in 2018 for all water and wastewater customers and a mid-year rate decrease for all retail customers.

A key component of Austin Water's debt management plan has been the use of revenues collected from the Capital Recovery Fee to pay down debt. Capital Recovery Fees are charged to developers to pay for new connections to Austin Water's system. In 2014, Capital Recovery Fee rates increased significantly to ensure that new development pays for its fair share of system growth. Revenues collected from the Austin's water and wastewater capital recovery fees, or impact fees, increased from approximately $8 million in fiscal year 2013 to approximately $30 million in fiscal year 2018.

G.3 Current Water Conservation Incentive Programs for Residential Customers

Traditional residential water conservation programs, such as rebates for plumbing fixtures and appliances or more efficient irrigation systems and landscapes, have been implemented by most public water utilities, including Austin, for many years. More and more of these programs are beginning to be phased out by Austin Water due to federal manufacturing standards, market saturation, and state/local requirements.

A summary of the City's water conservation incentive programs currently in place for residential customers is provided below; copies of the rebate applications are included in **Attachment D**. Austin Water's wholesale water customers are also eligible for most of the City's water conservation programs (see Attachment E for a list of wholesale customers eligible for Austin's water conservation programs).

The Austin City Council must approve rebates of more than $58,000. In addition, rebate funds are committed for payment during the fiscal year in which they are to be dispersed. A summary of the rebate activity for current and previous water conservation incentive programs is included in **Attachment C**.

G.3.1 Free Water Conservation Tools

The City offers a variety of free indoor and outdoor conservation tools to help customers save water. A summary of each tool is provided below; there is a limit of one item each per residential customer.

G.3.1.1 Indoor Tools

- Water-efficient showerhead – available in either regular or soap-up valve models (1.5 gpm)
- Kitchen & Bathroom Faucet Aerator – available for bathrooms (0.5 gpm) and kitchens (1.5 gpm)

G.3.1.2 5.1.2 Outdoor Tools

- Soil Moisture Meter - available in ladybug or frog design
- Treegator – available in 15-gallon size or tree seedlings/small shrubs and 20-gallon size for trees at least 2-3 inches in diameter with branches at least 25 inches from the ground
- Water Saver Hose Meter - digital meter attachment for garden hoses and hose-end sprinklers; available for check-out at the Austin Public Library
- Sunlight Calculator – used to measure the amount of light each area of your yard receives; available through check-out at the Austin Public Library

G.3.2 Irrigation System Evaluations and Rebates

Residential customers of Austin Water or a qualifying water provider (reference list in Attachment E) may schedule a free Irrigation System Evaluation by a licensed irrigator from Austin Water if they have an in-ground sprinkler system and have used either more than 25,000 gallons in one month or more than 20,000 gallons in two consecutive months.

Each audit varies depending on specific conditions but generally includes the following:

- Documenting current controller settings;
- Checking for leaks by verifying with the residential meter;
- Obtaining a current meter reading;

- Operating each station on the sprinkler system to determine flow rates and quantify the current schedule on the controller;
- Testing the system and noting deficiencies and opportunities for improvement or equipment upgrades;
- Providing a recommended watering schedule;
- Reviewing audit results with the customer;
- Reviewing controller functions and settings with the customer; and,
- Resetting controller to recommended settings if needed.

Eligible residential customers may also receive up to $400 in rebates for improving the water efficiency of their irrigation system. Installations of new irrigation systems and/or expansions to existing systems are not eligible for the rebate.

G.3.3 Pool Cover Rebate

To help reduce the amount of water lost to evaporation, residents can receive half of the purchase price up to (1) $50 for a new manual pool cover or solar rings; or (2) $200 for a new permanent, mechanical pool cover.

G.3.4 Pressure Regulating Valve (PRV) Rebate

The City offers a rebate of up to $100 to residential customers for the purchase and installation of a PRV. PRVs are inserted into a customer's plumbing to prevent misting and evaporation losses in irrigation systems.

G.3.5 Rainwater Harvesting Rebate

The City's Rainwater Harvesting Rebate provides residential, multi-family, and commercial customers of Austin Water or a qualifying water provider (reference list in Attachment E) up to $5,000 for purchasing equipment to capture rainwater.

G.3.6 Watering Timer Rebate

Austin Water residential customers can receive 50 percent of the cost (tax not included) of purchasing up to two hose timers with a maximum rebate of $40 per service account.

G.3.7 WaterWise Landscape Rebate

The City's WaterWise Landscape Rebate Program helps customers convert turf grass to native plant beds. Residents may receive $35 for every 100 sq. ft. (minimum 500 sq. ft.) of converted landscape with a rebate up to $1,750.

G.3.8 WaterWise Rainscape Rebate

Homeowners and schools can receive up to $500 ($0.30/sq. ft. -- 100 sq. ft. minimum) for installing landscape features such as berms, terraces, swales, rain gardens, porous pavement, and infiltration trenches that direct and retain rainwater/runoff on the property. A rainwater harvesting system may also be connected to the rainscape.

In order to be eligible to apply for the WaterWise Rainscape Rebate, applicants must be customers of Austin Water or a qualifying water provider (reference list at beginning of section). Participants are allowed

to apply for the program more than once if they have multiple eligible areas of landscape to convert. Applications are accepted two times per year (December-March for spring installation/June- September for fall installation).

This rebate program targets an existing, developed residential or school property, and does not require a site plan submission or other authorization under the City's Land Development Code. Plant materials must be installed between March 15 and May 15 (spring) and September 15 and November 15 (fall); gravel or rock rainscape must not extend over 3-feet in width.

G.4 CURRENT WATER CONSERVATION INCENTIVE PROGRAMS FOR BUSINESSES

The City continued to expand the water conservation programs over the years to gain additional water savings by offering monetary incentives, equipment giveaways, and subsidized sales. A summary of the City's water conservation incentive programs currently in place for residential customers is provided below. Austin Water's wholesale water customers are also eligible for most of the City's water conservation programs; reference the list in Attachment E, as well as copies of the rebate applications for businesses in Attachment G.

The Austin City Council must approve rebates of more than $58,000. In addition, rebate funds are committed for payment during the fiscal year in which they are to be dispersed. A summary of the rebate activity for current and previous water conservation incentive programs is also included in Attachment C.

G.4.1 Commercial Vehicle Wash Facility Efficiency Assessments

According to Rule Number R161-13.16, the City requires commercial, multi-family, and municipal facilities with vehicle wash equipment that uses potable water from Austin Water to submit an annual efficiency evaluation report. A plumber licensed by the State of Texas must perform the evaluation. Submittal deadlines are determined by the zone with the ZIP code for a facility's physical address. Based on the zone's submittal schedule, facilities must submit either a passing Vehicle Wash Equipment Assessment Form or a Compliance Plan. A facility may complete the evaluation up to 90 days before the official due date; however, the penalty for not submitting the required form by the deadline will result in a $200 late fee plus a daily accrual fine of $25 until Austin Water receives the form.

G.4.2 3C Business Challenge

The City is offering the 3C Business Challenge to allow businesses the opportunity to gain information about ways to reduce water usage and to show their commitment to saving water. WCD staff works closely with the businesses participating in the program to recommend steps for improving water efficiency and to determine their eligibility for rebates.

The 3C Business Challenge also allows businesses to earn points toward qualifying for Austin Green Business Leaders. This program provides businesses with tools and information to help them incorporate sustainable practices, including protecting the environment, practicing community stewardship, and maintaining a healthy workplace. The City also publicly recognizes businesses that implement green practices.

To help with making water-saving changes, Austin Water offers rebates of up to $100,000 to businesses that replace old equipment with new water-efficient models. Projects must be pre-approved before any equipment is purchased. The City also provides a number of online water and energy efficiency

assessment tools and guides for the commercial sector that include automated water, energy and cost savings calculators based on nationally recognized water and energy efficiency assumptions.

G.4.3 "Bucks for Business" Commercial Rebate

The City offers rebates of up to $100,000 for equipment and process upgrades that save water and exceed city water efficiency requirements.

Examples of eligible upgrades include, but are not limited to:

- Reuse of high quality rinse water used in the high-tech industry;
- New equipment and processes that reduce the amount of potable water used for cooling towers including those that maximize cycles of concentration for cooling towers above five cycles;
- Capturing on-site sources of water such as air conditioner condensate or foundation drain water to use for landscape irrigation, cooling tower water makeup, and other non-potable water uses;
- Laundry water use reduction measures such as ozone treatment and water reuse systems;
- New equipment that reduces water used in boilers to heat commercial and multi-family facilities including condensate return systems, automated conductivity controllers, make-up and blow down meters, and water quality treatment systems that treat corrosion and remove scaling to reduce make-up water demand; and,
- Health care equipment including steam sterilizers, vacuum pumps, air compressors, pure water stills, and analytical equipment.

The incentive available for each project is $0.50 for every 1,000 gallons saved over a ten-year lifetime of the rebated equipment or 50 percent of the cost, whichever is less, not to exceed $100,000. All projects must be approved prior to purchasing or installing any equipment. Some projects may also qualify for property or sales tax exemptions or other incentives.

G.4.4 Commercial Kitchen Rebates

Austin Water is providing rebates to commercial and institutional customers to replace their food service equipment with more efficient, cost-saving models. Eligible equipment and their rebate amounts are summarized in the specific rebate application included in Attachment G of this memo. The qualifying replacement equipment criteria are based on the Energy Star (Version 2.0) Program Requirements, effective February 1, 2013.

Rebates are available for both purchased and leased equipment. The equipment must be operational for at least a consecutive ten-year period. If replaced within the ten-year period, the replacement equipment must meet or exceed the efficiency standards under the rebate program for the remainder of the ten-year period.

Funding is limited and available on a first-come, first-served basis. The City also notes that the offerings, program guidelines, and rebate levels are subject to change without notice.

G.4.5 Industrial, Commercial, Institutional (ICI) Audit Rebate

Austin Water offers a rebate that pays customers up to $5,000 for an independent water efficiency audit of their industrial, commercial, or institutional facility. To qualify for the rebate, customers must commit to fixing any leaks and making any equipment or system setting adjustments recommended by the auditor.

The City offers rebates of 75 percent of the cost of the audit or up to $5,000, whichever is less to retail water customers of Austin Water or a qualifying water provider (reference list in Attachment E). A rebate is available for each individually metered facility that meets the minimum water usage of 100,000 gallons per year.

G.4.6 Irrigation System Improvement Rebate

Commercial and multi-family customers of Austin Water or a qualifying water provider (reference list in Attachment E) may receive rebates for installing the following irrigation system improvements:

- Central computer irrigation controller system ($50 per station, or 50 percent of cost, not to exceed $5,000);
- Master valves ($100 each on systems installed before Jan. 1, 2009);
- Flow sensors ($300 each); and,
- Converting entire stations from spray to multi-stream, multi-trajectory rotor nozzles ($4 per nozzle).

Central computer irrigation system controllers are typically used for larger areas, such as golf courses, park systems, school districts, university campuses, commonly owned or managed multi-family facilities, and large commercial complexes. They include a master controller (which can be a computer or mobile device) that allows users to remotely schedule and manage the irrigation system.

This rebate program targets existing irrigation systems; the installation of new irrigation systems and/or expansions to existing systems are not eligible for this rebate. Irrigation systems must comply with all applicable city codes, ordinances, and rules, including the Commercial Facility Irrigation Assessment Program.

G.4.7 Multi-family HOA WaterWise Landscape Rebate

The City's WaterWise Landscape Rebate Program helps customers convert turf grass to native plant beds. Multi-family Home Owners Associations (HOAs) that share one water or irrigation meter may receive $25 for every 100 sq.ft. (minimum 1,000 sq. ft.) of converted landscape with a rebate up to $5,000.

G.4.8 Multi-family Pressure Regulating Valve (PRV) Rebate

The City of Austin offers a $100 per unit rebate up to a maximum of $500 per property (parts and labor) for the purchase and installation of a PRV for multi-family water customers. To be eligible for the rebate, a property must have water pressure over 80 psi and not have an existing PRV already installed.

G.4.9 Rainwater Harvesting Rebate

The City's Rainwater Harvesting Rebate provides residential, multi-family, and commercial customers of Austin Water or a qualifying water provider (reference list in Attachment E) up to $5,000 for purchasing equipment to capture rainwater.

G.4.10 WaterWise Rainscape Rebate

Homeowners and schools can receive up to $500 ($0.30/sq. ft. -- 100 sq. ft. minimum) for installing landscape features such as berms, terraces, swales, rain gardens, porous pavement, and infiltration trenches that direct and retain rainwater/runoff on the property. A rainwater harvesting system may also be connected to the rainscape.

In order to be eligible to apply for the WaterWise Rainscape Rebate, applicants must be customers of Austin Water or a qualifying water provider (reference list in Attachment E). Participants are allowed to

apply for the program more than once if they have multiple eligible areas of landscape to convert. Applications are accepted two times per year (December-March for spring installation/June- September for fall installation).

