COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY

In the Matter of:

Proposed Adjustment of the Wholesale Water Service Rates of the Princeton Water and Wastewater Commission	)))	Case No. 2019-00444

CERTIFICATION OF RESPONSES TO INFORMATION REQUESTS

This is to certify that I have supervised the preparation of the Princeton Water and Wastewater Commission's responses to the Commission Staff's Second Request for Information and the Water Districts' Request for Information and that the responses are true and accurate to the best of my knowledge, information, and belief after reasonable inquiry.

Date: March 6, 2020

Tracy B. Musgove
Tracy B. Musgove, Finance Director

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Case No. 2019-00444
Princeton Water and Wastewater Wholesale Water Rates Increase
Responses to Commission Staff's Second Information Requests

1. Refer to Princeton's responses to the Commission's January 10, 2020 Order, Item 4 and Item 5.

a. Provide a pro forma income statement for the test year, 2019 fiscal year ending June 30, 2019, using the table below. The income statement should use the revenue and expense subaccounts listed in the trial balance.

	2019 Fiscal Year Operations	Pro Forma Adjustments	Pro Forma Operations
Operating Revenues			
Operating Expenses			
Net Utility Income			
Nonutility Income			
Income available for Debt Service			

b. Provide copies of all workpapers, calculations, and assumptions used to develop Princeton's pro forma adjustments. Include any documentation that shows that the pro forma adjustments are known and measurable.

c. Provide responses to Items 1.a and 1.b in Excel spreadsheet format with formulas unprotected and all rows and columns fully accessible.

Response: See Excel file attached as PSC 2-1 Pro Forma.

Witness: Tracy B. Musgove

2. Calculate Princeton's revenue requirement using the table below:

	Amounts
Pro Forma Operation & Maintenance Expenses	$ -
Pro Forma Depreciation	0
Pro Forma Operating Expenses	0
Plus: Average Annual Debt Principal and Interest Payments	0
Debt Coverage Requirement	0
Total Revenue Requirement	0
Less: Other Operating Revenue	0
Non-operating Income	0
Interest Income	0
Revenue Required from Rates	0
Less: Normalized Revenues from Water Sales	0
Required Revenue Increase/(Decrease)	$ -
Percentage Increase	0.00%

Response: See tab labeled as PSC 2-2 in Excel file attached to the previous response (PSC 2-1 Pro Forma).

Witness: Tracy B. Musgove

3. Provide the following information concerning the costs for the preparation of this case:

a. A detailed schedule of expenses incurred to date for the following categories

(1) Accounting;

(2) Engineering;

(3) Legal;

(4) Consultants ; and

(5) Other Expenses (Identify separately).

(6) For each category, the schedule should include the date of each transaction, the check number or other document references, the vendor, the hours worked, the rates per hour, the amount, a description of the services performed, and the account number in which the expenditure was recorded. Provide copies of contracts or other documentation that support charges incurred in the preparation of this case. Identify any costs incurred tor this case that occurred during the base period.

b. An itemized estimate of the total cost to be incurred tor this case. Expenses should be broken down into the same categories as identified in "a." above, with an estimate of the hours to be worked and the rates per hour. Include a detailed explanation of how the estimate was determined with all supporting workpapers and calculations.

c. Provide monthly updates of the actual costs incurred in conjunction with this rate case, reported in the manner requested in "a." above.

Response: See Excel file attached as Exhibit PSC 2-3 Rate Case Expense. A copy of invoices submitted will be supplemented.

Witness: Tracy B. Musgove

4. Refer to Princeton's responses to the Commission's January 10, 2020 Order, Item 1, the Direct Testimony of Tracy B. Musgove (Musgove Testimony), page 3. Among the factors that have prompted Princeton to request an increase in the wholesale water rate are "the mandated increases in the state retirement system, accounting changes mandated by General Accounting Standards Board (GASS) Pronouncement No. 68, GASS Pronouncement No. 74 and GASS Pronouncement No. 75 regarding the recognition of future pension costs and other postemployment benefits (OPES)."

a. The Kentucky General Assembly establishes the CERS employer contribution rate that will become effective on July 1 of each calendar year. Provide the total amount Princeton actually contributed to the CERS in fiscal years 2015 through 2019 and the amount of each contribution that was allocated to its water division. Explain how Princeton's CERS contribution was allocated to the water division.

b. Provide the CERS employer contribution rate that became effective on July 1 in fiscal years 2015 through 2019.

c. Provide a schedule that compares Princeton's reported CERS pension expense and conforms to the requirements of GASB Pronouncement No. 68 in fiscal years 2015 through 2019.

Response: (a) The actual amount contributed to CERS is calculated monthly by multiplying the contribution rate by the gross wages paid during that specific month. Lump sum payouts of accrued vacation time and/or accrued sick leave are exempt from CERS matching and withholdings and CERS payments are allowed to be deducted from gross wages when paid. Employees who retire or resign their position have these lump sum payments. Retirement expenses are allocated to the department by the payroll system and are based on the department to which each employee is assigned. If an employee is reassigned mid-year, subsequent expenses would be allocated to the new department.

Fiscal Year	Total PWWC CERS Payments	Water Portion
2015	$ 133,751.17	$ 24,444.59
2016	$ 125,421.76	$ 27,093.07
2017	$ 136,911.64	$ 30,277.89
2018	$ 138,282.28	$ 32,438.44
2019	$ 154,107.33	$ 37,659.36

(b) CERS Employer Contribution Rate for Fiscal Years 2015 – 2019

Fiscal Year	Contribution Rate
2015	17.67%
2016	17.06%
2017	18.68%
2018	19.18%
2019	21.48%
2020	24.06%

(c) See audit report pages 21-36, the most relevant of which are attached as Exhibit PSC 2-4(c) CERS GASB comparison

Witness: Tracy B. Musgove

Exhibit PSC 2-4(c)
CERS GASB comparison

REQUIRED SUPPLEMENTARY INFORMATION

SCHEDULE OF THE PRINCETON WATER AND WASTEWATER COMMISSION'S PENSION CONTRIBUTIONS COUNTY EMPLOYEE RETIREMENT SYSTEM OF THE KRS

For the Year Ended June 30,

	2015	2016	2017	2018	2019
Actuarially Determined Contribution (ADC)	$ 163,512	$ 134,426	$ 136,699	$ 138,390	$ 123,468
Contribution in relation to the actuarially determined contribution	163,512	134,426	136,699	138,390	123,468
Contribution deficiency (excess)	$ -	$ -	$ -	$ -	$ -
Princeton Water and Wastewater's covered-employee payroll	$ 775,239	$ 736,232	$ 764,508	$ 771,489	$ 767,408
Contributions as a percentage of Princeton Water and Wastewater's covered-employee payroll	21.09%	18.26%	17.88%	17.94%	16.09%

This is a 10-year schedule. However, the information in this schedule is not required to be presented retroactively. Years will be added to this schedule in future fiscal years until 10 years of information is available.

See Independent Auditor's Report and Notes to Pension Plan Information

PRINCETON WATER AND WASTEWATER COMMISSION
NOTES TO FINANCIAL STATEMENTS
June 30, 2019

Contributions – Required contributions by the employee are based on the tier:

	Required Contribution
Tier 1	5%
Tier 2	5% + 1% for insurance
Tier 3	5% + 1% for insurance

Employer contributions rates for the fiscal year were adopted by the Board of KRS based on actuarially recommended rates. The Commission's contributions to CERS for the year ended June 30, 2019 was $123,468.

Pension Liabilities, Pension Expense, and Deferred Outflows of Resources and Deferred Inflows of Resources Related to Pensions – At June 30, 2019, the Commission reported a liability $1,774,167 for its proportionate share of the net pension liability. The net pension liability for the plan was measured as of June 30, 2018, and the total pension liability used to calculate the net pension liability was determined by an actuarial valuation as of June 30, 2017 and rolled forward using generally accepted actuarial principles The Commission's proportion of the net pension liability for CERS was based on the actual liability of the employees and former employees relative to the total liability of the System as determined by the actuary. At June 30, 2018, the Commission's proportion was 0.029131%, a decrease of 0.000912 from its proportion measured as of June 30, 2017.

For the year ended June 30, 2019, the Commission recognized pension expenses of $216,578. At June 30, 2019, the Commission reported deferred outflows of resources and deferred inflows of resources related to pensions from the following sources:

	Deferred Outflows of Resources	Deferred Inflows of Resources
Differences between expected and actual experience	$ 57,868	$ 25,970
Change of assumptions	173,388	-
Net difference between projected and actual earnings on plan investments		21,273
Changes in proportion and differences between employer contributions and proportional share of contributions	-	52,891
Employer contributions subsequent to the measurement date	123,468	-
	$ 354,724	$ 100,134

The amount shown above for "Employer contributions subsequent to the measurement date" will be recognized as a reduction (increase) to net pension liability (asset) in the following measurement period.

REQUIRED SUPPLEMENTARY INFORMATION

SCHEDULE OF THE PRINCETON WATER AND WASTEWATER COMMISSION'S PROPORTIONATE SHARE OF THE NET PENSION LIABILITY COUNTY EMPLOYEE RETIREMENT SYSTEM OF THE KRS

For the Year Ended June 30,

	2015	2016	2017	2018
Total net pension liability (asset) for CERS	$4,299,525,565	$ 4,923,318,237	$ 5,853,308,000	$ 6,090,304,793
Princeton Water and Wastewater's proportion of the net pension liability	0.032450%	0.030903%	0.030043%	0.029131%
Princeton Water and Wastewater's proportionate share of the net pension liability	$ 1,395,193	$ 1,521,570	$ 1,758,509	$ 1,774,167
Princeton Water and Wastewater's covered-employee payroll	$ 775,239	$ 736,232	$ 764,508	$ 771,489
Princeton Water and Wastewater's proporitonate share of the net pension liability as a percentage of its covered-employee payroll	185.06%	206.67%	230.02%	229.97%
Plan fiduciary net position as a percentage of the total pension liability	59.97%	55.50%	53.30%	53.54%

*The amounts presented were determined as of June of the prior fiscal year

This is a 10-year schedule. However, the information in this schedule is not required to be presented retroactively. Years will be added to this schedule in future fiscal years until 10 years of information is available.

5. At page 4 of her testimony, Ms. Musgove states "A review of the past year's billing information was then completed and it became apparent that the smaller users were subsidizing the larger users (a hallmark of a declining block rate structure)." Provide a copy of any analysis, study, or documentation that supports Ms. Musgove's statement.

Response: Refer to Excel file PSC 2-5 Customer Analysis. A review of the customer consumption and billing reports indicate the smaller users, those with line sizes of 5/8" – 1.5" consume 37% of the water billed but contribute 51.5% of the water revenue. The largest users, those with 2" lines or greater consumer 2/3 of the system's production but supply less than half of the revenue. The plant upgrade in 2000 was not for increasing population in the City of Princeton but it was for future growth that would occur with the water districts. Therefore, the citizenry of Princeton has been saddled with the costs of capital expansion while bearing the largest amount of rate increases over the past two decades while the water districts have been able to enjoy "cheap" purchased water while marking up the price to their smallest users by greater than 800% in the case of Caldwell County Water District.

Witness: Tracy B. Musgove

6. At page 4 of her testimony, Ms. Musgove explains that:

> In lieu of performing an expensive cost of service study, Princeton accepted the free services of Stephen Lapp and Tom Roberts of the University of North Carolina Environmental Finance Center. Prior to delving into rate structures, Mr. Lapp and Mr. Roberts analyzed Princeton's audits to determine strengths and weaknesses of Princeton's finances and then performed an affordability study to see the effects a rate increase might have on Princeton's population.

a. Given that Princeton relied on an Affordability Study that was prepared by Mr. Lapp and Mr. Roberts, explain why Mr. Lapp and Mr. Roberts did not provide prefiled testimony to support the study they prepared.

b. Explain whether Ms. Musgove is able to respond to any questions regarding the mechanics of the Affordability Study.

c. Explain in detail how the Affordability Study was used in the development of Princeton's proposed wholesale rate.

d. Cite any other jurisdictions that have accepted an Affordability Study in lieu of a Cost-of-Service Study (COSS) or an across-the-board increase in rates.

Response: (a) Princeton's reliance on the Affordability Study was to inform management of the demographics regarding the community PWWC serves. Emails from Mr. Lapp and Mr. Roberts were shared in the first data response. Since the data in the Affordability Study came directly from the U.S. Census Bureau data and the financial analysis was a look back at where PWWC had been with data taken from audits, it was felt that no testimony was required.

(b) Ms. Musgove cannot respond to the specific mechanics of the Affordability

Study's spreadsheet. Most mechanics within the spreadsheet are described therein.

(c) The Affordability Study was in no way a substitute for the UNC rate models/scenarios and QS1 billing software models that were completed and on which Princeton relied to set rates. The Affordability Study supplied information regarding the demographics of the population in Princeton and surrounding areas. Some of this information was known in general terms by the PWWC; however, the Affordability Study was able to capture explicit data about our customer base, such as 28.9% of households have annual income below $25,000; Princeton has a higher rate of unemployment and people not in the labor force versus state and national averages. Additionally, Princeton has a higher percentage below the poverty level, a higher percentage on Social Security and more people getting food stamps or SNAP benefits than the state and national populations. This information only served to highlight the vulnerabilities of the PWWC customer base and was shared with management to further inform them of the difficulties faced by a large portion of Princeton's citizens. These tools provide a glimpse of where the utility has been and how it got to its current state and are used in conjunction with the rate analysis tools to plot the course going forward. None of this data was used in setting the wholesale rate; however, it underscored the need to narrow the gap between the cost of the smallest user and that of the larger users.

(d) None known.

Witness: Tracy B. Musgove

7. In its response to Item 6.c of the Commission's January 10, 2019 Order, Princeton provided a locked copy of its Affordability Study. Provide an unlocked copy of the Affordability Study with all inputs and outputs fully accessible.

Response: See Excel Exhibit PSC 2-7 (Unlocked Affordability Study)

Witness: Tracy B. Musgove

8. In its response to Item 6.c of the Commission's January 10, 2019, Order, Princeton explained that the proceeds of the United States Department of Agriculture (USDA) Series 2019 Bond were used to construct a new 16-inch transmission line to feed the Industrial Park Tank; to fund a major rehab of the Skyline Tank; and to fund the switch-over of service on the Sandlick Road around the UK Experiment Station to the high-level system, improving the water quality and water pressure in the area.

a. Explain in detail how the water construction project funded with the USDA Series 2019 Bond improved or impacted Princeton's ability to provide wholesale water service to either Lyon County Water District or to Caldwell County Water District.

b. Provide a copy of the engineering report or any other documentation that has a breakdown of the construction project costs funded with the proceeds of the USDA Series 2019 Bonds into its separate components and includes construction overheads.

Response: (a & b) The 16-inch water line project funded by the USDA Series 2019 Bond eliminated a hydraulic "bottle neck" that limited the amount of flow both in and out of the Industrial Park Tank. With this restriction eliminated, PWWC now has a greater reliability of service to all customers and improved water quality. The Skyline Tank provides water and maintains pressures in the PWWC High Service Zone. CCWD wholesale customer locations in this pressure zone are 91 North, E. Sandra Drive, Hwy 62 East, Wilson Warehouse Road and 293 North (See Exhibit labeled Princeton Water & Wastewater Water Facilities Serving Wholesale Customers (Response to PSC 2-19)).

The structural condition of Skyline Tank directly impacts the level of service to the aforementioned wholesale customers along with the retail customers in that area. The 8-inch water line improvements around the UK Experiment Station did not impact or improve PWWC's ability to serve its wholesale customers. The miles of line used by PWWC to serve Master Meters (Wholesale Customers) shown in the table located on the Princeton Water & Wastewater Water Facilities Serving Wholesale Customers (Response to Appendix B, Item 19) Exhibit does not include the 8-inch water line project.

For more details regarding project need for the projects listed above, see the Exhibit 2-8 2013 Water System Improvements Preliminary Engineering Report (Dated March 2013).

Witness: Tracy B. Musgove; Richard G. Oakley, Jr., P.E.

Exhibit 2-8

2013 Water System Improvements Preliminary Engineering Report (Dated March 2013)

Preliminary Engineering Report

For

2013 Water System Improvements

On Behalf of

The Princeton Water & Wastewater Commission

Date: March 2013

03/29/2013

Prepared By:

Hethcoat & Davis, Inc.

278 Franklin Road

Building 4, Suite 200

Brentwood, Tennessee 37027

(615) 577-4300

TABLE OF CONTENTS

CHAPTER I – PURPOSE

The purpose of this report is to develop a plan of action to address the following concerns identified by the Princeton Water & Wastewater department ("PW&W");

1. Inability of the Industrial Park Water Tank to fill and cycle appropriately
2. Low residual pressures, poor water quality and fire protection experienced on the water system near the University of Kentucky Research Center
3. Excessive amounts of unaccounted water in the distribution system
4. Deficiencies noted at the Skyline Water Tank

The above-noted concerns have been specifically identified by PW&W as problematic as they increase the risk of being able to provide to safe and reliable drinking water distribution, storage and fire protection at minimal financial impact to their customer base.

CHAPTER II – HISTORY & EXISTING SYSTEM

A. General

Princeton Water & Wastewater is located in the City of Princeton, which is the county seat of Caldwell County. Princeton is approximately 100 miles northwest of Nashville, TN and 16 miles east of the northern tip of Lake Barkley. The City Limits cover 9.1 square miles.

B. System Demand

The PW&W water system serves the City of Princeton and also has connections to Caldwell County Water District and Lyon County Water District to supply wholesale water. The average daily water demand for PW&W is approximately 1.425[1] MGD. According to the current billing records, the PW&W service area consists of 3,035

[1] Demand is based on monthly operating records for the Fiscal Year Ending June 30, 2012.

residential customers, 442 commercial/industrial customers and 16 wholesale meters which serve Lyon County and Caldwell County.

C. Water Source

Raw (untreated) water is supplied to the PW&W Water Treatment Plant from the Cumberland River (Lake Barkley). Lake Barkley is a 57,900 acre lake with 1,004 miles of shoreline. This reservoir provides electric power, flood control, navigation, recreation and water supply to the surrounding area, including Princeton. Its supply is essentially unlimited for the area.

D. Water Treatment Plant

The Water Treatment Plant, owned and operated by PW&W, is a surface plant rated for 3.0 MGD. The WTP utilizes the Actiflo process manufactured by Kruger, Inc. for floc formation and clarification. Filtration is accomplished by conventional dual media gravity filters which follow the Actiflo process. Filtered water is fluoridated and chlorinated and stored in a 400,000 gallon clearwell. The clearwell volume is 13 percent of the plant rating. The WTP is properly sized for its 3.0 MGD rating.

E. Distribution, Pumping & Storage

In addition to the raw water pumps, the WTP utilizes two (2) high service pumps to send treated water to the distribution system and tanks. Pumps are Fairbanks Morse 13H-7000AW with 10 stages. The design point for the pump is 2,100 gpm at 600 feet TDH. Both pumps are controlled by variable-frequency-drives (VDF’s), and plant operators generally have the pumps running at a reduced rate.

The water distribution network is divided into two (2) distinct pressure zones; the Low Service Zone and the High Service Zone (refer to Appendix A). The Low Service Zone is served by the Linton Hill and Industrial Park water tanks, which have an overflow (maximum water) elevation of 662 feet above mean sea level (“MSL”). The high service pumps are utilized to fill these tanks and pressurize the Low Service Zone. The High Service Zone is served by the Linton Hill Booster Pump Station and supported and maintained by the Skyline Water Tank, which has an overflow elevation of 730 feet above MSL. The Pump Station pulls water from the Linton Hill Tank (i.e. Low Service Zone) and pumps to the Skyline Tank and High Service Zone. Table 1 below provides a summary of the tanks owned and operated by PW&W.

Table 1

Water Storage Tank Summary			
Tank Name	**Pressure Zone**	**Overflow Elevation**	**Capacity (gal)**
Linton Hill	Low	662	600,000
Industrial Park	Low	662	1,000,000
Skyline	High	730	500,000

The water system's pipe network consists of approximately 89 miles of transmission and distribution lines ranging in size (diameter) from 2-inch to 16-inch. This includes approximately 76,000 LF of a 16-inch transmission line which transports water from the WTP to the Linton Hill Tank and the rest of the system.

F. Population History & Projected Trends

The University of Louisville's Kentucky State Data Center estimates that the population of Caldwell County will decrease by 0.28% by the year 2020 (based on 2010 U.S. Census Data). Additionally, said Data Center estimates that the population of Lyon County will increase by 2.51%. Refer to Table 2 below.

Table 2

Population Projections for Caldwell County & Lyon County			
County	**2010 (census)**	**2020 (projected)**	**% Change**
Caldwell	12,984	12,948	-0.28
Lyon	8,314	8,523	+2.51

Note that population projections for the City of Princeton were not available. Considering this, historical records were examined to determine (a) the population trend in the City of Princeton over the past two (2) decades, and (b) if the population projections for Caldwell and Lyon Counties were reasonable based on population trends over the past two (2) decades. Refer to Table 3 below.

Table 3

***Historical Population Data for the City of Princeton, Caldwell County & Lyon County (based on U.S. Census records)**				
Location	**1990 (census)**	**2000 (census)**	**2010 (census)**	**% Change from 2000 to 2010**
City of Princeton	7,057	6,538	6,329	-3.20
Caldwell County	13,232	13,057	12,984	-0.56
Lyon County	6,624	8,081	8,314	+2.88

**http://www.citypopulation.de/php/usa-census-kentucky.php*

As Table 3 illustrates, the population projections for Caldwell County and Lyon County shown in Table 2 seem reasonable based on past population trends. Additionally, considering that the population in the City of Princeton has decreased over the past two (2) decades and considering the projected population decrease for Caldwell County, it is fair to assume that the population in the City of Princeton will continue to decrease over the next decade. Assuming said population continues to decrease over the next decade at the same rate of the previous decade (3.20%), then the population in Princeton for the year 2020 can be estimated at 6,127. The following table reflects the overall population change expected for PW&W's service area over the next decade.

Table 4

Cumulative Population Projection for PW&W Service Area		
Location	**2010 Population (census)**	**Projected Population in 2020**
City of Princeton	6,329	6,127
Caldwell County	12,984	12,948
Lyon County	8,314	8,523
Total	27,627	27,598

As Table 4 indicates, the population of Princeton Water & Wastewater's service area is expected to decrease only slightly (0.10%) by 2020. For the purposes of water distribution planning, PW&W can safely assume that the population to be served will remain constant, and no increase in demand should be anticipated.

CHAPTER III – SYSTEM DEFICIENCIES

A. General

The Princeton Water & Wastewater Department has examined their entire water system and identified and prioritized deficiencies which negatively impact their ability to provide and maintain dependable drinking water distribution, storage and fire protection to its customer base. The following paragraphs describe in detail these deficiencies and how they impact the PW&W water system, both operationally and financially. Refer to Appendix B for a map showing the locations of the deficiencies.

B. Problem 1: Operation of Industrial Park Tank

In 2004, Princeton Water & Wastewater erected a 1.0 million gallon elevated water storage tank in the Princeton Industrial Park to provide increased water storage and pressure and to facilitate industrial and commercial growth in the western portion of the City. This tank was designed to work in conjunction with the existing Linton Hill

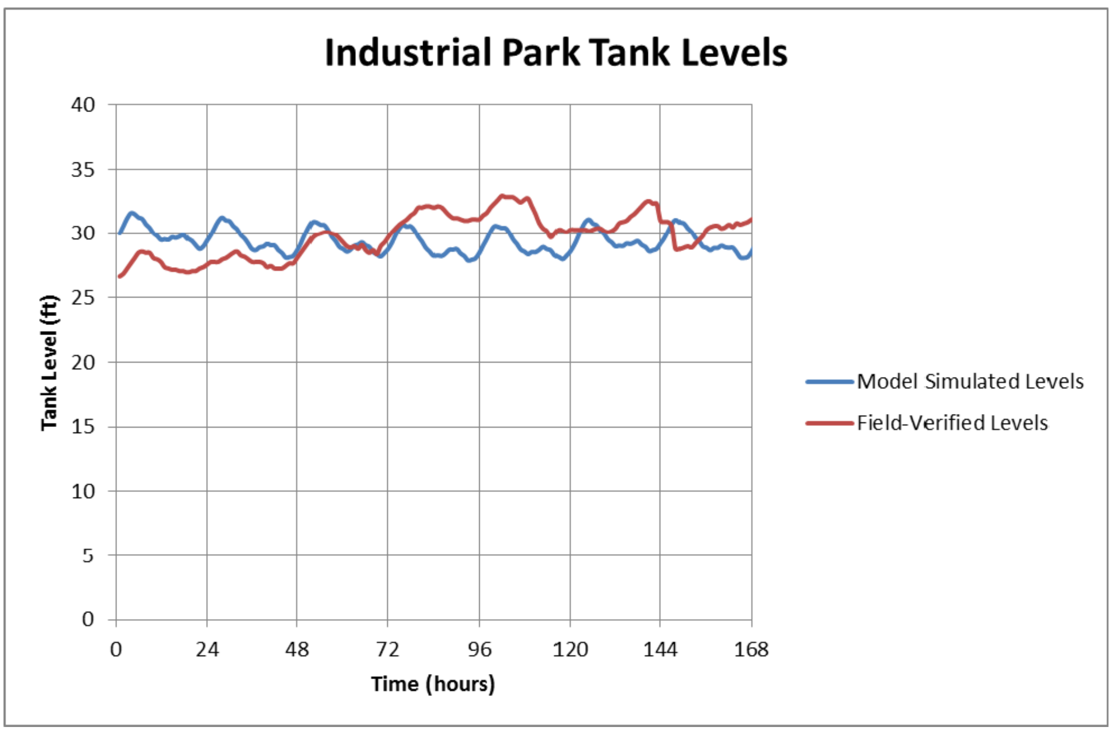
Water Tank and was installed with the same overflow elevation as said tank, which is 662.0 feet above MSL. PW&W anticipated that the two (2) tanks would share the water demand throughout the Low Service Zone of the system, and that the tank levels would fluctuate equally and simultaneously (i.e. rise/fall at the same time and at the same elevations). Unfortunately for PW&W, the Industrial Park Tank has never operated as anticipated and has only been able to fill to approximately 75% of its capacity. Furthermore, the Industrial Park Tank does not fluctuate appropriately as the water level typically ranges in elevation from 30' full to 34' full (40' total height). For comparison purposes, the water level in the Linton Hill Water Tank, which fluctuates appropriately, typically ranges in elevation from 25' full to 42' full (42' total height). The inability of the Industrial Park Tank to fill and fluctuate is a problem for the following reasons;

1. Poor water quality in the Tank
2. Reduced usage of available infrastructure
3. Increased flushing and maintenance costs

A major concern with the current condition of the Industrial Park Tank is the quality of water in the Tank. The Kentucky Division of Water ("DOW") distribution storage guidelines require that the stored water (i.e. water in a tank) is completely turned over (cycled) in a 72-hour period, or 33% each day, to maintain appropriate water quality. As stated earlier, the water level in the Industrial Park Tank only fluctuates approximately four (4) feet, or 100,000 gallons, every 24 hours. This is a 10% turnover rate, which would require ten (10) days (240 hours) for complete tank cycling. Considering this, PW&W is forced to periodically drain the old water in the tank out onto the ground to feed new water into the tank. PW&W estimates that up to approximately 1 million gallons of treated water are wasted each year due to draining of the Industrial Park Tank. Furthermore, it is estimated that an additional 4,574,785 gallons of treated water was wasted in the fiscal year ending June 2012 on a single hydrant on Highway 62 West. This hydrant and corresponding water line is fed directly from the Industrial Park Tank, which explains why water quality in the line is an ongoing issue. At an approximate cost to PW&W of $2.09 per 100 cubic feet to treat raw water, these are very costly deficiencies.

In 2008, PW&W tasked Hethcoat & Davis, Inc. ("H&D") to prepare a hydraulic model in order to replicate, as close as practical, its existing water distribution system. In conjunction with the hydraulic model, H&D identified system deficiencies and subsequent recommendations. Furthermore, the water model has been constantly updated since its initial development to reflect changes made in the distribution system and to more accurately simulate proposed improvements. In the current model, the water levels of the Industrial Park Tank closely match the field-observed levels, as indicated in Graph 1 below.

Graph 1



After further analysis, it was determined that the inability of the Industrial Park Tank to fill and fluctuate appropriately was due to the network of smaller diameter lines between the 16-inch transmission line and the Tank. The Linton Hill Tank is fed directly through a 16-inch transmission line which spans approximately 14 miles from the tank to the WTP. The Industrial Park Tank, on the other hand, is fed from the 16-inch transmission line through a series of 2-inch, 3-inch, 4-inch, 6-inch, 8-inch and 10-inch water lines. These smaller diameter lines create a greater head loss on the system when compared to the 16-inch line, thus the smaller lines restrict the flow of water across the system. This explains why the Linton Hill Tank is able to fill and fluctuate appropriately, and why the Industrial Park Tank is not able to do so.

As stated previously, the 1.0 million gallon Industrial Park Tank can only fill to approximately 75% of its capacity, which results in approximately 250,000 gallons of unused volume in the tank and an ineffective use of the infrastructure created. This unused volume could potentially be critical in times of emergencies, such as high service pump failure at the WTP and line breaks where transmission of water from the WTP to the system is compromised. In times such as these, the only available water for the PW&W service area would be the water that is currently in the tanks and lines. Unfortunately, PW&W has recently experienced such emergency scenarios. In January 2009, the City of Princeton and surrounding counties experienced a severe ice storm, which created a widespread power outage. The PW&W water treatment plant lost power and was unable to pump water into the system for four (4) days, at which point a temporary generator was finally obtained. As the system had only a 1-day supply of water in the system at the time of the power outage, PW&W's service area was completely out of water for a period of three (3) days. Though PW&W has since installed a permanent stand-by generator at the WTP, the additional capacity of the Industrial Park Tank could be critical during such an event. Then, at approximately 4:30 am on September 5th, 2012, the existing 10-inch water line, which is the primary conduit to transport water to the Industrial Park Tank, ruptured near its connection to the 16-inch transmission line from the WTP. This break occurred underneath a City-owned garage, which delayed the response time to locate and valve off the leak. The leak caused the Linton Hill Tank to completely empty within 1 and a half hours as the 16-inch water line provided a direct conduit for water to escape from the Linton Hill Tank. The Skyline Tank to empty within approximately 20 hours (note that the Skyline Tank emptied based on High Service Zone demand and lack of water supply from the Linton Hill Tank). On the other hand, it took approximately 25 hours for the Industrial Park Tank to empty. The fact that it took so long for the Industrial Park Tank to empty when compared to the Linton Hill Tank further illustrates the inability of the system to move water in and out of the Industrial Park Tank. Furthermore, this leak forced PW&W to issue a boiled water advisory for 2 and a half days, which caused local restaurants to close until the advisory was lifted. Several other businesses that depend on water for cooling and manufacturing were forced to adjust scheduling, shift work, etc. Considering these factors, the leak resulted in a significant loss in revenue in the City's central business district.

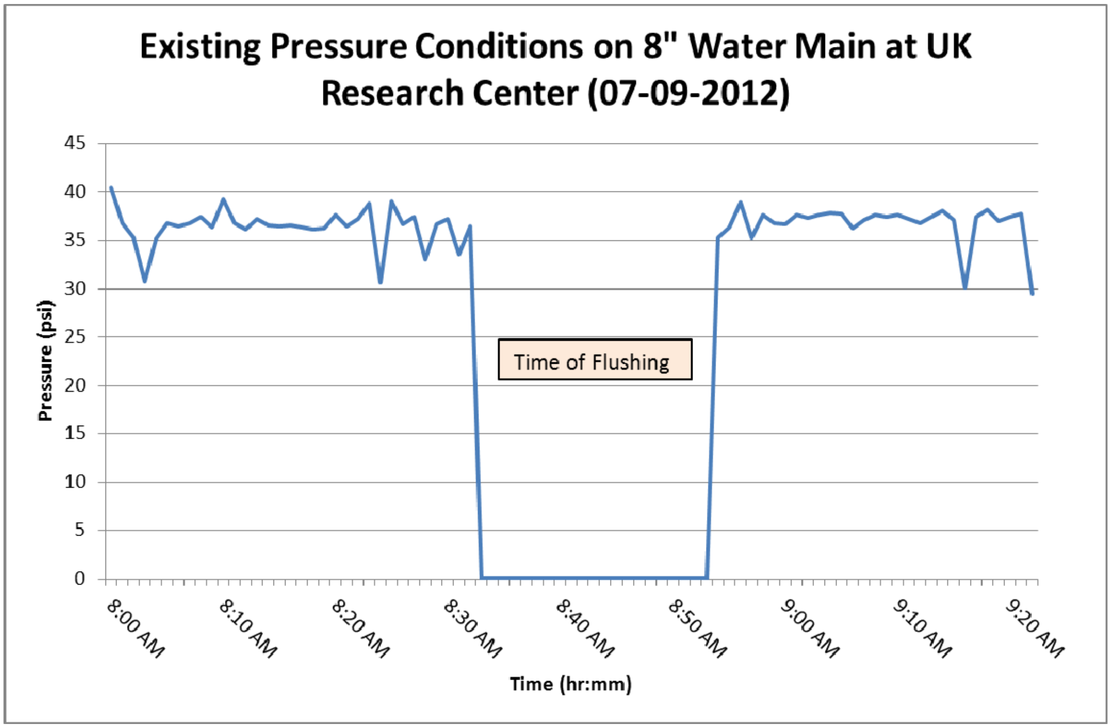
These events are extremely dangerous scenarios for residents and businesses that depend on water for domestic use and fire protection. In the event of a fire during such an event, firefighters might only have a limited supply of water, if any, and the probability of property damage and loss of life would increase significantly. Considering this, the extra 250,000 gallons of available storage in the Industrial Park Tank could be critical during emergencies if it is able to get into the system. Furthermore, the appropriate operation of the Industrial Park Tank will allow for water service to continue across the Low Service Zone in the event the Linton Hill Tank is temporarily placed out of service.

C. Problem 2: Water Infrastructure Near UK Research Center

The second-ranked deficiency occurs in the southeast portion of the distribution system. The University of Kentucky operates a research center located between Sandlick Road and Hopkinsville Street (Highway 91) on either side of University

Drive. Said Research Center draws water from an existing "dead-end" 8-inch water main along Sandlick Road and utilizes private pumps to boost pressures for the facility's daily operations. These pumps require a minimum residual suction pressure of 20 psi in order to operate (the pumps will automatically shut off if a suction pressure below 20 psi is experienced). Under normal operating conditions, residual pressures of approximately 30-40 psi are maintained in the line on the suction side of the booster pumps. Based on the limited water usage of the Research Center and the surrounding area, the dead-end 8-inch water line along Sandlick Road is oversized. In other words, there is not enough demand in the area to cycle water in the line and thus adequate chlorine residuals cannot be maintained. Considering this, PW&W utilizes a flushing assembly during the summer months (typically May – August) in order to drain the old water from the line and replace it with new water. The flushing is performed every day of the summer months for two (2) hours at a flow rate of approximately 280 gpm. This operation is costly to PW&W as approximately 34,000 gallons of treated water are wasted each day the flushing occurs. Furthermore, when said flushing does occur, residual pressures in the area drop well below 20 psi. The graph below reflects readings taken in July 2012 by a pressure recorder installed on a fire hydrant on Sandlick Road near the Research Center's pump station. This flushing event was conducted for only twenty minutes to illustrate the effect that flushing has on the residual line pressure.

Graph 2



Flushing events like the one graphed above cause the private pump station to shut down until the residual pressure increases to a point above 20 psi and the pumps are manually re-started.

More importantly, the issues caused by flushing illustrate the inability of PW&W to provide adequate fire protection at this location with the current infrastructure. The Kentucky DOW requires that a minimum residual pressure of 20 psi is maintained on the water main during a fire-flow of 500 gpm for a period of two (2) hours. As the above graph indicates, PW&W cannot achieve the State-required fire protection in this area.

The improvement of the water infrastructure in this area is critical to both Princeton Water & Wastewater and the University of Kentucky Research Center as it will improve water quality and residual pressure and provide adequate fire protection to the area.

D. Problem 3: Unaccounted Water

Unaccounted water, commonly referred to as “water loss”, is typically experienced in leaks or tank overflows where the amount of water leaving the system cannot be or is not metered and/or recorded. Pumping and billing records indicate that Princeton Water & Wastewater experienced an average water loss value of approximately 10% per month over the 2012 fiscal year. However, that value increased to an average of 17% per month between January 2012 and June 2012 (refer to Table 5 below).

Table 5

Month	Water Pumped from WTP (CF)	Accounted Water (CF)	Variance (CF)	Water Loss %
Jul-11	6,697,059	6,104,112	592,947	8.9%
Aug-11	6,885,695	7,110,982	(225,287)	-3.3%
Sep-11	6,528,209	6,487,735	40,474	0.6%
Oct-11	6,518,182	6,560,922	(42,740)	-0.7%
Nov-11	5,708,556	5,358,628	349,928	6.1%
Dec-11	5,966,711	5,511,126	455,585	7.6%
Jan-12	6,019,519	5,066,651	952,868	15.8%
Feb-12	5,620,722	5,256,330	364,392	6.5%
Mar-12	6,164,037	4,789,268	1,374,769	22.3%
Apr-12	6,432,620	5,406,540	1,026,080	16.0%
May-12	7,532,219	5,553,193	1,979,026	26.3%
Jun-12	7,444,385	6,335,019	1,109,366	14.9%
FYE 06/30/2012 Total	77,517,914	69,540,506	7,977,408	**10.3%**
Last 6-Months Total	39,213,503	32,407,001	6,806,502	**17.4%**

Many times, specifically in the karst landscape of Western Kentucky, water line leaks can be nearly impossible to identify and locate as the water can escape the pipe and quickly flow to underground caves/channels and never reach the surface. If leaks do not surface, they are rarely discovered without specialized leak detection equipment. Considering the amount of water line located in rural areas outside the densely populated Princeton City limits, PW&W currently does not know where deficient, leaking lines are concentrated. This knowledge would allow PW&W to be proactive in maintaining a reasonable percentage of unaccounted water.

Additionally, the oldest portion of the water distribution is located in the more densely populated downtown area. The age of the system in this area would indicate that the area is contributing significantly to water loss. Unfortunately, there are very few valves in this area that allow PW&W to locate and isolate leaks with minimal impact to water customers. The inability to isolate smaller areas of the system also contributes to water loss as leaks cannot be detected quickly.

E. Problem 4: Condition of Skyline Tank

The Skyline Tank, which provides water and maintains pressures to the High Service Zone, is a 500,000 gallon elevated storage tank. Since its erection in 1991, the tank has not been rehabilitated. In December 2012, the tank was inspected by representatives of Tnemec (paint manufacturer) to determine the need for rehabilitation and site improvements.

During the inspection, an ASTM 3359-B adhesion test was performed on the exterior of the tank riser, which indicated that the existing paint had only marginal adhesion. Additionally, significant deterioration of the top coat was noted on the exterior of the tank as the intermediate coat was visible in several locations. Furthermore, heavy rust is noted around the hatch opening and top six (6) interior ladder rungs, and corrosion was noted throughout the bowl. There were additional deficiencies noted during the tank inspection, including but not limited to inadequate vent and overflow screens, rusted and out-of-line safety climb notch rail and loose sway rod(s). Refer to Appendix C for a report of the tank inspection and corresponding photographs.

The inspection also revealed that there is no fence present around the perimeter of the water tank, nor is a gate present on the access road to the tank. The Kentucky Division of Water follows the design guidelines and requirements of the Upper Mississippi River Board's "Recommended Standards for Water Works" for its drinking water facilities. This document states the following in regards to Finished Water Storage (i.e. water tanks); "Fencing, locks on access manholes, and other necessary precautions shall be provided to prevent trespassing, vandalism, and sabotage. Consideration should be given to the installation of high strength, cut resistant locks or lock covers to prevent direct cutting of a lock." While the access point to the riser at ground level is locked, the lock is not cut-resistant nor is it equipped with a lock cover. Furthermore, the hatches at the top of the tank are not equipped with locks. In its current condition, the Skyline Water Tank is not adequately protected from trespassing, vandalism or sabotage per the Division of Water's recommendations.

During the inspection, it was also observed that the access road from Skyline Drive to the water tank site was extremely muddy and had a deteriorated drive and parking area for service vehicles. During wet conditions, vehicular access to the tank can be difficult. Furthermore, in order to manually drain the tank, PW&W is forced to valve off the discharge line and open a hydrant on the tank-side of the closed valve. While this operation in and of itself is not a concern, the drained water from the hydrant flows downhill and across the access road to a nearby drainage ditch. The same thing occurs during tank overflows as the overflow pipe is located near said hydrant. The water discharged during times of draining or overflows severely erodes and undermines the already deteriorated access road.

The Skyline Tank provides dependable drinking water and adequate residual pressures to its customers. Furthermore, these customers depend solely on the Tank to provide and maintain fire protection to its service area. Therefore, the rehabilitation of the Skyline Tank and improved site access/protection are critical to maintaining long-term water service and fire protection to the High Service Zone.

CHAPTER IV – REASONABLE ALTERNATIVES

A. General

This Chapter examines various alternative solutions that are available to address the water system deficiencies described in Chapter III. The goals PW&W desires to achieve with each solution are as follows.

1. **Goal 1: Allow the Industrial Park Tank to Fill and Empty Appropriately**. This will maintain adequate water quality in the Tank under normal operating conditions, prevent flushing of tank / wasting of treated water, and maximize usage of the available infrastructure.

2. **Goal 2: Improve Residual Pressures, Water Quality and Fire Protection Near the UK Research Center.** This will allow for the Research Center to maintain private pump operation during times of high usage. This will also allow PW&W to maintain adequate water quality and fire protection in the area while preventing flushing of line / wasting of treated water.

3. **Goal 3: Identify Areas Contributing to Water Loss.** This will allow PW&W to isolate and identify areas of the water system contributing to water loss so that repairs can be made to the deficient water lines.

4. **Goal 4: Increase the Longevity of the Skyline Water Tank.** This will ensure long-term dependable water service in the High Service Zone.

B. Goal 1: Allow the Industrial Park Tank to Fill and Empty Appropriately

1. <u>Alternative 1 – Utilize the Existing Altitude Valve at Linton Hill Tank</u>

As discussed earlier, under current conditions the Industrial Park Water Tank reaches only 75% of its storage capacity and does not fill/empty appropriately. One alternative for filling and emptying the storage tank is to utilize the existing altitude valve at the Linton Hill Tank. This altitude valve is simply a control valve that was designed and installed to "close" when the Linton Hill Tank becomes full and "open" once the Industrial Park Tank becomes full so that both could distribute water to the system. Unfortunately, utilizing the altitude valve alone is not a feasible alternative as PW&W has discovered that the pressure increase (i.e. "spike") on the system caused by the closing of the altitude valve produces line breaks on the smaller-diameter lines throughout the system. This alternative does not greatly improve distribution across the system. It also makes the Linton Hill Tank inoperable for the period of time that the altitude valve is closed to allow the High Service Pumps to direct water to the Industrial Park Tank.

2. Alternative 2 – Relocate Tank Site

A second alternative to improve the system storage capacity and water quality of the Industrial Park Tank is to abandon the tank at its current location and re-construct a new tank farther south in close proximity to the existing 16-inch transmission line. If designed correctly, the new tank should fill and empty appropriately in conjunction with the Linton Hill Tank as water would not have to travel through a network of small diameter lines in order to enter (and exit) the Tank. However, the Industrial Park Tank was designed and located in part to increase water storage and pressure and to facilitate industrial and commercial growth in the western part of the City. Relocating the tank site does nothing to achieve these goals, and would most likely reduce pressures in the western portion of the City. Furthermore, the proposed location for a new tank would need to be on the south side near the existing 16-inch transmission line. This is an area that currently has no pressure issues nor is it an area of anticipated growth. Considering this, abandoning the Industrial Park Tank in its current location and installing a new tank on the south side of the City is not a feasible alternative.

3. Alternative 3 – Install New Large Diameter Transmission Line

A third alternative to address the problems currently experienced in the Industrial Park Water Tank is to install a larger diameter line from the existing 16-inch line along Seminary Street to the Industrial Park Tank site. This larger line would allow a direct path for water to flow to and fill the Industrial Park Tank without having to meander through a network of small-diameter lines. Similarly, the large diameter line would also allow for the Tank to empty appropriately. This will achieve adequate turnover and improve water quality in the Tank, which would prevent the need to periodically drain the Tank and waste treated water. Based on system hydraulics, the Linton Hill Tank would fill slightly quicker than the Industrial Park Tank. Considering this, PW&W would need to utilize the existing altitude valve at the Linton Hill Tank (refer to Alternative 1 above) to allow for continued pumping to fill the Industrial Park without overflowing the Linton Hill Tank. Note that PW&W would no longer have concerns over breaks in the smaller diameter lines as the new main would greatly decrease the pressure spikes which have been experienced with closure of the altitude valve. The duration of closure of the Linton Hill altitude valve under this alternative will be significantly less than that in Alternative 1. The proposed route of the new transmission main will also allow for the abandonment of existing deficient water lines that have experienced chronic leaks and maintenance over the past decade. The abandonment of these lines should help reduce the water loss experienced in the distribution system. Furthermore, this alternative will allow for water service to continue across the Low Service Zone in the event the Linton Hill Tank is temporarily placed out of service.

C. Goal 2: Improve Residual Pressures, Water Quality and Fire Protection Near the UK Research Center

1. Alternative 1 – Replace Existing Oversized Water Line

   As stated previously, the University of Kentucky Research Center utilizes a private pump station to boost water pressure for its daily operations. Unfortunately, the existing water infrastructure compromises the pump station's operation, and does not provide adequate fire protection and water quality in the area. One alternative to improve water quality is to replace approximately 4,900 LF of the existing 8-inch diameter line along Sandlick Road with a smaller diameter line. While this would significantly improve the quality of water in the line, it would lower the already marginal residual pressure required to keep the pump station in operation. Furthermore, it would reduce the already insufficient fire protection at the end of the line. In the event that a large demand was experienced in the area, such as a line break, the research center would not be able to utilize its pump station and would basically be out of water for the duration of the event. Considering these factors, this is not a fundamentally sound engineering alternative for PW&W.

2. Alternative 2 – Install New Water Lines to Switch Service Area Over to High Service Zone

   A second alternative to increase residual pressures, water quality and fire protection near the UK Research Center is a two-part alternative. Part 1 involves the installation of approximately 5,200 LF of new 8-inch water line from the existing 8-inch line on Dawson Road (Highway 62) to the existing 8-inch water line on Sandlick Road. Along with closures of specific existing valves and/or installation of new valves, this would allow for the existing 8-inch water line which serves the research center to be switched over to the High Service Zone. This re-zoning would boost residual (suction) pressures for the booster pumps by approximately 35 psi. While it does allow for uninterrupted service to the research center even at times of flushing or other large usage, it does not alone address the issue related to water quality. Part 2 of this alternative includes the installation of approximately 2,200 LF of new 8-inch water line along University Drive from the existing 8-inch line on Sandlick Road to the existing 8-inch line along Hopkinsville Street (Highway 91). Just like Part 1 above, this would also require the closures and/or installations of valves to ensure the new line is served by the High Service Zone. This new line would greatly reduce the length of the oversized "dead-end" line, which would improve water quality in the area and prevent the need to periodically flush the line and waste treated water.

3. Alternative 3 – Do Nothing

   A third alternative would be to do nothing and leave the infrastructure in its current condition. Unfortunately, this will require constant flushing of the water line to maintain adequate water quality, which will reduce the residual line pressure below the 20 psi low suction cutoff of the private pump station and treated water wasted during flushing. Furthermore, it will continue to produce inadequate fire protection well below the Kentucky DOW requirements. Considering these factors, this is not a feasible alternative for PW&W.

D. Goal 3: Identify Areas Contributing to Water Loss

1. Alternative 1 – Contract a Leak Detection Company

   As stated previously, PW&W suffers from excessive water loss in their distribution system, and the sources of the water loss are unknown. One alternative to identify areas of the water system contributing to water loss is to hire a leak detection company to examine the distribution system and try to locate existing water leaks. This is done by an individual (or individuals) with specialized equipment to physically walk along the water lines and listen for leaks. In a small water system or in an isolated area where known leaks occur, this is an ideal solution for locating the leaks and sources of water loss. Unfortunately, PW&W's water system consists of approximately 89 miles of water line, and currently PW&W cannot identify smaller areas of the system which they feel contribute the most to water loss. Furthermore, the leak detection services can only identify leaks (or lack thereof) for that exact moment on a specific water line, thus it is not adequate for long-term monitoring. Considering these factors, this is not a feasible alternative for PW&W.

2. Alternative 2 – Install Master Meter Assemblies and Isolation Valves at Specified Locations

A second alternative to identify areas of the water system contributing to water loss is to install in-line master meter assemblies and isolation valves at specified locations. The meter assemblies will allow PW&W to monitor the amount of water travelling through the main line to a particular area of the system, and compare that value to the total water used by the customers in that area (individual meters). By comparing the two (2) values, PW&W could then determine if that specific area is contributing to water loss. If they find that area does contribute to water loss, it would then facilitate the use of a leak detection company to inspect that smaller, isolated portion of the system and locate the leaks/sources contributing to the water loss (if leaks are not visible). Furthermore, it would provide long-term monitoring of the specific areas so that PW&W could periodically check the master meter values versus the individual meter values to identify if and when new leaks occur in the system. The installation of isolation valves would allow PW&W to isolate smaller portions of the system during a leak to minimize service interruption to its customers. Furthermore, the valves would allow PW&W to more quickly locate and valve off a leak, which would decrease the amount of water lost at the leak.

3. Alternative 3 – Do Nothing

A third alternative would be to do nothing and leave the infrastructure in its current condition. Unfortunately, this will not allow PW&W to monitor isolated areas of the water system to identify those areas which are contributing to water loss. Without first identifying those areas, PW&W will remain ill-equipped to repair deficient water lines and reduce the water loss they currently experience. Considering these factors, this is not a feasible alternative for PW&W.

E. Goal 4: Increase the Longevity of the Skyline Water Tank

1. Alternative 1 – Paint Over Deficient Areas

As stated previously, a December 2012 tank inspection revealed numerous deficiencies in the Skyline Tank's physical condition and site protection (refer to Appendix C), as well as access to the Tank site. This Tank is the only source of water storage (and adequate pressure) in the High Service Zone, so the condition and protection of the Tank is critical to the long-term water service of the system. One alternative to address the Tank's physical condition is to apply a top-coat of paint over the noted deficient areas inside and outside of the Tank. This would simply be a cosmetic improvement to the Tank, and the paint would most likely only last for a few years due to the noted rust and corrosion which would undoubtedly surface above the new paint. Furthermore, several areas showed signs that sand previously used to blast the tank prior to the last painting was present beneath the existing top-coat. This sand creates small voids between the paint layers, allowing for moisture to accumulate and corrode the surface. Even at the locations where corrosion has not yet surfaced, it will most likely surface within a few years. Simply painting over the deficient areas does nothing to correct the existing deficiencies and prevent future deficiencies. Furthermore, painting the tank does nothing to improve site access and protection. Considering these factors, this is not a feasible alternative for PW&W.

2. <u>Alternative 2 – Rehabilitate the Entire Tank</u>

   A second alternative to increase the longevity of the Skyline Tank is to completely remove the existing interior and exterior paint and deficiencies by sand-blasting, and repaint the entire tank. This will ensure the Tank will remain in excellent conditions for 20+ years as the potential for constant re-painting of deficient areas will not be needed. Along with repainting the Tank, this alternative will also include installation of new safety climb accessories and other miscellaneous upgrades to ensure safety and protection of the water supply and PW&W personnel. Furthermore, this alternative will include an improved access road and new fencing to facilitate access of site to PW&W personnel while preventing unauthorized access to the Tank.

3. <u>Alternative 3 – Do Nothing</u>

   A third alternative would be to do nothing and leave the Tank in its current condition. Unfortunately, this will allow the Tank condition to continue to deteriorate to a point where it can no longer be utilized to store and supply water to the High Service Zone. At that point, PW&W would be forced to design and construct a new water tank in the High Service Zone, which is not a feasible alternative at this time.

CHAPTER V – RECOMMENDED SOLUTIONS / PROPOSED PROJECTS

A. General

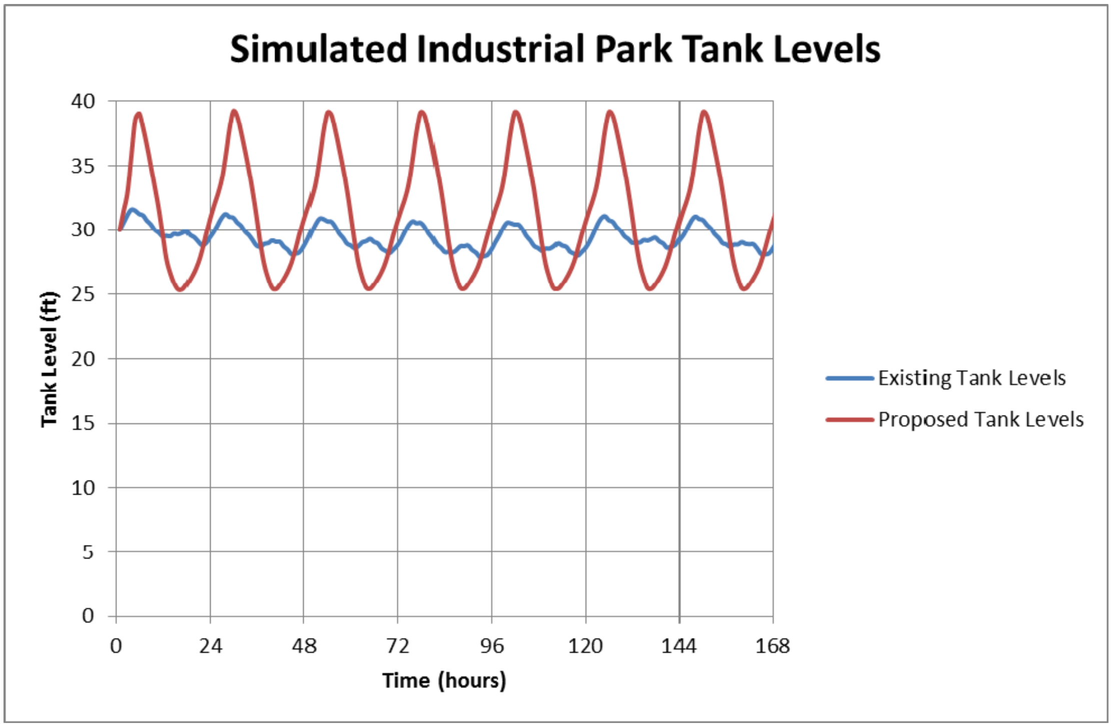
This chapter examines the solutions which have been selected to address the problems experienced in the Princeton Water & Wastewater distribution system. This chapter also outlines the corresponding proposed projects and construction cost estimates. **Refer to Appendix D for a location map of the proposed projects.**

B. Solution to Problem 1 (Operation of Industrial Park Tank)

1. Solution: Alternative 3 – Install New Large Diameter Transmission Line: This alternative is the most reasonable solution to maximizing the available storage and improving the water quality inside the Industrial Park Tank. This also allows the original goals of the Industrial Park Tank to be maintained (provide increased water storage and pressure and to facilitate industrial and commercial growth in the western portion of the City). Furthermore, this will allow PW&W to maintain water service within the Low Service Zone in the event the Linton Hill Tank is temporarily placed out of service.

2. The project will consist of approximately 9,500 LF of 16-inch water line from the existing 16-inch line along South Seminary Street to the existing 10-inch water line at Park Avenue / Highway 62W. The project will also include approximately 1,300 LF of 10-inch water line from the existing 10-inch water line along Highway 62W to the existing 10-inch water line serving Wal-Mart from the Industrial Park Tank. Graph 3 below shows the improved operation of the Industrial Park Tank with the addition of the transmission line.

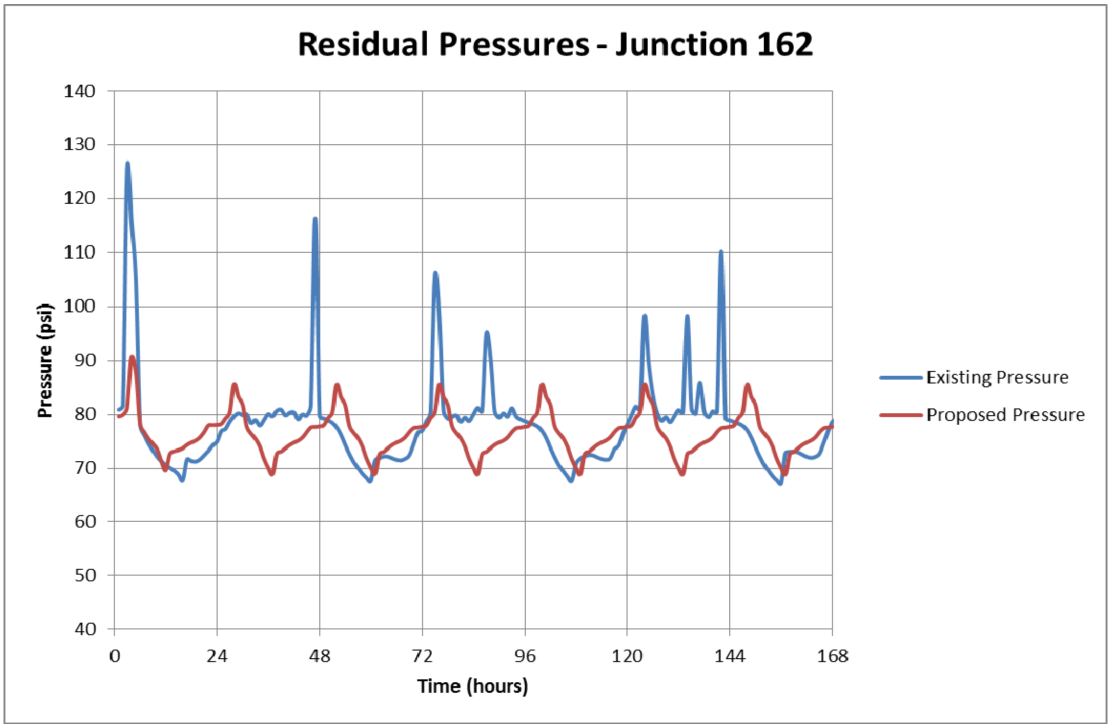
Graph 3



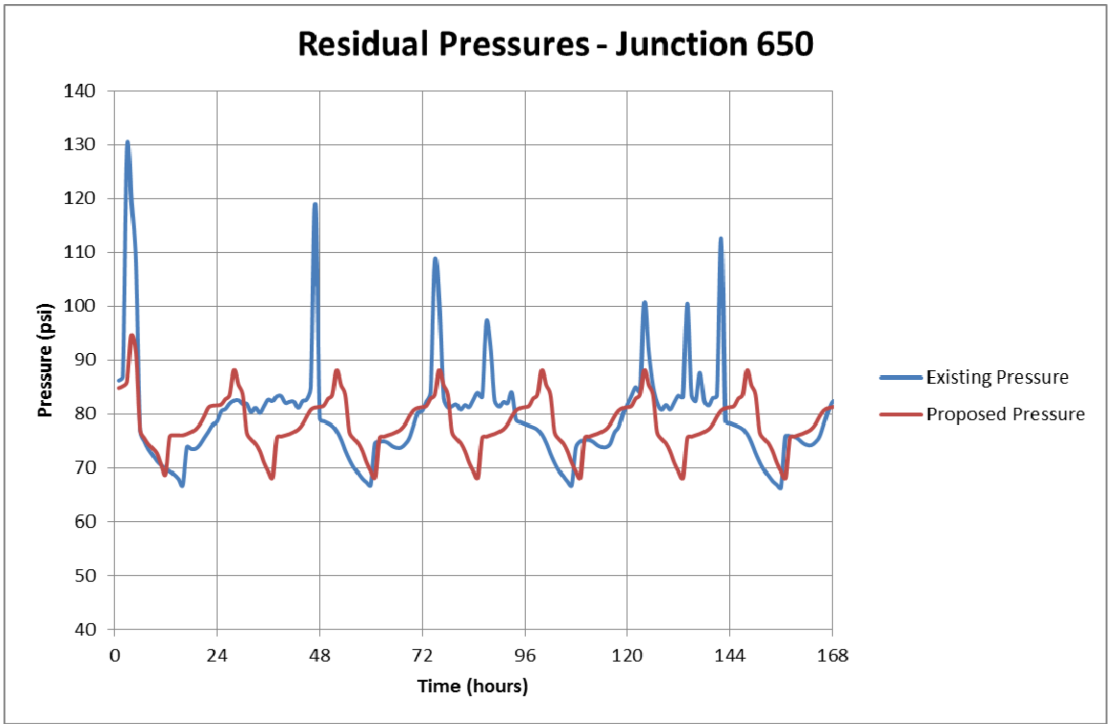
As Graph 3 indicates, the Industrial Park Tank will be able to fill and empty appropriately with the installation of the transmission line, which will achieve approximately 33% tank turnover within a day. This will meet the Division of Water distribution storage requirements. Furthermore, the Tank will be able to maximize its available capacity, which could be critical during times of emergency.

Graphs 4 – 6 below show the decreased pressure spikes at different locations in the Low Service Zone with the addition of the transmission line. **Refer to Appendix E for a map showing the location of each junction node.**

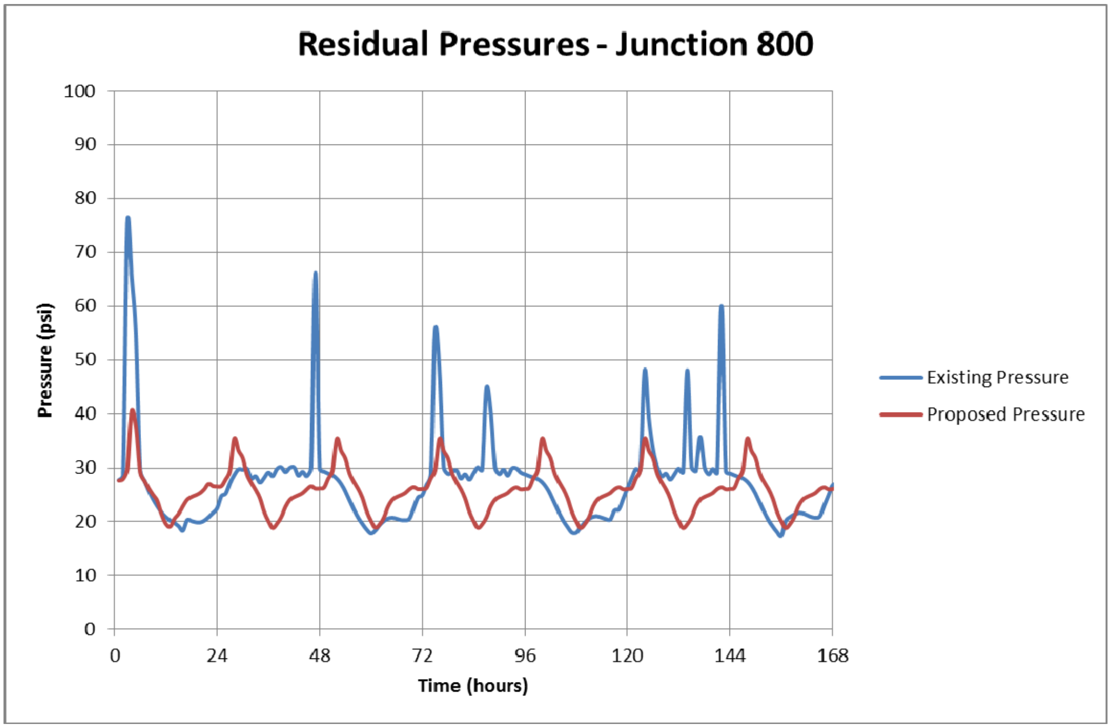
Graph 4



Graph 5



Graph 6



As Graphs 4-6 indicate, the pressure spikes will decrease significantly at all locations with the installation of the transmission line. In the case of Junction 650, the pressure spike will decrease by as much as 35 psi. This could alleviate the problems with line breaks previously experienced by PW&W.

3. The construction cost of the proposed project is estimated at $1,280,000. Refer to Table 6 below for itemized breakdown of costs.

Table 6

Project 1 - 16" Water Transmission Line					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
1	16" C905 PVC Water Line (outside of pavement)	8,300	LF	$60.00	$498,000.00
2	16" C905 PVC Water Line (inside of pavement)	1,000	LF	$70.00	$70,000.00
3	16" DIP Anchored to Outside of Bridge	200	LF	$200.00	$40,000.00
4	10" SDR 21 PVC (outside of pavement)	1,300	LF	$45.00	$58,500.00
5	Connect to Existing Water Line (10" - 16")	5	EA	$3,000.00	$15,000.00
6	Connect to Existing Water Line (8" & below)	9	EA	$2,000.00	$18,000.00
7	6" CL200 PVC Water Line	1,000	LF	$10.00	$10,000.00
8	16" Gate Valves	12	EA	$6,000.00	$72,000.00
9	10" Gate Valves	3	EA	$2,500.00	$7,500.00
10	6"-8" Gate Valves	13	EA	$1,000.00	$13,000.00
11	Standard Fire Hydrant Assembly	12	EA	$3,500.00	$42,000.00
12	Bore & Jack 30" Steel Casing w/ 16" Carrier Pipe	80	LF	$300.00	$24,000.00
13	Asphalt Pavement Repair	20,000	SF	$12.00	$240,000.00
14	Open-cut 3/4" HDPE DR9 Service Line	560	LF	$6.00	$3,360.00
15	Bore 3/4" HDPE DR9 Service Line (no casing)	700	LF	$16.00	$11,200.00
16	Service Reconnections to New Line	56	EA	$200.00	$11,200.00
17	Ductile Iron Fittings	16,600	LBS	$4.50	$74,700.00
18	Erosion Control	1	LS	$10,500.00	$10,500.00
19	Mobilization & Bonds	1	LS	$61,040.00	$61,040.00
				Total Project 1 =	**$1,280,000.00**

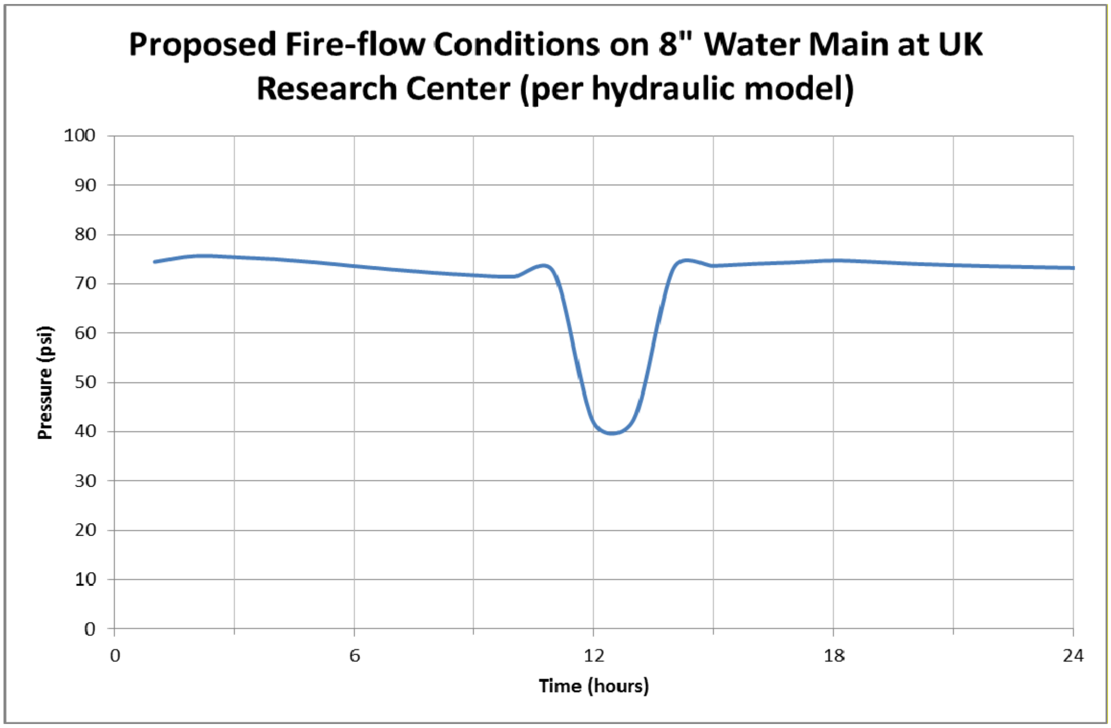
C. Solution to Problem 2 (Water Infrastructure Near UK Research Center)

1. Solution: Alternative 2 – Install New Water Lines to Switch Service Area Over to High Service Zone: This alternative is the most effective solution to increasing the residual pressures, water quality and fire protection near the UK Research Facility. Additionally, it will allow for uninterrupted operation of the private booster pump while reducing the amount of treated water wasted by flushing the line.

2. Part 1 of the project will consist of approximately 5,600 LF of 8-inch water line from an existing 8-inch line on Dawson Road to an existing 6-inch line along Sandlick Road. Part 2 of the project will consist of approximately 2,100 LF of 8-inch water line along University Drive from an existing 8-inch line along Sandlick Road to an existing 8-inch line along Hopkinsville Street (Highway 91). Both Parts 1 and 2 will also require valve insertion/configuration to move the area from the Low Service Zone to the High Service Zone. Graph 7 below illustrates the improved fire-flow capabilities of the water infrastructure near the UK Research

Center with the addition of these improvements. The pressure drop reflected in the graph occurred under a simulated fire-flow event of 500 gpm for two (2) hours.

Graph 7



As Graph 7 indicates, the normal operating pressure in the area will increase from approximately 35 psi to 75 psi. Furthermore, the residual pressure during a 500 gpm fire-flow event will only drop to approximately 40 psi, well above the DOW requirement of 20 psi.

3. The construction cost of the proposed project is estimated at $378,000. Refer to Table 7 below for itemized breakdown of costs. **Exhibit D indicates the location of the proposed water lines.**

Table 7

Project 2 - Water Line Improvements for UK Research Center					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
1	8" SDR 21 PVC Water Line, including fittings	7,800	LF	$40.00	$312,000.00
2	Connect to Existing Water Line (all sizes)	5	EA	$2,000.00	$10,000.00
3	8" Gate Valve	7	EA	$900.00	$6,300.00
4	Standard Fire Hydrant Assembly	4	EA	$3,200.00	$12,800.00
5	Asphalt Pavement Repair	1,000	SF	$12.00	$12,000.00
6	Erosion Control	1	LS	$7,000.00	$7,000.00
7	Mobilization & Bonds	1	LS	$17,900.00	$17,900.00
				Total Project 2 =	**$378,000.00**

D. Solution to Problem 3 (Unaccounted Water)

1. Solution: Alternative 2 – Install Master Meter Assemblies and Isolation Valves at Specified Locations: This alternative is the most effective long-term solution to monitor and identify specific areas of the distribution system contributing to water loss. Furthermore, it will facilitate the reduction of water loss as PW&W will be better equipped to repair leaks and correct other deficiencies. Note that the master meter assemblies can only be installed on lines that move water in a single direction.

2. The project will consist of flow meter assembly installations at the following approximate locations in the High Service Zone:
   a. Existing 10-inch water line on Highway 293N south of Oak Street
   b. Existing 8-inch water line on Highway 91N north of the 12-inch water line connection
   c. Existing 12-inch water line between North Jefferson Street and Dawson Road north of East Young Street.
   d. Existing discharge line of Linton Hill Booster Station

Refer to Appendix D for a map of the described locations.

The project will also include the purchase of main line tapping equipment, valve insertion equipment and miscellaneous valves so that PW&W can isolate portions of the downtown water system during leaks and repairs.

3. The construction cost of the proposed project is estimated at $195,000. Refer to Table 8 below for itemized breakdown of costs.

Table 8

Project 3 - Master Meter & Isolation Valve Installation					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
1	Install 6" Mag Meter Assembly, complete	2	EA	$25,000.00	$50,000.00
2	Install 4" Mag Meter Assembly, complete	2	EA	$20,000.00	$40,000.00
3	Purchase Water Line Tapping Equipment, Valve Insertion Equipment and Miscellaneous Valves	1	LS	$100,000.00	$100,000.00
4	Mobilization & Bonds	1	LS	$5,000.00	$5,000.00
				Total Project 3 =	**$195,000.00**

E. Solution to Problem 4 (Condition of Skyline Tank)

1. Solution: Alternative 2 – Rehabilitate the Entire Tank: This alternative is the most effective long-term solution to increase the longevity of the Skyline Water Tank and thus water service to the High Service Zone.

2. The project will consist of the rehabilitation of the interior and exterior of the existing Skyline Water Tank, including sand-blasting and repainting, replacement of safety climb assemblies and vent screens, replacement of ladder rungs where needed, tightening of sway rods and other miscellaneous work. Project will also consist of the installation of security fencing and upgrades to the site access road.

3. The construction cost of the proposed project is estimated at $247,000. Refer to Table 9 below for itemized breakdown of costs.

Table 9

Project 4 - Skyline Tank Rehabilitation					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
1	Skyline Tank Rehabilitation	1	LS	$220,000.00	$220,000.00
2	Install New 6' Fencing Around Tank Site	1	LS	$10,500.00	$10,500.00
3	Access Road Improvements	1	LS	$3,500.00	$3,500.00
4	Erosion Control	1	LS	$1,500.00	$1,500.00
5	Mobilization & Bonds	1	LS	$11,500.00	$11,500.00
				Total Project 4 =	**$247,000.00**

F. Summary of Proposed Projects & Costs

Table 10 below summarizes the proposed projects and the corresponding costs.

Table 10

Preliminary Cost Estimate - 2013 RD Water System Improvements	
Project 1 - 16" Water Transmission Line	$1,280,000.00
Project 2 - Water Line Improvements for UK Research Center	$378,000.00
Project 3 - Master Meter Installation, Equipment Purchases	$195,000.00
Project 4 - Skyline Tank Rehabilitation	$247,000.00
Total Construction (Projects 1 - 4) =	**$2,100,000.00**
Engineering Design & Construction Administration	$153,000.00
*Other Engineering	$130,000.00
Easement Acquisition	$10,000.00
Interest During Construction	$62,500.00
Project Contingencies	$210,000.00
Subtotal Project Cost =	**$2,665,500.00**
Legal	$22,000.00
**Other	$815,000.00
Total Project Cost =	**$3,502,500.00**
**Other Engineering*	
Preliminary Engineering Report	*$18,000.00*
Hydraulic Analysis	*$10,000.00*
Permit Preparation	*$5,000.00*
Easement Exhibit Preparation	*$5,000.00*
Construction Inspection	*$92,000.00*
Total =	*$130,000.00*
***Includes Payoff and Refinance of Existing KIA Loan*	

Note that the anticipated grant amount is 25% and the anticipated loan amount is 75% or $875,625 and $2,626,875 respectively. The annual debt on the loan financed over 38 years at 2.125% is approximately $109,320. Also note that the project includes the payoff and refinance of an existing KIA loan.

CHAPTER VI – PROJECT FINANCIAL ANALYSIS

Key components of the financial analysis are itemized in Table 11 below. However, the detailed financial analysis (Summary Addendum) has been prepared by the Princeton Water and Wastewater Commission's Financial Manager. Refer to Summary Addendum attached hereto for existing financial details of the PWW water and wastewater system and the impact resulting from the proposed project.

Table 11

Princeton Water System – First Year Operating Budget with Proposed Improvements

Revenue and Interest Earned	**$1,513,029**
Operating Expenses and Debt	**$1,496,152**
Operating Expenses	$1,297,676
Existing Bond/Loan Reserve	$8,100
RUS Debt (Existing)	$81,058
New RUS Debt	$109,318
Net Income and Balance for Coverage	**$16,877**

CHAPTER VII – PROJECT SCHEDULE

The following schedule is proposed for implementation of this project.

Table 12

Project Implementation Schedule		
Task	Date/Milestone	Duration (if applicable)
1. Submit Application to Rural Development	April 2013	
2. Secure Funding (Receive RD Letter of Conditions)	August 2013	
3. Begin Design (Survey)	September 2013	30 days
4. Begin Work with Bond Council	September 2013	
5. Complete Design – Submit Plans & Specifications to DOW and RD for Review	February 2014	30 days Review by Agencies
6. Advertise for & Receive Bids	April 2014	
7. RD Approval of Bids	May 2014	
8. Award Construction Contract	May 2014	9 month construction period
9. Complete Construction, Initiation of Operation	February 2015	
10. Begin Warranty Period	February 2015	12 month warranty period

CHAPTER VIII – CONCLUSIONS & RECOMMENDATIONS

A. CONCLUSIONS

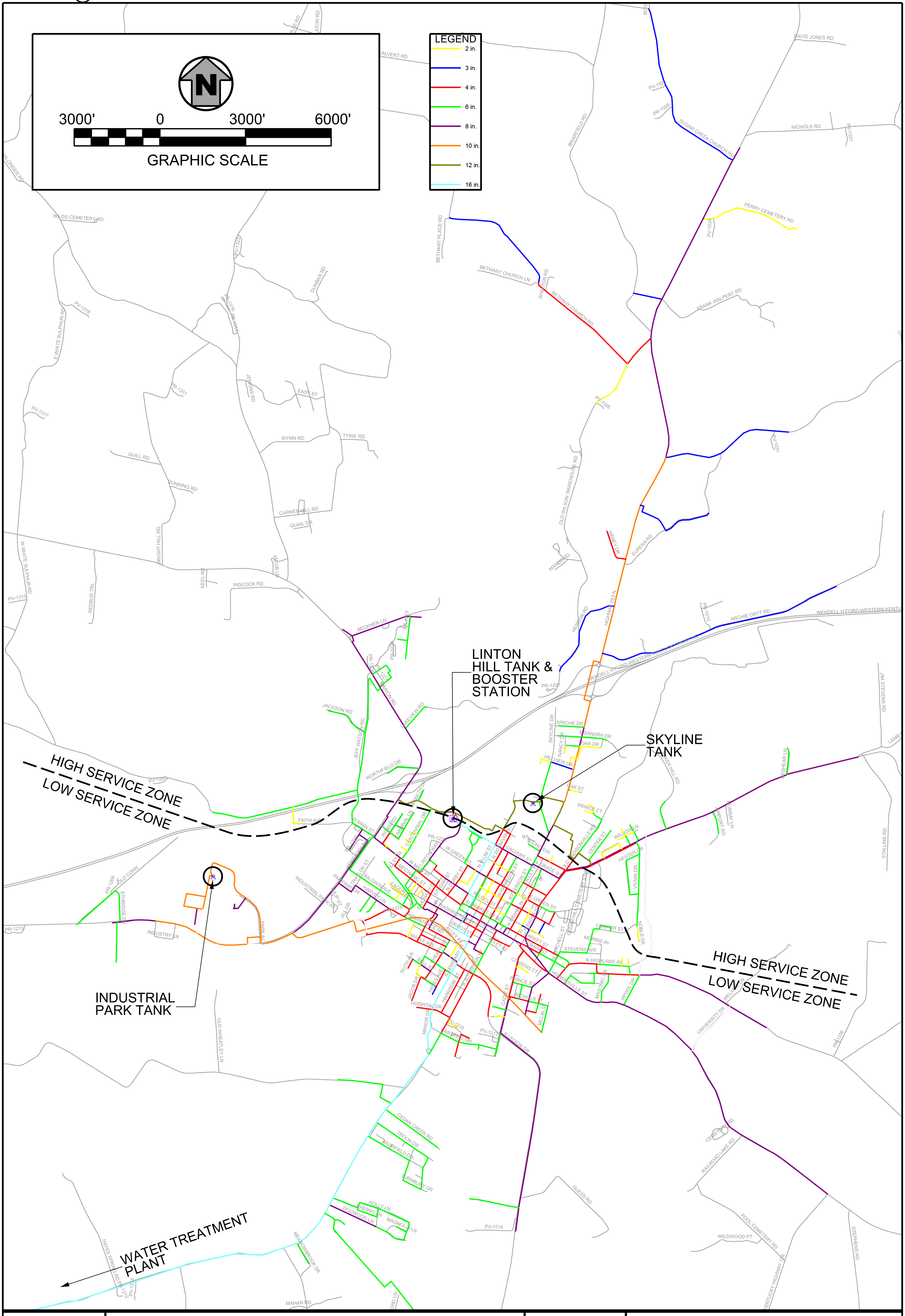
Based on the deficiencies identified by Princeton Water & Wastewater and described here-in, it is critical for PW&W to immediately pursue funding to help implement the proposed solutions outlined in Chapter V. Implementation of these solutions will allow PW&W to maximize available water storage, improve fire protection, water quality and residual pressures in specific areas of their system, identify areas contributing to water loss, and increase the longevity of the Skyline Water Tank.

B. RECOMMENDATIONS

It is our recommendation that Princeton Water & Wastewater submit an application to Rural Development for grant and loan assistance to fund the recommended projects outlined in this report. Completion of the projects will allow PW&W to improve the overall efficiency of the water system and maintain compliance with the Kentucky Division of Water's established regulations.