This rebate program targets an existing, developed residential or school property, and does not require a site plan submission or other authorization under the City's Land Development Code. Plant materials must be installed between March 15 and May 15 (spring) and September 15 and November 15 (fall); gravel or rock rainscape must not extend over 3-feet in width.

G.5 Previous Water Conservation Incentive Programs

In 1985, the Texas Water Commission (renamed as the Texas Commission on Environmental Quality) issued an enforcement order to the City for water quality violations and required the City to implement water conservation programs to retrofit and replace inefficient plumbing fixtures. As a result, Austin's Water Conservation Division (WCD) established the first conservation program for the City during that same year. Austin WCD teamed with Austin Energy in the Residential Energy Efficiency Audit Program from 1985-1990 and installed low-flow showerheads, faucet aerators and toilet dams in existing toilet tanks for residential customers. An overview of the City's water conservation incentive programs during the early years are summarized in the subsections below, and on **Table G-2**.

Table G-2. Summary of Previous Austin Water Conservation Incentive Programs

Water Conservation Program	Equipment or Service Issued	Implementation Date/End Date
Landscape Irrigation Audits	Free audit & hose timers	1985/since modified & still in effect
Toilet Rebate Program	Rebate for HETs[1]	1991/June 2010
Free Toilet Program	Free HETs*	1994/Dec. 2011
High-Efficiency Washing Machine Rebate Program	Rebate for HE Washing Machines	1998/2013
ICI Rebate	Free audit	1996/since modified & still in effect
Rainwater Harvesting Rebate	Rebate for rain barrels	2000/since modified & still in effect
Xeriscape Program	Rebate for using native plants & turf grasses	1984/1998
Residential Landscape Conversion Incentive – Lawn Remodel Option	Rebate to replace turf w/ Bermuda or Buffalo grasses	Oct. 2011/Sept. 2013
Restaurant Water Waste Program	Free audit & 1.6 gpm spray valves	2004/Jan. 2006

[1]High-efficiency (HE) toilets (HETs) that used 1.28 gallons per flush.

A summary of the rebate activity for the current and previous water conservation incentive programs is included in Attachment C.

G.5.1 Landscape Irrigation Audits

The City offered free landscape irrigation audits performed by a licensed irrigator from Austin Water to both residential and commercial customers who watered excessively outdoors; this was the City's first water conservation program established in 1985. The audits were voluntary and provided free advice to customers on best practices to reduce outdoor landscape watering. The irrigation audit program during

the early years was available exclusively to high water users using a minimum of 25,000 gallons per month. In 1997, the City offered free hose timers to customers who irrigated with hose-end sprinklers. This program was modified in October 2016 and is still in effect.

G.5.2 Toilet Rebate Program

In 1991, the City offered the Toilet Rebate Program to residential customers to encourage them to change-out old toilets with ultra-low flush (ULF) toilets that used 1.6 gallons per flush. This program initially offered a rebate of $60-80 per toilet and then increased to $200 per toilet depending on the model purchased.

Beginning in 1993, Austin Water offered two options, the Free Toilet Program and the Toilet Rebate Program, to customers wanting to replace inefficient toilets using 3.5 gallons per flush or more with higher efficiency models. The Free Toilet Program provided vouchers for a specific toilet that could be redeemed at a local plumbing supply company under contract with the City while the Toilet Rebate Program gave rebates for the purchase of toilets meeting specified efficiency criteria. In these programs, single-family customers could receive up to three toilets per home, multi-family customers could receive up to three toilets per dwelling unit, and commercial customers could replace all eligible toilets in a building.

Both programs proved to be very popular and resulted in accelerating replacement of more than 166,000 inefficient toilets: 93,077 single-family (61,769 Free/31,308 Rebate), 62,753 multi-family (26,346 Free/36,407 Rebate), and 10,537 commercial (3,963 Free/6,574 Rebate). In their final years, the programs experienced unprecedented participation, especially in the multi-family sector. The Toilet Rebate Program ended for multi-family/commercial customers in December 2009 and for residential customers in June 2010. The Free Toilet Program ended for all customers on August 31, 2011.

Austin Water ended these programs after data indicated they had reached a high degree of saturation. The Texas Water Development Board's Water Conservation Best Management Practices Guide states that utilities should aim to retrofit at least 50 percent of eligible toilets. Based on national replacement rates and end use data combined with program participation, Austin Water estimates that 75 percent of commercial, 88 percent of multi-family, and 80 percent of residential toilets had been replaced by the end of fiscal year 2010. Additionally, plumbing code changes that became effective in October 2010 required all toilets installed in new construction or to replace existing toilets to use no more than 1.28 gallons per flush.

G.5.3 Free Toilet Program

In 1994, the City offered the Free Toilet Program to encourage the replacement of older, less efficient models for low-income homeowners. This retrofit program was a high-efficiency toilet (HET) give-away, in which AWU purchased a single HET model in large quantities for volume discounts; free HETs were limited to three per residential customer. This program was initially limited to low-income residential customer, but it was expanded to all residential customers in 1996 and multifamily and commercial customers in 1998. The City provided vouchers for free toilets to customers who were eligible and willing to pick up the HETs; these vouchers could be redeemed at several vendors who contracted with the City. The City ended this program by the end of 2011.

G.5.4 High-Efficiency Washing Machine Rebate (WashWise Washer Rebate)

In 1998, the City established the High-Efficiency Washing Machine Rebate for water- and energy-efficient washing machines identified on a list published by the Consortium for Energy Efficiency. This rebate program also included an energy rebate from Austin Energy or Texas Gas Service for residential and multi-

family customers. The City lowered its rebate amount from $100 to $50 in July 2010 to make the program more cost-effective; however, the program ended in 2013 when the new federal standards were adopted.

G.5.5 ICI (Industrial, Commercial, Institutional) Rebate / Bucks for Business

In 1996, the City initiated a free service to commercial customers, where WCD staff auditors would evaluate a business' water consumption to determine how the company used water. These auditors would then suggest ways to reduce water use and explore potential eligibility for special commercial rebates to industrial, commercial, and institutional customers for installing new water conservation equipment and processes at existing facilities. The City initially offered rebates of up to $40,000 per project with the amount of the rebate limited to half the cost of the improvement up to $1/gallon saved per day and have since increased the amount of the rebate to $100,000. Manufacturers such as Motorola, AMD and Samsung previously participated in the program.

G.5.6 Rainwater Harvesting Rebate / Rain Barrel Sales

In 2000, the City offered rebates for rainwater harvesting, which included a $30 rebate for purchasing approved rain barrels. The City also offered a rebate of up to $500 for implementing higher-volume pressurized rainwater systems; the amount of the rebate depended on the storage capacity and overall cost of the system. In April 2001, WCD decided to supply barrels to its customers at a reduced and subsidized price of $60 per barrel. Since the program's inception, the City has sold more than 6,000 rain barrels. The Rain Barrel Sales Program ended in 2009. In July 2010, AWU increased rebate levels at a lifetime limit of $5000 per site to encourage more rainwater systems; this program is still in effect. This rebate program includes costs (materials and labor) for tank, pad, screens, filters, first-flush, and selected piping installation; gutters, irrigation system, shipping or delivery, and auxiliary water source requirements are not eligible costs. For tanks 500 gallons and up, customers must get pre-approval from Austin Water before purchasing and installing any equipment for this program. Details regarding the rebate amount are the following:

- Non-pressurized (no pump): $0.50 per gallon up to half of the equipment cost;
- Pressurized (has a pump): $1.00 per gallon up to half of the equipment cost; and,
- May apply every 12 months for system expansions until you reach $5,000.

G.5.7 Xeriscape Program

In 1984, the City initially launched an education program to promote the principles of Xeriscaping in an effort to emphasize the practice of using plants that were native or adapted to the climate in order to reduce or even eliminate the need for irrigation. By 1994, the Xeriscape program was modified, and a residential rebate for the program was initiated to encourage the installation of plants and turf grasses that were better adapted to Austin's climate. The program was later revised to emphasize only trees and shrubs in order to promote a hardier group of plants demonstrating a long-lasting water savings and to reduce the evapotranspiration from the surrounding area. The initiatives of this program were met with mixed success since it attracted customers already heavily conserving water; the program was in effect for a number of years and was eventually phased out in 1998.

G.5.8 Residential Landscape Conversion Incentive – Lawn Remodel Option

In response to the severe drought in 2011, Austin Water offered residential customers a one-time opportunity to replace water-thirsty turf with Bermuda or Buffalo grasses, which are more likely to survive future droughts. This program was implemented on October 31, 2011 and phased out by the end of

September 2013. Rebate amounts for this program ranged from $10 to $30 for every 100 square feet of turf converted. Approximately 800 participants committed to stop watering stressed turf until the drought ended and a sustained recovery was projected. Once Stage 2 Restrictions were lifted, Austin Water asked these participants to submit a design plan that may include selected turf varieties, native plants, and non-irrigated areas.

G.5.9 Restaurant Water Waste Program

In 2004, the City identified an area for additional water savings with the restaurant industry. Austin Water Conservation staff members performed water audits for restaurants in the Austin area and replaced old spray valves with new 1.6 gpm valves since most restaurants used 3-6 gpm spray valves to rinse dishes. The program was phased out in January 2006 when the Texas Legislature passed HB 2428 that required only spray valves with a flow rate of 1.6 gpm or less could be sold or distributed throughout the state.

G.6 Current Water Conservation Ordinances

The City of Austin water conservation ordinance applies to commercial businesses as well as residences throughout Austin. In the city ordinance, commercial buildings and a wide range of businesses are defined as facilities that must utilize water-conserving plumbing fixtures. These regulations also apply to schools, day care centers, hotels, motels, and shopping centers. Facility owners must install and maintain toilets equipped with a flush tank water saver that serves as a dam to withhold part of the flush tank water that would otherwise drain into the toilet bowl on flushing. The toilet must also be equipped with a flush valve water saver that shortens the flush cycle and further reduces the volume of water flow during a flush to not more than 3.0 gallons for each toilet flush and 1.0 gallon for each urinal flush.

Every lavatory or kitchen faucet must also utilize water-conserving measures with an aerator that reduces flow by introducing air bubbles into the water stream and a flow restrictor that reduces the opening through which water passes, or a spray tap that delivers water in a broad pattern of droplets. The ordinance specifies that the water flow of a lavatory or kitchen faucet may not exceed 2.75 gallons per minute with an inlet water pressure between 20 and 80 pounds per square inch, when measured with both hot and cold water supply valves in the fully open position.

In addition to utilizing water conserving toilets and faucets, any business or facility in Austin providing showers – from apartment complexes with five or more rental units to health or fitness centers – must be equipped with water-conserving showerheads that are designed to provide dispersed and reduced water flow and automatically clean debris from its water channels or pores. Showerheads must have an adjustable spray that produces a water cone that is not more than 42 inches wide in a size and half foot vertical drop. The showerhead is required to have a maximum flow rate of three gallons per minute in an inlet water pressure of between 20 and 80 pounds per square inch when measured with the adjustable spray in the fully opened position. These same requirements apply to hotels and motels in Austin.

In 2000, the City required that all new two-, three- and four-dwelling properties have a dedicated water meter for each unit. The City also required that all new commercial properties over a minimum size install a meter to register irrigation use. Enhanced irrigation standards were implemented in January 2008 for residential and commercial landscapes. These require more precise distribution of irrigation water applied to landscapes to increase efficiency of plant uptake, decrease run-off to hardscapes, and reduce application to non-irrigated areas.

Changes for new equipment, including vacuum pumps and garbage grinders, were made effective in the plumbing code in January 2008. New home construction has been required to use Pressure Regulating Valves (PRVs) since January 2008. Toilet standards for new buildings were made effective in May 2010. A chronology of the City's water conservation ordinances adopted during 2007 through 2017 is provided below:

2007

- Automatic irrigation systems prohibited from watering between 10:00 a.m. and 7:00 p.m. year-round (effective October 2007)
- No more than 2 times per week residential watering May thru September; commercial year-round (effective October 2007)

2008

- Submeters required in new multi-family and mixed-use facilities (effective January 1, 2008)
- HET urinals (0.5 gpf) required for new construction and retrofits (effective January 1, 2008)
- Commercial food waste and garbage disposal units prohibited (effective January 1, 2008)
- Liquid ring surgical and dental vacuum pumps prohibited (effective January 1, 2008)
- New or replacement cooling towers must achieve at least 5 cycles of concentration and have conductivity controllers, makeup and blowdown meters, overflow alarms, drift eliminators (effective January 1, 2008)
- Car wash equipment efficiency and facility certification requirements (effective January 1, 2008)
- Automatic irrigation system design standards for new commercial and multi-family residential properties (effective January 1, 2008)
- Commercial landscape soil depth and plant requirements adopted

2009

- 5th tier residential water rate for use above 25,000 gallons per month (effective November 2008)

2010

- HET 1.28 gpf toilets required for facilities built or renovated on or after October 1, 2010; waterless urinals allowed
- Innovative Commercial Landscape Ordinance requiring new commercial developments to capture storm water to prevent runoff and for landscape irrigation.