End of Report

APPENDIX A – MAP OF EXISTING DISTRIBUTION SYSTEM



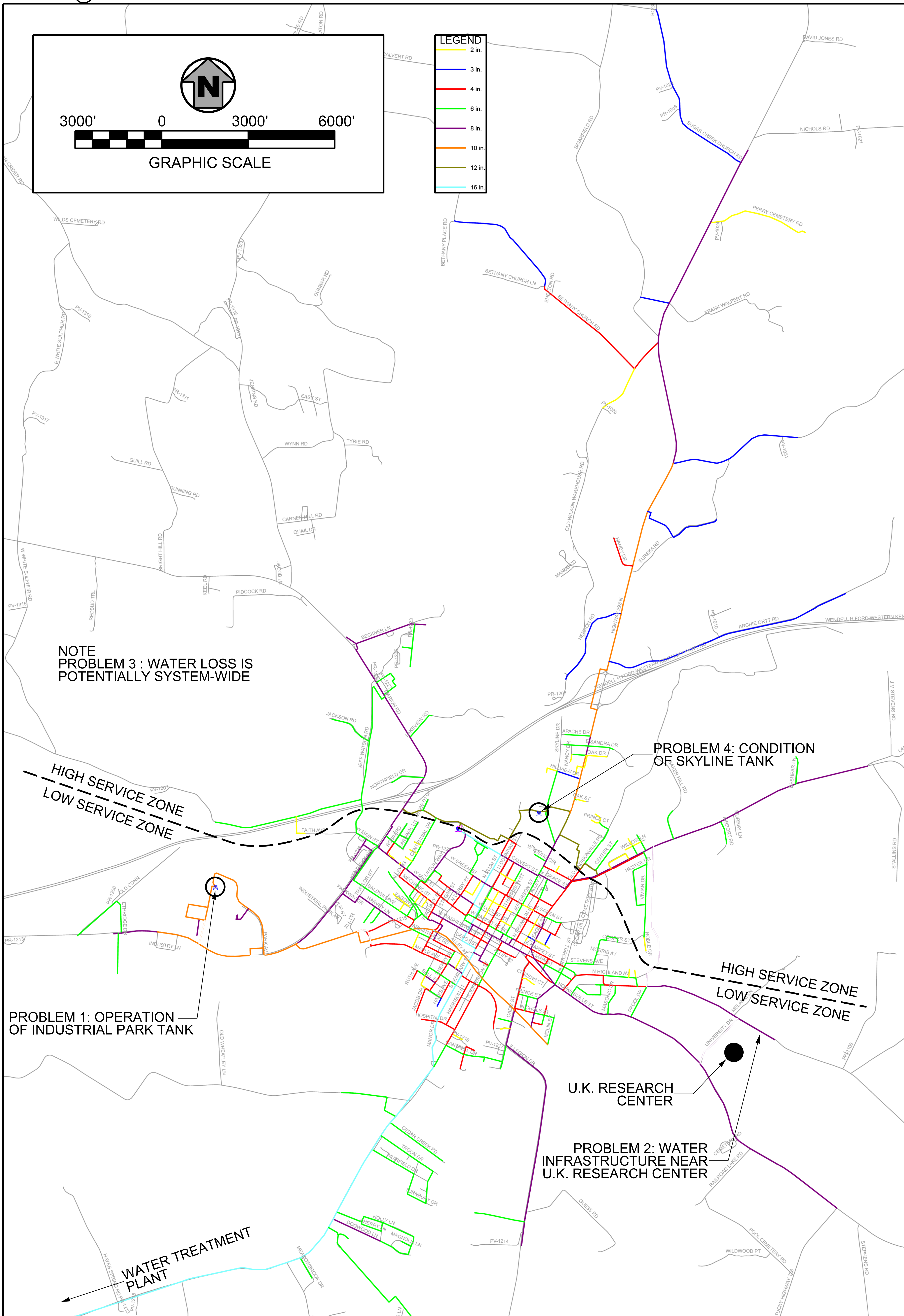
FILE NO. 1037-07

EXISTING DISTRIBUTION SYSTEM

2013 WATER SYSTEM IMPROVEMENTS
PRINCETON WATER & WASTEWATER
PRINCETON, KY

Hethcoat & Davis, Inc.
H & D
Engineers • Planners
278 FRANKLIN ROAD, SUITE 200 * BRENTWOOD, TENNESSEE * 615-577-4300

APPENDIX B – MAP OF EXISTING SYSTEM DEFICIENCIES



EXISTING SYSTEM DEFICIENCIES

2013 WATER SYSTEM IMPROVEMENTS
PRINCETON WATER & WASTEWATER
PRINCETON, KY

FILE NO. 1037-07

Hethcoat & Davis, Inc.
H & D
Engineers • Planners
278 FRANKLIN ROAD, SUITE 200 * BRENTWOOD, TENNESSEE * 615-577-4300

APPENDIX C – SKYLINE TANK INSPECTION REPORT & PHOTOS

Site Visit
Princeton, KY
Skyline Tank
500,000 elevated
12/27/2012

A site visit was conducted at the Princeton KY 500,000 gallon Skyline tank on December 27, 2012. Present were: Mark Goulet, Tom Williams and Justin Taute with Tnemec, Jon Allen with Hethcoat and Davis and Joseph Anderson of Princeton Water and Wastewater. This tank is a welded steel torosphere with 120.5 feet to the overflow and 83 feet to the base of the bowl. 6 legs support the tank along with one strut. The tank is accessed via a 5 foot door into a dry riser. Ascending up the dry riser ladder, interior coatings were in good condition until reaching the first landing. At this point rust is noted on the landing floor and approximately 6 feet above the entrance into the bowl area. Neither roof openings into the dry riser opening or the entrance into the wet area were locked, a rail comprised of two cross members circles the top of this tank and has one lightweight antenna attached. Entering into the wet area, heavy rust is noted around the hatch opening and top 6 ladder rungs. Further corrosion is noted throughout the bowl. Exterior coatings are chalky and show a significant amount of intermediate coat from deterioration of the topcoat. An ASTM 3359-B adhesion test was conducted on the exterior riser and found to have marginal adhesion resulting in a 2B rating. Dry film thickness readings taken on the riser and legs resulted in an average of 11.4 and 9.9 mils respectively. Due to the date of construction (1991), no tests for lead were taken.

Items to consider for repair:

- Blast and repaint exterior
- Blast and repaint interior
- Blast and paint areas of interior dry to SSPC SP-6 (first landing floor and first section into bowl)
- Replace interior and exterior safety climb with cable
- Replace vent screen with 24 mesh non-corrosive
- Add 24 mesh screen to overflow flapper
- Evaluate top 6 rungs on interior ladder for repair or replacement
- Tighten sway rods as needed
- Remove bolt in hatch lid to permit locking
- Evaluate piping under insulation for corrosion
- Fence the tank site

Photograph 1 – Skyline Tank Plaque

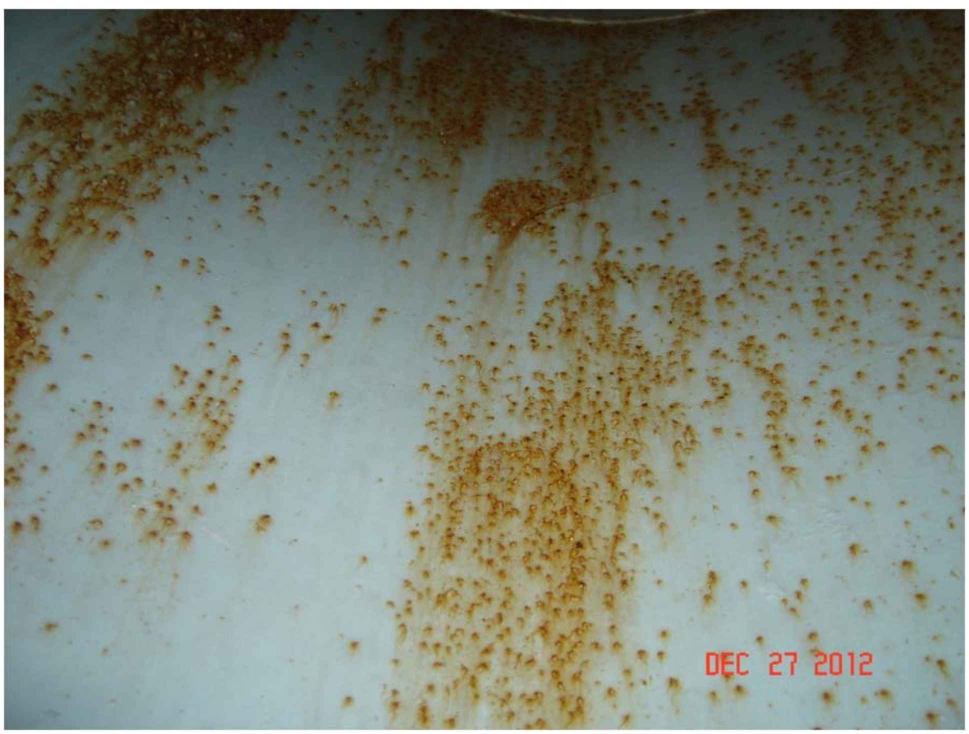
Photograph 2 – Vent Pipe Assembly on Top of Tank

Photograph 3 – Exterior of Top Hatch

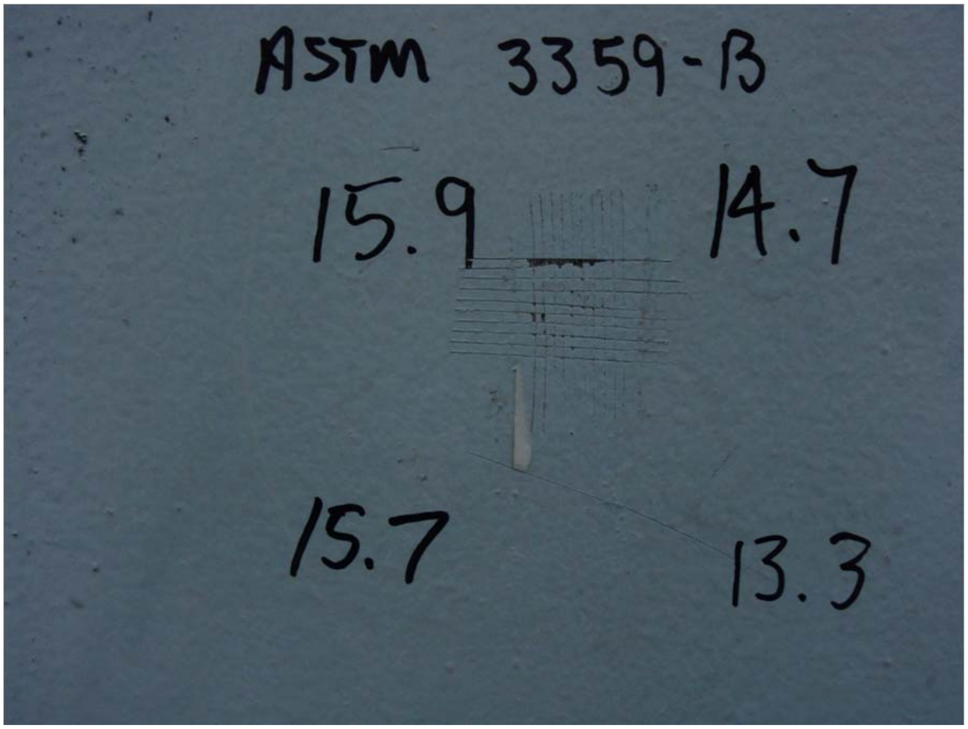
Photograph 4 – Interior Ladder and Hatch in Wet Area (looking down)

Photograph 5 – Interior of Dry Riser at First Landing (looking down)

Photograph 6 – Exterior of Bottom Bowl taken from Interior of Dry Riser above First Landing

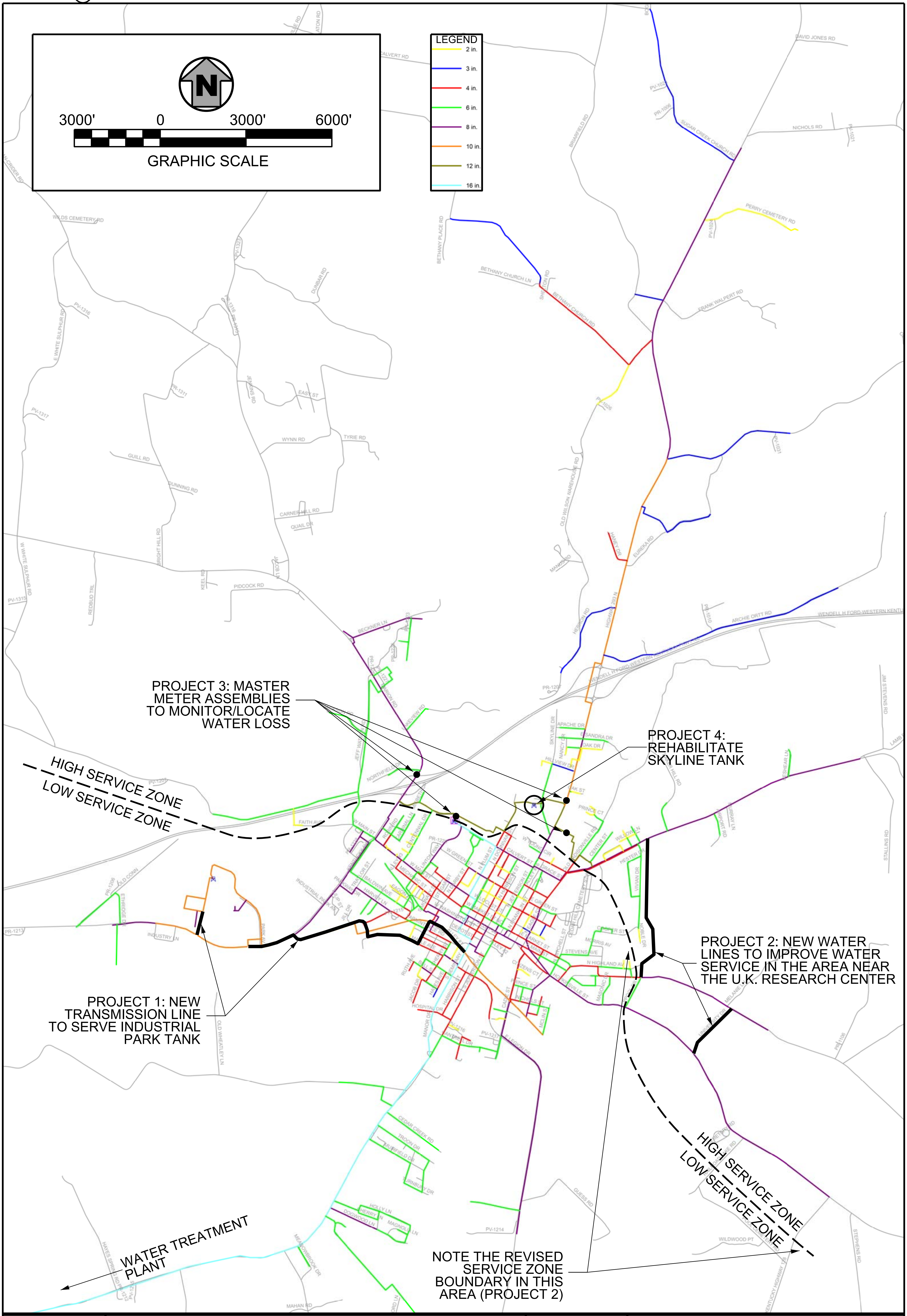


Photograph 7 – ASTM 3359-B Adhesion Test on Exterior Leg



Photograph 8 – Rusted Safe-T-Climb Rail System on Interior Dry Riser (looking up)

APPENDIX D – MAP OF PROPOSED PROJECTS



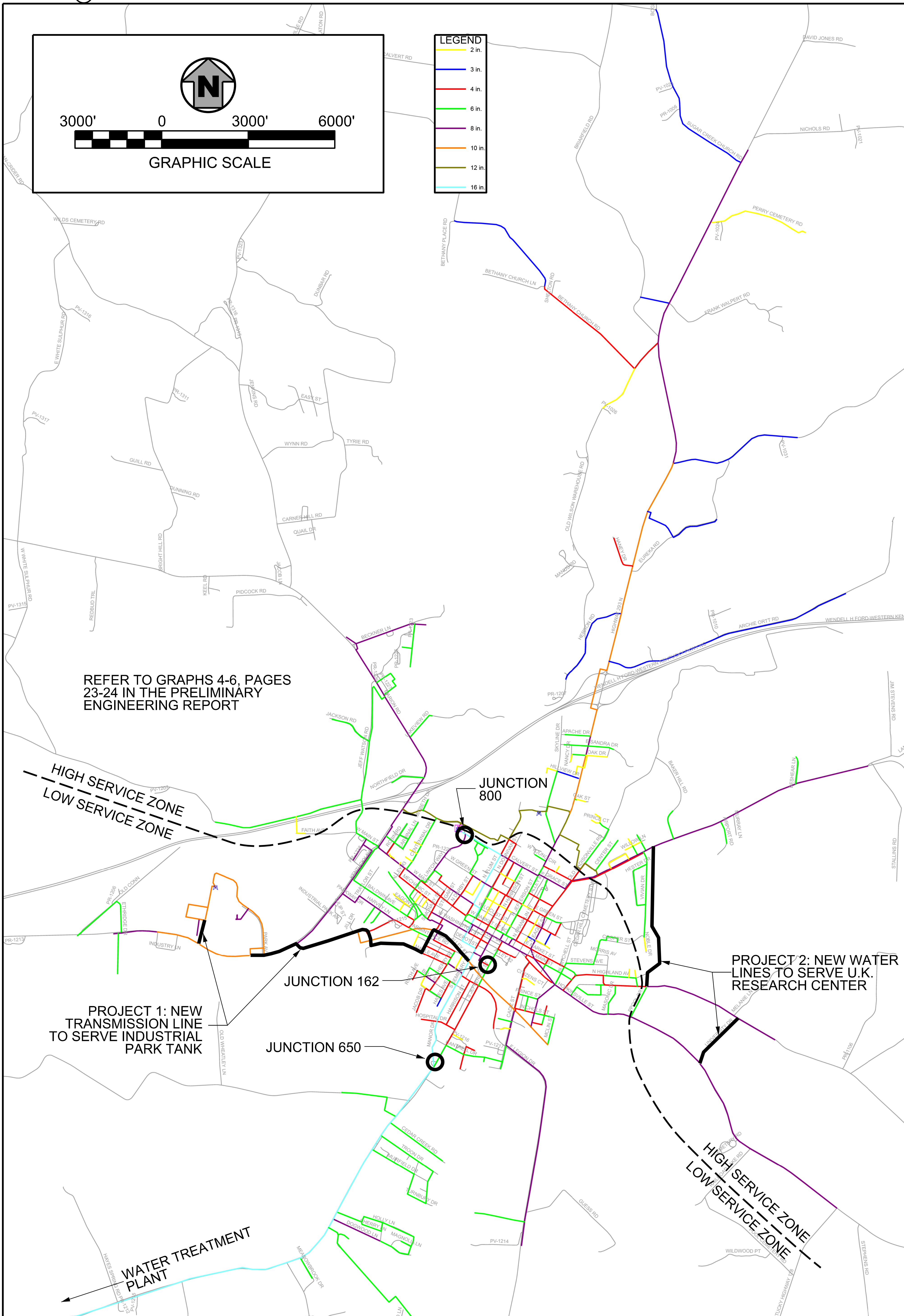
PROPOSED PROJECTS

2013 WATER SYSTEM IMPROVEMENTS
PRINCETON WATER & WASTEWATER
PRINCETON, KY

FILE NO. 1037-07

Hethcoat & Davis, Inc.
H & D
Engineers • Planners
278 FRANKLIN ROAD, SUITE 200 * BRENTWOOD, TENNESSEE * 615-577-4300

APPENDIX E – MAP OF PRESSURE GRAPH JUNCTIONS



PRESSURE GRAPH JUNCTIONS

2013 WATER SYSTEM IMPROVEMENTS
PRINCETON WATER & WASTEWATER
PRINCETON, KY

FILE NO. 1037-07

Hethcoat & Davis, Inc.
H & D
Engineers • Planners
278 FRANKLIN ROAD, SUITE 200 * BRENTWOOD, TENNESSEE * 615-577-4300

ADDENDUM NO. 1

Preliminary Engineering Report
For
2013 Water System Improvements

On Behalf of

The Princeton Water & Wastewater Commission

Date of PER: **March 29, 2013**

Date of Addendum: **August 2, 2019**

STATE OF KENTUCKY
RICHARD G. OAKLEY
17265
REGISTERED
PROFESSIONAL ENGINEER

HETHCOAT DAVIS

Hethcoat & Davis, Inc.
278 Franklin Road, Suite 200
Brentwood, Tennessee 37027
615-577-4300

This Addendum forms a part of and modifies the Preliminary Engineering Report dated March 29, 2013, and any subsequent addenda.

CHAPTER III: SYSTEM DEFICIENCIES

- ***Add the following section to Chapter III - System Deficiencies***

F. Problem 5: Water Treatment Plant Deficiencies

Two significant problems have been identified within the Water System resulting in compliance issues with Division of Water Regulations. The purpose of this Addendum, and the work included herein, is to mitigate these problems.

1. Water Quality – The original project was funded in 2014 to improve water quality in the area served by the Industrial Park Tank. Construction of the 16-inch transmission main towards the Industrial Park Tank (IPT) will improve the tank's fill and draw cycles, and thus, improve this portion of the distribution system to maintain chlorine residuals and reduce the opportunity for formation of disinfection byproducts.

   PW&W has generally been successful in achieving compliance with disinfection byproducts (DBPs), but concentrations within PW&W's system are sufficiently high and this puts Caldwell Co. WD in a vulnerable position with compliance. A review of reported DBPs indicates the higher concentrations begin to occur at the Water Treatment Plant (WTP). PW&W is in the process of switching to Chlorine Dioxide for disinfection which has shown the capability of reducing the formation of DBPs. In conjunction with the chemical disinfection change, a portion of the scope of this Addendum will further reduce the formation of DBPs. The clearwell has a biofilm coating on the walls and curtains which can promote the formation of DBPs. The clearwell is to be cleaned and baffle curtains replaced within the scope of this project. Figure 1 displays DBP testing sites within PW&W's system and recent test data from the WTP.

   Background - PW&W's WTP is a surface plant rated for 3.0 MGD. Two clearwells exist at the WTP with a total capacity 400,000 gallons. The clearwells were constructed during different phases of plant expansion but they share a common wall. Flow between the two clearwell basins is through a 36-inch x 36-inch saw cut opening in the common wall. Figures 2 and 3 show the saw cut opening and its location.

Figure 1 - WTP Recent DBP Testing Results

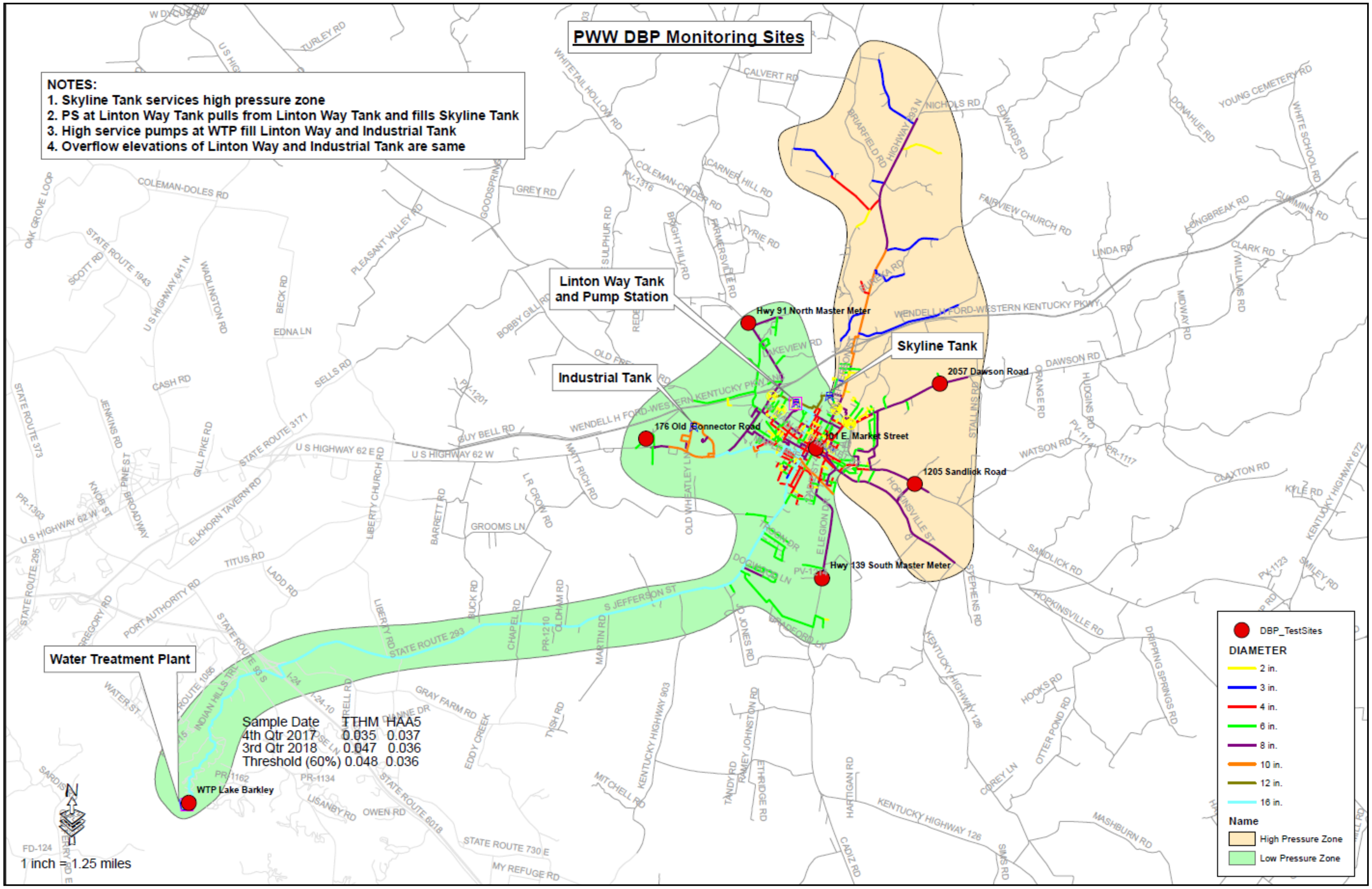


Figure 2 – Clearwell Common Wall Picture

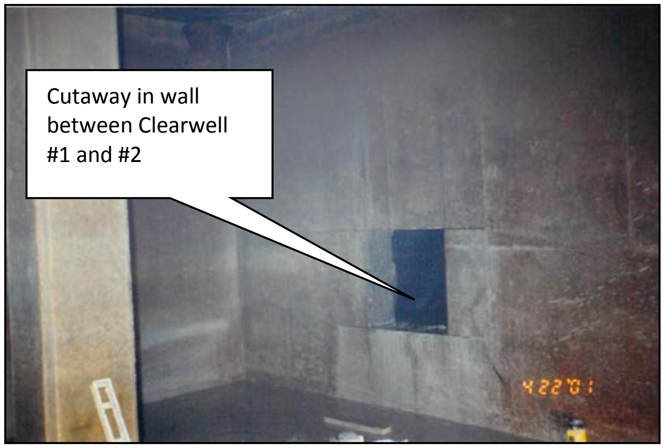
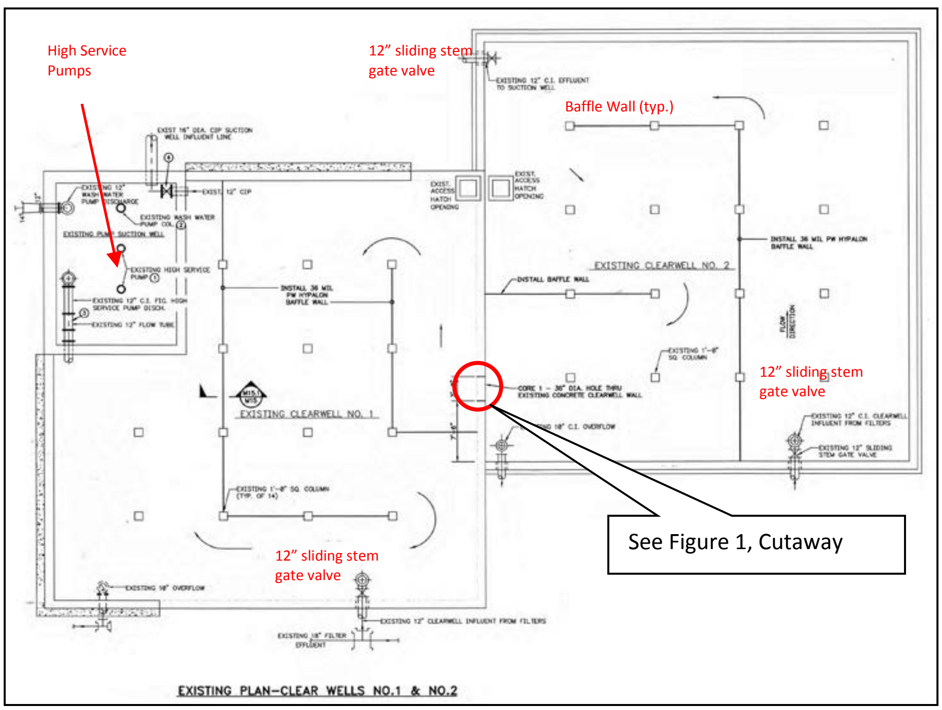


Figure 3 – Clearwell #1 & #2 Plan View



In 2017, PW&W contracted with Mainstream Commercial Divers, Inc. to perform an underwater inspection of both clearwells. The Inspection Report findings included the following:

1. Sediment buildup was observed in clearwell #1,
2. The Clearwells, including the baffle curtains, had a biofilm coating,

3. Numerous baffle curtain connections had failed, and

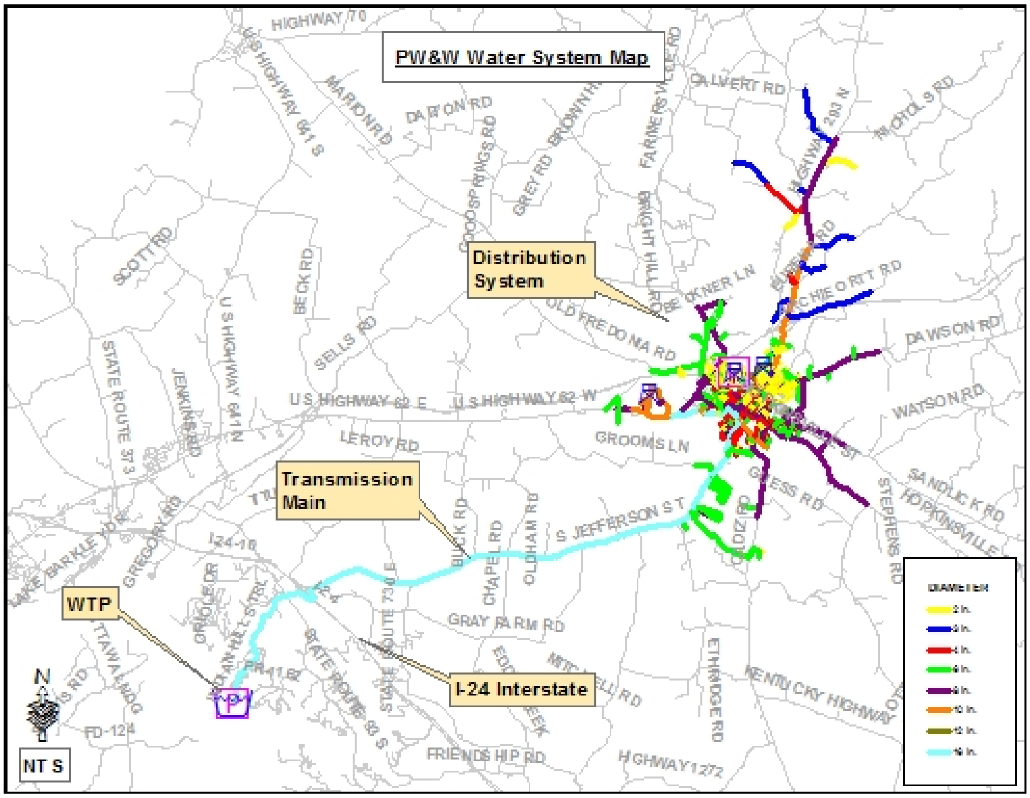
4. The baffle curtain hypalon coating had significant deterioration.
   While underwater inspection has the advantage of minimizing the impact on plant operation, the open square cutaway between the two clearwells severely impedes necessary maintenance/repair activities because both clearwells would have to be drained. If both clearwells were emptied for maintenance, the plant would be unable to produce water and thus be totally dependent upon finished water storage for the entire duration of maintenance activities. In the clearwells' current state, they cannot be taken out of service for maintenance.

In addition to the limitations created by the square cutaway, the three existing sliding stem gate valves at the clearwells (filter influent CW #1, filter influent CW #2, and effluent CW #2) have deteriorated to a point in which they are incapable of operating as intended. The effluent stem gate valve in clearwell #2 is completely inoperable and stuck in the closed position, thus eliminating the possibility of independent operation for this clearwell even if the common wall opening could be sealed. In addition to improving water quality, this project will make future maintenance on the clearwell(s) manageable.

2. Pressure Drop <30 psi – When the high service pumps are shut-down, the system pressures in the 16-inch transmission main near Hwy 293 and I-24 drop to zero (0) psi and a dangerous level of exposure to foreign pollutants potentially pulled into water distribution system is created. While only momentarily, this occurs several times each day as the WTP personnel shut the plant down for each backwash cycle and when the distribution system tanks are full or at the end of the second work shift. Surge suppression alternatives will be considered herein to minimize the pressure drop when the high service pumps are shut down.

   Background - As shown in Figure 3, the high service pump room is adjoined to clearwell #1. Both high service pumps have a design point of 2,100 gpm at 600 ft TDH. The pumps are controlled by variable frequency drives (VFD's), and the plant operators generally have the pumps running at a reduced rate (approx. 1,800 gpm - 2,000 gpm). The high service pumps send treated water from the WTP to the distribution system through a 16" transmission line, which is approximately 14.5 miles from the WTP.

Figure 4 – PW&W Water System Map



The long travel distance creates enough change in kinetic energy to induce a substantial pressure drop in the transmission main when the high service pumps cycle off. The pressure drop occurs over a short time period (approx. 90 sec.) but the impact is noticeable to some customers connected to the transmission main depending on what time of day the high service pumps are cycling on/off. Two hydraulic data recorders were temporarily installed at the WTP and near I-24 (a known high point in the transmission main) to field verify the occurring event. Figures 5 and 6 clearly display the pressure drop that occurs when the high service pumps cycle off.

Figure 5 – Pressure Graph at WTP

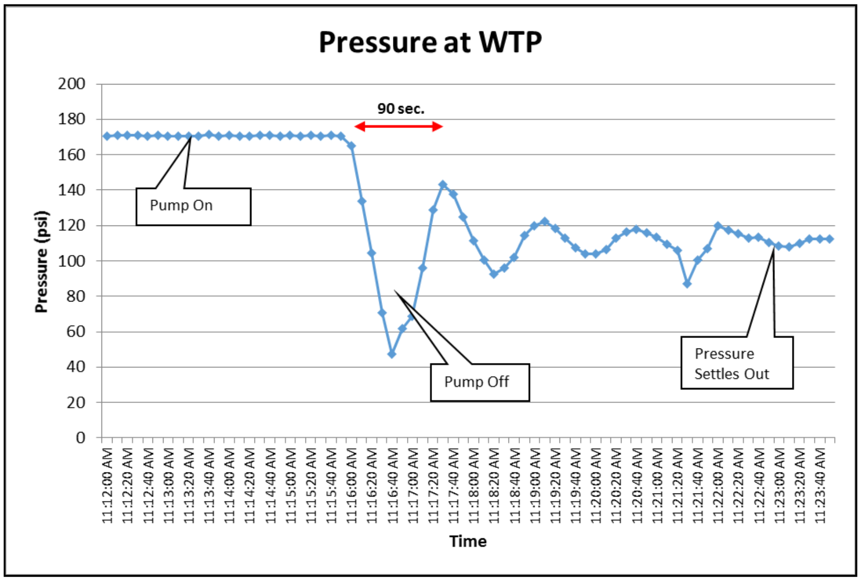
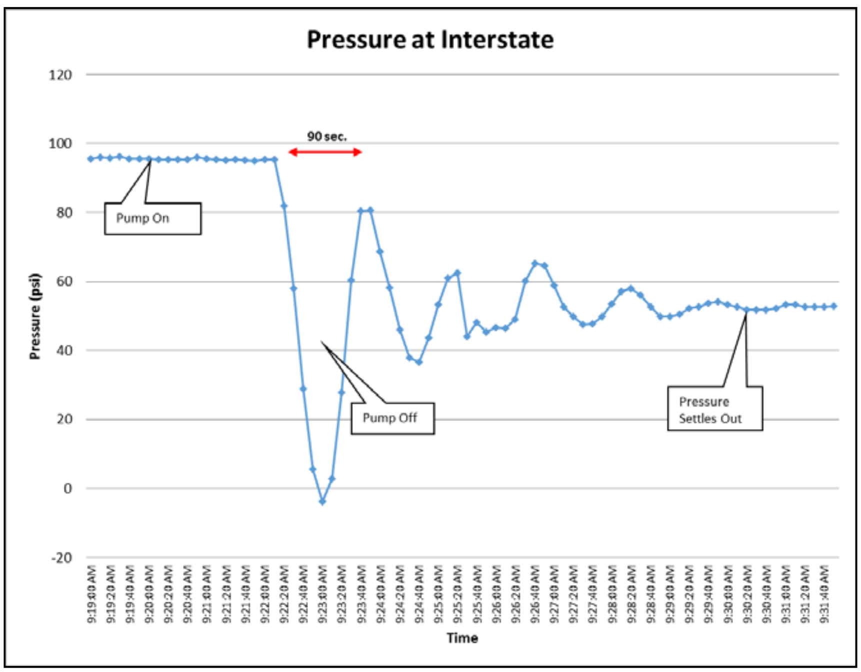


Figure 6 – Pressure Graph at Hwy 293 and I-24



- ***Add the following subsections to Chapter IV - Reasonable Alternatives, A. General***

5. **Goal 5: Perform Necessary O&M Activities in Both Clearwells While Minimizing Impact on Plant Operation**. This will ensure that the WTP can continue to operate as intended and provide safe potable drinking water to all PW&W customers.

6. **Goal 6: Eliminate Sudden Pressure Drop in Transmission Line That Are Directly Related to High Service Pump Operation**. This will maintain adequate operating pressures to effected PW&W customers at all times, regardless of high service pump cycle times.

- ***Add the following section and subsections to Chapter IV - Reasonable Alternatives***

F. Goal 5: Perform O&M Activities in Either Clearwell While Minimizing Impact on Plant Operation

1. <u>Alternative 1 – Bypass and Drain Clearwells to Install Slide Gate in Clearwell Common Wall</u>
   The following repairs are required at the WTP Clearwells:

   - Replace three deteriorated and/or inoperable 12" stem gate valves
   - Replace deteriorated and failing baffle walls

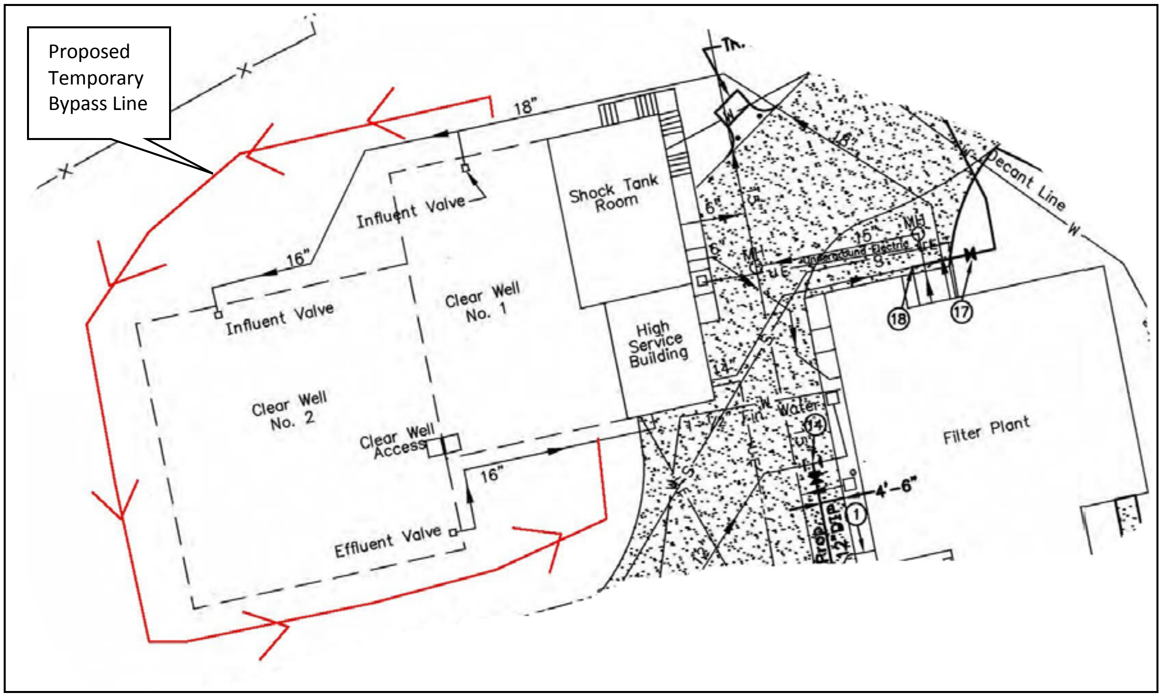
   In order to implement these repairs without simultaneously taking both clearwells out of service for extended periods of time, a slide gate must be installed over the cutaway in the clearwell common wall. With a slide gate in operation, filter effluent can be diverted into one clearwell while the other clearwell is drained and repairs are implemented. This will allow continuous plant operation without having to rely solely on finished water storage.

   Thus, there are three options available for installation of the slide gate:

   - Bypass and drain both clearwells and install the slide gate
   - Drain the clearwells (no bypassing) and install the slide gate
   - Install the slide gates utilizing underwater divers while maintaining adequate clearwell levels with minimal operational downtime

   Alternative 1 evaluates the feasibility of bypassing and draining the clearwells. Bypassing the clearwells would involve installing a temporary bypass line around the clearwells by connecting to the 18" filter effluent line prior to entry into clearwell #1 and connecting to the 16" influent line to the high service pump well.

Figure 7 – Proposed Clearwell Bypass Line



In addition to the temporary bypass line, valves would need to be installed to facilitate water flow into the bypass line and prevent flow from entering the clearwells. The filters have a capacity rating greater than the rated capacity of the high service pumps. Hydraulic calculations would need to be performed to ensure the proposed bypass line is sufficient in size to overcome friction loss in the line. The KY DOW would also need to approve this alternative because the chlorine contact time that normally occurs in the clearwells would be temporarily eliminated. While this alternative is possible and would facilitate favorable working conditions in the clearwells, there are ultimately too many variables and undue costs and risks associated with this option. If this option was the only available option, the slide gate proposed in Alternatives 2 and 3 would still be recommended in order to improve future maintenance capabilities within the clearwells.

2. Alternative 2 – Drain Clearwells (no bypass) to Install Slide Gate in Clearwell Common Wall
   Draining the clearwells to facilitate installation of the slide gate would undoubtedly provide advantageous working conditions. However, in doing so the Water System would be unable to treat water and be entirely reliable on finished water storage. Based on current operating conditions, the plant could only withstand downtime of approximately 10-12 hours. Other variables, such as water line breaks and fireflow, could drastically reduce the allotted downtime.

Any mishaps or unforeseen problems during the repair could force a hasty completion or require the clearwells to be filled with unfinished repairs and drained yet again to complete the repairs. This option is plausible and in an emergency event it might be a necessity. However, due to the inherent risks this Alternative is eliminated from further consideration.

3. Alternative 3 –Install Slide Gate Utilizing Underwater Diver
   Performing underwater construction work can be difficult and sometimes costly. However, the benefit of keeping the clearwells in service while installing the slide gate is arguably greater than the cost because plant operation can continue with minimal interruptions. This repair work would involve the installation of a new access hatch above and adjacent to the common wall opening which would allow the slide gate to be lowered into the water and installed. All installation components and equipment would be sterilized with a chlorine solution. Hydraulic lubricants that are NSF 60/61 approved will be necessary for underwater tools. Dispersion of residual hydraulic fluid in the clearwell is most susceptible during tool change out. This could be further mitigated by changing tools out above water and thoroughly cleaning and sterilizing fitting connection points prior to re-entry into the water.

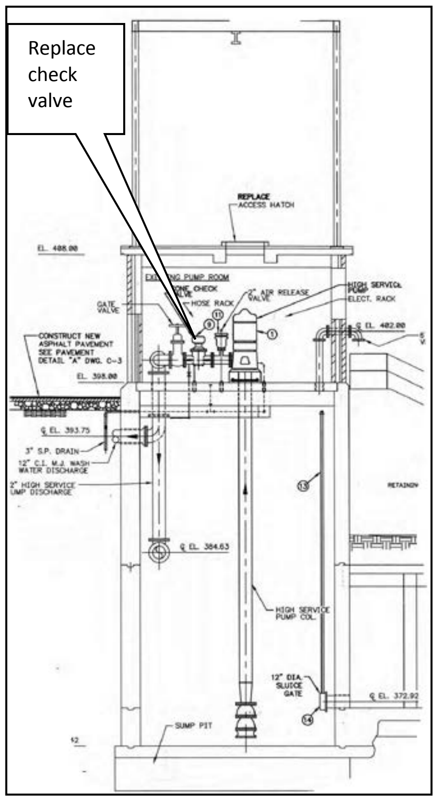
   The filter plant and the high service pumps would have to be temporarily out of operation while diving crews are underwater. However, once the divers are above grade, plant operation can resume as usual. Once the slide gate is installed, either of the clearwell influent lines could be closed and repair work related to stem gate valves and baffles could be performed in the dry while plant operation continues with one clearwell in service.

G. Goal 6: Eliminate Sudden Pressure Drop in Transmission Line That Are Directly Related to High Service Pump Operation

1. Alternative 1 – Replace Exist. High Service Pump Check Valves w/ New Check Valves
   The existing high service pump check valves do not have the ability to close as slow as is necessary over a pre-determined time period to eliminate the surge created during shut-down. The recorded drop in pressure shown in Figure 5 indicates the first surge occurs over an approx. 2-minute period. To eliminate this surge, the valves must be programmed to shut-down over a period in excess of 2-minutes. The velocity of the flow in the pipeline should be at or very close to 0 ft/sec at shut-down. When the pumps cycle off, the existing check valve initially was believed to close slowly (approximately 30 seconds reported) but sufficient pipeflow velocity remains to create a surge phenomenon in the water column where the change in kinetic energy is sufficiently abrupt which creates an abrupt

change in pressure. If the check valve could be slowly closed over an extended period of time, the valve would induce more head against the pump, which would in turn decrease the flow of the pump slowly until the pump ultimately reached shut off. The result of this would provide a slow and steady decrease in velocity and eliminate abrupt changes, thus eliminating the short durations of pressure drop in the transmission line when the pumps cycle off. Figure 8 depicts the location of the check valve.

Figure 8 – High Service Pump Room Profile



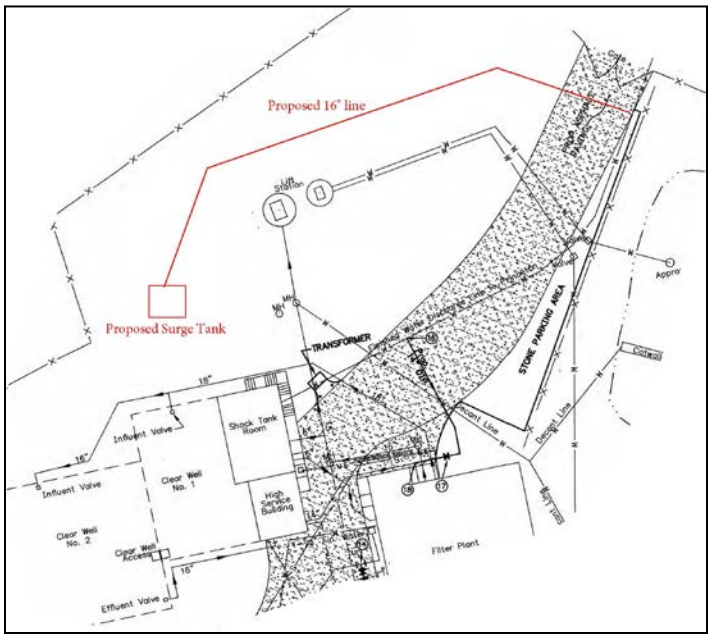
Installing a new check valve with a pump control panel would allow the check valve to close as slow or fast as the operator allowed (2 – 12 minutes). Estimated cost of replacement is as follows:

Table 1

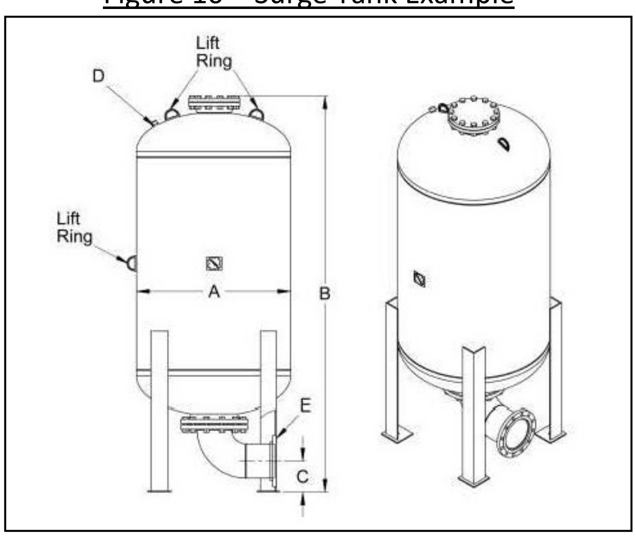
Construction Estimate - New Check Valves at High Service Pumps					
Item	Description	Qty.	Unit	Unit Price	Total Price
1	10" Check valve w/ Pump Control Panel	2	EA	$55,000	$110,000
2	SCADA	1	LS	$25,000	$25,000
3	Electrical	1	LS	$25,000	$25,000
				Subtotal Construction	$160,000

2. <u>Alternative 2 – Install Surge Relief Tank</u>
   A surge relief tank consists of a steel tank with an interior bladder that is filled with water. The annular space between the bladder and tank wall is filled with compressed air at a pre-determined pressure. If a surge event were to occur and the pressure began to drop in the transmission line, the higher pressure or head in the surge tank would immediately release water to seek out hydraulic equilibrium which in turn would prevent the significant pressure drop in the line. The surge tank bladder volume would be sized to account for full pump capacity (2,000 gpm) over the known duration of the pressure drop (120 sec.). Approximately 300 LF of 16" water line would need to be installed to connect to the pre-determined surge tank site.

<u>Figure 9 – Site Plan for Surge Tank at WTP</u>



<u>Figure 10 – Surge Tank Example</u>



Estimated construction cost for the surge tank is as follows:

Table 2

Construction Cost - Surge Tank Addition					
Item	Description	Qty.	Unit	Unit Price	Total Price
1	Concrete Slab on Grade	1	LS	$15,000	$15,000
2	16-inch Pipe Connection	1	LS	$24,000	$24,000
3	10-inch GV	1	EA	$5,000	$5,000
4	16-inch Water Line	300	LF	$120	$36,000
5	4,000 gallon Surge Tank	1	LS	$115,000	$115,000
6	Tank Painting	1	LS	$2,000	$2,000
7	Pavement Repair	1	LS	$3,000	$3,000
				Subtotal Construction	$200,000

3. Alternative 3 – Do Nothing
   A third alternative would be to do nothing and allow the short duration, significant pressure drops to continue. In doing so, points within the distribution system would continue to have momentary periods of time where minimum pressure requirements dictated by the KY DOW (greater than 30 psi) could not be maintained. This is not a feasible alternative because PW&W are required to meet the standards set forth by the KY DOW.

- ***Add the following section and subsections to Chapter V – Recommended Solutions/Proposed Projects***

F. Solution to Problem 5 (WTP Deficiencies – O&M Impediments)

1. Solution: Alternative 3 –Install Slide Gate Utilizing Underwater Diver: This alternative is the most effective solution for installing the slide gate while minimizing operational downtime at the plant.

2. The project will consists of the installation of a new access hatch in the clearwell, new slide gate over the clearwell common wall cutaway, three new sliding stem gate valves (two for influent clearwell lines at CW #1 and #2 and one for the effluent clearwell line from CW #2), and replacement of all baffle walls.

3. The construction cost of the proposed project is estimated at $200,000. Refer to Table 3 for an itemized breakdown of costs.

Table 3

Construction Estimate - WTP Clearwell Improvements					
Item	Description	Qty.	Unit	Unit Price	Total Price
1	Install New Clearwell Hatch	1	LS	$25,000	$25,000
1	Gate Valve Replacement	3	EA	$15,000	$45,000
2	Slide Gate Installation	1	LS	$65,000	$65,000
3	Baffle Curtain Replacement	1	LS	$45,000	$45,000
4	Clearwell Cleaning	1	LS	$25,000	$25,000
Subtotal Construction					$205,000

G. Solution to Problem 5 (WTP Deficiencies – Low Pressure Problems)

1. Solution: Alternative 2 – Install Surge Relief Tank: While Alternative #1 has a lower estimated construction cost, the inability of the existing check valve at the high service pumps to operate correctly has created concerns with the Owner to the likelihood of success with a new check valve. Further investigation is recommended for the check valve. In lieu of the concerns presented with the check valve, the surge relief tank is the recommended solution for eliminating pressure surges that are created by the pump on/off cycles.

2. The project will consists of the installation of approximately 300 LF of 16” water line and a new surge relief tank.

3. The construction cost of the proposed project is estimated at $200,000 as shown in Table 2.

- ***Add the following Tables to Chapter VI – Project Financial Analysis***

Preliminary Engineering Report
Princeton Water & Wastewater Commission
2013 Water System Improvements

Table 4

Budget Summary of Total Project

Princeton Budget 8/2/19				
Item Description	Original Budget	Actual Budget after Bids	Amount Over/Under Original Bids	Estimated Final Contract (as of 8/2/19)
1 Contract A - Water Lines	$1,853,000	$1,892,101	($39,101)	$1,916,750
2 Contract B - Skyline Tank Rehabilitation	$247,000	$327,855	($80,855)	$327,855
Subtotal Construction	$2,100,000	$2,219,956	($119,956)	$2,244,605
Contingency	$210,000	$90,044	$119,956	
Total Construction	$2,310,000	$2,310,000	$0	$2,244,605
Additional Construction Items				
Linton Hill SCADA Impvts				$10,007
Fire Hydrant PRV Valve (no record of turning in for RD Reimbursement)				$0
Clearwell Upgrade				$205,000
Surge Tank				$200,000
Remaining Contingencies				$10,388
Other Costs				
Original Engineering Design & Construction Admin.	$153,000	$153,000	$0	$153,000
Engineering Design and Construction Admin for Addendum No. 1				$35,000
Preliminary Engineering Report	$18,000	$18,000	$0	$18,000
Addendum No. 1 to Prelim. Engineering Report				$0
Hydraulic Analysis	$10,000	$10,000	$0	$10,000
Permit Preparation	$5,000	$5,000	$0	$5,000
Easement Exhibit Preparation	$5,000	$5,000	$0	$5,000

Preliminary Engineering Report
Princeton Water & Wastewater Commission
2013 Water System Improvements

Princeton Budget 8/2/19				
Item Description	Original Budget	Actual Budget after Bids	Amount Over/Under Original Bids	Estimated Final Contract (as of 8/2/19)
Construction Inspection	$92,000	$92,000	$0	$92,000
Construction Inspection for Addendum No. 1				$20,000
Easement Acquisition	$10,000	$10,000	$0	$10,000
Interest During Construction	$62,500	$62,500	$0	$62,500
Legal	$22,000	$22,000	$0	$22,000
Payoff & Refinance of Existing KIA Loan	$815,000	$815,000	$0	$400,000
Budget Totals	$3,502,500.00	$3,502,500.00	$0.00	$3,502,500.00

- ***Add the following Table to Chapter VII – Project Schedule***

Table 5

Project Implementation Schedule for Addendum No. 1 Work	
Planned Task or Anticipated Milestone	Anticipated Date or Period for Task
Submit Addendum No. 1 to PER	Aug 2019
Approval of Addendum No. 1	Oct. 2019
Design	Nov. – Dec. 2019
Approval of Addendum No. 1 Construction Docs	Jan. 2020
Receipt of Construction Bids	Feb. 2020
Construction	April – May 2020

- ***Add the following Section to Chapter VIII – Conclusions & Recommendations***

Conclusions for Addendum No. 1

1. The work presented in Addendum No. 1 is consistent with the goals of the project originally funded.
   a. Cleaning the clearwell and removing the biofilm from the walls at the WTP will improve water quality by reducing the possibility for formation of disinfection byproducts in the clearwell. Other work within the clearwell, such as replacing the isolation valves and installation of a slide gate will allow future cleaning and other maintenance to be undertaken without the burden of difficult conditions as PW&W is currently facing.

   b. Installation of effective surge suppression will correct a problem of momentary water pressure loss when the high service pumps cycle off. The change in pressure has been presented graphically and shows the extent of vulnerability or exposure PW&W has with a "cross-connection" contaminating the distribution system. Furthermore, the rapid and significant pressure changes place an unacceptable stress on the pipeline. A line break at Hwy 293 and I-24 (where the Data Logger was installed and is graphically represented in Figure 6) would result in the entire PW&W customer base being without water.

2. No additional Operation and Maintenance Costs are anticipate with any of the clearwell alternatives or surge suppression alternatives considered herein.

3. The alternatives considered herein for the surge suppression generally have the same anticipated useful life with proper care and maintenance. A Present Worth Cost Analysis would not change the cost of the alternatives considered.

4. The conclusions from this Report consider Alternatives 1 and 2 as equal for surge suppression. However, Alternative 1 is very similar to PWW's current check valve arrangement which is not effectively reducing surges. During the Design Phase of this Project, the Engineer and PW&W Manager will conduct further investigations of water systems successfully managing water surges with the proposed electric check valves and pump director panels. If the confidence in this Alternative can be restored, it appears to be the cost effective solution.

5. All proposed work is within the WTP property. Most of the work is within existing structures. This project is anticipated to receive a Categorical Exclusion for Environmental Review.

END OF ADDENDUM NO. 1

9. Refer to Princeton's Responses to the Commission's January 10, 2019 Order, Items 10 and 11. Princeton is currently is paying 100 percent of each employees health insurance coverage. Explain whether Princeton, through an outside consultant or otherwise, performed a study or survey to compare its wages, salaries, benefits, and other compensation to other local or regional enterprises.

a. If comparisons were made, provide and discuss the results of such comparisons. Include the results of the study or survey with your response, including all workpapers.

b. If comparisons were not made, explain why such comparisons were not performed.

c. Explain whether Princeton's policy of paying 100 percent of the health insurance benefits for its employees is consistent with the policies of the other companies in Princeton's service territory.

Response: See Exhibit PSC 2-9(a) KRWA 2019 Compensation & Benefit Survey and Excel Exhibit PSC 2-9(a) Compensation Comparison

(a) PWWC has relied on information discussed at KRWA seminars and meetings, annual KRWA Compensation and Benefits Surveys and local utility knowledge to address the total compensation packages offered to its employees. The percentage of health insurance paid by the employer is not shown in the surveys but is always discussed at the KRWA conferences with many utilities still choosing to pay 100% of health insurance. Unfortunately, what the surveys and discussions do not tell us are the particulars of deductibles, co-pays and maximum out of pocket payments of the health insurance plans offered by the utilities across the state. Several years ago, PWWC joined the Kentucky Employees Health Plan in an effort to control the significant spikes being experienced in health insurance premiums. The plans now offered have larger deductibles, lower co-pays and higher maximum out of pocket payments than what had been provided to the employees before 2005.

(b) Not applicable

(c) PWWC's policy of providing 100% family coverage health insurance is not consistent with most other private companies in our service territory. However, according to KRWA staff, it is widely recognized that utilities and government agencies offer higher benefits as incentives in order to offset higher salaries offered by the private sector. The wages paid by PWWC are typically within the average categories shown in the KRWA surveys but are below those of larger neighboring municipal utilities. Recently, two of the PWWC employees that had been lured away by the promise of higher wages returned to PWWC in less than six months due to the benefit package we offer. The benefits and the workplace environment have allowed PWWC to maintain the professionals needed to operate our treatment facilities and to provide the customer base with timely and professional service.

Witness: Tracy B. Musgove

Exhibit PSC 2-9(a)

KRWA 2019 Compensation & Benefit Survey

Kentucky Rural Water Association
Helping water and wastewater utilities help themselves

Memorandum

To: KRWA Member Utilities
From: Andy Lange
Assistant Director
Date: July 26, 2019
Subject: 2019 KRWA Compensation and Benefit Survey Results

Please find enclosed the 2019 KRWA Compensation and Benefit Survey results. We hope that the information compiled from this survey will give you a basis in your effort to provide equitable compensation and benefit packages for your employees.

We received a 38% response to the survey (132 out of 349 utilities) which provides salary and benefit information for over 2000 full-time employees. To ease in the interpretation of this data, we have broken down the information by type of utility (water district, municipality, etc.) and size (by number of connections). For each utility category, salaries are presented on an annualized basis with the minimum, average and maximum salary for each position. The wage information has been annualized using 2080 hours per year for full time employment. Please take into consideration that years of service, geographic location, and sophistication of operation have not been factored into this survey.

Benefit information is presented for each type and size of utility only in respect to whether a utility offers the benefit to its employees.

Thank you for participating in this survey. If you have specific questions concerning compensation and benefit issues, please give us a call and we will try to provide assistance.

Enclosures

1151 Old Porter Pike · Bowling Green, KY 42103 · Phone 270.843.2291 · Fax 270.796.8623
www.krwa.org

All Utilities (132)

Position	Count	Annual Salary Range Minimum	Average	Maximum
Asst. Manager/Asst. Superintendent	63	$29,120.00	$91,667.59	$215,436.00
Asst. Office Manager/Asst. City Clerk	36	$16,640.00	$36,843.32	$60,738.00
Bookkeeper	47	$29,000.00	$46,085.10	$87,556.00
Customer Service Rep (CSR)	269	$16,640.00	$36,192.93	$72,925.00
Distribution Supervisor/Foreman	72	$19,760.00	$54,386.10	$98,260.00
Engineer	30	$65,853.00	$95,686.27	$175,100.00
Engineer Assistant/Inspector	33	$32,136.00	$54,878.61	$92,862.00
Equipment Operator	76	$26,000.00	$42,894.95	$64,210.00
Finance Director/Accountant	34	$34,507.00	$76,181.41	$184,461.00
GIS Specialist	18	$30,992.00	$58,463.56	$86,565.00
IT Specialist	27	$44,625.00	$82,395.44	$185,297.00
Lab Technician	14	$24,960.00	$52,745.19	$86,118.00
Laborer	179	$16,640.00	$30,093.08	$50,000.00
Maintenance Supervisor/Foreman	54	$25,688.00	$51,948.49	$111,465.00
Manager/Superintendent	105	$31,200.00	$73,504.87	$242,190.00
Mechanic/Electrician	49	$26,000.00	$53,928.22	$67,642.00
Meter Reader	104	$19,615.00	$34,326.36	$61,070.00
Meter Reading Foreman	39	$28,184.00	$56,144.33	$118,675.00
Office Manager/City Clerk	88	$17,580.00	$45,142.22	$83,283.00
Wastewater Collection Operator	58	$22,984.00	$38,000.90	$60,070.00
Wastewater Collection Supervisor	7	$42,640.00	$54,417.86	$79,180.00
Wastewater Plant Operator	106	$19,614.00	$34,942.45	$72,384.00
Wastewater Plant Supt./Foreman	43	$32,406.00	$49,225.38	$96,762.00
Water Distribution Operator	214	$20,613.00	$45,536.22	$70,409.00
Water Plant Operator	200	$17,388.00	$39,780.74	$80,226.00
Water Plant Superintendent/Foreman	67	$34,528.00	$56,345.29	$94,305.00
	2032			

All Municipals and Privates (57)

Position	Count	Annual Salary Range		
		Minimum	Average	Maximum
Asst. Manager/Asst. Superintendent	47	$29,120.00	$106,547.30	$215,436.00
Asst. Office Manager/Asst. City Clerk	18	$24,000.00	$35,508.17	$53,685.00
Bookkeeper	28	$29,120.00	$51,256.25	$87,556.00
Customer Service Rep (CSR)	162	$17,194.00	$39,219.20	$72,925.00
Distribution Supervisor/Foreman	38	$30,576.00	$60,103.00	$98,260.00
Engineer	28	$66,560.00	$97,633.39	$175,100.00
Engineer Assistant/Inspector	29	$32,136.00	$55,517.03	$92,862.00
Equipment Operator	47	$26,000.00	$45,196.72	$59,987.00
Finance Director/Accountant	29	$34,507.00	$76,809.14	$184,461.00
GIS Specialist	15	$30,992.00	$61,456.13	$86,565.00
IT Specialist	27	$44,625.00	$82,395.44	$185,297.00
Lab Technician	12	$36,400.00	$59,420.75	$86,118.00
Laborer	95	$18,720.00	$30,726.07	$50,000.00
Maintenance Supervisor/Foreman	33	$25,688.00	$53,877.16	$111,465.00
Manager/Superintendent	46	$31,200.00	$78,368.51	$242,190.00
Mechanic/Electrician	43	$35,464.00	$55,571.49	$67,642.00
Meter Reader	60	$19,615.00	$37,572.63	$61,070.00
Meter Reading Foreman	27	$31,824.00	$60,372.11	$118,675.00
Office Manager/City Clerk	41	$17,580.00	$43,971.49	$83,283.00
Wastewater Collection Operator	41	$22,984.00	$39,240.71	$60,070.00
Wastewater Collection Supervisor	7	$42,640.00	$54,417.86	$79,180.00
Wastewater Plant Operator	85	$19,614.00	$35,416.27	$72,384.00
Wastewater Plant Supt./Foreman	33	$32,406.00	$49,382.56	$96,762.00
Water Distribution Operator	144	$20,613.00	$48,912.61	$70,409.00
Water Plant Operator	125	$17,388.00	$41,332.56	$80,226.00
Water Plant Superintendent/Foreman	45	$37,000.00	$59,145.89	$94,305.00
	1305			

Municipals-Less than 1,000 Connections (19)

Position	Count	Annual Salary Range		
		Minimum	Average	Maximum
Asst. Manager/Asst. Superintendent	4	$29,120.00	$35,828.00	$41,080.00
Asst. Office Manager/Asst. City Clerk	6	$24,000.00	$30,610.00	$38,480.00
Customer Service Rep (CSR)	2	$28,226.00	$29,113.00	$30,000.00
Laborer	9	$20,800.00	$31,521.56	$38,480.00
Maintenance Supervisor/Foreman	2	$34,500.00	$38,570.00	$42,640.00
Manager/Superintendent	9	$31,200.00	$51,248.78	$70,000.00
Meter Reader	2	$21,500.00	$23,323.50	$25,147.00
Office Manager/City Clerk	13	$17,580.00	$34,899.69	$44,720.00
Wastewater Plant Operator	7	$22,500.00	$32,625.14	$48,547.00
Wastewater Plant Supt./Foreman	6	$32,406.00	$37,437.00	$49,246.00
Water Distribution Operator	3	$25,709.00	$31,311.00	$39,104.00
Water Plant Operator	6	$21,840.00	$27,001.33	$37,128.00
Water Plant Superintendent/Foreman	3	$37,000.00	$41,000.00	$46,000.00
	72			

Municpals 1,001 to 4,999 Connections (21)

Position	Count	Annual Salary Range Minimum	Average	Maximum
Asst. Manager/Asst. Superintendent	5	$40,664.00	$55,944.00	$74,000.00
Asst. Office Manager/Asst. City Clerk	9	$31,200.00	$37,445.56	$53,685.00
Bookkeeper	3	$29,120.00	$36,864.67	$43,701.00
Customer Service Rep (CSR)	16	$21,736.00	$30,922.75	$46,000.00
Distribution Supervisor/Foreman	8	$30,576.00	$47,261.00	$58,350.00
Equipment Operator	7	$28,633.00	$34,911.86	$41,080.00
Finance Director/Accountant	4	$54,132.00	$62,654.00	$69,813.00
Laborer	33	$18,720.00	$25,573.55	$37,440.00
Maintenance Supervisor/Foreman	12	$25,688.00	$41,878.25	$63,648.00
Manager/Superintendent	18	$31,200.00	$59,071.61	$113,000.00
Meter Reader	9	$19,615.00	$27,339.33	$35,880.00
Office Manager/City Clerk	16	$24,960.00	$43,866.38	$83,283.00
Wastewater Collection Operator	10	$26,416.00	$36,780.40	$56,160.00
Wastewater Plant Operator	30	$19,614.00	$31,536.97	$50,523.00
Wastewater Plant Supt./Foreman	11	$33,500.00	$45,267.09	$64,500.00
Water Distribution Operator	20	$20,613.00	$37,584.55	$45,760.00
Water Plant Operator	46	$17,388.00	$34,412.80	$50,960.00
Water Plant Superintendent/Foreman	13	$37,000.00	$48,519.38	$63,232.00
	270			

Municipals Greater than 5,000 Connections (17)

Position	Count	Annual Salary Range		
		Minimum	Average	Maximum
Asst. Manager/Asst. Superintendent	38	$61,318.00	$120,649.76	$215,436.00
Asst. Office Manager/Asst. City Clerk	3	$37,440.00	$39,492.33	$41,704.00
Bookkeeper	25	$36,712.00	$52,983.24	$87,556.00
Customer Service Rep (CSR)	144	$17,194.00	$40,217.37	$72,925.00
Distribution Supervisor/Foreman	30	$40,518.00	$63,527.53	$98,260.00
Engineer	28	$66,560.00	$97,633.39	$175,100.00
Engineer Assistant/Inspector	29	$32,136.00	$55,517.03	$92,862.00
Equipment Operator	40	$26,000.00	$46,996.58	$59,987.00
Finance Director/Accountant	25	$34,507.00	$79,073.96	$184,461.00
GIS Specialist	15	$30,992.00	$61,456.13	$86,565.00
IT Specialist	27	$44,625.00	$82,395.44	$185,297.00
Lab Technician	12	$36,400.00	$59,420.75	$86,118.00
Laborer	53	$18,720.00	$33,799.17	$50,000.00
Maintenance Supervisor/Foreman	19	$35,214.00	$62,046.84	$111,465.00
Manager/Superintendent	19	$45,760.00	$107,232.37	$242,190.00
Mechanic/Electrician	43	$35,464.00	$55,571.49	$67,642.00
Meter Reader	49	$27,000.00	$39,705.80	$61,070.00
Meter Reading Foreman	27	$31,824.00	$60,372.11	$118,675.00
Office Manager/City Clerk	12	$38,771.00	$53,939.42	$79,768.00
Wastewater Collection Operator	31	$22,984.00	$40,034.35	$60,070.00
Wastewater Collection Supervisor	7	$42,640.00	$54,417.86	$79,180.00
Wastewater Plant Operator	48	$22,984.00	$37,978.79	$72,384.00
Wastewater Plant Supt./Foreman	16	$40,394.00	$55,698.88	$96,762.00
Water Distribution Operator	121	$21,840.00	$51,221.42	$70,409.00
Water Plant Operator	73	$19,760.00	$46,633.44	$80,226.00
Water Plant Superintendent/Foreman	29	$37,648.00	$65,023.00	$94,305.00
	963			

All Water Districts, Associations, Commissions and Sanitation Districts (75)

Position	Count	Annual Salary Range		
		Minimum	Average	Maximum
Asst. Manager/Asst. Superintendent	16	$31,000.00	$50,529.59	$88,425.00
Asst. Office Manager/Asst. City Clerk	18	$16,640.00	$38,108.21	$60,738.00
Bookkeeper	19	$29,000.00	$38,845.50	$53,891.00
Customer Service Rep (CSR)	107	$16,640.00	$31,722.94	$56,618.00
Distribution Supervisor/Foreman	34	$19,760.00	$47,996.62	$63,357.00
Engineer	2	$65,853.00	$68,426.50	$71,000.00
Engineer Assistant/Inspector	4	$43,500.00	$50,250.00	$56,700.00
Equipment Operator	29	$26,728.00	$39,164.48	$64,210.00
Finance Director/Accountant	5	$63,981.00	$72,540.60	$82,513.00
GIS Specialist	3	$33,000.00	$43,500.67	$61,502.00
Lab Technician	2	$24,960.00	$32,718.50	$43,160.00
Laborer	84	$16,640.00	$29,385.61	$46,509.00
Maintenance Supervisor/Foreman	21	$36,670.00	$49,009.57	$69,451.00
Manager/Superintendent	59	$35,000.00	$69,916.93	$128,000.00
Mechanic/Electrician	6	$26,000.00	$42,151.50	$56,994.00
Meter Reader	44	$20,500.00	$30,070.13	$45,573.00
Meter Reading Foreman	12	$28,184.00	$46,631.83	$58,614.00
Office Manager/City Clerk	47	$23,338.00	$46,142.23	$81,800.00
Wastewater Collection Operator	17	$24,440.00	$35,010.76	$45,401.00
Wastewater Plant Operator	21	$20,800.00	$33,047.14	$44,616.00
Wastewater Plant Supt./Foreman	10	$42,120.00	$48,722.40	$61,429.00
Water Distribution Operator	70	$21,840.00	$38,688.32	$57,595.00
Water Plant Operator	75	$19,972.00	$37,375.41	$55,640.00
Water Plant Superintendent/Foreman	22	$34,528.00	$50,744.09	$73,590.00
	727			

Water Districts, Associations, Commissions and Sanitation Districts (30)

(0-2,499 Connections)

Position	Count	Annual Salary Range		
		Minimum	Average	Maximum
Asst. Manager/Asst. Superintendent	6	$31,000.00	$37,707.17	$47,840.00
Asst. Office Manager/Asst. City Clerk	5	$16,640.00	$31,426.80	$37,170.00
Bookkeeper	4	$29,661.00	$38,391.50	$45,094.00
Customer Service Rep (CSR)	11	$24,960.00	$32,874.55	$49,774.00
Distribution Supervisor/Foreman	5	$36,379.00	$45,476.40	$54,101.00
Equipment Operator	3	$34,133.00	$34,590.33	$35,360.00
Laborer	15	$20,352.00	$26,471.80	$37,000.00
Maintenance Supervisor/Foreman	7	$36,670.00	$46,994.00	$57,886.00
Manager/Superintendent	19	$35,000.00	$57,278.37	$94,120.00
Meter Reader	3	$28,500.00	$32,545.33	$37,000.00
Office Manager/City Clerk	15	$25,002.00	$37,956.73	$58,229.00
Wastewater Collection Operator	5	$30,534.00	$35,097.20	$38,938.00
Wastewater Plant Operator	6	$30,534.00	$36,433.33	$42,058.00
Water Distribution Operator	15	$24,960.00	$37,759.07	$57,595.00
Water Plant Operator	18	$19,972.00	$38,165.22	$52,832.00
Water Plant Superintendent/Foreman	6	$42,578.00	$51,736.50	$72,883.00
	143			

Water Districts, Associations, Commissions and Sanitation Districts (24)
(2500-4999 Connections)

Position	Count	Annual Salary Range		
		Minimum	Average	Maximum
Asst. Manager/Asst. Superintendent	3	$50,461.00	$54,144.00	$56,971.00
Asst. Office Manager/Asst. City Clerk	6	$24,960.00	$33,358.33	$36,774.00
Bookkeeper	8	$29,000.00	$39,011.25	$53,891.00
Customer Service Rep (CSR)	31	$16,640.00	$30,826.55	$49,795.00
Distribution Supervisor/Foreman	9	$19,760.00	$43,502.11	$63,274.00
Equipment Operator	7	$30,160.00	$39,143.00	$52,918.00
Laborer	20	$16,640.00	$28,555.60	$46,509.00
Maintenance Supervisor/Foreman	9	$38,730.00	$47,147.11	$62,109.00
Manager/Superintendent	20	$38,750.00	$65,649.35	$109,000.00
Mechanic/Electrician	3	$37,440.00	$44,089.67	$56,994.00
Meter Reader	13	$20,500.00	$29,925.77	$45,573.00
Meter Reading Foreman	3	$35,027.00	$37,287.33	$38,459.00
Office Manager/City Clerk	16	$23,338.00	$43,516.13	$53,500.00
Wastewater Collection Operator	5	$29,910.00	$37,018.80	$45,401.00
Wastewater Plant Operator	7	$20,800.00	$31,984.43	$44,616.00
Wastewater Plant Supt./Foreman	5	$42,640.00	$48,601.00	$61,422.00
Water Distribution Operator	22	$21,840.00	$38,545.95	$54,683.00
Water Plant Operator	21	$20,800.00	$32,948.29	$49,109.00
Water Plant Superintendent/Foreman	5	$34,528.00	$41,371.20	$49,192.00
	213			

Water Districts, Associations, Commissions and Sanitation Districts (21)

(Over 5000 Connections)

Position	Count	Annual Salary Range		
		Minimum	Average	Maximum
Asst. Manager/Asst. Superintendent	7	$38,344.00	$59,773.00	$88,425.00
Asst. Office Manager/Asst. City Clerk	7	$31,200.00	$46,453.14	$60,738.00
Bookkeeper	7	$31,242.00	$39,532.29	$48,152.00
Customer Service Rep (CSR)	65	$18,720.00	$31,841.40	$56,618.00
Distribution Supervisor/Foreman	20	$37,648.00	$50,649.20	$63,357.00
Engineer	2	$65,853.00	$68,426.50	$71,000.00
Engineer Assistant/Inspector	4	$43,500.00	$50,250.00	$56,700.00
Equipment Operator	19	$26,728.00	$39,894.63	$64,210.00
Finance Director/Accountant	5	$63,981.00	$72,540.60	$82,513.00
GIS Specialist	3	$33,000.00	$43,500.67	$61,502.00
Lab Technician	2	$30,306.00	$36,733.00	$43,160.00
Laborer	49	$20,800.00	$30,553.88	$40,976.00
Maintenance Supervisor/Foreman	5	$43,618.00	$55,183.80	$69,451.00
Manager/Superintendent	20	$55,000.00	$86,472.75	$128,000.00
Mechanic/Electrician	3	$26,000.00	$40,213.33	$56,160.00
Meter Reader	28	$20,800.00	$29,766.96	$42,619.00
Meter Reading Foreman	9	$28,184.00	$49,746.67	$58,614.00
Office Manager/City Clerk	16	$35,464.00	$56,464.81	$81,800.00
Wastewater Collection Operator	7	$24,440.00	$33,514.71	$43,264.00
Wastewater Plant Operator	8	$22,880.00	$31,437.38	$42,640.00
Wastewater Plant Supt./Foreman	5	$42,120.00	$48,843.80	$61,429.00
Water Distribution Operator	33	$23,920.00	$38,928.30	$49,504.00
Water Plant Operator	36	$24,960.00	$38,846.28	$55,640.00
Water Plant Superintendent/Foreman	11	$39,520.00	$54,463.18	$73,590.00
	371			

Employee Benefits Summary
2019 Survey

All Utilities (132)	
Health Insurance	95%
Life Insurance	72%
Retirement	92%
Vacation	98%
Sick Leave	96%
Incentive Pay	19%

Utilities 0 to 2500 Connections (60)	
Health Insurance	89%
Life Insurance	52%
Retirement	85%
Vacation	97%
Sick Leave	95%
Incentive Pay	15%

Utilities 2500 to 4999 Connections (34)	
Health Insurance	100%
Life Insurance	81%
Retirement	94%
Vacation	97%
Sick Leave	94%
Incentive Pay	13%

Large Utilities Over 5000 Connections (38)	
Health Insurance	100%
Life Insurance	96%
Retirement	100%
Vacation	100%
Sick Leave	98%
Incentive Pay	27%

10. Refer to Princeton's responses to the Commission 's January 10, 2019 Order, Item 32.b. Princeton currently allocates the salaries and benefits paid to its Superintendent and Director of Finance evenly between its water and wastewater divisions . Provide a copy of any time study or analysis that Princeton has had completed to support its 50/50 allocation.

Response: Neither of these positions are required to keep daily records of time spent. Since both of these positions are primarily involved in the planning and operations of the water and sewer services versus clerical, it seemed appropriate to recoup these costs through volumetric rates rather than through the monthly customer service fee which serves to recoup other administrative costs. Therefore, the costs associated with these two higher paid positions were split equally between water and wastewater even though water customers outnumber sewer customers and water revenues are higher than sewer revenues.

Witness: Tracy B. Musgove

11. Refer to Princeton's Responses to the Commission's January 10, 2019 Order, Item 32.d. Princeton explains that the maintenance department expenses are randomly allocated with 45 percent going to water and 55 percent going to wastewater.

a. Provide a schedule that lists each item included in the total maintenance department costs and include the following for each item: the purchase or service date; the vendor; the check number; a detailed description of the item; and the amount. Include invoices to support each item contained in the schedule.

b. Provide a copy of any time study or analysis that Princeton has had completed to support its 45/55 allocation.

c. Explain how an expense allocation defined as "random" or an allocation based on an employee's opinion would meet the ratemaking criteria of being known and measurable.

d. In its response, Princeton states that the 45/55 allocation was the allocation prior to the last GASB & OPEB audit adjustment, which posted after these worksheets were completed. Provide detailed calculations to show how GASB and OPEB audit adjustments would impact the allocation of maintenance expense between the two divisions.

Response: Generally, a review of relevant information (as discussed below) demonstrates that significantly more than 45 percent of maintenance expenses should be allocated to the water system.

Refer to Excel Exhibits PSC 2-11 Maintenance Work Orders 2018 and PSC 2-11 Maintenance Work Orders 2019. The maintenance department has known and measurable expenses as shown in the general ledger expense categories with the "400" department code. The allocation of 45/55 was built into the spreadsheet when the spreadsheet was first used to try and determine what it cost to produce and distribute water. The 45/55 split was a result of consulting with department managers and maintenance staff before several million dollars were spent on the wastewater system and while not being able to document the actual time spent between departments, records of inventory used and work orders do show a majority of the time is actually water related instead of being sewer related. The normal work load of the maintenance department consists of water sampling, checking lift stations, road cut repairs, office work, water leak repairs, sewer line repairs, line locates, flushing, meter settings, sewer taps, truck and equipment maintenance, meter upgrades, maintenance at treatment plants, and jetting sewer lines. Office work and chlorine samples are completed every day. Office work is documented by work orders and consists of turn on, turn offs, and line locates (all water related), and sewer backups. A review of almost 1,400 office work orders for fiscal year 2018 show 495 water disconnects, 468 water connections and 428 miscellaneous calls of which only 40 were sewer related (3%). A review of 1,435 office work orders for fiscal year 2019 show 461 water disconnects, 437 water connections, and 537 miscellaneous calls of which only 52 were sewer related (3.6%). Chlorine samples are taken daily, lift stations (which are sewer related) are checked weekly and usually takes one employee 4 hours to complete. During the summer months, when the system requires additional flushing to maintain appropriate chlorine and DBP levels, one employee is dedicated to the autoflushers for at least one day each week.

Other work, such as meter upgrades, sewer repairs, meter settings, and sewer taps are documented on material request forms so that inventory usage can be entered into the system. Documentation from the inventory used in 2018 shows more than 91% of the items used were water related and 2019 shows 61% of the inventory items used were water related. See Excel Exhibits PSC 2-11 Inventory Expense 2018 and PSC 2-11 Inventory Expense 2019.

Ms. Musgove's statement, "This amount was the allocation prior to the last GASB & OPEB audit adjustment which posted after these worksheets were completed" only meant that the amount of the expenses of the maintenance department changed after receipt of the final auditor adjustments. The final audit adjustments included debits and credits which changed the total maintenance department expenses.

Witness: Tracy B. Musgove

12. Provide the number of customers served by Princeton's water and wastewater divisions as of the end of fiscal years 2015 through 2019.

Response:

PWWC Water Customers for Fiscal Years 2015 - 2019				
Fiscal Year	Inside Retail	Outside Retail	Wholesale	Total Meters
2015	3,014	399	16	3,429
2016	3,013	370	15	3,398
2017	3,027	372	15	3,414
2018	2,994	375	15	3,384
2019	2,991	380	15	3,386

PWWC Wastewater Customers For Fiscal Years 2015 - 2019	
Fiscal Year	Inside Retail Meters
2015	2,917
2016	2,874
2017	2,891
2018	2,823
2019	2,878

Witness: Tracy B. Musgove

13. Refer to Princeton's responses to the Commission's January 10, 2020 Order, Item 14, Depreciation Schedule and to the National Association of Regulatory Commissioners (NARUC) Depreciation Practices for Small Water Utilities, August 15, 1979, Figure 1, Typical Service Lives, Salvage Rates, and Depreciation Rates, Small Water Utilities (NARUC Survey). A copy is hereby attached.

a. Provide a schedule in Excel spreadsheet format that compares the depreciation lives in Princeton's schedule to the average service life ranges in the NARUC Survey.

b. Using the mid-point depreciation life of the average service life ranges in the NARUC Survey, recalculate Princeton's pro forma depreciation expense. Provide the recalculation of pro forma depreciation expense in Excel spreadsheet format with formulas unprotected and all rows and columns fully accessible.

Response: See attached Excel Exhibit PSC 2-13(a&b) Revised NARUC Depreciation Schedules.

Witness: Tracy B. Musgove

14. Refer to Princeton's responses to the Commission's June 10, 2019 Order, Item 14, Depreciation Schedule. Provide any analysis or study prepared by Princeton or its auditors showing that Princeton's Capitalization Policy and depreciation lives are reasonable.

Response: As with many smaller utilities, depreciation studies have not been completed and the PWWC has relied on the expertise of its auditors in matters related to depreciation.

Witness: Tracy B. Musgove

15. Refer to the Musgove Testimony, page 4. The testimony states that Princeton decided to take steps to replace the old, declining block-tiered method and move to a uniform rate structure that would be a more fair and equitable system for its customer base after researching water rates and trends in the industry.

a. Explain how Princeton's research into the trends in the industry assisted Princeton in setting its retail customer rates, and how this assisted Princeton in setting its wholesale customers rates.

b. Explain how Princeton was able to determine trends in the industry were an integral part of its attempt to move toward a uniform rate structure.

c. Explain whether Princeton's research included any COSS filed in rate cases with this Commission.

d. Explain whether Princeton's research included any COSS performed by Commission Staff that was filed in a rate case with this Commission.

e. Provide any bid request by Princeton from any COSS expert or ratemaking expert

f. Provide any research that Princeton performed in the industry and the trends in water service rates.

g. Additionally, provide the name of any industry expert that Princeton sought assistance from in its research of the industry and the trends in water service rates.

Response: Information received by PWWC indicated that there was industry support for full-cost pricing and that the industry was moving away from declining-block rates. Ms. Musgove researched and reviewed some PSC decisions and Staff Reports while developing and recommending rates to be adopted by PWWC.

Notably, this Commission has stated that the water industry is moving away from declining block rates. In a case involving Northern Kentucky Water District, the Commission noted: "NKWD proposes to retain a declining block rate design. The recent trend within the water industry has been to move away from declining block rates to other types of rate design that more effectively encourage water conservation. *See, e.g.*, Scott J. Rubin, *What Does Water Really Cost? Rate Design Principles for an Era of Supply Shortages, Infrastructure Upgrades, and Enhanced Conservation* 7-8 (NRRI July 2010)." *See N. Kentucky Water Dist.*, Case No. 2010-00094 at n.97 (Ky. PSC Jan. 7, 2011).

This is consistent with the Commission's treatment of rate design in the electric industry. The Commission has stated, "While a cost-of-service study may be essential properly to redesign certain categories of rates, it is not a prerequisite to eliminating declining block electric rates. Declining block rates send an inappropriate price signal to consumers, one that tends to promote the use of electricity in a manner that does not always result in an efficient use of resources. While there may be some justification for seasonal, off-peak use of declining block rates, the Commission generally favors flattening rates for energy consumption." *See S. Kentucky RECC*, Case No. 94-400 at 4-5 (Ky. PSC July 26, 1995).

Ms. Musgove has researched and reviewed significant amounts of information related to the utility industry and its trends. Some of those materials are attached as

Exhibit PSC 2-15 Utility-Related Materials. In addition, she reviewed an article in the Journal of American Water Works Association "The Conservation Conundrum: How Declining Demand Affects Water Utilities" (http://apps.awwa.org/WaterLibrary/showabstract.aspx?an=JAW) written by Janice Beecher, the Director of the Michigan State University's, Institute of Public Utilities Policy Research & Education. The article states: "Utilities face significant financial challenges with 'rising infrastructure costs that must be recovered from a shrinking sales base. . . . . Utilities will also need to examine rate-design options and assess whether they exacerbate or mitigate revenue volatility, uncertainty, and distributional consequences…'"

When researching the types of rate structures at the EPA website and reviewing the following article: https://www.epa.gov/sustainable-water-infrastructure/pricing-and-affordability-water-services It was noted that declining block rate structures were not even mentioned as a pricing structure for sustainability. Uniform rate structures and full cost pricing appear to be favored over declining block structures. Therefore, with more and more information covering uniform rates, full cost pricing, and the need for utilities to reexamine whether their rate structure is exacerbating or mitigating revenue problems, the decision was made to move forward with a structure that would be simple to explain and to work with in the future.

As mentioned previously, Ms. Musgove collaborated with Stephen Lapp and Tom Roberts of the University of North Carolina Environmental Finance Center.

Witness: Tracy B. Musgove

Case No. 2019-00444
Princeton Water and Wastewater Wholesale Water Rates Increase
Responses to Commission Staff's Second Information Requests

Exhibit PSC 2-15

Utility-Related Materials

Designing Water Rate Structures for Conservation & Revenue Stability

Mary Tiger
Jeff Hughes
Shadi Eskaf

February 2014

UNC Environmental Finance Center

Sierra Club
Founded 1892

About the Environmental Finance Center

The Environmental Finance Center at the University of North Carolina, Chapel Hill is part of a network of university-based centers that work on environmental issues, including water resources, solid waste management, energy, and land conservation. The EFC at UNC partners with organizations across the United States to assist communities, provide training and policy analysis services, and disseminate tools and research on a variety of environmental finance and policy topics.

The Environmental Finance Center at the University of North Carolina, Chapel Hill works to build the capacity of governments and other organizations to provide environmental programs and services in fair, effective and financially sustainable ways.

About the Sierra Club, Lone Star Chapter

The Sierra Club is a national environmental organization, and the Lone Star Chapter is the state level entity for the Sierra Club in Texas. The Sierra Club, Lone Star Chapter is a partner with the National Wildlife Federation (NWF) in the Texas Living Waters Project. The Texas Living Waters Project works with water policy specialists, public officials, and communities in Texas to ensure adequate water for both people and the environment. The Project works to reduce future demand for water through advocating for efficient use of existing supplies. A key goal of the Project is to involve citizens in decisions about water resource management at the local and state levels.

Acknowledgements

Written by Mary Tiger, Shadi Eskaf, and Jeff Hughes.

This report was a collaborative effort within the EFC and with the Sierra Club, Lone Star Chapter. This analysis would not have been possible without the expertise of Jennifer Walker, Water Resources Coordinator for the Sierra Club, Lone Star Chapter. Editorial assistance was provided by Alexandra Kay. Tyson Broad & Ken Kramer of Sierra Club and Myron Hess of NWF also reviewed report drafts and provided feedback.

This report is a product of the Environmental Finance Center at the University of North Carolina, Chapel Hill. Findings, interpretations, and conclusions included in this report are those of the authors and do not necessarily reflect the views of EFC funders, the University of North Carolina, the School of Government, or those who provided review.

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Designing Water Rate Structures for Conservation and Revenue Stability

Table of Contents

Executive Summary

Water conservation is critical to meeting the water needs of Texas. Many programs may be implemented to reduce water use, and a number of utilities across the State are making strong efforts to advance water conservation. This report focuses on how a utility may use its water rates and financial policies to encourage customers to reduce their water use while maintaining the financial viability of the utility.

It is a fundamental economic theory that the more you charge, the less people use (at least for most goods). That's what makes water pricing such a compelling and convincing tool to use in advancing water conservation. The principle is simple: to achieve conservation, just charge high rates. But of course, the reality of rates is far more complex.

First and foremost, water utilities must set rates to collect the revenue they need to operate the water utility, invest in its infrastructure, and protect public health. After that, utilities can and do tweak and tailor the structure of rates to meet any number of objectives, including customer affordability, economic development, and water conservation. And this is where it can get complicated. Some of these objectives can come in direct conflict with one another and with the primary objective of balancing the budget. One common conflict is the tension that arises between promoting water conservation and ensuring a stable revenue stream to cover the predominantly fixed charges of running a water utility. The relationship is complex; the solutions numerous.

This report explores the relationship between water pricing, water use, and revenue stability in the State of Texas using water rate data predominantly collected by the Texas Municipal League. Trends show that higher water prices are associated with lower average residential water use for water utilities that:

- increase rates from one year to the next (2012 to 2013),
- charge more for water at 5,000 gallons per month, and
- charge more at higher levels of water use.

Additionally, water rates in Texas show a range of revenue vulnerability across the state, which is influenced by marginal pricing and the level of base charges.

These trends are only a cursory exploration of the relationship between water use, water pricing, and revenue stability, but they confirm trends seen in other states and studies. There are many factors that contribute to a customer's water use from one year to the next and from one water utility to another. In addition to pricing, weather, economic factors, and customer demographics influence water use, and subsequently revenue. Similarly, there are many factors that impact the revenue stability for a water utility, such as cost drivers, service area characteristics, and demand projections.

Given the range of operating environments for water utilities, this report introduces a menu of rate structure, billing, and financial practice options that can be adopted to promote conservation AND ensure revenue stability. Water utilities can use locally-appropriate combinations of these options to promote water conservation without undercutting the bottom line. The specific mix of practices appropriate for a utility will be influenced by local conditions, as explored in three hypothetical scenarios.

There is no one-size-fits-all approach to using rate structures to achieve water conservation goals, but there are some general principles to keep mind when developing such rate structures:

- **The rate level itself matters more than the rate structure.** Prices that are artificially kept low and ignore key components of cost, (such as deferred maintenance) send inaccurate and shortsighted price signals to customers. Utilities should balance short- and long-term revenue and expenditure balance in setting rates. While different rate structures target specific types of water use, the overall price level is influential on demand.
- **Small details matter.** Pricing dialogue is often dominated by what type of block pricing is used when other design decisions, such as the size of the flat charge or the way wastewater charges are calculated, can have significant impact of pricing signals and revenue generation.
- **Utility methods matter.** Rate setting of any kind should begin with accurate demand projections that take into consideration the impact of pricing on consumption. Projections for revenue and demand should be reviewed annually and recalibrated to match current thinking. Furthermore, revenue risk can be mitigated with reserves (such as a rate stabilization fund) and conservative budgeting.
- **Rate awareness matters.** A better and more frequent understanding of pricing levels and water use by utilities and their customers will assist utilities in using pricing to achieve strategic objectives, such as conservation and revenue stability.

Texas utilities are not the first and only organizations dealing with the tension between water pricing, conservation, and revenues. This report concludes with a summary of the great body of work that addresses and investigates this issue across the country and recent times. Although some reports go back to the mid-1990s, the increase of thinking and writing on the topic reflects increasing interest and need for solutions as water supply constraints demand conservation and water infrastructure needs demand revenue.

Introduction

The purpose of this guide is to explore the balance between conservation and revenue stability in Texas' water structures and introduce rate structures, billing options, and financial practices that will help utilities advance water conservation objectives without undercutting needed revenue stability. Water utilities and their stakeholders will find it useful in evaluating how water rates compare within the state and identifying additional steps that can be taken to promote conservation and ensure revenue stability for water utilities.

Part One acknowledges the myriad of considerations that water utilities undertake in setting strategic rates and the need to balance these considerations. Part Two provides an assessment of the balance between pricing and revenue stability in the State of Texas with a statewide summary of pricing and case studies on two of the state's largest utilities (San Antonio Water System and the Austin Water Utility) that have strategically used water rates to promote conservation while at the same time seeking more revenue stability. Part Three provides guidance on water utility rate structure design and billing practices that promote conservation and help ensure revenue stability, given the various operating environments for utilities across the state. Part Four summarizes the primary resources on this topic. This document is not designed to address every aspect of rate making, but the appendix does define some of the basic elements of water rate structure design.

Part I. Considerations for Strategic Pricing for Water Utilities in Texas

First and foremost, water utilities set rates to balance budgets.

Revenue sufficiency is the primary financial objective for most water utilities that operate as enterprises. They must be financially self-sufficient, recovering not only the cost of daily operations but also funding capital improvements to fulfill their central public health mission. They strive to design rate structures and set rate levels in a manner that equitably charges a customer based on the cost-of-service. However, rates and rate structures can go well beyond these main objectives and provide an excellent avenue to help a utility achieve some of its goals and policies.

Some of the more prevalent secondary objectives of water pricing are:

- ***Conservation Promotion***: The amount that customers pay for water service acts as a price signal, often encouraging the customers to decrease consumption. A utility charging high rates typically discourages large volume use among many residential customers. In fact, many utilities in Texas have adopted increasing block rate structures (where the rate increases with increasing block rates of usage). The rationale behind conservation-oriented rates is that customers using a lot of water or those with large seasonal variations in consumption should pay their fair share, since distribution networks are sized to meet peak demands.

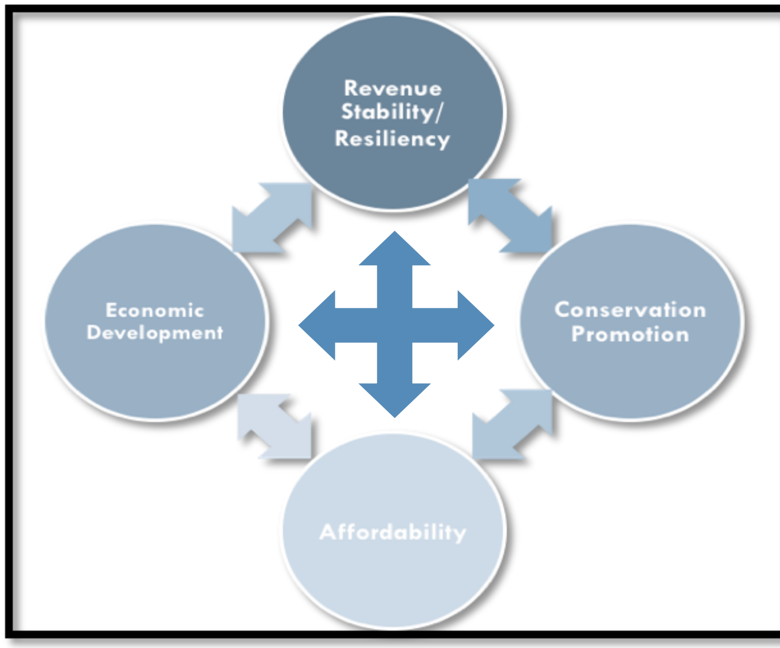
- ***Affordability:*** Ensuring that water is affordable to a community for basic services is a priority of many utilities and their governing boards. A “lifeline” rate as part of an increasing block rate structure, as well as low base charges, is a method employed by utilities to meet this objective. Maintaining “affordable” rates should almost never take precedence over charging rates that are necessary to recover the full costs of service. Artificially maintaining low rates will lead to deferring maintenance, rehabilitation and replacement, deteriorating infrastructure and creating public health hazards in the future, as well as masking the true cost (and value) of water. There are financial tools that can be used to maintain affordability for basic water needs while meeting the full cost of service.

- ***Economic Development:*** Utilities may strive to attract new or maintain existing commercial customers through water rates to foster greater community benefit. Historically, water utilities have done this with low rates targeted at very high levels of consumption that no household or average commercial customer would use.

- ***Short-Term Revenue Stability***: Year to year, most water utilities in Texas rely on revenue from water consumption charges to cover the predominantly fixed costs of the utility. Yet water consumption can vary and is on the decline for many utilities, undermining water utility revenue stability – which some are calling the “new normal.”

Other objectives, such as ease of customer understanding, are explored in further detail in the “Recommended Reading” section of this report.

Striking a Balance



In setting rates, utilities must prioritize and balance objectives that are sometimes complementary and sometimes contradictory. A utility (in conjunction with its customers and stakeholders) must decide the objectives that take precedence and design a rate structure and level that reflects those priorities. For example, a utility wishing to encourage conservation and foster business-friendly practices might be conflicted over the use of a single increasing block rate structure for all its customers. A balance must also be considered when prioritizing affordability and revenue stability. A utility wishing to maintain affordability by keeping base charges and rates low for low use might have to sacrifice its need for month-to-month and year-to-year revenue stability that can be maintained through higher base charges.

One of the most notorious conflicts in balancing rate setting objectives is between the goal of revenue stability and that of customer conservation. The most prevalent retail pricing model in the industry relies on a modest base charge coupled with a much larger variable charge that is based on volumetric use. This highly variable structure provides an incentive for customer conservation and efficiency. Generally, the larger the ratio of variable revenue to fixed revenue, the greater the conservation incentive. A utility that incorporates the majority of its predominantly fixed utility costs into variable customer charges will do fine as long as sales projections are met or exceeded. But when there is an unexpected decline in sales volume (due to drought restrictions, economic recession, wet weather, etc.) and the sharp drop in revenue does not correspond to a reduction in costs, utilities expecting the majority of their revenues from variable charges will struggle to recover costs. Furthermore, if in response to gradual declines in demand, a utility continually focuses on increasing the variable portion of its charges to meet shortfalls it may very well be increasing future revenue vulnerability due to price elasticity. This phenomenon has been coined the "conservation conundrum[1]".

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[1]Beecher, J. 2011. The Conservation Conundrum: How Declining Demand Affects Water Utilities. *Jour. AWWA*, 102(2): 78-80

Part II. Water Pricing in Texas

It is a fundamental challenge for water utilities (or any industry) to price a product such that it encourages customers to use less of it while at the same time recovering enough revenue to operate its business while not overcharging the customer.

Recently much has been written and studied regarding the "conservation conundrum", but it is not a new issue for the industry. (See Recommended Reading at end of report for older accounts of the conservation conundrum.) The following section provides an assessment of the balance between pricing and revenue stability in the State of Texas with a statewide summary of pricing and case studies of two of the state's largest utilities (San Antonio Water System and the Austin Water Utility) that have strategically used water rates to promote conservation while at the same time seeking more revenue stability.

Statewide Pricing

Each year, the Texas Municipal League (TML) conducts a survey of water and wastewater charges of the state's municipalities. Additionally, the Texas Water Development Board (TWDB) maintains a database of financial information on all the local governments that have outstanding debt with TWDB. The Environmental Finance Center has combined and analyzed this data to shed light on the state of rates and revenues, conservation pricing, and revenue stability with Texas water utilities.

Although this report discusses utility pricing from the perspective of the water utility engaged in supplying water, it is important to point out that the majority of wastewater utilities calculate charges based on water consumption, thereby compounding the financial impact of water consumption to the customer. Most customers are unlikely to distinguish the nuances of the charges, but rather respond to the absolute dollar impact of changes in water use.

Many utilities in Texas use a customer's average winter time water consumption to calculate monthly wastewater charges for an entire year. As a general practice, wastewater is not metered and so wastewater utilities use wintertime water consumption to equitably bill for the water that goes down the drain. This practice is likely to have two major impacts on customer demand. It reduces the price signal to customers to reduce water demand in the summer because the wastewater charge component is fixed. Nonetheless, it does enhance the pricing incentive to reduce water demand in the winter (likely indoor, less discretionary water demand) because a customer will be paying for that winter-time consumption all year long. Although the following analysis focuses on water pricing, it is important to consider that the rate for wastewater is likely to impact customer demand.

The concept of price elasticity explains why and how utilities use rates to encourage the conservation of water. Like most economic goods, there is an inverse relationship between price and the quantity of water demanded; i.e., price increases lead to reductions in demand. Price elasticity varies by geographic region, water end use, customer class, demographics, and weather, but for the most part, water demand is relatively inelastic. This means that a 10% change in price will cause less than a 10% change in demand.

Although there have been a number of studies on price elasticity of water, including one done for single-family residents in Texas[2], confounding factors make it difficult for individual utility managers to predict customer response to rates in the next year. Even harder is predicting how customers will respond to rate increases in the long-term because the long-term impacts of pricing are less known and studied[3]. Customer response to pricing could be behavioral (i.e. shorter showers or drier lawn) or structural (i.e. low-flow showerhead or replacement of lawn with xeriscape landscape), and behavioral responses are likely to diminish over time.

Although there are many other factors that influence water use, the following analysis provides narrow snapshots into the impact of water pricing on water use in the State of Texas and is introduced to provide context and explore concepts related to price elasticity. The trends shown in the analysis reiterate the impact of water pricing on water use; they do not contradict the numerous studies on price elasticity.

The data displayed in Figure 1 show the difficulty in driving revenue increases through rate increases. The utilities reflected in the graph below are those that took the Texas Municipal League's rate survey in 2007 and 2010 and have outstanding loans with the Texas Water Development Board. The change in the Consumer Price Index between 2007 and 2010 is plotted on the graph to provide scale to the degree of rate adjustments. Those utilities to the right of the vertical dotted line increased water rates more than inflation. Raising rates by a fixed percentage did not generate corresponding increases in revenues between 2007 and 2010 for all of these 103 utilities. In some cases, the divergence of rate increase percentages and revenue growth rates is severe. For some utilities, relatively significant rate increases corresponded to a period with no revenue growth or even a decline in overall revenues.

The data reveal that:

1) Revenues usually increase when rates increase, despite a downward pressure on customer demand due to elasticity;
2) Generally, larger rate increases are associated with disproportionately lower revenue increases;
3) The relationship between rate and revenue increases is complicated and varies from utility to utility.

---

[2] Stratus Consulting. Water Price Elasticities for Single-Family Homes in Texas. August 1999.
[3] Vista Consulting. Long-Term Effects of Conservation Rates. 1997. American Water Works Association. ISBN 0-89867-904-4

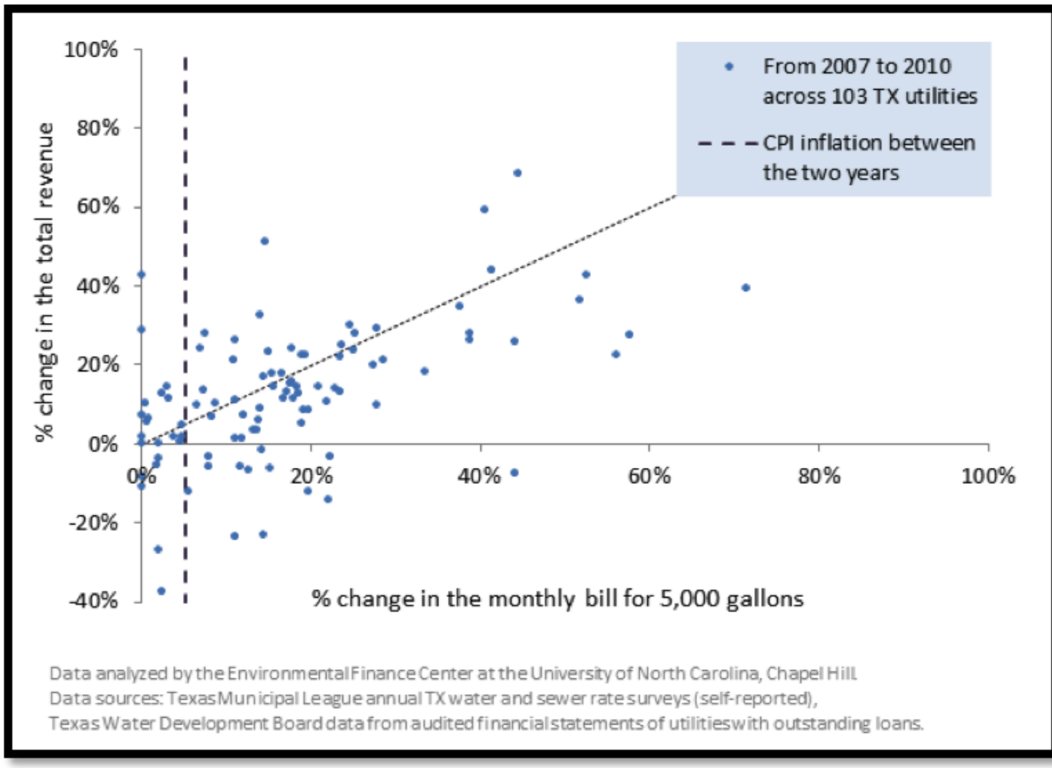


Figure 1. Driving Revenue Through Rate Increases

Of course, there are many factors beyond just price that affect this relationship (for utilities above and below the dotted line). Two utilities with identical rate increases may have very different outcomes in terms of revenue increases, even in the same state or region. **There is no single rule-of-thumb equation that utilities can use to accurately predict the effect of a rate increase on revenues, given that many other factors beyond the control of the utility will affect revenues.** Furthermore, the relationship between rate increases and revenue increases works in both directions; rate increases may drive down demand, which will lower revenue increases, and lower revenue increases may necessitate higher rate increases. **Utilities will probably find it difficult to raise rates fast enough to navigate their way out of a large revenue shortfall, since higher rate increases tend to yield disproportionately lower revenue increases[4].** As long as these trends are incorporated into revenue projections and pricing modifications, a utility should be able to maintain financial stability if they are willing to adjust rates accordingly. Problems can arise when utilities fail to consider scenarios that involve significant declines in usage and fail to set rates as realistic levels. Raising rates across-the-board is one tool to address revenue shortfalls, but this guide suggests other approaches as well.

[4] Hughes, J., and Leurig, S. 2013. Assessing Water System Revenue Risk: Considerations for Market Analysis. Ceres. http://www.ceres.org/resources/reports/assessing-water-system-revenue-risk-considerations-for-market-analysts

Figure 2 illustrates this effect by showing the change in a 5,000 gallon per month water bill between 2012 and 2013 versus the change in average household water use for the same time period. Although there are many more price points other than 5,000 gallons per month that could influence average household water use for an entire service area, **the trend shows a slight negative impact of pricing on water demand. In other words, as price increased, water use decreased.** The 512 Texas municipalities represented in the graph below are those that reported water rates in the Texas Municipal League's 2012 and 2013 water and sewer rate survey. This trend, however, is only cursory. There are many other factors that can influence water demand from one year to the next, predominantly weather.

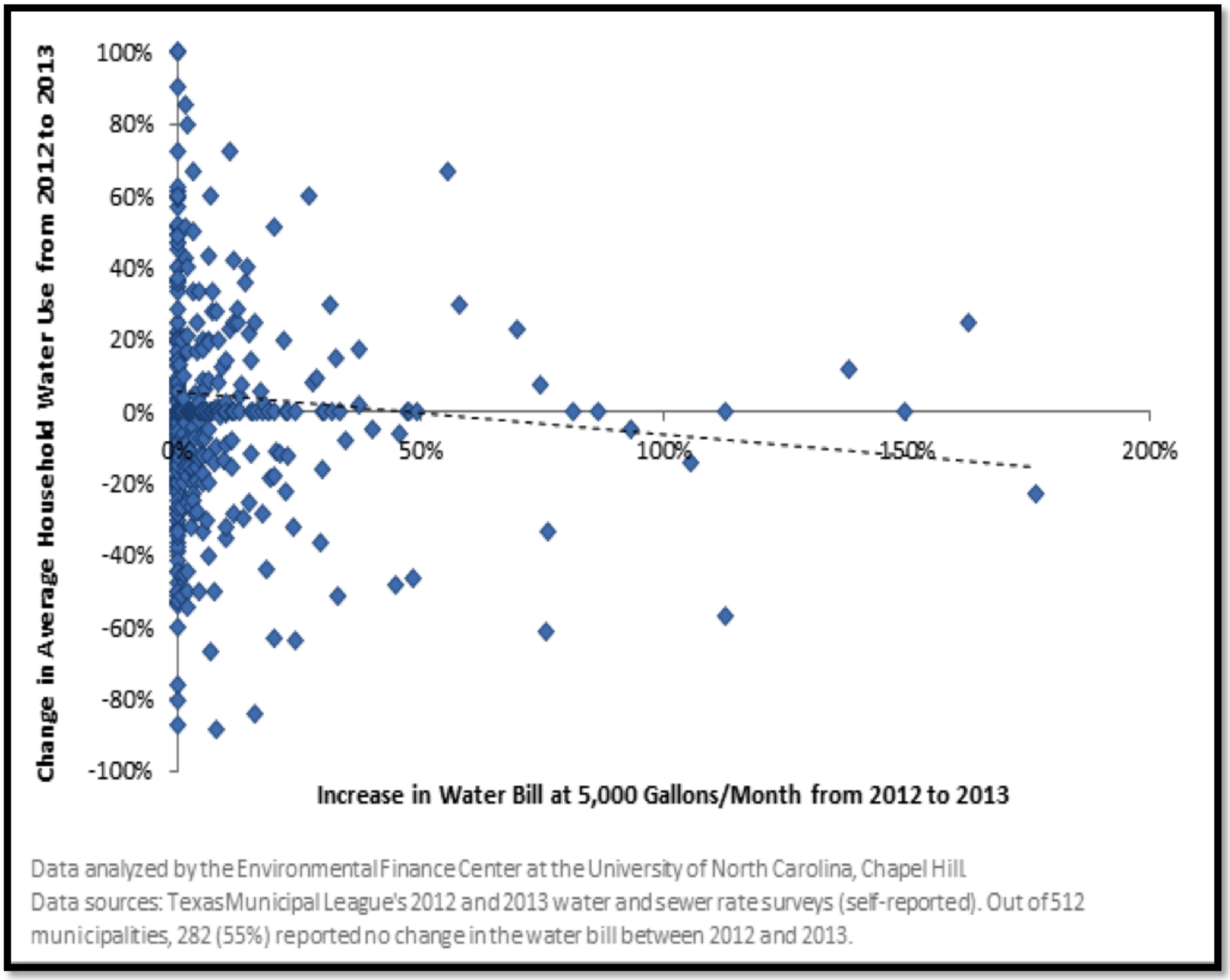


Figure 2. Changes to Water Prices and Average Household Water Use between 2012 and 2013 among 512 TX Municipalities

A simple comparison of prices versus average household water use demonstrates the pressure higher prices put on usage. Figure 3 summarizes water charges and average household water use by Texas water planning regions. The graph is arranged from highest-charging region to lowest-charging region. **Those regions with the higher charges tend to have the lowest trends in water use (i.e., Brazos G, Region B, North East Texas, and East Texas) while those that have lower charges tend to have the highest trends in water use (Rio Grande, Region H, and Panhandle).** The 528 Texas Municipalities included in the graph are those that reported water use and rates in the Texas Municipal League's 2013 water and sewer survey for which water planning region could be identified (excluding the Far West, Lavaca, and Plateau Regions due to an insufficient number of utilities with adequate data). And again, while the trend is interesting and insightful, there are many factors that influence usage beyond price including regional rainfall, economic condition, conservation ethos, etc. that may also be driving the usage differences.

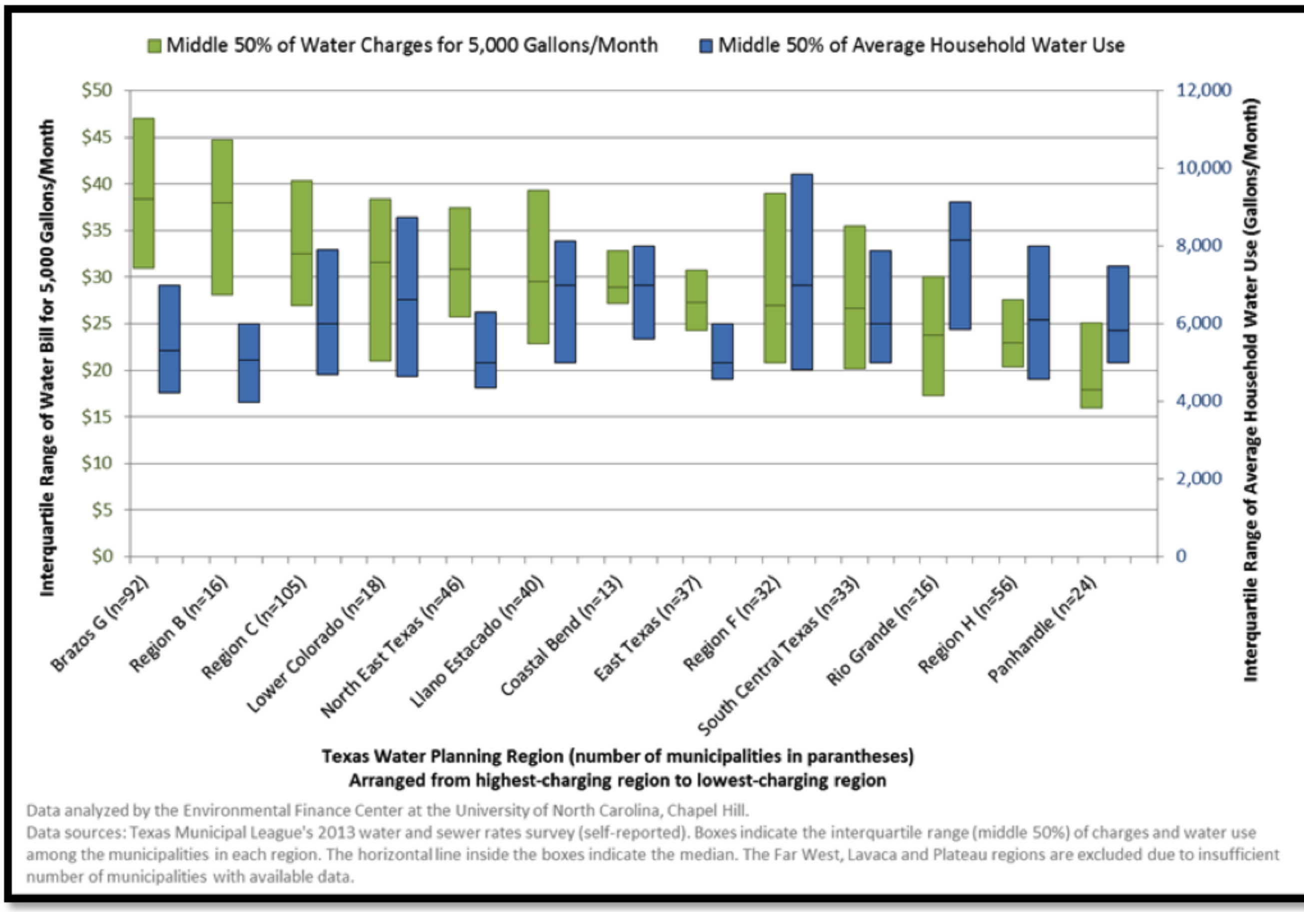


Figure 3. Water Charges and Average Household Water Use by Texas Water Planning Region Among 528 Texas Municipalities in 2013

Beyond the actual charge for a product, economists argue that it is the change in charge that a customer experiences when they use less or more of product that influences changes in use[5]. Figure 4 below shows the correlation between the change in charge between 10,000 gallons and 5,000 gallons per month (i.e. the marginal price of water between 5,000 and 10,000 gallons of use per month) versus a utility's average household water use**. It shows a downward trend between a utility's marginal price for water between these two consumption points and the average household water use for that utility, which suggests that as price increases water use decreases.** The 681 Texas Municipalities included in the graph are those that reported water rates and water use in the Texas Municipal League's 2013 water and sewer rate survey.

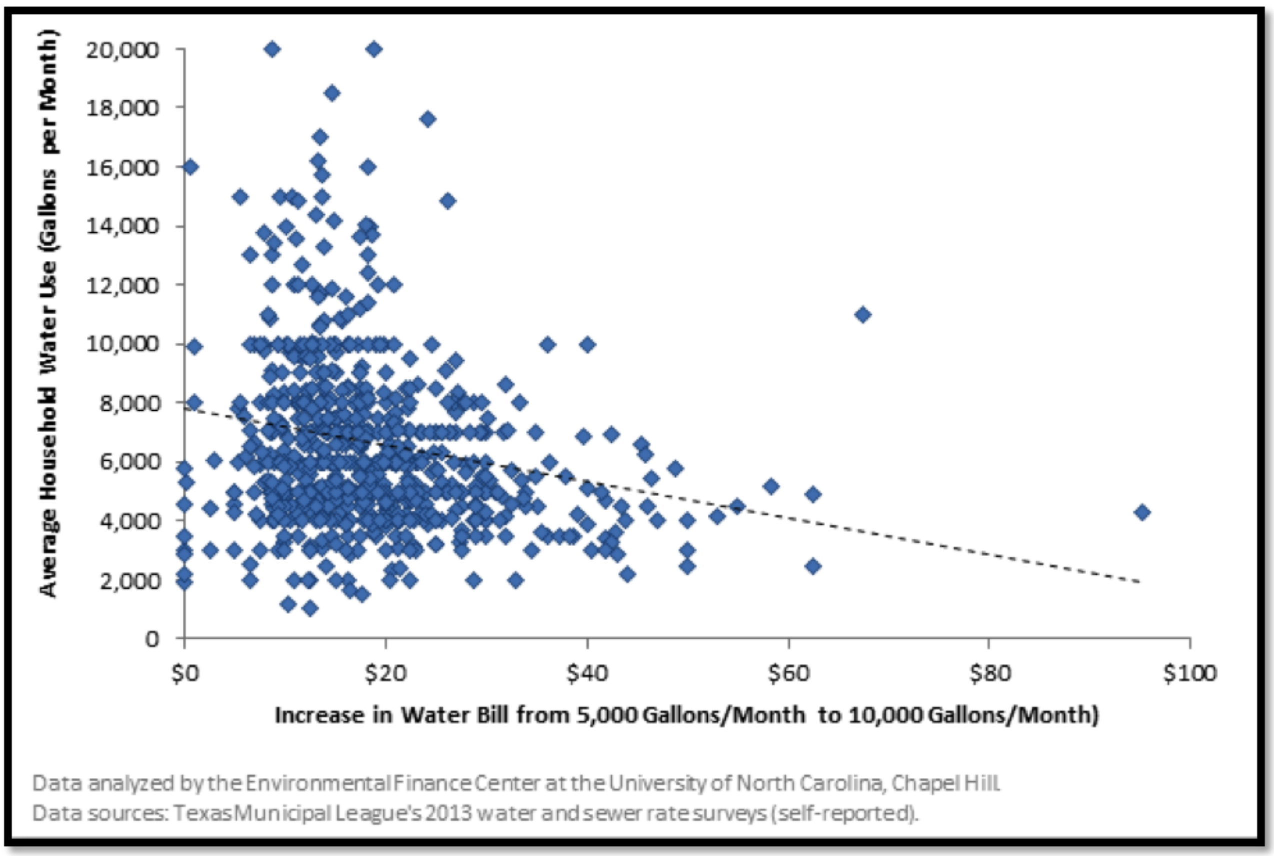


Figure 4. Correlation between Average Monthly Household Water Use and the Increase in Water Monthly Bill between 5,000 Gallons and 10,000 Gallons in 2013 (681 TX Municipalities)

[5] Howe, Charles. 2005. The Functions, Impacts and Effectiveness of Water Pricing: Evidence from the United States and Canada. Water Resources Development, Vol. 21, No. 1, 43–53, March 2005,

While a high marginal price may impact water use, it can mean more revenue volatility when customers reduce consumption. Figure 5 shows the wide range of price signals across Texas in terms of both the percent of bill and absolute expenditures. The figure reverses the marginal price metric shown in Figure 4 to show the percentage that a customer's bill is reduced when water use decreases by 5,000 gallons per month (from 10,000 gallons per month) along with the actual dollar amount of the decrease. For example, a customer served by Utility A will see their bill go down $24 dollars (representing 22% percent of their bill) when they reduce their water use from 10,000 to 5,000 gallons per month. Conversely, when a customer served by Utility B reduces their water use by half (from 10,000 to 5,000 gallons per month), they will see their bill go down $32 dollars which represents 62% in terms of percent of their bill. **The higher a point falls on the graph, the stronger the price signal in terms of percent change in bill and, consequently, the revenue vulnerability for the utility.** The average utility represented in the graph below will recover 36% less revenue from a customer using 5,000 gallons per month than one using 10,000 gallons per month. **But for 47 of the 693 utilities, a customer that reduces their water use by 50% (from 10,000 to 5,000 gallons per month) will reduce their bill by more than 50% signaling revenue vulnerability.**

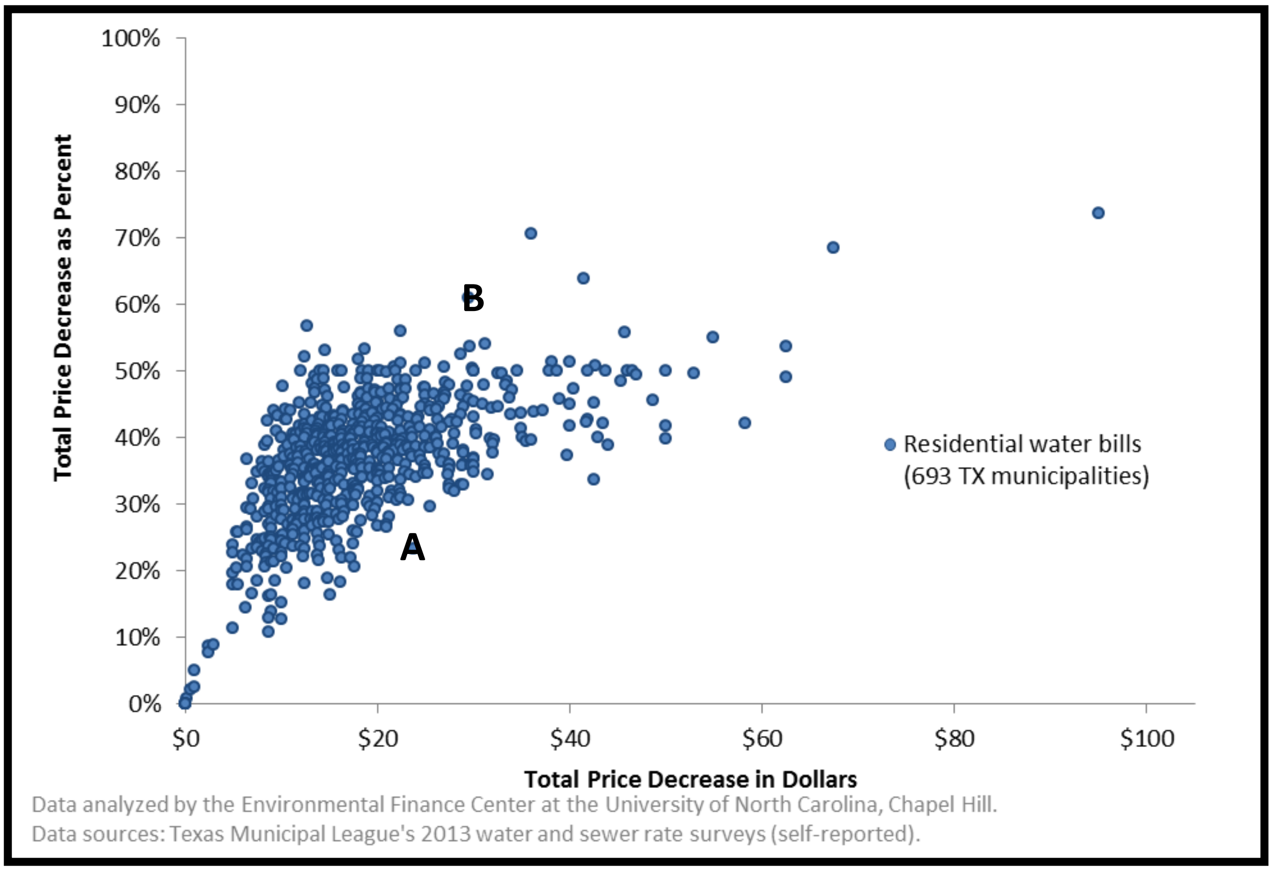


Figure 5. Reductions in Residential Monthly Water Bills for Decrease in Consumption from 10,000 to 5,000 Gallons in Texas in 2013

This can cause a revenue stability issue for utilities who derive more than 90% of their revenues from operating revenues and 80% of their operating revenues from consumption charges (a common situation for most utilities in the US)[6]. The 693 Texas utilities in the graphs are those that reported rates in the Texas Municipal League's 2013 water and sewer rates survey. Note: the 10,000 and 5,000 consumption points were chosen based on available data, but they also correspond to a realistic drop in usage that a family might see by implementing conservation initiatives particularly involving outdoor landscape irrigation.

The primary reason why this relationship between revenue and usage is not a 1:1 relationship (i.e. a 50% consumption reduction equates to a 50% bill reduction) is that volumetric rates are typically partnered with base rates (a fixed price that is charged no matter how much water used). The presence of a sizable base charge not only reduces the bill impact of conservation, but also helps to ensure a more fixed revenue stream for the utility. The 2013 Texas Municipal League rate survey did not collect base rate data. So the Environmental Finance Center collected base charge data from a geographically diverse group of fifty municipalities included in the 2013 Texas Municipal League rate survey (with an average population size of 22,707,and average household water use of 6,858 gallons per month) to compare "fixed versus variable" charges for customers and revenues for utilities. The figure below shows the range of bill (and to some extent revenue) stability at 5,000 gallons per month for each of these 50 utilities, with the median percent of residential water bill "fixed" falling between 51% and 60%. **In general, the higher the percent of residential water bill that is "fixed", the weaker the conservation signal and stronger the revenue stability.**

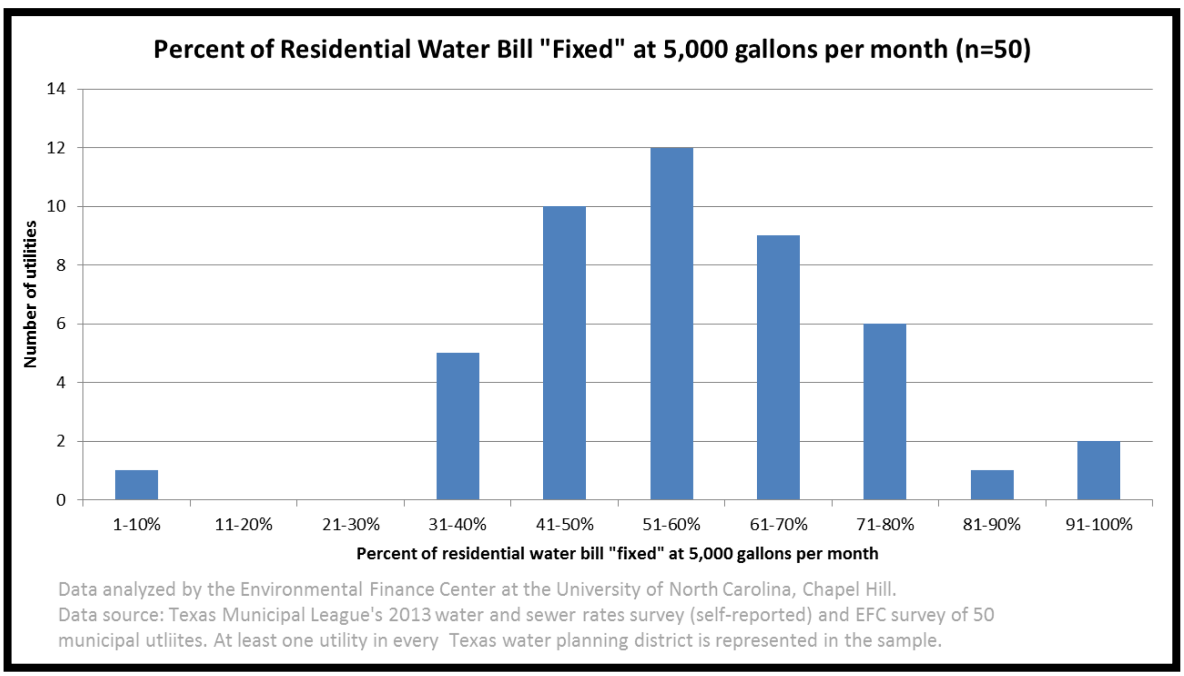


Figure 6. Percent of Residential Water Bill "Fixed" at 5,000 gallons per month (n=50)

[6] Hughes et al. Defining a Resilient Business Model for Water Utilities. Water Research Foundation Report. January 2014.

The analysis above explores the relationship between water pricing, water use, and revenue stability in the State of Texas using water rate data predominantly collected by the Texas Municipal League. Trends show that higher water prices are associated with lower average residential water use for water utilities that:

- increase rates from one year to the next (2012 to 2013)
- charge more for water at 5,000 gallons per month, and
- charge more at higher levels of water use.

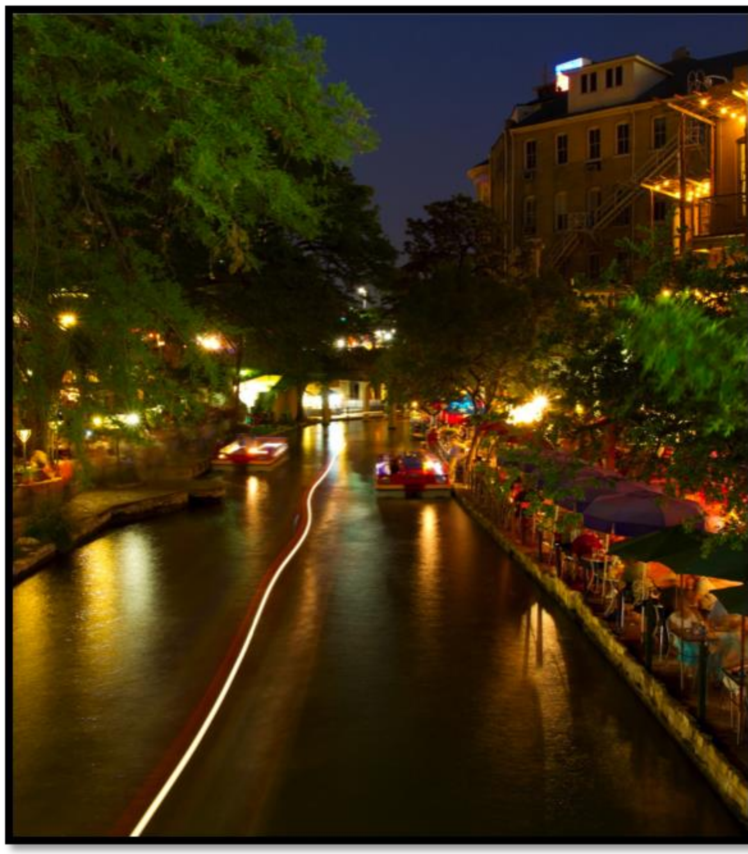
Additionally, water rates in Texas show a range of revenue vulnerability across the state, which is influenced by marginal pricing and the level of a base charge

These trends are only a cursory exploration of the relationship between water use, water pricing, and revenue stability, but they confirm trends seen in other states and studies. There are many factors that contribute to a customer's water use from one year to the next and from one water utility to another. In addition to pricing, weather, economic factors, and customer demographics influence water use, and subsequently revenue. Similarly, there are many factors that impact the revenue stability for a water utility, such as cost drivers, service area characteristics, and demand projections.

A Tale of Two Texas Cities

As two of Texas' largest water utilities, the cities of San Antonio and Austin have a long history of using rates to promote customer conservation. Their backgrounds reveal a combination of large and incremental rate adjustments to drive down demand and drive up revenue stability.

San Antonio Water System



San Antonio Water System (SAWS) has been using increasing block rates to incentivize water efficiency and conservation since the 1980s. Though SAWS has maintained an increasing block rate structure, it has made modifications to encourage conservation over the years. In 1988, SAWS added a fourth block on its increasing block rate structure and a seasonal differential (i.e. higher volumetric rates in the summer) to account for fluctuations in usage at different times of the year. SAWS has also made great efforts to educate its customers on water use and the price of water. Since the 1990s, customer bills have included an individualized chart showing water use for the previous 12 months and a comparison to neighborhood and overall SAWS average residential water use for that month[7]. In addition, the utility has a policy to conduct a complete rate study every five years; the last one was performed during 2009[8]. A new study is currently underway and a Rates Advisory Committee, comprised of local stakeholders, has been appointed[9].

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[7] Stratus Consulting. Water Price Elasticities for Single-Family Homes in Texas. August 1999.
[8] Guz, Karen. A Rate Structure that Promotes Conservation. A PowerPoint Presentation given for the Gulf Coast Conservation Symposium on March 2, 2011 by Karen Guz, Director of Water Conservation for the San Antonio Water System.
[9] Rate Advisory Committee Web site: https://www.saws.org/Who_we_are/community/rac/.

The utility uses its rate structure as a water conservation tool to:

- Send a price signal so customers become more conscious of their lawn and landscape water use
- Reward those who conserve water with lower bills
- Acknowledge that it is not fair to ask all customers to pay more for the lawn watering demands of a few. Rather, it is fairer to ask those who demand large amounts of water for irrigation purposes to pay for a higher cost of service[10].

In addition to conservation/demand management, SAWS identified two additional primary objectives for its rate structure in its 2009 rate study: financial sufficiency and rate stability[11]. The utility restructured its rates to reduce costs for low-using customers, helping to make water pricing more affordable for basic uses. Through its rate setting, the utility strives to fairly divide the "cost of service" across all customers.

SAWS funds operation and maintenance costs associated with conservation efforts through revenue generated from rates charged against the highest block of consumption, as well as a portion of the fixed monthly meter charges for general and irrigation class customers[12]. In addition, the utility has a drought surcharge that activates in stage four of drought, assessed for residential use greater than 12,717 gallons per month and commercial irrigation use greater than 5,236 gallons per month.[13] Drought surcharges are temporary charges additional to the existing rate structure. They can be effective at both promoting conservation (through increased charges for water use) and maintaining adequate revenues during times of drastic water use reductions[14]. Typically, the revenue recovered from a drought surcharge covers the revenue shortfall that occurs when customers conserve expectantly.

In 2001, SAWS added a flat water supply fee to fund the development, construction, and management of additional water supplies. Although, this helped the utility secure a more stable revenue base, it reduced the utility's conservation pricing signal. In 2010, the utility transitioned the water supply fee from a flat fee charged to all residential customers to a tiered, fixed water supply fee based on consumption. When it did this, it decreased the water delivery fee (variable rate) for residential consumption less than 12,717 gallons per month and increased the fee for consumption greater than 12,717 gallons per month. (The water supply fee is still flat for commercial customers.)[15] From its inception in 2001 through June 2013, the water supply fee has generated $862 million toward the investment in a diversified water supply portfolio.[16]

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[10] Guz, Karen. A Rate Structure that Promotes Conservation. A PowerPoint Presentation given for the Gulf Coast Conservation Symposium on March 2, 2011 by Karen Guz, Director of Water Conservation for the San Antonio Water System.

[11] Raftelis Financial Consultants. Comprehensive Cost of Service and Rate Design Study. Presentation to Rate Advisory Committee. October 30, 2008.

[12] Ibid

[13] San Antonio Water System Drought Operations Plan. Available at: http://www.sanantonio.gov/Portals/0/Files/Sustainability/DroughtOperationsPlan.pdf

[14] American Water Works Association. 2012. Principles of Water Rates, Fees and Charges (M1). 6th Edition. http://www.awwa.org/store/productdetail.aspx?productid=28731

[15] Guz, Karen. A Rate Structure that Promotes Conservation. A PowerPoint Presentation given for the Gulf Coast Conservation Symposium on March 2, 2011 by Karen Guz, Director of Water Conservation for the San Antonio Water System.

[16] San Antonio Water System. Water Management Plan Semiannual Report. January – June 2013.

Isolating the impact of SAWS' rate structure on water demand requires a detailed statistical study, but in its 2013 Water Management Plan Update, SAWS asserted that its customers would save more than 5 billion gallons of water per year by 2020 through its entire conservation program which includes rate structures[17].

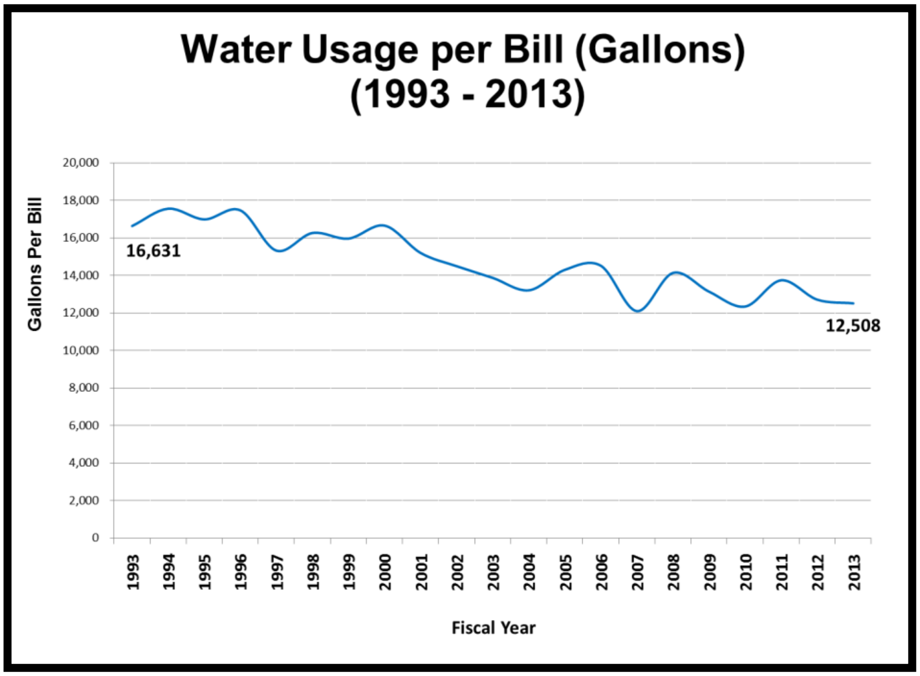

Figure 7. Changes in Water Use per Bill for the San Antonio Water System (1996 – 2013)[18]

Figure 7 shows a significant downward trend in water use per bill, volatility around that trend due to weather variation, and the downward effects of conservation drought restrictions from 1996 through 2013[19]. Average winter consumption (which is used to calculate wastewater charges) has also dramatically declined over the last decade as a result of indoor conservation efforts and growing public awareness about the winter averaging method and measurement period. In an effort to address a multitude of utility objectives through its rates, the San Antonio Water System has developed a fairly complicated rate structure over time. They are utilizing their rate structure for more than revenue recovery and have incorporated the predicted savings in response to increased rates into their water management plan. SAWS continues to grapple with the tradeoff between conservation promotion and revenue stability but have taken great strides to better align these often conflicting objectives.

[17] San Antonio Water System. Water Management Plan Semiannual Report. January – June 2013.
[18] Data provided by Doug Evanson, Chief Financial Officer for SAWS, February 14, 2014.
[19] SAWS. 2012 Annual Budget Report. Fiscal Year Ending December 31, 2012.

Austin Water Utility

Much can be learned about rate setting for conservation and revenue stability through the deliberations and recommendations of the Joint Committee on Austin Water Utility's Financial Plan that was convened in 2012[20] to "develop recommendations for short-term and long-term financial plans to strengthen the financial stability of the Austin Water Utility while continuing the city's goals of ensuring affordability of water rates and increasing water conservation."

The Joint Committee considered over 30 rate design options and compared each rate structure using a volatility, affordability and conservation ranking. This allowed the Committee members to see the impact of their recommendations.

Among the recommendations by the Joint Committee, two addressed the balance between conservation and rate stability objectives, including that the utility should:

- Increase fixed revenue goal to 20% of total water revenue requirements. Fixed revenues will be allocated to each customer class based on its relative water cost of service after the monthly minimum charge. The recommended increase will come from replacing a flat "revenue stability fee" with a tiered fixed fee based on volume of water used. *(Background: Prior to instituting a revenue stability fee in 2012, fixed revenue was about 11%. This effort was recently praised by Standard and Poor's Rating Agency[21].)*

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[20] Austin City Council Resolution that created the Joint Subcommittee. Available online at: http://www.austintexas.gov/sites/default/files/files/Water/JointSubcommittee/resolutionno20120112-063.pdf
[21] Hughes, Jeff, Peiffer Brandt, Mary Tiger, and Shadi Eskaf. 2014. Defining A Resilient Business Model for Water Utilities. Available at: http://www.waterrf.org/Pages/Projects.aspx?PID=4366

- Create an “as-needed” Revenue Stability Reserve Fund, which will be funded by a reserve fund surcharge (a volumetric surcharge charged to all customer classes in order to build or replenish the reserve fund), excess operating cash balances, and other sources. *(Background: The Revenue Stability Reserve Fund is only to be used to offset a current year water service revenue shortfall where actual water service revenue is less than the budgeted level by at least 10%. The utility can’t use more than 50% of the Fund’s existing balance at the time of the request.)*

Although the utility did not accept all of the committee’s recommendations, it did accept these two. The utility anticipates some significant rate increases over the next few years to achieve these revenue stability objectives and manage the system’s declining and fluctuating demand, as depicted in Figure 7.

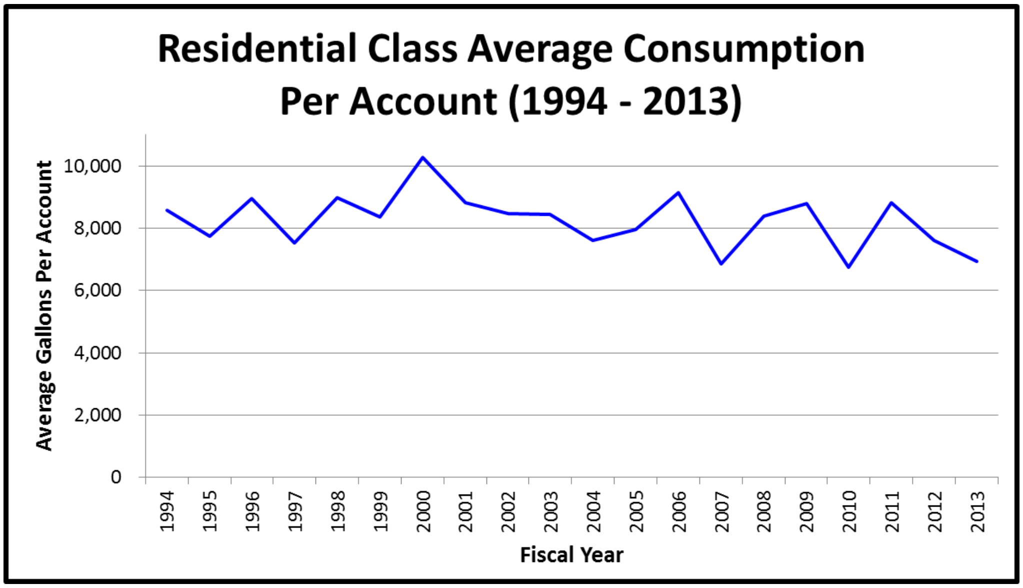


Figure 7. AWU Residential Class Average Consumption Per Account[22]

In recent years, declining demand is partially attributed to the intended and unintended water savings from watering restrictions enacted in response to drought[23]. As intended, the restrictions have helped reduce peak water use. However, an unintended consequence of the restrictions is that they (in combination with increasing water rates) have incentivized large irrigators to drill private wells to water freely from underground aquifers, further exacerbating water stresses in the region and reducing revenue for the utility. This experience highlights the fine line that water utilities walk between promoting conservation and ensuring revenue stability. As with SAWS, AWU’s deliberation with and evolution of the balance between revenue stability and conservation promotion highlights both the need for and reality of financially dealing with conservation and the thoughtful considerations of the outcomes of policy and pricing.

[22] Data provided by Michael Castillo, Utility Budget and Finance Manager at Austin Water Utility, February 11, 2014
[23] Interview with Michael Castillo, Utility Budget and Finance Manager at Austin Water Utility, February 11, 2014

Part III. Recommendations and Considerations for Designing Water Rate Structures for Conservation and Revenue Stability

The following section provides guidance on rate structure design and billing practices for water utilities that are attempting to decrease water usage among primarily their residential customers. There may be additional rate structure design and billing practices that utilities can implement to encourage water conservation among non-residential customers, but these are not addressed below. In 2004, the Water Conservation Implementation Task Force created by the Texas Legislature and appointed by the Texas Water Development Board produced a guide on water conservation Best Management Practices (BMPs). Many of the conservation guidelines listed below follow suit with the water conservation pricing BMPs in that guide.[24]

Rate Structure, Billing Options, and Financial Practices for Conservation and Revenue Stability

The following rate structures, billing options, and financial practices are designed to promote customer conservation and/or revenue stability. In many cases, a combination may be necessary to meet both objectives. All utilities should determine the cost to deliver service in the short and long term, and establish a baseline revenue requirement prior to engaging in additional rate deliberations.

[24] The Texas water conservation Best Management Practices are now available online and are updated periodically. https://www.twdb.texas.gov/conservation/BMPs/index.asp

Approaches to Ensure a Pricing Signal is Being Sent

1. **Use monthly billing period.** The more frequently a customer receives utility bills, the more aware they are of their consumption and the more price-responsive they are in their conservation efforts. Utilities are encouraged to use monthly billing when fiscally feasible.

2. **Provide price and use information on customers' bills.** Use the bill itself as a document to share information with the customer. Customers that can view their current and/or historic water use along with their utility's rates on the bill itself often adjust their consumption behavior and use less water. The 2004 Texas water conservation Best Management Practices Guide recommended at least 12 months of consumption history on a bill.

3. **Encourage sub-metering in existing apartment complexes and other master-metered multi-family residential housing areas.** Customers that receive their own utility bill directly have a greater financial incentive to repair leaks and conserve on water usage.

4. **Incorporate all the costs of water into price setting.** Many utilities fail to consider the true cost of their capital in pricing leading to artificially low prices that send inaccurate signals to customers about the value of the service.

5. **Understand the relative price signal**. Texas utilities can benefit from the body of rate and pricing information collected by the Texas Municipal League to allow utilities to understand how their pricing structures and signals compare across the state. A dashboard prepared by the Environmental Finance Center allows utilities to generate customized benchmarking analyses relatively quickly[25].

[25] Available online at: http://www.efc.sog.unc.edu/project/utility-financial-sustainability-and-rates-dashboards

Evaluation of the Pricing Signal at Various Consumption Points and Targeting Specific Types of Water Use

1. **Set prices that encourage water conservation at the average as well as high levels of residential customer consumption.** A price targeted at the average level of residential customer consumption will influence the water use of many more customers.
2. **Design a rate structure that significantly reduces total bills for customers that reduce water use – marginal price consideration.** This will have a great impact on the total bill for customers and have a higher potential to change behavioral and structure water use.
3. **Use an increasing block rate structure with 3 or 4 blocks within the first 20,000 gallons/month.** Having increasing block rate structures alone does not ensure a "conservation-oriented" rate structure. The first block beyond the base charge should be set near the wintertime average residential water use at the utility, or less than 5,000 gallons/month by default. If the difference between block rates is insubstantial, the customer will likely not notice any changes to their monthly bills as they move in and out of later blocks of usage. For a block rate structure to be effective in communicating the higher (or lower) price of water at different consumption levels, the difference in the block rates should be significant.
4. **As an alternative to an increasing block rate structure, use a higher uniform rate structure or a seasonal rate structure that permanently charges higher rates in the summertime than in the wintertime.** Seasonal rate structures can also be combined with increasing block rate structures.
5. **If irrigation water is metered separately, create an irrigation meter rate structure and charge a higher volumetric price for irrigation water than for standard household water.** Although this is likely to somewhat dissuade the use of a separate irrigation meter (thereby reducing the ability of the utility to measure irrigation water use), it will target pricing to peak-day consumption. The 2004 Texas water conservation Best Management Practices Guide suggested the adoption of a rule/ordinance requiring new commercial and institutional customers to install separate irrigation meters.
6. **Consider temporary rate adjustments (e.g. "drought surcharges") that are tied to drought conditions and water storage levels.** The implementation of these temporary rate adjustments should be clearly tied to water storage triggers identified in a utility's drought contingency plan. Utilities should develop and adopt temporary rate adjustment policies and communicate them with their customers before the next drought or water shortage period. This strategy can compensate for lost revenue due to the imposition of other water conservation measures, while at the same time encourage customer conservation when a water supply most needs it.
7. **Do not charge residential customers (or usage below 20,000 gallons/month) using decreasing block rate structures.** A "decreasing block rate structure" is one where the volumetric price for water ($/1,000 gallons or $/ccf) decreases for higher levels of consumption, thereby reducing the conservation signal for the most discretionary water uses. Some utilities with one price structure for all customers will use a decreasing block rate structure for usage at high levels to incentivize commercial and industrial customers.

Complementary Practices for Revenue Stability

1. **Review rates each year and adjust rates as needed to meet both operating and long-term costs**. Rates should be reviewed at least once a year to ensure that rates meet system costs. Increases also may be used to encourage conservation actions that respond to rate structure.

2. **Improve accuracy of demand and revenue projections.** Pricing that takes into consideration potential significant demand reductions are less likely to produce unexpected revenue shortfalls. While this worse case planning may lead to short term cash surpluses, in most cases these funds can be deployed effectively and efficiently to stabilize future rate increases or fund capital improvements that otherwise would have been debt financed.

3. Repeated - **Consider temporary rate adjustments (e.g. "drought surcharges") that are tied to drought conditions and water storage levels.** The revenue generated from these temporary rate adjustments can be used to off-set revenue shortfalls as a result of drought-time water use restrictions.

4. **Consider the establishment of and funding strategy for a rate stabilization fund.** Reserve funds have become an increasingly important part of water utilities' efforts to ensure financial stability and resiliency. Reserves dedicated as "rate stabilization funds" are used to create a monetary buffer to offset the financial risks of customer consumption reduction.

5. **Consider a fixed charge based on consumption, in addition to a fixed meter charge and volumetric charge.** Both the San Antonio Water System and the Austin Water Utility have adapted their increasing block rate structures to incorporate a "tiered" base charge based on a customer's consumption. This approach helps "levelize" charges and revenues, while still sending a conservation signal. You can read more about "Alternative Rate Designs" that promote conservation and advance revenue stability in the so-named chapter in "Defining a Resilient Business Model for Water Utilities" report cited in the "Recommended Reading" Section.

6. **Consider revenue generated from consumption at the highest tiers to be more vulnerable than other revenue (especially when paired with customer conservation).** Given a stronger pricing signal and a likely more discretionary water use that can be curtailed under the right pricing signal, revenue generated from higher levels of consumption (particularly when increasing block rate structures are used) are more volatile. Utilities should consider a use for this revenue beyond operations, maintenance, and debt service expenses.

Choosing the Right Practices to Match Local Conditions

While all utilities are encouraged to promote efficient use of water resources, there are varying degrees to which utilities may need to actively promote conservation in order to ensure adequate supply to meet their demands. Furthermore, some strategies may be more or less effective given various cost-drivers, supply projections, utility size, and demand projections.

One standard rate structure or set of pricing practices will not fit all utilities in the State of Texas. Hence, these guidelines represent good practice in many circumstances but are not necessarily all suitable for all water utilities or even the same water utility at different points in time. The following utility-specific scenarios are likely to influence the degree and approach of conservation-oriented rates by an individual utility. Most importantly, they are likely to influence the revenue per account required by the utility, which will influence the overall price of water across its service area and, subsequently, the conservation signal sent via rates.

Although these are not the only considerations in rate structure and financial practice design, they will largely drive the degree and approach of conservation-oriented rates at individual utilities.

- **Cost drivers for the utility.** In the short-term, water utility costs are largely fixed regardless of how much water is delivered to customers. But, in the long-run (depending on a utility's specific water supply projections, options to increase water supply, and state of capital needed to treat and deliver the supply), conservation can be a more cost-effective option than supply and capital expansion. This is the case for a utility facing expansion of either supply or capital (or both) within their planning horizon as opposed to a utility with adequate forecasted supply and capital. Additionally, the source of water can influence the cost-drivers for a utility. Water systems that purchase treated water will likely have much more variable costs than their counterparts that treat water. Depending on the purchase contract, utilities that purchase water will not likely suffer from the "conservation conundrum" (i.e. costs will align more with consumption). However, they are also not as likely to directly benefit from the long-term financial savings associated with conservation[26]. In 2011, 69% of the utilities that submitted total municipal water use surveys to the Texas Water Development Board used self-supplied water, 19% used purchase water, and 11% used a combination[27].

- **Size and characteristics of service area.** Perhaps one of the most generalizable determinants of utility financial performance and rate setting is facility size and customer base. Larger utilities

[26] Clarke, Margot. 2012. Thirsting for Less: Water Conservation Progress and Potential in North Central Texas. Sierra Club and theTexas Living Waters Project. Available at: http://www.texas.sierraclub.org/water/20121213ThirstingforLess.pdf
[27] Email exchange with Kevin Kluge, Acting Manager, Water Use, Projections & Planning, Texas Water Development Board. January 7, 2013.

can take advantage of economies of scale and spread their costs (which are mostly fixed) over a greater number of customers, thereby reducing costs per account. Smaller utilities have many of the same fixed costs and requirements with fewer customers to cover costs. Smaller utilities are likely to charge high base rates to their customers. Additionally, a smaller utility staff may lack time and expertise to set strategic rates. Larger systems are also more likely to have a diverse customer base (i.e. a healthy mix of residential, commercial, industrial, and wholesale customers) and are less vulnerable to revenue fluctuations as a result of individual customer behavior change.

- **Demand projections.** Demand projections, in conjunction with supply projections, drive much of the need for capital and water resource expansions. Water utilities have typically erred on the side of over-estimating customer demand for multiple reasons including:
  - (1) The risk to public health of over-projecting demand are much less than of under-projecting demand;
  - (2) A historic trend of increasing demand, and
  - (3) Assurance that the system will have capacity to support community development and growth that may or may not have been accurately forecast[28].

[28] Hughes, Jeff, Peiffer Brandt, Mary Tiger, and Shadi Eskaf. 2014. Defining A Resilient Business Model for Water Utilities. Available at: http://www.waterrf.org/Pages/Projects.aspx?PID=4366

Although the public health risks still remain if a utility under-predicts demand, financial pressures are increasingly leading utilities to become more conservative with their sales projections. Additionally, over-predicting sales and investing in infrastructure to meet that demand can risk public health if a utility forsakes expansion over infrastructure repair and replacement. Nonetheless, demand and population growth (in conjunction with water supply projections) will impact the degree and approach of conservation-oriented rates. These projections, compiled for each Texas Water Planning Region, are summarized in Table 1 below.

Table 1. Projected Water Supply, Water Demand, and Population Growth from 2020-2030

Texas Water Planning Region	Changes in Regional Water Supply from 2020 to 2030[29]	Municipal Water Demand Growth from 2020 to 2030[30]	Population Growth from 2020 to 2030[31]
Panhandle (A)	Decrease (-8%)	Moderate (8%)	Moderate (10%)
Region B	Decrease (-1%)	Low (1%)	Low (4%)
Region C	Stable (0%)	High (13%)	High (15%)
North East Texas (D)	Decrease (-1%)	Moderate (6%)	Moderate (9%)
Far West Texas (E)	Stable (0%)	Moderate (10%)	Moderate (14%)
Region F	Stable (0%)	Moderate (7%)	Moderate (9%)
Brazos (G)	Stable (0%)	High (12%)	High (15%)
Region H	Increase (2%)	Moderate (10%)	Moderate (12%)
East Texas (I)	Stable (0%)	Moderate (4%)	Moderate (7%)
Plateau (J)	Stable (0%)	Moderate (5%)	Moderate (9%)
Lower Colorado (K)	Decrease (-1%)	High (17%)	High (19%)
South Central Texas (L)	Decrease (-1%)	High (12%)	High (16%)
Rio Grande (M)	Stable (0%)	High (18%)	High (21%)
Costal Bend (N)	Increase (2%)	Moderate (5%)	Moderate (8%)
Llano Estacado (O)	Decrease (-15%)	Moderate (7%)	Moderate (10%)
Lavaca (P)	Stable (0%)	Low (0%)	Low (3%)
Texas Total	Decrease (-12%)	Moderate (11%)	Moderate (14%)

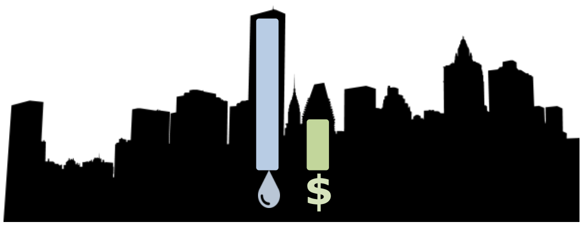
[29] Summarized from Regional Water Supply Summary and Projections in 2011 Regional Water Plans. http://www.twdb.state.tx.us/waterplanning/rwp/plans/2011/index.asp

[30] 2016 Regional Water Plan: Regional Summary of Water Demand Projections for 2020-2070 in acre-feet. Municipal Water Demand Growth calculated as the percent differences between municipal demand projections in 2020 and 2030. http://www.twdb.state.tx.us/waterplanning/data/projections/2017/demandproj.asp

[31] 2016 Regional Water Plan: State and Regional Population Projection for 2020-2070. “Population Growth” calculated as the percent differences between regional population in 2020 and 2030. http://www.twdb.state.tx.us/waterplanning/data/projections/2017/popproj.asp

Utilities with different cost drivers, customer characteristics, and supply and demand issues will come to different conclusions on the rate structure design that is most appropriate for them. Below are three hypothetical scenarios followed by a discussion of how each hypothetical utility can utilize rate setting and structure to promote conservation and ensure revenue stability.

Scenario #1: Urban Utility with Relatively Low Costs, High Demand, and Water Supply Challenges

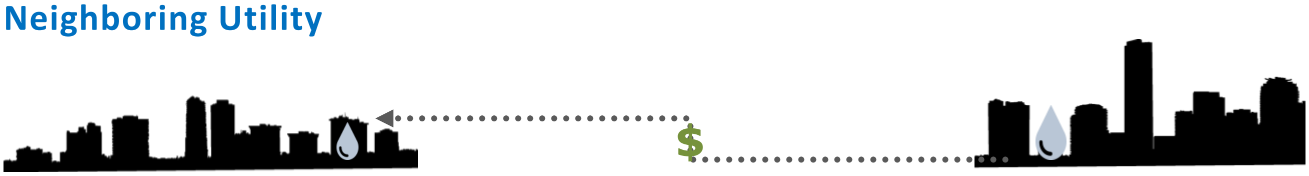


In this scenario, an urban utility with low per-customer costs of service and high peak demand wishes to encourage conservation. Their primary rate-setting objective for rates is to recover costs of service, and their second highest objective is to encourage conservation.

Urban utilities typically have a very large and diverse customer base over which they can spread more of the fixed costs of water treatment and delivery. As such, this utility can have lower base charges and build more cost recovery into the variable charge, ensuring that customer bills are sensitive to use reductions. Furthermore, larger utilities typically have the staff and billing software capacity to utilize increasing block rates, bill monthly, and provide detailed usage information.

Although they may already have increasing block rates in place, they can do more to promote conservation by making the differences in rates between the blocks greater and setting rates high for the highest level of consumption. But if they are pricing the highest tiers of consumption at levels to promote conservation, they should be financially ready for it. They will likely want to budget for the revenue from the highest tiers of consumption to be vulnerable and variable and/or maintain a rate stabilization fund to mitigate revenue fluctuations.

Scenario #2: Mid-Size Water System That Purchases Treated Water from Neighboring Utility



The water system in this scenario has about 25,000 customers and purchases treated water from a neighboring utility. While they still have the fixed costs associated with the distribution system, the majority of their costs are dependent on how much water is delivered. For this utility, there is much more of a direct relationship between costs and revenues than its counterparts that secure and treat water; conservation will have a much more immediate impact on the utility's expenses without a great deal of financial risk. As such, this mid-size purchase system can have a very low flat fee and a significant variable charge to promote conservation. It will likely want to align its customers' rate structure with the utility's rate structure for the purchased water.

Scenario #3: Rural Water Utility with Naturally High Costs That Wants to Maintain Affordability

This rural utility with naturally high rates wants to maintain water affordability, while also helping to send a signal to its customers to not waste water. In this case, water will be naturally more expensive for all users and there is much less of a need for an aggressive increasing block rate structures to send a pricing signal.

Uniform rates are simple to design and implement, and cost recovery of the naturally high costs of water will practically require a pricing level that sends a conservation signal. The tradeoff occurs between base charges and consumption allowances. Since the utility has high costs of service, it may be forced to set a high base charge. If this happens, the utility can offset some of that impact on low income customers by including a consumption allowance with the base charge. However, if possible, the utility will want to set as low a base charge as possible to keep bills low for low consumption customers and send a conservation signal. Monthly billing should be used to send out smaller bills more frequently to their customers instead of larger bimonthly or quarterly bills, which could be difficult to pay for some customers. In the case of maintaining residential affordability, utilities can look beyond their rates and rate structures and implement customer assistance programs. This would assist the customer who needs assistance the most, while also ensuring that the utility collects the revenue it needs to protect public health.

Texas utilities are not the only ones that deal with the "conservation conundrum." Utilities across the country are grappling with the same issues and there are a number of good rate setting guides and documents available that have been prepared for specific regions or states. The following resources contain material applicable to Texas utilities.

Part IV. Recommended Reading

Assessing Water System Revenue Risk: Considerations for Market Analysis

Hughes, J., and Leurig, S. 2013. Assessing Water System Revenue Risk: Considerations for Market Analysis. Ceres. http://www.ceres.org/resources/reports/assessing-water-system-revenue-risk-considerations-for-market-analysts

This report is a result of a partnership between The Environmental Finance Center at UNC and Ceres that investigates water system revenue risk and offers considerations for market analysts. The report offers an analysis of revenue risk using actual utility data in three states that are experiencing changing water use patterns: Colorado, North Carolina, and Texas. The analysis demonstrates that utilities with the same generic pricing structure can have widely variable exposure to revenue instability from changes in customer use. This report characterizes the challenges facing many utilities and identifies potential metrics that may be used by bond analysts to understand the revenue resilience of water systems' pricing structures. The report describes factors driving current pricing practices among drinking water providers, including financial requirements, public policy goals, ease of implementation, and political constraints, and offers analysis of pricing structures. Finally, the report proposes metrics for assessing rate structures, which include competitiveness, affordability, revenue sufficiency, revenue vulnerability, and conservation pricing signals.

California Water Rates and the "New Normal"

Donnelly, K., and Christian-Smith, J. 2013. California Water Rates and the "New Normal". The Pacific Institute. http://www.pacinst.org/publication/water-rates-series/

The first in a series of white papers to help water service providers cope with the "new normal" of decreased water demand and rising costs, this paper offers analysis of different rate structures that can be used to meet costs and ensure revenue resiliency. This paper is structured to support providers in evaluating common water rate structures (e.g. flat rate/fee, uniform volumetric rate, block or tiered rate) by examining rate structures and the characteristics of the new normal, which includes more uncertain water supply; new legislation, codes, and standards; and overall increasing costs to provide a safe drinking water supply. The report also prepares managers to educate their customers about how water is priced, and provides case studies highlighting challenges associated with adopting new rate structures.