2011

- Stormwater retention and irrigation required for new commercial properties (effective January 2011)

2012

- Year round two times per week watering schedule for all customers (effective September 2012)
- Morning automatic irrigation system watering reduced midnight to 5:00 a.m.
- Mandatory reclaimed water hook-up (effective October 2012; implemented May 2015)

2013

- Revised rate structure to compress residential rate tiers including 5th Tier to now apply to residential use above 20,000 gallons per month (effective February 1, 2013)
- Mandatory irrigation system audits every two years for commercial/multi-family/city properties over one acre (effective 2013)
- Mandatory annual vehicle wash facility efficiency assessment for commercial, multi-family and city facilities (effective 2013)
- Administrative enforcement process/penalties for water use violations (effective 2013)
- Water may be served only by customer request at restaurants (effective 2013)
- Hotels must have towel/linen exchange programs (effective January 2013)

2016

- Year-round watering one time per week for automatic irrigation systems

2017

On June 8, 2017, a mandatory annual cooling tower water efficiency registration and inspection program was approved by the City Council as part of the adoption of local amendments to the 2015 Uniform Mechanical Code, effective September 6, 2017. The purpose of the program is to assist Austin Water customers in meeting cooling tower water use efficiency standards and equipment requirements, identify rebate opportunities, and save customers money on their water and wastewater bills.

The inspection must occur within the preceding 90 days prior to the March 1st deadline, and it must be completed and signed by an independent third party (Texas licensed mechanical or chemical engineer or a person holding a Class A - TDLR Texas Air Conditioning and Refrigeration License with a combined endorsement for process cooling and refrigeration).

First adopted by the City Council on October 18, 2007 and effective January 1, 2008 and currently codified under the city's local amendments to the 2015 Uniform Mechanical Code and 2015 Uniform Plumbing Code, cooling towers installed after December 31, 2007 using Austin Water potable water must include the following:

- make-up and blow down sub-meters;
- a conductivity controller;
- a drift eliminator with a drift rate of not more than 0.005% of the circulated water flow rate for cross-flow towers and 0.002% for counter flow towers;
- an overflow alarm; and
- achieve a minimum of five cycles of concentration.

In addition, the owner must maintain a written log on-site that contains the monthly make-up and blow down meter reads, conductivity values, and cycles of concentration; this information needs to be available to City inspectors upon request.

For new cooling towers (effective September 6, 2017) of 100 tons or greater combined cooling tower capacity, the make-up and blow down meters and overflow alarm must be connected to the building's Central Energy Management System or Utility Monitoring Dashboard. In addition, the facility must either

have a water storage tank, plumbing and treatment system to utilize blow down water for wash down, cleaning, toilet flushing, subsurface irrigation and other authorized purposes; or offset a minimum of 10 percent of the make-up water with reclaimed or on-site alternative water sources.

In June 2017, the City Council approved the adoption of the 2015 Uniform Mechanical Code including local amendments requiring new commercial and multi-family facilities with a combined cooling capacity of 200 tons or greater to have air conditioning (AC) condensate recovery systems. Although there are many variables in calculating cooling capacity, 200 tons would generally be the amount needed for approximately 100,000 to 120,000 square feet of cooled space.

G.7 Water Loss Programs

Austin Water has a 544 square mile service area boundary, comprised of approximately 232,000 connections; more than one million retail and wholesale customers; and, approximately 3,900 miles of transmission and distribution water lines. A primary conservation goal of the utility is to continue to manage water loss due to leaks in the distribution system.

G.7.1 Leak Response and Repair

Austin Water uses acoustic technology to inspect more than 1,500 miles of water lines for leaks. In 2013, the utility completed a five-year program of inspecting the entire distribution system. That information is now being used to enhance Austin Water's active leak detection program. Austin Water has an accelerated leak response and repair program that has proven highly successful, with most leaks now repaired in one day or less and almost 90 percent of emergency leaks responded to within three hours. During the recent historic drought Austin Water experienced a record number of water leaks because of extreme drought conditions;

Based on the American Water Works Association's Infrastructure Leakage Index (ILI), Austin Water performs well in a national group of utilities that have active water loss programs, typically either exceeding its goal of an ILI of 3.0 or less or falling in the range of 3.0 – 5.0 being recommended by the Texas Water Development Board (TWDB) as the target range for utilities with demand management interventions (leakage management and water conservation) included in the long-term plan. The ILI is calculated by taking the real losses (water lost due to leaks) and dividing them by the unavoidable real losses. Copies of the 2012-2016 water loss reports submitted annually to TWDB are included in **Attachment F**.

G.7.2 Renewing Austin

Austin Water has launched Renewing Austin, an on-going program which invests $125 million in a five-year program to replace and upgrade aging water lines and keep pace with the infrastructure demands of a growing city; this program will continue to prioritize the list of water lines on the Capital Improvement Program (CIP) on an annual basis. A summary of Austin Water's performance measures related to linear feet of pipe replaced per year is presented below in **Table 3**.

Table G-3. Renewing Austin Program Summary

	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
Number of LF of water main rehabilitated w/ CIP	0	0	0	0	0	0	0
Number of LF of water main rehabilitated w/ Pipe Bursting	8,113	903	0	0	0	0	0
Number of LF of Water main replaced w/ CIP Project Rehab	10,654	25,321	55,574	47,127	40,018	12,097	26,273
Number of LF of Water main replaced w/CIP Project Relocation	0	13,838	40,153	3,595	10,946	34,085	22,397
Number of LF of Water main replaced by Utility Crews	1,589	6,533	7,124	5,874	6,571	6,341	7,627
Total Linear Feet of Deteriorated Water Mains Replaced or Relocated	**20,356**	**46,595**	**102,851**	**56,596**	**57,535**	**52,523**	**56,297**
Total Capital Cost	**$19.1M**	**$19.6M**	**$17.3M**	**$30.7M**	**$20.8M**	**$16.0M**	**$18.6M**

G.8 Dropcountr Pilot Project

In April 2015, Austin Water contracted with Dropcountr, Inc. to provide 10,000 residential customers with free home water use reports on a pilot basis. Dropcountr's mobile application ('app') was selected to allow Austin Water the ability to quickly provide customers with information and alerts, as well as give customers the necessary ease in accessing the information.

Dropcountr calculated the water use goal by using the household characteristics affecting water use (provided by customer) along with lot size information from the Travis County Tax Appraisal District; indoor and outdoor water efficiency metrics were also applied based on local and national studies. If the proposed goal was lower than the monthly water use, then the customer was asked to consider water saving tips and rebate programs to conserve water. If the goal was higher than the monthly water use, this indicated the household may already be efficient with their water usage. However, the customer had the option to determine and adjust the goal by identifying additional water savings to keep water use and monthly bills low.

To recruit participation in this pilot study, Dropcountr emailed approximately 121,000 Austin Water customers from their contact information on file in Austin Water's billing system. Afterwards, approximately 8,500 participants were randomly selected based on those who expressed interest in participating in the pilot program. Those selected were notified with instructions on how to download the application or access their report online. This randomization process was intended to help provide a statistically valid analysis of behavior changes prompted by use of the application. In addition, three control groups of 500 customers each were randomly selected based on individual high water usage and geographic location within the City. The customized home water use reports were designed to help customers identify potential water savings and ideas on how to save water and money on their water bills.

Based on an independent analysis performed by researchers at the University of Kentucky, Dropcountr had a statistically and economically significant conserving effect on water consumption. The introduction

of the Dropcountr services for the population of households participating in Dropcountr resulted in a 9 percent reduction in water usage with a significant variation in the effect across households' dependent on baseline consumption quintile. Households in the highest quintile of baseline consumption reduced consumption by an estimated 17 percent in response to the Dropcountr services.

Based on the results of the pilot program, Austin Water has contracted with Dropcountr and now offers free, digital home water use reports to all of their residential customers. The reports can help customers save both water and money. Reports are available by mobile app and/or by internet and include the following:

- Customized household water use profile;
- Information about a customer's past water use compared to similar households, utility bill rate tiers and water efficiency standards;
- The customer's water saving goals;
- Suggestions for ways to save water and links to Austin Water conservation programs; and,
- Utility alerts and announcements about new conservation programs.

Dropcountr's home water use reports have resulted in significant water savings. The reports also helped customers better understand their water use, address high water bill complaints, and communicate a wide range of services and programs offered by Austin Water. The mobile app platform was the most preferred delivery method and was the most cost-effective and quickest method to communicate alerts and other information to customers. Mailed written reports, on the other hand, were more costly, less interactive, and less effective in reaching the customer.

G.9 Advanced Metering Infrastructure (AMI)

Austin Water has been recently studying the cost and feasibility of implementing Advanced Metering Infrastructure (AMI), which involves including 'smart' meters that automatically report daily, hourly or water usage more frequently to the utility and the customer. This study includes evaluating advanced analytics to provide precise water budget calculations for each customer to help identify those with the largest potential to conserve water. These calculations are based on climate, parcel size, vegetation coverage and other information derived from aerial imaging surveys and provide individual water conservation recommendations directly to customers through their home water use reports. Current pilot studies are underway studying savings from residential customer engagement via mobile and web-based application.

G.10 Water/Energy Partnerships

Energy and water are intertwined, and all sources of energy require water in their production processes. In turn, energy is necessary for the production and delivery of water, including irrigation and potable water uses. As a result, Austin Water is promoting water conservation by connecting water and energy consumption through the following programs:

G.10.1 Home Efficiency Assistance Program

Since 2012, Austin Water has partnered with Austin Energy and Texas Gas to provide low income residential customers holistic water and energy efficiency evaluations, free high efficiency water and energy fixtures and plumbing repairs, and other assistance to save water and energy and their associated costs. By partnering together, the utilities have been able to:

- Reduce water and energy costs for low income residents, older facilities, and renters;
- Increase compliance with water and energy efficiency ordinances;
- Provide customers a one-stop-shop approach to utility efficiency programs;
- Leverage program resources and widen their reach and effectiveness; and
- Overcome split incentives imbedded in rented and low income building spaces.

G.10.2 Multi-Family Efficiency Program

Austin Water continues to partner with Austin Energy and Texas Gas Service to provide 'one touch' energy and water efficiency evaluations, upgrades and retrofits to low income multi-family facilities with consistently higher than average water and energy use. The program was initiated in late 2011 as a result of a competitively awarded federal stimulus grant from the U. S. Department of Energy.

G.10.3 Green Building Program

The City of Austin created the nation's first green building program in 1990. Austin Energy Green Building (AEGB) is now the nation's most successful sustainable building program. AEGB encourages the design and construction of more sustainable homes and buildings by using an Austin specific rating systems for energy and water efficiency above the baseline code requirements. Certain scores above the baseline code are required through zoning ordinances for new development in high growth areas.

G.11 Water Conservation Public Education Programs

An expanded focus on customer engagement using electronic technology has shown to increase customer awareness of water usage and leaks, as well as promoting water efficiency measures and the City's conservation incentive programs. A summary of Austin Water's water conservation public education programs is provided below.

G.11.1 Water IQ

EnviroMedia created Water IQ, an official State of Texas public awareness water conservation program campaign that has been implemented with varying funding levels across the state. The Water IQ brand is based on statewide quantitative and qualitative research conducted by EnviroMedia on behalf of the governor's Water Conservation Implementation Task Force.

Specifically in Central Texas, EnviroMedia has worked extensively with the LCRA, the City of Cedar Park, and the City of Austin on Water IQ water conservation campaigns, helping to promote a regional approach to conservation. In 2006, EnviroMedia assisted with media relations promoting a new partnership between LCRA and the City of Austin to help people extend and protect the region's water supply. An interactive news conference was held on at a resident's home, where influential local and state officials lined up to demonstrate their support for the new water awareness campaign, 'Water IQ: Know Your Water.' Experts from LCRA and City of Austin offered hands-on demonstrations of water-saving tips. The press conference was a great success, as six local news organizations attended the event. Similar Central Texas Water IQ partnership press conferences with LCRA and other regional water providers were held again in both 2008 and 2010.

EnviroMedia developed a Water IQ campaign designed specifically to meet the City of Austin's needs. The campaign was comprehensive, featuring advertising, media relations, and outreach; creative messages that resonated with the Austin community; and a media buy that geotargeted Austin's residents.

Objectives of the Water IQ Campaign:

- Reduce peak-day consumption;
- Raise awareness of water as a finite resource;
- Educate residential and commercial consumers about their natural water source;
- Encourage all local Austin stakeholders to consider the impact their everyday lifestyle choices have on the current and future water supply by providing ideas and information that guide proactive decision-making; and,
- Educate consumers and businesses on the reasoning behind the regional water conservation measures adopted by Austin and encourage them to support the local watering schedule.

EnviroMedia combined efforts and/or budgets as requested for all three Central Texas Water IQ entities (Austin Water, LCRA, and Cedar Park) to enable messages and media budgets to stretch further. This collaboration resulted in two successful and well-covered regional press conferences during the drought in 2009, in addition to shared advertising, shared media buys, and shared outreach setups and events.

In early 2010, Austin Water hired EnviroMedia to conduct an assessment of the utility's water conservation marketing efforts. They conducted quantitative and qualitative research in March 2010 to gauge awareness and attitudes about the utility, its conservation programs, and water use in general. In addition to a public online and phone survey, EnviroMedia conducted in-depth interviews with key stakeholders of Austin Water. This research provided the foundation of the strategies and recommendations presented to City Council in June 2010.

As part of this project, EnviroMedia developed a Positioning and Awareness Plan for Austin Water, along with a 10-year blueprint to assist Austin Water with marketing its conservation efforts in order to achieve its goal of 140 GPCD by 2020. The Positioning and Awareness Plan provided the tools for Austin Water to raise its brand awareness in the community and establish the utility as a leader in developing a "culture of conservation" in the region. EnviroMedia also identified key Austin Water stakeholders and opportunities to engage them, and they devised a methodology for the City to effectively and consistently communicate with them. At this time, Austin Water is no longer participating in Water IQ.

G.11.2 WaterWise Partner Program

Through the WaterWise Partner program, Austin Water recognizes commercial customers that have made comprehensive water-efficiency upgrades in their facilities or incorporated efficiency measures into the design of new properties. Austin Water launched the WaterWise Hotel Partner program at the end of FY 2011. Participants receive a certificate to display publicly from Austin Water regarding their achievement, as well as table tents, coasters, door hangers and other water conservation signage.

G.11.3 Dowser Dan Show

The Dowser Dan Show is a popular program that educates children and teachers about water conservation. The City of Austin first designed the program in 1992 and has modified and updated it on an annual basis. Targeting kindergarten through fourth grade students, the Dowser Dan Show reaches approximately 18,000 students each school year. In addition, students receive promotional items, such as calendars, magnets, stickers, and bookmarks containing water conservation tips and lessons.

G.11.4 Mobile Classroom

In partnership with the Colorado River Alliance (CRA), Austin Independent School District (AISD), and other local entities, Austin Water expanded its current youth education programs to include the Texas Colorado River Mobile Learning Experience. Since 2015, the mobile exhibit functions as a traveling, interactive science museum, utilizing interactive exhibits and hands-on activities housed inside a 40-foot trailer. Students enter a world where science and technology merge to encounter critical thinking about water. The exhibit currently brings the field trip experience to more than 5,000 seventh grade students in AISD. In addition, CRA and Austin Water are targeting to reach an additional 3,000 to 5,000 middle school students through community events and expanded partnerships with surrounding area schools.

G.11.5 Speakers' Bureau

Since 1999, Austin Water has offered presentations on water conservation techniques and available programs to a variety of interest groups including homeowners associations, garden clubs, professional organizations and other community groups. Austin Water also participates in festivals, school events and informational fairs by providing staff and materials to promote water conservation. In 2009, it developed a Water Conservation Speakers' Bureau, allowing area groups to schedule speakers on topics of interest. Staff members are available to speak on topics that include conservation measures, irrigation, leak detection, and water waste; Austin Water annually participates in more than 100 events and programs.

G.11.6 WaterWise Irrigation Professional Seminar

Since 1997, Austin Water has offered seminars to licensed professional irrigators in the area in order to provide continuing education credits toward their license renewal. These seminars include information on water-efficient irrigation systems, water conservation programs, and the mandatory watering schedule and watering hours. Additional topics include electrical troubleshooting, irrigation auditing, and turf grass watering requirements.

Austin Water periodically hosts 'Irrigation Controllers 101' classes each year. In this hands-on workshop, customers review how controllers work and find out about hidden features and options that can help them save water and money. Participants also practice programming a controller similar to the one in their yard and learn efficient scheduling strategies.

G.11.7 Annual Austin Water/LCRA ICI Water Conservation Technical Workshop

Austin Water and the Lower Colorado River Authority (LCRA) jointly hold an annual free water conservation technical workshop in September with industrial, commercial and institutional (ICI) customers, facility managers and engineers on water saving measures, technologies, and rebate programs. This program is still ongoing and was initiated in 2013.

G.11.8 Online Information, Electronic Newsletters and Social Networking

Since 1998, Austin Water has provided conservation information, policies, and program offerings to customers through online postings on *www.WaterWiseAustin.org*. Communication efforts have also been expanded by providing updates on conservation-related topics through Facebook, Twitter, NextDoor and YouTube. Since March 2004, Austin Water has offered the WaterWise e-Newsletter to increase communications with customers, as well as participation in water conservation initiatives. The e-newsletter is distributed electronically to a database of approximately 30,000 customers and made available on the Water Conservation website. A quarterly Commercial Conservation e-newsletter is also published.

APPENDIX H: DEMAND MANAGEMENT SCREENING PROCESS

Water conservation programs (i.e., demand management) have been and will continue to be a critical element in Austin's management of water resources. Accordingly, Austin Water (AW) and the Water Forward Task Force have established water conservation as a major focal point for the Integrated Water Resource Plan (IWRP). Thus, an important task of the IWRP is to describe existing conservation measures implemented by AW, identify potential new options for future implementation, screen the potential new options to a list of those best analyzed as potential components of the IWRP, and characterize and quantify those measures (Task 4). This memorandum summarizes the demand management options screening effort and results. The outcome of this process will be a list of the ten demand management measures to be fully evaluated for cost and benefits and thereby carried forth into the subsequent task of portfolio development.

H.1 Screening Criteria and Weight

The screening process for assessing the potential demand management options under consideration for the IWRP focused on a total of four broad qualitative criteria:

- Incremental Water Savings Potential: This criterion provides a qualitative, comparative assessment of the incremental water savings potential for a given measure. Each measure is scored numerically from a 0 to 5, with 0 indicating very little water savings potential and 5 indicating significant water savings potential. The water savings potential for each measure is determined based on consideration of current or historical programs that have targeted the end-use targeted by the measure, additional savings that can be achieved by that measure given the extent of the sector/end use demand currently, new vs existing development, the 100-year planning horizon that projects an addition of roughly 3 million additional people to be serviced, and success that other utilities have had implementing a similar program.
- Incremental Utility Cost of Implementation: This criterion characterizes the incremental utility cost of implementing a measure. Each measure is scored numerically from 1 to 5, with 1 indicating significant expense and 5 indicating minimal costs. The utility cost of implementation scoring takes into consideration whether the measure requires rebate investments, staff time and resources, potentially for requiring capital expenditures, and the complexity of designing an ordinance or code, for examples, and considers how these costs might change over time.
- Ease of Implementation: This criterion provides a qualitative assessment of how difficult or easy it will be to implement a given measure. Each measure is scored numerically from 1 to 5, with 1 indicating the measure is extremely difficult to implement with many hurdles and 5 indicating minimal implementation challenges and minimal additional staff/resources required. The ease of implementation scoring for each measure takes into consideration customer/stakeholder acceptance or resistance, programmatic design challenges, enforcement assumptions, and technological hurdles.

- Incremental Customer Cost of Implementation: This criterion characterizes the incremental customer cost of implementing a measure. Each measure is scored numerically from 1 to 5, with 1 indicating significant expense to the customer and 5 indicating minimal customer expense. The customer cost of implementation scoring takes into consideration the potential costs that would be absorbed by the customer for a given measure, such as cost of compliance, cost of equipment/materials, maintenance, and considers how these costs might change over time.

These four criteria are then combined (as follows) to develop a single weighted score:

- Incremental Water Savings Potential was assumed 50% of weighted score.
- The Incremental Utility Cost of Implementation, Ease of Implementation, and Incremental Customer Cost of Implementation are also assumed 50% of weighted score.

For the purposes of calculating the weighted score, the incremental water savings potential was multiplied by three and then added together with the remaining scores. The highest potential score is a 30, which would indicate a demand management measure that has high water savings with low overall costs that is easy to implement.

H.2 Demand Management Options

The demand management options list was defined through a collaborative process, with options developed based on previous task force recommendations, input from the Water Forward Task Force members, AW staff, the public, and the consulting team.

Of the initial 25 options, two were re-categorized as supply side options, two were determined to be continuing best management practices, and three were determined to be necessary implementation components to other options. The remaining options were combined or split out into one or more options, thereby reducing the number of options for screening to thirteen.

To recap, given the list of potential measures that was ultimately developed and for which input was sought, through discussions with AW staff and the consulting team several options were determined to be best handled through a separate process, as follows:

- The option to require or incentivize expansion of the use of the current reclaimed water system along with an option to require or incentivize building plumbing innovations such as dual plumbing were moved to the supply side list.
- The option to require or incentivize government-recognized energy and water efficiency-labeled residential and commercial fixtures and the option to incentivize or require toilet, urinal, and bathroom faucet aerator efficiencies were determined to be “continued best management practices” to be included in demand offsets separately (i.e., off-the-top reduction from the baseline forecast that does not require evaluation through the IWRP process) and reflects Austin Water’s longstanding programs to incentive, require or freely distribute these fixtures.
- Three options were determined to be “implementation components” of a successful conservation program and were not further evaluated or screened. These measures include water rates and fees to promote water use efficiency while maintaining affordability, customer education enhancements, and use of social media programs and web-based content to promote conservation. These types of programs are indeed critical to a successful program but do not have significant water savings of their own, but rather they assure the successful implementation of other programs.

The remaining measures were then combined or split out into one or more options so that, if selected to be fully evaluated, the option would represent a single definable measure with scalable parameters. For example, ordinances and incentives for landscape transformation have different costs on a per unit basis at the utility-level, thus the implementation approach is assessed as two different options. This approach will allow further assessment of a range of potential implementation approaches within the options characterization process. As another example, graywater was identified as being an alternative water source that has characteristics that differ from other sources (such as rainwater or stormwater) because of the implementation complexity and thus was analyzed as a separate measure. In total, 13 demand management options for the screening were identified and delineated, as shown in **Table H-1**. The goal of the screening process is to identify the ten demand management options for fuller characterization and use within the portfolio development process.

Table H-1. List of Demand Management Measures for Screening

Measure Name	Measure Description	Sector; End Use	Target[1]
Alternative Water Incentives	Incentivize on-site (building-scale) alternative water use (for rainwater, stormwater, blackwater, and ac condensate)	All; Nonpotable with potential for potable RWH in Single Family	Existing
Alternative Water Incentives - Graywater	Offer an Incentive to encourage the installation and use of graywater systems	All; Nonpotable indoor and irrigation	Existing and New
Alternative Water Ordinances	Require on-site (building-scale) alternative water use (for rainwater, stormwater, blackwater, and ac condensate)	Multifamily, Commercial; Nonpotable	New
Advanced Metering Infrastructure (AMI)	Implement customer-facing programs that provide real-time water use information (including commercial customer benchmarking), including identification of customer-side leaks and other water-saving opportunities (implemented through Advanced Metering Infrastructure - AMI)	All; All	All
CII Ordinances Cooling Towers	Require older cooling towers to meet water efficiency standards and use efficient equipment and require efficiency standards for steam boilers in new development	Commercial; Colling towers, Steam Boilers	Existing
CII Ordinances Swimming Pools	Require swimming pool efficiency (retrofit)	COA, Multifamily, Commercial; Pools	Existing
Water Use Estimates/ Benchmarking Plan Submittal	Require water use estimate submittal for new development concurrent with preliminary plan submittal, to be reviewed by City staff for comparison to benchmarks. As part of this review, City staff will provide potential water use efficiency recommendations and information on available incentive and rebate programs.	All; All	New/Re-development
Water Use Estimates/ Benchmarking Seller Disclosure	Require sellers of commercial property to provide written disclosure of older water using equipment not meeting current standards or fixtures at point of sale to buyers and City staff	Commercial; All	All

[1] For this analysis, the definitions for existing/new sectors are tied to the development permitting and review process. “Existing” is any development that has received a certificate of occupancy. “New” is any new development in the process of obtaining permitting approvals.