Declining Water Sales and Utility Revenues: A Framework for Understanding and Adapting

Beecher, J., and Chesnutt, T. 2012. Declining Water Sales and Utility Revenues: A Framework for Understanding and Adapting. Alliance for Water Efficiency. http://www.ipu.msu.edu/research/pdfs/Summit-Summary-and-Declining-Water-Sales-and-Utility-Revenues-2012-12-16.pdf

This white paper offers a discussions of the root causes of and potential solutions to the revenue shortfalls and fiscal distress associated with declining water sales and utility revenues. The paper examines how and why water sales are declining, the degree to which water utility revenues are falling short of revenue requirements, communications strategies for water utilities and the conservation community, methods to improve fiscal stability, and the role of industry standards, practices, and policy reforms.

Defining a Resilient Business Model for Water Utilities, Water Research Foundation Project 4366

Hughes, J. et. al. 2013. Defining a Resilient Business Model for Water Utilities. Water Research Foundation. http://www.waterrf.org/Pages/Projects.aspx?PID=4366

This report provides an assessment of the revenue model and resulting financial condition of water utilities in North America, considers factors influencing financial performance, and discusses practices that have the potential to improve financial resiliency. This report primarily addresses the revenue and rates side of financial balance that utilities must navigate. It first summarizes the financial condition and state of revenues in the water industry, goes on to consider trends in the context of the factors that influence a utility's business model, and presents option for revenue resiliency strategy, policy, and practices. Additionally, the report presents a potential methodology and tool for assessing the risk of revenue losses. The analysis shows that there is no one generalizable financial outcome for the industry, as there are clear differences between regions, states, and utilities.

Designing, Evaluating, and Implementing Conservation Rate Structures

Chestnutt, T. 1997. Designing, Evaluating, and Implementing Conservation Rate Structures. California Urban Water Conservation Council. http://www.cuwcc.org/docDetail.aspx?id=720

This report sets forth information on innovative ways to price urban water service. This handbook provides practical assistance to utilities and their rate consultants implementing rate structures that promote more efficient use of water while taking into account the other functions a rate structure must fulfill.

Forecasting Urban Water Demand, Second Edition

Billings, B. and Jones, C. 2008. Forecasting Urban Water Demand. 2nd Ed. American Water Works Association. http://www.awwa.org/store/productdetail.aspx?ProductId=6395

The American Water Works Association's *Forecasting Urban Water Demand* is a resource that provides detailed tools and strategies to assist water managers in forecasting short-, mid-, and long-term water demands. The book includes discussion on a variety of factors that impact urban water demand, including population, weather, climate, water rates, and conservation programs. It also includes guidance on how managers can tailor forecasting methods according to the purpose of the forecast, for example how forecasting for revenue may differ from forecasting for raw water supply or infrastructure improvements. In addition, the book incorporates instruction on data requirements and statistical analysis and is paired with a CD that contains daily water data, daily water use, an interactive demand curve chart, per capita water demand, and more.

Gauging the Understanding and Support of a Drought Surcharge in Mecklenburg County

Tiger, M. 2009. Gauging the Understanding and Support of a Drought Surcharge in Mecklenburg County. The Environmental Finance Center at UNC. http://www.efc.sog.unc.edu/reslib/item/gauging-understanding-and-support-drought-surcharge-mecklenburg-county

A drought threatens both water supply and a utility's primary source of revenue. Consequently, many utilities explore the use of surcharges, which temporarily increase water rates during drought, as a way to stabilize revenues and promote conservation while keeping in mind the need for affordable water. Such was the case for Charlotte-Mecklenburg Utilities during the 2007-08 drought. The purpose of this research is to gauge common themes of customer and City Council member perspectives on a proposed drought surcharge in Mecklenburg County. Insight from this research helps utilities in their consideration, development and communication about drought surcharges in their own communities. The report concludes that effective communication about surcharges is imperative, and that a drought surcharge should be a part of a portfolio of other strategies to help ensure adequate water supply.

Long-Term Effects of Conservation Rates

Long-Term Effects of Conservation Rates. 1997. American Water Works Association. ISBN 0-89867-904-4

This report from the AWWA recognizes the importance of conservation pricing and rate design in water conservation efforts. This early study examines the long-term effects of pricing for conservation on water demand and a utility's revenues. The report provides an overview of the relationship between rate design and conservation, as well as a summary of common conservation-oriented rate designs (peak/nonpeak rates, inverted rates, and seasonal rates). It includes a comprehensive discussion of price elasticity, the mathematical measure of demand response to price changes, longer-term effects of conservation rates, and analysis of different rate designs and strategies. The report also includes an example Conservation Rates Model and a User Manual that allow managers to test a variety of different rate design scenarios.

Pricing Practices in the Electricity Sector to Promote Conservation and Efficiency: Lessons for the Water Sector

Donnelly, K., Christian-Smith, J., and Cooley, H. 2013. Pricing Practices in the Electricity Sector to Promote Conservation and Efficiency: Lessons for the Water Sector. The Pacific Institute. www.pacinst.org/publication/water-rates-pricing-practices

Water utilities are increasingly faced with the challenges of adapting to the "new normal" – a world in which declining water demand and increasing costs can result in deficits. Using data from California electric utilities, this report examines how other utilities have confronted these challenges to manage fiscal instability while providing fair pricing. Although there are certainly major differences between the water and electricity sectors, the study describes a number of electricity pricing practices could be implemented in the water sector. These practices include marginal pricing, tiered pricing, time-variant pricing, demand response contracts, decoupling, lost revenue adjustment mechanisms, rate stabilization funds, and straight fixed-variable pricing. This report is part of a series by the Pacific Institute on key issues related to water pricing practices and policies in California that is accessible through the Pacific Institute website.

Principles of Water Rates, Fees, and Charges

American Water Works Association. 2012. Principles of Water Rates, Fees and Charges (M1). 6th Edition. http://www.awwa.org/store/productdetail.aspx?productid=28731

The American Water Works Association's manual on Principles of Water Rates, Fees, and Charges is a comprehensive resource that provides water managers with information needed to evaluate and set water rate structures, fees, charges, and pricing policies. The manual provides an overview of cost-based rate making, revenue requirements, cost allocation, rate design, capacity and development charges, and implementation issues. This includes in-depth discussion on rate structure considerations and analysis of the advantages and disadvantages of a variety of common rate structures.

Revenue Instability and Conservation Rate Structures

Chestnutt, T., Christianson, J., Bamezai, A., McSpadden, C., Hanemann, W. 1995. Revenue Instability and Conservation Rate Structures. American Water Works Association. http://www.waterrf.org/PublicReportLibrary/RFR90681_1995_839.pdf

In response to the growing popularity of conservation rate structures, this report details how revenue stability is affected by changes in water demand and provides strategies to cope with revenue uncertainty in the face of changing costs. It outlines managerial strategies necessary to cope with uncertainty brought on by conservation rate structures, and illustrates how empirical analysis can support the design of better rate structures. The study focuses on the experience of and available data from Los Angeles, CA, and Phoenix, AZ, to create a conceptual framework for how to develop coping strategies. It concludes that revenue volatility can be quantified, that coping mechanisms can be developed, and that rate structures can be used as a conservation device.

Water Conservation-Oriented Rates: Strategies to Extend Supply, Promote Equity, and Meet Minimum Flow Levels

Wang, Y., Smith, W. and Byrne, J. 2004. Water Conservation-Oriented Rates: Strategies to Extend Supply, Promote Equity, and Meet Minimum Flow Levels. American Water Works Association. http://www.awwa.org/store/productdetail.aspx?productid=6544

Water conservation-oriented rates are an effective tool for reducing water use in states and cities that are faced with drought, shrinking water supplies, or other reasons to conserve water. This book discusses rate structures that encourage water conservation: drought demand rates, excess use rates or excess surcharges, inclining block rates, and seasonal rates. The book explores implementation issues, economic issues for the utility and the consumer (especially low-income consumers), advantages and disadvantages, which rate type is suitable for specific customer groups or situations, and real-world utility experiences with conservation rates.

Appendix A. Elements of Rate Structure Design

Customer Classes/ Distinction	Utilities have several options in deciding how to charge different sets of customers. However, utilities can only legally charge different rates for customers based on cost-related factors, such as usage. Hence, it is possible to set a rate structure for residential customers and a separate rate structure for commercial or industrial customers, since the non-residential customers use a lot more water and the marginal cost of providing them with additional units of water is very low. One advantage to creating different rate classes of customers is that it provides the utility with greater flexibility in targeting different objectives for different types of customers. For example, a utility could charge increasing block rate structures for residential customers to encourage conservation but also charge uniform rates for non-residential customers to avoid overburdening them with excessively high rates. Residential irrigation meters provide the utility with an ability to charge residential customers a different rate structure for their outdoor (mostly seasonal and discretionary) water use for regular, indoor household use. Before adding new rate structure classes, utility managers should first assess the ability of their billing software to handle the complexity of this switch, and also the staff's ability to make the conversion and continuously monitor, assess and correct the inevitable increase in billing errors.
Billing Period	The billing period refers the length of time between meter reads and bills. From a customer perspective, monthly billing provides greater advantages than any other billing period. A utility must evaluate the tradeoff between increased operating costs for meter reading and billing against the advantages of monthly billing, including providing a much more stable month-to-month revenue stream. Additionally, EFC research finds that customers who are billed quarterly or bimonthly use more water on average than customers who are billed monthly. Hence, to a conservation-oriented rate structure would use monthly billing when possible.
Base Charges	A base charge is the amount a customer is required to pay each billing period, regardless of the amount of water that is used. This is oftentimes called a "minimum charge." Base charges are highly stable sources of revenue for utilities, since they are immune to water use behavior. There is an incentive to charge as much of the fixed costs of running the utility in the base charge as possible, tempered only by affordability (since all customers pay this charge). The higher the base charge, the more stable the utility's revenues will be, but the less sensitive the total customer bill will be to changes in usage patterns. Hence, a customer reducing use significantly will not see a proportional decline in their bill if the base charge is a large component of the total bill. Utilities concerned about setting conservation-oriented rates by utilizing usage-sensitive rate structures are more likely to charge lower base charges (and higher volumetric rates). Also, utilities concerned about affordability may find it difficult to set high base charges. Due to the capital intensive nature of water utility costs, and because of economies of scale, large utilities are able to spread their costs over large customer bases and thus are often able to charge low base charges. Smaller utilities, however, typically rely on higher base charges to recover some of their fixed costs.

Consumption Allowance with Base Charge	In order to offset some of the burden of high base charges on their customers, utilities sometimes include a minimum consumption allowance with the base charge such that any use within the consumption allowance is “already paid for” by the base charge. As with base charges, the higher the amount included in the consumption allowance, the less sensitive the total bill will be to water use reductions, and the less conservation-oriented the rate structure will be. Unlike with base charges however, the utility has no revenue stability incentive to include higher amounts of water in the consumption allowance. In fact, the more water is included in the consumption allowance, the less revenue the utility can expect to collect from the majority of its customers if the base charge is not adjusted similarly.
Volumetric Rate Structure	Water utilities use a variety of volumetric rate structure types. Volumetric rates are those charged based on a customer’s water use. The most common are uniform rates (often called flat rates), increasing block rates and decreasing block rates. Uniform rate structures charge the same rate, no matter what level of consumption. They are relatively simple to implement and communicate. Increasing block rate structures are volumetric rates that increase with increasing block rates of consumption; decreasing block rate structures are volumetric rates that decrease with increasing block rates of consumption. Water utilities should avoid using decreasing block rate structures for residential consumption. Additionally, some utilities adopt different volumetric rate structures for summer months than in the rest of the year. This discourages residents from increasing use significantly during the summer months when the majority of irrigation occurs. Seasonal rates are also appropriate for seasonal communities where demand for water is high in certain months and very low in others. The utility manager should select the type of rate structure that best fits the primary rate setting objectives.

Block Designs (If Applicable)	Increasing block rate structures, alone, are not sufficient to encourage conservation. The design of block rate structures is critical to set the appropriate price signals to the customers, not unduly overburden certain segments of the service population, and to provide sufficient revenue stability for the utility. For a utility to target residential consumption with increasing block rates, it should use at least 2 blocks within the normal range of residential use, from 0 through 15,000 gallons/month. It does not do any good to start the second block at a usage level that only a very small number of customers use. In determining the number and size of blocks, it is very useful to analyze from billing records the number of bills sent out each month for different usage levels. Increasing block rate structures for residential use should at least start the second block just over the average residential usage level. If the utility only uses one rate structure for all of its customers, the block sizes at much higher levels of use should be carefully considered from the commercial and industrial customers' perspective. Some utilities have a single decreasing block rate structure for all customers, but set the first block size to cover a large amount of water (e.g.: 50,000 gallons/month) in order to essentially charge residential use at a uniform rate, while providing decreasing block rates to commercial and industrial customers.
Frequency of rate changes	Although the frequency of rate changes is not an element of the rate structure design itself, it is an important policy objective that should be addressed by the utility. Ideally, utilities would review their rates and rate structures annually to adjust them to changes to the utility or customer characteristics. At the very least, utilities should review their financial performance indicators annually and review their rates and rate structures when any of the indicators reflect poor financing.

United States
Environmental Protection
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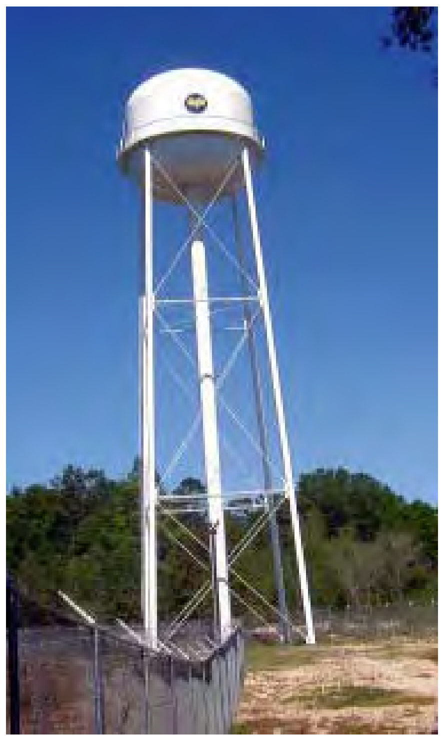
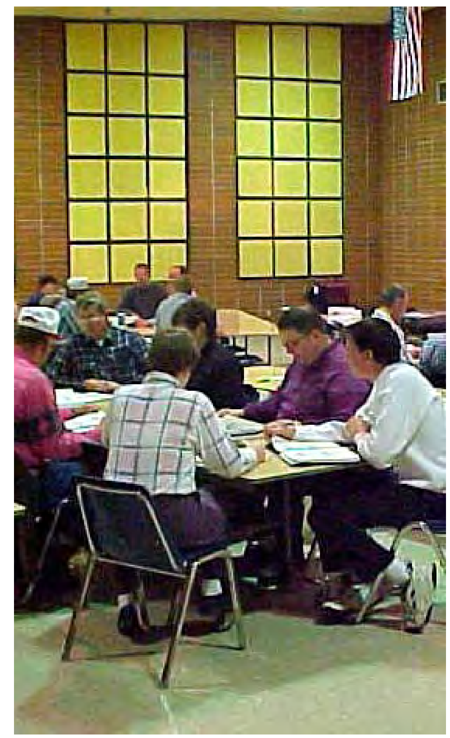
Setting Small Drinking Water System Rates for a Sustainable Future

One of the Simple Tools for Effective Performance (STEP) Guide Series





Office of Water (4606M)
EPA 816-R-05-006
January 2006
www.epa.gov/safewater

Contents

Key Terms

Affordability	The ability to pay a water bill without affecting your ability to pay for other essential goods and services.
Amortization	The gradual elimination of a liability, such as a mortgage, in regular payments over a specified period of time. These payments must cover both principal and interest. Or, writing off the cost of an intangible asset investment over the projected life of the asset.
Asset Management	A planning process for maintaining and replacing your system's infrastructure in the most efficient manner. Data on infrastructure (criticality and condition) are used to prioritize capital investments.
Capacity Development	A process through which your water system can acquire and maintain technical, managerial, and financial capabilities to consistently provide a safe and reliable source of drinking water.
Capital Expenditure	The amount your system spends to acquire or upgrade your system's assets.
Capital Improvement Plan (CIP)	A budgeting and financial tool that a system can use to establish asset rehabilitation and maintenance priorities and to establish funding for repairs and improvements.
Community Water System (CWS)	A public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.
Debt Service	Principal or interest payments on an outstanding debt (e.g., a mortgage or loan).
Decreasing Block Rate	A rate structure under which the price of water per unit (block) decreases as the amount used increases. Blocks are set according to consumption (e.g., up to 2,000 gallons used, 2,000 to 6,000 gallons, etc.).
Depreciation	An estimate of the reduction in the value of an asset due to wear and tear, obsolescence, or impairment. Also, the allocation of the cost of an asset over time for accounting and tax purposes—an annual depreciation charge in accounts represents the amount of capital assets used up in the accounting period.
Fixed Costs	Costs that remain the same regardless of variations in how much water your system pumps, treats, and delivers (e.g., debt service on loans, rent, etc.).

Flat Rate/Fixed Fee	Rate structure under which all customers pay a set fee (monthly, quarterly, etc.) for water service that is not tied to the amount of water used.
Increasing Block Rate	Rate structure under which the price of water per unit (block) increases as the amount used increases. Blocks are set according to consumption (e.g., up to 2,000 gallons used, 2,000 to 6,000 gallons, etc.). This type of rate structure encourages water conservation.
Net Revenue	The difference between total revenue and costs.
Public Water System (PWS)	A system that provides water for human consumption to the public through pipes or other constructed conveyances. These systems have at least 15 service connections or regularly serve an average of at least 25 individuals daily at least 60 days out of the year.
Rate	The charge a system assesses its customers for use of the system's services, usually billed monthly.
Rate Structure	A set of fees and rates that a water system uses to charge its customers for water.
Reserve Account	An account used to hold funds set aside to finance future system expenses such as infrastructure rehabilitation or replacement, or to address system emergencies.
Revenue	Funds earned by the system through the sale of water or by other means.
Seasonal Rate	A rate that varies depending on the time of the year. Seasonal rates can be used in conjunction with any rate structure, including flat rates and uniform, decreasing, or increasing block rates.
Single Tariff Rates	A unified rate structure for multiple water systems (or other utilities) that are owned and operated by a single utility but that may or may not be contiguous systems or physically interconnected. Under single-tariff pricing, all customers of the utility pay the same rate for service, even though the individual systems providing service may vary in terms of the number of customers served, operating characteristics, and stand-alone costs.
Strategic Planning	A process through which an organization defines what it does and why. A strategic plan defines an organization's long-term goals and objectives and provides a framework through which to meet these goals. Strategic plans should be flexible to make them adaptable in response to unexpected changes.

Transfer Payment	Payment made by a government as a gift or aid, not as payment for any good or service nor as an obligation.
Uniform Rate	A rate structure under which customers pay a single charge per unit of water. For example, customers may pay $2 per thousand gallons. The cost per thousand gallons remains constant even if usage changes. A uniform rate may be combined with a fixed fee so customers would pay a fixed monthly fee plus a charge per unit of water purchased.
Variable Costs	The costs of operating your system that change as the amount of water that you pump, treat, and sell increases or decreases. Examples include chemicals and maintenance.

Is This Guide for Me?

As a water system owner or manager, one of your most important jobs is making sure that your system brings in enough money to cover the full costs of doing business now and in the future. This guide is designed to help owners, operators, and managers of community water systems (CWSs) serving 3,300 or fewer persons understand the full costs of providing a safe and adequate supply of drinking water to their customers and how to set water rates that reflect those costs. Systems that will find this guide useful are small publicly or privately owned entities whose primary business is providing drinking water.

Many states have rate setting requirements and restrictions. Check with your state for specific requirements. Contact information can be found in Appendix B (State Drinking Water Primacy Agencies), Appendix C (Tribal Drinking Water Contacts), and Appendix D (State Public Service Agencies).

Why is the Rate Setting Process Important?

This guide will help you determine how much money you need to collect annually from customers through rates to fully cover your expenses and help you think through how to determine an appropriate rate structure. Doing so involves taking a detailed look at your current and future costs and expenses, your rate structure options, and the amount of water your customers use. Although the process takes time, the benefits are significant—you will gain the tools you need to:

- Maintain your system's financial stability by ensuring a sufficient revenue stream.
- Collect and reserve the funds needed to cover the costs of future asset rehabilitation and repair projects, security upgrades, and compliance with future regulations, among other things.
- Plan ahead for reasonable, gradual rate increases when necessary.
- Deliver fairly priced, high-quality drinking water to your customers now and in the future.

Additional copies of this guide may be obtained by calling the Safe Drinking Water Hotline at (800) 426-4791. You may also download the guide from EPA's Safe Drinking Water Act Web site at http://www.epa.gov/safewater/smallsys/ssinfo.htm.

What Will I Learn?

As the manager or operator of a drinking water system, your most important job is delivering safe drinking water to your customers. If your system does not have the resources to cover the full cost of producing and delivering water, your job will be all the more difficult. (The full cost of water service includes the costs of production, treatment, storage, distribution, debt service, capital expenditures, regulatory compliance, and other operation and maintenance costs.)

This guide's information and worksheets will help you understand the importance of recovering the full cost of running your system through customer charges and how to structure your rates to achieve full recovery. Structuring your rates in this way will ensure that you have the financial resources to operate effectively and efficiently now and in the future. This process has seven steps:

Step 1: **Determine** the full cost of doing business by calculating your costs.

Step 2: **Determine** your current revenues.

Step 3: **Consider** your reserve requirements to ensure you have enough funds to cover your asset rehabilitation and repair costs as well as unexpected costs during the next 5 years.

Step 4: **Calculate** how much money you need to collect from customer charges to cover your costs and fully fund your reserve account.

Step 5: **Evaluate** appropriate rate structures and design an appropriate rate.

Step 6: **Implemen**t the rates.

Step 7: **Review** your rates and make changes when appropriate.

This guide is designed to help you plan financially for the next 5 years. However, once you have a better understanding of your system's finances and future needs, it will be to your advantage to plan even further ahead—at least 20 years in advance, if possible. EPA's *Strategic Planning: A Handbook for Small Water Systems* (EPA 816-R-03-015) will give you the information and tools you need to develop long-term plans for managing and operating your system.

What is Full-Cost Pricing?

Charging customers for the actual cost of water service will guarantee you the revenue needed to cover the costs of operation, treatment, storage, and distribution and will provide funds for future investments. This concept of recovering the costs of running your system through user charges is called "full-cost pricing" and is discussed throughout this guide.

Ideally, full-cost pricing:

- Ensures rates are a sufficient and stable source of funds. Charging for the full cost of delivering water will ensure your system's financial health, enabling you to provide safe water now and in the future.

- Provides information on costs to customers. How much you ask your customers to pay sends a signal to them about the value of the product they are purchasing. Charging for the full cost of the service your system provides will help customers recognize the value of the service and be more mindful of their water use.

Planning for the Future

EPA encourages water systems to plan for the future. **Strategic planning** helps you address and prepare for anticipated and unexpected problems by evaluating your system's current physical, managerial, and financial condition. It also requires you to make important decisions about your water system's purpose, structure, and function.

What are the Benefits of Recovering Your Costs Through Revenues?

Evaluating your costs annually and adjusting customer charges to cover your costs does take time and may sometimes result in a rate increase for your customers. The benefits to your system and your customers, however, will be worth the effort. The most important benefit will be financial stability and security, which will ensure that your system has adequate capacity and long-term sustainability.

Water system capacity is the ability to plan for, achieve, and maintain compliance with drinking water standards, thereby ensuring the quality and adequacy of the water supply. Capacity has three components:

1. **Financial capacity** – the ability to acquire and manage sufficient financial resources. Recovering costs through revenues increases your financial capacity by increasing your available resources and improving your credit worthiness. Some loan and grant programs, including the Drinking Water State Revolving Fund (DWSRF), assess capacity during the loan application process. You might not qualify for a loan if you do not have adequate capacity.

2. **Technical capacity** – a system's physical infrastructure and operational abilities. Recovering costs through revenues increases your technical capacity by giving you the means to invest in your system's physical infrastructure and to make necessary repairs.

3. **Managerial capacity** – a system's management and administrative capabilities. Recovering all costs through revenues will increase your managerial capacity by enabling you to attract, retain, and continually train certified operators and other working staff.

The following pages describe the seven steps to recovering the full cost of running your system through water rates and ensuring that your system has the capacity to operate effectively and efficiently now and in the future.

Step 1 – Determining Your Costs

It may sound obvious, but the first step in setting rates that reflect the true cost of delivering safe drinking water is determining how much it costs to operate your system every year (your annual costs).

In determining your costs, you need to consider all aspects of your system, such as physical equipment, staff, outstanding loans, and mortgage payments. Knowing what your costs are and understanding how they have changed in the past and can change in the future is key to knowing how much money you will need to collect from your customers every year.

Annual Costs Worksheet

The Annual Costs Worksheet helps you determine the annual costs of running your water system. To make sure that you collect enough revenue to cover the full cost of delivering water to your customers, you need to know your full annual operating costs.

There are many ways to account for your system's costs. You should pick one that works well with your current accounting system and that supports the rates you plan to use. Any approach you use must fully account for your costs. To estimate these costs, review records of last year's expenditures and take into account anything that might change over the next 5 years (e.g., increased energy costs). Remember to include only costs related to the provision of water.

You should complete the Annual Costs Worksheet every year.

Two copies of the worksheet are provided. The first worksheet is a completed example. The second copy includes instructions on how to complete the worksheet.

Explanation of Example Annual Costs Worksheet

To better understand this system's financial condition, the water system's manager has completed an annual cost worksheet that estimates costs for the upcoming year. To develop the estimates, the manager reviewed records of the system's costs from the past year. In doing so, the manager included:

- personnel costs such as salaries, wages, and benefits;
- non-personnel costs for things like equipment, supplies, utilities, the purchase of water, waste disposal, laboratory costs, and taxes and franchise fees; and,
- costs for debt service and other interest owed by the system.

Note that most costs are for maintenance, salaries and benefits, and chemicals.

Example Annual Costs Worksheet	
Date Worksheet Completed/Updated: 6/19/05	
Personnel Costs	$126,627
Non-Personnel Costs (excluding debt service)	$84,857
Debt Service	$25,570
Total Costs	$235,054

Using the Annual Costs Worksheet

This section presents instructions for completing the Annual Costs Worksheet. Each step presented here corresponds to a numbered section of the sample worksheet on page 15.

Step 1: **Enter the date**. Circle whether you are completing or updating the worksheet and fill in the date. You should update this worksheet once a year. You can either make minor adjustments to the worksheet or start a new worksheet each year.

Step 2: **List your annual costs**. Fill in your costs on the lines provided. Divide your costs into three categories:

Personnel costs for costs such as salaries and wages for administrative staff and functions, for operations and maintenance staff and functions including labor costs for treatment, monitoring, maintenance, and testing; and benefits paid on their behalf, including medical insurance, retirement, vacation, etc. Also include billing operations, including meter reading, mailing of bills, and processing of returns. Note that costs for billing operations, meter reading, and processing of returns can be contracted to a third party. If your system contracts these services, include them as non-personnel costs (excluding debt service).

Non-personnel costs (excluding debt service) for costs of operating the office, including rent and utilities; property, general, and liability insurance, workers' compensation, insurance on vehicles; accounting, legal, engineering, and other professional services; annual principal and interest payments on mortgages; office supplies, computer software, etc.; utilities for the operation of the system, including electricity and telephone charges; supplies used in the day-to-day operations of the system and maintenance of the system (not including major capital purchases); purchase of treated and untreated water that is resold to customers; chemicals; annual expenses on equipment leased to operate the system; cost of regular maintenance and repair of equipment (not including major repairs); cars, trucks, etc. used in daily operations; certification and training of operations staff; removal or disposal of waste residuals from water treatment; testing associated with water quality monitoring; equipment used for security, like locks and video tapes; other miscellaneous costs, taxes paid on annual profits, and franchise fees. (Public systems may include payments made in lieu of taxes not including indirect taxes like sales taxes charged by the utility, amounts withheld from employees for federal or state income tax liability, or amounts withheld from employees for their social insurance contributions).

Debt service for cost of annual principal and interest payments on debt of the system incurred to finance investment, other than mortgages. Also,include any other interest owed by the system.

Step 3: **Calculate total annual costs**. Calculate your total costs by adding the annual costs you listed in Step 2. Enter this number in the box marked “Total Costs.”

Annual Costs Worksheet	
Date Worksheet Completed/Updated:	
Personnel Costs	
Non-Personnel Costs (excluding debt service)	
Debt Service	
Total Costs	

1

2

3

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Step 2 – Determining Your Current Revenue

After determining your costs, you need to calculate how much money you collect every year (your annual revenue).

Annual Revenue Worksheet

The Annual Revenue Worksheet will help you account for your annual revenue and includes detailed instructions for determining:

1. Your system's annual revenues from **current rates**, **interest**, and **other sources of revenue**.

2. Any **additional revenue** including how much money you save every year as a result of **subsidy** and **transfer payments** (e.g., the portion of your town's property tax revenue that is allocated to your system).

Two copies of the worksheet are provided. The first worksheet is a completed example. The second copy includes instructions on how to complete the worksheet.

Explanation of Example Annual Revenue Worksheet

After completing the Annual Costs Worksheet, the water system manager completes the Annual Revenue Worksheet to get an accurate picture of the money the system will likely spend in the upcoming year versus the amount of money it will take in. When accounting for annual revenue, the manager includes the additional revenue, including revenue from a grant and transfer payment the system expects to receive to complete a capital improvement project. Note that in the example worksheet almost all revenue (97 percent) comes from water sales.

Looking at the total costs identified in the Annual Costs Worksheet ($235,054) and subtotal of operating revenue and interest listed in the Annual Revenue Worksheet ($228,024), it appears that this water system's costs and revenues are fairly even (taking into account the total additional revenues). However, this worksheet does not account for the money that the system will need to set aside every year to cover the infrastructure rehabilitation and replacement costs that most likely will arise. By calculating how much money the system should contribute annually to a reserve fund in Step 3, the system manager will have a much better picture of the system's financial situation.

Example Annual Revenue Worksheet	
Date Worksheet Completed/Updated: 6/19/05	
Operating Revenue and Interest	
Water Sales	$221,465
Fees and Service Charges (include late fee, connection fee, fire fee, system development fee, etc).	$4,881
Interest	$967
Other	$711
Subtotal Operating Revenue and Interest	$228,024
Additional Revenue (Subsidies)	
Grants	$1,824
Transfer Payments	$4,000
Other	$432
Subtotal Additional Revenue (Subsidies)	$6,256
Total Annual Revenue	$234,280

Using the Annual Revenue Worksheet

This section presents instructions for completing the Annual Revenue Worksheet. Each step presented here corresponds to a numbered section of the sample worksheet on page 21.

Step 1: **Enter the date**. Circle whether you are completing or updating the worksheet and fill in the date. You should update this worksheet once a year. You can either make minor adjustments to the worksheet or start a new worksheet each year.

Step 2: **List your operating revenue and interest.** Fill in your revenue in the lines provided. If your system has other sources of revenue not listed on the worksheet, enter them on the "Other" line provided. Do not include funding you expect but have not yet secured.

Step 3: **Calculate total operating revenue and interest.** Calculate your total operating revenue and interest by adding all the operating revenue and interest you listed in the previous step. Enter this number in the box marked "Subtotal Operating Revenue and Interest."

Step 4: **List any additional revenue (subsidies).** Fill in additional revenues on the lines provided. This category should include subsidies such as any grants to support day-to-day operations of the system, transfer payments, or other subsidies you receive that are used to support day-to-day operations of the system.

Step 5: **Calculate the subtotal of additional revenue (subsidies)**. Calculate your total additional revenue by adding all the additional revenue (subsidies) you listed in the previous step. Enter this number in the box marked "Subtotal Additional Revenue (Subsidies)."

Step 6: **Calculate the total annual revenue.** Calculate your total annual revenue by adding the operating revenue and interest you listed in Step 3 to the additional revenue (subsidies) you listed in Step 5. Enter this number in the box marked "Total Annual Revenue."

Annual Revenue Worksheet		
Date Worksheet Completed/Updated:		1
Operating Revenue and Interest		
Water Sales		
Fees and Service Charges (include late fee, connection fee, fire fee, system development fee, etc).		2
Interest		
Other		
Subtotal Operating Revenue and Interest		3
Additional Revenue (Subsidies)		
Grants		
Transfer Payments		4
Other		
Subtotal Additional Revenue (Subsidies)		5
Total Annual Revenue		6

Step 3 – Setting Aside a Reserve

Having enough revenue to cover your costs is the first step in ensuring that you can consistently provide high-quality drinking water. Two more critical components to providing safe drinking water are taking care of your facilities and equipment and planning for any needed repairs and replacements.

You should set aside money every year in a reserve account to help fund asset replacement and rehabilitation. The amount that you need to save must be factored into your system's rates because rehabilitation and repair costs are part of the overall cost of providing service. If you do not already have a reserve account, consider establishing one as soon as possible; having a reserve account is critical to developing financial capacity.

To establish and properly fund a reserve account you will need to rely on your capital improvement plan, in which you establish your asset rehabilitation and maintenance priorities and determine the funding required for these improvements. Asset management will be an important tool to help you do this. Asset management can be a lengthy process, but it involves five basic steps that will help you determine how much you should set aside in a reserve fund each year:

Asset Depreciation

Each time you operate a piece of equipment, you subject it to wear and tear, thereby reducing its value. This loss in value is called *depreciation.* Some water systems include depreciation in their budget as a cost of operation. Depreciation can be a useful guide for determining the annual contribution to your reserve fund. Additional information is available in Appendix F.

1. **Develop an inventory** of all of your assets by listing them and collecting information on the condition, age, service history, and useful life of each one.

2. **Prioritize your assets** to help you decide how best to allocate your limited resources. Priority should be based on the asset's importance to the operation of your system and the protection of public health. Other factors to consider include how soon you will have to replace the asset (its remaining useful life) and whether other pieces of equipment can do the same job (its redundancy).

3. Determine the **costs of asset rehabilitation and replacement.**

4. Decide what **percentage** of these costs you will cover with cash (i.e., money you set aside in the reserve account), and how much you will cover through grants or loans. (In some cases, it may make more financial sense to borrow money to cover the cost of the project.)

5. **Review and revise your plan.** Your asset management plan should be used to help you shape your system's operations. It should evolve as you gain more information and as your priorities change.

This process will help you determine how much money you need to raise every year through rates to generate the cash necessary to implement your capital improvement plan. While this is a very brief description of how to determine how much you need to save in your reserve fund every year, if you do not already have a reserve account in place, it is a good first step towards thinking about how you will prepare your system to cover the costs of expensive repair and replacement projects.

There are other resources available to help you develop an asset management plan. EPA's *Asset Management: A Handbook for Small Water Systems* (EPA 816-R-03-016) will guide you through inventorying and prioritizing your assets using a series of worksheets and examples. For more information on long-term planning, you also can consult EPA's *Strategic Planning: A Handbook for Small Water Systems* (EPA 816-R-03-015).

Determining Your Required Reserve: An Example

Using *Asset Management: A Handbook for Small Water Systems*, the water system manager completes an asset management plan that prioritizes the system's assets and determines what rehabilitation and replacement projects will be necessary during the next five years. The manager also determines what large longer-term capital improvement projects the system needs to start saving for now. Using engineering reports and historical cost data, the manager estimates the total cost of the capital improvements required. The manager then determines how much cash the system will use to make these improvements and the amount it will need to borrow. For this example, the manager determines the system must contribute $87,400 to a reserve fund in the first year to implement its plan. The water system manager completes his asset management plan each additional year and adjusts the annual reserve contribution to account for changing priorities and water system needs. The system manager will use the first year’s reserve contribution in the calculation of the annual revenue that must be recovered from customers in Step 4: Determining Actual Revenue Required from Your Customers.

Step 4 – Determining Actual Revenue Required from Your Customers

Now that you have a better sense of what your costs and revenues will be and how much money you will need to put in your reserve account over the next few years, you are ready to determine the total revenue that you will need to collect from customers each year. To cover the full cost of doing business (i.e., to meet the goals of full-cost pricing), the amount of revenue that you receive from your customers should equal your total annual costs including your annual reserve contribution minus any subsidies or transfer payments you receive.

You will need to calculate your required revenue annually, taking into account your budget for the upcoming year. In addition, you will need to think beyond your needs for the next year. Variable costs, changes in subsidies, debt service costs, and other factors can affect your required revenue from year to year. Estimating costs for the next several years based on your fixed costs, operating expenses, asset rehabilitation and repair needs, and existing grants or loans can help avoid a significant gap between revenue and costs. Once you have a better idea of actual costs for future years, you can revise your estimates accordingly.

The next worksheet will help you with short-term planning. Use the worksheet to calculate your revenue requirements for the upcoming year and to estimate how much revenue you need to generate over the next 5 years.

Short–term Revenue Required from Your Customers Worksheet

The Short-term Revenue Required from Your Customers Worksheet will help you calculate how much revenue you need to generate every year from customer charges. This activity will take into account the annual costs and revenues that you calculated in the Annual Costs Worksheet on and the Annual Revenue Worksheet and the amount you need to reserve every year to replace and rehabilitate assets, as determined in Step 3.

Financial planning is an important step in avoiding large revenue shortfalls. Knowing what your costs and revenues will be over the next several years will help you decide now whether you will be able to recover your costs through customer charges, whether rate increases will be necessary to cover costs over the next few years, how your surplus or deficit will change over time, and whether you will need to consider restructuring your system, as described later in this guide.

The Short–term Revenue Required from Your Customers Worksheet will help you develop a detailed estimate of your costs and revenue for the next 5 years. This, in turn, will help you understand the need for and impact of rate increases over the next few years as you work towards recovering costs through water rates. This worksheet displays information for the current year and can be used to develop long-term estimates as well.

Long-term planning is another important step to ensuring the financial health of your system. Estimating your costs for the next 15 to 20 years will help you identify future large capital improvement projects that you should start saving for now. You may want to use a worksheet similar to the Short–term Revenue Required from Your Customers Worksheet to evaluate your long-term revenue needs. You can estimate your operating costs, reserve contribution requirements, revenue needs, and surplus or shortfall for five-year increments rather than each year.

EPA's *Strategic Planning: A Handbook for Small Water Systems* (EPA 816-R-03-015) is a good source of information that will guide you through the long-term planning process using worksheets and examples.

Two copies of the worksheet are provided. The first worksheet is a completed example. The second copy includes instructions on how to complete the worksheet.

Explanation of Example Short–term Revenue Required from Your Customers Worksheet

After factoring in the amount the system needs to put into its reserve account in the first year ($87,400), the system manager determines that the system's actual revenue will not be enough to cover its costs. The manager has to decide how the system will begin to cover those costs. The manager also needs to estimate costs and revenue for the upcoming years to determine whether this problem will continue and to determine whether it is possible to increase customer charges at a reasonable rate to eliminate this shortfall. To do this the system manager:

- Estimated the system's annual cost are $235,054 (page 13).
- Adds the estimated annual costs to the system's reserve fund contribution ($87,400) determined on page 23.
- Subtracts the total additional revenue (subsidies) calculated on page 19 from the sum of the system's total costs and total reserve fund contribution.
- Estimates the amount of money the system needs to cover its costs in the first year is $316,198. The manager will use this amount to determine its rates.

Looking out a few years the manager realizes that despite a fairly small deficit in the first year, the system's failure to recover costs could become a much bigger problem as early as five years from now. The system's operating costs are expected to increase every year, and the amount the system needs to contribute to the reserve fund may change because the system manager completes Step 3 annually and realizes repair and replacement needs and priorities change. The manager realizes that, to make a dent in the growing deficit while avoiding customer rate shock, the system must seriously consider cutting operating costs, rethink how often and how much water rates should be increased, and consider changing the way customers are charged.

Example Short-term Revenue Required from Your Customers Worksheet					
Date Worksheet Completed/Updated: 6/29/05					
	Year: 2006	Year: 2007	Year: 2008	Year: 2009	Year: 2010
Annual Operating Costs:	$235,054	$258,555	$284,250	$312,000	$342,850
Annual Reserve Fund Contribution:	$87,400	$89,350	$83,300	$85,670	$82,670
Total Annual Cost of Business:	$322,454	$347,905	$367,550	$397,670	$425,520
Total Additional Revenue (subsidies):	$6,256	$8,100	$7,900	$8,000	$8,600
Total Annual Revenue Needed: (Total Annual Cost of Business - Total Additional Revenue)	$316,198	$339,805	$359,650	$389,670	$416,920
Projected Revenue:	$228,024	$230,500	$235,820	$239,600	$245,200
Revenue Surplus or Deficit:	($88,174)	($109,305)	($123,830)	($150,070)	($171,720)
Cumulative Surplus/Deficit:	($88,174)	($197,479)	($321,309)	($471,379)	($643,099)

Using the Short-term Revenue Required from Your Customers Worksheet

This section presents instructions for completing the Revenue Required from Your Customers Worksheet. Each step presented here corresponds to a numbered section of the sample worksheet on page 29.

Step 1: **Enter the date.** Circle whether you are completing or updating the worksheet and fill in the date. You should update this worksheet once a year. You can either make minor adjustments to the worksheet or start a new one each year.

Step 2: **Enter the year(s).** Enter the year(s) for which you are calculating your estimates.

Step 3: **List total annual operating costs.** Enter your estimated total costs per year for the first 5 years starting with the total costs you determined in the Total Annual Costs Worksheet. For the next four years consider total annual costs from previous years and adjust them, taking into account any information you have on debt payments.

Step 4: **List total annual reserve fund contribution.** Enter the total annual required reserve amount as discussed in Step 3. (Use the Asset Management Step Guide to calculate your reserve fund needs.)

Step 5: **Sum costs and reserve fund contribution.** Add the amount entered in Step 3 (total annual costs) to the amount entered in Step 4 (required annual reserves) and enter the total in the box provided.

Step 6: **List total additional revenue (subsidies).** Enter the total additional revenue (subsidies) amount calculated on the Annual Revenue Worksheet (grants plus transfer payments).

Step 7: **Calculate total revenue needed.** Subtract the total additional revenue entered in Step 6 from the sum of your costs and reserve fund contribution calculated in Step 5. This is the estimated amount of money that your system must generate to cover its costs for each year.

Step 8: **Enter projected revenue.** Enter the amount you anticipate your system actually will take in from customer charges each year based on the operating and interest subtotal amount calculated on the Annual Revenue Worksheet.

Step 9: **Enter funding deficit or surplus.** Subtract the number in Step 7 from the number in Step 8 and enter the result. If the result is zero or greater, you are taking in enough money to fully recover your costs (and possibly more). If the result is a negative number, you will not recover all your costs and should re-evaluate your rates based on this figure.

Step 10: **Enter cumulative surplus/deficit.** Sum the surplus or deficit from each of the previous years.

Short-term Revenue Required from Your Customers Worksheet						
Date Worksheet Completed/Updated:						1
	Year:	Year:	Year:	Year:	Year:	2
Annual Operating Costs:						3
Annual Reserve Fund Contribution:						4
Total Annual Cost of Business:						5
Total Additional Revenue (subsidies):						6
Total Annual Revenue Needed: (Total Annual Cost of Business - Total Additional Revenue)						7
Projected Revenue:						8
Revenue Surplus or Deficit:						9
Cumulative Surplus/Deficit:						10

What if My System's Costs Exceed Its Revenue?

After determining whether you have a deficit or a surplus, you may need to re-evaluate how your system is operated and how you are generating revenue. If the actual revenue exceeds the amount needed to cover all costs, you are in good financial shape. This surplus may be due to fluctuations in demand and may disappear in future years. While your system may face a shortfall or surplus in any given year, your revenue requirement should be met over the longer-term. If your actual revenue is consistently below the amount required to cover all costs, you may need to consider options for reducing the gap between actual and required revenue.

Some options are:

- Reducing operating costs.
- Finding additional sources of revenue.
- Restructuring, which includes such options as purchasing water from another system rather than pumping and treating from your own source, consolidating your operations with a nearby water system, or contracting the operation and maintenance of your water system to another party in order to obtain increased operational efficiency and possibly reduce costs.

If the gap between your actual revenue and the revenue needed to cover your costs is as high as 50 percent, you should contact your state (see Appendix B) to discuss your restructuring options; it is unlikely that you could eliminate the deficit through customer charges alone.

Accounting for Subsidies

Many systems receive subsidies that lower the costs faced by their customers. For example, your system may receive an explicit transfer from your local municipality or a grant from the federal, state, or local government to help finance your operations. Or, your system may not pay the full cost of some of the goods and services it uses or may pay interest rates on loans that are less than the rates charged in private markets. These subsidies will reduce the amount of revenue you must generate through rates and fees. Your annual deficit would be larger (or your annual surplus would be smaller) if you did not receive these subsidies. However, keep in mind that these subsidies should be used as a way to achieve financial stability, not as a permanent solution for revenue shortfalls.

Step 5 - Designing a Rate to Cover Your Costs

Now that you know your costs and the amount of money you need to collect from your customers to fully cover those costs, Steps 5 through 7 will help you start thinking about *how* you're going to collect this money. One way is through water rates.

Considerations for Choosing a Rate Structure

Water rates can be structured in several different ways and there are a number of things to consider, in addition to recovering costs, when selecting the best rate structure for your system and your customers.

To determine which structure is best for your water system, you should evaluate the characteristics of your system, its customer base, and your options for maintaining the predictability of rates and any rate increases. In addition to recovering all your costs, you should consider:

1. **Rate Stability.** Customers are more likely to pay for rate increases if their rates are generally stable. Most systems know that the worst thing they can do is maintain a stable rate for many years, then increase it by 10 percent or more. A single, large increase can lead to "rate shock" and opposition to the increase. It is far better to increase rates by 2 percent per year for 5 years than 10 percent once every 5 years.

2. **Rate Predictability.** As the manager of a small water system, you need to know how much revenue you expect to take in next year and in the years to come. However, predicting revenue can be difficult, as water use can vary from year to year. Water use can increase significantly during a dry year and decrease during a wet year. If you promote conservation, you may see a reduction in water use, requiring a rate increase. This lack of predictability should not discourage you from experimenting with rate structures that promote a valuable public program (like conservation). Instead, you should aim to generate and keep sufficient reserves so that your system can survive a significant decrease in water use.

3. **Number of Customers.** If your system serves fewer than 500 persons, the simplest approach to rate setting might be to take the revenue you need to raise and divide it more or less equally among your customers. If you serve more customers, you might choose an alternative rate structure, e.g., increasing block rates (discussed in more detail on page 43).

4. **Customer Classes.** Some systems may serve only residential customers while others also serve industrial, commercial, or agricultural customers. Residential, industrial, commercial, and agricultural customers may have very different patterns of water use. The cost of servicing these customers may be different as well. You may want to use different rates and rate structures for different classes of customers in order to meet their specific needs.

5. **Water Use.** Examine your customers' water use habits during peak and off-peak seasons. If most of your customers use roughly the same amount of water, a flat fee might make the most sense for your system. If your customers use significantly different volumes of water, you should consider charging for the amount of water used. A family of four should not expect to receive the same water bill as a car wash or laundromat.

   Water is a scarce commodity. You can structure rates so that they send a "price signal" to customers and encourage conservation. Customers who recognize the value of the service you are providing will be more likely to use that product in a way that reflects its true value.

6. **Customer Needs.** There may be differences among customers within a class that affect the cost of providing water service to them, or their ability to pay for that service. For example, some residential customers may have low fixed incomes and therefore may have difficulty paying their water bills. Faced with these types of issues, you may want to consider rate structures that allow for different rates for customers with different needs within a single customer class.

Common Rate Structures

There are six common types of rate structures, described in more detail below: **flat rate or fixed fee, uniform rate, decreasing block rate, increasing block rate, seasonal rate**, and **single tariff**.[1] Under each of these rate structures, systems have the flexibility to set different rates for different categories of customers (for example, different rates for residential users and agricultural users).

Flat Rate/Fixed Fee Rate Structure

Under this rate structure, your customers pay the same amount regardless of how much water they use. A flat rate/fixed fee structure may make sense for very small water systems whose customers all use about the same amount of water. It can save your system the cost of installing meters, which are necessary when implementing a rate structure that is based on water consumption. If the cost of installing meters will far outweigh the benefits of having them in place, this may be the best option for your system, for the time being.

However, in times where water use is higher than average, your system will not be generating the additional revenue needed to keep up with higher demand (e.g., additional treatment costs). In addition, this rate structure offers no incentive for customers to conserve water. Also, keep in mind that some states award additional DWSRF priority points to applicants that have meters in place. Despite the cost, meters are a worthwhile long-term investment.

Uniform Rate Structure

The uniform rate structure is similar to the flat rate/fixed fee structure, but it is based on customers' water consumption and requires meters. Under this structure, customers are charged a uniform rate per unit of water (e.g., gallon, hundred cubic feet) regardless of the amount of water used. This rate structure can also include a fixed service charge. Uniform rate structures are most appropriate for systems whose customers have similar water use patterns.

This rate structure can guarantee a stable revenue stream for your system and can help encourage conservation because the average cost of water does not decline as use increases as it does with fixed fees or decreasing block rates, discussed below. It is fairly easy to implement and easy for customers to understand.

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[1]Information provided on the rate structures below draws from: Janice A. Beecher, Ph.D. and Patrick C. Mann, Ph.D., with John D. Stanford, J.D., *Meeting Water Utility Revenue Requirements: Financing and Ratemaking Alternatives*, The National Regulatory Research Institute, Columbus, OH, November 1993.

Decreasing Block Rate Structure

Under this rate structure, customers are charged lower rates per unit of water for successive blocks (fixed quantities). As with uniform rates, systems may charge a fixed fee in addition to the decreasing block rates. This rate structure is especially beneficial for industrial or commercial customers who use large amounts of water.

However, this rate structure can be difficult to implement and offers little incentive for customers to conserve water. In addition, it may result in insufficient revenue for the system if demand is unexpectedly high or an unanticipated future need arises. A system must also have meters in place in order to implement this rate structure.

Increasing Block Rate Structure

Under this rate structure, customers are charged higher rates per unit of water for successive blocks (fixed quantities). Systems may charge a fixed fee in addition to the increasing block rates.

This rate structure sends a strong signal to customers about the value of the service you are providing and offers the most incentive for customers to conserve water. The reduction in water use that conservation brings can ease any potential strains on system infrastructure, potentially postponing or eliminating the need for expensive upgrades or new equipment. This rate structure's emphasis on conservation is also beneficial for systems with a limited water source or high treatment costs. The increasing block rate structure does require meters.

Seasonal Rate Structure

Changes in water use patterns from season to season due to changes in weather occur at most systems. In a smaller subset of systems, these fluctuations can be more extreme, for example, if a system serves a significant number of seasonal customers. These systems may want to consider implementing a seasonal rate structure. Under this rate structure, you would charge higher rates to customers during peak season.

A seasonal rate structure is not appropriate for all systems that experience seasonal fluctuations in water use. Consider this rate structure if: increases in usage occur over the same time period every year, the variation in usage between seasons is significant, and your system's capacity is determined by demand during peak season.

Systems can apply one of two forms of seasonal rate structure. The first option is to set one rate for the off-peak season and one for the peak season (these rates can be uniform or increasing or decreasing block rates). The second option is to set one rate (uniform or increasing block rate) and apply excess usage charges (i.e., charge for water use in excess of that used on average during off-peak times) during peak season. In this second option, customers' rates increase in the peak season only if their use is higher than during the off-peak season.

Seasonal rates can encourage conservation, reducing peak use and therefore limiting the need to expand system capacity (as maximum capacity is determined by peak use rates). In addition, for systems in areas with a significant seasonal population, customers using water during off-peak months would not be required to shoulder the full burden of recovering system costs incurred primarily during peak season.

Setting seasonal rates may require you to increase the frequency with which meters are read, as you will need to assess average usage at the beginning and end of peak and off-peak periods and intermittently throughout each period to fairly distribute costs among peak and off-peak season customers.

Single-Tariff Rate Structure

Some small systems are consolidated into larger systems that have a single owner. This does not mean that the systems are contiguous to one another or physically interconnected, just that one utility owns all of the small utilities. In such a situation, one approach to rate design would be to allow each of the small systems to establish its own rate structure. Since systems vary in terms of their operating characteristics and their costs of operation, each would design rates to recover its own costs.

This, however, is not the only option. Under the concept of "single-tariff pricing," the larger utility that owns all of the small utilities can use a single tariff (or single rate structure) for all of the customers it serves, regardless of the specific costs of each small system that it owns. This approach is particularly useful for large systems when they are acquiring systems, many of which may need substantial investment. Making that investment in each very small system acquired, and charging the full cost of that investment to the customers of that system, would be a burden to those customers. Spreading the costs over the entire customer base of the larger utility can make rates more stable and affordable for all customers.

Single-tariff pricing removes the direct link between a small system's cost structure and its rates, and it therefore may be less efficient than other options. It may fail to send the proper price signals to customers. On the other hand, it will stabilize rates and revenues and mitigate rate shock. It also will make rates more affordable for customers of the smallest and most expensive systems. If you are considering a single-tariff rate structure, see http://www.epa.gov/safewater/utilities/stptitle.pdf for more information.

Estimating the Amount of Water Used by Customers

Now that you have reviewed some of the other rate considerations and common rate structures, you need one final piece of information to set your rates. Most water rates are a charge per unit of water (except a flat rate/fixed fee). To ensure that you meet your revenue requirement, your rates must equal the amount of money you need to collect from customers based on the amount of water delivered to your customers. Therefore, unless you use a flat rate or fixed fee, information on water usage is necessary to set rates.

This information will also help you allocate costs, which will be important if you plan to use a different set of rates for each customer class. For example, if residential customers use three-quarters of the water sold by your system, you may want to collect three-quarters of your revenue from residential customers. Or if you have seasonal variation in use, you may want to allocate costs between peak and off-peak seasons.

All of the water your system draws from its sources may not be delivered to paying customers. For example, your system may not charge customers for all of the water it delivers. A common example of uncompensated usage is water provided to municipalities for firefighting. Your system also may consume some of its water during treatment. A system that filters its water, for example, may use some water to backwash its filters. Finally, your system may have water losses, due to leaks in the distribution network or elsewhere. Water meters that monitor withdrawals from the source and meters that monitor water delivered to the customer can help you identify and address that water loss. Remember that rates are calculated using the full cost of producing, treating and storing water. Therefore, it is important to have good estimates of the amount of water used by your customers in order to ensure that all of these costs are divided fairly among customers.

The best source of information to determine the amount of water used by your customers is your billing data. On average, most water systems measure the amount of water used each month. If your system does not have meters in place, you may need to estimate the amount of water used by your customers. If you have more than one class of customer, you should determine the amount of water used by each class. (If the volume of water used by customers in each customer class is similar, you may want to determine the total water use for all customers.)

In addition, you may choose to divide your customer classes into blocks based on the amount of water they use. For example, you may want to determine the number of customers and volume of water delivered to residential customers using up to 1,000 gallons each month, 1,001–2,000 gallons, 2,001–3,000 gallons, and so on. But if you find that average usage does not vary across customers, you may not need to make these distinctions.

Average Monthly Usage Worksheet

The Average Monthly Usage Worksheet will help you summarize usage by having you determine the number of service connections served by your system in each customer class and the total amount of water used by these connections in a typical month. If you have seasonal variation in usage, you may want to divide use into peak and off-peak seasons. You can fill out a separate worksheet for each customer class if use varies by class. If usage is similar across customer classes, you can fill out one worksheet for all your customers.

The worksheet lets you divide your customers into blocks based on the amount of water they use. The number of blocks you use and the cut-offs for each block is up to you and will depend on the type of rate structure you wish to implement and the objectives you hope to achieve with your rates. If you choose to divide your customer classes into more than one block, use billing records or meter books to determine the number of customer service connections that fall into each block and the total volume used by customers in each block. If you do not have exact information on water usage, use estimates.

Explanation of Example Average Monthly Usage Worksheet

To better understand this system's customer base, the water system's manager uses information from billing records covering the past 2 years and categorizes residential customers according to their average usage habits. The manager divides the system's residential customers into usage blocks. The manager considers implementing an increasing block rate with 2 blocks. To divide the residential customers into 2 blocks, the manager sets the first block of usage between 0 and 7,000 gallons per month, and the second block at more than 7,000 gallons per month. The manager determines the total number of residential customer service connections that use no more than 7,000 gallons of water each month and the total amount of water used by these customers. The manager then determines the number of customer service connections that use more than 7,000 gallons per month and the total amount of water used by these customers. If the manager wants to use more than 4 blocks, additional rows can be added to the worksheet. The manager fills out a similar worksheet for the system's non-residential customers.

Example Average Monthly Usage Worksheet

Date Worksheet Completed/Updated: 6/17/05

Customer Class: Single Family Residential

Unit of measure of monthly usage: Gallons

Water Usage per Month per Customer	Number of Service Connections	Subtotal Usage per Month
0-7,000	520	2,790,000
>7,000	610	4,902,000
Total	1,130	7,692,000

Using the Average Monthly Usage Worksheet

This section presents instructions for completing the Average Monthly Usage Worksheet. Each step presented here corresponds to a numbered section of the sample worksheet on page 41.

Step 1: **Enter the date.** Circle whether you are completing or updating the worksheet and fill in the date. You should update this worksheet once a year. You can either make minor adjustments to the worksheet or start a new one each year.

Step 2: **Enter the customer class.** If you have a single customer class, enter the customer class on the line. If you have more than one customer class, you may want to complete one worksheet for each customer class. If you plan to charge all customers the same rate, you can enter the total number of customers and their water usage in one table.

Step 3: **Enter the unit of measure of monthly usage.** Enter the units in which you measure water volume (e.g., gallons, cubic feet, acre feet).

Step 4: **Determine a water usage block.** Divide the number of customers and the amount of water used into blocks. If you plan to use a uniform rate, you can use only one block–i.e., put the total number of customer connections and the total amount of water used by these customers on a single line. If you plan to use an increasing or decreasing block rate, you will need several blocks. Enter the cut-offs for the blocks on the lines provided. You should add rows to the table if you want to use more than four blocks.

Step 5: **Estimate the total number of service connections.** Enter the total number of service connections that your water system serves for each block of water.

Step 6: **Enter the total volume of water used each month.** Using billing records, meter records, or your estimates, enter the total usage for each block. If you plan to use seasonal rates, you should distinguish between peak and off-peak usage.

Step 7: **Enter the total number of service connections for all blocks.** Add the total number of service connections for each block of customers you listed in Step 5. Enter the total on this line.

Step 8: **Enter the total amount of water used for all blocks.** Add the total amount of water used for each block of customers you listed in Step 6. Enter the total on this line.

Average Monthly Usage Worksheet			
Date Worksheet Completed/Updated:	____________		1
Customer Class:	____________		2
Unit of measure of monthly usage:	____________		3

Water Usage per Month per Customer	Number of Service Connections	Subtotal Usage per Month	
____________	____________	____________	4 5 6
____________	____________	____________	
____________	____________	____________	
____________	____________	____________	
____________	____________	____________	7 8

Fixed and Variable Rates

Just as your water system has fixed and variable costs, you can set fixed and variable rates. A fixed rate is an amount that your system charges each customer every month, regardless of how much water the customer uses. Fixed rates guarantee stable, predictable revenue, regardless of how much water your customers use; they also can be used to cover your system's fixed costs. A variable rate can be based on customer usage, which is determined by routine meter readings. The more water a customer uses, the more the customer has to pay (in addition to the fixed rate). Variable rates are a good way to encourage water conservation.

If your revenue becomes too unpredictable because of aggressive conservation programs, one could place somewhat more reliance on fixed rates. You would still be sending a price signal to customers through variable rates, but fixed rates could help preserve some predictability in revenue from year to year.

Using fixed and variable rates works best in combination with a block rate or seasonal rate structure and the use of meters. Although installing meters can be expensive, the expense can be well worth it in the long run. Meters will give you a much more accurate picture of how usage varies among customers, how usage varies seasonally, and whether your efforts to encourage conservation have been successful. Meters can also help you identify any structural problems within the system. This information can help you more accurately predict future costs and, therefore, set rates that are designed to recover your costs.

Setting Your Rate

Now that you have organized your usage data, you may want to consider using the data to set rates. There are many ways to set rates; the option you choose should reflect the considerations discussed at the beginning of this step. The basic steps are the same for each approach: the revenue requirement is allocated to customers and then divided by the volume of water used by those customers. In practice, the calculations can involve many steps and can be complex. Fortunately, there are many resources available to help systems calculate rates for many different rate designs. (Appendix A provides information about some of these resources.)

The following example demonstrates how to set a uniform rate. It uses data from the previous example worksheets and assumes that the system serves only residential customers.

- Using data from the Average Monthly Usage Example worksheet (page 39), we see the system serves 1,130 single-family residential customer connections.

- The Average Monthly Usage Example worksheet (page 39) shows that total consumption is 7,692,000 gallons per month. Over the full 12 months of the year, consumption is 92,304,000 gallons.

- In the Short-term Revenue Required from Your Customers Example worksheet (page 27), we see the annual revenue the system must recover from customers is $316,198 in 2006.

- The system chooses to recover its costs through a uniform rate. The water rate will be set per thousand gallons of water used. Water usage is reported in gallons and must therefore be divided by 1,000 to convert from gallons to thousands of gallons.

To meet its annual revenue requirement with a uniform rate, the system must divide the revenue it will need by the volume of water it will sell during the year. Therefore, the uniform rate per thousand gallons that meets its revenue requirement is:

$$\textbf{Uniform Rate} = \frac{\$316{,}198}{92{,}304 \text{ (thousands of gallons)}} = \$3.43 \text{ per thousand gallons}$$

Each customer would be charged $3.43 per thousand gallons of water delivered. Appendix A lists additional sources of information on rate setting, including electronic rate-setting tools. Now you are ready to consider how to implement this rate; Step 6 will help you with this process.

Step 6 – Implementing the Rate

Once you have decided on a rate structure and appropriate rates, it is important to consider a number of other factors before charging your customers. Your rates may need to be adjusted because of the particular circumstances of your system. Factors to consider include:

1. **Public Perception.** Customers should know what the rates are and should understand that they will be paying a fair and equitable share of the cost of providing safe drinking water. If, after calculating the amount you need to receive from customers every year, you determine that a substantial rate increase is necessary, consider preparing outreach materials (e.g., mailings, announcements in local newspapers, fliers) to explain the reason for the rate increase. Make sure your customers understand that your ability to provide safe drinking water depends greatly on having sufficient revenue, most of which comes from customer charges. Keep your customers informed throughout the rate setting process; informed customers are more likely to understand and tolerate rate increases. You might also consider increasing your rates over a number of years or when water use is low to make the rate increase easier on your customers.

2. **Regulatory Requirements.** Ensuring your water system has the resources to meet all current and future state and federal drinking water requirements should be considered when setting rates.

3. **Public Service Agency Requirements.** The state may require formal approval to institute a rate or to change rates or rate structures. See Appendix D for a list of Public Service Agencies.

4. **Administration.** The rate structure should be easy to administer. Complex structures may increase administrative costs and confuse customers.

5. **Security Planning.** If financial considerations have prevented you from addressing security in the past, you should use the rate setting process as an opportunity to fund those projects.

Step 7 – Reviewing the Rate

Ideally, you should review your rates, rate structure, and rate setting procedures at least once every year. Annual reviews ensure that your rate is appropriate even if circumstances have changed (e.g., new regulatory requirements, increasing customer base) and that you will continue to generate sufficient revenue to cover costs.

You might also want to submit your rate structure for an independent review. Your state or a technical assistance provider might offer programs to help you evaluate your rate structure and set rates. Consider assembling a special review committee, since a review performed by an external party can be more transparent and impartial. Determining who should review the rate is an important part of the process. Persons with management and budget experience are good candidates for the review committee. Depending on your system, a review committee could include:

1. Your water system's operator
2. The town clerk
3. A professional from the community (e.g., accountant, lawyer, water system engineer)
4. A member of the town council
5. Customers
6. The manager of a neighboring system

Many states may require systems to receive formal approval to change rates or rate structures. See the box on the right for more information.

Public Service Agencies

Every state has a Public Service Agency (e.g., a Public Utility or Public Service Commission). In some states, these agencies evaluate water system proposals for rate increases. During this process, the agencies can also evaluate the system's financial capacity.

Agencies primarily regulate privately owned systems (particularly investor-owned systems). But some states also regulate publicly owned small systems.

If you are regulated by a Public Service Agency, you may receive special assistance during the rate increase evaluation process. Most agencies have established expedited rate review procedures for small systems and understand that you may not have the resources to prepare the type of proposal required of large systems. During the expedited process, agency staff members often meet with the system before a formal hearing to discuss the proposal. Some agencies also have simplified forms that can be used by small systems.

To find out if you are regulated by a Public Service Agency or if there are expedited procedures for rate increase approvals, check with your state. A list of state Public Service Agencies is included in Appendix D.

You Are on Your Way to a Financially Sound Future!

As you have learned, setting sustainable rates is an important part of ensuring your system's financial health. Accounting for all of your system's costs including reserve contributions, and revenues including grants and subsidies will help you establish a full-cost pricing structure so you can recover the funds necessary to provide safe drinking water now and in the future. This guide has helped you:

- Determine the **full cost of doing business**.
- Determine your current **revenues**.
- Consider your **reserve requirements** to ensure you have enough funds to cover costs during the next 5 years.
- Calculate how much money you need to cover your costs and fully fund your reserve account using **customer charges**.
- Evaluate your options and **design an appropriate rate**.
- **Implemen**t the rate.
- **Review** your rates and make changes when necessary.

Ideally, you should review your system's rates each year using this guide to help you through the process. Although it takes time, an annual rate review will ensure that you are maintaining a balance between your costs and revenues; maintaining adequate technical, managerial and financial capacity; and, most important, delivering high-quality drinking water to your customers at a fair price. In addition, communicating effectively with your customers about the full cost of doing business will have a positive impact on your relationship with your customers and will help alleviate rate shock when a rate adjustment is necessary.

Appendix A – Sources for More Information on Rate Setting

Electronic Programs

1. **The Environmental Finance Center at Boise State University** has developed several easy-to-use computer programs to help water systems evaluate their financial capacity and rate structure:

   - **CapFinance** helps systems develop an inventory of their assets and analyze funding options for rehabilitation and replacement of assets.

   - **Ratio8** is a financial assessment tool that can help systems identify potential problems and monitor their financial situation. It analyzes data from eight areas: operations, revenue, liability, sales, expenses, assets, debts, and accounts receivable.

   - **RateCheckup** is a rate setting program that generates rate schedules and provides budgets and financial forecasts.

   For more information on these products, visit the Environmental Finance Center online at http://sspa.boisestate.edu/efc/services.htm or call (208) 426-1567.

2. **Show-me Water Ratemaker**. The Missouri Department of Natural Resources has developed analysis software to help water systems set rates. To obtain a free copy visit http://www.dnr.mo.gov/services/emi-suite/Showme41Water.xls or call (800) 361-4827.

3. **Safety/Setting Water Rates - Small Water Systems Operation and Maintenance.** The Office of Water Programs at California State University Sacramento developed a series of CD-ROMs. CD: 702E contains information on setting water rates from the Small Water System Operation and Maintenance manual. The CD is the companion material for the 15-contact hour course on safety and setting water rates but can be purchased separately online at http://www.owp.csus.edu/ordering.htm.

Documents

1. *A Guidebook of Financial Tools.* This document is available by e-mail from: efin@epa.gov or by calling (800) 490-9198.
2. *Financial Accounting Guide for Small Water Utilities,* Michael D. Peroo (Kansas Rural Water Association). This document is available by calling the National Drinking Water Clearinghouse, West Virginia University, 800-624-8300.
3. *Small System Guide to Developing and Setting Water Rates,* Rural Community Assistance Partnership, Inc. The document is available by mailing or faxing a request to RCAP at Rural Community Assistance Partnership, Inc., 1522 K Street NW, Suite 400, Washington, DC 20005. Fax: (202) 408-8165.
4. *Rate Setting and Capacity Development,* the Environmental Finance Center at the University of Maryland. The document is available online at http://www.efc.umd.edu/issues/Rate_Setting.cfm or by calling (301) 403-4220 ext. 26.
5. *North Dakota's Small Community Water System's Handbook on Developing and Setting Water Rates,* the Midwest Assistance Program, the Midwestern RCAP, under a contract with the North Dakota Department of Health. This document is available online at http://www.map-inc.org/Publications/Publications/WatrRate.pdf.
6. *A Guide for Financing and Rate Setting Options for Small Water Systems,* Andrea L. Williams/Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University. The document is available online at http://www.vwrrc.vt.edu/pdf/sr-17.pdf.

Technical Assistance

1. EPA's Environmental Finance Program provides financial and technical assistance to water systems and other regulated entities. Visit www.epa.gov/efinpage/ or call (202) 564-4994 for more information about the program, for access to the program's publications, and to reach the Environmental Finance Center network.

Organizations

1. Governmental Accounting Standards Board: www.gasb.org, (203) 847-0700.
2. National Association of Regulatory Utility Commissioners: www.naruc.org, (202) 898-2200.
3. American Water Works Association: www.awwa.org, (303) 794-7711.
4. Association of State Drinking Water Administrators: www.asdwa.org, (202) 293-7655.
5. Government Finance Officers Association: www.gfoa.org, (202) 393-8020.
6. National Association of Water Companies: www.nawc.org, (202) 833-8383.
7. National Drinking Water Clearinghouse: www.nesc.wvu.edu/ndwc/, (800) 624-8301.
8. National Rural Water Association: www.nrwa.org, (580) 252-0629.
9. Rural Community Assistance Partnership: www.rcap.org, (888) 321-7227.
10. US Department of Agriculture Rural Development: www.rurdev.usda.gov/rus, (202) 720-9540.

Appendix B – State Drinking Water Primacy Agencies

For additional information or to learn more about the laws in your state please contact your Regional Coordinator or State Drinking Water Agency.

State Contact Information	Web site	Phone Number
Alabama Department of Environmental Management: Water Supply Branch	www.adem.state.al.us/WaterDivision/Drinking/DWMainInfo.htm	(334) 271-7700
Alaska Department of Environmental Conservation: Drinking Water Program	www.state.ak.us/dec/eh/dw	(907) 269-7647
American Samoa Environmental Protection Agency	www.asg-gov.com/agencies/epa.asg.htm	(684) 633-2304
Arizona Department of Environmental Quality: Safe Drinking Water Program	www.azdeq.gov/environ/water/dw/index.html	(602) 771-2300
Arkansas Department of Health: Division of Engineering	www.healthyarkansas.com/eng/	(501) 661-2623
California Department of Health Services: Division of Drinking Water and Environmental Management	www.dhs.ca.gov/ps/ddwem/technical/dwp/dwpindex.htm	(916) 449-5577
Colorado Department of Public Health and Environment: Drinking Water Program	www.cdphe.state.co.us/wq/drinking_water/drinking_water_program_home.htm	(303) 692-3500
Connecticut Department of Public Health: Drinking Water Division	www.dph.state.ct.us/BRS/water/dwd.htm	(860) 509-7333
Delaware Health and Social Services: Division of Public Health	www.state.de.us/dhss/dph/about.html	(302) 744-4700

State Contact Information	Web site	Phone Number
District of Columbia Environmental Protection Agency Region 3	www.epa.gov/reg3wapd/drinkingwater	(215) 814-2300
Florida Department of Environmental Protection: Drinking Water Program	www.dep.state.fl.us/water/drinkingwater/index.htm	(850) 245-8335
Georgia Department of Natural Resources: Water Resources Branch	www.gaepd.org/	(404) 657-5947
Guam Environmental Protection Agency: Water Programs Division	www.guamepa.govguam.net/programs/water	(671) 475-1658
Hawaii Department of Health: Environmental Health Division	www.hawaii.gov/health/environmental/water/sdwb/index.html	(808) 586-4258
Idaho Department of Environmental Quality: Water Quality Division	www.deq.state.id.us/water/	(208) 373-0194
Illinois Environmental Protection Agency: Bureau of Water	www.epa.state.il.us/water/index-pws.html	(217) 785-8653
Indiana Department of Environmental Management: Drinking Water Branch	www.in.gov/idem/water/dwb/	(317) 232-8603
Iowa Department of Natural Resources: Water Supply Program	www.iowadnr.com/water/drinking/index.html	(515) 725-0275
Kansas Department of Health and Environment: Bureau of Water	www.kdhe.state.ks.us/pws/	(785) 296-5503
Kentucky Department for Environmental Protection: Division of Water	www.water.ky.gov/dw	(502) 564-3410
Louisiana Office of Public Health: Safe Drinking Water Program	www.oph.dhh.louisiana.gov/engineerservice/safewater/	(225) 765-5038
Maine Maine Department of Health and Human Services: Drinking Water Program	www.state.me.us/dhs/eng/water/	(207) 287-2070

State Contact Information	Web site	Phone Number
Maryland Department of the Environment: Water Supply Program	www.mde.state.md.us/programs/WaterPrograms/Water_Supply/index.asp	(410) 537-3000
Massachusetts Department of Environmental Protection: Drinking Water Program	www.mass.gov/dep/brp/dws/dwshome.htm	(617) 292-5770
Michigan Department of Environmental Quality: Water Bureau	www.michigan.gov/deq	(517) 373-7917
Minnesota Department of Health: Drinking Water Protection Section	www.health.state.mn.us/divs/eh/water/index.html	(651) 215-0770
Mississippi Department of Health: Water Supply Division	www.msdh.state.ms.us/msdhsite/index.cfm/44,0,76,html	(601) 576-7518
Missouri Department of Natural Resources: Water Protection and Soil Conservation Division	www.dnr.state.mo.us/wpscd/wpcp/index.html	(573) 751-1300
Montana Department of Environmental Quality: Public Water Supply Program	www.deq.state.mt.us/wqinfo/pws/index.asp	(406) 444-4071
Nebraska Department of Health and Human Services: Public Water Supply Program	www.hhs.state.ne.us/enh/pwsindex.htm	(402) 471-0521
Nevada State Health Division: Safe Drinking Water Program	http://ndep.nv.gov/bsdw/index.htm	(775) 687-6353
New Hampshire Department of Environmental Services: Water Division	www.des.state.nh.us/wseb/	(603) 271-2153
New Jersey Department of Environmental Protection: Water Supply Administration	www.state.nj.us/dep/watersupply/	(609) 292-5550
New Mexico Environment Department: Drinking Water Bureau	www.nmenv.state.nm.us/dwb/dwbtop.html	(505) 827-1400

State Contact Information	Web site	Phone Number
New York New York State Department of Health: Bureau of Water Supply Protection	www.health.state.ny.us/nysdoh/water/main.htm	(518) 402-7650
North Carolina Department of Environment and Natural Resources: Public Water Supply Section	www.deh.enr.state.nc.us/pws/	(919) 733-2321
North Dakota Department of Health: Division of Water Quality	www.health.state.nd.us/mf/	(701) 328-5211
Ohio Environmental Protection Agency: Division of Drinking and Ground Water	www.epa.state.oh.us/ddagw/	(614) 644-2752
Oklahoma Department of Environmental Quality: Water Quality Division	www.deq.state.ok.us/WQDnew/index.htm	(405) 702-8100
Oregon Department of Human Services: Drinking Water Program	http://oregon.gov/DHS/ph/dwp/index.shtml	(971) 673-0405
Pennsylvania Department of Environmental Protection: Office of Water Management	www.dep.state.pa.us/dep/deputate/watermgt/wsm/ WSM.htm	(717) 772-4018
Puerto Rico Department of Health: Public Water Supply Supervision Program	www.epa.gov/region02/cepd/prlink.htm	(787) 977-5870
Rhode Island Department of Health: Office of Drinking Water Quality	www.health.ri.gov/environment/dwq/index.php	(401) 222-6867
South Carolina Department of Health and Environmental Control: Drinking Water Program	www.scdhec.net/eqc/water/html/dwater.html	(803) 898-4300
South Dakota Department of Environment and Natural Resources: Drinking Water Program	www.state.sd.us/denr/des/drinking/dwprg.htm	(605) 773-3754

State Contact Information	Web site	Phone Number
Tennessee Department of Environment and Conservation: Division of Water Supply	www.state.tn.us/environment/dws/index.html	(615) 532-0191
Texas Texas Commission on Environmental Quality	www.tceq.state.tx.us/nav/util_water/	(512) 239-4691
Utah Department of Environmental Quality: Division of Drinking Water	www.drinkingwater.utah.gov	(801) 536-4200
Vermont Vermont Agency of Natural Resources	www.anr.state.vt.us/dec/watersup/wsd.htm	(802) 241-3400
Virgin Islands Department of Planning and Natural Resources: Division of Environmental Protection	http://dpnr.gov.vi/dep/home.htm	(340) 773-1082
Virginia Department of Health: Office of Drinking Water	www.vdh.state.va.us/dw/index.asp	(804) 864-7500
Washington Division of Environmental Health: Office of Drinking Water	www.doh.wa.gov/ehp/dw/	(360) 236-3100
West Virginia Bureau for Public Health: Department of Health and Human Resources	www.wvdhhr.org/oehs/eed/	(304) 558-6715
Wisconsin Department of Natural Resources: Bureau of Drinking Water and Ground Water	www.dnr.state.wi.us/org/water/dwg/	(608) 266-0821
Wyoming EPA Region 8: Wyoming Drinking Water Program	www.epa.gov/region08/water/dwhome/wycon/wycon.html	(303) 312-6812

Appendix C – Tribal Drinking Water Contacts

For additional information or to learn more about the laws governing your tribe use the contact information provided in this Appendix.

US EPA Headquarters	Web site	Phone Number
American Indian Environmental Office	www.epa.gov/indian	(202) 564-0303

US EPA Tribal Coordinators	Web site	Phone Number
EPA Region 1	www.epa.gov/region01/govt/tribes/index.html	(888) 372-7341
EPA Region 2	www.epa.gov/region02/nations/index.html	(212) 637-3000
EPA Region 4	www.epa.gov/region04/ead/indian/index.htm	(404) 562-6939
EPA Region 5	www.epa.gov/region5/water/stpb	(312) 353-2123
EPA Region 6	www.epa.gov/region06/6xa/tribal.htm	(800) 887-6063
EPA Region 7	www.epa.gov/region07/government_tribal/index.htm	(913) 551-7003
EPA Region 8	www.epa.gov/region08/tribes	(303) 312-6312
EPA Region 9	www.epa.gov/region09/cross_pr/indian/index.html	(415) 947-8704
EPA Region 10	yosemite.epa.gov/r10/tribal.NSF	(206) 553-4011

Other Contacts	Web site	Phone Number
Administration for Native Americans	www.acf.dhhs.gov/programs/ana/	(877) 922-9262
Bureau of Indian Affairs	www.doi.gov/bureau-indian-affairs.html	(202) 208-3710
Indian Health Service	www.ihs.gov	(301) 443-3024
Native American Water Association	www.nawainc.org	(775) 782-6636

Appendix D – State Public Service Agencies

Some states have more than one Public Service Agency, not all Public Service Agencies regulate water rates, and some Public Service Agencies regulate rates for particular water systems (e.g., those serving more than 10,000 customers). Check with your State Public Service Agency or State Drinking Water Primacy Agency for more information.

State Contact Information	Web site	Phone Number
Alabama Alabama Public Service Commission	http://www.psc.state.al.us/	(334) 242-2946
Alaska Regulatory Commission of Alaska	http://www.state.ak.us/rca/	(907) 276-6222
Arizona Arizona Corporation Commission	http://www.cc.state.az.us/	(602) 542-4251
Arkansas Arkansas Public Service Commission	http://www.accessarkansas.org/psc/	(501) 682-2051
California California Public Utilities Commission	http://www.cpuc.ca.gov/	(415) 703-2782
Colorado Colorado Public Utilities Commission	http://www.dora.state.co.us/puc/	(303) 894-2000
Connecticut Connecticut Department of Public Utility Control	http://www.state.ct.us/dpuc/	(860) 827-1553
Delaware Delaware Public Service Commission	http://www.state.de.us/delpsc/	(302) 739-4247
District of Columbia District of Columbia Public Service Commission	http://www.dcpsc.org/	(202) 626-5100
Florida Florida Public Service Commission	http://www.psc.state.fl.us/	(850) 413-6100

State Contact Information	Web site	Phone Number
Georgia Georgia Public Service Commission	http://www.psc.state.ga.us/	(404) 656-4501
Guam Guam Public Utilities Commission	http://guampuc.com/main/	(671) 472-1907
Hawaii Hawaii Public Utilities Commission	http://www.hawaii.gov/budget/puc/	(808) 586-2020
Idaho Idaho Public Utilities Commission	http://www.puc.state.id.us/	(208) 334-0300
Illinois Illinois Commerce Commission	http://www.icc.illinois.gov/home.aspx	(217) 782-7295
Indiana Indiana Utility Regulatory Commission	http://www.ai.org/iurc/index.html	(312) 232-2700
Iowa Iowa Utilities Board	http://www.state.ia.us/government/com/util/util.html	(515) 281-5979
Kansas Kansas Corporation Commission	http://www.kcc.state.ks.us/	(785) 271-3354
Kentucky Kentucky Public Service Commission	http://psc.ky.gov/	(502) 564-3460
Louisiana Louisiana Public Service Commission	http://www.lpsc.org/	(225) 342-4404
Maine Maine Public Utilities Commission	http://www.state.me.us/mpuc/	(207) 287-3831
Maryland Maryland Public Service Commission	http://www.psc.state.md.us/psc/	(410) 767-8000
Massachusetts Massachusetts Department of Communications and Energy	http://www.mass.gov/dte/	(617) 305-3500

State Contact Information	Web site	Phone Number
Michigan Michigan Public Service Commission	http://www.michigan.gov/mpsc	(517) 241-6180
Minnesota Minnesota Public Utilities Commission	http://www.puc.state.mn.us/	(651) 296-7124
Mississippi Mississippi Public Service Commission	http://www.psc.state.ms.us/	(601) 961-5434
Missouri Missouri Public Service Commission	http://www.psc.state.mo.us/	(573) 751-3234
Montana Montana Public Service Commission	http://www.psc.state.mt.us/	(406) 444-6199
Nebraska Nebraska Public Service Commission	http://www.psc.state.ne.us/	(402) 471-3101
Nevada Public Utilities Commission of Nevada	http://puc.state.nv.us/	(775) 684-6101
New Hampshire New Hampshire Public Utilities Commission	http://www.puc.state.nh.us/	(603) 271-2431
New Jersey New Jersey Board of Public Utilities	http://www.bpu.state.nj.us/home/home.shtml	(973) 648-2026
New Mexico New Mexico Public Regulation Commission	http://www.nmprc.state.nm.us/	(505) 827-6940
New York New York Public Service Commission	http://www.dps.state.ny.us/	(518) 474-7080
North Carolina North Carolina Utilities Commission	http://www.ncuc.commerce.state.nc.us/	(919) 733-7328
North Dakota North Dakota Public Service Commission	http://pc6.psc.state.nd.us/	(701) 328-2400

State Contact Information	Web site	Phone Number
Ohio Public Utilities Commission of Ohio	http://www.puco.ohio.gov/puco.cfm	(800) 686-7826
Oklahoma Oklahoma Corporation Commission	http://www.occ.state.ok.us/	(405) 521-2211
Oregon Public Utility Commission of Oregon	http://www.puc.state.or.us/	(800) 522-2404
Pennsylvania Pennsylvania Public Utility Commission	http://www.puc.state.pa.us/home.aspx	(717) 783-1740
Puerto Rico Junta Reglamentadora de Telecomunicaciones	http://www.jrtpr.gobierno.pr/	(787) 756-0804
Rhode Island Rhode Island Public Utilities Commission	http://www.ripuc.state.ri.us/	(401) 941-4500
South Carolina Public Service Commission of South Carolina	http://www.psc.sc.gov/	(803) 896-5100
South Dakota South Dakota Public Utilities Commission	http://www.state.sd.us/puc/index.htm	(605) 773-3201
Tennessee Tennessee Regulatory Authority	http://www.state.tn.us/tra/	(800) 342-8359
Texas Public Utility Commission of Texas	http://www.puc.state.tx.us/	(512) 936-7000
Utah Public Service Commission of Utah	http://www.psc.state.ut.us/	(801) 530-6716
Vermont Vermont Public Service Board	http://www.state.vt.us/psb/	(802) 828-2358
Virgin Islands Virgin Islands Public Services Commission		(340) 776-1291

State Contact Information	Web site	Phone Number
Virginia State Corporation Commission of Virginia	http://www.scc.virginia.gov/	(804) 371-9967
Washington Washington Utilities and Transportation Commission	http://www.wutc.wa.gov/	(360) 664-1160
West Virginia Public Service Commission of West Virginia	http://www.psc.state.wv.us/	(304) 340-0300
Wisconsin Public Service Commission of Wisconsin	http://psc.wi.gov/	(608) 266-5481
Wyoming Wyoming Public Service Commission	http://psc.state.wy.us/	(307) 777-7427

Appendix E – Other STEP Documents

This guide is one in a series of Simple Tools for Effective Performance (STEP) documents for small drinking water systems that can help them through the rate setting process. Currently available STEP documents can be obtained from EPA by calling the Safe Drinking Water Hotline at (800) 426-4791 and requesting the document by its publication number.