Measure Name	Measure Description	Sector; End Use	Target[1]
Irrigation Efficiency Incentives	Expand current irrigation rebate programs to include irrigation system controllers that respond to leaks, high pressure, and soil moisture; Incentivize retrofit of grandfathered irrigation systems to encourage more efficient irrigation systems	All; Irrigation	Existing
Irrigation Efficiency Code Change	Replace existing code that requires installation of a permanent irrigation system with a code that allows for installation of a temporary irrigation system to establish permanent landscaping	Multifamily, Commercial; Irrigation	New
Landscape Transformation Ordinances	Implement ordinances to encourage water use efficiencies and reduce water needs for outdoor irrigation and other goals through regionally appropriate landscapes with an emphasis on landscape functionality (Implementation of this option could include implementing turf grass area, irrigated area, and/or irrigation area limitations)	All; Irrigation	New
Landscape Transformation Incentives	Implement incentives to encourage water use efficiencies and reduce water needs for outdoor irrigation and other goals through regionally appropriate landscapes with an emphasis on landscape functionality (implementation of this option could include increasing WaterWise landscape rebates for residential and multifamily and implementing a new WaterWise landscape rebate for commercial)	All; Irrigation	Existing
Water Loss Control Utility Side	Enhance current utility –side water loss control programs	System Wide; Nonrevenue Water	N/A

H.3 Screening Results

H.3.1 Summary of Screening Results

Based on the screening criterion described in **Section H.1**, the list of measures identified for screening were characterized based on professional judgement of the CDM Smith team in consultation with AW conservation staff. Results of the screening are provided in **Table H-2**. The tables in the following section provide the general assumptions that went into scoring each measure. Where readily available, examples of similar programs are provided. The top ten ranked measures, shown as bolded in the table, were carried forward to the options characterization process.

Table H-2. Demand Management Measure Screening Results (Bolded Options Carried Forward to Characterization)

Rank	Measure Name	Incremental Water Saving Potential	Incremental Cost Implementation Utility	Ease of Implemen-tation	Incremental Cost Implementation Customer	Weighted Score
1	**Landscape Transformation - Ordinances**	**5**	**2**	**2**	**2**	**21**
2	**Advanced Metering Infrastructure (AMI)**	**4**	**1**	**1**	**5**	**19**
3	**Water Loss Control Utility Side**	**3**	**1**	**1**	**5**	**16**
4	**Landscape Transformation - Incentives**	**3**	**2**	**3**	**2**	**16**

Rank	Measure Name	Incremental Water Saving Potential	Incremental Cost Implementation Utility	Ease of Implementation	Incremental Cost Implementation Customer	Weighted Score
5	**Irrigation Efficiency - Incentives**	**2**	**3**	**4**	**2**	**15**
6	**CII Ordinances - Cooling Towers and Steam Boilers**	**2**	**4**	**3**	**2**	**15**
7	**Alternative Water - Ordinances**	**3**	**3**	**1**	**1**	**14**
8	**Water Use Estimates/ Benchmarking - Plan Submittal**	**2**	**2**	**2**	**4**	**14**
9	**Alternative Water -Incentives**	**2**	**2**	**3**	**2**	**13**
10	**Alternative Water Incentives - Graywater**	**1**	**2**	**2**	**3**	**10**
11	Water Use Estimates/ Benchmarking - Seller Disclosure	1	2	1	3	9
12	CII Ordinances - Swimming Pools	1	3	2	1	9
13	Irrigation Efficiency - Code Change	0.5	4	2	1	8.5

H.3.2 Additional Detail on Option Screening Scores

Tables Table H-3 through **Table** H-15 provide additional detail on the assumptions that went into creating screening scores for each demand management measure.

Table H-3. Screening Score Detail for Landscape Transformation Ordinances

Landscape Transformation Ordinances		
Measure Name	**Description**	
Definition	Implement ordinances to encourage water use efficiencies and reduce water needs for outdoor irrigation and other goals through regionally appropriate landscapes with an emphasis on landscape functionality. Implementation of this option could include implementing turf grass area, irrigated area, and/or irrigation area limitations.	
Savings Score	5 - Future outdoor use represents the largest potential demand sector in Austin over 100 years. Regionally appropriate landscapes requiring little or no supplemental irrigation beyond establishment could reduce future outdoor use by a considerable amount. Savings from this measure would need to be evaluated in light of current 1x per week irrigation restrictions.	
Utility Cost Score	2 - Landscape ordinances will take time and effort to develop in the beginning and will require additional staff resources to implement and enforces. Costs could reduce in the long-term.	
Implementation Ease Score	2 - In the early phases of implementation, effort will be required to inform, educate and to inspect, and verify to ensure proper implementation. Will require substantial coordination with other departments in Austin and the land development code.	
Customer Cost Score	2 - Customer costs for landscaping may be higher initially until the industry fully adapts to the ordinances. Over the long-term perspective, customer costs would be expected to decline as the incremental costs come down.	
Notes	A long-term effort yielding substantial water savings in a critical sector. Incremental customer costs are expected to decline over time.	
Examples	*California*	The State of California has a Model Water Efficient Landscape Ordinance (MWELO) which sets a maximum applied water allowance on landscape areas for all new construction. The

Landscape Transformation Ordinances		
		formula used to calculate the estimated total water use has limits on the percent of landscape that is irrigated turf. This percentage has been changed over time.
	Colorado	Westminster Colorado has landscape ordinances requiring minimum soil amendments and mulch for all new landscapes, coupled with inspections and verification. A water use analysis approach to the connection fee calculations provides financial incentive for water efficiency across all new buildings and landscapes.

Table H-4. Screening Score Detail for AMI

Advanced Metering Infrastructure (AMI)		
Measure Name	**Description**	
Definition	Implement customer-facing programs that provide real-time water use information, including identification of customer-side leaks and other water-saving opportunities (implemented through Advanced Metering Infrastructure - AMI); AMI + customer portal and engagement with personal electronic technology (including commercial customer benchmarking).	
Savings Score	4 - The future efficiency potential from customer information and engagement brought about by AMI is significant. Preliminary studies suggest a 5% reduction in residential usage from engagement efforts. This technology is still in its infancy and implementation anticipated to help reduce customer side leaks and excessive use for years to come.	
Utility Cost Score	1 - AMI and customer engagement software represents a significant investment for AW. Over the next 100 years, the AMI system is likely to be replaced multiple times as equipment ages.	
Implementation Ease Score	1 - Metering and meter replacement is standard utility function, but AMI implementation will require substantially more effort and maintenance over time. Implementation of this option may be more difficult as development of a new customer portal will be required.	
Customer Cost Score	5 - This measure is not anticipated to have required significant customer-side incremental costs.	
Notes	This is an in-process option that is focused on better measuring and managing supply as well as increasing customer engagement. It is expected that all water utilities will eventually utilize these technologies.	
Examples	*Austin, TX*	Pilot scale AMI project underway
	Fort Collins, CO	AMI leak alert program started in 2015, notifying customers with continuous use. Leveraging AMI for Leak Detection www.watersmartinnovations.com/documents/sessions/2015/2015-W-1532.pdf
	East Bay MUD	Various AMI pilots and evaluation of engagement software platforms.
	Valencia, CA	Water budgets linked with AMI technology for advanced customer communication.
	Leesburg, VA	Reduced non-revenue water from 15% to 7% since installing AMI

Table H-5. Screening Score Detail for Utility-Side Water Loss Control

Water Loss Control – Utility Side		
Measure Name	**Description**	
Definition	Enhance current utility–side water loss control programs	
Savings Score	3 - As Austin's system ages over the next 100 years, advanced water loss control will yield increased water savings. Water loss in systems 50 - 100 years older than AW is much higher. New water loss control technologies are expected too.	
Utility Cost Score	1 - A significant incremental expense for AW, particularly if the costs of leak repair and pipe replacement are included.	
Implementation Ease Score	1 - Water loss control is already a core AW utility function. The enhanced program will require more utility staff and effort and may face challenges associated with capital project implementation.	
Customer Cost Score	5 - This measure is not anticipated to have required significant customer-side incremental costs.	
Notes	As Austin's system ages, reducing water loss will become increasingly important.	
Examples	*Georgia*	State mandated annual validated water loss audits. Funding tied to steady improvement.
	Texas	The City of Fort Worth submitted a SWIFT application for implementation of AMI with an automated leak detection system. Water loss for the City was estimated at 14%. The expected annual volume of water conserved was estimated at 9,450 AFY. http://texaslivingwaters.org/wp-content/uploads/2016/11/SWIFT-Guidance-Document_FINAL.pdf
	California	Major new state water loss control initiative focused on training, education, audit validation, and continuous improvement.
	Texas	Water loss audits are required by State for all retail public water suppliers every five years. Retail water suppliers with greater than 3,300 connections are required to submit an audit annually.

Table H-6. Screening Score Detail for Landscape Transformation Incentives

Landscape Transformation Incentives	
Measure Name	**Description**
Definition	Implement incentives to encourage water use efficiencies and reduce water needs for outdoor irrigation and other goals through regionally appropriate landscapes with an emphasis on landscape functionality. Implementation of this option could include increasing WaterWise landscape rebates for residential and multifamily and implementing a new WaterWise landscape rebate for commercial.
Savings Score	3 - Current outdoor use represents about 22% of total metered demand. Regionally appropriate landscapes requiring minimal supplemental irrigation beyond establishment would help adapt landscapes to require less water and could further reduce outdoor use by a considerable amount. Savings from this measure would need to be evaluated in light of current1x per week irrigation restrictions.
Utility Cost Score	2 - AW already offers landscape incentives and has a program in place for implementation. The incremental cost of expanding the program is scalable and comparatively low.
Implementation Ease Score	3 - A moderate level of effort is anticipated as the program expands. This option will require coordination with other departments (WPD) and Land Development Code

Landscape Transformation Incentives		
Measure Name	**Description**	
Customer Cost Score	2 - Customer receives an incentive, but replacing landscaping can be expensive. Compared with other measures, there will be some incremental customer costs.	
Notes	This measure anticipated to accelerate water savings and landscape transformation in Austin.	
Examples	*California*	Metropolitan Water District and member agencies implemented a massive turf replacement program in 2014-16. Thousands of acres of turf were converted and more than $370 million in rebates were provided.
	Nevada	The Southern Nevada Water Authority developed and continues to implement a landscape incentive program focused on locally appropriate plantings. Significant impact and reduction in turf landscapes.
	Colorado	Water utilities and a local non-profit team annual to offer "Garden in a Box" plant packages, aimed a regionally appropriate landscaping.

Table H-7. Screening Score Detail for Water Use Estimates/ Benchmarking Plan Submittal

Water Use Estimates/ Benchmarking Plan Submittal		
Measure Name	**Description**	
Definition	Require water use estimate submittal for new development concurrent with preliminary plan submittal, to be reviewed by City staff for comparison to benchmarks. As part of this review, City staff will provide potential water use efficiency recommendations and information on available incentive and rebate programs.	
Savings Score	2 - Beginning with a development review process focused on sensible efficiency recommendations, the water savings may be relatively small. Over the 100-year timeframe, this effort will likely evolve into a process where new buildings in Austin are scored against efficiency benchmarks. Eventually this could lead to the creation of a reasonable water allocation (water budget) for every new (and eventually existing) property in Austin that could be used to benchmark efficiency. Phased implementation of this option could lead to more substantial water savings over time.	
Utility Cost Score	2 - This will require significant effort at the outset, but overtime as benchmarks are established and the process becomes more routine, effort is anticipated to be reduced.	
Implementation Ease Score	2 - A challenging implementation for AW at the outset. This option could build off of the Austin Energy Green Building program or AW Service Extension Request process. This option could be resource intensive in terms of staffing and process to establish benchmarks.	
Customer Cost Score	4 - Some additional time and resources may be expended by customer/contractor/engineer for this preliminary submittal. No incremental cost to current customers. Future customers benefit from built-in water efficiency.	
Notes	Could be an important step for AW in the direction of customer-specific water efficiency and ensuring new buildings join the system as highly water efficient from the start.	
Examples	*Colorado*	Westminster Colorado charges substantially higher connection fees based on increased tap size and anticipated water usage based on customer type and size. This brings new buildings to the table with water efficiency built-in to achieve a lower connection fee.
	California	A water budget approach to both new and existing customers has been used by a handful of utilities for years, and has recently been adopted widely across the state. The State has embraced this approach from the customer up through the utility itself.

Table H-8. Screening Score Detail for Irrigation Efficiency Incentives

Irrigation Efficiency Incentives		
Measure Name	**Description**	
Definition	Expand current irrigation rebate programs to include irrigation system controllers that respond to leaks, high pressure, and soil moisture. Incentivize retrofit of grandfathered irrigation systems to encourage more efficient irrigation systems.	
Savings Score	2 - Impacts existing irrigation systems and savings are assumed to accrue in first 20 - 30 years only. Savings likely to be relatively small with 1x per week irrigation restrictions in place.	
Utility Cost Score	3 - Moderate incremental cost. Scalable, based on rebate level.	
Implementation Ease Score	4 - AW already offers an irrigation incentive for residential and a smart controller incentive for multifamily and commercial with programs in place for implementation. AW also offers free evaluations for residential and mandatory irrigation audits for commercial and multifamily. The incremental effort of expanding the program is scalable and comparatively low.	
Customer Cost Score	2 - Customer's receive an incentive, but must bear the costs of system repair and replacement. Compared with other measures, there will be some incremental customer costs.	
Notes	Incentives could be designed to assist in landscape transformation as well. Impacts existing customers.	
Examples	*Arizona*	Tucson and other cities offer rebates for drip irrigation and climate-based control
	Utah	Salt Lake City. WaterCheck irrigation audits and system upgrades. Rebates.
	Texas	San Antonio (SAWS) has offered a variety of irrigation efficiency programs. Dallas Water Utilities also offers free irrigation system check-ups.