Asset Management: A Handbook for Small Water Systems
This workbook guides small systems through a four-step process of developing an asset management plan and includes worksheets on completing a thorough asset inventory; prioritizing the maintenance, rehabilitation, and replacement of your assets; developing a simple asset management plan; and carrying out the plan. The workbook also provides information about how asset management can help improve your system's financial health and ability to provide safe drinking water.
Publication number EPA 816-K-03-016

Strategic Planning: A Handbook for Small Water Systems
This workbook is designed to help systems understand the concept of strategic planning and how it can help them prepare to meet public expectations and regulatory requirements while maintaining organizational and financial stability in the future. The workbook provides worksheets to help systems create a vision statement and mission, assess their capacity, define their area of service, identify challenges, and develop a strategic plan for their system.
Publication number EPA 816-R-03-015

Taking Stock of Your Water System: A Simple Asset Inventory for Very Small Drinking Water Systems
This workbook will guide very small systems through a simple asset inventory of their drinking water system and the first steps of an asset management plan. The workbook includes worksheets on asset condition and prioritization.
Publication number EPA 816-K-03-002

Appendix F – Depreciation Accounting

If your water system has financial statements (revenue statements and balance sheets) that are prepared in a manner consistent with generally accepted accounting principles (GAAP), you will use the concept of "depreciation." Depreciation accomplishes two objectives:

- It ensures that the asset values in your balance sheet are not overestimated. Since an asset is unlikely to be as valuable in year 2 as it was in year 1, depreciation provides a method for proper estimation.

- Accounting for depreciation on your revenue statement is another way of estimating your reserve fund requirements. If your accounts currently show depreciation, you may be able to skip the exercise in Step 3, where you learned how to calculate annual reserve fund requirements.

From an (over-simplified) accounting perspective, the amount of each year's addition to "accumulated depreciation" on the balance sheet should create an expense (of the same amount) on the revenue statement. Note, however, that unlike many costs, this does not involve the outlay of cash.

What, therefore, should one do with the revenue associated with this expense? It is recommended that the expense be moved into a reserve account where it can accumulate and be available for the rehabilitation and replacement of assets.

If you fail to contribute to a reserve fund, regardless of how you calculate your annual contribution, you will not create a reserve fund large enough for your future capital needs.

Depreciation and GASB 34

You may have heard discussions of the term "GASB 34." GASB stands for the Government Accounting Standards Board, an organization that establishes accounting and financial reporting standards for government organizations. If your system is part of a municipal government, its accounting standards are established by GASB.[1] GASB 34 is "Statement Number 34, Basic Financial Statements and Management's Discussion and Analysis for State and Local Governments."

[1] If you are a privately owned system, your accounting standards are established by a similar organization for the private sector, the Financial Accounting Standards Board (FASB).

The most important change made by GASB 34 is the requirement that state and local governments report all current and long-term assets and liabilities, including infrastructure, on the balance sheet of the government-wide financial statement. GASB allows government agencies to comply with this requirement in one of two ways:

- By depreciating those assets.
- By using a “modified approach,” which allows state and local government agencies to report the current costs of preserving infrastructure to be reported, in lieu of depreciation.[2]

Therefore, an organization may comply with GASB 34 by adopting depreciation in balance sheets and revenue statements, but that is not the only way to comply. In fact, organizations that are concerned about public works[3] are concerned that the mere addition of depreciation to financial statements might be an inadequate approach to accumulating sufficient funds to adequately preserve vital infrastructure. An agency that uses the “modified approach” to comply with GASB 34 would need to report what it spent on maintenance and replacement and then it would need to show—based on the change in asset condition from year to year—whether it had spent enough. An agency that simply reports depreciation, but does not set that revenue aside in a reserve account, does nothing to improve its long-term financial ability to pay for the preservation of asset value. It creates an increase in revenue that is simply rolled over in the following year, creating no long-term reserves.

Conclusion: Build a Reserve Fund

The lesson from this discussion of GASB 34 is that full accounting for the cost of doing business must include an annual contribution to a reserve fund. Whether the amount of that contribution is determined by a worksheet (as shown in Step 3) or by a depreciation expense on a revenue statement, it still must go into the reserve fund. Failure to contribute to that reserve fund each year is a failure to properly calculate the cost of doing business.

[2] See GASB 34, para. 20.
[3] See, e.g., the position statement of the American Public Works Association, 2003.

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REVIEW AND RECOMMENDATIONS FOR IMPLEMENTING WATER AND WASTEWATER AFFORDABILITY PROGRAMS IN THE UNITED STATES

March 2014

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Since 1969, the nonprofit National Consumer Law Center® (NCLC®) has used its expertise in consumer law and energy policy to work for consumer justice and economic security for low-income and other disadvantaged people, including older adults, in the United States. NCLC's expertise includes policy analysis and advocacy; consumer law and energy publications; litigation; expert witness services, and training and advice for advocates. NCLC works with nonprofit and legal services organizations, private attorneys, policymakers, and federal and state government and courts across the nation to stop exploitive practices, help financially stressed families build and retain wealth, and advance economic fairness.

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EXECUTIVE SUMMARY

Across the nation, water and sewer bills are skyrocketing. From 1990 to 2006, water and wastewater bills increased by 105.7 percent—a 4.6 percent average annual increase. Over that same time period, median household income increased by 61 percent, or an average of 3.0 percent per year. The price of water is anticipated to rise even more, particularly for customers of municipal utilities, with anticipated repairs and replacements of aging systems. Because a water utility's revenue generally is comprised only of customer (i.e., ratepayer) revenue, the largest burden of funding these anticipated cost increases will likely fall on customers, including low-income customers. In some areas, water rates are rising faster than any other utility rate, including heating bills. While states require that electric and gas companies provide discounts to their low-income customers and telephone discounts are also available to poor consumers nationwide, most states lack any requirement that water/wastewater utilities provide a discount program to low-income customers.

A basic tenet of public utility regulation is that authorized rates need to be reasonable. The creation and success of necessary water affordability programs can be achieved when agencies possess explicit statutory authority to implement any reasonable affordability program to ensure "reasonable" rates. Current programs offered by water and wastewater utilities for payment-troubled customers are limited and even the utilities themselves have indicated that current assistance programs are not sufficient to address current needs.

Key Recommendations

Utilities, public utility commissions, and federal and state government could consider the following recommendations to efficiently increase affordability of water and wastewater service for low-income customers and to help these customers better manage their bills related to this basic necessity. The recommendations are those of advocates from the National Consumer Law Center.

1. **Measures used to determine the affordability of water and wastewater rates to residential customers should be broadened.** Affordability measures should include household size and income, size of approved rate increase, and rate of customer growth in the system. An affordability analysis should also focus on customer ability to pay, including the level of past due bills and the rates at which service is terminated and reconnected. Qualitative measures could include whether payment of water and sewer bills compromises ability to pay for other basic necessities, such as food and shelter, and a review of whether other assistance programs are available to the consumer.

2. **Flexibility is key and should be incorporated into policies to achieve water and wastewater affordability.** Some states have relaxed their interpretations of existing statutes to allow for rate relief in disadvantaged communities under certain circumstances. Flexibility to deviate from the strict application of district specific pricing

or single-tariff pricing should be an option when reasonably necessary, based on all relevant factors. Tracking expenses on a district specific level even in the context of single-tariff pricing or rate consolidation may help to ensure that companies are held accountable and incur only those costs that are reasonable. Flexibility is also necessary to create effective payment plans that take into account the different circumstances of payment- troubled customers.

3. **State regulators should ensure that the allowed return on equity is as low as it can reasonably be set and adopt rate designs favorable to low-income customers.**

4. **Rather than a subsidy, low-income rates should be considered a "discount" in cases where low-income rates recover marginal costs and make a contribution to fixed costs, similar to "discount rates" that are offered to industrial customers.**

5. **Payment plans should be implemented with the goal of maximizing the opportunities for payment-troubled customers to meet their payment obligations.** Advocates can consider seeking a requirement from the commission that when a utility offers a customer a payment plan, it should be reasonable based upon each payment-troubled customer's financial and special circumstances. A reasonable plan should maximize the customer's opportunity and ability to pay as well as the ability to maintain essential services to the household. Utilities could be required to offer payment troubled customers at least one second payment agreement. Allowing customers to select a payment due date that will best enable customers to meet their payment obligations should be considered by policymakers.

6. **Discount programs and assistance programs should be paired with conservation training and leak repair programs.**

7. **Require uniform data reporting across utilities within each state** to shed light on the true cost of water and wastewater service, bring to light management and financial problems, and help identify best practices for wider implementation.

8. **Use benchmarking to increase incentives for utilities to actively manage their customer bills, rates, and affordability programs.** Regulators could set or approve realistic aspirations for utilities to achieve on a given affordability related measurement, such as number of customer terminations due to nonpayment. Benchmarks should be paired with meaningful utility obligations to help achieve affordability in the event that benchmarks are not met.

9. **Adopt a federal Low-Income Water Assistance Program**, possibly implemented as grants to states to provide targeted assistance and funded by Congressional appropriation.

I. INTRODUCTION

Across the nation, water and wastewater bills are skyrocketing. From 1990 to 2006, water and wastewater bills increased by 105.7 percent—a 4.6 percent average annual increase. Over that same time period, median household income increased by 61 percent, or an average of 3.0 percent per year.[1] In fact, the Water Research Foundation and U.S. Environmental Protection Agency (EPA) noted that "[T]here is no question that water and wastewater costs are taking an increasing share of household's budgets. Costs are increasing faster than general inflation and faster than the rate of change in typical incomes."[2]

Summer and fall drought conditions nationwide additionally underscore the importance of a comprehensive water policy that includes customer affordability programs.[3] Conservation measures, while necessary, may mean that consumers directly experience cost increases through revisions to rate structures, such as changing flat rates to inclining tiered rates.[4] For example, in Texas, drought conditions combined with population growth and increased water demand may mean building additional reservoirs or obtaining additional water supply from higher cost sources, such as desalination.[5] These costs will be recovered in part through increases to local rates.[6]

Additionally, aging water infrastructure, much of which is at or near the end of its useful life, is a major challenge. Experts estimate exorbitant replacement costs. In 2009, the American Society of Civil Engineers (ASCE) issued a D- (the lowest grade) to "Drinking Water" and "Wastewater" when it rated 15 categories from "Aviation" to "Wastewater." ASCE's evaluation focused on the criteria of capacity, condition, current funding, and future costs with funding

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[1] Water Research Foundation and U.S. Environmental Protection Agency, Best Practices in Customer Payment Assistance Programs (2010) (Water Research Foundation/EPA) at 29-31. However, these impacts on households are understated in that they include cost of service to households who do not directly pay for water or wastewater bills. Id.

[2] Water Research Foundation/EPA at 32.

[3] In June 2012, the National Climatic Data Center reported that 47 percent of the country was in a state of moderate to exceptional drought, while 71 percent of the country was abnormally dry or in the exceptional drought category. Delaware had the driest January-June period on record. With a third of the country "very dry," June 2012 ranked as the third driest month in a 118 year old record. National Oceanic and Atmospheric Association National Climatic Data Center, State of the Climate: Drought (June 2012), available at: http://www.ncdc.noaa.gov/sotc/drought/#national-overview.

[4] See Kate Galbraith, "In Era of Drought, Texas Cities Boost Water Rates" (*The Texas Tribune*, Jun. 12, 2012), available at: http://www.texastribune.org/texas-environmental-news/water-supply/drought-and-rate-hikes-show-texans-value-water/.

[5] See id.

[6] Low-interest loans from the Texas Water Development Board, along with local rates, are financing a 145 to 225 million dollar desalination plant in San Antonio. See Kate Galbraith, "Texas' Water Woes Spark Interest in Desalination" (*The Texas Tribune*, Jun. 10, 2012), available at: http://www.texastribune.org/texas-environmental-news/water-supply/texas-water-woes-spark-interest-desalination/.

prospects, operation and maintenance, public safety, and resilience.[7] In 2013, "Drinking Water" and "Wastewater" grades slightly improved to a D.[8] ASCE noted the problems of more than 240,000 water main breaks per year and sewer overflows could be addressed with pipe replacement, repair, and expansion.[9] The EPA and Congressional Budget Office (CBO) have separately issued findings that the gap between necessary investment and available funding for water/wastewater is in the tens of billions of dollars or more over the next 20 years. While EPA's study addresses a gap that can be attributed mostly to municipal owned systems (generally not regulated by state commissions), these commissions do regulate some municipal systems when they serve customers outside municipal borders.

Possible future cost drivers include both novel and traditional items. On the side of novelty, regulators may face costs of water treatment related to hydraulic fracturing ("fracking"). Although wastewater resulting from fracking may not always be reintroduced into the environment and consumed, in Wyoming, for example, the EPA found that chemicals in drinking water were likely associated with fracturing that took place in close proximity to the drinking water wells in the area.[10] More typical cost drivers for water utilities can include high costs of obtaining water supplies, production and treatment costs, small customer base over which to spread costs, geography, age of the system, and level of investment needed. Compliance with the federal Safe Drinking Water Act will also continue to be a cost driver.

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[7] ASCE, 2009 Report Card for America's Infrastructure, available at http://www.infrastructurereportcard.org/2009/sites/default/files/RC2009_exsummary.pdf.

[8] ASCE, 2013 Report Card for America's Infrastructure (ASCE 2013 Report Card), available at http://www.infrastructurereportcard.org/a/#p/grade-sheet/gpa. The 2013 report card grading methodology similarly included the same seven criteria form capacity to resilience as the previous 2009 report card, but additionally includes innovation as an eighth criteria. See id. at http://www.infrastructurereportcard.org/2009/sites/default/files/RC2009_exsummary.pdf.

[9] ASCE, 2013 Report Card (Executive Summary) at http://www.infrastructurereportcard.org/a/#p/overview/executive-summary.

[10] Deborah Solomon and Russell Gold, "EPA Ties Fracking, Pollution," *Wall Street Journal* (Dec. 9, 2011) (discussing water quality problems of Pavillion, Wyoming), available at http://online.wsj.com/article/SB10001424052970203501304577086472373346232.html; Amy Mall's Blog, National Resources Defense Council Switchboard, New Report: Expert Confirms EPA Finding that Fracking Linked to Wyoming Ground Water Contamination (May 1, 2012), available at http://switchboard.nrdc.org/blogs/amall/pavillion_independent_experts.html. See also Press Release, U.S. EPA, Wyoming to Lead Further Investigation of Water Quality Concerns Outside of Pavillion with Support of EPA (June 20, 2013). Drilling companies' hazardous spills have impacted water supplies in Colorado and gas operations in New Mexico have caused 800 cases of water contamination. See OMB Watch, The Right to Know, The Responsibility to Protect: State Actions Are Inadequate to Ensure Effective Disclosure of the Chemicals Used in Natural Gas Fracking (July 2012) at 15 (citing Thyne, Geoffrey, Review of Phase II Hydrogeologic Study, Prepared for Garfield County," SBS LLC, Dec. 20, 2008, available at http://s3.amazonaws.com/propublica/assets/methane/thyne_review.pdf.

In a 2004 survey by the American Water Works Association of its members, 22 percent of all respondents rated nonpayment of water bills as a big problem.[11] Twenty-nine percent of all respondents rated it as a growing problem.[12] Among larger utilities responding (i.e., those serving over 100,000 people) the concern over bill nonpayment was even more pronounced: approximately 33 percent considered nonpayment a big problem and 40 percent considered nonpayment a growing problem.[13] The Water Research Foundation and EPA summarize the concern:

> Simply, low income households that are already having difficulty paying for all of these necessities will find it increasingly more difficult to pay their water and wastewater bills. The same will be true for many higher-income households that, due to competing needs (such as higher energy and food costs, increasing needs for health care, among others) are not able to afford all of their necessities. Those difficulties can have a direct impact on public health in the community.
>
> *This means that customer payment assistance efforts need to be not only a current priority for utilities but also an area of growing importance.*[14]

The price of water is already unaffordable for large portions of many communities and is anticipated to rise even more, particularly for customers of municipal utilities, with anticipated repairs and replacements of aging systems. Because a water utility's revenue generally is comprised only of customer (i.e., ratepayer) revenue, the largest burden of funding these anticipated cost increases will likely fall on customers, including low-income customers. While water bills are historically lower than energy bills, in some areas, water rates are rising faster than any other utility rate, including heating bills. Yet, while states require that electric and gas companies provide discounts to their low-income customers and telephone discounts are also available to poor consumers nationwide, most states lack any requirement that water/wastewater utilities provide a discount program to low-income customers.

This report examines existing affordability programs, best practices, and ideas from multiple jurisdictions as well as other utility sectors that increase affordability and protect low-income water and wastewater customers from losing their utility service. Throughout the report, attorneys and consumer advocates from different states offer their experience as well as describe and identify ratemaking and rate design mechanisms that address affordability. They also discuss direct customer assistance programs. The authors have highlighted affordability

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[11] 338 complete responses were received from government-owned utilities (82%), private (4%), utilities that were both publicly and privately owned (1%) or other ownership such as member owned, nonprofit, and special districts (11%). See Water Research Foundation and U.S. Environmental Protection Agency, Best Practices in Customer Payment Assistance Programs (2010) at 13.
[12] Water Research Foundation and U.S. Environmental Protection Agency, Best Practices in Customer Payment Assistance Programs (2010) (Water Research Foundation/EPA) at 13.
[13] Id.
[14] Water Research Foundation/EPA at 32 (emphasis added).

mechanisms that may help advocates and policymakers implement practices to increase affordability of water and wastewater service to consumers.

II. STATUTORY BASIS FOR WATER AND WASTEWATER AFFORDABILITY

A basic tenet of public utility regulation is that authorized rates need to be reasonable. However, the ratepayer protections afforded by requiring reasonable rates are distinct and frequently inadequate to ensure the establishment of truly affordable rates for all customers. More troubling, statutes that were enacted to create "reasonable" rates are often so narrowly interpreted that they serve to prevent the very regulatory mechanisms which might be the most effective in achieving affordability.

When considering options to provide needed relief to low-income customers, numerous water utilities and public agencies struggle with interpreting laws that forbid unduly discriminatory utility rates. Throughout the United States, regulatory bodies and water agencies have repeatedly viewed any program that might subsidize one ratepayer class at the expense of another as potentially violating the anti-discriminatory rate provisions found in their respective state statutes. And while some jurisdictions have more broadly interpreted anti-discriminatory statutes, which facilitates the development of ratepayer assistance programs, the fact remains that absent specific legislative authorization, some affordability programs might be precariously positioned to pass judicial scrutiny.

In 1993, the legislature of California enacted Section 739.8 of the California Public Utilities Code, which declared that "access to an adequate supply of healthful water is a basic necessity of human life, and shall be made available to all residents of California at an affordable cost." While helping to clear the way for all of California's water utilities to enact affordability programs, the code section required specific consideration for water utilities under the commission's jurisdiction to "implement programs to provide rate relief for low-income ratepayers." Approximately ten years after this California code section became effective, the National Association of Regulatory Utility Commissioners (NARUC) adopted a resolution sponsored by the association's water and consumer affairs committees to "work closely to develop effective programs to assist low-income water utility ratepayers."[15] In January 2014, legislation was introduced in California that would require the California Public Utilities Commission to extend the Low-Income Rate Assistance Program statewide and increase the level of assistance provided to eligible ratepayers.[16]

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[15] See National Association of Regulatory Utility Commissioners, Joint Resolution Supporting a LIHEAP-Equivalent to Assist Low-Income Drinking Water Utility Ratepayers (Mar. 10, 2004), available at http://www.naruc.org/Resolutions/liheap04.pdf.

[16] See "Yamada introduces water rate assistance legislation," *Sonoma Valley Sun* (Jan. 6, 2014).

With a widening income gap in most parts of the United States, the need for greater flexibility to implement water affordability programs becomes more significant. Some states have relaxed their interpretations of existing statutes to allow for rate relief in disadvantaged communities under certain circumstances. Yet, the continued creation and success of necessary water affordability programs can be best achieved when agencies possess the explicit guidance through legislation or other statutory authority that any reasonable affordability program that might be adopted will not place their agency in an ironic and bureaucratic conflict with previous statutes on "reasonable" rates.[17]

III. MEASURING AFFORDABILITY

What is affordability and how is it measured? The EPA, for example, considers "what is affordable to the typical, or 'middle of the road' household."[18] For purposes of this paper, the context is affordability of water and wastewater service to the residential end-user customer. What is considered affordable to the median household or average customer, however, may drastically differ from what is affordable to a low-income household. Affordability drivers include not only household income, but also size of approved rate increase, and rate of customer growth in the system. An affordability analysis should also focus on customer ability to pay,[19] keeping in mind that ability to pay is distinct from willingness to pay.[20]

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[17]CA Public Utilities Code 728 states that "Whenever the commission, after a hearing, finds that the rates or classifications, demanded, observed, charged, or collected by any public utility for or in connection with any service, product, or commodity, or the rules, practices, or contracts affecting such rates or classifications are insufficient, unlawful, unjust, unreasonable, *discriminatory, or preferential*, the commission shall determine and fix, by order, the just, reasonable, or sufficient rates, classifications, rules, practices, or contracts to be thereafter observed and in force." Cal. Pub. Util. Code § 728 (emphasis added). See also Cal. Pub. Util. Code § 739.8 (Access to "affordable water" is mandated and Commission has authority to implement low-income assistance programs).
Other state provisions for low-income water utility customer assistance include: NM Stat. Ann §§ 27-6A-1 to 27-6A-5 (Low Income Water, Sewer and Solid Waste Service Assistance Act); Tx Special Dist. Local Laws Code Delay of Collection of Tap-in Charges, Connection, or Hookup Fees for Low-Income Persons); WA Revised Code § 57.08.014 (Authority to Adjust or Delay Rates or Charges for Low-Income Persons); WV 24-2A-5 (Special Rates for Certain Water Utility Customers). While Massachusetts also has a statute, MA Gen. Law Ch. 23B §24B (Low-Income Sewer and Water Assistance Program, or LISAWAP), this program is no longer in operation.

[18] Scott J. Rubin, Affordability of Water Service, Rural Water Partnership Fund (May 24, 2001) (Rubin) at 9.

[19] To clarify, this paper discusses numerous existing affordability programs which themselves may use varying measures of affordability. In order to provide analysis, critique and comparison of different affordability programs, they are analyzed by using more consistent metrics, as described in this section. Affordability, as defined by "ability to pay" with one's income or financial resources, has been used by the Environmental Protection Agency to define affordability of water quality standards for individuals or households. National Drinking Water Advisory Council, Recommendations of the National Drinking Water Advisory Council to U.S. EPA on Its National Small Systems Affordability Criteria (July 2003) at 9.

A. Income and Household Size

One approach to determine whether water is affordable references the proportion of household or area median income that is spent on a water bill.[21] For example, although different entities choose different threshholds,[22] two percent of household income or a community's median income is often used as an affordability reference for drinking water, and a four percent threshold used as an affordability reference for drinking and wastewater combined.[23] These thresholds determine the point at which assistance programs may become available to consumers.[24] A two percent threshold representing a household's "water burden," could serve as the yardstick by which affordability is determined for payment-troubled customers with arrearages.[25] For example, the closer that total charges on a payment-troubled customer's water bill come to representing no more than two percent of household income, the more affordable the water bill. While these thresholds may be somewhat subjective, they are considered reasonable and widely accepted.[26]

However, a recent report has cast some doubt upon the reliability of using median income, without more, as a reference against which to measure affordability.[27] Researchers from the

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[20] Rubin at 4.

[21] Margot Saunders, Water Affordability Programs (AWWA Research Foundation and American Water Works Association 1998) (Saunders) at 51.

[22] For example, the EPA's use of a median household income threshold for determining affordability, in order to limit variances from its goal of implementing the Safe Drinking Water Act, is a view of affordability through the lens of what can be implemented by the utility at water system level. This goal overlaps with, but is also distinct from the goal of ensuring that the end user consumers have reliable and safe access to water and wastewater services that are reasonably priced.
In the context of compliance with the Arsenic in Drinking Water Rule, EPA established a national affordability criterion that sets 2.5% of median household income as a threshold for affordability. See United States Environmental Protection Agency Office of Water, Report to Congress: Small Systems Arsenic Implementation Issues (Mar. 2002) at 4 (describing 2.5% threshold), available at http://water.epa.gov/drink/info/arsenic/upload/2005_11_10_arsenic_congr_ars_mar_02.pdf. However, EPA's measurement fails to capture the relative affordability to low-income households.

[23] Saunders, at 51 (using 2% of a geographic area's median income as the benchmark against which to measure affordability, based on what percentage of household income us required to pay a water bill).

[24] Id.

[25] Id.

[26] Breisach, Raymond et al., Results and Recommendations of Water and Wastewater Affordability Study (2004) at 1, Report prepared for the City of Kalamazoo Department of Public Services, available at http://research.upjohn.org/reports/180/ (noting the subjectivity of the 2% and 4% thresholds, but considering them reasonable given "their widespread acceptance in the industry and consistency with recommendations made by the Environmental Protection Agency's (EPA) Environmental Economics Advisory Committee, trade associations, and policy analysts."); See Pacific Institute, Assessing Water Affordability: A Pilot Study in Two Regions of California (Aug. 2013) at 8.

[27] See Pacific Institute, Assessing Water Affordability: A Pilot Study in Two Regions of California (Aug. 2013) at 2, available at http://www.pacinst.org/wp-content/uploads/2013/08/assessing-water-affordability.pdf.

Pacific Institute investigated water bill affordability for California customers in both urban and rural settings. In Sacramento, researchers found that measuring affordability based upon whether customer water bills were at or above two percent of median income resulted in a finding that no water systems had unaffordable rates.[28] In contrast, measuring affordability based on household income revealed over 100,000 households with unaffordable water bills.[29] The study found similar results for rural water customers in Tulare. Using median income at a water system level to measure affordability, the study found just 9 out of 51 systems in Tulare exceeded the affordability threshold.[30] Measuring affordability based on household income revealed that almost one-third or almost 4,000 households exceeded the affordability threshold.[31] When water is affordable at the water system level, it can be unaffordable at the household level.[32]

To examine affordability from the perspective of the customer, affordability measures using household income can present a more accurate and comprehensive picture than using median income alone. Using the traditional measure of examining water affordability -- what percentage of median household income the water bill constitutes — can fail to account for impacts on vulnerable members of society who earn less than the median income.[33]

However, there are limitations to strictly using a threshold of household income to assess affordability.[34] Household size and income should be periodically reviewed when measuring affordability. Household income and household income and expenses can change as the number of household members expand or contract. For example, in a household headed by two working adults, finances may be spread thinner when new responsibilities of elder and infant care mean additional members are added to the household. At the same time, the larger household is associated with increases in water and wastewater consumption and use, which are reflected in higher water and wastewater bills. As an alternative or complement to programs using a percentage of household income as an affordability metric, consumer advocates and policymakers can investigate assistance programs that support the costs of customers' basic water needs on a per capita basis.[35]

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[28] Id. at 10.

[29] *I.e.,* households for which water bills comprise 2% or more of household income. Id.

[30] Id. at 13.

[31] I.e., households spending 2% or more of household income on the water bill. Id. at 13. If replacement costs of water (replacements are substitutes to water service such as bottled water, vended water, or water filters) are factored in, the affordability threshold would be exceeded for over half of rural Tulare households. Id at 13, 15.

[32] Id. at 15.

[33] Id. at 15.

[34] See Saunders at 61.

[35] Basic water needs could be defined by policymakers, but as an example, might include costs of indoor water use and exclude the costs of filling a swimming pool.

B. Effect on Level of Arrearages

The level of arrearages, or past due bills, would seem to be a clear indicator of whether water bills are affordable. One study found that 97 percent of all consumers pay all bills on time, every month, in a good economy.[36] Assistance programs that provide some level of arrearage forgiveness may help increase affordability by lowering arrearages. Doing so lowers the amount of the customer's household income that is necessary to maintain water service.[37]

C. Effect on Rate of Disconnections

The rate at which service is disconnected is directly related to whether water service is affordable. The American Water Works Association has stated that, along with rising arrearages and higher collection costs, more frequent terminations of service for nonpayment indicate the need to consider affordability alternatives.[38] In a related example, the Division of Ratepayer Advocates, an independent organization within the California Public Utilities Commission, noted that energy service disconnections and reconnections are indicators of customers' ability to manage energy costs, pay bills, and maintain service.[39] The same could be said for water utility service.

Along with disconnections, it could be helpful to review the rate of reconnections. For example, if a utility reconnects 100 percent of its customers shortly after disconnection, it is likely that the utility is overly aggressive in collections and is using disconnection as a collection tool. It could be informative to review the rate of reconnections within different time periods, such as

[36] Based on the finding of a 1977 Senate report. See Robert Hobbs, Debt Collection Defense Intensive at National Consumer Law Center Conference (Boston, Nov. 14, 2010); Fair Debt Collection (NCLC 2008), App. A.3 (Senate Report 95-382 (Aug. 2, 1977)). Reasons why the remaining 3% of consumers may fail to pay include unemployment, illness or death, family break-up, overextension, and disputed debt. The report also found that 0.1% of consumers are able to pay, but will not pay. While these exact percentages may have shifted over time, one would expect the overall relationship to remain the same in the face of such uneven numbers, *i.e.,* that the vast majority of consumers pay bills on time when they have the financial ability to do so. Indeed, this is consistent with more recent findings reported by the Water Research Foundation, which cited to studies from 2004, 2005 and 2007. "Surveys of disconnected customers indicate that most people want to pay their utility bills on time if it is at all possible for them to do so." Best Practices in Customer Assistance Programs, Water Research Foundation at 35 (citing 2004, 2005 and 2007 studies). Factors contributing to disconnections for nonpayment are unusually high monthly bills just prior to disconnection, loss of work, illness/injury, and breakdown of family relationship. Id. at 34.

[37] As noted above, level of income needed to cover water expense is also a measure of affordability.

[38] Melissa J. Stanford, Memorandum to NARUC Committees on Water and Consumer Affairs at 9 (citing AWWA, Manual of Water Supply Practices-M1, Fifth Edition, Principles of Water Rates, Fees and Charges, 2000).

[39] See Dana S. Appling, Status of Energy Utility Service Disconnections in California, Division of Ratepayer Advocates – California Public Utilities Commission (Nov. 2009) at 1.

30 days, 60 days, 90 days, and over 90 days. Reconnections made only after longer periods of time could indicate greater affordability concerns where consumers do not have the resources on hand to more quickly re-establish service. Failure to reconnect at all can also indicate that water or wastewater service and/or the reconnection charge is unaffordable.

D. Qualitative Measurements

Affordability may also be defined more qualitatively. For example, whether a water or sewer bill is affordable can be measured by whether the customer or household can pay the bill without compromising the ability to also purchase other essentials, such as food and healthcare related costs.[40] Two studies found that when consumers' expenses exceed their income, they will forgo spending on food, transportation, clothing, and medical care in order to pay rent and utility bills.[41] To the extent that an "affordability" definition includes the maintenance of life-sustaining utility services, such as water, it should also acknowledge that consumers must have the concurrent ability to maintain other basic necessities. A more qualitative definition of affordability could be defined as "a customer or household's ability to pay rates that are low enough to ensure access to safe, clean, water and wastewater services adequate for household purposes, and that basic necessities, such as food, shelter, medical, clothing, utility service, and education, do not have to be foregone or disrupted."

E. Accessibility of Assistance Programs

Another measure of affordability of service is the accessibility and availability of low-income and other assistance programs.[42] While such programs are prevalent throughout the states for energy and telephone service assistance, thanks in large part to the existence of federal support

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[40] For example, in a bill called the Clean Water Affordability Act, "[t]he term 'affordability' means, with respect to payment of a utility bill, a measure of whether an individual customer or household can pay the bill without undue hardship or unreasonable sacrifice in the essential lifestyle or spending patterns of the individual or household, as determined by the Administrator" 112th Congress, S.2094, Clean Water Affordability Act of 2012 (referred to the Committee on Environment and Public Works on Feb. 9, 2012). The bill has not been enacted, but the definition it used is still instructive.
The California Public Utilities Commission Division of Water Audits has similarly proposed a definition of affordability along these lines: "Rates low enough so that basic food, shelter, medical, clothing [and education] needs do not have to be foregone". See California Public Utilities Commission Docket R.11-11-008, Comments of The National Consumer Law Center and The Utility Reform Network on Proposed Definitions of Terms, Phrases, and Concepts for Use in This Proceeding (citing to the Commission's Water Division's definition of affordability as adapted from *Raucher, Bob on "Affordability of Water Service" presentation at NAWC Annual Conference, 2004*).

[41] Breisach, Raymond et al., Results and Recommendations of Water and Wastewater Affordability Study (2004) at 16, Report prepared for the City of Kalamazoo Department of Public Services, available at http://research.upjohn.org/reports/180/.

[42] See Jeffrey D. Goltz, What's Keeping Me Up at Night: The Impact of Increasing Utility Rates on Low- and Fixed-Income Customers, NRRI Monthly Essay (Jan. 2012). The author, Mr. Goltz, is Chairman of the Washington Utilities and Transportation Commission.

Programs, such as the Low Income Home Energy Assistance Program (LIHEAP), for home heating and cooling assistance and Lifeline for telecommunications assistance, no such national direct financial assistance exists for water or wastewater customers. Some states, however, have given their commissions or utilities legislative authority to set discounted rates for seniors and low-income consumers through ratepayer funded programs.[43] Individual water utility companies also sometimes offer assistance programs.[44]

IV. CURRENT PROGRAMS AND PRACTICES

A. Types of Water and Wastewater Affordability Programs

Water and wastewater affordability programs develop through various regulatory mechanisms. In some states, such programs were authorized by commission regulation, state statute, or municipal ordinance. In others, the programs evolved through settlements of administrative cases or due to a corporate decision to offer the programs. Existing water and wastewater affordability programs can be composed of one or more of these elements.[45]

1. Bill Discount Programs

a. Total Bill Discounts

This type of program requires a flat amount or percentage discount on the total bill, depending upon the household income, or other income related criteria, of the low-income customer.[46] One rule of thumb has emerged which calls for an affordability threshold of two percent of median household income for water and four percent for water and wastewater combined.[47] For

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[43] See id; West's RCWA 80.28.068 (The Washington Commission "may approve rates, charges, services, and/or physical facilities at a discount for low-income senior customers and low-income customers. Expenses and lost revenues as a result of these discounts shall be included in the company's cost of service and recovered in rates to other customers."); N.M. Stat. 27-6A-4 ("A utility may provide assistance in the form of reduced or subsidized rates to or on behalf of those individuals who meet the eligibility criteria of one or more need-based assistance programs administered by the department and who are not living in nursing homes or intermediate care facilities or not living in circumstances that do not require them to pay, directly or indirectly, for water, sewer or solid waste service."). *See also* Cal. Pub. Util. Code 739.8 ("commission shall consider and may implement programs to provide rate relief for low-income ratepayers").
[44] See infra, Section IV, Current Programs and Practices at 19-22.
[45] *Financing and Charges for Wastewater Systems*, Water Environment Federation, Manual of Practice No. 27 (2005) at 226-227.
[46] Water Research Foundation/EPA at 49 (2010); W.Va. Code § 24-2A-5 (eligibility for rate discount depends on whether customer participates in Supplemental Social Security; Temporary Assistance for Needy Families (TANF); TANF-Unemployed Parent Program; or for customers who are at least 60 years of age, the Supplemental Nutrition Assistance Program).
[47] Water Research Foundation/EPA at 49 (2010) (acknowledging the widespread acceptance of the 2% and 4% income thresholds for affordability but criticizing them); Breisach, Raymond et al., Results and

example, the Seattle Human Services Department offers such assistance for eligible customers of the city's electric, water, sewer, and garbage services. Seattle provides a 50 percent discount off water bills for income eligible customers. The program is open to low-income customers, senior citizens, and adults with disabilities who have incomes at or below 70 percent of the state median income level. Seattle has established two separate enrollment processes for: (1) senior citizens and persons with disabilities and (2) all other low-income customers. Low-income customers who live in federally funded public housing and Section 8 housing are not eligible for the program.[48]

In contrast, Section 739.8 of the California Public Utility Code requires the water utilities to consider implementing Low-Income Rate Assistance Programs.[49] Pursuant to this statute, all Class A, and some B and C water companies,[50] provide such Low-Income Rate Assistance Programs. Class A utilities may also provide a discount to military families. The statute allows the Commission to "take into account variations on water needs caused by geography, climate, and the ability of communities to support these programs."[51]

Pursuant to their general base rate case orders, each of the utilities is authorized to offer a specific assistance program unique to its service territory. The California Public Utility Commission also requires Class A and B water utilities with service territories that overlap those of regulated energy utilities to share their low-income customer information and to automatically enroll those customers who are eligible for another utility's low-income programs.[52] Not all California utilities offer a percentage discount on the total bill; for example,

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Recommendations of Water and Wastewater Affordability Study (2004) at 1, Report prepared for the City of Kalamazoo Department of Public Services, available at http://research.upjohn.org/reports/180/ (noting the subjectivity of the 2% and 4% thresholds, but considering them reasonable given "their widespread acceptance in the industry and consistency with recommendations made by the Environmental Protection Agency's (EPA) Environmental Economics Advisory Committee, trade associations, and policy analysts.")

[48] National Consumer Law Center, *Access to Utility Service Fifth Edition* (Boston 2011) (Access) at 353, *citing* www.seattle.gov/light/accounts/assistance. Seattle has established a separate enrollment process for senior citizens and persons with disabilities. Seniors and persons with disabilities must enroll through the Mayor's Office for Senior Citizens, and low-income customers who are not in either of those categories must enroll through the Seattle Human Services Department.

[49] Access at 353-354; Cal. Pub. Util. Code § 739.8; *Assessment of Water Utility Low-income Assistance Programs*, California Public Utilities Commission Division of Water and Audits (October 2007) at 38; see also, http://www.cpuc.ca.gov/PUC/Water/wateralternativerates.htm.

[50] Class A, B, and C are California Public Utilities Commission's designation of the size of the utilities for the purposes of assessing fees. As the Access manual notes, Class A, and some Class B and C utilities, offer low-income assistance programs. Access at 354, *citing* Seaneen Wilson, California Pub. Util. Comm'n Div. of Water & Audits, Assessment of Water Utility Low-Income Programs (Oct. 2007), ftp://ftp.cpuc.ca.gov/PUC/water/dwa_low-income_research_paper_112507.pdf.

[51] Cal. Pub. Util. Code § 739.8(d).

[52] Access at 354, *citing*, Decision 11-05-020, Adopting Guidelines for Sharing of Low-Income Customer Information (California Public Utility Commission May 5, 2011).

the companies known as Park and Apple Valley Ranchos offer a flat discount on the total bill, $5.50 and $5.83, respectively.

California American offers its H2O (Help to Others) Program. Whether the utility offers a total bill discount depends on the particular region of the service territory. It is available whether the water customer has metered rates or flat rates; however, wastewater customers are not eligible for this assistance. California American offers a $5 discount on total bill for the Sacramento area and an $8.50 discount on the total bill for the Larkfield area.[53]

b. Partial Bill Discounts

A discount on or complete waiver of just the customer or meter charge to income-eligible customers -- or a discount on just the consumption charge is the basis for this program. In areas where scarcity of water is an issue, discounts on the fixed customer charge are preferred since reducing the fixed charge does not affect customers' conservation efforts.[54]

One example of a partial bill discount is the District of Columbia Water and Sewer Authority (DCWSA) program discount on the fixed charge. Beginning in 2009, DCWSA began to offer free service for the first 400 cubic feet per month of water and sewer services on the customer's bill.[55] According to the DCWSA, customers can save approximately $28.80 per month with this discount.[56] Approximately one-quarter of the customers use less than 400 cubic feet per month and therefore pay no water or sewer consumption or usage charges, but those customers do pay other minimum fees, including "metering and payment in lieu of taxes."[57]

Some of the California public utilities also offer partial bill discounts. Section 739.8 of the California Public Utility Code requires the water utilities to consider implementing Low-Income Rate Assistance Programs and does not specify the type of discount to be offered, i.e., whether the discount provided should be a partial bill or total bill discount.[58] Only some California utilities offer partial bill discounts; for example, Golden State and San Jose each offer a 15 percent discount on the service charge. Similarly, California Water Service, San Gabriel Valley,

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[53] See Seaneen Wilson, California Pub. Util. Comm'n Div. of Water & Audits, Assessment of Water Utility Low-Income Programs (Oct. 2007) at 9, ftp://ftp.cpuc.ca.gov/PUC/water/dwa_low-income_research_paper_112507.pdf.

[54] Water Research Foundation/EPA at 51-52.

[55] http://www.dcwater.com/customercare/special_programs.cfm.

[56] Id.

[57] Access at 353, citing District of Columbia Water & Sewer Authority, Retail Rates and Low Income Residents: Discount Program and Impacts (2009); see also, http://www.dcwater.com/customercare/special_programs.cfm.

[58] See Seaneen Wilson, California Pub. Util. Comm'n Div. of Water & Audits, Assessment of Water Utility Low-Income Programs (Oct. 2007) at 9, ftp://ftp.cpuc.ca.gov/PUC/water/dwa_low-income_research_paper_112507.pdf.

Valencia, and Great Oaks offer a 50 percent discount just on the applicable monthly or bi-monthly service charge.[59]

2. Rate Structure & Billing Alternatives

a. Lifeline Rates

Lifeline rates provide for lower rates for initial consumption blocks for low-income customers compared to the rates of other residential customers. The initial lifeline block may be priced lower than the marginal cost of service to provide low-income customers the public health benefit of a minimum quantity of water representing non-discretionary water use, or water that is needed for daily living. After the initial lifeline block is used, the price per 1000 gallons increases to recover the company's full cost of service for what represents discretionary water use.[60] The major difference between these rates and inclining block or conservation rates is that the "lifeline block may be priced below the marginal cost of service in recognition of the public health need to ensure that a minimum quantity of water is available to all customers."[61] Low-income rates for customers in Los Angeles, California and Oregon City, Oregon appear likely to be lifeline rates. In accordance with municipal code, the City of Los Angeles provides a 31 percent reduction in the sewer service charge to low-income customers for the first 18 hundred cubic feet (hcf) of a two-month bill or for the first 9 hcf of a one-month bill.[62] Additionally, Oregon City has a Low-Income rate for water and sewer customers.[63] The rate is in effect for eligible customers up to the point that the average winter consumption is reached, after which the normal residential rate applies.

b. Bill Frequency Modifications

When customers in any rate class receive smaller monthly water bills rather than larger quarterly bills, they often maintain adequate and timely bill payments. [64] This can be particularly true for some low-income customers, which is why some experts and regulatory commissions have cited this factor as a reason for approving the change to monthly rather than quarterly billing for water and wastewater utilities.

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[59] Id.

[60] See Water Research Foundation/EPA at 55; United States Environmental Protection Agency, Water: Sustainable Infrastructure Affordability Considerations, available at http://water.epa.gov/infrastructure/sustain/affordability.cfm.

[61] Water Research Foundation/EPA at 55 (2010).

[62] Los Angeles Municipal Code Ordinance No. 171. 571, Section 7h.

[63] See Oregon City Rates and Fees page for water, available at http://www.orcity.org/finance.

[64] Access at 355; Seaneen Wilson, California Pub. Util. Comm'n Div. of Water & Audits, Assessment of Water Utility Low-Income Programs at 38 (Oct. 2007), ftp://ftp.cpuc.ca.gov/PUC/water/dwa_low-income_research_paper_112507.pdf.

c. Levelized Billing

Levelized or budget bills can assist customers by making it easier for them to budget for the same amount each month. The typical levelized bill reflects an average usage over a 12-month period, thus avoiding extremely high or low bills in a single month.[65]

3. Payment Plans and Waivers

a. Payment Plans

Payment plans spread a number of periodic customer payments over an extended amount of time so that large balances and arrearages are more manageable to pay in smaller, frequent increments rather than in one fell swoop. Payment plans may be offered in utility-designed structures, or terms may be negotiated between utility and the individual customer. Generally, payment plans give the customers the opportunity to gain control over their financial situation over a longer period of time. There may be requirements for receiving a payment plan, however. For example, in California, water utility customers may qualify for a payment plan when shut-off of water service is imminent.[66] A payment plan also may be initiated when a customer files a billing complaint; requests an extension of payments within a specific time period; or the customer is elderly, disabled, or the physician certifies that it would be life-threatening to discontinue water service.[67] Many Class A water utilities also may provide payment plan assistance to military families.[68]

Specifically, California American's payment arrangements require the customer to:

1) pay at least 25 percent of the bill within 48 hours;
2) pay the rest of the bill, including any late charges, according to an agreed-upon schedule that may not exceed a 6-month period; and
3) pay all future bills as they come due. This payment program is only available to customers who have not broken similar agreements in the past 12 months.[69]

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[65] See Seaneen Wilson, California Pub. Util. Comm'n Div. of Water & Audits, Assessment of Water Utility Low-Income Programs at 39 (Oct. 2007), citing *Thinking Outside the Bill: A Utility Manager's Guide to Assisting Low-income Water Customers*, a study sponsored by the American Water Works Association (AWWA) Water Utility Council (November 2004) at 22-23.

[66] See, http://www.cpuc.ca.gov/PUC/Water/wateralternativerates.htm; see also, Seaneen Wilson, California Pub. Util. Comm'n Div. of Water & Audits, Assessment of Water Utility Low-Income Programs at 39 (Oct. 2007), ftp://ftp.cpuc.ca.gov/PUC/water/dwa_low-income_research_paper_112507.pdf.

[67] Id.

[68] Id.; see also, Seaneen Wilson, California Pub. Util. Comm'n Div. of Water & Audits, Assessment of Water Utility Low-Income Programs at 39-40 (Oct. 2007), ftp://ftp.cpuc.ca.gov/PUC/water/dwa_low-income_research_paper_112507.pdf.

[69] See, www.amwater.com/caaw/customer-service/low-income-program.html.

b. Waivers or Reductions of Miscellaneous Charges

Utilities may waive or reduce consumption charges or miscellaneous charges, such as disconnection, reconnection, and late fees to alleviate the problem of unaffordable water or wastewater bills.[70] There are good policy reasons for waiving or reducing these miscellaneous charges. Water and wastewater are essential public health services necessary for life, and additional fees and miscellaneous charges can act as barriers to maintaining a low-income customer's existing service or restoring disconnected service. A low-income customer who is facing termination or was terminated is already having trouble paying the utility bill for services. The imposition of a late fee, reconnection fee, or disconnection fee will only serve to further impede the customer's ability to have service restored and worsen the problem.[71] Waiver of these charges can assist customers with getting back "on-line" sooner or prevent termination.

4. Promoting Affordability by "Shrinking the Bill"[72]

a. Introduction

Another important way to assist low-income customers is to help to reduce the overall water and wastewater bills where wastewater is tied to water usage. Shrinking the overall bill can be achieved through assistance with conservation education, water-saving devices and financial assistance with leak repairs.

b. Conservation Requirements

Water conservation programs may be targeted towards the low-income population in a particular service area or to small users. This could include education, distribution of water-saving devices and other conservation tools. Conservation can result in an overall decrease to water bills and will reduce the wastewater bill where it is tied to water usage.

c. Leak Repairs

A leak repair program can assist both water and wastewater customers where wastewater bills are tied to water use. It decreases the overall bill and provides water affordability benefits, too. Grant programs towards repairs may be offered as part of, or alongside, leak repair programs.

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[70] Access at 354 See also Water Research Foundation/EPA at 51-52 (noting water utilities have waived consumption charges) & 99 (Washington Revised Code § 36.94.370 provides that waiver of tap-in charges, connection or hook-up fees, if allowed, should be by ordinance).

[71] Water Research Foundation/EPA at 65.

[72] Water Research Foundation/EPA at 41-57.

5. Connecting Customers to Community Resources and Public Assistance Programs

Connecting customers with other public assistance programs and available funds may help to improve bill payment. Ensuring that eligible customers take advantage of all available assistance, whether or not related to water, can help reduce the competition of other financial obligations with customer resources for paying water and/or wastewater bills.

a. Crisis Assistance

Voluntary hardship funds through either customer contributions or shareholder contributions or a combination of both can provide assistance to low-income or needy customers who are otherwise unable to pay. These hardship funds may be administered through the utility itself or by a community-based organization, for determination of the customer need. Crisis vouchers can be given at intervals, i.e., once every year or two years, to use as a credit towards the outstanding utility bill and to prevent termination. Such vouchers could be limited based upon income eligibility requirements or allowed only following extraordinary circumstances, such as job loss or major income change.

For example, Missouri American Water offers a version of the H2O Help to Others Program.[73] The Missouri American program is an emergency assistance program created by Missouri American and Missouri's Community Agencies. It provides additional funding to customers who have trouble paying their bills and is funded as a hardship fund from shareholders and voluntary customer contributions.

United Water Cares Neighbors Helping Neighbors program provides temporary assistance to those with a financial hardship, including job loss, illness, death or military service. This appears to be a program that is across many United Water Companies (at least Pennsylvania, New Jersey and Idaho). In New Jersey, it is administered by the New Jersey SHARES program.

b. Financial Counseling

Utilities may make arrangements with experts in the field and refer customers to these experts. The utility may benefit by reducing the bad debt expense, and the customer can benefit through learning to manage his or her budget and therefore be more able to afford bills.

c. Federal Public Assistance

The Earned Income Tax Credit (EITC) provides a refundable tax credit to low-income households with earned income. This means that the household receives a federal government cash amount whether or not the household owes taxes. Two other programs that help to

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[73] See, www.amwater.com/moaw/customer-service/low-income-program.html.

provide more assistance to customers are the federal Supplemental Nutrition Assistance Program (SNAP, formerly the food stamp program) and the federal school lunch nutrition program. Additionally, the Low Income Home Energy Assistance Program (LIHEAP) provides crisis and/or bill payment assistance to help low-income customers maintain their heating and/or cooling. Although LIHEAP provides energy assistance rather than direct water assistance, receipt of LIHEAP funds could potentially expand the dollars available for the household budget.[74]

6. Combinations of Low-Income Program Elements for Water and Wastewater Assistance

Many of the water and wastewater programs combine many of the elements previously listed, which can help to optimize their effectiveness. In particular, they often combine a service discount type program with a conservation and leak repair assistance program. Examples of such programs follow.

a. Aqua America

Helping Hand is Aqua Pennsylvania's (AquaPA's) low-income assistance program. Aqua Pennsylvania combines a monthly credit, a conservation kit, and a hardship fund.

The eligibility requirements for a monthly credit are that:

(1) the household income is less than 200% of the Federal Poverty Level;

(2) the account is more than 30 days past due; and

(3) the customer has at least $100 in unpaid water bills.

For customers who qualify, AquaPA works with the referring agency to develop a good faith payment plan. Under the payment plan, the customer typically pays 10 percent of the customer's total account balance up to $110; a reconnection fee if the service has been terminated; and a fixed monthly payment based on an average bill, plus $25. Customers who make timely payments receive a credit to their account each time they make a timely monthly payment. The customers also receive a water conservation kit that includes information and parts for detecting and repairing leaks and conserving water. Low-flow shower heads and kitchen swivel aerators are included. Helping Hand also has a hardship fund through which other customers can make donations.[75]

b. American Water Companies

Many of the American Water Companies offer a low-income assistance program called H2O Help to Others Program.[76] The specific benefits of the program differ from state to state.

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[74] Water Research Foundation/EPA at 59-61 (2010).

[75] See, https://www.aquaamerica.com/our-states/pennsylvania.aspx .

[76] See, www.amwater.com/njaw/Customer-Service/low-income-program.html.

Benefits may include waiver or discount of the service charge, grant assistance, and water conservation education and assistance.[77]

New Jersey American Water's (NJAW) program is administered by New Jersey SHARES.[78] Eligible customers must have an annual income of at or below 200 percent of the Federal Poverty Level guidelines. The Company states that as of December 2010, the Company had 560 customers enrolled in the program.

NJAW offers a service charge discount of 100% percent, which essentially waives the monthly fixed service charge for water. The Company provides a grant of up to $500 to help pay the water bill. In some cases if the $500 grant does not cover the customer's entire water bill, the recipient must pay a portion of the bill based on their income. The Company states that, in 2010, it provided $170,000 in assistance grants to 609 households. In April 2011, the Company launched an additional water saving and education program which included (1) comprehensive water audits by phone, (2) free water saving retrofit kits, and (3) up to $300 for in-home leak repairs and the installation of water efficient devices.

Pennsylvania American Water Company (PAWC) also offers the H2O Help to Others program.[79] Its program is very similar to the NJAW. One difference, however, is that customers must have incomes at or below 150% percent of the Federal Poverty Level. Like NJAW, Pennsylvania American Water offers one-time hardship grants of up to $500 but PAWC's 65 percent discount on the monthly service fee is lower than the 100 percent discount offered by NJAW. PAWC's conservation devices and education materials include a low-flow showerhead, faucet aerators, plumbing tape, a toilet tummy and an educational booklet. The Company provided $327,000 in assistance grants in 2010.

In January 2011, PAWC added a wastewater assistance program in addition to the water assistance program.[80] The wastewater assistance program offers grants up to $500 per year and a 15 percent discount on the total wastewater charges.

c. Philadelphia Water Department

The Philadelphia Water Department (PWD) offers a discount, several payment plans, a conservation program, assistance with leaks and repairs, and hardship funds. The discount is a Senior Citizen Discount of 25 percent for customers 65 years of age or older who live at the

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[77] See, http://www.amwater.com/njaw/Customer-Service/low-income-program.html.

[78] New Jersey also offers a 2-1-1 call referral line to help low-income customers find available energy and water assistance programs.

[79] See, http://www.amwater.com/files/H2O%20-%20PA.pdf.

[80] http://www.amwater.com/files/H2O%20-%20PA.pdf; Pa. PUC v. Pennsylvania-American Water Company Northeast Wastewater Operations, 2010 Pa. PUC LEXIS 1990 (Order entered December 16, 2010).

address on the application, who have water and sewer bill in the customer's name, and who meet the annual income requirement.[81]

PWD offers a Water Revenue Assistance Program (WRAP), which includes a number of payment plans, to help customers who are delinquent in their bills and whose income level is at, or below, 250 percent of the Federal Poverty Level. WRAP provides a city grant of up to $200 annually or $17 month to help low-income customers enter into a payment agreement or to pay their bills in full. There are three different types of WRAP agreements. The first is known as the 10/5, where the customer must pay 10 percent of the delinquent balance as a down payment and 5 percent of the delinquent balance plus current charges monthly, with a period of up to 20 months to pay the balance in full. The second is the D/I (Disposable Income), where 10 percent of the delinquent balance is paid as a down payment and the rest of the delinquent balance and current charges are paid according to a schedule of payments based upon the amount of disposable income. A maximum of 36 months is permitted for full payment of the balance. The third is the Water Revenue Bureau Conference Committee Agreement (WRBCC)[82], which calls for payment towards the current cycle bills only, in some cases in an amount less than the actual cost of the service received.[83] To qualify for the WRBCC, the customer must petition a special committee for an extended payment plan based on the customer's ability to pay. Customers with incomes below 100 percent of the Federal Poverty Level are referred to the WRBCC committee for this purpose.[84] For homeowner-occupants, there is no arrearage forgiveness but the WRBCC suspends the arrearages and stops the accrual of penalties and interest.

The PWD's Water Conservation Assistance Program (CAP) is designed to help customers reduce water waste. Customers can reduce waste by repairing leaks and installing water conservation devices. Customers with an income at or below 150 percent of the Federal Poverty Level may receive assistance at the Neighborhood Energy Center with repairing these issues. A customer may receive a maximum cost of service per household of $275.00 for non-WRAP customers and $300.00 for WRAP customers. The following assistance is provided:

1) plumbing leak repair on supply lines
2) low-flow showerheads

[81] Customers of Philadelphia Gas Works (PGW) similarly were granted this discount for many years, but under the jurisdiction of the Pennsylvania Public Utility Commission, the PGW discount has been closed to new customers and has been "grandfathered" for those previously enrolled in the program. The Senior Citizen Discount provided discounts to 21,878 seniors in FY2011 at a cost of $2,623,696. See, http://www.pgworks.com/index.aspx?NID=118.
[82] The WRBCC operates as the collections arm of the Philadelphia municipal government and is part of the Revenue Department. Access at 353.
[83] See, Philadelphia Water Department Regulations, Payment Arrangements, §100.9.
[84] NCLC at 353.

3) faucet aerators, and
4) toilet dams or other comparable device and education.[85]

PWD also offers the Homeowners Emergency Loan Program (HELP), which is an emergency residential customer, loan program for water service line or sewer lateral repairs and replacements of which are the responsibility of the homeowner.[86]

Customers can also receive hardship funds from the Utility Emergency Services Fund (UESF). The grant program provides assistance to prevent shut-off or to restore water service for customers at or below 175 percent of the Federal Poverty Level. Grants up to $500 may be provided every other year.[87] The grants include $250 UESF grant and a matching Water Department credit.

d. Los Angeles Department of Water and Power

The Los Angeles Department of Water and Power (LADWP) offers a low-income subsidy consisting of a maximum 15 percent discount on electricity, water, and sewer services.[88] LADWP offers payment extensions. If the customer pays 50 percent of the balance, that customer will receive a two-week payment extension on the remainder. LADWP will also make a partial installment payment arrangement for those having difficulty paying their bills and it offers a Low Income Discount Program to customers with qualifying income levels for electricity, water, and sewer services. The City also offers a Life-Support Device Discount to water and electric service customers who provide proof that a member of household regularly requires the use of an essential life-support device. In addition, LADWP offers a Physician Certified Allowance Discount for customers who provide verification that a full-time member of the household is a paraplegic, hemiplegic, quadriplegic, multiple sclerosis patient, neuromuscular patient, or scleroderma patient being treated for a life-threatening illness.[89]

7. Additional Programs and Methods for Increasing Access to Service

a. Introduction

In addition to the programs discussed, each state may have distinct programs. For example, to address the problem where the customer is required to contribute thousands of dollars to

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[85] See, http://www.pcacares.org/ServiceDetail.aspx?service=Philadelphia+Water+Department+-+Home%2FHousing%2FRepairs%2FModifications; see also, http://www.phila.gov/water/educationoutreach/customerassistance/Pages/default.aspx.
[86] See, Id.
[87] See, http://www.phila.gov/Water/UESF.html.
[88] Access at 353; see, https://www.ladwp.com/ladwp/faces/ladwp/residential/r-financialassistance/r-fa-discountrates?_adf.ctrl-state=d5pufljw_4&_afrLoop=88205570683000.
[89] https://www.ladwp.com/ladwp/faces/ladwp/residential/r-financialassistance/r-fa-discountrates?_adf.ctrl-state=d5pufljw_4&_afrLoop=88205570683000.

construct a water line extension from the main to the customer's premises in order to receive service, Pennsylvania has approved utility-to-consumer loan tariff provisions.

Perhaps in part because of Pennsylvania's size and proportion of densely populated areas to sparsely populated areas, the expansion of service within regulated water utility service territories has not been consistent. Historically, extensions of water mains were governed by the "35- foot rule". In other words, if a new connection could be made by extending the main only 35-feet or less, the prospective customer was not required to pay a "contribution in aid of construction." In rural areas and even in many suburban areas, extensions to new customers that would require construction of mains only 35-feet long or less were rare even a decade ago, a situation that led to many complaints against water utilities over demands for cost-prohibitive contributions in aid of construction (CIAC).

In the mid-1990s, the 35-foot rule was abandoned in favor of an economic formula that weighs some of the costs of new main construction against the revenues the utility anticipates receiving from the prospective customers.[90] Particularly in the more sparsely populated areas where the costs of construction per prospective customer ran high, cost-prohibitive CIAC resulted from application of this formula in many cases and complaints against large water utilities continued to be filed.[91]

Partially as a result of the many complaints, large water utilities proposed tariffs allowing for assistance in the form of loans to customers who sought public water service due to a lack of supply or to contamination of their natural sources, but who were unable to afford the requisite CIAC. Since the hydraulic fracking drilling began in several areas of Pennsylvania several years ago, fears of water contamination due to drilling operations have increased and given rise to even more requests for public water service to replace on-site wells as a household water source. The program now available to assist those for whom the mandatory CIAC amounts may not be immediately affordable is described in the next section.

b. Connection Loan Programs

The two largest public utilities in Pennsylvania have Commission-approved tariffs implementing loan programs for prospective customers who apply for service but who may have trouble paying for CIAC and the cost of installing the customer service line.[92] The

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[90] 52 Pa. Code Section 69.1 *et seq.*

[91] Three appeals were filed from orders approving CIAC demands and the issue of the legality of the economic balancing formula came before the Pennsylvania Supreme Court. The Court agreed with the utilities and the Commission that the regulation requiring the use of the formula was lawful under the Public Utility Code and that the agency was entitled to deference in interpreting and applying its regulations. Popowsky v. Pa. P.U.C., 589 Pa. 605, 910 A.2d 38, 2006 Pa. LEXIS 2261 (2006).

[92] AquaPA's Water System Connection Loan Program is set forth in Supplement No. 67 to Water-PA. P.U.C. No. 1, Fifth Rev. Page No. 47 – Fourth Rev. Page No. 49; PAWC's Customer Connection Loan Program is set forth in Supplement No. 260 to Tariff Water – PA P.U.C. No. 4, 1st Rev. Page 18.1 – 18.3.

provisions of these two programs are virtually identical. Both programs are limited to applicants for service that are single-family residences and the loans are limited in amount ($8,000 for AquaPA and $10,000 for PAWC) for only certain items of plant and subject to certain terms and conditions. Both AquaPA and PAWC describe eligible costs as actual amounts for the main extension itself, the customer service lines, meter boxes or vaults, shut-off valves or backflow prevention devices, and alterations to customer plumbing required to permit the customer to take service.

For an AquaPA customer, the principal amount of the loan plus interest is repaid through a surcharge added to the customer's regular monthly water bill over a term selected by the customer of no less than three and no more than eight years. For PAWC customers, the payments are separately invoiced, also for a term of the customer's choice, between three and eight years. Both are fixed interest rates, set consistent with the posted short-term interest rate as of a date certain, but not to exceed 8 percent.

c. Return on Equity (ROE)

Moderating utilities' rate increase requests is among the most direct of all ways that state commissions can increase the affordability of consumer bills. Although a profit is not guaranteed, an investor-owned utility should have the opportunity to earn a return on its invested capital sufficient to maintain financial integrity and attract needed capital. To help provide this opportunity, regulators generally determine an appropriate return on equity rate (ROE) for each rate-regulated utility.[93] There is no completely uniform approach to this determination across jurisdictions. However, there are common techniques and issues across jurisdictions and utilities. A discussion of some of these issues relevant to water utilities follows.

1. Leverage at the Parent

Some regulatory jurisdictions recognize leverage at the parent company. Because the subsidiary's equity is not outstanding in the market, they rely on the parent to determine the appropriate return of a parent's subsidiary. A reasonable rate of return is one that recognizes that a subsidiary company's invested capital is comprised of different sources of capital generated from a pool of capital dollars provided by the parent, including debt and equity. Use of a leverage adjustment prevents profits resulting from excessive earnings on overstated rates of return.

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[93] Consumer advocates and some regulators have argued that the level of return on equity should be adjusted downward, with a decrease in investor risk. See Mark Ballard, Capitol News Bureau, Miss. Regulators look at utility profits (Aug. 25, 2012). (Mississippi regulators following the lead of Louisiana Public Service Commission Chair in calling for lower return on equity where low interest rates make loans cheaper for utilities and "utility companies' risks are as low as they have ever been"). See also Mark Ballard, Capitol News Bureau, Campbell seeks drop in utility profits (Jul. 6, 2012). (Louisiana Public Service Commission considers whether return on equity should be dropped).

2. Market Return Methodologies

Appropriate results are most often achieved when regulators assume that investors have a long-term horizon in their investment decisions and rely on analysis that is based on market based ROE valuation models, such as the discounted cash flow model (DCF) and the capital asset pricing model (CAPM).

The economic foundation for using the DCF model is that the price an investor is willing to pay for an investment under any market condition depends on, and is equal to, the present value of the expected future income stream the investment is expected to generate. For a freely traded common stock investment, the market price reflects the present value of the expected income stream. The future income stream may take the form of cash dividends or capital gains. The combination of current and future income streams is what the investor relies upon in determining the investor's expected return on investment.

In the DCF model, the cost of common equity is expressed as K equal to D/P + G, where D is the dividend, P is the price of the investment, and G is the expected growth rate. The data points used in the DCF analysis are typically derived from actual market data for the publicly traded stock of a group of companies. This group of companies, called the proxy group, is carefully selected to fairly represent the risks and investor expectations associated with an investment in the utility in question. This same proxy group is also usually used in calculations performed under other models, such as the CAPM.

Further, the DCF yields more appropriate results when it is assumed that indicated dividend is the best indicator of investors' expected dividend. The indicated dividend is the most recently declared quarterly dividend multiplied by four to reflect the fact that utility common stocks generally pay dividends four times a year.

In addition, the dividend growth rates in the DCF model should be based on estimated values instead of forecasted growth rates of earnings per share. Growth rates should be determined through a full business cycle (often 10 years). Dividend growth rates should be determined by considering all components of dividend growth (Earnings Per Share or EPS, Dividends Per Share or DPS, Book Value Per Share or BVPS, and the Internal Growth Rate), and coming up with the best representative of dividend growth.[94]

In some instances, the CAPM is used to establish an ROE for a utility. An important factor in the CAPM is the mean market return. There are two frequently used approaches to computing a mean market return. One is based on the geometric mean market return. The other is based on an arithmetic mean market return from "Ibbotson-Morning Star."

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[94] Benjamin Graham, David Dodd and Sidney Cottle, *Security Analysis: Principles and Techniques*, McGraw-Hill Book Company, 1962, p. 475.

The geometric mean calculation is preferable over the arithmetic mean calculation because the geometric mean calculation more accurately measures the change in wealth over multiple periods. There are several sources that support the use of the geometric mean vs. the arithmetic mean. In fact even Dr. Roger Ibbotson's 1982 SBBI yearbook supported the use of both the geometric and arithmetic mean risk premium to employ a CAPM analysis. In the 1982 Edition of *Stocks, Bonds, Bills and Inflation: The Past and the Future (page 59)*, Ibbotson supported the use of a geometric mean as well as an arithmetic mean:

> The arithmetic mean historical return on a component is used in making one-year forecasts, since the arithmetic mean accurately represents the average performance over a one-year period. Over a long forecast period, however, the geometric mean historical return represents average performance over the whole period (stated on an annual basis). Therefore, we input the arithmetic mean for a one year forecast, **the geometric mean for the 20-year** forecast and intermediate values for two, three, four, five and ten year forecasts.

While more current editions of Ibbotson's *Stocks, Bonds, Bills and Inflation* yearbook advocate the use of only the arithmetic mean the authors have not found Ibbotson's explanation for his change. In the more current "Equity Risk Premiums (ERP): Determinants, Estimations and Implications – The 2012 Edition" (p. 25), Dr. Aswath Damodaran supports the use of a geometric mean risk premium:

> There are, however, strong arguments that can be made for the use of geometric averages. First empirical studies seem to indicate that returns on stocks are negatively correlated over time. Consequently, the arithmetic average return is likely to overstate the premium.

Another important factor in the CAPM is the risk-free rate of return. The determination of an appropriate risk-free rate of return is often at issue in rate proceedings. Long-term treasury-bond yield is best used as the basis of the risk-free rate of return. Long-term treasuries reflect the longevity of the holding period of an asset such as a common stock. Moreover, the beta in the CAPM reflects the necessary correlation between market return and a company's stock return.

3. Non-market Based Equity Valuation Model

The Comparable Earnings Model (CE) tends to overestimate the ROE for utilities because it relies on book value returns (realized returns) as opposed to market expected returns. The CE model assumes that the average book equity returns expressed by the "comparable risk" group is representative of investors' return expectation and thus indicative of the company's cost of equity. Book return is a measure of earned returns subject to operating elements of the utility. As opposed to market return, book returns ignore capital markets and thus do not react to market changes. Additionally, the CE model assumes that there is a relationship between risk and book equity return where none exists.[95]

4. Costs of Equity Premium Adders

Some utilities justify point adjustments based on different risk factors. Adjustments include:

1) a financial risk adjustment to the ROE of a utility to capture the higher investment risk of a utility that is riskier than the companies in the proxy group,
2) a business's risk adjustment to a subsidiary ROE because the subsidiary utility is generally smaller in capital size compared to those companies in the proxy group, and
3) size and flotation cost adjustments.

Financial risk adders disregard the market valuation process that already accounts for financial risk differences across companies. Additionally, investors are concerned with the aggregate risk of a utility and not its individual components. Lastly, when portfolios are aggregated on the basis of size, the beta risk premium approach fully explains returns across different companies.[96] Thus, adjusting the ROE to capture the risk associated with the small size of a subsidiary will unjustifiably overstate the subsidiary's ROE. Flotation cost is the cost incurred by a publicly traded company to issue new securities in the capital market. This adjustment is not usually relevant in the case of large holding companies in which equity capital has been outstanding in the market for a relatively long period of time and which have not issued new shares. Flotation cost has to be part of the overall cost to service as opposed to an equity return rate adjustment.

B. Single Tariff Pricing vs. District Specific Pricing and Affordability

In utility rate cases, often one of the most challenging and contentious issues is how to design rates that are just and reasonable for all customers and customer classes. Commissions are often asked to adopt rate designs that balance cost of service with rate impact and affordability considerations. Affordability is greatly affected by how costs are spread to the various customers served by the utility.

Cost of Service (COS) studies may be used to determine the revenue requirement for the utility as a whole. Class cost of service (CCOS) studies assign revenue requirement at a more granular level identifying cost responsibility by class of customer. Cost assignment through COS and

[95] Solomon, E. and Laya J.E. "Measurement of Company Profitability: Some Systematic Errors in Accounting Rate of Return." In Financial Research and Management Decisions, Edited by Robiceck. New York: Wiley and Sons, 1967.
[96] Eugene Fama and Kenneth French. The Cross-Section of Expected Stock Returns. *The Journal of Finance*, Vol XLVII, No2. June 1992, Page 432.

CCOS studies can provide a utility regulator with a general guide as to the just and reasonable rates, but other factors are also relevant considerations. On a case-by-case basis, utility commissions must balance CCOS with the value of service to customers, service affordability, rate impact, and rate continuity, among other things.

One question that often arises is how to spread the costs of a utility among customers that are located in non-interconnected systems with different geographic and geological characteristics such as customer density and terrain, and in some cases differing sources of supply. In general, there are two schools of thought: share the costs or cost-causer-pays.

1. Single Tariff Pricing

Single-tariff pricing (STP) is defined as the use of a unified rate structure for multiple water or sewer systems that are owned and operated by a single utility, but that may or may not be physically interconnected. Under STP, all customers in a particular class of service pay the same rate for service, even though the individual systems or districts providing service may vary in terms of operating characteristics and costs. Costs are allocated to each customer class and district based on customer cost, revenues, and/or other factors. In this way, costs are spread across systems throughout the utility's territory, and in theory, are equally allocated to each customer. From a consumer impact perspective, a primary benefit of STP is that it helps to mitigate potential rate shock associated with significant capital improvements to any individual system by spreading recovery of those costs across a larger customer base. By spreading cost recovery across high and low cost systems, STP may result in more affordable rates for customers in small and/or high cost districts that lack economies of scale. Commissions may find that by spreading costs over a larger customer base, these cost differences and effects of necessary or large local district expenditures are smoothed out. Major improvements that could otherwise increase the rates of a small system by tens or hundreds of dollars per month might result in increases of only pennies per month if spread across the utility's entire customer base.

Some argue that STP reduces customer confusion and dissatisfaction associated with customers "looking over the fence" to compare their rates with those paid by customers in a utility's other districts. Other benefits attributed to STP include administrative ease in cost assignment, reduced resource costs in processing rate cases, and facilitation of large utility acquisition of small troubled systems.

However, an inherent difficulty under a STP structure is that system costs may not be similar for distinct, diverse, and non-interconnected districts. Districts may have substantially different characteristics, including different source of supply, different water quality, processing and treatment requirements, customer density, and differences in other distribution characteristics, such as age of the system. The result of averaging costs and dividing them among all customers is that some customers will pay rates below their district costs but some customers will pay rates in excess of their district costs. Because of the disparity in capital improvements and other cost characteristics exhibited between different rate districts, subsidization from the customers of lower cost districts to the customers of higher cost districts could occur under STP. Subsidy exists if some customers pay rates that recover less than marginal costs while other customers pay rates that recover in excess of stand-alone costs. STP may also create market distortions by increasing incentives for a utility to make excessive district specific investments, under the reasoning that because there are more customers to pay for an investment, the per customer impact is lowered. This result represents a reduced focus on economic decision-making. Therefore, it is crucial that utility commissions monitor the growth of investments to assure the investments are appropriate to the district being served.

2. District Specific Pricing

District Specific Pricing (DSP) is defined as a rate structure under which direct costs associated with a specific system or district are recovered from that particular system or district. It is argued that DSP better reflects the disparity in capital improvements and other cost characteristics exhibited between districts compared to rates that recover a simple average of company-wide cost of service. In support, some argue that on a cost causative basis, DSP is a more appropriate method for recovering system costs that are primarily incurred on a "stand-alone" basis sharing only a limited amount of overhead costs and common corporate costs. DSP advocates also note that moving each district's revenue closer to its district-specific cost can work to reduce incentives for making excessive district specific investments. From a customer impact perspective, DSP can better accommodate differentiated pricing based on differences in service quality or water quality. DSP is also consistent with the common sentiment that customers are generally are willing to pay their own cost of service but are not so willing to pay for something which provides them no personal benefit.

One concern of DSP, especially for smaller systems, is that a significant capital improvement in one rate district could cause rate shock for the customers of that district. Investment costs are not always proportionately smaller with a smaller system size. While a capital investment in a district with a large number of customers could mean an increase of pennies on the bill, the same capital investment in a district with just a few customers could mean doubling or tripling the customer bill, potentially making it unaffordable. This may discourage necessary investment in infrastructure.

3. Evaluating Rate Pricing Programs

Both STP and DSP can represent rate design that reflects movement to cost of service among rate districts while balancing rate shock and other equity concerns. The question for regulators is whether the disparity in capital improvements and other cost characteristics exhibited among rate districts should result in a revenue request that only reflects district specific costs, or whether consumers could benefit from consolidated costs and rates where there are considerable common and allocated costs. Some considerations in determining whether STP or DSP is appropriate include how many different rate districts are under common ownership, what costs are common to the company, and what costs are particular to the district. For systems with sufficient economies of scale, DSP can have advantages over STP. For example, moving each district's rate revenue close to its district specific cost can reduce the incentive to make unnecessary or excessive district specific investments. On the other hand, where there is a single owner of several systems with significant common and allocated costs, STP can capture economies of scale for consumers and reduce resulting costs for the utility, consumers, and commissions.

Both STP and DSP have merit from an economic and public policy perspective. But there are times when another design is needed. In some cases, consumer advocates have argued for flexibility to deviate from the application of strict DSP or STP when reasonably necessary based on all relevant factors. One type of alternative DSP rate design is a hybrid where an extremely high cost district is moved towards cost of service over a period of time. Another rate design hybrid consists of consolidation of districts with similar costs and structure. In a hybrid STP approach, districts with different water sources can be allocated different source costs, which are often recovered in consumption based rates, while administrative and customer service costs can be shared and may be included in a fixed customer charge. This flexibility helps to retain significant focus on cost of service among the rate districts while also balancing rate shock and other equity concerns of the customer.

V. BEST PRACTICES IN AFFORDABILITY: BORROWING LESSONS LEARNED FROM OTHER UTILITY SECTORS

A. Introduction

Current programs offered by water utilities for payment-troubled customers are limited. Of those that exist, as discussed elsewhere in this report, they include bill discounts, special low-income and/or special rate design, choice in billing date or more frequent billing, levelized (i.e., "budget") billing, arrearage management and payment plans, waivers of certain charges, plumbing assistance, referral to a government or private agency for assistance, education, conservation assistance, elder assistance, and flexibility of form of payment to include postdated checks or credit cards.[97] However, even utilities have indicated that current assistance programs are not sufficient to address current needs.[98]

[97] See infra, Section IV Current Studies, Programs and Practices: Types of Water and Wastewater Affordability Programs. See also Water Research Foundation and U.S. Environmental Protection Agency, Best Practices in Customer Payment Assistance Programs (2010) at 16.
[98] Id. at 18 (69% of surveyed utilities were either neutral or disagreed with the statement that their existing assistance programs address current needs well). Limitations of current utility programs, according to the utilities, included lack of available funds, the difficulty of distinguishing customers in need from irresponsible customers, narrow eligibility criteria, crisis assistance does not address the chronic financial problems of some customers, problems of program awareness and customers requesting help only after disconnection, slow processing of assistance payments, lack of communication between

An evaluation of some of the types of water and wastewater affordability programs in this report is discussed in this section. In addition, the water and wastewater sectors could adopt programs similar to those which were successfully implemented in other utility sectors, including the energy and/or telecommunications sector.

B. Return on Equity[99]

Ensuring that the allowed ROE is as low as it can reasonably be set and adopting rate designs favorable to low-income customers are among the most direct ways that state commissions can increase the affordability of bills. Special scrutiny of utility claims associated with rate increase requests is justified when many ratepayers are grappling with foreclosure, unemployment, and lost employment or depressed wages. Commissions should place a new lens on how the rates and rate designs it approves will impact low-income customers at risk of disconnection and higher income customers who are having problems making ends meet.[100] For example, the West Virginia Public Utilities Commission recently disallowed certain routinely claimed utility expenses based on their magnitude and unreasonableness, "given current economic conditions."[101] How rates are designed to be recovered by different customer classes is key to whether residential customers will find rates to be affordable.

C. Single-Tariff Pricing or Consolidation of Rates

In using single-tariff pricing or rate consolidation as a tool to average costs to smooth out peaks in pricing,[102] it is important not to lose the utility incentive to maintain efficiencies. For example, in making major distribution infrastructure investment in districts subject to single tariff pricing, a utility that can spread the increased costs across a larger consolidated customer base may lack incentive to negotiate a least-cost contract or otherwise control costs, knowing that increases in costs may amount to only a small increase on each customer bill. Decisions made

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utilities and local assistance groups regarding amounts of customer assistance received, and lack of personnel to address customer requests for assistance. Id at 18-19.

[99] See infra, Section IV.B.

[100] See, e.g., Paul Rogers and Steve Johnson, Governor says ratepayers should not pay for retirement of PG&E CEO, *Contra Costa Times* (April 22, 2011), available at: http://www.contracostatimes.com/busienss/ci_17911977?nclick_check=1.

[101] See Commission Order on the Application for a Rate Increase, Appalachian Power Co. and Wheeling Power Co., both dba American Electric Power, Docket No. 10-0699-E-42T at 54 (disallowing certain routinely claimed expenses based on their magnitude and unreasonableness "given current economic conditions").

[102] Single-tariff pricing can be especially effective as a mechanism to enable a utility to expand, acquire, or consolidate with a smaller system that is in need of expensive repair and improvement. The larger customer base of the acquiring utility can help subsidize the costs of repairing and improving the smaller system. Without single-tariff pricing, undertaking the repairs and improvements would result in exorbitant rates for customers of the smaller system.

with the assumption that added costs can easily be absorbed through the enlarged customer base can result in numerous unnecessary and unjust additional expenses to customers.

In interests of accountability and lowering costs to ratepayers, it may be preferable that certain expenses, such as large infrastructure investments, be tracked and attributed to consumption and need in specific areas of a company's territory. In this transparent way, it is possible to maintain incentives to the utility to negotiate lower cost contracts. Tracking expenses on a district specific level even in the context of single-tariff pricing or rate consolidation can help to ensure that companies are held accountable and incur only those costs that are reasonable. A reasonable cost standard may in some cases be synonymous with least-cost. Alternatively, there could be a threshold expenditure level established by the commission so that certain investment, operational, maintenance and/or administrative costs that exceed a threshold amount for a given service area/district, are deemed unreasonable and therefore unrecoverable from ratepayers. See Appendix A for more on consolidation.

D. Low-Income Rates or Discounts and PIPPs

Instead of considering low-income rates a "subsidy," it may more appropriate to consider low-income rates a "discount" in cases where low-income rates recover marginal costs and make a contribution to fixed costs. This characterization of low-income rates is similar to the characterization of "discount rates" that are offered to industrial customers that also recover marginal costs and make a contribution to fixed costs.

Some energy utilities offer a percentage of income payment plan. The Percentage of Income Payment Plan (PIPP) is an example of a rate design that reduces the contribution of low-income customers toward the overall utility revenue requirement through reduced rates. PIPPs are payment plans that do not exceed a certain percentage of the customer's income. The PIPP could be imported to the water sector as well. While reduced rates, such as the PIPP, may be supported through surcharges or very slight rate increases to non-low-income customers, if lower uncollectibles result, the total required utility revenue could be the same as it would be without PIPP.