Table H-9. Screening Score Detail for Alternative Water Ordinances

Alternative Water Ordinances		
Measure Name	**Description**	
Definition	Require on-site (building-scale) alternative water use (for rainwater, stormwater, blackwater, and air conditioning (AC) condensate) for new developments in the multifamily and commercial sectors	
Savings Score	3 - Applies to future construction which represents a big portion of future demand. Scalable.	
Utility Cost Score	3 - These regulations will be complex to design, implement, and regulate, particularly in the early stages. Over time, the implementation effort could be reduced.	
Implementation Ease Score	1 - The challenges of design and early stage implementation are unknown and could be significant.	
Customer Cost Score	1 - Mandating these systems will increase the cost of land development. Installation of these systems would require dual plumbing. Long term maintenance of these systems adds to customer expense as well.	
Notes	While generally expensive and challenging to implement, this option could provide savings and other benefits. As with all measures, savings must be proven for this to be considered a reliable source of future demand reduction for Austin.	
Examples	*Australia*	Gold Coast Water, south of Brisbane mandated dual plumbing and on-site capture systems during the millennial drought. Most systems were quickly abandoned once the drought ended. AWE published a "lessons learned" from the Australian drought report.
	San Antonio, Texas	San Antonio requires new commercial construction on or after January 1, 2006, to have a single independent condensate collection line to collect condensate for use as process water, cooling tower makeup, and landscape irrigation.

Table H-10. Screening Score Detail for CII Ordinances for Cooling Towers and Steam Boilers

CII Ordinances: Cooling Towers and Steam Boilers		
Measure Name	**Description**	
Definition	Require older cooling towers to meet water efficiency benchmarks and use efficient equipment and require efficiency standards for steam boilers in new development	
Savings Score	2 - Impacts cooling towers installed prior to 2008. New equipment is assumed efficient by code. All savings accrue in the first 30 - 40 years.	
Utility Cost Score	4 - Incremental utility cost is comparatively small.	
Implementation Ease Score	3 - Enforcement and verification patterned after existing car wash program through registration, third-party inspection paid by customer, and self-reporting will help with ease of implementation.	
Customer Cost Score	2 - Complying with the cooling tower requirement portion of this option would have low to moderate costs for customers.	
Notes	This measure was considered as part of the plumbing code adoption cycle that occurred during the development of the Water Forward IWRP. The Austin City Council approved cooling tower efficiency requirements including mandatory registration and annual inspection requirements on June 8, 2017 as part of the adoption of local amendments to the 2015 Uniform Mechanical Code	
Examples	*Colorado*	Denver Water has had trouble maintaining long term water savings from cooling tower retrofits.
	California	Metropolitan Water District (MWD) offers different cooling tower incentives but has not established formal requirements.

Table H-11. Screening Score Detail for Alternative Water Incentives

Alternative Water Incentives		
Measure Name	**Description**	
Definition	Incentivize on-site (building-scale) alternative water use (for rainwater, stormwater, blackwater, and AC condensate) for existing developments	
Savings Score	2 - Applies to existing development as retrofit. Scalable.	
Utility Cost Score	2 - Program would add to complexity of existing programs. Over time, the implementation effort could be reduced.	
Implementation Ease Score	3 - Design and early stage implementation could be built off of existing incentive programs for rainwater harvesting and ac condensate.	
Customer Cost Score	2 - Even with an incentive, these systems are usually expensive to retrofit. Installation of these systems would require dual plumbing for use indoors.	
Examples	*Australia*	Gold Coast Water, south of Brisbane mandated and incentivized dual plumbing and on-site capture systems during the millennial drought. Most systems were quickly abandoned once the drought ended. Alliance for Water Efficiency (AWE) published a "lessons learned" from the Australian drought report.

Table H-12. Screening Score Detail for Alternative Water Incentives - Graywater

Alternative Water Incentives - Graywater		
Measure Name	**Description**	
Definition	Offer an Incentive to encourage the installation and use of graywater systems, which are defined as shower-to-toilet and landscape irrigation systems that collect shower, faucet, and laundry discharge, provide some element of filtration and treatment and then reuse the water.	
Savings Score	1 - Limited water savings potential as clothes washers, faucets, and showers become more efficient and use less and less water. Less and less graywater will be produced.	
Utility Cost Score	2 - Comparatively expensive to implement. Incentives would need to be substantial to achieve meaningful participation rates. 2017 Alliance for Water Efficiency (AWE) study found some potential long-term benefits for water utilities, but also cautioned about the lack of cost effectiveness and demonstrable savings data.[2]	
Implementation Ease Score	2 - Graywater systems are complex. Implementation from the utility perspective will be on a long-term time frame requiring staff effort.	
Customer Cost Score	3 - From the AWE report, "if the total life-cycle costs of the system exceed the total life-cycle savings from reduced potable water purchases, the system will have a net cost to the homeowner." This is the expected outcome from most systems.	
Notes	The 2017 research indicates that graywater systems have yet to be proven cost-effective from the customer or the utility perspective.	
Examples	*Australia*	Gold Coast Water began installing on-site systems during the millennial drought. Generally these systems were quickly abandoned once the drought ended.

[2] Gauley, Bill (2017) *Water Savings and Financial Benefits Associated with Single-Family Package Graywater Systems*. Alliance for Water Efficiency. Chicago, IL.

Table H-13. Screening Score Detail for Water Use Estimates/ Benchmarking - Seller Disclosure

Water Use Estimates/ Benchmarking - Seller Disclosure		
Measure Name	**Description**	
Definition	Require sellers of commercial property to provide written disclosure of older water using equipment not meeting current standards or fixtures at point of sale to buyers and City staff	
Savings Score	1 – This is not a mandate for water efficient fixtures, only for disclosure. Water savings could be significant if turned into a "retrofit on resale" requirement as California has just done. Without a mandate or incentive, the potential for water savings should be assumed limited, until proven.	
Utility Cost Score	2 - Setting the "current standards" and developing the process that must be met would be an on-going challenge for AW. Requires staff effort and will likely require new staff because of real estate transaction complexity and reporting.	
Implementation Ease Score	1 - Expect significant pushback from the real estate industry and commercial property owners. Anything that complicates the transfer of real property is seen as an impediment. Monitoring real estate transaction will be very difficult, especially for the commercial sector.	
Customer Cost Score	3 - Customer cost would likely be low to moderate but could have cost and transaction time impacts.	
Notes	While savings are scored low, the effort could evolve into a major contributor to future water efficiency in Austin if retrofit on resale was included.	
Examples	*California*	State law mandates 1.28 gallons per flush (gpf) toilets and other fixtures in all single-family residences. Effectively a retrofit on re-sale ord. Expected to be enforced as part of the inspection and title transfer of real estate.
	California	City of Burbank has “retrofit upon resale” requirements for residential properties that went into effect in 2010. https://www.burbankwaterandpower.com/water/rules-and-regulations-water/retrofit-upon-resale-requirements
	California	City of San Diego has “retrofit upon resale” requirements for residential properties that went into effect in 2000. https://www.sandiego.gov/water/conservation/selling

Table H-14. Screening Score Detail for CII Ordinance for Swimming Pools

CII Ordinances: Swimming Pools	
Measure Name	**Description**
Definition	Require swimming pool efficiency (retrofit)
Savings Score	1 - The sector impacted is comparatively small. 100-year savings are small.
Utility Cost Score	3 – Varies; measures range from water efficient backwash filters to major leak repairs.
Implementation Ease Score	2 – High level of staff expertise and effort required for successful implementation.
Customer Cost Score	1 – Incremental cost of implementation for customers with pools could be substantial.
Notes	Require swimming pool efficiency (retrofit)

Table H-15. Screening Score Detail for Irrigation Efficiency Code Change

Irrigation Efficiency Code Change	
Measure Name	**Description**
Definition	Replace existing code that requires installation of a permanent irrigation system with a code that allows for installation of a temporary irrigation system to establish permanent landscaping
Savings Score	0.5 - Water savings would be realized only when combined with another option like landscape transformation.
Utility Cost Score	4 – Once implemented this requirement would not have a significant utility cost impact.
Implementation Ease Score	2 – Challenging to implement initially, but easier over time. Would require coordination with Watershed Protection Department and consistency with the Innovative Commercial Landscape Ordinance.
Customer Cost Score	1 – Could be “cost neutral” to customers depending on implementation approach.

APPENDIX I: WATER SUPPLY OPTION SCREENING PROCESS

A diverse, cost effective and resilient future water supply portfolio is a primary objective of the Austin Water (AW) Integrated Water Resource Plan (IWRP). The process for evaluating future water supply portfolios began with a high-level assessment of potential demand management and water supply options. With review and input from the public, AW and the Water Forward Task Force identified over twenty supply options for possible inclusion in developing water supply portfolios. As there were many possible supply options, the IWRP process included a method to screen out water supply options which, for this cycle of the planning process, were not recommended for more detailed study and possible recommendation. The screening process focused on describing the supply options identified and screening them against high-level criteria including cost, yield, supply type, implementation challenges, and resiliency. This appendix describes the screening process and the metrics which were used to screen each option.

I.1 Screening Process and Criteria

The IWRP screening process was consisted of several steps. First, criteria to asses each option was defined. Option-level assessments were then conducted which generated estimates for the criteria values. Then, options scores were binned or scaled to evaluate their performance relative other options. Finally, options were compared and the highest-performing options, as indicated by the previous screening steps, were selected for further analysis.

The screening process used for this effort focused on four broad criterion used to assess each option: cost, yield, implementation challenges, and hydrologic resilience. Each criterion is described in more detail in the following subsections. Criteria estimates for each option were based on previously published studies, cost estimates, and the best professional judgement of the IWRP project team (including AW staff and the IWRP consultants). After development, these criteria estimates were evaluated by assigning a categorical bin (as for cost and yield) or score on a qualitative scale (as for implementation challenges and hydrologic resilience). In this appendix, higher-numbered bins or scores are more favorable to AW's long-term water supply objectives. For screening, the AW IWRP evaluated each water supply option under its own merit and did not explicitly consider any synergies or potential conflict between options in the group of water supply options evaluated. These interactions were considered later in the IWRP process during portfolio evaluation. Due to the complexity of assessing and comparing various water supply options, data visualization graphics were used to convey the high-level screening information.

I.1.1 Annual Unit Cost of Water

The annual unit cost of water in this analysis included the total option capital cost (annualized over the lifetime of the option and including debt financing interest), the annual operations and maintenance costs, annual energy costs, and annual treatment costs. This total annual cost was then divided by the average annual water supply yield to generate an annual unit cost of water (in acre-feet/year). Development of supply option screening level costs were based on previous work completed by the Austin Water Resource Planning Task Force in 2014, associated feasibility studies, Texas Water Development Board (TWDB) Regional Water Plans, and other related studies that provided relevant costing information. When

applicable, assumptions consistent with AW's internal financing methods and the TWDB Unified Costing Model were applied. For the purposes of screening, water supply options were categorized by a range of annual unit costs and assigned to an overall cost bin. The screening level annual unit cost bins are shown in **Table I-1.** These annual unit costs were high-level in nature and were primarily intended for comparison within the group of water supply options under consideration. Costs were further evaluated in option characterization (see **Appendix J** for more detail on option characterization) and portfolio evaluation (see **Appendix L** for more detail on portfolio evaluation).

Table I-1. Annual Unit Cost - Screening Bins

Annual Unit Cost	Bin
$0/AF to $500/AF	4
$500/AF to $2,000/AF	3
$2,000/AF to $4,000/AF	2
$4,000/AF and above	1

I.1.2 Average Annual Yield

A primary objective of the AW IWRP is to evaluate the quantity and reliability of AW's future water resource portfolio, including demand measures and water supply options. One way this objective was addressed at the screening level was by estimating the potential average annual yield of each water supply option as part of the screening evaluation. Yields were further refined in option characterization, but the screening-level estimates were important to inform decision making about which options should more forward for further analysis.

Like the annual unit cost, water supply option yields were categorized using a range and assigned an overall potential annual yield screening bin. The yield bins are shown in **Table I-2.** These yield estimates were high-level in nature and were used for comparison within the group of water supply options under consideration.

Table I-2. Potential Annual Yield - Screening Bins

Potential Annual Yield	Bin
0 AF to 10,000 AF	1
10,000 AF to 35,000 AF	2
35,000 AF and above	3

I.1.3 Implementation Challenges

This criterion provided a qualitative assessment of how difficult or easy it would be to implement a given water supply option. Each water supply option was scored numerically from one to five, with one indicating the water supply option may be extremely difficult or time-consuming to implement, with many uncertainties involved, and five indicating minimal implementation challenges. The implementation challenge score for each water supply option is based on consideration of anticipated customer/stakeholder acceptance or resistance, programmatic design challenges, permitting and legal complexities, enforcement assumptions, scalability of the water supply option, and technological hurdles.

I.1.4 Hydrologic Resiliency

This criterion qualitatively assesses each water supply option's susceptibility to future variations in hydrology and climate. Each water supply option is scored numerically from one to five, with one indicating a water supply option may be highly impacted or variable under future hydrologic and climatic variations, and five indicating minimal impact to a water supply option's performance under future hydrologic or climatic variations.

I.1.5 Other Scoring Considerations

I.1.5.1 Performance Score

For the purposes of portfolio screening, the implementation challenges and hydrologic resiliency criterion scores were combined into one overall "performance score" that was a representation of a portfolio's general performance. The overall performance score was developed by equally weighting (50/50) the scores of implementation challenges and resiliency. For example, a water supply option that received an implementation challenge score of 3 and a resiliency score of 4 would receive an overall performance score of 3.5.

I.2 Preliminary Water Supply Options

The AW IWRP preliminary water supply options list was created through a collaborative process that involved AW staff, the consulting team, the current IWRP Task Force, the 2014 Austin Water Resource Planning Task Force report, and consideration of public input. In total, 21 water supply options were identified for screening, as shown in **Table I-3**. This table includes the water supply option number, name, and associated primary supply type. Colors for the supply types correspond to graphics presented later in the document.

Table I-3. List of the 21 Preliminary Supply Options for Screening

Option Number	Option Name	Supply Type
1	Edwards/Trinity Aquifer Storage and Recovery (Feasibility and Engineering Analysis 5)	Storage
2	Direct Non-Potable Reuse (Reclaimed Water System)	Reuse
3	Lake Austin Operations	Surface Water
4	Stormwater Harvesting (community-scale)	Decentralized
5	Rainwater Harvesting (community-scale)	Decentralized
6	Sewer mining (wastewater scalping)	Decentralized
7	Distributed wastewater systems	Decentralized
8	Capture Lady Bird Lake Inflows (Feasibility and Engineering Analysis 4)	Surface Water
9	Indirect Potable Reuse – Through Bed and Banks	Reuse
10	Indirect Potable Reuse – Through Lady Bird Lake (Feasibility and Engineering Analysis 2)	Reuse
11	Indirect Potable Reuse – Through Alluvial Aquifer	Reuse
12	Direct Potable Reuse	Reuse

Option Number	Option Name	Supply Type
13	Brackish Groundwater Desalination	Desalination
14	Seawater Desalination	Desalination
15	Lake Evaporation Suppression	Storage
16a	Conventional Groundwater (Developed)	Groundwater
16b	Conventional Groundwater (Purchased)	Groundwater
17	Additional supply from LCRA	Surface Water
18a	Carrizo-Wilcox Aquifer Storage and Recovery (Infiltration)	Storage
18b	Carrizo-Wilcox Aquifer Storage and Recovery (Conventional)	Storage
19	Regional partnership with Corpus Christi	Surface Water
20	Interbasin transfers	Surface Water
21	Off-Channel Reservoir	Storage

I.3 Screening Results

Each water supply option listed in the previous table was evaluated against the screening criteria described in **Section I.1**. **Table I-4** presents the metrics for each option that were used to determine their score within each criterion. As noted previously, cost and yield information were largely based on previous studies and reports; however, when necessary, the reference costs were adjusted or scaled to better reflect the water supply option being evaluated in this plan. Option 19, regional partnerships, was determined to be a potential implementation strategy and was therefore not screened as a unique water supply option.

Table I-5 presents the screening score for each water supply option. The screening score was created based on the results from **Table I-4** and the bins and scales described in the first section. Data resented in both tables are high-level screening results and may have changed between this step and option characterization, when more detailed analysis on each selected screened option is performed.

Table I-4. Option Screening-Level Metrics (metrics may be different from characterization-level estimates)

Option No.	Description	Yield (AF)	Annual Unit Cost ($/AFY)	Implementation Challenges	Hydrologic Resiliency
1	Edwards/Trinity Aquifer Storage and Recovery	4,300	$ 2,631	Current regulations do not allow injection wells that transect or terminate in the Edwards Aquifer in Travis County.	Little sensitivity to variation in hydrology or climate. Recovery rate may be influenced by fluctuations in supply available for storage.
2	Direct Non-Potable Reuse	43,100	$ 1,132	Coordination with customers (location)	Actual water demands may increase faster/slower than projected.
3	Lake Austin Operations	2,500	$ 218	Public acceptance	Hydrology impacts long-term reliability. Concerns with low lake levels.
4	Stormwater Harvesting (community-scale)	18,558	$ 4,122	Variable water quality can impact yield, current regulation may limit-large scale stormwater harvesting (waters of the state), retrofitting is expensive.	Yield is climate-dependent. Provides less supply benefit during drought.
5	Rainwater Harvesting (community-scale)	7,886	$ 8,383	Storage issues, lot-scale rainwater or community-scale stormwater often more cost effective, collection of rainwater from property may be perceived negatively.	Yield is relatively small and climate dependent. Provides less supply benefit during drought.
6	Sewer mining (wastewater scalping)	19,117	$ 3,977	Retrofitting has many challenges, site suitability impacted by considerations of sewer system, cost-effectiveness highly site-specific, benefits difficult to quantify.	Moves toward constant closed loop supply.
7	Distributed wastewater systems	20,639	$ 2,744	Public accepts treatment plants in growth areas of Austin. Benefits hard to quantify.	Moves toward constant closed loop supply.
8	Capture Lady Bird Lake Inflows	3,000	$ 456	Public acceptance due to new infrastructure. Potential operational constraint.	Actual hydrology would impact the long-term reliability of option. Limited depth could affect pump. Potential ecological concerns.
9	Indirect Potable Reuse – Through Bed and Banks	20,000	$ 529	Water rights permitting, coordination with LCRA, coordination with TCEQ.	Supplies all end uses and moves toward closed loop supply. Potential impacts of downstream environmental conditions.
10	Indirect Potable Reuse – Through Lady Bird Lake	20,000	$ 621	Public acceptance and permitting.	Supplies all end uses and moves toward closed loop supply.
11	Indirect Potable Reuse – Through Alluvial Aquifer	11,000	$ 1,287	Public acceptance concerns, amount of excavation needed, extensive permitting to ensure compliance with all environmental considerations.	Supplies all end uses and moves toward closed loop supply. Yield uncertainty due to effectiveness of infiltration and well.
12	Direct Potable Reuse	20,000	$ 1,940	Public acceptance, regulatory uncertainty, permitting challenges, coordination with TCEQ, concentrate disposal options are limited, potential water quality issues.	Supplies all end uses and moves toward closed loop supply.
13	Brackish Groundwater Desalination	10,000	$ 2,078	Uncertain timeframe fir water rights and permitting, permitting within groundwater districts, changes in groundwater rules, public acceptance, water quality issues.	Sensitivity to variations in climate and hydrology would vary depending on source aquifer and utilization rates.
14	Seawater Desalination	84,000	$ 2,716	Coordination, construction /O&M of pipeline/pump station, public acceptance, brine.	Minimal dependence on hydrologic and climate variability.
15	Lake Evaporation Suppression	827	$ 252	Public acceptance.	Mild to moderate winds could affect suppressant effectiveness.
16a	Conventional Groundwater (Developed)	20,000	$ 1,087	Uncertain timeframe fir water rights and permitting, permitting within groundwater districts, changes in groundwater rules, public acceptance, water quality issues.	Sensitivity to variations in climate and hydrology would vary depending on source aquifer and utilization rates.
16b	Conventional Groundwater (Purchased)	20,000	$ 975	Austin Water would not own supply, contract insecurity, ongoing changes in groundwater regulation, public acceptance, water quality compatibility.	Sensitivity to variations in climate and hydrology would vary depending on source aquifer and utilization rates.
17	Additional supply from LCRA	54,600	$ 352	Uncertainty regarding new contracts, cost.	Highly dependent on variations in climate and hydrology.
18a	Carrizo-Wilcox Aquifer Storage and Recovery (Infiltration)	20,000	$ 495	Water trading agreement with LCRA, permitting, ongoing changes in groundwater regulation and court decisions, public acceptance.	Little sensitivity to variation in hydrology or climate. Recovery rate may be influenced by fluctuations in supply available for storage.
18b	Carrizo-Wilcox Aquifer Storage and Recovery (Conventional)	10,000	$ 1,014	Permitting, ongoing changes in groundwater regulation and court decisions, public acceptance	Little sensitivity to variation in hydrology or climate. Recovery rate may be influenced by fluctuations in supply available for storage.
19	Regional partnership	Considered as an implementation strategy.			
20	Interbasin transfers	100,000	$ 1,153	Interbasin transfer permitting, public acceptance.	Yield dependent on rainfall, surface water subject to evaporation.
21	Off-Channel Reservoir	25,000	$ 812	Could limit yield of stormwater harvesting or raise water rights issues (state permits).	Vulnerable to evaporation. Yield dependent on inflows or local rainfall.

Table I-5 Supply Option Screening Results

Opt. #	Option Name	Cost Bin (1-4)	Yield Bin (1-3)	Implementation Challenge Score (1-5)	Resiliency Score (1-5)	Performance Score (1-5)
1	Edwards/Trinity Aquifer Storage and Recovery (Feasibility and Engineering Analysis 5)	3	2	3	4	3.5
2	Direct Non-Potable Reuse (Reclaimed Water System)	3	3	3	5	4
3	Lake Austin Operations	4	1	3	2	2.5
4	Stormwater Harvesting (community-scale)	2	2	4	2	3
5	Rainwater Harvesting (community-scale)	1	1	4	1	2.5
6	Sewer mining (wastewater scalping)	2	2	3	5	4
7	Distributed wastewater systems	2	2	3	5	4
8	Capture Lady Bird Lake Inflows (Feasibility and Engineering Analysis 4)	4	1	2	2	2
9	Indirect Potable Reuse – Through Bed and Banks	4	2	2	4	3
10	Indirect Potable Reuse – Through Lady Bird Lake (Feasibility and Engineering Analysis 2)	3	2	2	4	3
11	Indirect Potable Reuse – Through Alluvial Aquifer	3	2	2	4	3
12	Direct Potable Reuse	3	2	1	5	3
13	Brackish Groundwater Desalination	3	2	2	3	2.5
14	Seawater Desalination	2	3	1	5	3
15	Lake Evaporation Suppression	4	1	2	3	2.5
16a	Conventional Groundwater (Developed)	3	3	2	3	2.5
16b	Conventional Groundwater (Purchased)	3	3	2	3	2.5
17	Additional supply from LCRA	4	3	4	2	3
18a	Carrizo-Wilcox Aquifer Storage and Recovery (Infiltration)	4	2	2	4	3
18b	Carrizo-Wilcox Aquifer Storage and Recovery (Conventional)	3	2	3	4	3.5
19	Regional partnership with Corpus Christi	Not screened, option considered an implementation strategy				
20	Interbasin transfers	3				
21	Off-Channel Reservoir	3	2	3	3	3

After scoring, the water supply option screening analysis used data visualization graphics to better understand, compare, and analyze the list of water supply options. **Figure I-1** illustrates the previous table to show how options scored according to the primary screening criteria: cost (yield is added in the next figure) and performance score (which includes implementation challenges and hydrologic resiliency). In

each figure, the x-axis displays the annual unit cost bin, with water supply options further to the left on this axis considered more cost-effective. The y-axis displays the overall performance score; water supply options further down on the y-axis were considered higher-performing with respect to AW IWRP objectives. To increase display clarity, performance scores and/or placement of water supply options within the cost bins were adjusted slightly to avoid overlapping. The position of water supply options corresponds to a relative "greater than" or "less than", but the spacing is not to scale. Because of this, options should be viewed by their overall cost bin and closest performance score integer.