E. Arrearage Management Plans

Arrearage management programs (AMPs) can consist of the utility writing-off and forgiving a portion of the customer's debt along with a structured payment plan for the remaining arrearage and new charges. Arrearage management plans have been found to encourage good customer payment patterns when customer diligence in making consistent monthly payments is rewarded by forgiveness of a portion of the arrearage. An arrearage forgiveness program comprised of an affordable fixed payment plan,[103] budget counseling, and forgiveness of past

[103] Customer payment patterns improve when bills are made predictable. Camille Watts-Zagha, Status of Energy Utility Service Disconnections in California, Division of Ratepayer Advocates (Mar. 2011) at 20

debt in exchange for timely payments under the new plan can help the customer pay down past charges.[104]

In Massachusetts, AMPs have been adopted by gas and electric companies with great success.[105] Representatives of Massachusetts's large and small regulated energy companies alike report that AMPs have kept payment troubled customers connected longer and payments received by customers have increased with AMPs. Massachusetts prohibits late payment charges to residential customers by energy utilities, opting instead to provide credits to low-income households' accumulated arrearages. The credits demonstrate progress toward bill payment and serve as an incentive for delinquent customers to keep up on their current and future bills to maintain gas and electric services over the long-term. The utility, by maintaining these customers, also maintains streams of customer revenue that otherwise would be lost when customers are disconnected, without reconnection.[106]

In Pennsylvania, AMPs (which include budget counseling) along with efficiency programs and PIPPs have been combined with success.[107] In Washington, a utility program that combined a PIPP with arrearage forgiveness, weatherization, and consumer education, reported positive results as well. The program reported a reduction in delinquency, reduction in write-offs, reduction to average grant assistance, increased customer contribution to revenue, and decrease in disconnections.[108]

The above energy assistance examples from different states demonstrate that targeting customers for enrollment in a combination of assistance programs can be effective and these approaches should be considered in addressing the affordability of water and wastewater service. While there is some administrative cost to providing additional assistance programs to customers, costs are mitigated because customers who receive adequate assistance are better able to make regular bill payments that provide a stream of income to the utility service

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(citing Apprise and Roger Colton, Ratepayer Funded Low-Income Energy Programs Performance and Possibilities Final Report, July 2007, Executive Summary, xiii).

[104] Jerrold Oppenheim, Esq. and Theo MacGregor, Low Income Consumer Utility Issues: A National Perspective (Oct. 2000) (Oppenheim/MacGregor, National Perspective), available at http://www.democracyandregulation.com/detail.cfm?artid=22&row=1, at 15.

[105] See Charlie Harak, *Helping Low-Income Utility Customers Manage Overdue Bills through Arrearage Management Programs (AMPs)* at 22 (NCLC 2013), available at http://www.nclc.org/images/pdf/energy_utility_telecom/consumer_protection_and_regulatory_issues/amp_report_final_sept13.pdf.

[106] *See* 2005 Mass. Acts Ch. 140 § 17(a) (Nov. 22, 2005) at http://www.mass.gov/legis/laws/seslaw05/sl050140.htm.

[107] Jerrold Oppenheim, Esq. and Theo MacGregor, Protecting Low-Income Consumers: Building on Two Decades of Lessons Learned (Nov. 2000) (Oppenheim/MacGregor, Lessons Learned), available at http://www.democracyandregulation.com/attachments/23/ENTERGY_paper.doc (Sections IV.A.2 and IV.A.3).

[108] Oppenheim/MacGregor, Lessons Learned at http://www.democracyandregulation.com/attachments/23/ENTERGY_paper.doc (Section IV.A.3)

provider. This income might be lost if these customers are terminated. Costs can be mitigated by reduced arrearage carrying costs, uncollectibles, and bad debt; reduced termination and reconnection costs; reduced costs of establishing new payment plans; reduced costs of collection and termination activities and notices; and reduced administrative and regulatory costs of resolving bill disputes and other complaints.[109]

F. Payment Plans

Payment plans should be implemented with the goal of maximizing the opportunities for payment-troubled customers to meet their payment obligations. This requires flexibility and consideration of individual circumstances. In New York, for example, "a utility must negotiate in good faith with a customer in order to arrange a payment agreement that the customer or applicant is able to pay, considering his or her financial circumstances."[110]

When reviewing utility data regarding number and frequency of customer defaults on payment plans, advocates should first review whether the payment plan offered and entered is realistic, with a reasonable possibility of being maintained by the customer. If not, it would be incorrect to simply conclude that a default on payment means that the payment plans are ineffective or that customers are irresponsible. Rather, the plans likely are in need of improved design.

Unreasonable payment plans that are offered to payment-troubled customers should be reviewed by the commission. Advocates can consider seeking a requirement from the commission that when a utility offers a customer a payment plan, it should be reasonable based upon each payment-troubled customer's financial and special circumstances. A reasonable plan should maximize the customer's opportunity and ability to pay as well as maintain essential services to the household.

Because low-income households may experience changes to household income and circumstances more frequently than do more stable, higher-income households, advocates may want to seek a commission requirement that utilities offer an opportunity for renegotiating the payment terms if the customer defaults or if the customer's financial circumstances have changed significantly due to conditions beyond his or her control.[111] Utilities could be required to offer payment troubled customers at least one second payment agreement.[112]

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[109] *See* Oppenheim/MacGregor, National Perspective at 2-3, available at http://democracyandregulation.com/detail.cfm?artid=22.

[110] 16 NYCRR 14.10(a) (3) (deferred payment agreements for water utility customers).

[111] See, e.g., 16 NYCRR § 14.10(a) (5); 16 NYCRR § 11.10 (e) (1) (ii).

[112] New York requires water utilities to renegotiate and amend a payment agreement if the customer or applicant demonstrated significantly changed financial circumstances due to conditions beyond his or her control. *See* 16 NYCRR § 14.10 (a) (4).

G. Waiver and Apportionment of Late Payment Charges and Partial Payments

Apportionment of customer payments may become an issue where both an arrearage and a current bill are owed. In some cases, a utility's tariff may allow it to allocate partial payments among components of the bill in proportion to the amount owned on each component.[113] However, a policy that first directs payments to the basic provision of water or wastewater service, rather than affiliate charges or water line maintenance charges, could help enable the customer to maintain service where there is also a policy against terminations for affiliate charges.[114]

Additionally, late payment penalties should be reviewed for whether they are appropriate to impose on low-income consumers. For example, if a policy goal is to increase affordability of service and reduce terminations of service due to nonpayment, late payment charges could be waived for low-income customers at risk of disconnection. Late fees and reconnection fees may be inappropriate and counterproductive to a goal of keeping payment-troubled customers connected to their essential water and wastewater services.[115] Some states have prohibited late charges from being applied to customers who fall into a general residential hardship category; prohibit late fees on arrearages below a certain dollar amount; or have prohibited late fees entirely on certain utility bills. Instead, they opt to promote ways that payment-troubled customers can meet a significant portion of their obligations.[116]

H. Billing Frequency Choice and Choice in Billing Date

Some utilities have moved away from quarterly billing in favor of monthly billing, stating that smaller amounts on more frequent bills will be more easily paid by consumers. While this may be true for some consumers, a change to monthly billing that fails to match the consumer's income receipt cycle can put some consumers at greater and more frequent risk of disconnection.

Selecting a payment due date that will best enable customers to meet their payment obligations should be considered by policymakers. While data or studies that directly answer the question

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[113] See, e.g., Pacific Gas and Electric Company Tariff, Gas Rule No. 9.E.5.

[114] This is an analog of telecommunications policy where payments toward arrearages are first applied to help maintain basic telephone service, before optional services.

[115] Similarly, reconnection charges imposed upon low income customers may be counter-productive in that they present yet another cost barrier to already payment-troubled customers in re-establishing their utility service.

[116] See, e.g., Mass. Gen. Laws Ch. 164, § 94D (gas and electric companies cannot impose late fees on residential accounts); *In re Bozrah Light & Power Co.*, 76 Pub. Util. Rep. 4th 697, *1986 Conn. PUC LEXIS 87, *49* (Conn. Dept. of Pub. Util. Control 1986) (no late fees for residential hardship customers); Or. Admin. R. 860-021-0126 (energy utilities may only impose late charges on balances of at least $200 that are carried over two consecutive months, and the utility must offer the customer the opportunity to select a preferred billing date).

of whether a choice in billing date option results in lower arrearages are difficult to find, state regulatory agencies and utilities adopting the practice show it to be of value. The Oregon Public Utility Commission and Arkansas Public Service Commission have adopted the choice in billing date option. Oregon prohibits energy utilities from imposing late charges on residential customers unless the customers were offered the option of selecting or changing a bill date.[117] Arkansas has an "extended due date policy" that allows certain customers to ask utilities to change the payment due date "to coincide with or follow the customer's receipt of that income."[118]

There are also examples of utilities offering a customer-choice-in-bill-date option. In California, Pacific Gas and Electric Company (PG&E) has noted that it accommodates customer requests for different monthly billing dates, within the capacity of PG&E's operations.[119] Entergy in Arkansas provides the Pick-A-Date program.[120] Wisconsin Public Service, an electric and gas utility, offers Preferred Due Date, which allows customer choice for monthly billing date.[121] Some Pennsylvania utilities offer a modified billing date to customers, who receive Social Security or other such fixed income by monthly checks. The due date is adjusted to a time after the monthly check is received.[122] While not a true choice-in-bill-date option, this option also illustrates an attempt to address the very real problem that a mismatch of consumer income to expenses cycles poses to making timely payment.

I. Federal Assistance: Low Income Water Assistance Program (LIWAP)

While consumers have benefitted from federal telecommunications and energy assistance programs for many decades, one glaring omission of federal policy is a federal assistance program that directly helps low-income consumers maintain water and wastewater service.

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[117] OR. ADC 860-021-0126(2)(a) (energy customer has opportunity to change bill date at least once every 12 months).

[118] 126 03 CARR 003 (Rule 5.09 of Arkansas Public Service Commission General Service Rules provides this option to customers receiving Aid to Families with Dependent children, Aid to the Aged, Blind and Disabled, Supplemental Security Income, or customers who have Social Security or Veterans Administration disability or retirement benefits as the primary source of income).

[119] *See* Reply Comments of the National Consumer Law Center on Phase II Issues Pursuant to ALJ Ruling of August 26, 2010, Docket R.10-02-005 (Sept. 24, 2010) at 1 (quoting Pacific Gas and Electric Company's Opening Comments on Phase II Scoping Memo Issues).

[120] http://entergy-arkansas.com/your_home/mypaymentoptions. *See also* http://www.entergy-arkansas.com/content/price/tariffs/eai_ps01_padp.pdf.

[121] *See* http://www.wisconsinpublicservice.com/home/preferred.aspx.

[122] *See* UGI Utilities, Inc. Gas Tariff Including the Gas Service Tariff and the Choice Supplier Tariff, Supplement No. 91 to Gas-Pa.P.U.C. No. 5, available at http://www.ugi.com/gasmngmt/UGIU/doc/tariff/GStariff.pdf (Rule 9.3.1); PPL Electric Utilities Corporation General Tariff, Supplement No. 102, Electric Pa. P.U.C. No. 201 (Rule 9.C), available at https://www.pplelectric.com/at-your-service/electric-rates-and-rules/current-electric-tariff/~/media/PPLElectric/At%20Your%20Service/Docs/Current-Electric-Tariff/rule9.pdf.

To help ensure that affordability-challenged communities receive the same public health protections provided to other areas and to assist low-income consumers in small systems with high rates due to compliance costs associated with the Safe Drinking Water Act, the National Drinking Water Advisory Council (NDWAC) recommended in 2003 and in 2009 that a Low Income Water Assistance Program (LIWAP) be adopted.[123] LIWAP was envisioned as an analog to LIHEAP, possibly to be implemented as grants to states to provided targeted assistance and funded by Congressional appropriation.[124] As noted by NDWAC, "By providing financial assistance at the individual household level, rather than, or in addition to, assistance at the system level, more of the taxpayer funding would go to households in need. When a water system is subsidized, all ratepayers benefit from taxpayer support, even those who are not low income."[125]

Although NDWAC recommended LIWAP to address the affordability gap for customers of small systems, it is explicitly modeled on LIHEAP, a program of much larger scope. Additionally, in 2004, NARUC passed a resolution "to develop effective programs to assist low-income water utility ratepayers, considering, but not limited to LIHEAP as a potential model."[126] These proposals indicate that LIWAP or a similar direct assistance program to consumers should not be limited to small systems, but should also be considered to address affordability issues in larger systems.

In 2002, the Congressional Budget Office (CBO) concluded that direct federal assistance to consumers could be more efficient than investment in water systems:

> "*Federal aid to households could address distributional objectives with more precision and less loss of efficiency than can be achieved from aid for investment in water systems.* A program that aided households directly could be more cost-effective in achieving a given distributional objective because fewer households would face reduced water prices and water system managers would not face distorted choices [footnote deleted]. A program designed to defray the expense of basic water use –one that provided a dollar amount determined by the number of members in the household instead of paying benefits as a proportion of water

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[123] See EPA National Drinking Water Advisory Council, Letter from Gregg Grunenfelder to Lisa Perez Jackson, U.S. Environmental Protection Agency (June 12, 2009) at 3, available at http://www.epa.gov/safewater/ndwac/pdfs/letter_ndwac_admin-06-12-09-small%20systems.pdf; EPA National Drinking Water Advisory Council, Recommendations of the National Drinking Water Advisory Council to U.S. EPA on Its National Small Systems Affordability Criteria (July 2003) at 35-40, 93-94.
[124] EPA National Drinking Water Advisory Council, Recommendations of the National Drinking Water Advisory Council to U.S. EPA on Its National Small Systems Affordability Criteria (July 2003) (NDWAC) at 37-38.
[125] NDWAC at 93-94.
[126] See National Association of Regulatory Utility Commissioners, Joint Resolution Supporting a LIHEAP-Equivalent to Assist Low-Income Drinking Water Utility Ratepayers (Mar. 10, 2004), available at http://www.naruc.org/Resolutions/liheap04.pdf.

bills, for example – would not affect households' marginal costs of water consumption, thus preserving incentives for consumers to avoid overusing water services [footnote deleted]. A consumption subsidy could also be designed to support conservation measures –for example, by subsidizing repairs to fix leaky plumbing. However, beneficiaries (and others allocating funds on their behalf) are likely to prefer direct assistance over conservation measures with even moderately long payback periods. [footnote deleted].[127]

While it has not been implemented, the idea for a federal water assistance program for low-income households has been raised. So far, there has been a lack of Congressional will to make LIWAP a reality. Advocates should periodically review whether an effort to implement a LIWAP at federal or state level is feasible.

J. Utility Assistance

An alternative or addition to implementing LIWAP broadly would be implementing similar grant assistance at the utility level. For example, Fuel Funds have been established by energy utilities. In Ohio, qualified families can receive this benefit once a year and receive up to $300 (and in some instances, up to $500) to pay a bill. These funds can be funded by utility revenue or external funds. A utility can contribute funds, which are managed by a community assistance agency that is under contract, to help the utility's customers apply for and access the fund.

Grant assistance from the utility should be distinguished from utility-sponsored loan assistance. While loans from the utility to the customer ideally assist customers with upfront costs such as installation of new customer service lines, these loans to already payment troubled customers can be disastrous. Such loan proposals by utilities should be reviewed carefully by advocates. A consumer's default on a loan could result in loss of water service or in the utility placing a lien on the consumer's property, ultimately risking loss of the home.[128] Regulators and advocates should review the proposed consumer eligibility criteria for such loans and determine whether it is necessary to condition approval of utility loan proposals on the simultaneous adoption of consumer safeguards. Safeguards could include disconnection protections, clear disclosure of the risks involved in defaulting on the loan, and a consumer right to renegotiate and revise a payment plan when the consumer is at risk of default.

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[127] Congressional Budget Office, Future Investment in Drinking Water and Wastewater Infrastructure (Nov. 2002) at 42-43 (emphasis added).

[128] Especially in the context of municipal run utilities, a small amount on an overdue water or wastewater bill can subject the customer's home to a tax lien, which if not paid, can result in a foreclosure sale. In one instance, an elderly woman in Rhode Island was evicted from her home of over 40 years two weeks before Christmas due to a $474 arrearage on a sewer bill. Her home was bought at a tax sale for $836.39, and the buyer sold the home for $85,000. John Rao, *The Other Foreclosure Crisis* (National Consumer Law Center July 2012) at 9, 37, available at http://www.nclc.org/issues/the-other-foreclosure-crisis.html.

K. High Cost Fund

In the telecommunications industry, the High Cost Fund is one of the four mechanisms of Universal Service, the federal program focusing on bringing voice communication services to everyone in the country at a reasonable charge.[129] The High Cost Fund is the largest Universal Service Fund,[130] with the intent of making telecommunications service in rural and other high cost areas affordable and reasonably comparable to those of urban areas. Universal Service programs have contributed to an achievement of a steady penetration rate for household telephone subscribership of about 96 percent.[131]

While not prevalent in the water or wastewater industry, California has approved what some might consider a version of a high cost fund for use within one water utility.[132] The California Public Utilities Commission approved a Rate Support Fund (RSF) for all California American Water Company (Cal Water) customers in three districts. Unlike the industry-wide telecommunications high cost fund, the scope of RSF applies to customers of the single utility, but the RSF was established with similar ideas and purposes. Similar to telecommunications' universal service fund, which has both a high cost component and low-income discount component, the RSF, as initially established, provides support for both high cost areas as well as support for a low-income discount.[133] The RSF applies to entire geographic areas (districts) rather than to particular low-income customers. The RSF is funded through a surcharge of $0.010 per 100 cubic feet for all metered customers and a flat rate surcharge for flat rate customers throughout Cal Water's territory.

A high cost fund implemented in the water sector could follow the RSF model. This would be an example of a utility-administered approach. Each regulated water utility in a state could be directed to implement a company-wide high cost fund. This approach may allow each utility to knowledgably target the funds within its own service territory.

However, ratepayer funding that is utility-managed and directed must be paired with accountability measures and commission review for reasonableness. Accountability measures

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[129] The other three mechanisms of the Universal Service Fund (USF) are Low Income (i.e., Lifeline), Schools and Libraries, and Rural Health Care. It should be noted that recently, the FCC has ordered that USF be transformed to the Connect America Fund, with a focus on broadband deployment.
[130] In 2008, the federal telecommunications high cost fund represented 63% of universal service payments, or almost $4.5 billion. *See* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-301823A1.pdf at Chart 19.1 and Table 19.2.
[131] See http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-306752A1.pdf at Table 3 (penetration rates).
[132] See D.00-06-075 (Cal. P.U.C. June 22, 2000) at 14 (idea of high cost fund mentioned in an application case for rate consolidation: "a state-wide fund collected from all water customers to provide lifeline rates to customers in high-rate districts").
[133] Over time, the RSF's low-income component has been absorbed into Cal Water's Low-Income Rate Assistance (LIRA) program, a standalone low-income support program.

could include tracking fund expenditures and demonstrating a relationship to infrastructure projects in high cost areas, and providing justification for funding as necessary. Reasonableness and accountability measures may also include holding the funds in an interest-bearing account, with interest dedicated to the benefit and use of the company's customers.

A high cost fund could also be represented by a modified version of the RSF. Instead of a fund established for use within a single company, a high cost fund could be applied to encompass customers of all state-regulated water and/or wastewater utilities. In this case, this industry-wide fund would be administered by the state commission or another third party unaffiliated with the utilities. All customers in all districts of all regulated water and/or wastewater companies would contribute to a single, central fund.[134] The advantage of a high cost fund administered by the commission or third party is the potential of more even-handed allocation of funding across utilities, creating opportunities for smaller utilities to access a larger funding pool in any one instance. Customers of large utilities could also benefit from an equally large distribution of high cost assistance.

Variations in how a high cost fund is implemented could include whether the fund emphasizes direct customer bill assistance, similar to the telecommunications Lifeline program, or indirect customer assistance with infrastructure and operational costs in high cost areas. Another variation could include what constitutes the source of revenue for the fund. In the case of California's RSF, a surcharge is applied to the company's broader customer base. Alternatively, a high cost fund could be funded through a tariff provision that allocates a percentage of retail water revenues to the fund. For example, a high cost fund, either separately or in addition to other water/wastewater customer assistance programs could be funded by 1 percent of retail water/wastewater revenues.[135]

However, while Cal Water's RSF makes "rates more affordable for all Cal Water customers in highest-cost areas, provi[ding] additional support for low-income customers, and does both at minimal cost to its other ratepayers,"[136] the California Public Utilities Commission has voiced concern that application of RSF assistance might be inefficient. The RSF applies to all customers in Cal Water's three targeted districts, including customers who are able to afford their water bills.[137] Another potential problem with a high cost fund is that, if improperly designed to broadly apply to all high cost areas, it could result in lower income ratepayers in lower cost of service areas subsidizing higher income ratepayers in higher cost districts. However, a high cost fund could be designed to target only eligible customers.

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[134] Depending upon the laws and regulations of a particular state, there might be a single high cost fund established for water and wastewater, or water and wastewater companies would separately establish two high cost funds.
[135] *Cf.* Eugene Water & Electric Board, Customer Care Programs, http://www.eweb.org/assistance ($2 billion annually, from approximately 1% of electric retail revenues, benefits more than 4,000 households with utility bill assistance every year).
[136] D.06-08-011 (Cal. Pub. Util. Comm'n Aug. 24, 2006) at 13.
[137] D.06-08-011 (Cal. Pub. Util. Comm'n Aug. 24, 2006) at 12.

Eligibility standards for customers to benefit from a high cost fund, if adopted, should take into account income and number of household members.[138] The benefit could be applied as a percentage discount off a household's water bill. Alternatively, to encourage conservation, the benefit level could be a dollar amount that takes into consideration the average consumption for the average household of similar income and size. The result of a dollar discount should be that larger households with more members receive a higher benefit level than smaller households with fewer members. The National Regulatory Research Institute recommended that a list of questions be considered regarding whether a telecommunications high cost fund should be established at state level. In addition to the considering the items already discussed, the same questions that apply in the telecommunications arena could be asked by regulators and advocates in determining whether a high cost water fund is appropriate to implement in a state.

These include:

1) whether there is need for a fund;
2) whether the law permits the establishment of the fund;
3) the goals of the fund;
4) the services, providers, and facilities that would be supported by the fund;
5) which distribution mechanism is best;
6) what controls, if any, should there be over growth of the fund;
7) how funds will be collected;
8) who administers the fund; and 9) how does one evaluate the fund and how is accountability achieved?[139]

The immediate appeal of a high cost fund applied to water is similar to its application to telecommunications in that it can help make an essential utility service affordable in areas that are costlier to serve. While similar investment and expenditures for infrastructure and facilities may be needed to serve a metropolitan and a rural area, the smaller customer base upon which to spread costs in the latter may make utility service prohibitively expensive there. Additionally, implementing a high cost fund may help alleviate the complaints of inequities that can arise under single tariff pricing, when one district largely subsidizes the costs of service of smaller, high cost districts.

L. Referral to Other Assistance Programs and Agencies

Because affordability is enhanced whenever discretionary income becomes more available, customers should also be made aware of energy and telephone discounts and assistance programs. To the extent that the same customers who are eligible for water assistance are also

[138] See infra, Section III.

[139] National Regulatory Research Institute, State High Cost Funds: Purposes, Design, and Evaluation at Appendix A (Summary of Steps to Establish a High Cost Fund) available at http://www.nrri.org/pubs/telecommunications/NRRI_state_high_cost_funds_jan10-04.pdf.

eligible for energy, telephone, or other assistance programs, utility representatives should be knowledgeable to make those referrals. These representatives need not be utility personnel, but can be members of community based organizations with whom the utility contracts for outreach and application enrollment.[140]

Enrollment of eligible households in water and wastewater affordability programs could be paired with conservation training for the customer.[141] While low-income customers will likely have less elasticity of water demand and may lack opportunity to conserve beyond their current efforts to limit their water bills, all customers could benefit from conservation education. As an example of pairing conservation with rate relief, Golden State Water Company in California ran a pilot from 2009 to 2011, through which the company sought to assist income-qualified customers already receiving a discount in hard-to-reach service areas, where distribution of high efficiency toilets was not available.[142] The Low-Income Direct Install Project, implemented under a grant, was directed toward self-selected discount-rate customers. They received installation of two high efficiency toilets or ultra-high efficiency toilets after taking a water use survey. Additionally, participating customers received installation of high efficiency showerheads and low-flow bathroom aerators to achieve conservation savings estimated at 50 percent or more of usage. Although these programs were not mandated and are no longer running, they appear to have been valid attempts to balance the increased costs of utility investment in hard to serve areas with more affordable rates through conservation programs. Additionally, leak detection, pipe inspection, and minor repairs and efficiency measures in the home could be performed by utility personnel or trained representatives of community action agencies to ensure that a problem of affordability is not inadvertently caused by waste.[143] Minor repairs could include fixing leaks. Efficiency measures could include installing low-flow showerheads and faucet aerators.[144]

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[140] *See* The Results Center, Philadelphia Water Department, Conservation Assistance Program Profile #109 (Lessons Learned/Transferability section) (Results Center), available at http://ecomotion.us/results/pdfs/109.pdf (through utility's contract with independent, education-oriented, community-based organizations, the same field crew can efficiently deliver gas, electric, and water assistance programs at the same time, potentially during a single visit to the customer's home).

[141] CalAm has described a pilot conservation program in its Los Angeles that incorporates some of these suggestions, including conservation education and installation of efficiency measures. *See* CalAm Annual Water Conservation Program: 2010 Annual Report.

[142] The discount was through the California Alternative Rates for Water (CARW) program.

[143] *See* Results Center, available at http://ecomotion.us/results/pdfs/109.pdf.

[144] Id. Installing low-flow showerheads, efficient toilets, and low-flow bathroom aerators was also undertaken by California's Golden State Water Company in a pilot program in 2011.

VI. FRAMEWORK FOR THE FUTURE

Few people, if any, would question that shelter and water are needed for subsistence at the most basic level. While federal, state, and municipal laws and policies have directed support to low-income housing, comparably widespread and available governmental laws and policies for consumers struggling to obtain or maintain water and wastewater service remains lacking. This is especially surprising because disconnection of either water or wastewater service makes a residence uninhabitable and can become a housing problem. This discrepancy may be because costs for water were much lower in the past. Today, however, water rates are considerably higher, and will likely continue to outpace inflation.[145]

The offering of direct customer assistance for obtaining water and wastewater service should be the norm, rather than the exception. Rather than a "subsidy," it may more appropriate to consider low-income rates a "discount" in cases where low-income rates recover marginal costs and make a contribution to fixed costs. This characterization of low-income rates is similar to the characterization of "discount rates" that are offered to industrial customers that also recover marginal costs and make a contribution to fixed costs.

Discounts for the benefit of low-income and payment troubled consumers can be targeted in different ways – to customers or to utilities. For customer-directed programs, customers paying a greater proportion of income to water and/or wastewater bills could receive higher discounts relative to other customers who pay a smaller proportion of their income to these bills. Alternatively, customers could receive a fixed monthly credit that is calculated based on the customer's income and expected annual bills. In most cases, discount programs should preserve a price signal to customers receiving the benefit so they can appreciate the true cost of water.

Discount programs and assistance programs should be paired with conservation training and leak repair programs To the extent that conservation education and leak repairs can assist those who have not maximized their opportunities to conserve, reducing low-income customers' water demand can be an effective way to reduce bill payments and increase bill affordability. Conservation kits could include a low-flow showerhead, a faucet aerator, toilet flapper, leak detection tablets, and educational materials.[146] The company could provide residential audits, rebates, conservation devices, and installation of high efficiency toilets for certain customers.[147]

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[145] See Water Research Foundation/EPA at 29-31 (change in water and wastewater costs is greater than change in general inflation).

[146] Breisach, Raymond et al., Results and Recommendations of Water and Wastewater Affordability Study (2004) (Breisach) at 20, Report prepared for the City of Kalamazoo Department of Public Services, available at http://research.upjohn.org/reports/180/.

[147]. California American Water Company had a direct installation pilot program in its Los Angeles and Sacramento districts as part of the 2010 Conservation Program. Through the direct installation pilot, CalAm provided residential audits by WaterWise Consulting, rebates, conservation devices, installation of high efficiency toilets. *See* CalAm's Water Conservation Program 2010 Annual Summary Report.

While there is some administrative cost to providing additional assistance programs to customers, costs are mitigated because customers who receive adequate assistance can make regular bill payments. There will also be numerous reduced costs associated with arrearages termination and reconnection, collection and termination, and bill disputes and other complaints.[148] Giving a role to community action agencies in assisting customers with enrolling in the programs can also lower costs of government administration.[149]

On the other side of the coin, for programs directed toward utilities, policymakers should ensure that companies do not lose incentives to control expenses and pursue more efficient operations. For example, California is re-examining the state subsidy to telecommunications providers through the High Cost Fund-A because the commission found that companies participating in that program were "gold plating" by spending much more in expenses than non-participating companies. In other words, because of the way California awards funds from the High Cost Fund-A to companies, the Fund creates an incentive for telecommunications providers to build unnecessary improvements on top of their already adequate systems. Added investment increases the ratebase, and therefore contributes to justification for increasing rates where the rate calculation depends upon the amount in ratebase.[150] Such funding assistance should be tracked and traceable to a benefit to the utility's low-income or payment troubled consumers. This ensures accountability and avoids problems like gold plating.

The first step in designing an affordability program that directs benefits to the utilities rather than directly to consumers is to ask whether any cost reductions and additional control of escalating costs are possible. If cost reductions and efficiencies have been maximized, and affordability is still an issue, assistance funded through a subsidy may be appropriate.

A. Better Data Reporting Requirements

The lack of good quality and uniform data reporting across utilities and states poses a problem for policymakers seeking to create informed and effective rules and regulations. Uniform data reporting can help shed light on the true cost of water and wastewater service, bring to light management and financial problems, and help identify best practices for wider

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However, depending upon the size of the up-front costs, rebates may not be feasible for low-income households who lack the ability pay the up-front costs.

148 See Oppenheim/MacGregor, National Perspective at 2-3.

149 See Breisach at 12-13, Report prepared for the City of Kalamazoo Department of Public Services, available at http://research.upjohn.org/reports/180/ (citing Saunders).

150 California Public Utilities Commission Telecommunications Division Staff, Workshop in R.11-11-008 (Cal. Pub. Util. Comm'n July 17, 2012).

implementation.[151] The lack of routinely collected uniform data could be remedied by a uniform reporting requirement.[152]

Where limited data may pose an obstacle to making informed decisions, such as deciding whether water affordability programs are needed or how they should be implemented, it has been suggested that specific items of data be collected by state commissions as part of annual filing requirements:

1) number of terminations for nonpayment,
2) number of customers in arrears,
3) uncollectible levels,
4) number of low-income customers, and
5) percent of eligible customers participating in affordability programs.[153]

Additionally, tracking customer complaints regarding water affordability would be helpful.[154]

The National Association of State Utility Consumer Advocates (NASUCA) has passed a Resolution 2011-2, Urging States to Gather Uniform Statistical Data on Billings, Arrearages and Disconnections of Residential Gas and Electric Service.[155] No such NASUCA Resolution presently exists for water service, but the reasons requiring Resolution 2011-2 are also applicable to water service. For example, Resolution 2011-2 points out that uniform data can help better evaluate the design and effectiveness of payment mechanisms for payment troubled customers, and that "uniform reporting by utilities of billing and arrearage data enables policymakers to quantify both the number of consumers who are experiencing problems in paying their utility bills and the financial impact of the arrearages [footnote deleted]".[156] Compilation of this data helps to evaluate adequacy of financial assistance programs whereas lack of consistent data and reporting impedes identification of best practices and standards.[157]

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[151] It has been suggested that implementing and considering consumer affordability programs should be undertaken similarly to how a business plan is undertaken. This would include establishing a way to measure and evaluate the effectiveness of the mechanism that likely will include a cost benefit analysis.[151] See Water Research Foundation/EPA at 10-11. Underlying data would also be important to review.

[152] See Melissa J. Stanford, Memorandum to NARUC Committees on Water and Consumer Affairs (April 27, 2007) (Stanford) at 17 (noting lack of data to be shortfall of study on determining need for water affordability programs and their structure).

[153] See Stanford at 18.

[154] Id.

[155] Similarly, in 2007, the National Association of Regulatory Utility Commissions passed a NARUC Resolution Supporting the Gathering of Data for Electric and Natural Gas Distribution Companies by Individual State Utility Commissions or Energy Offices (November 14, 2007). See http://www.naruc.org/Resolutions/CA1%20Resolution%20Supporting%20the%20Gathering%20of%20Data%20for%20Electric%20and%20Natural%20Gas%20Distribution%20Companies%20by%20Individual%20State%20Utility%20Commissions%20or%20Energy%20Offices.pdf.

[156] National Association of State Utility Consumer Advocates Resolution 2011-2 at 1-2.

[157] Resolution 2011-2 at 1.

Among other things, data on billings, arrearages, and collections should be publicly available, to "enable [] an understanding of issues of affordability impacting customers in paying utility bills and the effectiveness of available resources to help customers."[158]

B. Areas and Issues for Additional Affordability Research

One possible area for future review is the use of benchmarking to increase incentives for utilities to actively manage their customer bills, rates, and affordability programs. Benchmarking for affordability requires regulators to set or approve a realistic aspiration for utilities to achieve on a given affordability related measurement, such as number of customer terminations due to nonpayment. For example, if a utility typically undertakes termination of X customers per month, a benchmark could be set for a monthly termination rate of no more than 80 percent of X, representing a goal of reducing terminations due to nonpayment by 20 percent. If the benchmark is not met, the utility is required to take certain actions, such as implementing new assistance programs, investing more in outreach regarding enrollment in its existing low-income and/or assistance programs, increasing reporting requirements (i.e., reporting the number of terminations for nonpayment as a new metric or reporting it on a monthly rather than annual basis), and waiving reconnection charges in prescribed instances.[159] Incentives for the utility to actively manage its termination rate so that it falls at or below the benchmark threshold would be the condition precedent for regulators to relax or lift the increased utility obligations. Benchmarks should be paired with meaningful obligations that will help address the problem of affordability, even absent improved performance on the utility's own initiative. Both benchmarks and obligations should be aspirational, represent real improvement from the utilities' past performance, and realistically achievable with some effort from the utility.

Along with benchmarks, another area to investigate is assistance programs for low-income consumers in rental situations. Many low-income consumers are renters, not homeowners. Most affordability programs discussed impact the customer of record. In the case of a

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[158] Resolution 2011-2 at 2.

[159]As a settlement provision, benchmarking has proven to be effective in reducing the rate of disconnections by energy companies in California, which have actively managed their disconnection rate to stay below the benchmark in order to avoid obligations imposed by settlement designed to mitigate the impact to customers of higher levels of disconnections. Following its successful implementation in settlement, the California Commission subsequently incorporated a similar benchmark mechanism in its order applying to two of the state's largest energy utilities. See National Consumer Law Center, "California Adopts Measures to Help Reduce Utility Disconnections of Vulnerable Households, http://www.nclc.org/images/pdf/energy_utility_telecom/electric_and_gas/cpuc-disconnectorder.pdf. See also Settlement and Order in CA PUC Docket R-10-02-005, Order Instituting Rulemaking on the Commission's Own Motion to Address the Issue of Customer's Electric and Natural Gas Service Disconnection, available at http://www.nclc.org/images/pdf/energy_utility_telecom/electric_and_gas/model-settlement-cu-utilities.pdf (settlement dated Sept. 10, 2010) and http://www.nclc.org/images/pdf/energy_utility_telecom/electric_and_gas/final-order-phase-2.pdf (Order dated Mar. 22, 2012).

low-income consumer who rents, his or her water and wastewater may be paid for by the landlord and the costs included in rent. The problem is ensuring that the benefits of affordability programs reach low-income customers when it is the landlord who is the utility's customer.

Lastly, before delving into research for which affordability mechanism should be implemented in a particular situation, the first question should be to ask whether the utility is already doing everything possible to operate in a cost-effective way. For example, unaccounted water that is a persistent and continuing problem in a system may create unnecessary costs for consumers who in their rates are paying for the supply, treatment, and delivery of water that is never used. To the extent that such a utility expense can be eliminated or reduced through reasonable cost measures, those measures should be undertaken as priorities. Taking relatively simple steps such as deploying leak detection devices and undertaking a systematic and routine program of leak detection and repair can help break a cycle of unnecessarily high bills.

Water and wastewater bills throughout the United States have increased significantly over the last few years and will likely continue. States, regulatory bodies, and advocates should consider adopting affordability measures such as those discussed here to reduce the burden on low-income customers who require water and wastewater service as a basic life and public health necessity.

APPENDIX A: CONSOLIDATION AND REGIONALIZATION

Consolidation and regionalization are terms that are interchangeably used. However, regionalization usually refers to the combination or merging of separate water systems within a region. Consolidation, however, is broader, and is used to refer to not only regionalization, but also informal agreements between systems to provide a service or share resources (informal cooperation); formal service contracts with another system (contractual assistance); multiple independently operated systems partnering to form a new entity to meet a goal or undertake a specific project (joint powers agency); rate consolidation (single-tariff pricing); and acquisition of a system by another entity through which management is combined or merged.[160]

Informal agreements may benefit small systems with the sharing of knowledge, expertise, facilities and supplies, equipment and bulk purchasing power.[161]

Through more formal contractual assistance, small systems may call upon another entity to conduct monitoring, operation and maintenance, and emergency assistance, among other services.[162]

A joint powers agency can be used where systems will perform more effectively in a partnership than acting independently, such as developing new water sources, shared ownership of storage and lab facilities and/or equipment and supplies, and sharing costs of billing and collection.[163]

Single-tariff pricing, as a move away from cost-based pricing for the specific community to which it is applied, can distort the price signal but has the potential to provide more affordable service to customers of small systems and can mitigate rate shock.[164]

Ownership transfer can be used to merge systems, either voluntarily or through regulatory requirement, where one system can no longer independently operate, due to lack of financial, technical, or managerial expertise and resources.[165] Merger could include interconnecting multiple systems, but such interconnection is not necessary and may be difficult due to distance and geography.

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160 See Paige S. Manning, et al., Consolidation Issues: Pros, Cons, Options and Perceptions (Mississippi State University Extension) (Manning, et al.)at 6-8.

161 See id. at 6.

162 See id. at 7.

163 See id. at 8.

164 See Janice A. Beecher, U.S. Environmental Protection Agency and the National Association of Regulatory Utility Commissioners, Consolidate Water Rates: Issues and Practices in Single-Tariff Pricing (Sept. 1999) (Beecher) at viii and 57.

165 See Manning, et al., at 8.

Small water systems that serve fewer than 3,300 customers [the upper threshold number that the EPA uses to classify customers in what is defined as a small water system] are generally not expected to be able to achieve economies of scale on their own, such as in production, especially if they lack any large volume users.[166] Therefore, consolidation of separate agencies or operations can potentially lead to economies of scale (declining cost per unit of production) and elimination of duplicate services. Consolidation can lead to savings in operation, maintenance and administrative expenses; capacity planning and development of supplies, and combined efforts in management, billing, engineering and inspections, laboratory services, leak detection, meter reading and testing, and equipment maintenance.[167] Other advantages may include additional financing opportunities for capital investment to replace aging infrastructure that may not be available to smaller systems.[168] Consolidated systems may better comply with federal and state safe drinking water requirements, due to increased access to skilled employees with necessary expertise.[169]

Some states, such as Pennsylvania, have a Commission policy encouraging consolidation, and/or single tariff pricing.[170] Incentives include rate of return premiums, acquisition adjustments, deferral of acquisition improvement costs and a temporary plant improvement surcharge.[171] Through single tariff pricing, the rates of the main division of the acquiring company are applied to the rates of the acquired territory. Texas has a different, but somewhat similar code provision that encourages consolidated rates by region.[172]

Disadvantages and barriers to regionalization include the imposition of potentially burdensome acquisition debt upon ratepayers, and some inequities in costs and benefits among different communities when comparing the investment per new customer in the smaller, acquired system, with investment per existing customer of the larger, acquiring system.[173] There may be

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166 See Beecher at 32-33.

167 See Mike Lee, Water agencies consider consolidation, UAT San Diego (May 16, 2011); see Manning, et al., at 4.

168 See Manning, et al., at 6-8. Larger and more diverse customer bases can lead to increased access to public funding and grants. Id. at 4.

169 See id. at 4.

170 See 52 Pa. Code 69.711(a)(6).

171 See 52 Pa. Code 69.711. See also and 66 Pa.C.S. § 523 (adjustment to rate of return allowed for efficiency, effectiveness and adequacy of service); 66 Pa.C.S. § 1327(e)(credit acquisition adjustment); 66 Pa.C.S. § 1327 (a)(debit acquisition adjustment).

172 *See* Texas Water Code 13.182(c). New York also encourages consolidation of small water systems as a policy, although it does not mean approval of consolidation in every case. See Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Aqua New York, Inc., Case 08-W-0107 (Dec. 23, 2008), 2008 N.Y. PUC LEXIS 760, *2-*3 (citing Case 93-W-0962, Incentives for Acquisition and Merger of Small Water Companies, Statement of Policy on Acquisition Incentive Mechanisms for Small Water Companies (issued August 8, 1994) (AIM Policy).

173 See Manning et al., at 5, 9.

a loss of local control or responsiveness to local customer service issues. There may also be confusion among customers regarding whom to contact for water service.[174]

In approaching the question of whether to consolidate, it has been suggested that consolidation should result in economic efficiency, equity in cost bearing among customers, political accountability and responsiveness to customers, and administrative and technical efficiency. [175]Toward that end, it has been suggested that the following questions be considered: (1) whether the utility has an operating ratio (operating revenue to operating expenses) of 1.0 or more; (2) what is the condition of the infrastructure; (3) whether the system can afford the costs of necessary improvements; (4) whether the characteristics of the customer rate base will support costs of needed improvements and/or obtaining state and federal grants for improvements; (5) whether the price and terms are fair; (6) how customers will be impacted such that they are treated fairly; (7) whether new debt will be incurred for additional improvements and what countervailing effect may there be from reduction of expenses through consolidation; (8) what are the alternative and impacts to not consolidation; (9) whether there exists technically capable staff to operate the combined system; and lastly, (10) what is the public's sentiment about potential consolidation.[176]

[174] Id.
[175] See Manning, et al., at 13-14.
[176] See Manning, et al., at 10-13.

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Talent

Labor Costs and the Rate Case

Incentives, staffing, and benchmarking in a tight economy.

BY DAVID W. SOSA, PH.D., AND VIRGINIA PERRY-FAILOR

In several recent utility rate cases, regulators, under pressure to contain rate increases, have disallowed a portion of a utility's claimed employee compensation expenses, citing local economic conditions and the need for austerity. Ratepayers should of course expect that the costs that lie behind the rate remain "just and reasonable." However, if a utility is unable to recover reasonably incurred costs through its rates, its overall costs might rise, jeopardizing its financial health, Future ratepayers might end up paying more for service. Quality of service ultimately might suffer. Moreover, management's ability to keep the ship running might be compromised if companies are denied flexibility to adopt viable alternative compensation packages, or if certain components of employee compensation are inappropriately disallowed.

In the typical rate case, the utility offers evidence that its employee compensation costs are reasonable. If the evidence proves insufficient, regulators may choose to disallow certain requested costs. The regulator must review the evidence and consider how a cost allowance will affect rates. However, if regulators focus on specific components of employee compensation—without adequately considering the reasonableness of total costs—then the rate order might do financial harm to the utility, and, in the long term, to ratepayers.

> Management's ability to keep the ship running might be compromised if certain components of employee compensation are inappropriately disallowed.

Utilities can choose different ways to present labor costs to regulators to best support their claims of reasonableness—even as regulators, too, can and should consider a range of factors in reviewing compensation and utility revenue requirements. Here, we look at both sides of the rate-making process, and discuss some key trends in utility compensation practices.

Trends in Cost Management

A utility's employee compensation typically comprises cash compensation—salary and incentives—and non-cash compensation, including pension and retirement plans, medical and dental care, and other benefits. The Bureau of Labor Statistics (BLS) reported that through September 2011 approximately 61 percent of employee compensation at utilities came in the form of cash wages and salaries, while the remaining 39 percent represented benefit costs.[1] Across all industries, the costs of non-cash compensation have climbed swiftly, prompting utilities and other employers to deploy a range of strategies for managing these expenses. Examples include retirement plan restructuring; increased use of incentive-based compensation; and reductions in headcount.

First, utilities have switched employees from defined-benefit pension plans to defined-contribution pension plans, thereby shifting pension funding responsibility to employees. From 1980 through 2008, the proportion of private wage and salary workers participating in defined benefit pension plans fell from 38 percent to 20 percent.[2] Over the same period, the percentage of workers covered by a defined contribution pension plan—that is, an investment account established and often subsidized by employers but owned and controlled by employees—rose from 8 percent to 31 percent.

Second, utilities have extended incentive compensation to more employees and increased the amount of total compensation at risk by implementing plans that link a portion of an employee's compensation to his or her achievement of individual and companywide goals. A recent Towers Watson survey of utility compensation, which was cited in a decision by the Indiana Public Service Commission, reported that, "93 percent of the individuals in exempt-level positions were eligible for annual incentives."[3,4]

Third, through a variety of mechanisms, including hiring freezes and severance programs, many utilities have reduced employee headcount in recent years. The BLS reports that total employment in utilities fell from around 600,000 in 2001 to 555,000 as of November 2011.[5] However, as with all workforce initiatives, utilities must be

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careful that any changes made don't compromise safety, reliability, and quality of service.

At the same time that utilities seek to rework their employee compensation plans to better control costs, they're also facing a wave of retirements and, as a result, a shortage of qualified workers in many areas. Between 2009 and 2015, approximately 46 percent of skilled technicians and 51 percent of engineers in the utility sector will become eligible for retirement.[6] Some employees have deferred retirement in light of economic conditions; still, the replacement of these skilled workers is a growing problem. Moreover, industry-wide goals to "replace aging infrastructure and achieve modernization objectives"[7] mean that utilities will need to add staff over and above the replacements for those retiring—including, perhaps, different resources at a time when younger qualified workers and trainable employees are in short supply.

In fact, utilities across the country are participating in new initiatives for identifying and training qualified candidates; the Center for Energy Workforce Development's members include more than 80 energy-related enterprises, including utilities, but it takes time to adequately prepare employees for certain industry roles. For example, it can take 10 to 12 years to fully train a lead lineman.[8] Meanwhile, many U.S. universities have scaled back their electrical engineering programs, and many foreign graduate students are finding attractive opportunities in their home countries, causing the pipeline of engineering talent to run low.[9] These labor market conditions limit the talent pool available to utilities and put upward pressure on the levels of compensation needed to attract and retain qualified employees.

Tools for Regulator Review

In determining rate changes, regulators must take into account the full range of economic challenges and the remedies that utilities are employing to combat them. More specifically, regulators should focus on total compensation, plus the trend of expenses in the recent past.

In particular, however, regulators must stay mindful of factors that tend to make a simple apples-to-apples comparison perhaps less indicative than it might otherwise appear, such as: 1) offsetting tradeoffs between cash- and non-cash compensation schemes; 2) the financial value of goals achieved or missed under incentive compensation plans; 3) employee productivity as affected by conservation or efficiency programs; and 4) how industry benchmarking can be affected by the diversity of economic conditions among local utility service territories.

Utilities have extended incentive plans to more employees, linking compensation to individual and companywide goals.

When regulators evaluate individual components of employee compensation, they must be careful to account for the fact that companies are changing the mix of cash and non-cash compensation. Increases in one component of compensation might offset decreases in another.

For example, a utility might increase employee cash salaries to offset the non-cash effect of shifting employees from a defined-benefit pension plan to a defined-contribution pension plan. The appropriate question for regulators to address is: How will changing the levels of total employee compensation affect rates? Regulators' examination of one particular component without adequate emphasis on total costs might be misleading.

Regulators also must take a similarly holistic approach to evaluating incentive compensation. The objective of these programs should be to encourage individual and collective employee behavior that benefits ratepayers as well as the company. Incentive compensation programs will obviously vary across utilities, based on management objectives and company-specific circumstances. To be most effective, however, and to support the recovery of program costs, these programs should have clearly defined goals and objective measurement criteria. Program goals might include improved reliability, customer service, expense management, and financial performance. For their part, regulators need to be transparent about the extent to which they consider financial criteria—which benefit ratepayers as well as shareholders—acceptable program metrics for compensation expense to be recoverable.

Some utilities have seen increases in employee productivity over the past several years, and that's a significant benefit for ratepayers. As employees work longer and harder, they reduce output-adjusted compensation costs, all else being equal. However, evaluations of productivity can be complicated when utilities are attempting to reduce output—for instance, developing energy efficiency and conservation-related resources, which is increasingly becoming the industry norm. Productivity is traditionally measured according to level of output—electricity sales, for instance—per unit of labor input; more output per unit of labor input would denote an increase in productivity. However, gains in energy efficiency might cause a decline in electricity sales per unit of labor input—and productivity, by this measure, will appear to be declining as well, even though employees are performing effectively. For this reason, standard labor productivity metrics might not capture the full scope of employee effort and achievement, thereby understating labor productivity.

Benchmarking can help regulators understand employee compensation cost levels and trends, and determine whether requested cost recovery is reasonable. Benchmarking also can assist regulators in evaluating more detailed questions, such as: How does the target utility compare to peers in terms of labor productivity, or in terms of cash compensation?

In particular, peer group benchmarking compares the business performance and practices of a company to those of comparable companies. This technique, which companies, market analysts, and regulators often rely on to evaluate operational and financial performance, can be used to assess indicators of overall company performance as well as the performance of specific activities relative to peers.

However, another benchmark is being introduced in rate cases with greater frequency: the comparison between measures of utility compensation and measures of local economic conditions, including wages and employment. Although regulators might find it useful to look at the local wages of workers who have skills similar to utility employees, general wage and employment rates aren't appropriate benchmarks for evaluating employee compensation costs, for several reasons. As described above, the utility labor force is highly specialized and characterized by a scarcity of qualified personnel. Utilities compete with one another, regionally and even nationally, for employees to fill many positions. In the ratemaking context, evidence regarding total compensation costs—including over time and relative to other comparable companies—is critical. Regulators might also be interested in evidence regarding the utility's salary structure and individual components of compensation. However, it's critical to evaluate these measures relative to the appropriate benchmarks, which must be derived from comparable companies and not merely on the basis of geographic proximity.

Identifying an appropriate benchmark group—or panel of comparable companies—will allow regulators to focus on the regional or national labor market in which a particular utility competes. It also will provide a reliable context for evaluating both the level and format of utility compensation expenses. Companies should be aware that regulators might be tempted to interpret a benchmark as a bright line, so it might be important to discuss the statistical properties of the benchmark sample in any interpretation of results.

Regulators' examination of one particular component without adequate emphasis on total costs might be misleading.

Two principal steps are involved in peer-group benchmarking.

■ *Normalization:* The evaluator should determine whether the cost or performance measures at issue can be directly compared across companies, or whether a common means of measurement must be established for presentation to regulators. In the case of employee compensation, these costs will vary based on a number of factors including customers served, geographic region, and degree of vertical integration. Therefore, aggregate measures of employee compensation expense must be normalized—that is, transformed into a common unit of measurement—before a meaningful comparison can be made between the subject company's performance and the performance of companies in the benchmark group. For employee compensation costs, measures of output, including sales and customers, are the commonly used normalization measures. Another normalization factor is number of employees.

■ *Panel construction:* Once a common basis of comparison has been established, the evaluator needs to construct the panel of companies—a list of "comparables," in real-estate parlance—against which financial or service-level performance can be compared. The selection criteria will depend on the objective of the exercise. For example, regulators might want to conduct a broad evaluation of a utility's performance relative to the entire electric industry. That would require a benchmark group that includes as large a group of utilities as possible, screening for company characteristics that are relevant to the particular compensation measure at issue. As a general matter, the selection criteria for benchmark companies would be based, in part, on company characteristics that affect expense levels, such as degree of vertical integration and lines of business.

Since any given geographic area will likely have only one regulated electric utility and one regulated gas utility, companies must recruit for skilled workers regionally and nationally. Factoring in the previously mentioned labor challenges utilities face, regulators will need to benchmark salary ranges by job description; this lens should reflect the regional and national labor markets in which utilities compete for talent. The commonly used sources for such data include industry-specific and broad-based compensation surveys. To the extent that utilities have outsourced positions that require lower skill levels and draw from local markets—for example, non-critical security services—they wouldn't factor into employee compensation costs.

Some U.S. regulatory commissions have explicitly acknowledged that utilities' employee compensation strategies » are developed to attract, retain, and motivate employees, and that the proper concern of regulators is whether a utility can demonstrate that the overall level of employee compensation expenses is reasonable. These regulators have established criteria, including market labor rates, for evaluating reasonable compensation levels, but they recognize that the allocation of the package over its various components, including incentive compensation, is a matter best left to management. The Massachusetts Department of Public Utilities (MDPU) offers an example of this approach.

The MDPU sets forth evaluation criteria that explicitly recognize "that the different components of compensation are to some extent substitutes for each other and that different combinations of these components may be used to attract and retain employees." Utilities are required to demonstrate that their costs conform to those criteria and that their total unit-labor cost "is minimized in a manner supported by their overall business strategies." Utilities are also required to compare their costs against a market-based standard.[10]

Regulators in Indiana and Nevada also have considered overall compensation against established evaluation criteria. In Indiana, regulators evaluated Vectren South's compensation package, including incentive compensation up to a board-approved level, and found that it was at the low end of the competitive range in the market, relative to comparable companies. As a result, Indiana regulators approved the utility's compensation request.[11] Similarly, in Nevada, the Nevada Public Utilities Commission (NPUC) has evaluated a combined compensation package of payroll and benefit costs. The commission found that Sierra Pacific had actually reduced its payroll and benefit costs by about $16 million, "reflecting the reduction in growth that has occurred during the recession,"[12] and approved Sierra Pacific's compensation request.

What Utilities Should Do

Given the complex compensation issues involved, and the competing claims of stakeholders in rate proceedings, utilities need to anticipate the issues that intervenors and regulators are likely to focus on and develop a record that establishes the reasonableness of employee compensation expenses. Utilities' compensation presentations should offer regulators clear and concise information regarding levels of total employee compensation over time and compared with other utilities. As much as possible, these presentations should conform to prior commission decisions and should reflect concerns about current economic conditions. To the extent changing circumstances justify departures from prior regulatory precedent, these departures should be identified, and the justification for the change should be clearly articulated. Among other things, the utility should be able to identify changes in employee compensation and explain to regulators why these changes have occurred and why the observed expenses are reasonable.

Also, to the extent that a utility has been able to reduce employee compensation costs through discrete initiatives, such as severance programs or initiatives that improve labor productivity, regulators might be tempted to appropriate some or all of the expense savings prior to the rate effective period, on behalf of ratepayers. However, this treatment is short-sighted because regulatory lag—the time between when a utility initiative begins generating expense savings and when that savings is passed on to consumers via rates—creates incentives for utilities to implement cost-savings initiatives with uncertain outcomes. If an initiative is successful, the utility will have the opportunity to capture some of the expense savings before they're passed on to ratepayers, compensating the company for some of the assumed risk.

Utilities should remind regulators that regulatory lag benefits ratepayers and encourage commissions to take a forward view rather than attempting to capture expense savings retroactively. Additionally, employee compensation levels might reflect rising productivity—for example, staff reductions might have contributed to increased productivity, which benefits ratepayers. Individual compensation might have risen to reflect improved performance, even though aggregate compensation has fallen. Utilities can assist their commissions to place individual compensation levels in context by offering statistics that describe productivity through time.

Endnotes:

1. http://www.bls.gov/iag/tgs/iag22.htm
2. Butrica, Barbara, Howard Iams, Karen Smith and Eric Tober, "The Disappearing Defined Benefit Pension and Its Potential Impact on the Retirement Incomes of Baby Boomers," *Social Security Bulletin*, Vol. 69, No. 3, 2009.
3. State of Indiana, Indiana Regulatory Commission, Final Order Cause No. 43839, p.48.
4. http://data.bls.gov/timeseries/CMU2034400000000D?data_tool=XGtable
5. http://data.bls.gov/timeseries/CES4422000001?data_tool=XGtable
6. *The Center for Energy Workforce Development 2009 Survey*, June 2009.
7. Wanda Reder, president, IEEE Power & Energy Society and vice president of power systems services at S&C Electric, Feb. 18, 2009.
8. DOE's *Workforce Labor Trends in the Electric Utility Industry Report to the United States Congress*, pursuant to Section 1101 of the *Energy Policy Act* of 2005.
9. Ibid.
10. Order of The Commonwealth of Massachusetts, Division of Public Utilities in Petition of Massachusetts Electric Company and Nantucket Electric Company, pursuant to G. L. c. 164, § 94, and 220 C.M.R. § 5.00 et seq., for a General Increase in Electric Rates and Approval of a Revenue Decoupling Mechanism, DPU 09-39, Nov. 30, 2009.
11. State of Indiana, Public Utility Commission, Final Order, Cause No. 43839, Approved April 27, 2011, p. 50. (published at 289 PUR4th 9.)
12. Public Utilities Commission of Nevada, Order, Docket 10-06001, Dec. 23, 2010.

Overview of Water & Sewer Rate Studies

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Consulting Engineers

Water and Sewer Rates Overview

- Water and Sewer Funds
- Revenue and Rate Structures and Cash Flow
- Capital Funding Cash versus Connection Fees versus Loans/Bonds
- Rates and Rate Structure Trends

Water and Sewer Funds

Enterprise Funds

Revenue derived by "Users" of the system, receiving services

- Gallons of water supplied
- Gallons of sewage removed and/or treated

Expenses derived from providing those services

Not much different than any other service *business*...

Water and Sewer Funds

Enterprise Funds

Cash Flow is King

GASB 34 Accounting

- Important but not more related to asset management and auditing
- Depreciation
  - Typically NOT part of Water and Sewer Fund Cash Expense
  - Confuses policy makers and rate payers

Water and Sewer Funds

Full Cost of Service Model

Charge what is REQUIRED to operate and maintain the system in good working order and meet all permit requirements

Typically subdivided in Water and Sewer sub categories

Storm Water is typically NOT included

- Storm water should be based on property area or other means, not water usage.

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Full Cost of Service

Operating Expenses

- Cost of Water (Producing or Buying)
- Administrative (Billing, Permits, HR, Penalties)
- Operators and Operations
- Commodities (Electric, gas, materials)

Capital Funding

Debt Service

Transfers to General Fund

Depreciation: NOT INCLUDED!

Water and Sewer Funds

Fund Reserves

Minimum Operating Expenses

- Emergency capital or operations
- Funding shortfalls (economic downturns)

"Standard" per AWWA is 25% of Operating Expenses (not inclusive of capital or debt service)

- Can have higher reserves based on Experience/Ordinance/Debt Service

Revenue and Rate Structures

Revenue = Allocation of Costs

Uniform Usage Rate

Incline Block Rate Structure
- Classification
- Usage
- Equivalent Meter

Fixed Charges

Special Rate (Irrigation)

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Revenue and Rate Structures

Revenue = Allocation of Costs

Uniform Usage Rate

Simple, easy to manage and understand

Typical for small, mostly residential communities

Common for sewer

- Sewer usage costs not as linear as water costs EXCEPT FOR WWTP's!

Encourages conservation

Lower users could be subsidizing higher volume users for capital improvements

Rate Structures

Incline Block Rate Structure

General

Higher Usage → Higher Rate

- Higher volume users "cost" more of the system for operations and capital
- Recover administration costs – Meter installation/checking

Sends more distinct price signals for conservation

Need to allocate costs to users

- Classifications,
- Volume Usage tiers
- Meter size

Revenue and Rate Structures

Incline Block Rate Structure

Classification

By some sort of category, such as residential, commercial, industrial, other

Common, easy to establish

Equitable? Some residential users may use more water that some commercial users.

Revenue and Rate Structures

Incline Block Rate Structure

Usage Tiered

Water Rates (or Sewer Rates) Based on Usage Volumes

- Lower Volume Users at One Rate
- Higher Volume Users (Commercial/Industrial) at Another Rate (Double Usually)

Common, mostly for water rates

- Direct correlation between operating costs for higher users (booster stations, electricity, etc) for water
- Not as direct for sewer (sewers do not operate in a linear fashion with usage as water mains do)

Revenue and Rate Structures

Incline Block Rate Structure

Per Meter Size: Equivalent Meter Ratio

- Increasing costs allocated to higher users based on the ratio of a base meter capacity compared to increasing meter size capacity
- Equitable, although based on maximum meter capacity
- Hard to implement; need accurate meter size information and sophisticated billing system
- More suitable for complex systems with many different types of users

Fixed Monthly Charges

Monthly Minimum Charge (Availability)

- Charged only if account uses less than minimum water volume
- Largely ineffective as most users use more than minimum and thus do not get charged

Administrative Charge (Availability)

- Fixed costs of doing business no matter how much water is used
- Billing, HR, insurance, etc.
- Structure: Uniform or incline block

Fixed Monthly Charges

Debt Service

- Specific to annual debt service payments
- Good way to ensure debt servicing, which equates to financial stability

Capital Fund Charges

- Build up asset investment fund for capital funding
- Unless substantial, doesn't fund significant capital

Fixed Monthly Charges

Good for Stable Cash Flow

- Less reliant on volume usage
  - Water conservation is GOOD…but not for CASH FLOW!

Bad for Lower Volume Users

- Seniors/low income

Rate Structures

Special Rates

Irrigation/Landscaping

Use water for landscaping/filling of pools, etc

Assumption: Water doesn't go down the sewer

- YOU ARE RIPPING ME OFF!

Solutions: Irrigation Cap/Deduct Meter/Premium User Rates

Note: Costs DON'T CHANGE! Must make up the revenue somehow!

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Capital Funding

Connection Fees

Usage or Capital Recovery Fees

Bonds and Loans

Capital Funding

Connection Fees

Connection and other fees paid to capital accounts to fund required improvements

Ideal for specific projects or booming economic development

Not a significant source of revenue post Great Recession....but may be increasing

- Careful: Debt Service *reliance* on connection fees is risky!

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Capital Funding

Usage Fees (Cash)

Part of Usage Fees or Fixed Fees

- Fixed Fee is NOT an SSA's

Typically supports minor capital funding
(short water mains, sewer lining, hydrant replacement etc.)

Not suitable for large improvements projects
(major pump stations, treatment facilities, etc.)

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Capital Funding

Bonds/Loans (Debt Service)

Borrow for capital project, especially large ones

Results in annual debt service payments, far easier to manage cash flow

Most common capital funding mechanism

- Money is not expensive, *currently*
- Helps keep user rates low

Capital Funding

Bonds

General Revenue or Obligation Bonds

Collateral: User Fees, Taxes, etc.

- May have significant reserve requirements

Variable debt service periods

Ideal for General Service Project

- Involving other infrastructure such as roads, storm sewers, etc.

Get the money WHEN you need it

Interest rates *typically* higher than IEPA Loans

Capital Funding

Loans

IEPA State Revolving Loan Funds (SRF)

- Water Pollution Control Loan Program (WPCLP)
  - Storm water *may* to be included on a limited basis
- Public Water Supply Loan Program (PWSLP)

Clean Water Initiative

- More money available for loans and approval process easier.

Suitable for Specific Projects (Water Mains, Pump Stations, Treatment Plants)

Capital Funding

IEPA SRF Loans

- Low interest rates
- Long and involved application process (~1 Year)
- 20 year payback
- Most common method of funding water and sewer capital infrastructure

Rate and Rate Structure Trends

Past Trends

Moderate or no rate changes for years

Recent Trends

City of Chicago Water Supply Increases

- 30%, 20%, 18%, 17% annually
- 43% overall in five years

Dupage Water Commission Water Transmission Increases

- 3% Annually

Will it continue?

Rate Trends

Average Water Rate: 2014

Per 1,000 gallons:
$4 to $9

6000 gallons per Month Bill:
$36 to $54

Average Sewer Rates: 2014

Per 1,000 gallons:
$2 to $7

6000 gallons per Month Bill:
$12 to $42

Rate Trends

Typical Fixed Rate Fees

$1 to $6 month, residential

Total Average Rates: 2014

Per 1,000 gallons:
$6 to $16

Fixed Rates:
$1 to $6 per month

6000 gallons per Month Bill: $48 to $112

What Impacts Rates the Most

Water Supply Costs (From Anyone)

Personnel Costs

Infrastructure Heavy

- Pump Stations
- Treatment Plants

Rate Trends

Defining Charges on Bill

- Water Supply Costs
- Capital Recovery Costs
- More information is usually good…but don't make it like the phone bill

Assessing Fixed Fees to Improve Cash Flow

- Administrative
- Debt Service
- Capital
  - Common for storm water utility

Rate Study and Planning

DO'S

- Involve policymakers in rate development process
- Define specific charges, like water supply costs, on your bill
- Assign Fixed Fees to stabilize cash flow
- Consider more frequent billing
- Codify rate increases in Ordinance
- Consider professional 3rd party assistance in rate studies/design

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DON'TS

Absorb water supply or major commodity increases

Spring major rate increases and rate structure changes at open Council meetings!

Be afraid of debt –
Bonds and loans are there for a reason!

Neglect capital funding to "reduce rates"

- Repackage if you must

Questions?

Thank you!

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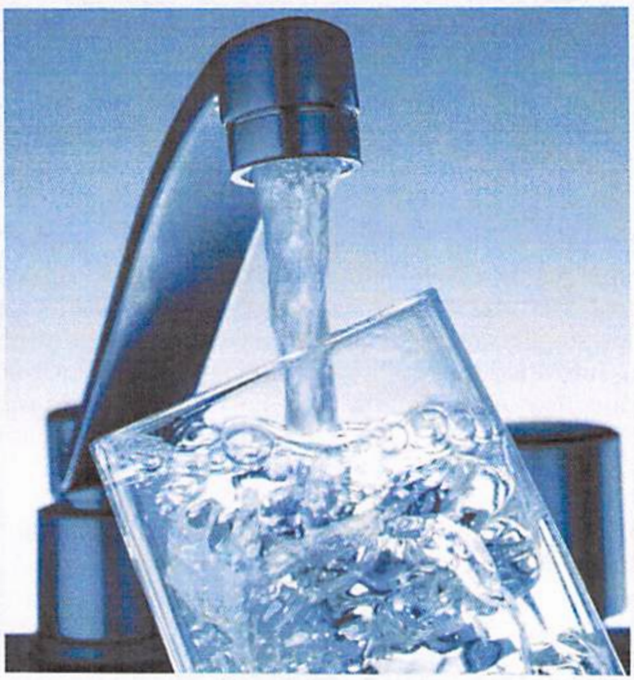
Designing Rate Structures that Support Your Objectives: Guidelines for NC Water Systems

June 2009



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Funding support for these guidelines provided by the Public Water Supply Section of the North Carolina Department of Environment and Natural Resources, and the United States Environmental Protection Agency

Designing Rate Structures that Support Your Objectives: Guidelines for NC Water Systems

JUNE 2009

AUTHORS:
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UNC
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ENVIRONMENTAL FINANCE CENTER

FUNDING SUPPORT FOR THESE GUIDELINES PROVIDED BY THE PUBLIC WATER SUPPLY SECTION OF THE NC DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES, AND THE U.S. ENVIRONMENTAL PROTECTION AGENCY

The purpose for these rate setting guidelines is to provide water and wastewater utility managers and technical assistance providers with a framework in setting water and wastewater rates and rate structures that would meet the state's and the utility's policies and objectives. These guidelines provide step by step instructions and necessary information to allow the utility manager to make an informed policy-driven choice on the rate structure design. These guidelines do *not* provide instruction on how to project revenues and costs and how to calculate rates (dollar amounts) to balance a budget, but references other documents that provide such guidelines.

These rate setting guidelines were developed by the Environmental Finance Center at the University of North Carolina's School of Government in June 2009. Funding support was provided by the Public Water Supply Section at the North Carolina Department of Environment and Natural Resources and the United States Environmental Protection Agency. The guidelines have enough general information to be useful in any state or country where water/wastewater rate setting is generally unregulated, but also has elements that are specific only to North Carolina systems.

Ideal Pricing

- Prices cover full "costs" of service
- Prices send and reinforce strategic messages
- Prices follow State's laws and policies
- Beneficiaries pay for their benefits and polluters pay for their pollution
- Ability to pay is recognized and addressed
- Simple

Generally speaking, utilities are primarily concerned about balancing their budgets when setting rates for the next year. However, rates and rate structures can go well beyond this, and provide an excellent avenue to help the utilities achieve some of its goals and policies. In an ideal world, rates would accomplish these points:

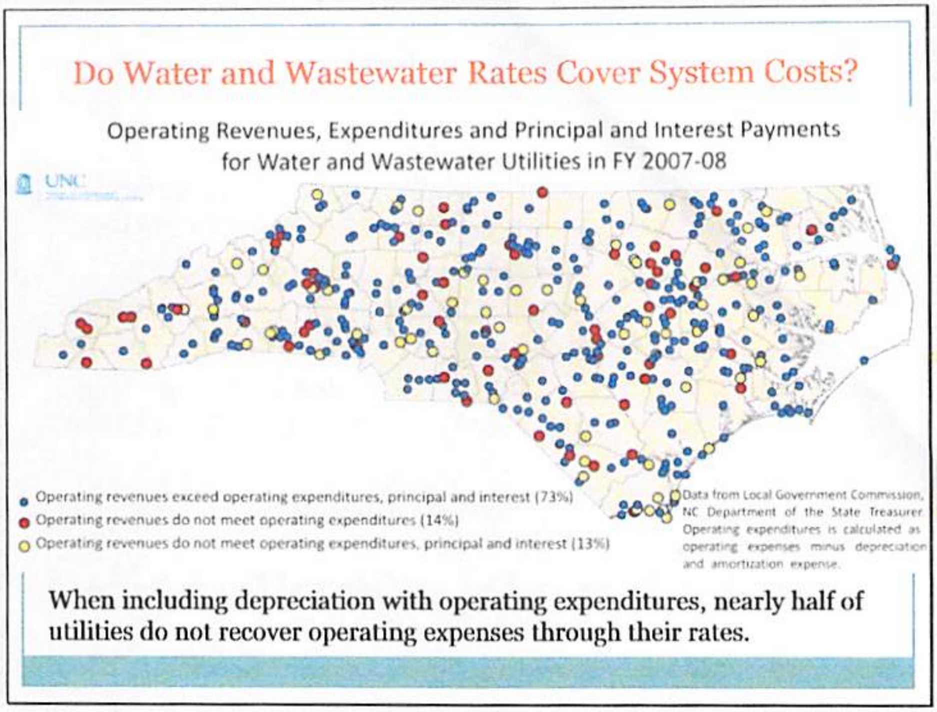
- Water and wastewater utilities in North Carolina are run as public enterprises. They must be financially self-sufficient, recovering not only the cost of daily operations but also being able to fund capital improvements.
- The amount that customers pay on their bills provide price signals to the customers. A utility charging high rates typically discourages large volume use among residential customers. There are ways to make the bill amount more sensitive to consumption behaviors and thereby further encourage conservation.
- Public water systems have very few laws specifying how they can set their rates with the exception of the recently passed NC Session Law 2008-143 (commonly known as the 2008 Drought Bill), which imposes a new requirement on residential water rate structure designs in North Carolina, and provides a definition for "full cost pricing".
- Customers using a lot of water or those with large seasonal variations in consumption should pay their fair share, since distribution networks are sized to meet peak demands.
- Maintaining "affordable" rates should almost never take precedence over charging rates that are necessary to recover the full costs of service. Artificially maintaining low rates will lead to deferring maintenance, rehabilitation and replacement, deteriorating infrastructure and creating public health hazards in the future. There are ways to address affordability issues within rate structure designs without placing the utility in financial risk, and importantly, there are alternative customer service programs that could be used to assist customers who are unable to pay their utility bills.
- Rate structure design should be simple for the customers to understand in order to take full advantage of the price signals intended by it, and also because, as with any other government service, the administration of water services should be transparent.

"Full Cost Pricing"

- 2008 N.C. Session Law 143-355.4(b)(1) [the "2008 Drought Bill"] :

"... adequate to pay the **cost of maintaining, repairing**, and **operating** the system, including reserves for payment of **principal and interest on indebtedness** incurred for maintenance or improvement of the water system during periods of normal use and periods of reduced water use due to implementation of water conservation measures."

The 2008 Session Law requires that all local governments and large community water systems have full cost pricing (as defined here) in order to be eligible for state loans and grants for water infrastructure. According to this Session Law, full cost pricing entails recovering all daily operating expenses, maintenance costs, principal and interest payments on indebtedness, or building up reserves in advance of applying for loans and grants for capital improvements. Utilities with asset management programs and Capital Improvement Plans are in the best position to plan for future expenses and ensure that their rates are adequate to cover the full cost of service.



Nearly a quarter of the local government water and wastewater utilities in North Carolina did not meet the definition of full cost pricing set by Session Law 143-355.4(b)(1). Data for this analysis were obtained from the local government utilities' audited financial data from the Local Government Commission at NC Department of the State Treasurer. The Session Law's definition of "full cost pricing" is in some ways a barebones definition. In addition to being able to pay for current operating expenditures and principal and interest, utilities should also be setting money aside for future capital replacement costs. One of the most common accounting costs relating to capital other than debt service is depreciation expense. Utilities should be recovering a significant (if not all, or more) portion of their depreciation expense through their rates to be able to fund future capital costs. In FY 2008, about half of the local government utilities did not recover operating expenses (including depreciation). Since construction costs in general increase faster than the rate of inflation, utilities should aim to recover more than 100% of their depreciation especially if most of their assets are very old and nearly entirely depreciated in value.

A utility that does not cover its operating expenditures, principal and interest payments, and depreciation through its revenues may need to review their rate structure and raise their rates.

How to Measure "Full Cost Pricing": A Few Financial Indicators and Benchmarks

- Operating Ratio: Operating revenues must exceed operating expenses, including at least depreciation
- Days Cash on Hand (Emergency Reserves): At a minimum have enough cash on hand to satisfy your billing period (e.g.: 2 months) or enough cash on hand to replace the single most expensive asset (e.g.: largest pump). Aim for more than 6 months of cash on hand.
- Debt Service Coverage Ratio: Must at least be >1. AAA-rated utilities have a median ratio of 1.5
- Transfers In From (or Out to) General Fund: Zero!

Operating ratio (operating revenues divided by operating expenditures or expenses) was described previously. Debt service coverage ratio is calculated as operating revenues minus operating expenses divided by principal and interest. The objective is to raise enough revenue (after expenses) that can at least fully cover principal and interest payments.

Another important financial indicator is the sufficiency of the utility's emergency reserves (days cash on hand) to be able to immediately pay off the price of replacing the most expensive asset in the system (e.g.: largest pump) in case of a sudden failure of that asset. Likewise, the emergency reserves should be able to cover the operating expenditures and debt service payments of several months of operations in case of sudden declines in revenue, either through non-payment of bills or reduced consumption, particularly during watering restriction periods.

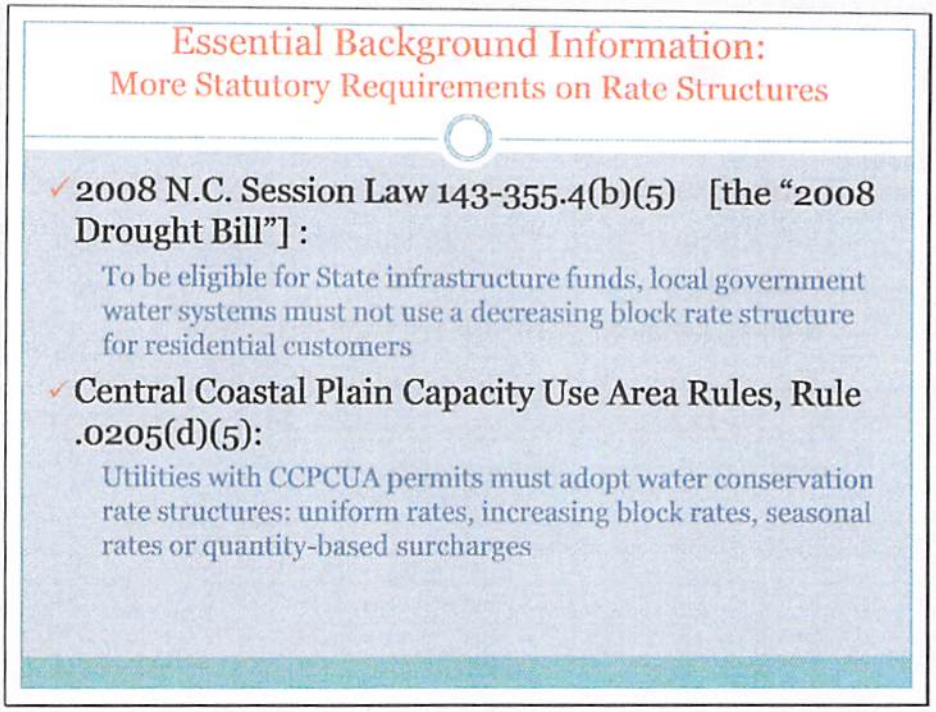
As a public enterprise, utilities should rely solely on self financing sufficiency and avoid transfers in from (or out to) the General Fund.

Utility managers should constantly, at the very least annually, evaluate these financial indicators and respond quickly by reviewing rate structures and raising rates if any of the indicators suggest less than optimal financial health.

The Process of Setting Rates

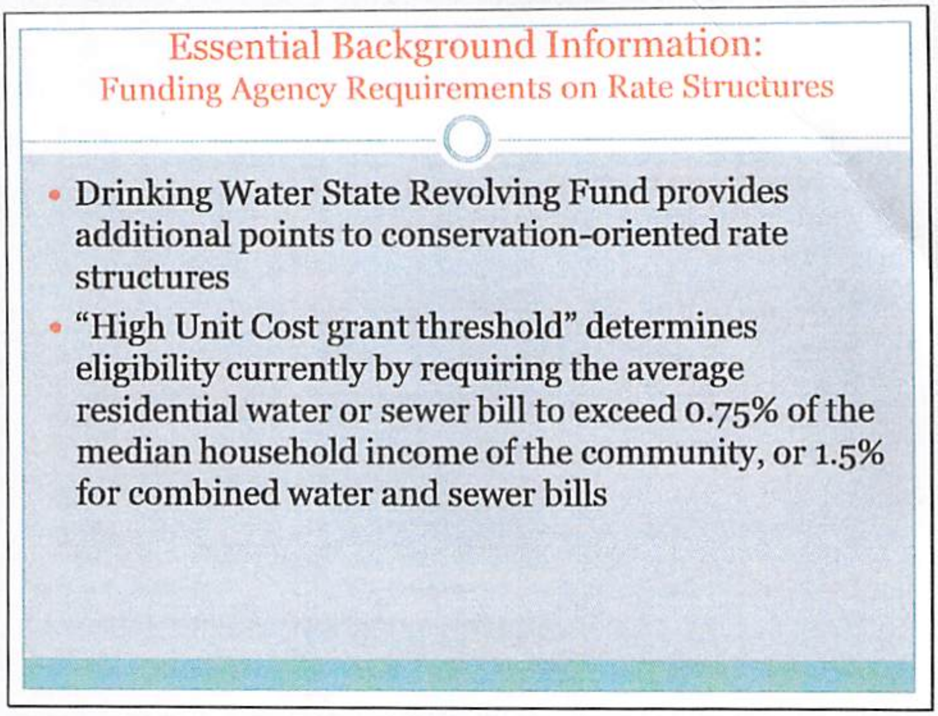
1. Learn essential background information about rates
2. Determine critical characteristics of your utility and community
3. Design the most appropriate rate structure
4. Price out rates using projected costs and revenues
5. Re-evaluate rate structure features after pricing and adjust to fit your primary objectives

These are the steps that utility managers generally take in setting rates. Steps 1 and 2 are general education steps that are necessary in order to ensure that the rate structures and rates set for the upcoming year are appropriate for the utility and its customers. These guidelines provide information for Steps 1, 2 and 3, and lists references for other documents that may be used to assist in Step 4.

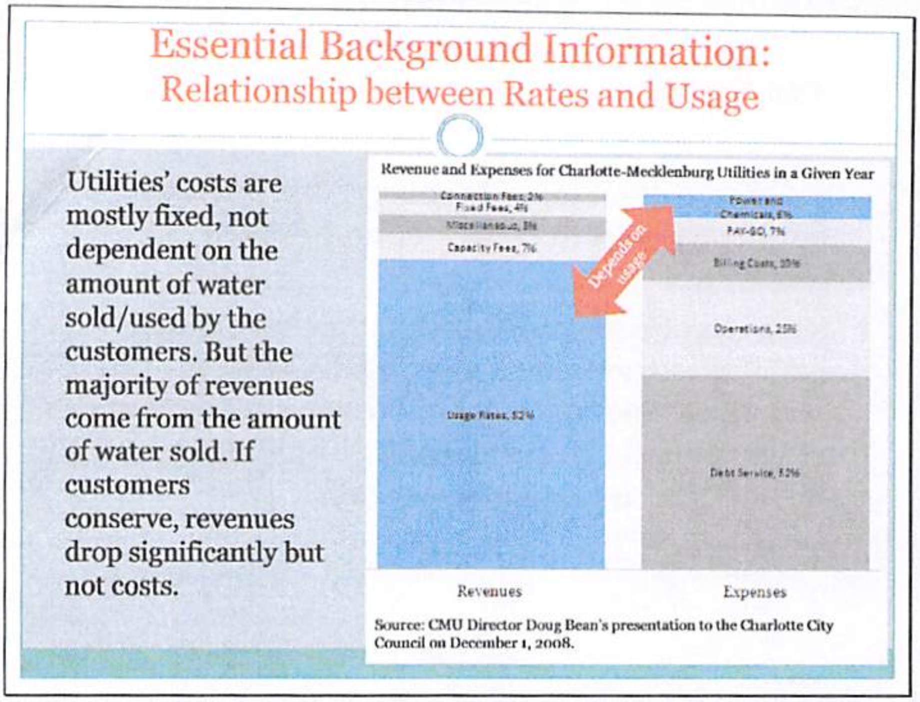


In North Carolina, there are two statutory requirements on rate structure designs, shown here. The 2008 Drought Bill requires that all local government and large community water systems not use decreasing block rate structures for their residential customers to be eligible for State infrastructure funds, starting July 1, 2009. The utilities within the Central Coastal Plain Capacity Use Area that hold CCPCUA groundwater withdrawal permits, regardless of their eligibility for State infrastructure funding, may not use decreasing block rate structures for any type of customer.

The State of North Carolina does not require any single rate structure design, and apart from the above two statutory requirements, utilities are able to select and design their own rate structures.