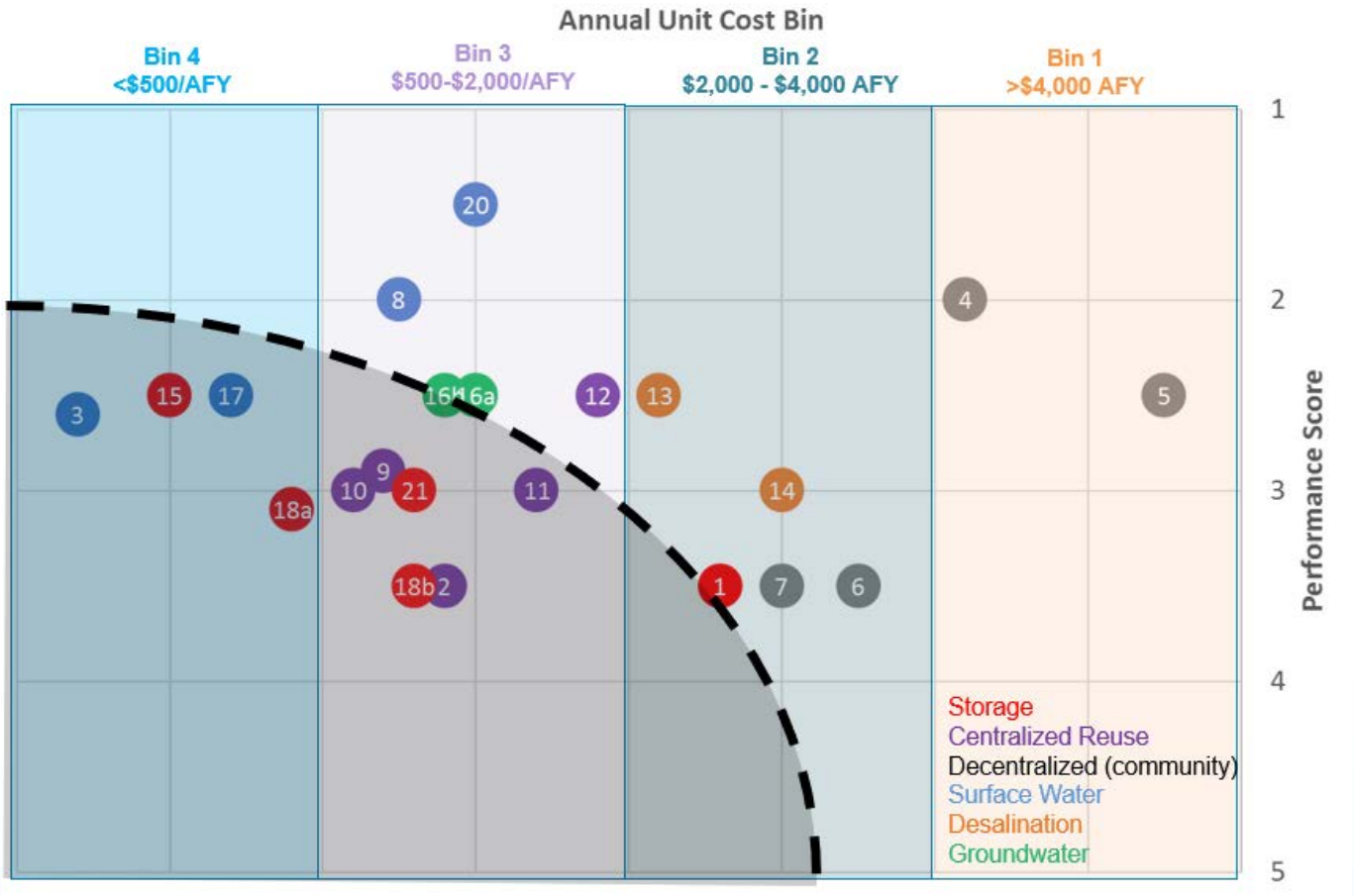

Figure I-1. Supply Screening Results

The previous figure provides a visual summary of the water supply options screening results. Generally, water supply options that are placed lower and to the left are considered more favorable. A screening arc was superimposed on each figure to highlight the group of water supply options that demonstrate a reasonable balance between both unit cost and performance score. Another important consideration was potential yield from the water supply options. To allow visualization of that information in concert with the screening results, **Figure I-2** was developed to vary each option's representative dot size by the potential supply yield bin.

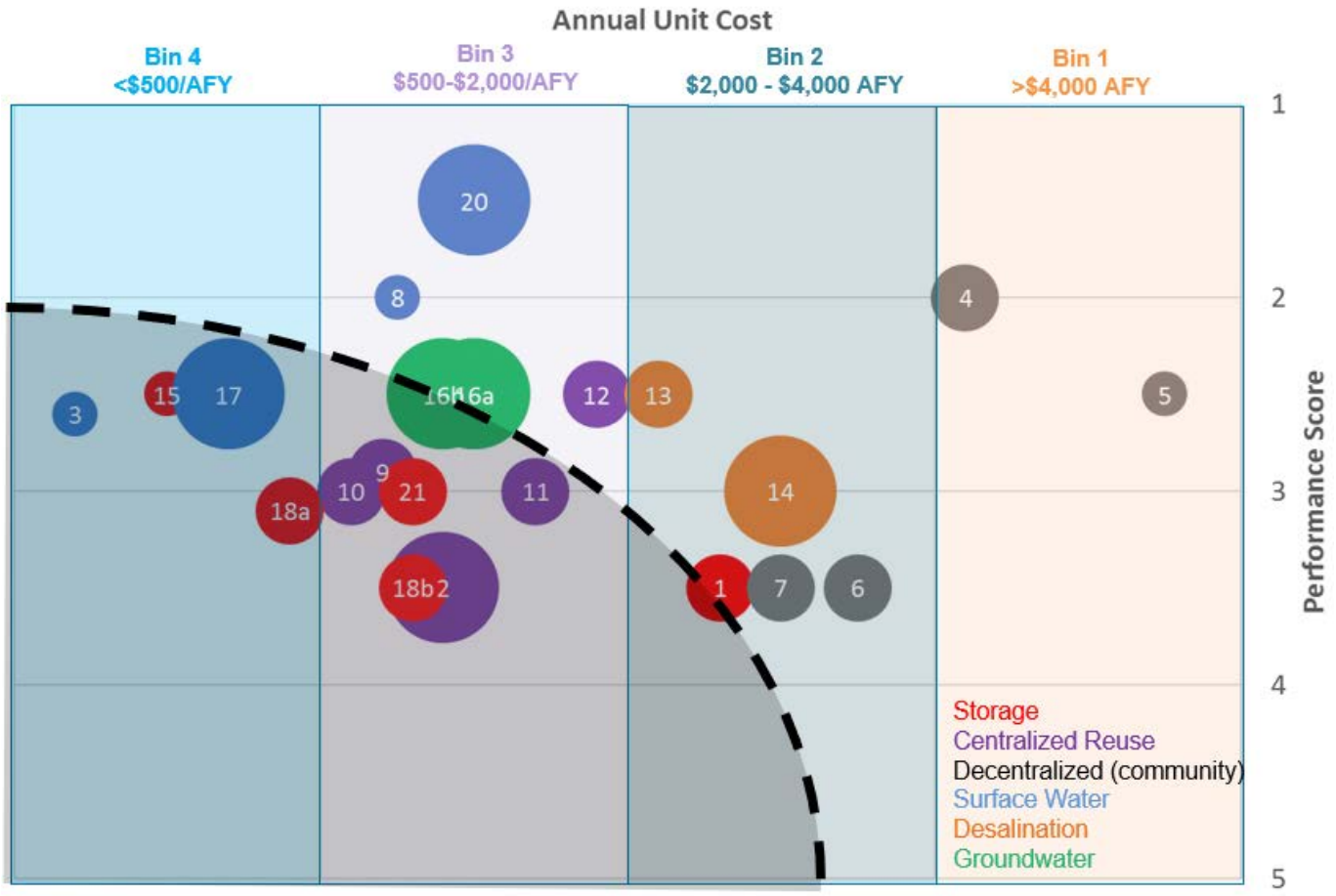

Figure I-2. Supply Screening Results with Relative Yield (Final Option Selection Based on Screening Analysis and Task Force Feedback)

I.4 Candidates for Characterization

The water supply options screening analysis was used to identify a suite of candidate water supply options for characterization. The 21 water supply options were narrowed down to thirteen candidates based on the screening assessment presented in the previous sections and feedback from the Water Forward Task Force. As part of this process, several decisions were made to consolidate and/or group options in order to carry more options through characterization while still staying within the scope of the project. A summary of these key decisions is found below.

I.4.1 Combined Options

As previously described, some water supply options were combined to represent a single definable option to move on to characterization. These water supply options were combined because they ultimately rely on the same or a similar type of source water and primarily differ only in implementation strategy. The combined options include:

Aquifer Storage and Recovery (ASR) – this combination groups Options 1, 18a, and 18b (Edwards/Trinity ASR, Carrizo-Wilcox Infiltration ASR, and Carrizo-Wilcox Conventional ASR). The representative water supply option from the grouping that was used for characterization is Option 18b—Carrizo-Wilcox Conventional Aquifer Storage and Recovery.

Indirect Potable Reuse (IPR) – this combination of water supply options groups Options 8, 9, 10, and 11 from the screening analysis (capture Lady Bird Lake inflows, IPR through bed and banks, IPR through Lady Bird Lake, and IPR through alluvial aquifer). The representative water supply option moving forward to characterization was one option including both Option 8 and Option 10 (capture Lady Bird Lake inflows and IPR through Lady Bird Lake). This decision was made because the infrastructure needed for Option 8 is essentially the same as the infrastructure for Option 10.

Off-Channel Reservoir – this representative option will combine elements of Option 15 (lake evaporation suppression) with Option 21 (off-channel reservoir). The option moving forward to characterization was one item which included both screening options; it was characterized as an off-channel reservoir with lake evaporation suppressant applied.

I.4.2 Large-Scale Import Options

Another consideration that was addressed during the screening process was the identification of large-scale import water supply options. One of the primary objectives of the screening process was to ensure that there are adequate water supply options to meet water supply needs throughout the IWRP planning horizon and develop reliable portfolios. To this end, three large-scale water supply options were identified which include seawater desalination, conventional groundwater, and interbasin transfers. Based on the preliminary needs assessment discussed in **Appendix F**, the need for these large-scale supply options is anticipated sometime after 2070. Due to the relatively distant planning horizon, implementing these larger-scale import options is quite uncertain.

Of the larger-scale import options, only seawater desalination and conventional groundwater were selected as representative options for the large-scale import group for characterization. The conventional groundwater group combines Options 16a and 16b (conventional groundwater—developed, and conventional groundwater—purchased). The representative option used for portfolio analysis was developed conventional groundwater. In the future, interbasin transfer or purchased conventional groundwater could still be a water supply strategy would like to use, but for the purposes of this plan, seawater desalination and groundwater represented the large supply options that could be used to meet needs at distant planning horizons.

I.4.3 Best Practice Option

Option 3 (Lake Austin operations) was identified as a best practice water supply option due to its high level of certainty for implementation. For the IWRP, this means that it will be included in all AW IWRP portfolios.

I.4.4 Implementation Strategy Options

As noted previously, Option 19 (regional partnerships) was considered more as an implementation strategy than a unique option. It was not specifically characterized or evaluated in the subsequent steps of the IWRP; however, it will be considered during implementation of the AW IWRP's preferred portfolio.

I.4.5 Deferred Options

A small group of water supply options were assigned a deferred status, including conventional developed groundwater and interbasin transfers. These water supply options should be considered in future AW IWRP efforts; however, at this time they will not move on to characterization and subsequent portfolio analysis.

I.4.6 Final Candidates for Characterization

In total, thirteen water supply options were identified as candidates for characterization, as shown in **Table I-6,** and moved forward in the IWRP process. Potential interactions between options and use of the same source water will be addressed as part of the characterization and portfolio analysis phases of the IWRP process. The table also identifies the screening status of all other "non-candidate" water supply options classified as either best practice, large-scale (narrative), implementation or deferred.

Table I-6. Summary of Candidates for Characterization

Screening Result	Option Characterization Candidate ID	Screening Option Number	Option Name	Supply Type
Candidate Options for Characterization				
Candidate	1	1, 18a, 18b	Aquifer Storage and Recovery	Storage
Candidate	2	13	Brackish Groundwater Desal	Desalination
Candidate	3	2	Direct Non-Potable Reuse	Reuse
Candidate	4	12	Direct Potable Reuse	Reuse
Candidate	5	8, 9, 10, 11	Indirect Potable Reuse and Capture Lady Bird Lake Inflows	Reuse
Candidate	6	17	Additional Supply From LCRA	Surface Water
Candidate	7	15, 21	Off-Channel Reservoir with Lake Evaporation Suppression	Storage
Candidate	8	14	Seawater Desalination	Desalination
Candidate	9	16a, 16b	Conventional Groundwater	Groundwater
Candidate	10	7	Distributed wastewater systems	Decentralized
Candidate	11	6	Sewer mining (wastewater scalping)	Decentralized
Candidate	12	4	Stormwater Harvesting (community-scale)	Decentralized
Candidate	13	5	Rainwater Harvesting (community-scale)	Decentralized
Non-Candidate Options for Characterization				
Best Practice	na	3	Lake Austin Operations	Surface Water
Implementation	na	19	Regional Partnerships	Surface Water
Large-Scale Import Group	na	20	Interbasin Transfers	Surface Water

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