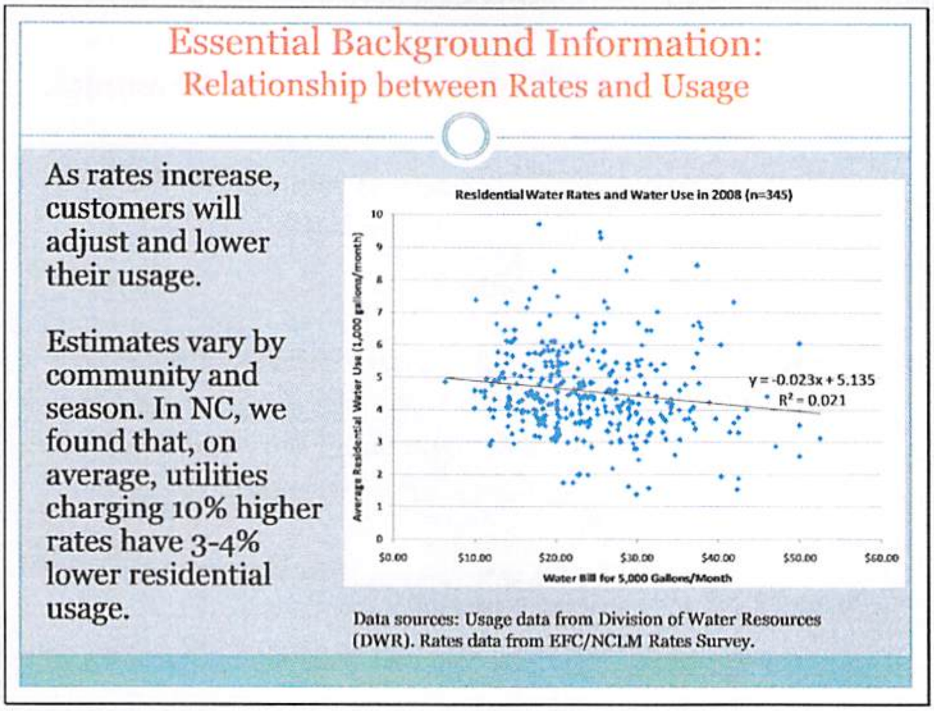


However, utilities applying for infrastructure loans and grants may find additional eligibility requirements set by the funding agencies or incentives to design rate structures in a certain way. Two of the requirements are shown here. A utility planning on applying for infrastructure funds should review the eligibility requirements far enough in advance in order to implement any necessary changes to its rate structures to comply with the funding agency's requirements.

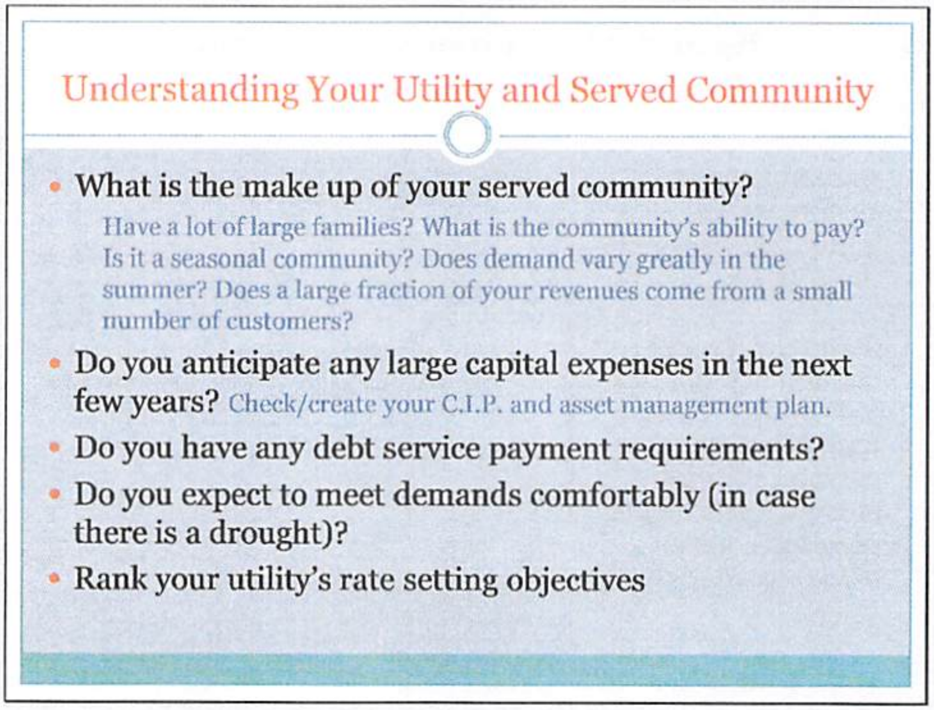


One of the key lessons that all utility managers should remember is that water and wastewater utilities are very capital-intensive. The vast majority of the expenses for a utility are tied to capital and administrative costs, and not tied to how much water is treated and distributed. *Variable costs* increase in the short run as more water is treated and distributed, such as the cost for energy and chemicals. *Fixed costs* are the other costs that the utility incurs, and do not vary in the short run based on volume of water produced. For most utilities, such as this example from Charlotte-Mecklenburg Utilities, the vast majority of costs are fixed costs, while the majority of revenues come from usage rates. Thus, if customers reduce their consumption significantly (e.g.: during mandatory watering restriction periods), revenues will reduce significantly while the overall costs will not change much. This is the reason why utilities frequently have insufficient revenues during mandatory restriction periods, and require a significant rate increase the next year.

There are ways the utility can design its rate structures to buffer against this effect, mainly through charging higher non-variable base charges, but these methods require a balance between setting revenue stability-oriented rate structures and conservation-oriented rate structures that reward customers financially for reducing consumption.

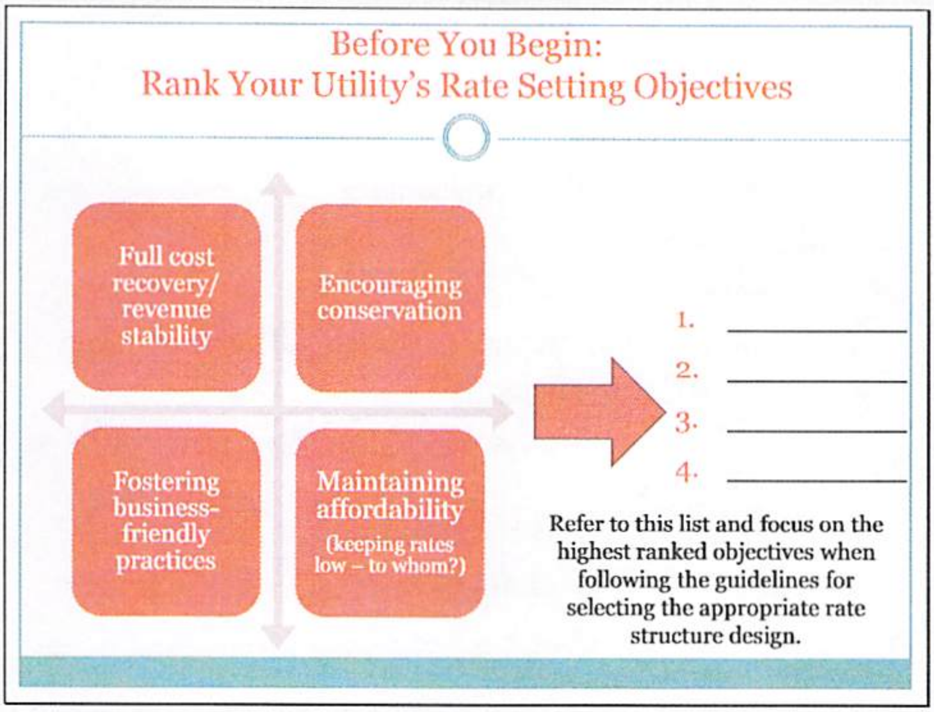


Generally speaking, customers of utilities that charge high rates use less water than utilities that charge low rates. More specifically, in North Carolina, utilities charging 10% higher rates have 3-4% lower residential usage on average. If a utility plans on raising rates significantly, it should expect a decline in per-customer use, and should use the lower usage estimates in projecting potential revenues. If a utility uses historical average consumption estimates without adjusting for price effects, it may over-project use and revenues, and set rates that are not sufficient to recover costs in the next fiscal year.

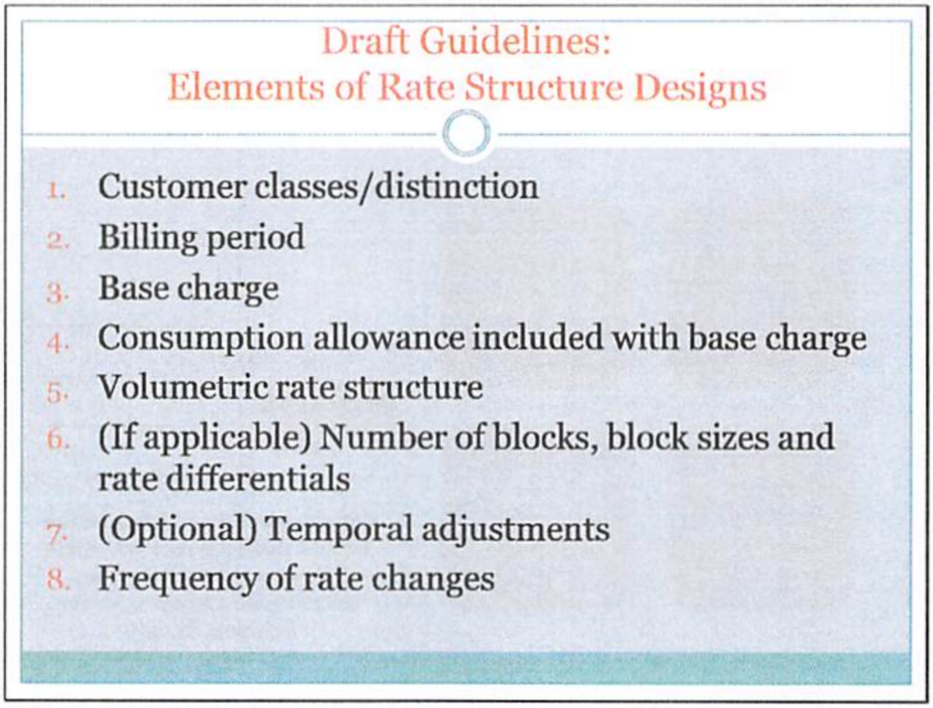


These are some of the questions the utility manager must be able to answer before reviewing rates. In particular, knowledge of the customer base is essential in designing appropriate rate structures that are fair and not overburdening for the customers. For example, a utility serving a community with a lot of large families might overburden many of its customers by switching to increasing block rate structures, since the large families may end up paying the high block rates without the ability of reducing consumption to drop to the lowest blocks.

Ranking the utility's rate setting objectives will provide a framework in designing appropriate rate structures.



Utilities have different objectives, some of which may be supported (or discouraged) through the rate structure design. While some of these objectives are complimentary, others may be contradictory. For example, a utility wishing to encourage conservation and foster business-friendly practices might be conflicted over the use of a single increasing block rate structure for all of its customers. Also, a utility wishing to maintain affordability by keeping base charges and rates low for low use might have to sacrifice its need for month-to-month revenue stability that can be maintained through higher base charges. Because some of these objectives require tradeoffs when designing the rate structure, it is a useful practice for the utility manager to begin by ranking the objectives first, and always referring to the top ranked objectives when tradeoff decisions appear.



These rate setting guidelines provide information about the following elements of rate structure designs. The guidelines should be followed sequentially.

Elements of Rate Structure Designs: 1. Customer Classes/Distinction

Alternative	Targets
One rate structure for all	All are equal
Separate rate structure for residential, irrigation, commercial, industrial, governmental, or wholesale customers	Specific type of customer
One rate structure, but with different base charges based on meter size	Non-residential or multi-family housing
One rate structure for all, but with blocks that implicitly only target non-residential use	Non-residential
Negotiated rate structure with individual high-use customers (typically an industrial customer)	Only one customer
Different rates for customers outside municipal limits/service area boundaries	"Outside" customers

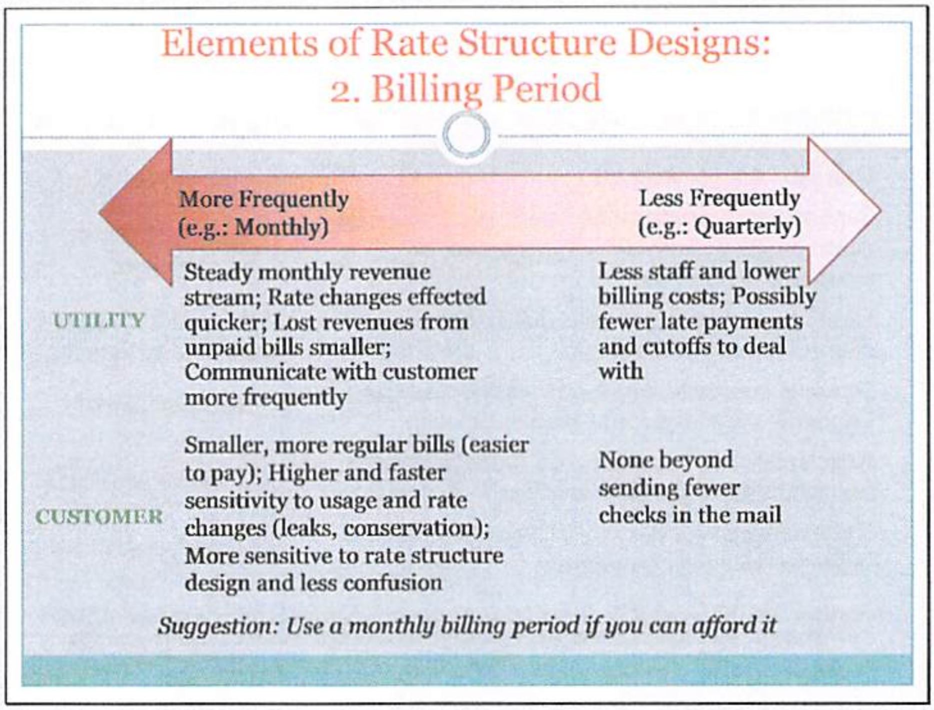
Important: You can only legally charge different rates for customers based on cost-related factors (often usage). E.g.: cannot charge lower rates to seniors or low-income customers explicitly.

Utilities have several options in deciding how to charge different sets of customers. However, utilities can only legally charge different rates for customers based on cost-related factors, such as usage. Hence, it is possible to set a rate structure for residential customers and a separate rate structure for commercial or industrial customers, since the non-residential customers use a lot more water and the marginal cost of providing them with additional units of water is very low. Utilities *cannot* charge lower or higher rates to customers based on non-cost related factors, and thus providing discounted rates to senior citizens or low-income customers purely on that basis is illegal.

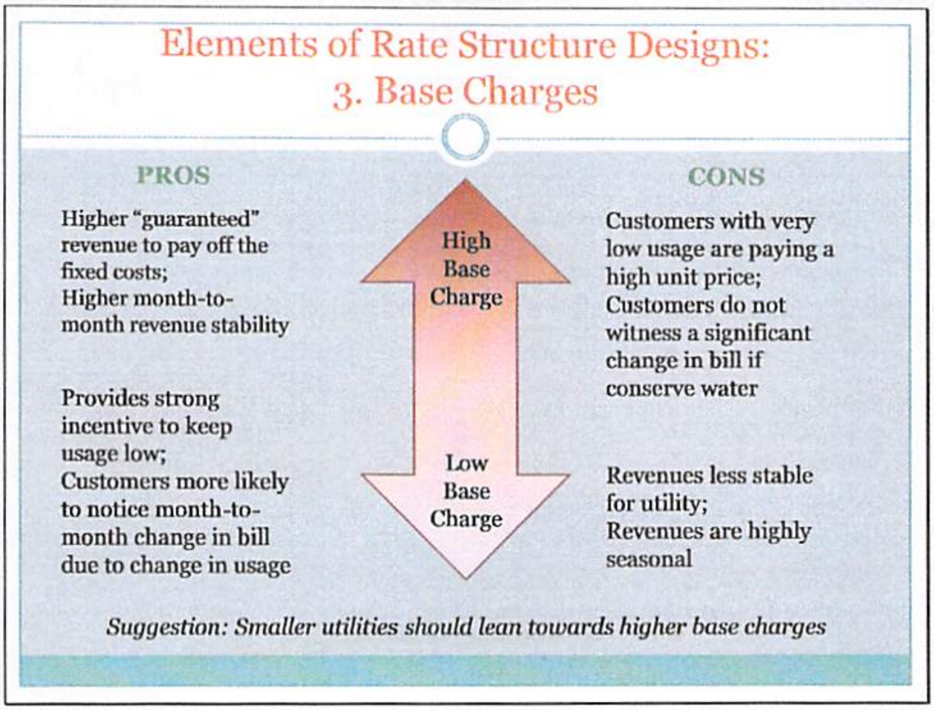
One advantage to creating different rate classes of customers as shown here is that it provides the utility with greater flexibility in targeting different objectives for different types of customers. For example, a utility could charge increasing block rate structures for residential customers to encourage conservation but also charge uniform rates for non-residential customers to avoid overburdening them with excessively high rates.

Residential irrigation meters provide the utility with an ability to charge residential customers a different rate structure for their outdoor (mostly seasonal and discretionary) water use. As of 2009, nearly 10 percent of utilities in North Carolina had created separate irrigation rate structures, charging much higher water rates (but no sewer rates) for irrigation water use than for regular, indoor household use. Since the Drought Bill requires that all new in-ground residential irrigation systems be separately metered after July 1, 2009, more utilities will now consider using irrigation rate structures.

Before adding new rate structure classes, utility managers should first assess the ability of their billing software to handle the complexity of this switch, and also the staff's ability to make the conversion and continuously monitor, assess and correct the inevitable increase in billing errors.



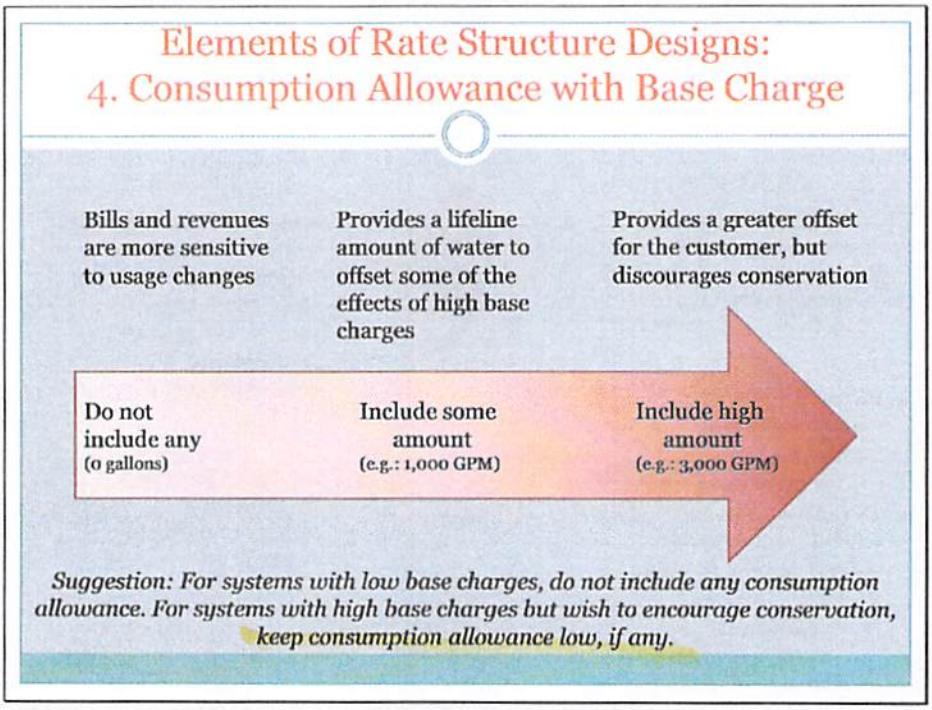
The advantages of using monthly or longer-than-monthly billing periods are shown here. From a customer perspective, monthly billing provides greater advantages than any other billing period. A utility must evaluate the tradeoff between increased operating costs for meter reading and billing against the advantages of monthly billing, including providing a much more stable month-to-month revenue stream. Additionally, our research finds that customers who are billed quarterly or bimonthly use more water on average than customers who are billed monthly. Hence, to a conservation-oriented rate structure would use monthly billing when possible.



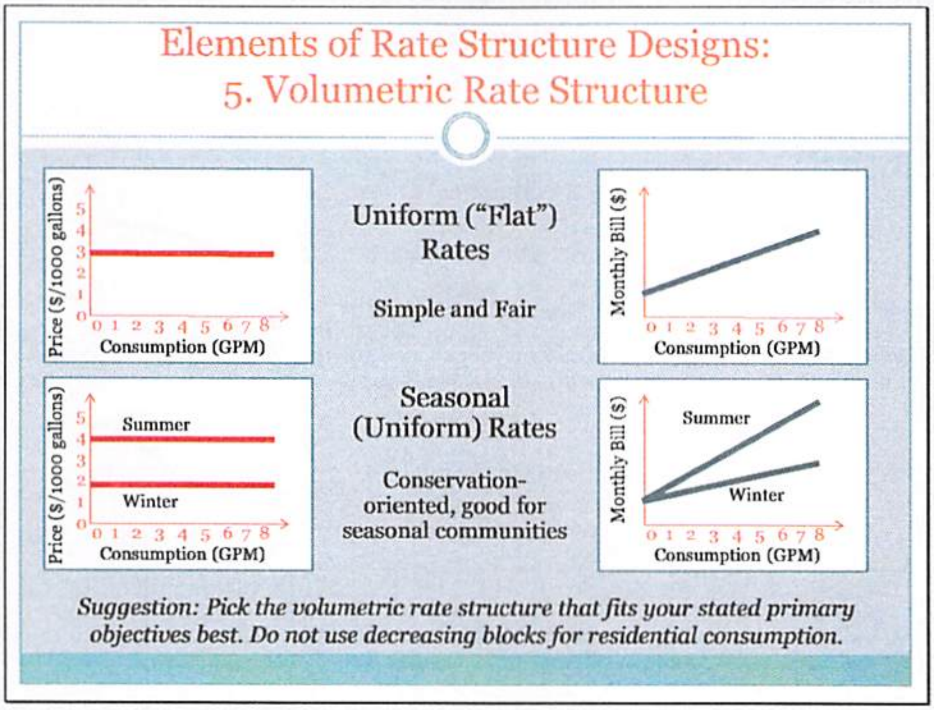
A base charge is the amount a customer is required to pay each billing period, regardless of the amount of water that is used. This is oftentimes called a "minimum charge." Base charges are highly stable sources of revenue for utilities, since they are immune to water use behavior. There is an incentive to charge as much of the fixed costs of running the utility in the base charge as possible, tempered only by affordability (since all customers pay this charge). The higher the base charge, the more stable the utility's revenues will be, but the less sensitive the total customer bill will be to changes in usage patterns. Hence, a customer reducing use significantly will not see a proportional decline in their bill if the base charge is a large component of the total bill. Utilities concerned about setting conservation-oriented rates by utilizing usage-sensitive rate structures are more likely to charge lower base charges (and higher volumetric rates). Also, utilities concerned about affordability may find it difficult to set high base charges.

Due to the capital intensive nature of water utility costs, and because of economies of scale, large utilities are able to spread their costs over large customer bases and thus are often able to charge low base charges. Smaller utilities, however, typically rely on higher base charges to recover some of their fixed costs.

Need to re-look at option to turn off meter + pay nothing — Need to still be able to recover fixed costs of providing access to water.

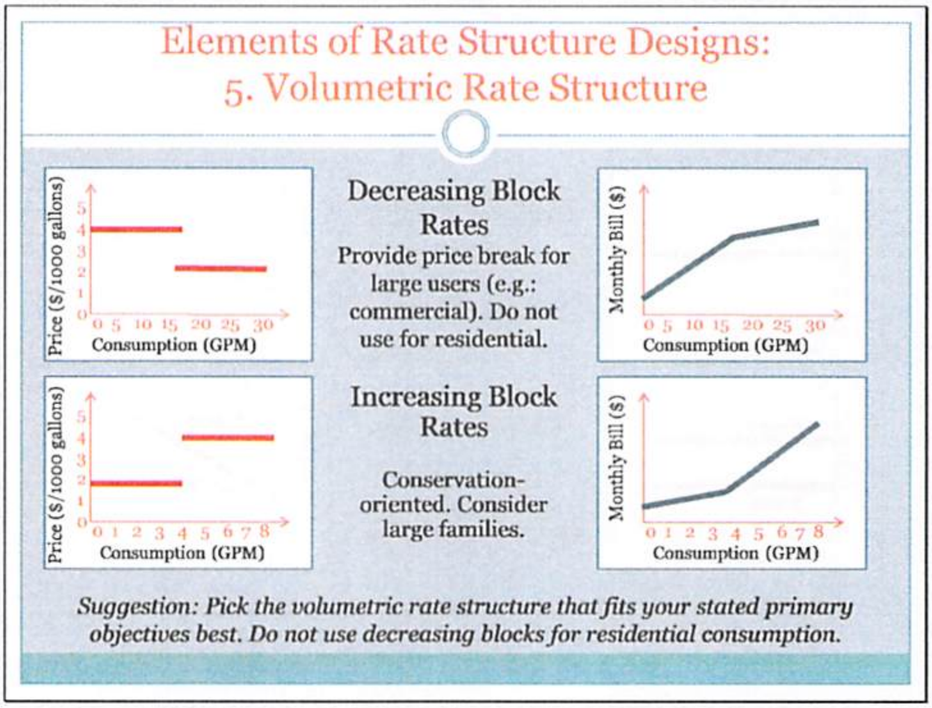


In order to offset some of the burden of high base charges on their customers, utilities sometimes include a minimum consumption allowance with the base charge such that any use within the consumption allowance is "already paid for" by the base charge. As with base charges, the higher the amount included in the consumption allowance, the less sensitive the total bill will be to water use reductions, and the less conservation-oriented the rate structure will be. Unlike with base charges however, the utility has no revenue stability incentive to include higher amounts of water in the consumption allowance. In fact, the more water is included in the consumption allowance, the less revenue the utility can expect to collect from the majority of its customers if the base charge is not adjusted similarly.

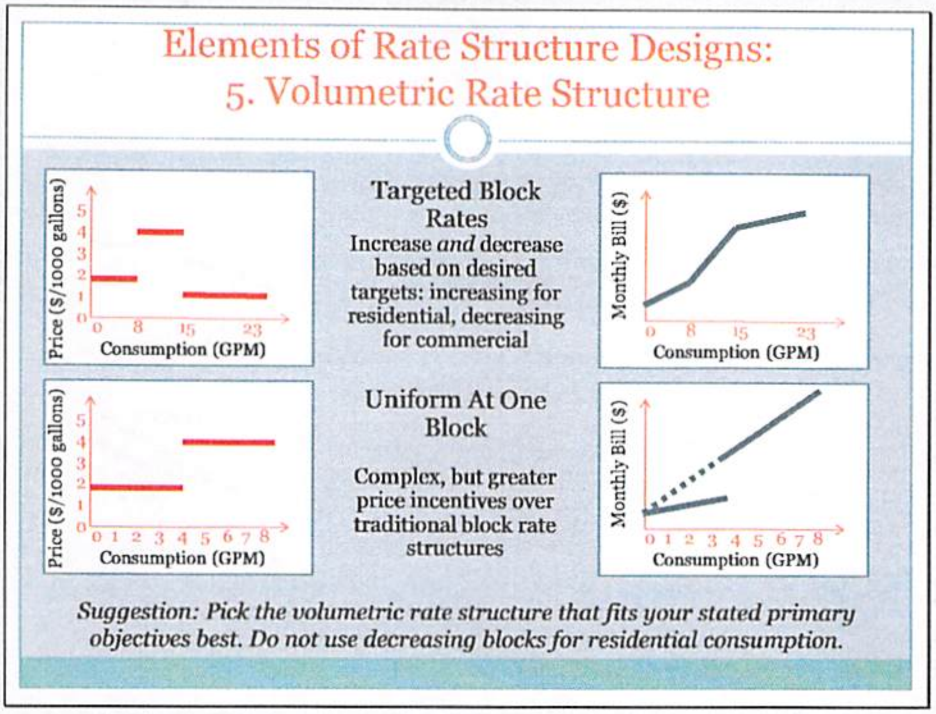


Utilities in North Carolina use a variety of rate structure types. The most common are uniform rates (often called flat rates), increasing block rates and decreasing block rates. In the past few years, utilities have been switching away from using decreasing block rate structures for residential customers, and adopting either uniform or increasing block rates. There are a few unique rate structure types. The utility manager should select the type of rate structure that best fits the primary rate setting objectives identified previously.

Seasonal rates are similar to uniform rate structures, but the price for water ($/1,000 gallons) is higher in specific summertime months than in the rest of the year. This discourages residents from increasing use significantly during the summer months when the majority of irrigation occurs. Seasonal rates are also appropriate for seasonal communities where demand for water is high in certain months and very low in others.

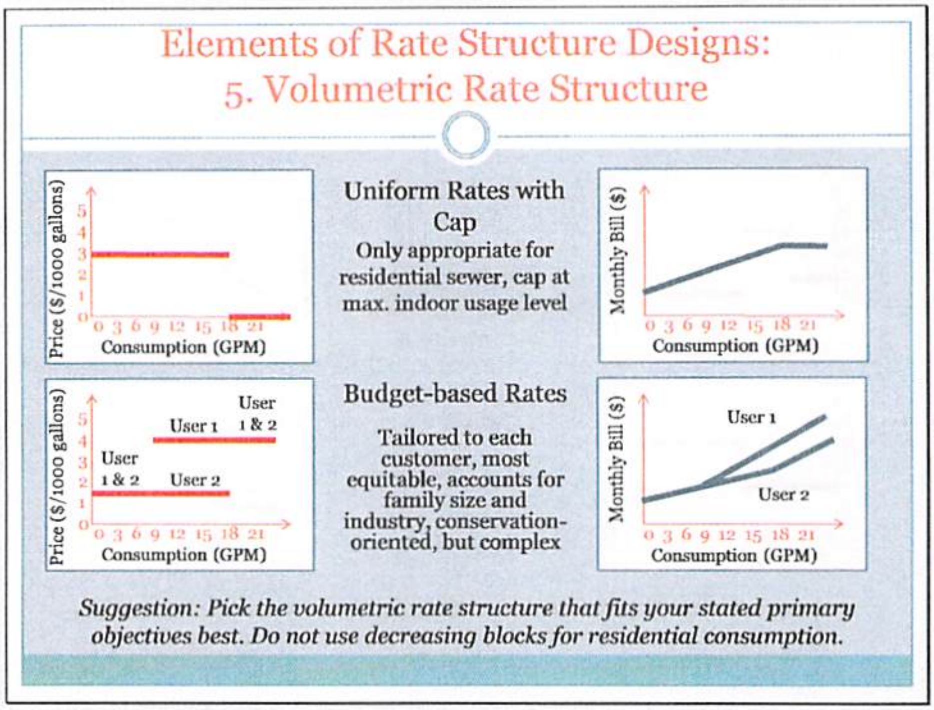


Water utilities should avoid using decreasing block rate structures for residential consumption. Some utilities have a single decreasing block rate structure for all customers, but set the first block size to cover a large amount of water (e.g.: 50,000 gallons/month) in order to essentially charge residential use at a uniform rate, while providing decreasing block rates to commercial and industrial customers.



Some utilities use a block rate structure, but instead of the block rates always increasing or always increasing, the block rates may increase and then decrease or vice versa. This rate structure type targets the highest (or lowest) price at a specific range of use. For example, some utilities with a single block rate structure for all customers target their highest block rate between 10,000 and 30,000 gallons/month, to cover residential irrigation use, and then provide a price break for commercial and industrial customers.

Another unique block rate design charges the customer the entire consumption amount at the block rate of the last unit of water, instead of charging use within each block at that block's rate. This version of a block rate design provides a much stronger incentive to avoid reaching the "next block" than a typical increasing block rate structure, since the bill difference will be substantial upon reaching the next block.



Some utilities charge wastewater rates using a uniform rate structure with a cap. Rates are charged uniformly up to a certain cap, which is usually set at the estimated maximum indoor usage level, after which no more wastewater charges are incurred. This assumes that any water use above the cap is really outdoor irrigation use, where the water does not return to the sewer system, and therefore it is fair to not charge customers wastewater rates for this use. This rate structure design should never be used for water rate structures.

Budget-based rate structures are essentially customized rate structures that are tailored to each individual customer. A customized block rate structure is set for each customer, where the blocks are determined by that customer's average historical wintertime use. This rate structure is complex to administer, but is arguably the most conservation-oriented rate structure, while also avoiding the common issues of traditional increasing block rate structures, such as accounting for family size and other variables that affect each customer's minimum monthly use.

Elements of Rate Structure Designs: 6. (If Applicable) Block Designs

For block rate structures to be effective:

- **Decide on the correct number of blocks**

  How many targets should you set on residential usage? Do you want all non-residential use to be charged at a uniform rate, or provide blocks for non-residential use as well?

- **Decide on where the blocks should end/start**

  Start the second block only where summertime residential use ends and non-residential use continues (i.e.: charge residential use at uniform rates)? Set increasing block rates for residential customers where the blocks end at average use (e.g.: 5,000 GPM), then double it (e.g.: 10,000 GPM), and then over that (to target irrigation use more specifically)?

Increasing block rate structures alone are not sufficient to encourage conservation. The design of block rate structures is critical to set the appropriate price signals to the customers, not unduly overburden certain segments of the service population, and to provide sufficient revenue stability for the utility. If a utility will use a block rate structure (increasing, decreasing, targeted, uniform at one block, or budget-based), they should consider these questions and use data-driven analyses to make decisions when possible.

For a utility to target residential consumption with increasing block rates, it should use at least 2 blocks within the normal range of residential use, from 0 through 15,000 gallons/month. It does not do any good to start the second block at a usage level that only a very small number of customers use. In determining the number and size of blocks, it is very useful to analyze from billing records the number of bills sent out each month for different usage levels. Increasing block rate structures for residential use should at least start the second block just over the average residential usage level.

If the utility only uses one rate structure for all of its customers, the block sizes at much higher levels of use should be carefully considered from the commercial and industrial customers' perspective.

Elements of Rate Structure Designs: 6. (If Applicable) Block Designs

For block rate structures to be effective:

- **Set significant rate differentials between blocks**

  Charging only 50 cents/1,000 gallons more in one block than in the preceding block defeats the purpose of using an increasing block rate structure. If you select a block rate structure, select significant rate differentials to see any added value of your rate structure.

- **Keep in mind your base charge and consumption allowance**

  High base charges and consumption allowances may be significant portions of the total bill, greatly diluting the effect of an increasing block rate structure on providing incentives to conserve. Offset high base charges by reducing the consumption allowance, or setting high block rates.

If the difference between block rates is insubstantial, the customer will likely not notice any changes to their monthly bills as they move in and out of later blocks of usage. For a block rate structure to be effective in communicating the higher (or lower) price of water at different consumption levels, the difference in the block rates should be significant.

Remember that use of consumption allowance and/or high base charges reduces the sensitivity of the total bill amount to changes in use, and thereby dilutes the effect of the rate structure. Block rates differentials should be even greater in the presence of high base charges or consumption allowances. Similarly, customers who pay combined water and wastewater bills may be less sensitive to the water block rate structure if wastewater is charged using a different rate structure (e.g.: uniform rates).

Elements of Rate Structure Designs: 6. (If Applicable) Block Designs

For block rate structures to be effective:

- **Meter reading must be punctual**

  If the meter is read a few days too late, it may unjustly place the last few days' of a customer's use in a higher block.

- **Replace meters frequently and repair lines quickly**

  Faulty meters or leaking pipes will cause the customer to be billed at the wrong block levels, costing either the utility lost revenue or the customer more.

Block rate structures require additional work on behalf of the meter readers and utility staff. In order to be provide good customer service and avoid inaccurately and unjustly billing customers at the higher block rates, utilities with block rates should make a commitment to read meters punctually (and consider the effect of holidays on meter reading) and also repair leaks quickly.

Meters should be replaced frequently in order to ensure the accuracy of meter reading. As meters wear out, they register less flow than what actually occurs, and utilities may end up inaccurately charging customers at the lower blocks, and lose revenue that is due to the utility.

Elements of Rate Structure Designs: 6. (If Applicable) Block Designs

For block rate structures to be effective:

- **Consider the adverse effect on large families**

  Large families consistently use high amounts of water throughout the year and may not have capacity to conserve. An increasing block rate structure therefore negatively affects the customer, without achieving any conservation objectives. Investigate your billing records to estimate the number of residential accounts that consistently use high amounts of water and use this knowledge to select the appropriate block sizes to mitigate this effect. Consider using uniform rates or budget-based rate structures if the community has many large families.

Elements of Rate Structure Designs: 7. (Optional) Temporal Adjustments

- Prepare for drought in advance: create an ordinance *in advance* to give the utility the ability to raise rates temporarily during a water shortage scenario (sometimes called "drought surcharges").
- Specify the potential rate increases precisely.
- Rate increases should be substantial to encourage conservation.
- Explicitly state the conditions that would trigger the temporary rate changes on and off. Tie the triggers to your water shortage response plans and water reservoir/well levels.

Note: Temporary rate increases that are significant in magnitude have been shown to be effective methods of encouraging conservation while recovering lost revenue.

In times of drought and mandatory watering restrictions, utilities' revenues are vulnerable to reductions in use, while the utilities' costs do not decline significantly. The vulnerability of revenues to reductions in use is particularly strong for utilities that designed conservation-oriented rate structures. In order to recover some of the lost revenue during the drought, and to prevent a permanent increase of rates right after the drought, some utilities have considered *temporarily* raising rates during the mandatory restrictions period. These are sometimes called "drought surcharges." These temporary rate increases would go into effect for two simultaneous reasons:

1) To recover some of the lost revenue as customers use less water (in order to continue paying the very high fixed operating costs), and
2) To encourage further conservation by setting higher rates for high volume use.

These temporary rate increases must be prepared for and communicated to the customers well in advance of droughts. Create an ordinance or internal policy with specific rules about when the temporary rates would be implemented, when they would be removed, which blocks would be affected, and how high the rates would go. The temporary rate increases must be substantial in order to encourage conservation. Ideally, the timeline for implementing and removing the temporary rates would be tied to water storage trigger levels and/or the water shortage response plan triggers. This removes the ambiguity of making the policy and political decision of when to implement the rates. Temporary rate increases can be staggered when tied to different water shortage response plan stages. For utilities with block rate structures, temporary rate increases can at first be implemented only on the highest use blocks in order to target outdoor irrigation water use while maintaining normal rates at the lowest blocks and avoid overcharging for indoor water use.

The creation of temporary rate adjustments is optional. However, once the utility has created an ordinance or internal policy, after public review, the utility should implement the temporary rate adjustment policy as specified when the trigger levels are reached.

Elements of Rate Structure Designs: 8. Frequency of Rate Changes

Decide when and how often you will review your rates. Some alternatives:

- Always review your rates annually (recommended)
- Review your financial health indicators annually, and then review your rates if any of the indicators reflect poor financing
- Pass an ordinance or internal policy to raise rates each year automatically based on inflation

Important: Avoid maintaining low rates at the expense of your utility's financial health. It will either lead to a sudden, massive rate increase in the future, or to failing systems and endangering public health.

Although the frequency of rate changes is not an element of the rate structure design itself, it is an important policy objective that should be addressed by the utility. Ideally, utilities would review their rates and rate structures annually to adjust them to changes to the utility or customer characteristics. In North Carolina, nearly 80% of utilities review their rates annually and about 50% raise rates in any given year.

At the very least, utilities should review their financial performance indicators annually and review their rates and rate structures when any of the indicators reflect poor financing.

A few utilities choose to pass an ordinance or internal policy to adjust rates annually based on inflation. While this step is certainly better than not reviewing and adjusting rates at all, it should not entirely replace the process of reviewing rate structures and rates. Occasional reviews will still be necessary to ensure that the rate structure and rates are aligned with current conditions.

It is very important that utilities avoid maintaining artificially low rates at the expense of the utility's financial health! This leads to deferred maintenance and capital improvements, and either to a sudden massive rate increase in the future, or a failing system with risks to public health.

Scenario #1: Urban Utility Currently With Low Costs and High Demand, Wishing to Encourage Residential Conservation

1. Customer class: possibly create separate residential class.
2. Billing period: use monthly.
3. Base charge: keep base charges low.
4. Consumption allowance: do not include.
5. Volumetric rate structure: increasing block, seasonal, uniform, budget-based. Set high rates.
6. (If applicable) Block design: multiple blocks within residential use (first block ends <5,000 GPM, second block ends near large family indoor use, third block within irrigation levels). Set low rates in blocks up to 5,000 GPM and much higher rates in later blocks.
7. (Optional) Temporal adjustments: recommended.
8. Frequency of rate changes: annual.

Utilities with different customer characteristics, supply and demand issues, and policy objectives would come to different conclusions on the rate structure design that is most appropriate for them.

In this scenario, an urban utility with low per customer costs of service and high demand wishes to encourage conservation. Their primary objective for rates is to recover costs of service, and their second highest objective is to encourage conservation. The utility in this case would aim create a conservation-oriented rate structure and ensure that customer bills are sensitive to use reductions. Hence: low base charges, no consumption allowance, high rates, small block sizes and significant block rate differentials. Temporary rate adjustments would be especially attractive to this utility. The utility may decide to create separate rate classes of customers if it is concerned about the effects of high rates on non-residential customers.

A useful document that guides the user in setting conservation-oriented rate structures may be downloaded at http://www1.gadnr.org/cws/Documents/Conservation_Rate_Structures.pdf

Scenario #2: Rural Water Utility With Naturally High Costs and Excess Capacity, Wants to Maintain Affordability

1. Customer class: possible create separate residential class.
2. Billing period: use monthly.
3. Base charge: if majority of customers use little water, charge fair base charge and include allowance. Otherwise, low base charge, and shift high rates to high volume users.
4. Consumption allowance: if including, set at a lifeline amount (~2,000 gallons/month).
5. Volumetric rate structure: probably use uniform
6. (If applicable) Block design: if using, first block at least 4,000 GPM, depending on your customers' consumption.
7. (Optional) Temporal adjustments: none.
8. Frequency of rate changes: annual.

Note: Set up a customer assistance program: http://www.efc.unc.edu/tools.htm#customer_assistance.

In this scenario, a rural utility with naturally high rates and with excess capacity wants to sell water and maintain water affordability, and is not concerned as much with conservation. In this case, there is no real need for increasing block rate structures, and uniform rates are simple to design and implement. The tradeoff occurs between base charges and consumption allowances. Since the utility has high costs of service, it may be forced to set a high base charge. If this happens, the utility can offset some of that impact on low income customers by including a consumption allowance with the base charge. However, if possible, the utility will want to set as low a base charge as possible to keep bills low for low consumption customers. Monthly billing should be used to send out smaller bills more frequently to their customers instead of larger bimonthly or quarterly bills, which could be difficult to pay for some customers. Temporary rate adjustments would not be attractive to this utility.

In the case of maintaining residential affordability, utilities can look beyond their rates and rate structures and implement customer assistance programs. For example, some of the larger utilities in North Carolina provide their customers with the option to always round up their bill to the nearest dollar. The extra few cents paid each month go into a customer assistance account, which can then be used by the utility to assist low income customers who are not able to pay their utility bill. This would assist the customer who needs assistance the most, while also ensuring that the utility receives its due revenue. An Excel-based tool to help utilities cost out customer assistance programs is available at
http://www.efc.unc.edu/tools.htm#customer_assistance

Pricing Out Your Rate Structure (References)

Use any of several reference documents with step by step instructions on calculating projected costs, revenues and rates:

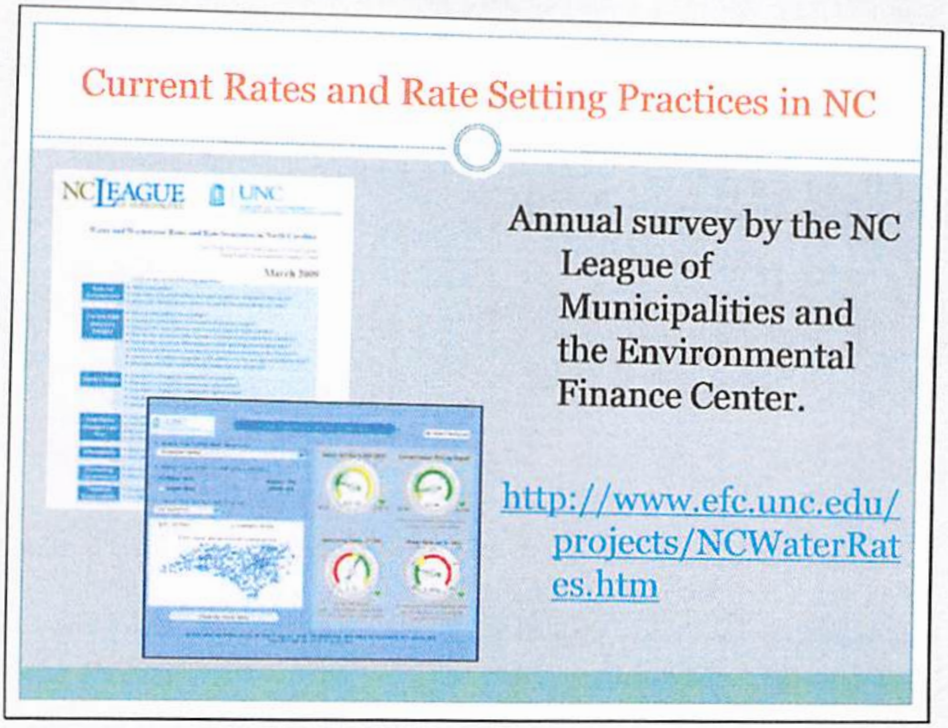
- AWWA (2000). *Principles of Water Rates, Fees, and Charges: Manual of Water Supply Practices, M1.*
- U.S. Environmental Protection Agency (2006). *Setting Small Drinking Water System Rates for a Sustainable Future: One of the Simple Tools for Effective Performance (STEP) Guide Series.* EPA 816-R-05-006. Office of Water, Washington DC. 62 pages. http://www.epa.gov/waterinfrastructure/pdfs/final_ratesetting_guide.pdf
- Georgia Environmental Protection Division (2007). *Conservation-Oriented Rate Structures.* http://www1.gadnr.org/cws/Documents/Conservation_Rate_Structures.pdf

There are dozens of manuals, guideline documents, tools and models that provide step by step instructions on how to price out rates using projected demand, costs and revenues. These first two documents listed here provided excellent guidance for pricing out rates, and the second is particularly useful for utilities with simpler rate structure designs. The third document listed provides guidance on setting conservation-oriented rate structures from the State of Georgia.

Re-evaluate the Proposed Rate Structure

- ✓ Will your new rate structure provide sufficient revenue next year to be considered "full cost pricing"?
- ✓ Is your rate structure design in tune with statutory and/or funding agency requirements?
- ✓ Is the overall rate structure design in sync with the primary objective(s) you identified?
- ✓ Is the bill for average residential consumption within the ability to pay of your customers, including your low-income customers?
- ✓ Are the rates fair and equitable to your non-residential customers?
- ✓ Is your rate structure relatively simple to understand?

After designing the rate structure, assess whether the proposed rate structure meets requirements and your stated objectives. This is a checklist of a few of the questions to consider.



For frequently asked questions about current rates, rate structures and rate setting practices in North Carolina, please visit this webpage. The Environmental Finance Center and the North Carolina League of Municipalities conduct annual rates surveys in which nearly every local government and non-profit utility in the state participates. In the 2009 rates survey, 498 utilities participated.

The Johnson Foundation AT WINGSPREAD

Alliance for Water Efficiency

Declining Water Sales and Utility Revenues:

A Framework for Understanding and Adapting

Water has been readily available & inexpensive. However the concept of ...

National Water Rates Summit

Racine, Wisconsin
August 2012

SUMMIT SUMMARY

Declining Water Sales and Utility Revenues

A FRAMEWORK FOR UNDERSTANDING AND ADAPTING

August 29 – 31, 2012
The Johnson Foundation at Wingspread

Summary of the Identified Problem

In increasingly more regions across the United States, maintaining long-term water supply reliability has become an important concern. This concern has underscored the need for and the implementation of widespread water conservation efforts, and has spawned the creation of such organizations as the Alliance for Water Efficiency (AWE) to help water suppliers design appropriate responses.

Partly due to successful water conservation programs, improved water-saving fixtures and technology, and a number of other factors, both water sales and water-related revenues are falling on a national level. With sales and revenues declining, how can water utilities cover costs of water treatment and delivery? How can they cover the rising costs of infrastructure repair and replacement? Most importantly, how can they meet these costs while still encouraging much-needed conservation efforts?

This daunting question – dubbed the "conservation conundrum" – provided the backdrop and framing for the Declining Water Sales and Utility Revenues summit.

Summary of the Process

The Alliance for Water Efficiency successfully convened this summit of water rates experts at the Johnson Foundation at Wingspread on August 29 – 31, 2012. Twenty-five industry experts participated, along with five observers. The experts included rate setters, economists, regulators, utility executives, and advocates. The conversation was wide-ranging and productive.

To prepare the attendees for the summit, Dr. Janice Beecher of Michigan State University's Institute of Public Utilities and Dr. Thomas Chesnutt of A&N Technical Services prepared a framing paper and the Alliance for Water Efficiency hosted a webinar a week before the event. Subsequent to the summit, Drs. Beecher and Chesnutt incorporated elements of the discussion into a White Paper that was distributed to the participants, is available on AWE's website, and will be the basis for subsequent working groups on the topic and presentations at professional meetings. This work was made possible by funding from the Walton Family Foundation.

The summit itself entailed seven elements. It began with opening presentations that framed the conversation as one that far transcended economics alone, introducing political, regulatory, social, and communication context as well. It then addressed five different discussion topics:

1) How and why are water sales declining?
2) Are water utility revenues falling short of revenue requirements?
3) Do water utilities and the conservation community have a messaging problem?
4) What methods are available to repair revenues and improve fiscal stability?
5) What role do industry standards, practices, and policy reforms play?

It concluded with a summary discussion of ways in which the thinking of the experts had shifted as a result of the summit conversation.

This document summarizes the compiled proceedings of the summit.

Framing Discussion: Politics and the "Conservation Conundrum"

The economic and financial components of this conversation cannot take place without a profound discussion of political components as well. While the simultaneous needs for balanced budgets and water conservation are reasonably well accepted, political considerations alter the playing field. Despite politician's good intentions, forces such as NIMTO – "not in my term of office" – and a desire for political advancement can inhibit approvals for rate increases. Most politicians' primary motivation, after all, is to get reelected. Water boards tend to be a good starting point for young political aspirants. Raising rates is neither a road to reelection nor political advancement because of the unfortunate negative perception by the rate-paying public.

Furthermore, in many regions, water availability follows a pattern of boom and bust. In periods of shortage, water utilities encourage conservation, and consumers respond effectively. In periods of plenty, however, the pattern reverts. Utilities collect as much revenue as they can, and consumers feel confident that the supply will remain reliable well into the future.

The group as a whole embraced and expanded on these realities. Public dialogue in rate cases, while expensive, time consuming, and cumbersome, can help relieve the pressure on the rate case decision makers, especially when those decision makers are elected officials. However, they require planning, time, money, and hard work. Likewise, with education and a deeper understanding of the systemic consequences of unreliable water supplies, consumers could vote with their heads instead of their wallets; politicians and constituents alike need to be educated on issues related to water supply.

One proposed solution that was discussed entails shifting the onus of responsibility from elected to non-elected officials, appointed boards, or independent municipally owned corporations, thus putting distance between the electoral process and rate setting, sidestepping the re-election dilemma. Another entails engaging the "intense minority": those individuals who care enough to make noise about an important issue.

Utilities are not free of responsibility in addressing this problem. Few utilities fully understand the reliability requirements or concerns of their customers. If the true costs of reliability could be effectively measured and communicated, consumers might be more willing to agree to the related costs.

Discussion #1:
How and why are water sales declining?

The intent of the discussion was to lay a foundation for quantifying root causes of declining sales and declining revenues, thus potentially establishing a list of priorities for addressing the problem. What proportion is due to utility undercollection? To the relocation of industries? To the downturn in the economy? To stricter codes and standards? To active water conservation programs? The group, however, quickly shifted the direction because of the dynamic, constantly shifting nature of the playing field. No answer for one region could hold for others. This dynamic overtone of the conversation persisted throughout the summit.

The conversation began with a comparison of the Seattle and Denver areas. As the Seattle area experienced a drop in water usage, a suburban water agency did not interpret the available data quickly enough and did not adjust rates accordingly. As a result, it entered into unnecessary contractual agreements with water suppliers and is now buying unneeded water at a premium price. Part of the dilemma grew from unreliable demand forecasting. While utilities must make decisions based on forecasts, those forecasts often miss the mark. In practical terms, per capita water use in the region dropped by 20% to 50% because of a combination of code changes, more efficient use, active conservation programs, price, community education, and weather and rain patterns. The situation is not yet really changing: even as the population increases, water sales are declining, not for one reason, but for all of these reasons in shifting proportions.

Another challenge highlighted by this complexity is variability. Weather patterns shift continuously, economic conditions are cyclic, and neither is easily predictable.

Denver, on the other hand, saw its supplies dwindling as the population continued to grow. It responded by spending millions of dollars on a consumer education campaign that few smaller utilities could afford. The resulting conservation awareness and improved efficiencies stabilized the supply dilemma, and the city revised its rates to reflect a balance of declining sales despite increasing population. As a result, the city is tightly controlling the historical spikes in water sales that occur on very hot days. The city is now planning around the notion of a permanent decline in per capita usage.

Measuring demand presents a snapshot of the complexity of the dilemma: predicting water sales requires precise metering and more rigorous demand forecasts. Upgrading meters to measure lower flows, however, costs millions of dollars. Building that money into the budget is challenging and time consuming, especially in light of the fact that the outcome simply reflects more accurate billing and consumption records. Past methods of straight-line extrapolation of per-capita consumption are no longer valid. Accurately measuring and predicting the effects of climate change simply cannot be done. Despite the complexity of these challenges, the group agreed that better methods for estimating future demand and converting to modern, more accurate metering are important and necessary steps nationwide.

The discussion revealed a logical red flag: while there has been a long-term trend of per capita water use declining, will the trend continue or will water use stabilize? How can demand forecasters know when reductions in usage are long-term or short-term?

Likewise, cultural shifts are taking place. While warm climate populations continue to grow, per capita water use continues to decline. The big drivers tend to be code changes, more efficient fixtures, landscape changeouts, and better data. Cultural changes, however, are also appearing to be significant as the historical desire for green lawns seems to be waning in upcoming generations. In Phoenix, for example, changeovers from turf lawns and high-water-demand plants to native desert landscaping are shifting water use patterns dramatically. As the summit panel noted upon hearing such information, while the revenue declines are of very serious concern, the long term successes in service to a more sustainable future must be celebrated.

Discussion #2:

Why are revenues falling short of requirements?

Current research from the Water Resource Foundation is revealing that while a sampling of utilities are seeing water use drops of 20% or more, revenues are declining by only about 5%. They are looking at rate structures and strategies that control utilities' financial risks and examining the effects of specific elements, such as economic cycles, various finance and rate models, and risk assessment tools. The results of this study will be published in mid-2013. Interim findings appear on the Water Resource Foundation blog.

While not all utilities everywhere are experiencing revenue shortfalls, the very notion of falling revenues raises serious concerns among officials. Effective rate setting is core concern, but setting rates is a challenging process because it is so complex and involves so many stakeholder groups. Regulatory lag, for example, is a well-known and understood problem – and, in fact, valuable in controlling monopolistic effects – but not one that is readily manageable. To put lag into operational terms, it is not uncommon for two years to pass from the completion of a cost design to actual revenue collection.

The group suggested a research effort aimed at identifying financially sound utilities and capturing their differentiating practices. The question of whether a utility is private or public did not seem to drive financial decision making or long term financial security. Solutions such as fixed revenue schemes ensure revenue but do not encourage efficient operation, which is a cornerstone concept among water providers.

The complex relationships among revenue, costs, and budgets girded a number of conversations. Their relationship is a systemic one, rather than linear. Miscalculations related to any of them can throw the full calculation out of balance.

Likewise, the effects of the declining economy and housing market have been complex and wide ranging. In addition to reduced water sales, for example, development charges and connection fees have plummeted in some service territories. Interestingly, similar sets of conditions have resulted in a range of impacts to the financial health of utilities, probably depending on the accuracy of the long-term forecasting, the effectiveness of the management team, and the speed with which the utility could respond to shifting conditions.

Effective forecasting drives many of these institutional concerns affected by the management and decision-making process, but effective forecasting presents unusual challenges. While engineers might tend to overestimate sales, financial analysts fear the budgetary implications of overestimation.

The depth of these complexities became more apparent during a conversation related to budgeting for maintenance and equipment replacement. From an economic perspective, the most cost-effective strategy in certain situations might be to budget for no system maintenance whatsoever, and instead run the equipment "to failure." This approach flies in the face of demonstrated management theory, and could not be a viable strategy when reliability and the public health are parts of the equation. Thus, rate setters and accounting systems must balance any unusual factors.

Further, water bills often contain items in addition to drinking water itself, such as the cost of waste water treatment, storm water management, fire protection and other forms of resource management. Indeed, entire watersheds might be considered infrastructure in need of maintenance, and "forest to faucet" watershed governance might become increasingly common. Obviously, line item charges need to be real, but they are not always readily apparent. Since customers respond to the bill rather than the line items, this public education effort is challenging and difficult.

Discussion #3:

Do water utilities and the conservation community have a messaging problem?

The City of Austin kicked off this conversation by identifying a strategic messaging error: the utility told customers they could save on their water bill by conserving water. Those savings rarely appear on the bill, and explaining how reduced water use does not always translate to a lower water bill is problematic. Worse, utilities have often responded to this enigma by slashing conservation budgets in times when supplies are not at risk.

The issue of language became increasingly apparent during this discussion. To some, conservation is synonymous with rationing. To many, it means efficiency. Rarely is conservation understood to be a long-term investment strategy in water supply that will offset future capitals costs to the ratepayers. Thus, conservation often gets a "bad rap" from customers and water commissioners.

Another example of the messaging challenges we face is that people have no idea of the real cost of water or its value to society. Tap water in the United States has a long history of being readily available and inexpensive. It has been so cheap and plentiful as to devalue its actual worth. Nevertheless, its quality and importance cannot be overstated.

The overall customer message needs to be clearer. It needs to be properly segmented so customers understand such distinctions as those between "conservation" and "efficiency." With the Internet revolution and the rise of social networking, new tools are available for addressing these messaging challenges.

The messaging challenge goes far beyond conservation and efficiency. Consumers need to be able to differentiate between rates and bills, especially in instances when bills rise even when water use does not. The concept of "cheap" water needs to become a thing of the past. Consumers also need to value a clean water supply's contribution to public health and safety, as well as the economy.

A question of marketing arose in the discussion: why is it that water is generally marketed by engineers rather than by branding or marketing experts? The complexities related to capturing, treating, and delivering drinking water might require just such a shift. (If the concept of "clean coal" can get such traction, why does clean, reliable water present such a challenge?) Billing units present a strong case in point: depending on the water provider, customers may be billed in gallons, cubic feet (cf), or hundred cubic feet (ccf), and very few consumers know what a cf or ccf is.

The inevitable raising of rates will require trust, clarity, and understanding. Consumers need to understand the full implications of not raising rates. They need to understand the drivers of rates and rate increases. For many utilities, effectively communicating these messages will require professional help.

One aspect of water that affects the messaging challenge is that "all water is local," so national messaging campaigns are not perceived by consumers to be relevant to them. Consumers tend to be more responsive to water issues when they understand the sources of their water. When water utilities import water from long distances, establishing a sense of stewardship proves challenging; thus, utilities have not been able to capitalize on the potential benefits of national messaging.

Overall, the group expressed widespread agreement that messaging is an essential practice that has not received the attention it needs.

Discussion #4:

What methods are available to repair revenues and improve fiscal stability?

Segueing from the last discussion, this conversation began with the premise that rates should be accurately calculable under virtually any circumstance. What is not readily calculable is the extent of political will needed to accomplish this goal.

Consumption also plays an important role in rate setting. While fixed costs are not directly related to consumption, consumption plays a role in driving fixed and variable costs. Different rate-setting methodologies prioritize consumption and costs in different ways.

In Southern California, Rancho California Water District has implemented a water budget-based rate structure. The structure has a 500% rise between the lowest "budget" tier ($1 per hundred cubic feet) and the highest tier ($5 per hundred cubic feet). Since the implementation of this structure, the top tier of users has reduced its usage by 50%. While the water district has seen total water demand decline by 30% over the last five years, it has still maintained full cost recovery due to the basic rate setting principal of recovering fixed cost with fixed revenues and structuring the budget-based tiered rates to reflect the marginal costs of water supply sources. Rancho California and others, such as the City of Austin, have framed their innovations as a strategy for providing a baseline of essential water at a very low rate within a rate structure that encourages water use efficiency and helps ensure appropriate cost recovery in changing demand cycles.

There are numerous case studies of a wide variety of rate structure types. The overriding lesson is that no single rate structure can work for all communities, and customization to the culture and the needs of the service area is essential. Some customers will always be displeased, regardless of rate structure. Rate stabilization funds can supplement rate structures by offsetting unexpected drops in water sales, but all-too-often, they get raided for general fund purposes, thus compromising their value for the intended purpose.

The direction of this discussion broached an innovative idea that generated some interest among the full group: creating a mechanism for demand insurance for water, perhaps similar to a derivative program. If the political will existed, a market could emerge for sharing the risks associated with supplying water.

The other conversation that generated some degree of interest – though not as positive as that for demand insurance – was of decoupling, similar to the efforts prevalent in the electricity market. In short, decoupling efforts in California have not worked to the satisfaction of consumers. According to one participant, "California's experience with decoupling is troubling. It isn't working." Water and energy differ in a number of significant ways, which in turn shift the ways that strategies such as decoupling can work. While decoupling is successfully increasing efficiencies in electrical consumption, overall electrical consumption continues to increase. This equation cannot be sustained with fresh water. Likewise, there are very large gaps between large and small water users. Who picks up the costs when large users cut back on consumption?

This conversation led to a widely accepted truth, summarized by this thought: "We are looking for a magic pill. We have the basics and must recognize that there is a new normal in water usage. Since rate making spreads costs over water sales, the industry must accept that sales are down to a new lower level."

This "back to basics" thought generated real interest, and the idea emerged that perhaps this entire conversation has become more complicated than it needs to be, once the concept of a "new normal" is taken into account. As one participant noted, rate designs do not improve revenues; they only improve stability, and different structures provide different levels of stability. Revenues must cover costs. And as another voice noted, getting the basics right is always necessary, but in this shifting environment, it may not be sufficient.

Discussion #5:

What role might industry standards, practices, and policy reforms play?

A number of ideas kicked off this discussion: increased sophistication in capital planning, more detailed cost-of-service studies, clearer debt standards, continuing education on rates, professional certification, tiered rate structures. All are important, but the future must be approached with caution. Consumers need information, and if behavior is to change, financial incentives will be needed as well.

The issue of values and value judgments is a vexing one: behavior change efforts entail value suppositions, as does the allocation of water budgets. An appropriate amount of water for one customer in one community may be quite different for one customer in another community. Nationwide regulation might provide some value, but the risks might outweigh the benefits. In addition, much water infrastructure was built to support businesses and industries that no longer exist. That said, however, there are strong and important differences between mandates and incentives.

Likewise, the future needs to balance the costs of action and of inaction: what are the effects of not undertaking a project? How do you charge a ratepayer when the benefit of the action spreads beyond that sphere? To some, these thoughts approach the socializing of costs, which becomes tricky. The engineering and planning communities need better information.

According to a recent survey by the American Water Works Association 70% of water utilities are not fully recovering their costs. This is an unacceptable situation. We need to improve the ability for public water systems to get the revenue they need. At the very least, states could use third-party agencies that are disconnected from utilities and politicians that could determine whether or not revenues are sufficient. The State of Wisconsin Public Service Commission (PSC) regulates both public and private water systems, and assumes the responsibility for approving all changes to water rate-making in the state. Thus, the political "heat" is off at the local level and water systems can more easily approach the PSC for needed changes to their revenue structures.

At the very least it seems to make economic sense for utilities' sustainability doctrines to mandate that efficiency be incentivized and not penalized, and doing so is possible in this era of social media with new tools for reaching out. The primary challenges, however, focus on staying responsive to citizens and respecting local needs.

Summary Discussion

At the end of the Summit, each participant noted summary thoughts and areas where his or her thinking had shifted during the summit. This summary clusters those thoughts by topic area but keeps the tone and language of the thoughts relatively intact.

General Comments

- The time has come for the whole industry to shift from a paradigm of growth to a paradigm of sustainability.
- We have done a great job up until now. Now we face a new set of challenges. We have to begin by stepping back to the basics.
- We must concentrate on building utilities that are sustainable, not only financially, but in other ways as well. Is today's utility structure unsustainable? Building sustainable utilities is more important than addressing revenue losses alone.
- Big utilities may not need regulation. Small ones do.
- Although there is not one single magic solution, water utilities need to embrace efficiency as a way to better serve customers by minimizing costs and maximizing benefits from smarter water services.

Forecasting and Rate Design

- We need to realize the value of avoided costs.
- We need to improve our analytical tools, including measurement and verification. We need to implement standards on system reliability.
- We need to evaluate utilities based on their sustainable management practices.
- We have not yet seen the end of declining water sales.
- We must quantify and standardize. We don't have industry-wide methods for demand forecasting or assessing system conditions. We don't have metrics for affordability and equity. With those, we could make better cases to elected officials.
- We need to shift our approach to demand forecasting from thinking of it as a single point to simulation and risk modeling. We need to represent the future as a distribution of possibilities rather than a point, and we need to inform decision makers about probabilities and consequences of risk.
- We need to emphasize that well-designed outdoor efficiency efforts can contribute to revenue stability by lowering weather-related fluctuations.

- Utilities need to comprehensively reassign costs, revenues, risk management, and customer communications.

- All assessments need to include environmental and social benefits.

Political Observations

- In the case of setting water rates, regulation appears to have some significant value because it removes rate setting from the political arena. Since rates get set by regulatory boards, the politicians have a cover and consumers can have some confidence that they are paying fair rates. On the one hand, removing the decision making from the immediate view of the consumer may be viewed as being anti-democratic. On the other hand, doing so removes the process from political wrangling, thus increasing effectiveness.

- The problems we face right now are more political than technological.

- As a group, we must resist being fatalistic, especially about politics.

- Although the challenge of matching revenue with sales is technical, at some level the solutions are all political.

Communicating and Messaging

- We must work harder to communicate meaningfully with customers who need regular messaging on real costs.

- We need to improve public understanding. While we have been successful with efficiency improvements, we are behind on infrastructure, and the public still takes water for granted. We need to message "the value of water."

- Communication and education are key. People need to understand the full range of reasons of why usage is declining. We need to educate regulatory bodies. We need to recognize full costs.

- Utilities must advocate for the stewardship of the resource. Consumers need to understand their water sources. Water use is not going to rise again; it will continue to decline.

- We need to work harder to prepare the next generation of voters. Kids need to understand the plumbing beneath their streets and their homes. They need to tour water and sewer plants. Focusing on the next generation will help us in our role as public servants.

New Ideas

- The idea of spreading risk, such as by insurance, is intriguing. We can find ways to recover revenues without just raising rates.

- The idea of creating insurance instruments is worth pursuing.

- We should focus on the top 20% - 30% of the utilities to help move best practices forward. Then we can focus on the others to help them achieve the basics. As part of that effort, we can develop manuals of best practice. Perhaps we should even require attendance at a "rate school" that informs utilities of the basics. Perhaps we should consider certification. Perhaps we need to better define the broad set of management and leadership skills that need to be taught. Right now, there is a leadership void in the industry.

- We must find a mechanism that will force change. State regulators are not the answer. We need a conscious strategy to reach a wider audience.

Needed Research

- We need to understand the full span of causes for changing water usage, both in the short and long terms. Reductions come from much more than conservation and efficiency, but they are often framed as the cause. We need to stay creative in looking at solutions.

- These issues we are confronting – the conservation conundrum – are real. We need to understand them better and we need to help others understand them better.

SUMMIT ATTENDEE LIST

#	Salutation	First Name	Last Name	Organization
1	Mr.	Jeff	Armstrong	Rancho California Water district
2	Mr.	Laurent	Auguste	Veolia North America
3	Mr.	Drew	Beckwith	Western Resource Advocates
4	Dr.	Janice	Beecher	Institute of Public Utilities, MSU
5	Mr.	Gary	Breaux	Metropolitan Water District of Southern California
6	Dr.	Thomas	Chesnutt	A&N Technical Services
7	Mr.	Chuck	Clarke	Cascade Water Alliance
8	Ms.	Heather	Cooley	Pacific Institute
9	Mr.	Todd	Cristiano	Denver Water
10	Mr.	Michael	Deane	National Association of Water Companies
11	Ms.	Mary Ann	Dickinson	Alliance for Water Efficiency
12	Ms.	Linda	Discepolo	Regional Water Authority of South Central CT
13	Mr.	Douglas	Frost	City of Phoenix
14	Mr.	Rick	Giardina	Red Oak Consulting/EFAB
15	Dr.	Ronald	Griffin	Texas A&M/MIT Press Book
16	Mr.	Ben	Grumbles	Clean Water America Alliance
17	Ms.	Sarah	Hayes	American Council for an Energy Efficient Economy
18	Mr.	John	Howard	South Carolina PSC / NARUC
19	Mr.	Jeff	Hughes	UNC Finance Center
20	Mr.	Dave	LaFrance	American Water Works Association
21	Mr.	Tracy	Mehan	The Cadmus Group
22	Dr.	Kenneth	Mirvis	The Writing Company
23	Mr.	David	Mitchell	M.Cubed
24	Mr.	Edward	Osann	Natural Resources Defense Council
25	Mr.	Jeffrey	Ripp	Wisconsin Public Service Commission
26	Mr.	Scott	Rubin	Attorney/Consultant
27	Mr.	Todd	Rydstrom	San Francisco Public Utilities Commission
28	Mr.	Darryl	Slusher	City of Austin
29	Dr.	Manny	Teodoro	Colgate University
30	Mr.	Christopher	Woodcock	Woodcock Associates
	Observers			
1	Ms.	Carole	Baker	Texas Water Foundation
2	Dr.	Lynn	Broaddus	The Johnson Foundation
3	Mr.	Claus	Dunkelberg	Milwaukee Water Council
4	Mr.	Andrew	Fahlund	Stanford University
5	Ms.	Jenny	Hoffner	American Rivers
6	Ms.	Sharlene	Leurig	CERES

Declining Water Sales and Utility Revenues
A Framework for Understanding and Adapting

A White Paper for the
National Water Rates Summit
August 29-30, 2012
Racine, Wisconsin

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The views and opinions are those of the authors and do not necessarily reflect those of the Alliance for Water Efficiency or the Johnson Foundation.

The scenario is becoming all too familiar. Utility managers see falling water sales and falling revenues. Rates must be raised simply to maintain revenues, but rate increases are also needed to pay for the rising cost of infrastructure replacement and improvement. Higher rates might even induce a price response in the form of further declines in usage (shifts along the demand curve).[1] The effects of economic recession make matters worse, particularly for areas experiencing declines in service population and economic activity (shifts in the entire demand curve). As water price increases outstrip overall inflation, boards of directors and water customers alike are balking at successive and high rate increases. Promoting water conservation in this context seems illogical at best and self-destructive at worst. In a twist of distorted incentives, the water manager may even hope for drought. Infrastructure-intensive public utilities face a serious "conservation conundrum"[2] in that socially beneficial efficiency appears contrary to their financial self-interest, particularly in the short run. The combination of rising costs and falling sales is a potential recipe for revenue shortfalls and fiscal distress. *What is a water manager or rate regulator to do?*

A Summit on Declining Water Sales and Utility Revenues Summit in Racine, Wisconsin, convened by the Alliance for Water Efficiency, examined how this problem is manifested across the country. This white paper explores its root causes and offers potential utility and policy solutions.

Introduction

This white paper was drafted initially to frame the central issues in advance of an August 30, 2012 national summit of prominent water industry leaders, economists, and financial experts to examine the root causes of the current problems with water utility rates and revenues, and to outline potential utility solutions as well as policy and regulatory reforms. Finalized following the summit, the paper presents a framework for defining the problem and exploring both root causes and potential utility and policy solutions, as organized around five issue areas:

- Issue 1. How and why are water sales declining?
- Issue 2. Are water utility revenues falling short of requirements?
- Issue 3. Do water utilities and the conservation community have a messaging problem?
- Issue 4. What methods are available to repair revenues and improve fiscal stability?
- Issue 5. What role might industry standards, practices, and policy reforms play?

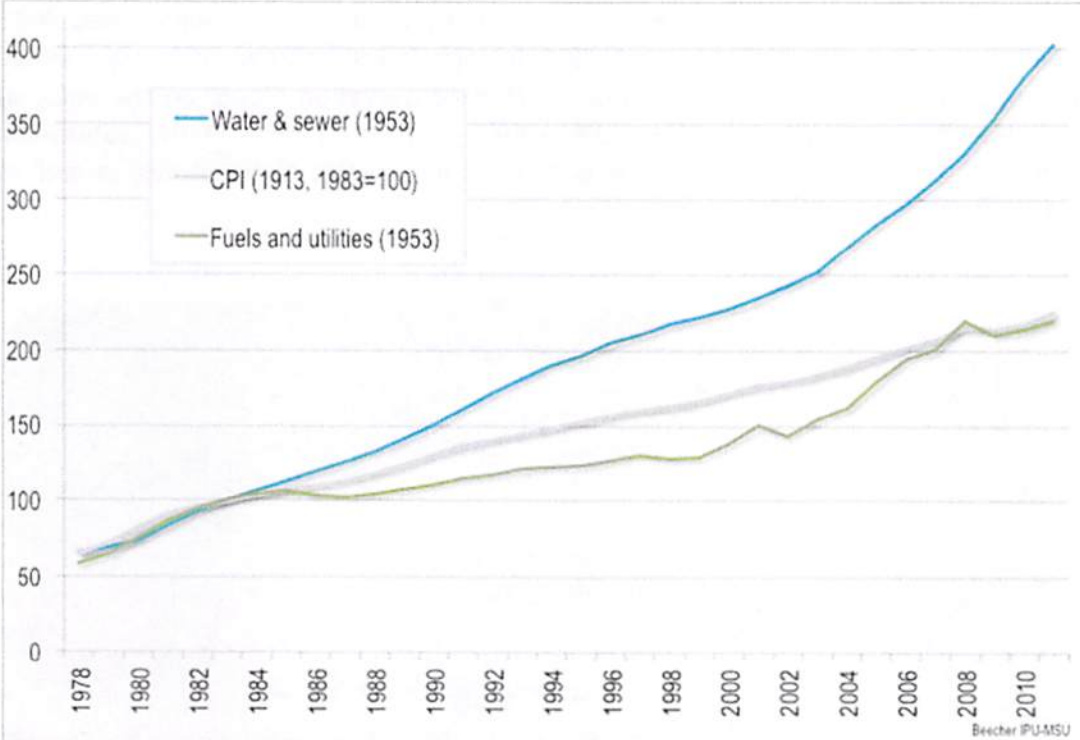
Water utilities today face a serious challenge related to what is loosely understood as "declining demand." Water "demand" connotes different meanings. Engineers think about demand in terms of water supply or production measures, also understood as "system load." Planners think about demand in terms of water consumption or sales measures, also understood as "realized demand." Economists think about demand in terms of a choice-based functional relationship between prices charged and *quantity*

[1] The association of rate increases with falling revenues is a phenomenon sometimes referred to as a "death spiral," even though relative price inelasticity will forestall the actual demise of a utility enterprise and rates can be adjusted for "demand-repression" effects in the context of rising revenue requirements. The responsiveness of water usage to prices varies but water demand has been empirically estimated to be less price-elastic than energy demand, making the "death-spiral" metaphor less applicable.

[2] Janice A. Beecher, "The Conservation Conundrum: How Declining Demand Affects Water Utilities." *Journal American Water Works Association* (February 2010).

infrastructure. Yet more efficient water supply systems are de facto more sustainable systems because they are better positioned to operate within their economic and ecological means. The parameters of sustainability may vary by location, but true efficiency gains are universally good from an economic perspective.

Exhibit 2. Trends in Consumer Prices (CPI) for Water and Sewer Maintenance and Utilities



Source of data: Bureau of Labor Statistics.

In the long term, water supply and demand will find an efficient equilibrium. In the short term, however, reductions in water sales are a cause of fiscal stress for utilities and a potential disincentive to further investment in efficiency. This problem is exacerbated by the fact that water supply in general is a rising-cost industry. The combination of declining sales and rising costs, along with the movement toward full-cost pricing, is placing considerable pressure on utility water rates. For water utilities, a price that reflects true costs is a more efficient price. Regardless of the reason, higher rates can be expected to cause additional reductions in price-sensitive customer end uses, which in turn may require additional rate increases. Raising rates can become a political issue with elected boards and city councils as well as state regulatory agencies when jurisdiction applies. Customers are generally unhappy with high utility bills, particularly unhappy about paying anything more for water, and especially unhappy when they pay more while using less.

Water pricing is complex because it tends to involve multiple and sometimes competing policy goals (Exhibit 3). Pricing is central to long-term sustainability (Exhibit 4). Sustainable systems spend to an optimal service level and price in a manner that recovers capital and operating expenditures. The logic of economic efficiency applies both to spending and pricing. Underspending and overspending have deleterious effects, as do underpricing and overpricing. Cost studies can inform these determinations.

Revenue sufficiency and stability are core goals and a function of both rate levels and rate design. Ideally, rates are set to recover all revenue requirements, or the true cost of service. Water utilities are highly capital intensive but recover some fixed costs through variable charges, in part to amplify price signals and improve efficiency in usage over time. In some respects, the emphasis that conservation places on the *value of water* has detracted attention from the value – and the cost – of the substantial *infrastructure* required to provide safe, adequate, and reliable water service as well as fire protection and wastewater services.

Exhibit 3. Water Pricing Goals

Source: Janice A. Beecher, Institute of Public Utilities, Michigan State University.

Exhibit 4. Water Pricing and Sustainability

	Expenditures Relative to Optimal Service Level		
Prices relative to total expenditures	*<1 expenditures are below optimum ("cost avoidance")*	*= 1 expenditures are optimal*	*>1 expenditures are above optimum ("gold plating")*
<1 prices are below expenditures ("price avoidance")	Deficient system	Subsidized system	Budget-deficit system
= 1 prices are at expenditures	Underinvesting system	**SUSTAINABLE SYSTEM**	Overinvesting system
= >1 prices are above expenditures ("profit seeking")	Revenue-diverting system	Surplus system	Excessive system

Source: Janice A. Beecher, Institute of Public Utilities, Michigan State University.

For public utilities, it is not uncommon to see marginal costs (total costs/total units sold) below average costs, so pricing at marginal cost can result in insufficient revenues. In *demanded* (a downward sloping curve reflecting both willingness and ability to pay).[3] For the purposes of this paper, we consider demand generally in terms of the aggregate quantity demanded from, and provided to, water customers.

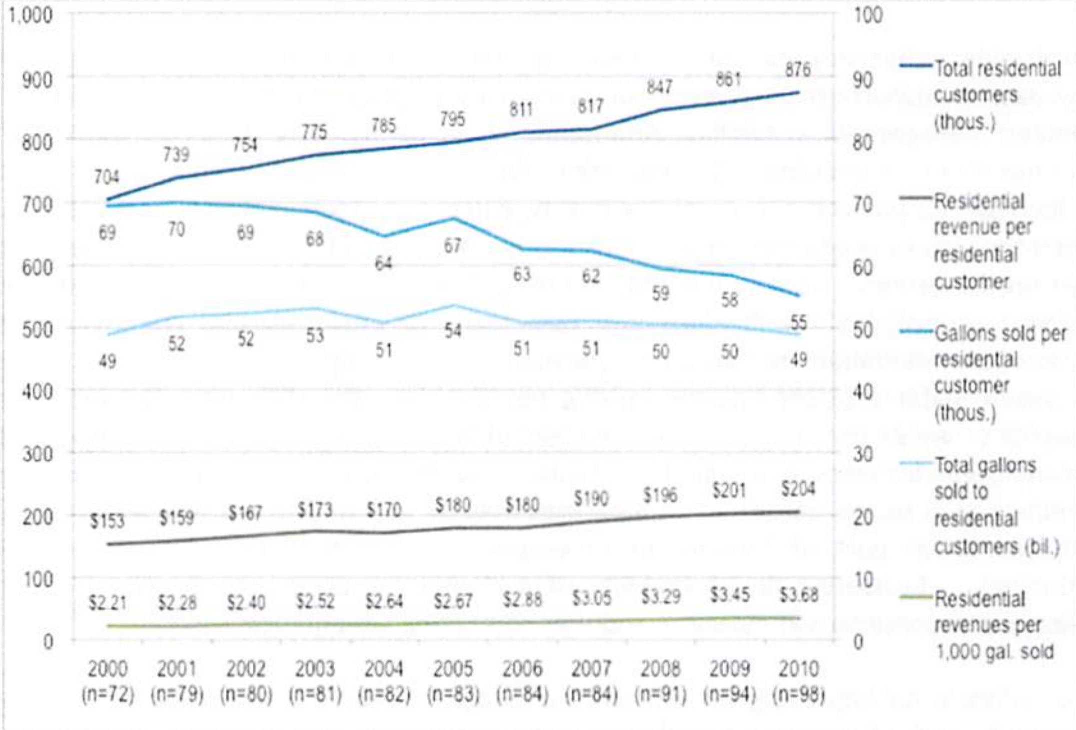
For decades, efficiency and conservation have been advanced as part of an integrative approach to resource management that recognizes the joint consideration of supply and demand management in fulfilling community water needs. Like demand, "efficiency" also has different meanings. Technological efficiency is achieved when it is impossible to increase output without increasing inputs, whereas economic efficiency is achieved when the cost of producing a given output is as low as possible.[4] The latter depends in part on the former. Efficiency might also be defined in broader social terms (such as "service accessibility" or "highest and best use") or environmental goals (such as "resource preservation" or "maximizing production of ecological services"). This paper considers water efficiency as maximizing net benefits—the difference between the benefits of water consumption and the costs of the resources required to supply that consumption, including disposal of any "waste" water. Conservation generally involves a reduction in usage; conservation measures may be imposed to reshape water usage patterns or as part of drought or emergency management (including temporary rationing). Evaluating the desirability of a change in water consumption through efficiency or conservation measures requires comparing benefits and costs.

The rationale for improving the efficiency of usage through full-cost pricing, efficiency standards, and other means has always rested on the idea that efficiency gains on the demand side will translate into more efficient utility operations, including reduced operating costs in the short run (including the cost of energy and chemicals) and avoided capacity costs in the long run (including the cost of supply development, pipeline transmission, and treatment plants). Improved efficiency also reduces risk and uncertainty, including risk and uncertainty associated with volatile sales. Reduced environmental costs or added environmental benefits are also achieved over both the short and long terms.

Aggregate water withdrawal trends clearly illustrate the stability of water withdrawals relative to population growth, reflecting both lower per-capita usage and efficiency gains.[5] To illustrate the reality of declining water usage and its effects, we examine trends over the last decade for residential sales, revenues, and average sales price for a large sample of utilities in Wisconsin – host state to the National Water Rates Summit (Exhibit 1). Though the total number of residential customers has risen over the last decade (top line) total residential sales has been flat (light blue line) while the sales per customer trend shows a decline. Revenues per residential customer or per volume of sales (a proxy for average prices) have gone up.

[3] For more on understanding water demand, see Stephen Merrett (2004), "The Demand for Water: Four Interpretations," *Water International* 29 (1): 27-29.
[4] These definitions are from About.com: Economics.
[5] Kenny, J.F. et al. (2009) *Estimated use of water in the United States in 2005.* U.S. Geological Survey Circular 1344.

Exhibit 1. Trends in Residential Water Sales and Revenues for Wisconsin Utilities (Class AB)



Source of data: Wisconsin Public Service Commission.

At least some of the trend in aggregate water usage appears to be durable, making for "new normals" in the water business. Flat or declining sales are affecting many water utilities, regardless of whether they have actively engaged in conservation programs. The loss of load caught many utility managers, industry analysts, and even efficiency advocates off guard. Improved standards and practices have helped to improve water efficiency and shift demand. In some cases, utility programs have accelerated market penetration and impact. Rising prices are also playing a role. Wisconsin is not the only state in the nation experiencing a rise in the real price of water. Exhibit 2 compares the national Consumer Price Index (CPI) to the indices for "water and sewer maintenance" and "fuels and utilities." Trends clearly indicate that water prices are under pressure, suggesting the potential for prices to influence the quantity demanded, even when demand is relatively "price inelastic."

Conservation may have value to the environment and society, but its economic value to utilities depends in part on whether costs can be avoided or revenues can be generated from an alternative end use for "conserved" water; if no economic value is perceived, the rationale for utility conservation programs is undermined. Otherwise, loss of water sales (or load) translates directly into loss of revenues, and loss of revenues translate into higher rates and charges simply to maintain revenue neutrality and cover the cost of operations, much of which is fixed in the short run. Given the prospects of new normals in water usage, utility revenues are in need of repair as much as water the short run, marginal costs may be low for systems with excess capacity resulting from load loss. When marginal costs exceed average costs (as in persistent scarcity conditions), then pricing at marginal cost can result in excess revenues. Depending on average and marginal costs (considered in the short and long runs), selling available water may well be efficient and consistent with the goals of stewardship and the boundaries of sustainability. Some communities are actively trying to attract water-intensive industries to their service territories (Evanston, Illinois, provides an example). Although total system (full accounting) costs are used to define revenue requirements, marginal costs can provide guidance for rate design. Indeed, marginal-cost pricing lends theoretical support for conservation-oriented rate structures.

Cost allocation and rate design assign cost responsibility to customers but should be "revenue neutral." Different rate structures, however, have different incentives and implications for utilities and their customers. High fixed charges (and decreasing-block rates) provide revenue stability and mitigate the utility's incentive to sell, but can weaken usage-based price signals and raise affordability concerns. High variable (or volumetric) charges (and increasing-block rates) provide more affordability but less stability, and make utilities more dependent on sales (including dry weather cycles). Concerns about revenues are turning more attention to a variety of conventional and unconventional cost recovery, revenue assurance, and rate-design options.

These dynamics have already been a source of frustration for utility managers and their customers. The relationship between revenue requirements, rates, and bills is complex (Exhibit 5). Particularly vexing is the potential association of efficiency and conservation with higher rates, which can undermine support for efficiency goals as well as the public's trust. Utility sponsored conservation programs can be especially hard to justify; in a context of excess capacity and revenue shortfall they appear rather self-defeating. Improving communications in this area is an urgent challenge for the water sector. The revenue issue is as much about messaging as about rates and rate structures.

Water utilities that are content with their financial situations have probably done many things correctly; there are a correspondingly large number of ways for water utilities might end up in a less satisfactory place. Thinking about solutions requires reexamining "the problem" and its root causes. Only by better understanding the nature of the problem and how it came to manifest can decision makers, water managers, and rate analysts begin to sculpt solutions.

Although much has been written about the revenue effects of conservation, there remains a need for a systematic framework for mapping potential relationships among revenues, rates, and bills. Such a framework can provide the basis for a new narrative about water conservation, in part to dispel the perceived connection between water conservation and all rate increases. The intended audience is water utility managers and their oversight boards, public utility regulators, consumer groups, conservation advocates, and other stakeholders. The following sections examine each of the five issue areas that framed the discussion at the National Water Rates Summit.

Exhibit 5. Revenues, Rates, and Bills: Mapping the Message

Condition	Revenue Requirements	Rate ($/unit)	Bill ($/customer)
Usage			
Usage decline (other things equal near term)	neutral	↑	neutral
Economic demand management	↓	↑	↓
Uneconomic demand management	↑	↑	↑
Costs			
Rising infrastructure costs	↑	↑	↑
Rising operating costs	↑	↑	↑
Supply-side efficiency	↓	↓	↓
Market			
Customer additions (gain scale)	↑	↓	↓
Customer losses (lose scale)	↓	↑	↑
Rate design			
Price-elastic usage	neutral	↑	↓
Price-inelastic usage	neutral	↑	↑
Cost reallocation	neutral	↓↑	↓↑
Full-cost pricing			
Subsidy	↓	↓	↓
Loss of subsidy	↑	↑	↑
Transfers	↑	↑	↑

Source: Janice A. Beecher, Institute of Public Utilities, Michigan State University.

Issue 1: How and why are water sales declining?

- Water usage and sales relate directly to water utility design, investment, and operation.
- Declining water sales of 1 to 3% annually is not an uncommon observation today.
- Water usage patterns differ between developed and developing political economies.
- Given water's essential nature, the trend in water sales will not reach zero.
- Water sales should eventually stabilize at a relatively efficient, predictable, and sustainable level.
- Declining sales are particularly problematic for "declining cities" experiencing population loss and weak economic activity.
- Declining sales have operational effects on water and wastewater systems.
    - Reduced water flows can affect water quality.
    - Reduced water and wastewater flows can affect infrastructure integrity (e.g., corrosion).
- Implications of declining water usage on operations.
    - Water and wastewater systems are likely suboptimal relative to utilization.
    - Long-life water infrastructure should be built to meet today's increasingly efficient use and tomorrow's prevailing usage patterns.
    - Changes in load create opportunities to avoid costs and redirect investment.
- Many systems have experienced declines in sales even under conditions of dry weather.
- A universally valid and reliable empirical model for estimating contemporary water sales has yet to be specified.
- Aggregate water usage is partly a function of socioeconomic conditions and characteristics.
    - Total water usage can grow with growing population and economic activity.
        - Growth masks per-connection and per-capita trends.
        - Loss of population will suppress sales.
    - Economic recessions will tend to suppress sales.
    - Recessionary influences on water sales vary in their duration and durability.
    - Water usage varies seasonally according to weather, namely, precipitation and evapotranspiration.
    - Climate change will influence weather and the quantity of water supplied and used in a given time period.
- Aggregate water usage can be understood as a function of per-connection and per-capita usage because different drivers are at work.
    - Evidence suggests that both are falling in many areas.
- Per-connection or household usage (weather adjusted) is a function of:
    - Household size (fewer people per household) and demographic composition.
    - Property (lot) size.
    - Composition of single- and multi-family housing.
    - Growth policies affecting housing.
    - Nature of commercial activities and industrial processes.
    - Efficiency in irrigation practices on customer premises.
    - Local codes and restrictions on irrigation.
    - Price-induced effects on discretionary use.
        - Metering elasticity of demand.
        - Price elasticity of demand (effect of marginal prices and the total bill for both water and wastewater).

- Per-capita water usage (weather-adjusted) is a function of:
  - National standards and codes for water-using fixtures and appliances.
  - Commercial and industrial process efficiencies and technologies.
  - Incentives that accelerate efficiency deployment (programs, rebates).
  - Changing culture, attitudes, and environmental ethic (for example, reduced urban irrigation) based in part on perceptions of scarcity in water supplies.
- Price appears to be playing an increasingly important role.
  - Full-cost pricing is necessary but not always sufficient for inducing efficient water use.
  - The current decline in water sales embeds a customer response to price that is often imperfectly recognized in utility planning and ratemaking.
  - Water is subject to the laws of supply and demand, just like other goods and services – water is essential but technically not "priceless" (that is, water services are excludable and "priceable").
  - Price is how we "self-ration"; that is, prices guide our consumption decisions.
  - Utility services are generally less price-elastic, but not perfectly inelastic (that is, usage is not completely unresponsive to changes in price).
  - The "real" (inflation-adjusted) price of water in the U.S. has been rising.
  - Usage may have entered a more price-elastic portion of the demand curve for water.
  - Different water uses within and across customer classes present different elasticities (essential use is less elastic).
  - Consistent with the law of demand, rising prices will affect the quantity of water demanded whether or not they are part of a conservation strategy.
- Falling sales and revenues are industry-wide problems directly related to the adoption of efficiency standards and practices.
  - Much of the efficiency gains are related to the effects of standards, prices, and economic conditions.
  - Some are due to the impact of utility efficiency programs.
  - The revenue impact may be the same but the policy implications differ.

Issue 2: Are water utility revenues falling short of revenue requirements?

- For the water industry, aging infrastructure needs and costs are blamed for a widening "gap" between expenditures and revenues for many, though not all, public utilities.
- The gap is essentially a "construct" for focusing policy attention.
- Strategies for closing the water utility funding gap from the top include:
  - Efficiency practices (least-cost).
  - Technological innovation (capital and operating).
  - Market-based approaches as appropriate (bidding).
  - Industry restructuring (consolidation and convergence).
  - Integrated resource management (supply and demand).
- Strategies for closing the water utility funding gap from the top include cost-based rates for water services.
- Economic regulation by state public utility commissions can help ensure both cost prudence and cost-based pricing.
  - State regulation can help "depoliticize" local ratemaking to some degree.
  - Given rising costs and falling revenues, operational efficiency and "cost control" are important but many utility costs cannot be avoided through supply-side and demand-side efficiency.

- Assuming that the utility's revenue requirements reflect the prudent cost of service, adjusted for any costs reduced or avoided through efficiency gains, the revenue shortfall problem can normally be explained by rates that are too low.
- Reasons for revenue shortfalls:
  - Lagging rate increases, so that revenues from rates will never be sufficient to cover actual revenue requirements or the budgeted cost of service.
    - Rate lag can reflect bureaucratic processes or "political will" (also known as "willingness to charge").
  - Under-collection of revenues or receivables owed to the utility.
  - Inadequate cost forecasting in the ratemaking process, including reliance only on historical cost data.
  - Inadequate sales forecasting in the ratemaking process, including "demand-repression" effects associated with rate increases.
    - Simplistic and non-robust linear forecasts and moving averages are inadequate.
    - End-use modeling is needed (market adoption rates).
    - General trends in water sales can be effectively forecast.
    - Scenarios can be used for modeling weather effects and the effects of weather on water usage can be estimated.
  - Inattention to rate design in terms of the allocation of costs to fixed and variable charges, and elasticity effects on revenue stability and sufficiency.
- For most water utilities, infrastructure replacement costs are outweighing the costs avoided through efficiency (particularly in the short term).
  - Water bills continue rise but not as much as they would without improved efficiency.

Issue 3: Do water utilities and the conservation community have a messaging problem?

- The water utility investment and cost profile may not be widely understood or appreciated.
- Piped community water service is capital intensive with high fixed costs.
- Fire protection needs present an engineering design and operational constraint.
- The conservation ethic has focused considerable attention on the "value of water" as compared to the "value of water service."
- In the long term, all costs are variable, but in the short term most costs are fixed.
- Water efficiency helps water systems avoid operating costs in the short run and capital costs in the long run.
- Declining sales may leave systems with excess capacity and stranded investment, which undermines the case for conservation in the short run.
  - Promoting water use and attracting water-using industries is controversial.
- The impact of efficiency and conservation on water rates and bills is controversial, but not necessarily well understood or well-articulated.
  - Revenue neutrality in ratemaking suggests that water rates increase due to falling sales, but water bills increase due to rising costs.
  - Lower sales volume, given a relatively fixed revenue requirement, implies the need for a higher average rate per unit of water (net of efficiency savings actually reflected in authorized requirements).
  - In the face of rising rates, customers who can conserve will pay less than customers who cannot conserve (a distributional effect).

- Conservation investments (like other investments) should be prudent.
  - Water use has both negative and positive impacts and externalities.
  - While efficiency is almost always desirable, not all forms of conservation are desirable, cost effective, or economically efficient.
  - Cost-effective conservation, by definition, reduces utility revenue requirements.
  - Prudent and planned conservation should not result in revenue shortfalls.
  - Although prices are rising, water bills over time will be lower than they otherwise would be (that is, lower highs).
- Water utilities and the conservation community have not been very successful in crafting a message to the public about:
  - The role of water utilities in resource stewardship and sustainability (the "blue industry" is a "green" industry).
  - The realized and anticipated benefits of efficiency in terms of water, energy, environmental protection, and infrastructure costs.

Issue 4: What methods are available to repair revenues and improve fiscal stability?

- A number of methods that utilities are considering for addressing revenue shortfalls are summarized here (Exhibit 6).
- When considering potential solutions, water utility managers are concerned about:
  - Rate lag between cost incurrence and cost recovery.
  - Reliance on volumetric charges and sales for utility revenues.
  - Revenue sufficiency and revenue stability over time.
- In many respects, traditional ratemaking principles and practices can effectively address material changes in costs, cost volatility, and changes in usage.
  - Under changing conditions of costs and sales, utilities need to be vigilant about rates.
  - All costs should be included in revenue requirements (full-cost pricing).
  - Revenue requirements should include costs for prudent conservation expenditures.
- Four key culprits in the revenue shortfall appear to be:
  - Lack of timely rate adjustments, including cost-adjustment rate mechanisms.
    - Ratemaking and regulatory politics may play a role.
    - Rate adjustments should be easier and more expedient for unregulated and/or publicly owned systems.
  - Inadequate cost and sales forecasting for the revenue requirements test year.
    - Lack of acceptance from state economic regulators.
  - Cost-allocation and rate-design practices.
    - Suboptimal allocation of costs to fixed and variable charges.
    - Possible over-reliance on variable charges.
  - Current loss of other revenue sources.
    - Subsidies from grants, loans, and intergovernmental transfers.
    - Recessionary effects on growth and system-development fees.
- The solution set varies based on utility organizational structure.
  - Larger systems have greater capacities and more options.

- Publicly owned systems may be subject to local political forces, but may have more flexibility to change practices.
- Regulated systems, including all private systems, must comport with regulatory standards and reviews.

❖ No recommendations are made here, as each method has potential advantages and disadvantages and involves tradeoffs.

- Policy choices depend on perspective and goals (including equity and efficiency).
- Some methods achieve similar goals by different means.
- Consistency with generally accepted principles and practices and legal defensibility are concerns when departing from traditional forms of cost-based ratemaking.

Exhibit 6. Methods for Addressing Revenue Shortfalls

	Description	Key Advantages	Key Disadvantages
Rate adjustments	Rate reviews and adjustments that keep pace with changing conditions	▫ Reduces rate-adjustment lag	▫ Increases ratemaking expense ▫ May be politically unwelcome
Full-cost pricing	Water prices based on system budgeting cost of service studies	▫ Supports fiscal autonomy of system ▫ Enhances price efficiency	▫ May cause significant rate increases for subsidized systems
Depreciation expense	Include in rates an expense for the depreciating the value of utility assets	▫ Provides cash flow to system	▫ Requires utility basis of accounting and ratemaking ▫ May cause significant rate increases
Replacement value ratemaking	Base rates on anticipated cost of asset replacement	▫ Account for inflationary effects	▫ Requires utility basis of accounting ▫ May be arbitrary and inflate rates unnecessarily
Reserve-account funding	Use a special charge or equity return mechanism to build a reserve account	▫ Builds a reserve account for infrastructure replacement needs	▫ May be arbitrary and inflate rates unnecessarily ▫ May cause intergenerational equity concerns ▫ Funds may be diverted
Improved cost forecasting	Pro forma adjustments for known and measureable cost changes or use of future test year	▫ Reduces rate lag	▫ Requires analytical skill
Improved sales forecasting	Enhanced econometric modeling v. simple moving averages (e.g., statistically adjusted end-use modeling)	▫ Reduces rate lag ▫ Weather-adjusted water usage is relatively predictable	▫ Requires analytical skill
Weather normalization	Adjustment to forecast sales based on expectation of normal weather and precipitation	▫ Reduces weather impact on revenues	▫ Requires analytical skill

Exhibit 6. ***Continued***

Cost-adjustment mechanisms	Pass through to customers of certain substantial and volatile costs (e.g., purchased water or power)	▫ Simplifies and expedites rate adjustments ▫ Keeps rates in line with actual costs	▫ May provide a disincentive for cost control
Cost indexed rates	Rate adjustments based on a predetermined inflation index	▫ Simplifies and expedites rate adjustments	▫ May mis-estimate real costs
Demand-repression adjustment	Adjusts sales forecast to account for price elasticity on usage	▫ Reduces rate lag by incorporating elasticity effects	▫ Requires analytical skill
Revenue-stable rate design	Use of uniform rates, uniform by class, or large first blocks that stabilize revenues	▫ Simplification and customer understanding	▫ May not be perceived as sufficiently conservation-oriented
Fire-protection charges	Design of fixed charge based on the value and cost of fire protection	▫ Stabilizes revenues by establishing a fixed charge	▫ Weakens variable price signals ▫ More affordable if based on property values
Three-part tariff	Design rates with three components: customer, capacity, and commodity charges	▫ Stabilizes revenues by establishing a charge related to capacity costs	▫ High fixed charges ▫ Raises affordability concerns ▫ May weaken variable price signals, particularly with regard to future capacity costs
Straight fixed-variable pricing	Alignment of fixed and variable charges with fixed and variable prices	▫ Stabilizes revenues by effectively decoupling revenues from sales ▫ Neutralizes the incentive to sell	▫ High fixed charges ▫ Raises affordability concerns ▫ Weakens variable price signals, particularly with regard to future capacity costs
Water-budget rates	Rate design that considers property size, household size, and other variables in designing rate blocks based on a determination of "need"	▫ Enhances revenue stability ▫ Promotes conservation awareness ▫ Politically acceptable to large-volume customers	▫ Difficult to reconcile with cost-of-service and related equity and efficient principles ▫ Administratively complex ▫ May reinforces legacy choices ▫ Regressive in customer impact
Rate stabilization fund	A designated fund for managing revenue deficits and surpluses	▫ Provides fiscal protection for utility	▫ May cause intergenerational inequity

Exhibit 6. *Continued*

Public-benefit surcharge	A customer surcharge used to fund efficiency or other programs considered beneficial to the public	▪ Educates customers about programs and costs	▪ May invite political resistance
Lost-revenue adjustment	A rate mechanism or revenue recoupling method used to recover revenues lost due specifically to mandates designed to reduce usage	▪ Neutralizes the incentive to sell	▪ Difficult to segregate sales lost due to mandates ▪ Overstates incentive to sell
Revenue assurance or decoupling	A rate mechanism or revenue cap designed to decouple sales from revenues and profits	▪ Neutralizes the incentive to sell ▪ Case is easier for publicly owned utilities (risk and profit issues)	▪ Overstates incentives to sell ▪ Discourages economic sales ▪ Undermines price efficiency and variable pricing incentives ▪ Perpetuates legacy investment ▪ Shields utilities from elasticity effects
Earnings adjustment mechanism	A rate mechanism to compensate private utilities for profit erosion due to efficiency	▪ Neutralizes the incentive to sell ▪ Can be used with various performance metrics	▪ Undermines performance incentives ▪ Shifts risks to customers

Source: Janice A. Beecher, Institute of Public Utilities, Michigan State University.

Issue 5: What role do industry standards, practices, and policy reforms play?

- The impressive success of improved efficiency and the reality of declining water sales presents a challenge to water utilities is terms of:
  - The appropriateness of ratemaking methodologies.
  - The ongoing role of efficiency programs.
  - A discordant conservation message.
- Many policies and practices for water and other resources reflect an underlying assumption of economic and sales growth.
  - Water sales will not be a source of revenue growth for the water industry.
  - Expansion of the water industry will be limited.
  - Estimates of infrastructure needs may be distorted.
  - Infrastructure investment should emphasize re-optimization.
- Utility efficiency programs should be scrutinized to ensure they are prudent and cost effective.
  - Program subsidies must be cost-justified and ideally transitional with the purpose of hastening the adoption of self-sustaining efficiency technologies and practices).
  - Efficient prices, along with efficiency standards and consumer information, should be sufficient in the long run for most utilities and normal (nonemergency) circumstances.

- Analysts have considered the relative impact of prices and programs, with some asserting the predominant role of price (see Olmstead and Stavins, 2007).
- Sustainability is emerging as a better paradigm for water.
  - The industry must adjust to new normals in water usage in terms of infrastructure investment and efficient operations.
- Water utilities must have sufficient revenues to cover fixed costs and maintain safe and reliable service, including fire protection.
- Some solutions to the revenue shortfall issue raise institutional or public policy issues beyond the direct control of the individual utility.
- Policy responses that might be considered include:
  - Expanding economic regulation to ensure prudent investment and full-cost pricing, and depoliticize the ratemaking process (e.g., Wisconsin regulates all water systems).
  - Encouraging fiscal autonomy for water systems, supported by accounting and reporting standards as well as public and private lending requirements and other incentives.
  - Imposing regulatory, zoning, permitting or other restrictions on bypass of water utility service within an enfranchised service territory.
  - Promoting short-term and long-term supply and forecasting methodologies for both costs and sales, and requiring their use in capital planning and ratemaking.

Thinking About Solutions

- No single universally applicable solution can be offered: there is no magic bullet.
- Thinking about solutions requires reexamining "the problem" and its root causes.
- In thinking about potential solutions, some key questions should be addressed:
  - Does defining the problem define the solution?
  - Is the revenue sufficiency issue primarily a technical or political challenge?
  - Do structural characteristics of water systems matter to potential solutions?
  - What core ratemaking and other principles apply?
  - What tradeoffs are involved when choosing solutions?
- Does defining the problem define the solution?
  - Conducting a thorough assessment of existing rates is a necessary first step.
  - The assessment should consider whether the existing rate structure has proved adequate in the absence of severe recession, drought restrictions, or wet and cool weather.
  - More broadly, current water rates need to be assessed relative to expenditures, and expenditures need to be assessed relative to optimal service levels, preferable in a broader context of sustainability
- Is the revenue sufficiency issue primarily a technical or political challenge?
  - The water industry is not lacking in knowledge and tools for forecasting both sales and costs, as well as for asset and watershed planning and management.
  - Many nominal technical problems have underlying root problems: adherence to outdated financial practices, institutional inertia, regulatory guidance, and real or perceived political constraints.
  - Ratemaking to achieve goals requires leadership and political will, as much as technical knowledge (e.g., overcoming "NIMTO or not in my term of office").
- Do structural characteristics of water systems matter to potential solutions?
  - The form and nature of solutions will be shaped and sometimes constraints by the institutional context.

- Small water utilities will not have the same resources and options that are available to larger ones.
- Municipal water utilities face a different set of political constraints and oversight than do investor-owned water utilities.
- Different utilities can also face different regulation and different regulators.

- What core ratemaking and other principles apply?
  - Ratemaking is guided by a long tradition of well-established and well-tested principles, particularly in the regulatory context.
  - Generally accepted ratemaking principles relate primarily to efficiency and equity considerations, while recognizing the importance of compensating utilities for the cost of service.
  - Departures from cost-based rates and revenue neutrality in rate design are cause for concern and may invite legal challenges.
- What tradeoffs are involved when choosing solutions?
  - Water rates are designed to accomplish multiple objectives (Exhibit 3).
  - Revenue sufficiency is a necessary but not sufficient condition for water utilities to fulfill their mission.
  - Regulatory and political acceptance of rates is essential.

Concluding Thoughts

New normals in water usage are forming and the industry must find ways to navigate a path toward more efficient usage patterns. The water industry needs to own the issues of declining sales and revenues and update its message of conservation and efficiency to one of service and sustainability. Despite current trajectories, the declining usage problem is a transitory one; sales and revenues will eventually stabilize.

In many respects, the water sector has arrived at an inflection point where water managers must make tough decisions and where the industry as a whole needs to embrace a paradigm of sustainability, as opposed to one of perpetual growth. This is not to say that efficiency is no longer essential; in fact, efficiency is core to long-term sustainability. Efficiency efforts must be adjusted to new and hopefully improved conditions. Ironically, the industry and the conservation community must concede that efforts to improve efficiency are not failing but working. Efficiency gains should be celebrated for their impact on both water and energy, and also incorporated into capital planning and investment decisions. No longer just theoretical, the opportunity to avoid costs has arrived. The biggest risk for the industry may be building tomorrow's water supply infrastructure to meet yesterday's water demand.

Selected Readings

Aubuchon, Craig P. and J. Alan Roberson (2012) "Price perception and nonprice controls under conservation rate structures," *Journal American Water Works Association*.

Abstract: This research evaluates the effect of price and nonprice conservation controls on monthly water system demand and explores differences in rate design, education and outreach programs, population growth, and regional climate variables among a national cross section of utilities. Using the Shin price perception parameter, this study found that under conservation rate structures, aggregate demand was related to something other than marginal or average price. The price–demand response increases with higher levels of consumption for both the marginal price and the total bill, which may provide preliminary evidence that the price signal of the total bill matters for demand. Nonprice controls were not found to be statistically significant in the study sample. Income elasticities were positive and slightly larger in magnitude than price elasticities, suggesting that over the long term, utility managers may need to increase rates faster than regional income growth for effective demand management.

Beecher, Janice A. (2010). "The conservation conundrum: How declining demand affects water utilities." *Journal American Water Works Association* 102 (2):78-80. [http://apps.awwa.org/WaterLibrary/showabstract.aspx?an=JAW_0071587]

Abstract: This article discusses the significant financial challenge that utilities face in the rising infrastructure costs that must be recovered from a shrinking sales base. Fortunately, strategic coping methods are available such as forecasting, scenario-building, and planning. Utility plans should incorporate long-term goals and performance metrics as well as prudent investment strategies based on changing demand patterns. Cost recovery should recognize expenditures for cost-effective investments in efficiency, and regulators can provide additional incentives as appropriate. As long as costs and demand continue to shift, more frequent rate adjustments will help reduce lag and ensure that rates are properly aligned with costs. Forward- looking rates can be established by using a "future test year" for revenues. A demand-repression adjustment may be needed to recognize the effects of programs and prices on forecast use. Utilities will also need to examine rate-design options and assess whether they exacerbate or mitigate revenue volatility, uncertainty, and distributional consequences.

Beecher, Janice A. (2012). The ironic economics and equity of water budget rates. *Journal American Water Works Association* 104 (2). [http://www.awwa.org/publications/AWWAJournalArticle.cfm?itemnumber=58445]

Abstract: Water budget rates are gaining attention in the water sector. Although clearly well-intended, the water budget approach to rates raises serious theoretical and practical issues familiar to applied regulatory economics. In essence, water budget rates exemplify "social rate-making," that is, a system of pricing that departs from traditional economic standards in the interest of serving social goals—in this case water conservation. The inherent problem with this particular rate structure, however, is not its good intentions but its disconcerting implications. The troubling irony of water budget rates appears to be lost in the deliberation.

Chesnutt, T.W., G. Fiske, J.A. Beecher, D.M. Pekelney (2007) *Water Efficiency Programs for Integrated Water Management*, Water Research Foundation.

Executive Summary: Water utilities have increasingly come to appreciate the value of water use efficiency (WUE) for accomplishing their long-term mission of providing a safe and reliable potable water supply. The importance of water efficiency goes well beyond the short-term measures invoked to respond to drought emergencies, and is much broader in scope. Improved water-use efficiency is

seen as a viable complement to – and in some instances, a substitute for – investments in long-term water supplies and infrastructure. This understanding of water efficiency includes outdoor as well as indoor WUE, nonresidential water customers as well as residential customers, and utility delivery efficiency as well as end use efficiency. At the heart of the new understanding of water efficiency is an economic standard: a good WUE program produces a level of benefits that exceed the costs required to undertake the program.

Coomes, Paul, Tom Rockaway, Josh Rivard, and Barry Kornstein (2009). *North America Residential Water Usage Trends Since 1992,* Water Research Foundation. [http://www.waterrf.org/ExecutiveSummaryLibrary/4031_ExecutiveSummary.pdf]

Conclusion: "This research documents a pervasive trend toward lower water usage per household. The magnitude of the decline is consistent across North American utilities and is confirmed by more detailed data provided by the study's 11 partner utilities, although there were annual variations due to regional factors. The results of the study's statistical models identify the magnitude of both positive and negative forces affecting water usage. The decline in number of residents per household is clearly an important factor in falling water consumption per residential customer. However, the negative consequences of smaller households appears to be more than offset by the positive consequences of higher household incomes. Higher incomes have led to larger homes, with more water-using appliances, and more landscape irrigation. Thus, the net decline in water usage per household appears to be due to the steady penetration of low-flow appliances over the past 20 years. The end-use study found that low-flow appliances and changing household demographics accounted for a 16 percent reduction in average household water use in 2007, as compared to 1990... The steady decline in usage per household has important financial-planning consequences for water utility companies, as infrastructure is spread over more housing units using less water than before. The data compiled in this research are intended to assist utilities in developing realistic management plans that take into account the primary causes of declining residential water usage. The data provide a tool for projecting residential water usage in light of utility-specific trends. Utilities serving communities with growth in single-occupant households are likely to see erosion in revenues per household. Additionally, new federal regulations governing water-conserving appliances and fixtures further indicate that residential water usage will continue to decline as newer homes make up a larger component of the housing stock. Utilities may find it useful to track persons per household in addition to number of households as they plan infrastructure and set rates... Although the rate of decline may slow, there is no indication that national household-size trends will reverse. Also, new and existing federal regulations will prompt further penetration of water-conserving appliances.

Dalhuisen, Jasper M., Raymond J.G.M. Florax, Henri L. F. de Groot, and Peter Nijkamp (2003). "Price and Income Elasticities of Residential Water Demand: A Meta-Analysis," *Land Economics* 79 (2):292-308. [http://le.uwpress.org/content/79/2/292.abstract]

Abstract: This article presents a meta-analysis of variations in price and income elasticities of residential water demand. Meta-analysis constitutes an adequate tool to synthesize research results by means of an analysis of the variation in empirical estimates reported in the literature. We link the variation in estimated elasticities to differences in theoretical microeconomic choice approaches, differences in spatial and temporal dynamics, as well as differences in research design of the underlying studies. The occurrence of increasing or decreasing block rate systems turns out to be important. With respect to price elasticities, the use of the discrete-continuous choice approach is relevant in explaining observed differences.

Danielson, Leon E. (1979). "An Analysis of Residential Demand for Water Using Micro Time-Series Data," *Water Resources Research* 15 (4):763-767. [http://www.agu.org/pubs/crossref/1979/WR015i004p00763.shtml]

Abstract: Residential water demand is estimated as a function of temperature, rainfall, house value, water price, and household size using monthly cross-section and time-series meter readings from 261 residential households in Raleigh, North Carolina, between May 1969 and December 1974. Tests for validity of assumptions are made, and a methodological approach is used that provides unbiased estimates of parameters and standard errors with data that exhibit serially correlated residuals. Demand relations are estimated for total residential, winter, and sprinkling demands. Sprinkling use per period per customer for each year is estimated by subtracting winter (November–April) from summer (May–October) use. Household size explained the largest proportion of the variation in the data. Estimated sprinkling demand was found to be highly responsive to changes in water price and the level of the climatic variables, while total residential demand and winter demand were less responsive to price changes.

Fenrick, Steven Andrew, and Lullit Getachew (2012). "Estimation of the Effects of Price and Billing Frequency on Household Water Demand Using a Panel of Wisconsin Municipalities," *Applied Economics Letters* 19 (14): 1373-1380.
[http://www.tandfonline.com/doi/abs/10.1080/13504851.2011.629977]

Abstract: A demand function of residential water consumption is developed from a 1997 to 2006 panel of 200 Wisconsin water utilities. A double-log functional form is assumed and parameters are estimated using a random effects model. The results suggest that the price is inelastic yet negative and statistically significant and this elasticity response grows stronger as the marginal price level is increased. Additionally, the model reveals water savings due to monthly billing and also the annual water savings from technology adoption.

Grafton, R. Quentin, Michael B. Ward, Hang To, and Tom Kompas (2011). "Determinants Of Residential Water Consumption: Evidence and Analysis from a 10-Country Household Survey," *Water Resources Research* 47. [http://www.agu.org/pubs/crossref/2011/2010WR009685.shtml]

Abstract: Household survey data for 10 countries are used to quantify and test the importance of price and nonprice factors on residential water demand and investigate complementarities between household water-saving behaviors and the average volumetric price of water. Results show (1) the average volumetric price of water is an important predictor of differences in residential consumption in models that include household characteristics, water-saving devices, attitudinal characteristics and environmental concerns as explanatory variables; (2) of all water-saving devices, only a low volume/dual-flush toilet has a statistically significant and negative effect on water consumption; and (3) environmental concerns have a statistically significant effect on some self-reported water-saving behaviors. While price-based approaches are espoused to promote economic efficiency, our findings stress that volumetric water pricing is also one of the most effective policy levers available to regulate household water consumption.

House-Peters, Lily A., and Heejun Chang (2011). "Urban Water Demand Modeling: Review of Concepts, Methods, And Organizing Principles," *Water Resources Research* 47 (5).
[http://www.agu.org/pubs/crossref/2011/2010WR009624.shtml]

Abstract: "In this paper, we use a theoretical framework of coupled human and natural systems to review the methodological advances in urban water demand modeling over the past 3 decades. The goal of this review is to quantify the capacity of increasingly complex modeling techniques to account for complex human and natural processes, uncertainty, and resilience across spatial and temporal scales. This review begins with coupled human and natural systems theory and situates urban water demand within this framework. The second section reviews urban water demand literature and summarizes methodological advances in relation to four central themes: (1) interactions within and across multiple spatial and temporal scales, (2) acknowledgment and quantification of uncertainty, (3) identification of thresholds, nonlinear system response, and the consequences for resilience, and

(4) the transition from simple statistical modeling to fully integrated dynamic modeling. This review will show that increasingly effective models have resulted from technological advances in spatial science and innovations in statistical methods. These models provide unbiased, accurate estimates of the determinants of urban water demand at increasingly fine spatial and temporal resolution. Dynamic models capable of incorporating alternative future scenarios and local stochastic analysis are leading a trend away from deterministic prediction.

Hunter, Margaret, Kelly Donmoyer, Jim Chelius, and Gary Naumick (2011). "Declining Water Use Presents Challenges, Opportunities," *American Water Works Association Opflow*. [http://www.awwa.org/publications/OpFlowArticle.cfm?itemnumber=56556]

Abstract: For many North American utilities, residential water use has declined steadily for the last 20 years. In many locations, the trend has accelerated in the last decade. Several factors appear to contribute to declining household water use. The long-term trend could significantly affect the way utilities conduct their business and operations.

Krause, Kate, Janie M. Chermak, and David S. Brookshire (2003). "The Demand for Water: Consumer Response to Scarcity," *Journal of Regulatory Economics* 23 (2): 167-91. [http://ideas.repec.org/a/kap/regeco/v23y2003i2p167-91.html]

Abstract: Provision of water raises several issues for municipal utility companies and other suppliers, including reliability of supply in and regions or during droughts, equity issues that arise because water is literally a necessity, and heterogeneity in consumer response to regulatory policy. We combine experimental and survey responses to investigate demand for water. The experiments simulate water consumption from a potentially exhaustible source, revealing heterogeneous demand for water. We estimate econometrically water demand for different consumer groups. A regulator could use estimates of disaggregated demand to attain conservation goals by designing an incentive compatible pricing system. The example given achieves a conservation goal while minimizing enforcement costs and welfare loss.

Mayer, P., W. DeOreo, T. Chesnutt, D. Pekelney, and L. Summers (2008). "Water Budgets and Rate Structures: Innovative Management Tools," *Journal American Water Works Association* 100 (5).

Abstract: Water budgets, volumetric allotments of water to customers based on customer-specific characteristics and conservative resource standards, are an innovative means of improving water-use efficiency. Once thought to be impractical because of technological constraints, water budgets linked with an increasing-block rate structure have been implemented successfully by more than 20 utilities. Key issues identified in this examination of water budgets and their potential value to North American water utilities include: different practical approaches to water budget rate structures; the benefits and challenges of these approaches; the potential uses of water budgets during drought; and, important steps in the water budget implementation process.

Mehan, G. Tracy, III and Ian Kline (2012). "Pricing as a Demand-Side Management Tool: Implications for Water Policy and Governance," *Journal American Water Works Association* 104 (2). [http://www.awwa.org/publications/AWWAJournalArticle.cfm?itemnumber=58441]

Abstract: Full-value or -cost pricing and conservation pricing as demand-side management tools are examined along with the benefits of maintaining responsive and transparent government and the benefits realized as a result of such practices.

Merrett, Stephen (2004), "The Demand for Water: Four Interpretations," *Water International* 29 (1): 27-29.

Abstract: The management of water resources draws on a wide range of disciplines and one of the most frequent terms used among these disciplines is the "demand" for water. In fact, this single word can have at least four quite distinct meanings: the use of water, the consumption of water, the need for water, or the economic demand for water. Each of these four separate terms is carefully defined in the paper in the context of the hydrosocial balance of a region. The paper recommends precisely defining these four terms (use, consumption, need, economic demand) is necessary to avoid the ambiguities and confusion in water resources management that can arise from the catch-all term "demand." It is also indicated that to regard supply-side activities to reduce leakage and evaporation as a form of demand management is mistaken.

Mieno, Taro, and John B. Braden (2011). "Residential Demand for Water in the Chicago Metropolitan Area," *Journal of the American Water Resources Association* 47 (4):713-23. [http://onlinelibrary.wiley.com/doi/10.1111/j.1752-1688.2011.00536.x/abstract]

Abstract: "This paper provides the first contemporary analysis of residential water demand in humid Northeastern Illinois, in the vicinity of Chicago, and explores seasonal and income-based differentials in the responsiveness of water use to water prices. Using a panel of system-level data for eight water systems and controlling for seasons, weather, incomes, and community characteristics, the analysis yields low estimates of price elasticity of demand for water in line with other studies. Furthermore, price response is greater in summer and less in higher income communities. We suggest that use of seasonal pricing can help mitigate equity issues arising from differential income elasticities while taking advantage of the greater price responsiveness of summertime water use."

Olmstead, Sheila M., and Robert N. Stavins. 2007. "Managing Water Demand: Price vs. Non-Price Conservation Programs," Pioneer Institute.
[http://www.hks.harvard.edu/fs/rstavins/Monographs & Reports/Pioneer Olmstead Stavins Water.pdf]

Excerpt from conclusion: "Water management in the United States has typically been approached as an engineering problem, not an economic one. Water supply managers are often reluctant to use price increases as water conservation tools, instead relying on non-price demand management techniques. These include requirements for the adoption of specific technologies (such as lowflow fixtures) and restrictions on particular uses (such as lawn watering)... This paper has offered an analysis of the relative merits of price and non-price approaches to water conservation. On average, in the United States, a ten percent increase in the marginal price of water can be expected to diminish demand in the urban residential sector by about 3 to 4 percent. For the purpose of comparison, this average of hundreds of published water demand studies since 1960 is similar to averages reported for residential electricity and gasoline demand... Estimates of the water savings attributable to non-price demand management policies such as watering restrictions and low-flow fixture subsidies vary from zero to significant savings. These programs vary tremendously in nature and scope. More stringent mandatory policies (when well-enforced) tend to have stronger effects than voluntary policies and education programs."

Rockaway, Thomas D., Paul A. Coomes, Joshua. Rivard, and Barry. Kornstein (2011). "Residential Water Use Trends in North America," *Journal American Water Works Association* 103 (2): 76-89. [http://www.awwa.org/files/Resources/Waterwiser/JAW0211rockaway.pdf]

Conclusion: "This research investigated trends in household water use in North America. When controlling for weather and other variables, the evident decline in residential use was pervasive among the national and regional components of the study. A household in the 2008 billing year used 11,678 gallons less water annually than an identical household did in 1978... To investigate the causes of this decline, a local study of statistically representative households of the LWC was conducted in

Louisville. Adjusting for weather, water use per LWC customer fell from 208 to 187 gpd between 1990 and 2007, a decline of 21 gallons. Data-logging devices were installed at participating homes, and the data were incorporated into statistical models to examine possible causes and the relationships among socioeconomic factors, demographic factors, water-using appliances, behavior patterns, significant water features and types of irrigation, and residential water consumption. Demographic factors can account for a decline of 5 gallons, whereas income-related factors suggest an increase of about 5.4 gallons. This study attributes the remaining estimated net decline, about 19 gpd, to the increased installation of low-flow appliances in the Louisville market."

Standard & Poor's (2012) *From Droughts to Conservation: Water Can Have Big Effects on U.S. Municipal Utility Credit Quality.*

Overview: Intense competition for potable water means that while water in most of the U.S. is not yet priced like a commodity, it could be, and sooner than many might think. Although conservation efforts affect utility financial risk profiles, they can be beneficial. Making the most of increasingly scarce federal funds for infrastructure renewal and prudent risk management, including raising rates as needed, will be vital for utilities to maintain credit quality.

EXHIBIT A

Schedule of Principal Payments

Payment Due January 1,	Principal Payment	Payment Due January 1,	Principal Payment
2021	$43,000	2040	$70,000
2022	44,000	2041	72,000
2023	45,000	2042	74,000
2024	46,500	2043	76,000
2025	47,500	2044	78,000
2026	49,000	2045	80,000
2027	50,000	2046	82,000
2028	51,500	2047	84,000
2029	53,000	2048	86,500
2030	54,000	2049	88,500
2031	55,500	2050	91,000
2032	57,000	2051	93,500
2033	58,500	2052	96,000
2034	60,000	2053	98,500
2035	61,500	2054	101,000
2036	63,500	2055	103,500
2037	65,000	2056	106,500
2038	66,500	2057	109,000
2039	68,500	2058	109,500

What Exactly is a Sustainable Water System?

5-9-19 issue National Rural Water Association Magazine

By Kirk Stinchcombe, Waterworth CEO

What exactly is a "sustainable" water or wastewater system? This term gets thrown around a lot, and it seems like everyone has a slightly different idea of what it means. I tend to think about sustainability in a very broad sense, which is how it is rooted in history.

The concept of sustainability has been around since at least the 1970s, but it really started to come into vogue in the late 1980s. In 1987, the United Nations' World Commission on Environment and Development released a landmark report called *Our Common Future*. The authors coined the term "sustainable development," which they defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

People often think about sustainability quite narrowly to be just about the environment, but the authors of *Our Common Future* had a much more holistic view. Certainly, protecting the natural environment was at the front of their minds, but for them that was just one part of it. Social and financial sustainability were viewed as equally important. Together, these three pillars—caring for the environment, society and our financial health—are what sustain our communities and ecosystems.

Let's think briefly about how these three pillars apply to the water and wastewater systems that we are the custodians of. When it comes to environment, the first thing that comes to mind is water conservation—using the resource efficiently so we can leave more in streams and aquifers for fish and other species. But we positively and negatively affect the environment in lots of other ways too—minimizing energy use for pumping and treating, maximizing the life of infrastructure to avoid impacts of manufacturing and installing new pipe and other gear, adequately treating wastewater before we dispose it back into the environment. These and many other things we do have a significant impact on local and global ecosystems.

The biggest impact we have on social sustainability is actually hugely positive—the fact that we consistently deliver safe and reliable water right to the tap. This is something that we do really, really well. So much so, in fact, that our customers often seem to take it for granted. But one does not have to travel far in the world to see the devastating impact that unsafe drinking water has on communities. Another key way we affect social sustainability is by keeping rates affordable, particularly for lower income families. Also important is whether our rates are fair by charging different residents and businesses proportionate to the costs they impose on the system based on the way they use water.

Financial sustainability is mainly about whether we are collecting enough revenue to keep the system running year after year. Crucially, this includes planning for infrastructure replacement as system components wear out over time. Recall that the concept of sustainable development includes ensuring that future generations can meet their needs. When we fail to plan for infrastructure replacement, effectively this means we intend to pass these costs on to the future, which raises some big questions about inter-generational fairness.

When everything comes together, we deliver water safely and reliably; our finances are in order and are considerate of the costs we will pass on to future generations; our impacts on the natural environment are well managed, and we have strong support from our residents and elected officials. That, in a nutshell, is a sustainable water or wastewater system.

Of course, pursuing all of these things in parallel takes time, perseverance and resources—including money. Sometimes it can seem overwhelming, particularly when we have already fallen behind in one or more of these areas.

Sustainability is never easy, but there are a few things that keep me going. First, I try to take a holistic outlook. Take, for example, water rate setting. On the one hand, we need to keep rates affordable. On the other, we need to collect enough money to continue to operate the system, including managing our environmental impacts. These goals may seem at odds, but I think that misses a holistic view of sustainability. Rather than thinking about rate management as trading off between competing goals, I think of it as a delicate balancing act between the three equally important pillars. The goal is to ask what is going to move us forward most with sustainability broadly defined.

Second is the fact that there are so many partners out there to help with the journey. There are colleagues from other water service providers who share what they have learned at conferences and industry events. There are federal and state agency partners who can offer knowledge, resources and, in a pinch, grant programs. And, of course, we have the National Rural Water Association and state level RWAs. The breadth of programs that NRWA and state associations offer amazes me. In that vein, my company, Waterworth, recently commenced a pilot project with NRWA to provide software and support services to members focused on bolstering financial sustainability (see www.waterworth.net/NRWA). I feel very privileged to be part of this project, knowing the vital role that NRWA plays in helping water service providers across the country with planning their sustainability road maps.

Third is taking the long view. Way back when I was in university, not long after *Our Common Future* first came out, a wise professor told me that sustainability is not a place you arrive at, but rather an ongoing journey. That's a lesson I've never forgotten. Your water or wastewater system is never going to "become" sustainable. This is something you just have to continuously work towards. But the journey is important, and in taking it, we make our communities and the environment better. Regardless of where you are on your sustainability journey, the key is to keep the end goals in sight, even if they will always be on the distant horizon.

What We Offer

- Workshops
- Webinars
- Individualized Technical Assistance
- Small Group Support
- eLearning Modules
- Online Tools & Resources
- Blogs

Who Should Participate

- Operators
- System Managers
- Elected Officials
- Finance Staff
- DPW Superintendents
- Clerks, Bookkeepers
- Planners
- Sustainability Directors
- Emergency Management Staff
- Regional, State, Federal Personnel

2018 Workshop Topics

Asset Management for Water Systems: Prolonging Asset Life for Sustained Operations

Controlling Energy Costs at Your Water System: How to Save Thousands

Financial Management for Small Water Systems: Planning for the Next 5 Years and Beyond

Water System Finance: Identify Funding and Strengthen Your Proposals

How to Talk to Anyone: Effective Communication and Decision-Making Strategies for Small Water Systems

Reduce Costs and Maximize Revenue Through Water Loss Control

The Power of Partnership: Sharing Resources with Neighboring Systems

How to Weather the Storm: Preparing for the Aftermath of Extreme Weather Impacts

Workforce Planning: How to Attract and Retain Talent at Your Water System

Workshop Topics Continued...

Drought: Is Your Water Utility Prepared?

Intermediate Asset Management: Beyond the Basics

Advanced Asset Management: Completing and Implementing Your Plan

Individualized Technical Assistance

This service is provided FREE to small drinking water systems serving 10,000 or fewer people. If you are interested in requesting assistance from our experts, please fill out the form at: *efcnetwork.org/assistance/request-assistance/*

Types of Participants - Water Systems Operated by:

- Local governments
- Tribal governments
- Alaska Native Villages
- Hawaiian Homelands
- Private Water Companies
- Mobile home parks
- Homeowner associations
- Condo associations
- Hotels
- Restaurants
- Shopping Malls
- Zoos
- Hospitals
- Military Bases
- Schools
- Federal Government Facilities
- State Government Facilities
- Apartments
- Nursing Homes
- Parks
- Small Businesses

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About the Program

This program is offered free of charge to all who are interested. Our team provides services in every state, territory, and the Navajo Nation. All small drinking water systems are eligible to receive free training and technical assistance.

About the Environmental Finance Center Network (EFCN)

The EFCN is an organization creating innovative solutions to the how-to-pay question of environmental protection and improvement.

Program Partners

Environmental Finance Center at The University of North Carolina at Chapel Hill

Southwest Environmental Finance Center at the University of New Mexico

Syracuse University Environmental Finance Center

Environmental Finance Center at Wichita State University

Environmental Finance Center West

Environmental Finance Center at the University of Maryland

New England Environmental Finance Center at the University of Southern Maine

Great Lakes Environmental Infrastructure Center

Government Finance Officers Association

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2018

Overview of free programs and services available through a cooperative agreement with the US EPA

www.efcnetwork.org

16. Refer to the Musgove Testimony, page 4. The testimony states that, prior to this increase, city retail customers at the lowest residential customer tier were paying $5.73 per 100 cubic feet. The largest users, including wholesale customers, paid only $2.29 per 100 cubic feet.

a. Explain how the rates were calculated to arrive at these steps.

b. Explain the differences in the demand placed upon the system by residential customers, larger customers, and wholesale customers.

c. Explain how the demand on the system was taken into consideration in the development of the rate of $2.97 per 100 cubic feet.

Response: (a) Prior to the rate increase in August 2019 the minimum volumetric bill was $8.60 for 150 cubic feet of water. $8.60/1.5 = $5.73 per 100 cubic feet. The wholesale pricing in the previous rate structure was $2.29.

(b) – PWWC does not have specific information on customers' peak-hour or peak-day demands.

(c) – Demand was not taken into consideration in proposing $2.97 per 100 cubic feet for wholesale customers and the highest block of retail customers.

Witness: Tracy B. Musgove

17. Refer to the Musgove Testimony, page 7. The testimony states that the proposed rates are less than what the COSS would justify based on revenue and expenses as verified by a current Independent Auditor's Report and as adjusted by known and measurable expenses .

a. Explain how Ms. Musgove came to this conclusion since Princeton failed to do a COSS or any other type of analysis.

b. Explain how Ms. Musgove concludes that having revenue and expenses stated in an Independent Auditor's Report justifies the wholesale rate determined by Princeton is being a fair, just, and reasonable rate.

Response: (a) Ms. Musgove used her accounting background and training to understand the total cost associated with treating and distributing water and treating and disposing of wastewater. Cost accounting is used in manufacturing entities to derive the "unit cost" of particular products by adding all direct and indirect labor and material costs and then dividing by the total number of units produced. Hence, this same approach was utilized to find out the "unit cost" of the products produced and sold by PWWC, water and wastewater disposal. Water is sold in units of 100 cubic feet; therefore, by adding together all of the direct costs of production and distribution (i.e. water treatment plant expenses) along with the indirect costs to deliver and maintain the distribution system (i.e. maintenance, management and depreciation) plus costs of financing and maintaining adequate reserves and then dividing this total by the total amount of net water produced and available for sale to arrive at a total cost per 100 cubic feet. Thus, Ms. Musgove was suggesting the $2.97 wholesale rate was less than the cost it took to produce and distribute 100 cubic feet of water. The term "cost of service" was misused and should have been cost of production and distribution as calculated in the excel worksheet. There was no intent to imply that a COSS had been performed.

(b) The goal of the PWWC is to recoup 100% of all audited expenses either through water or wastewater volumetric rates or through the monthly customer service fee. Since all expenses were thought to be allocated fairly and the $2.97 wholesale rate was only 79% of the $3.76 total cost of production, the rate seems to be fair, just and reasonable especially considering that retail customers pay a higher price.

Witness: Tracy B. Musgove

18. Explain how the Affordability Analysis set the wholesale rate. Refer to the Musgove Testimony, page 8. The testimony states that Princeton will amortize the total rate case expense over a 36-month period and split the amount equally between each of the water districts.

a. Provide support for the 36-month amortization.

b. Explain why Princeton proposes a 36-month amortization period given that there has been more than since the last increase to Caldwell District and Lyon District.

Response: The 36-month amortization is based on decisions and guidance from the Public Service Commission. The Commission recently issued a report in Case No. 2019-00041 entitled "Confronting the Problems Plaguing Kentucky's Water Utilities." The very first paragraph of the section in that report discussing "Poor Financial and Accounting Practices" relates to "Infrequent Rate Increases." The Commission specifically stated: "[B]oards and managers of small, rural water utilities will take extraordinary steps to avoid coming to the Commission for a rate increase, opting instead to try and operate on razor-thin margins. A utility that fails to increase revenues to match rising expenses cannot maintain its financial integrity, especially over the long-term. Moreover, when a utility delays increasing rates by covering operational expenses with depreciation reserves or through other funding mechanisms, true financial needs are masked."

Based on this determination, the Commission recommended that water utilities review rates every three years. Specifically, the Commission recommended that "[e]very water district and association should be subjected to a rate and operations review every three years to ensure that revenue is adequate to properly operate the system over the long term.

Similarly, a 36-month amortization period is consistent with the Commission's recent emphasis that electric utilities should evaluate the need for more frequent rate cases. The Commission established a case in December 2018 in part "to encourage Distribution Cooperatives to make more frequent, smaller rate adjustments." A Review of the Rate Case Procedure for Electric Distribution Cooperatives, Case No. 2018-00407 (Ky. PSC Dec. 11, 2018).

The Commission's recent emphasis of filing rate cases every three years is supported by the fact that the Commission frequently approves three-year amortization periods for rate case expenses. The following list identifies some of the cases in which a three-year amortization of rate case expense for similar expenses was approved.

Kentucky-American Water Co., Case No. 2018-00358 (Ky. PSC June 27, 2019)

Jackson Purchase Energy Corp., Case No. 2019-00053 (Ky. PSC June 20, 2019)

Grayson RECC, Case No. 2018-00272 (Ky. PSC Mar. 28, 2019)

Water Serv. Corp. of Kentucky, Case No. 2018-00208 (Ky. PSC Feb. 11, 2019)

Inter-County Energy Coop. Corp., Case No. 2018-00129 (Jan. 25, 2019)

City of Lebanon, Case No. 2017-00417 (Ky. PSC July 12, 2018)

Atmos Energy Corp., Case No. 2017-00349 (Ky. PSC May 3, 2018)

Big Sandy RECC, Case No. 2017-00374 (Ky. PSC Apr. 26, 2018)

PR Wastewater Mgmt., Inc., Case No. 2018-00337 (Ky. PSC Apr. 12, 2018 and Mar. 22, 2018)

Monroe Cnty. Water Dist., Case No. 2017-00070 (Ky. PSC Jan. 12, 2018)

Kentucky Frontier Gas, Case No. 2017-00263 (Ky. PSC Dec. 22. 2017)

CitiPower, LLC, Case No. 2017-00160 (Ky. PSC Nov. 14, 2017)

Nolan RECC, Case No. 2016-00367 (Ky. PSC June 21, 2017)

Farmers RECC, Case No. 2016-00365 (Ky. PSC May 12, 2017)

Martin Gas, Inc., Case No. 2016-00332 (Ky. PSC Apr. 6, 2017)

Licking Valley RECC, Case No. 2016-00174 (Ky. PSC Mar. 1, 2017)

Cumberland Valley Elec. Inc., Case No. 2016-00169 (Ky. PSC Feb. 6, 2017)

Kenergy Corp., Case No. 2015-00312 (Ky. PSC Sept. 15, 2016)

Oldham Woods Sanitation, Inc. Case No. 2016-00131 (Ky. PSC Nov. 16, 2017 and July 7, 2016)

Big Rivers RECC, Case No. 2012-00535 (Ky. PSC Oct. 29, 2013)

Delta Natural Gas Co., Case No. 2010-00116 (Ky. PSC Oct. 21, 2010)

Kentucky-American Water Co., Case No. 2010-00036 (Ky. PSC Sept. 3, 2010)

Kenergy Corporation, Case No. 2003-00165 (Ky. PSC Apr. 22, 2004)

Fleming Mason Water Dist., Case No. 2001-00244 (Ky. PSC Aug. 7, 2002)

Union Heat and Light, Case No. 2001-00092 (Jan. 31, 2002)

Louisville Gas and Elec. Co., Case No. 2000-00080 (Ky. PSC Sept. 27, 2000)

City of Owenton, Case No. 98-283, (KY. PSC Feb. 22, 1999)

Goshen Utilities, Inc., Case No. 93-482 (KY. PSC June 17, 1994)

Cedarbrook Treatment Plant, Case No. 93-327 (Ky. PSC June 1, 1993)

West Oldham Utilities, Inc.. Case No. 89-136, (Ky. PSC Feb. 16, 1990)

Moreover, PWWC believes that the three-year amortization of rate case expense is reasonable because the surcharge mechanism is designed such that there is no ability to "over-recover." Nearly all of the above-referenced cases allow the amortized rate case expense to be built into the volumetric (or equivalent) rate. When rate case expense is built into a volumetric rate, there is incentive to use an amortization period that is consistent with the anticipated rate case cycle of a particular utility. If the utility is permitted to include rate case expense in its volumetric rate and amortize the expense over a 36-month period, the utility would over-recover on that single expense if it waited 60 months to file its next rate case. PWWC's surcharge, however, is limited to a set number of months. PWWC will not be able to "over-recover" because the term of the surcharge will expire when PWWC recovers the full amount.

Witness: Legal; Tracy B. Musgove

19. Refer to Staff 's First Request for Information (Staff's First Request), Item 18(c).

a. Explain whether Princeton charges any meter or customer charge to Lyon District for the seven master meters.

b. Explain whether Princeton charges any meter or customer charge to Caldwell District given that Caldwell District owns the master meters.

Response: Yes, Princeton charges a monthly customer service charge to Lyon County and Caldwell County Water Districts. The monthly customer service fee is in place to allow PWWC to recoup the administrative and billing costs which total almost $250,000 and which <u>are not</u> allocated to either water or wastewater volumetric rates. Total administrative costs (excluding the salaries and benefits of the Superintendent and the Director of Finance) are spread between all customers based on number of meters in service. Therefore, all customers are charged a monthly customer service fee per meter in use. The PSC approved the initial rate of $4 per meter in 2013. Caldwell County owning their master meters does not change the fact that bills must be prepared, postage must be paid, services are provided, and the office is open throughout the week to serve all customers, including wholesale customers.

Witness: Tracy B. Musgove

20. Refer to the Staff's First Request, Item 23.

a. Provide support for the 30.392 percent of water that is produced and used for Plant Use, Other Internal Use, Flushing, and Fire Protection[1].

b. Explain whether Princeton is aware that their Line Loss (Unaccounted for) is 17.833 percent,[2] and that for ratemaking purposes, the Commission is limited by regulation to allowing only 15 percent of line loss.[3]

(1) If Princeton is aware of this information, explain whether Princeton has a plan to reduce its line loss to 15 percent or lower.

(2) If Princeton is not aware of this information, provide whether Princeton's Commission will address this information in the future.

Response: (a) PWWC believes that the calculation of 30.392 percent is erroneous. It appears that the percentage should be 10.372 percent based on dividing 52,112,271 by 502,417,000. For supporting data, please see the internal reports attached as Exhibit 2-20 2019 Flushing.

(b) PWWC has been monitoring water loss since 2005. We are aware of the current line loss and are also aware of the Commission's policy by which the Commission reduces vaiable expenses to reflect a maximum of 15% unaccounted-for

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[1] Plant Use of	12,815,940
Other Internal Use of	5,769,077
Flushing and Fire Protection of	33,527,254
Total	52,112,271
divided by Total Produced	502,417,000
Equals	30.392%

[2] Line Loss (Unaccounted for)	89,596,902
divided by Total Produced	502,417,000
Equals	17.833%

[3] 807 KAR 5:066, Section 6(3).

water. In fiscal year 2015, PWWC had line loss exceeding 28% and we have been making strides each year to reduce this level. While we have not attained the 15% or lower goal, we have improved greatly. Part of the funds in the 2019 RD Bond Issue were used to install master meters in the system (installed in August 2019) and we are coding sections of town to compare readings of the customer routes with corresponding master meter readings. Our hope is to be able to utilize these and other tools to continue to drive down water loss.

Witness: Tracy B. Musgove and James A. Noel

Exhibit 2-20

2019 Flushing

Enter Data in Highlighted fields only. For Auto Flushing Hydrants, enter # days as long as minutes/day and GPM stay the same
For Leaks and Other Flushing that is metered, enter actual gallons and description
Save File with new date at the end of the file name and email to Tracy @ tracymusgove@bellsouth.net.

MAINTENANCE DEPARTMENT USAGE REPORT FOR MONTH OF July-18

LOCATION	REASON	MINUTES PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	# DAYS	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
62 West	Auto Flushing	210	231.049	48,520	18	873,365	116,760
62 West		270	170.000	45,900	13	596,700	79,773
Old Fredonia Road	Auto Flushing	30	193.233	5,797	30	173,910	23,250
Old Fredonia Road			193.233	-		-	-
Dawson Road	Auto Flushing	210	284.240	59,690	18	1,074,427	143,640
Dawson Road		300	202.000	60,600	13	787,800	105,321
Sandlick Road	Auto Flushing	360	30.000	10,800	30	324,000	43,316
Sandlick Road			30.000	-		-	-
293 North	Auto Flushing	180	269.280	48,470	18	872,467	116,640
293 North		360	150.000	54,000	13	702,000	93,850
Archie Ortt Road	Auto Flushing	30	59.840	1,795	30	53,856	7,200
Archie Ortt Road			59.840	-		-	-
WAL MART 62 WEST	Auto Flushing	300	135.000	40,500	30	1,215,000	162,433
WAL MART 62 WEST			135.000	-		-	-
91 SOUTH	Auto Flushing	240	180.000	43,200	18	777,600	103,957
91 SOUTH		360	170.000	61,200	13	795,600	106,364

		Last Meter Reading	Present Meter Reading		
RUTH AVE	Auto flushing	16,843	17,863	7,630	1,020
Giannini Farms	Auto flushing	108,554	110,154	11,968	1,600
E Shepherdson St	Auto flushing	246,540	258,347	88,316	11,807
BETHANY CHURCH RD	Auto flushing	153,219	160,452	54,103	7,233
DOWELL DRIVE		-	2,298	17,189	2,298
		-	-	-	-
			Subtotal Auto Flushing	**8,425,931**	**1,126,461**

LOCATION	REASON	DATE	GALLONS USED	CUBIC FT
TREEHOUSE FOODS	TANK FILL	7/30/2018	44,004	5,883
FAITH AVE & OLD FREDONIA ROAD	LEAK	7/10/2018	10,000	1,337
112 HWY 62 WEST	FLUSHING LINE	7/10/2018	40,000	5,348
VARIOUS LOCATION	WASHING SEWER	7/18/2018	700	94
600 BRDLOCK OLD MADISONVILLE	FLUSHING LINE	7/19/2018	4,800	642
QUEEN ANN CT & JACKSON RD	FLUSHING HYDRANTS	7/19/2018	4,000	535
VARIOUS LOCATION	FLOW TESTING	7/19/2018	6,000	802
VARIOUS LOCATION	WASHING SEWER	7/24/2018	2,800	374
VARIOUS LOCATION	WASHING SEWER	7/25/2018	2,400	321
VARIOUS LOCATION	FLOW TESTING	7/25/2018	10,000	1,337
VARIOUS LOCATION	FLOW TESTING	7/26/2018	16,500	2,206
BESHEAR LN FLUSH BOX	FLUSHED	7/11/2018	17,054	2,280
BESHEAR LN FLUSH BOX	FLUSHED	7/24/2018	12,120	1,620
SANDLICK RD FLUSH BOX	FLUSHED	7/18/2018	1,800	241
SANDLICK RD FLUSH BOX	FLUSHED	7/24/2018	3,600	481
				-
				-
				-
		Subtotal Other	**175,778**	**23,500**

Total Maintenance Usage	**8,601,709**	**1,149,961**

Enter Data in Highlighted fields only. For Auto Flushing Hydrants, enter # days as long as minutes/day and GPM stay the same
For Leaks and Other Flushing that is metered, enter actual gallons and description
Save File with new date at the end of the file name and email to Tracy @ tracymusgove@bellsouth.net.

MAINTENANCE DEPARTMENT USAGE REPORT FOR MONTH OF August-18

LOCATION	REASON	MINUTES PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	# DAYS	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
62 West	Auto Flushing	270	231.049	62,383	2	124,766	16,680
62 West		530	170.000	90,100	29	2,612,900	349,318
Old Fredonia Road	Auto Flushing	30	193.233	5,797	31	179,707	24,025
Old Fredonia Road			193.233	-		-	-
Dawson Road	Auto Flushing	300	284.240	85,272	2	170,544	22,800
Dawson Road		360	202.000	72,720	29	2,108,880	281,936
Sandlick Road	Auto Flushing	600	30.000	18,000	29	522,000	69,786
Sandlick Road		300	30.000	9,000	2	18,000	2,406
293 North	Auto Flushing	180	269.280	48,470		-	-
293 North		360	150.000	54,000	31	1,674,000	223,797
Archie Ortt Road	Auto Flushing	30	59.840	1,795	31	55,651	7,440
Archie Ortt Road			59.840	-		-	-
WAL MART 62 WEST	Auto Flushing	300	135.000	40,500	30	1,215,000	162,433
WAL MART 62 WEST			135.000	-		-	-
91 SOUTH	Auto Flushing	240	180.000	43,200		-	-
91 SOUTH		360	170.000	61,200	31	1,897,200	253,636

		Last Meter Reading	Present Meter Reading		
RUTH AVE	Auto flushing	17,863	20,577	20,301	2,714
Giannini Farms	Auto flushing	110,154	111,672	11,355	1,518
E Shepherdson St	Auto flushing	258,347	270,262	89,124	11,915
BETHANY CHURCH RD	Auto flushing	160,452	171,401	81,899	10,949
DOWELL DRIVE		2,298	8,090	43,324	5,792
		-	-	-	-
			Subtotal Auto Flushing	**10,824,651**	**1,447,146**

LOCATION	REASON	DATE	GALLONS USED	CUBIC FT
215 STEVENS AVE	LEAK	8/1/2018	30,000	4,011
OLD CONNECTOR RD	FLUSHING	8/13/2018	115,200	15,401
VARIOUS LOCATION	FLUSHING	8/13/2018	79,200	10,588
622 OLD MADISONVILLE ST	WASHING SEWER	8/13/2018	700	94
807 W MAIN	LEAK	8/15/2018	11,000	1,471
KENTUCKY AVE	WASHING SEWER	8/24/2018	700	94
62 WEST	FLUSHING	8/31/2018	10,200	1,364
SANDLICK RD	FLUSHING	8/31/2018	5,400	722
TREE HOUSE	TANK FILL	8/16/2018	36,670	4,902
				-
				-
				-
				-
				-
				-
				-
				-
				-
		Subtotal Other	**289,070**	**38,646**

Total Maintenance Usage **11,113,721** **1,485,792**

Enter Data in Highlighted fields only. For Auto Flushing Hydrants, enter # days as long as minutes/day and GPM stay the same
For Leaks and Other Flushing that is metered, enter actual gallons and description
Save File with new date at the end of the file name and email to Tracy @ tracymusgove@bellsouth.net.

MAINTENANCE DEPARTMENT USAGE REPORT FOR MONTH OF September-18

LOCATION	REASON	MINUTES PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	# DAYS	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
62 West	Auto Flushing	270	231.049	62,383		-	-
62 West		530	170.000	90,100	27	2,432,700	325,227
Old Fredonia Road	Auto Flushing	30	193.233	5,797	27	156,519	20,925
Old Fredonia Road			193.233	-		-	-
Dawson Road	Auto Flushing	300	284.240	85,272		-	-
Dawson Road		360	202.000	72,720	27	1,963,440	262,492
Sandlick Road	Auto Flushing	600	30.000	18,000	27	486,000	64,973
Sandlick Road		300	30.000	9,000		-	-
293 North	Auto Flushing	180	269.280	48,470		-	-
293 North		360	150.000	54,000	27	1,458,000	194,920
Archie Ortt Road	Auto Flushing	30	59.840	1,795	27	48,470	6,480
Archie Ortt Road			59.840	-		-	-
WAL MART 62 WEST	Auto Flushing	300	135.000	40,500		-	-
WAL MART 62 WEST			135.000	-		-	-
91 SOUTH	Auto Flushing	240	180.000	43,200		-	-
91 SOUTH		360	170.000	61,200	27	1,652,400	220,909

		Last Meter Reading	Present Meter Reading		
RUTH AVE	Auto flushing	20,577	23,223	19,792	2,646
Giannini Farms	Auto flushing	111,672	113,069	10,450	1,397
E Shepherdson St	Auto flushing	270,262	279,639	70,140	9,377
BETHANY CHURCH RD	Auto flushing	171,401	181,563	76,012	10,162
DOWELL DRIVE		8,090	13,754	42,367	5,664
		-	-	-	-
			Subtotal Auto Flushing	**8,416,289**	**1,125,172**

LOCATION	REASON	DATE	GALLONS USED	CUBIC FT
208 Mitchell	Leak	9/10/2018	9,000	1,203
U K Research	JSJ Tie In on New Line	9/10/2018	58,500	7,821
Mclin Street	Flushing	9/14/2018	4,950	662
105 Grooms Street	leak	9/17/2018	18,720	2,503
HWY 62 West	Sewer	9/19/2018	700	94
300 Block South Darby	leak JSJ	9/21/2018	12,000	1,604
500 Bradford Ln	leak	9/25/2018	32,400	4,332
129 W Main & S Harrison	Leak	9/25/2018	440,000	58,824
500 Bradford Ln	Flushing For BWA	9/25/2018	98,400	13,155
129 W Main & S Harrison	Flushing Fire Hyd	9/25/2018	78,300	10,468
310 Bluegrass St	Leak	9/26/2018	24,750	3,309
208 N Mitchell	Leak	9/27/2018	11,000	1,471
TREE HOUSE	TANK FILL	9/28/2018	55,005	7,354
				-
				-
				-
				-
				-
		Subtotal Other	**843,725**	**112,797**

Total Maintenance Usage	**9,260,014**	**1,237,970**

Enter Data in Highlighted fields only. For Auto Flushing Hydrants, enter # days as long as minutes/day and GPM stay the same
For Leaks and Other Flushing that is metered, enter actual gallons and description
Save File with new date at the end of the file name and email to Tracy @ tracymusgove@bellsouth.net.

MAINTENANCE DEPARTMENT USAGE REPORT FOR MONTH OF October-18

LOCATION	REASON	MINUTES PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	# DAYS	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
62 West	Auto Flushing	270	231.049	62,383		-	-
62 West		530	170.000	90,100		-	-
Old Fredonia Road	Auto Flushing	30	193.233	5,797		-	-
Old Fredonia Road			193.233	-		-	-
Dawson Road	Auto Flushing	300	284.240	85,272		-	-
Dawson Road		360	202.000	72,720		-	-
Sandlick Road	Auto Flushing	600	30.000	18,000		-	-
Sandlick Road		300	30.000	9,000		-	-
293 North	Auto Flushing	180	269.280	48,470		-	-
293 North		360	150.000	54,000		-	-
Archie Ortt Road	Auto Flushing	30	59.840	1,795		-	-
Archie Ortt Road			59.840	-		-	-
WAL MART 62 WEST	Auto Flushing	300	135.000	40,500		-	-
WAL MART 62 WEST			135.000	-		-	-
91 SOUTH	Auto Flushing	240	180.000	43,200		-	-
91 SOUTH		360	170.000	61,200		-	-

		Last Meter Reading	Present Meter Reading		
RUTH AVE	Auto flushing			-	-
Giannini Farms	Auto flushing			-	-
E Shepherdson St	Auto flushing			-	-
BETHANY CHURCH RD	Auto flushing			-	-
DOWELL DRIVE				-	-
		-	-	-	-
			Subtotal Auto Flushing	**-**	**-**

LOCATION	REASON	DATE		GALLONS USED	CUBIC FT
703 E Market St	washing sewer main	10/2/2018		700	94
Maple Ave	saw cutting manholes	10/3/2018		700	94
N Cave,W Green, Tyler St	saw cutting manholes	10/3/2018		700	94
Old Connector Rd	flushing fire hydrant	10/4/2018		21,000	2,807
Varmint Trace and S Darby inters	leak	10/6/2018		15,000	2,005
403 Muirfield Dr	flush fire hyd	10/11/2018		7,500	1,003
403 Muirfield Dr	leak	10/11/2018		5,000	668
500 W Washington St	Leak	10/16/2018		1,020	136
820 Maple Ave	leak	10/17/2018		1,200	160
310 Bluegrass St	leak	10/18/2018		5,700	762
255 Old Wilson Warehouse Rd	Leak	10/19/2018		3,888	520
Various Location	flushing fire hydrant	10/23/2018		41,100	5,495
Hwy 91 south fire hyd (rogers group)	flushing fire hydrant	10/24/2018		26,400	3,529
mitchell, E Main, Chestnut St	saw cutting manholes	10/25/2018		2,800	374
Various Location	quarterly sewer list	10/30/2018		2,100	281
Sandlick, hopkinsville, Old Conn Rd	flushing fire hydrant	10/31/2018		63,200	8,449
VARIOUS Location	quarterly sewer list	10/31/2018		2,800	374
Tree House Foods	tank fill	10/22/2018		51,338	6,863
			Subtotal Other	**252,146**	**33,709**

Total Maintenance Usage **252,146** **33,709**

Enter Data in Highlighted fields only. For Auto Flushing Hydrants, enter # days as long as minutes/day and GPM stay the same
For Leaks and Other Flushing that is metered, enter actual gallons and description
Save File with new date at the end of the file name and email to Tracy @ tracymusgove@bellsouth.net.

MAINTENANCE DEPARTMENT USAGE REPORT FOR MONTH OF November-18

LOCATION	REASON	MINUTES PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	# DAYS	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
62 West	Auto Flushing	270	231.049	62,383		-	-
62 West		530	170.000	90,100		-	-
Old Fredonia Road	Auto Flushing	30	193.233	5,797		-	-
Old Fredonia Road			193.233	-		-	-
Dawson Road	Auto Flushing	300	284.240	85,272		-	-
Dawson Road		360	202.000	72,720		-	-
Sandlick Road	Auto Flushing	600	30.000	18,000		-	-
Sandlick Road		300	30.000	9,000		-	-
293 North	Auto Flushing	180	269.280	48,470		-	-
293 North		360	150.000	54,000		-	-
Archie Ortt Road	Auto Flushing	30	59.840	1,795		-	-
Archie Ortt Road			59.840	-		-	-
WAL MART 62 WEST	Auto Flushing	300	135.000	40,500		-	-
WAL MART 62 WEST			135.000	-		-	-
91 SOUTH	Auto Flushing	240	180.000	43,200		-	-
91 SOUTH		360	170.000	61,200		-	-

		Last Meter Reading	Present Meter Reading		
RUTH AVE	Auto flushing			-	-
Giannini Farms	Auto flushing			-	-
E Shepherdson St	Auto flushing			-	-
BETHANY CHURCH RD	Auto flushing			-	-
DOWELL DRIVE				-	-
		-	-	-	-
			Subtotal Auto Flushing	**-**	**-**

LOCATION	REASON	DATE	GALLONS USED	CUBIC FT
VARIOUS LOCATIONS	FLUSHING	11/5/2018	45,000	6,016
HWY 91 SOUTH	FLUSHING	11/6/2018	90,000	12,032
GREEN STREET	Cutting around manhole	11/6/2018	700	94
SEWER PLANT	CLARIFIER	11/6/2018	700	94
423 VIOLET LOOP	LEAK	11/6/2018	24,000	3,209
845MAPLE AVE	LEAK	11/13/2018	24,000	3,209
1015 V T ROAD	LEAK	11/13/2018	10,000	1,337
VARIOUS LOCATIONS	FLUSHING	11/14/2018	120,240	16,075
91 S ROGERS GROUP	FLUSHING	11/19/2018	18,000	2,406
PRIMARY& ELEMETRY SCHOOL	WASHING SEWER	11/21/2018	700	94
827 W MAIN	WASHING SEWER	11/21/2018	700	94
SEWER PLANT	CLARIFIER	11/26/2018	700	94
205 GARRET STREET	WASHING SEWER	11/27/2018	700	94
TREE HOUSE	TANK FILL	11/13/2018	29,336	3,922
TREE HOUSE	TANK FILL	11/25/2018	29,336	3,922
				-
				-
				-
		Subtotal Other	**394,112**	**52,689**

Total Maintenance Usage **394,112** **52,689**

Enter Data in Highlighted fields only. For Auto Flushing Hydrants, enter # days as long as minutes/day and GPM stay the same
For Leaks and Other Flushing that is metered, enter actual gallons and description
Save File with new date at the end of the file name and email to Tracy @ tracymusgove@bellsouth.net.

MAINTENANCE DEPARTMENT USAGE REPORT FOR MONTH OF December-18

LOCATION	REASON	MINUTES PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	# DAYS	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
62 West	Auto Flushing	210	231.049	48,520		-	-
62 West		270	170.000	45,900		-	-
Old Fredonia Road	Auto Flushing	30	193.233	5,797		-	-
Old Fredonia Road			193.233	-		-	-
Dawson Road	Auto Flushing	210	284.240	59,690		-	-
Dawson Road		300	202.000	60,600		-	-
Sandlick Road	Auto Flushing	360	30.000	10,800		-	-
Sandlick Road			30.000	-		-	-
293 North	Auto Flushing	180	269.280	48,470		-	-
293 North		360	150.000	54,000		-	-
Archie Ortt Road	Auto Flushing	30	59.840	1,795		-	-
Archie Ortt Road			59.840	-		-	-
WAL MART 62 WEST	Auto Flushing	300	135.000	40,500		-	-
WAL MART 62 WEST			135.000	-		-	-
91 SOUTH	Auto Flushing	240	180.000	43,200		-	-
91 SOUTH		360	170.000	61,200		-	-

LOCATION	REASON	Last Meter Reading	Present Meter Reading	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
RUTH AVE	Auto flushing			-	-
Giannini Farms	Auto flushing			-	-
E Shepherdson St	Auto flushing			-	-
BETHANY CHURCH RD	Auto flushing			-	-
DOWELL DRIVE		-		-	-
		-	-	-	-
			Subtotal Auto Flushing	**-**	**-**

LOCATION	REASON	DATE		GALLONS USED	CUBIC FT
91 S FH ROGERS GROUP	FLUSHING	12/4/2018		18,000	2,406
828 MAPLE AVE	WASHING SEWER	12/4/2018		700	94
91 S FH ROGERS GROUP	FLUSHING	12/6/2018		14,400	1,925
BALDWIN & LEECH STREET	WASHING SEWER	12/10/2018		700	94
91 S FH ROGERS GROUP	FLUSHING	12/10/2018		19,800	2,647
615 MAPLE AVE	LEAK	12/11/2018		12,000	1,604
JSJ CONTRACTING	FLUSHING	12/18/2018		2,800	374
307 MAPLE AVE	LEAK	12/24/2018		10,000	1,337
MAPLE AVE PROJECT ENVISION	WASHING SEWER	12/26/2018		1,400	187
MAPLE AVE PROJECT ENVISION	WASHING SEWER	12/27/2018		700	94
MAPLE AVE PROJECT ENVISION	WASHING SEWER	12/28/2018		2,100	281
NEW 16" WATER MAIN	FLUSHING FOR BAC T	12/28/2018		50,000	6,684
TREEHOUSE	TANK FILL	12/14/2018		36,670	4,902
TREEHOUSE	TANK FILL	12/17/2018		51,338	6,863
TREEHOUSE	TANK FILL	12/28/2018		44,004	5,883
					-
					-
					-
			Subtotal Other	**264,612**	**35,376**

Total Maintenance Usage	**264,612**	**35,376**

Enter Data in Highlighted fields only. For Auto Flushing Hydrants, enter # days as long as minutes/day and GPM stay the same
For Leaks and Other Flushing that is metered, enter actual gallons and description
Save File with new date at the end of the file name and email to Tracy @ tracymusgove@bellsouth.net.

MAINTENANCE DEPARTMENT USAGE REPORT FOR MONTH OF January-19

LOCATION	REASON	MINUTES PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	# DAYS	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
62 West	Auto Flushing	270	231.049	62,383		-	-
62 West		530	170.000	90,100		-	-
Old Fredonia Road	Auto Flushing	30	193.233	5,797		-	-
Old Fredonia Road			193.233	-		-	-
Dawson Road	Auto Flushing	300	284.240	85,272		-	-
Dawson Road		360	202.000	72,720		-	-
Sandlick Road	Auto Flushing	600	30.000	18,000		-	-
Sandlick Road		300	30.000	9,000		-	-
293 North	Auto Flushing	180	269.280	48,470		-	-
293 North		360	150.000	54,000		-	-
Archie Ortt Road	Auto Flushing	30	59.840	1,795		-	-
Archie Ortt Road			59.840	-		-	-
WAL MART 62 WEST	Auto Flushing	300	135.000	40,500		-	-
WAL MART 62 WEST			135.000	-		-	-
91 SOUTH	Auto Flushing	240	180.000	43,200		-	-
91 SOUTH		360	170.000	61,200		-	-

LOCATION	REASON	Last Meter Reading	Present Meter Reading	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
RUTH AVE	Auto flushing			-	-
Giannini Farms	Auto flushing			-	-
E Shepherdson St	Auto flushing			-	-
BETHANY CHURCH RD	Auto flushing			-	-
DOWELL DRIVE				-	-
		-	-	-	-
			Subtotal Auto Flushing	**-**	**-**

LOCATION	REASON	DATE		GALLONS USED	CUBIC FT
MAPLE & V T	WASHING SEWER	1/2/2019		1,400	187
OLD CONNECTOR & 91 S ROGERS GROUP	FLUSHING	1/2/2019		1,800	241
SANDLICK RD	FLUSHING NEW LINE	1/4/2019		43,309	5,790
OLD CONNECTOR & 91 S ROGERS GROUP	FLUSHING	1/7/2019		3,300	441
VARIOUS	WASHED LIFT STATIONS	1/8/2019		700	94
BLUEGRASS STREET	LEAK	1/14/2019		600	80
STEVENS AVE	Cleaned off road	1/15/2019		700	94
212 STEVENS AVE	LEAK	1/15/2019		30,000	4,011
406 S DARBY	FLUSHING NEW LINE	1/15/2019		20,000	2,674
GARDEN ACRES & MAPLE	FLUSHING NEW LINE	1/16/2019		6,850	916
GRAPEVINE DRIVE	LEAK	1/19/2019		75,000	10,027
GARDEN ACRES & MAPLE	FLUSHING NEW LINE	1/22/2019		8,580	1,147
MAPLE AVE	FLUSHING NEW LINE	1/22/2019		6,800	909
102 MANOR DRIVE	LEAK	1/28/2019		18,000	2,406
TREEHOUSE	TANK FILL	1/9/2019		44,004	5,883
TREEHOUSE	TANK FILL	1/27/2019		66,006	8,824
					-
					-
			Subtotal Other	**327,049**	**43,723**

Total Maintenance Usage **327,049** **43,723**

Enter Data in Highlighted fields only. For Auto Flushing Hydrants, enter # days as long as minutes/day and GPM stay the same
For Leaks and Other Flushing that is metered, enter actual gallons and description
Save File with new date at the end of the file name and email to Tracy @ tracymusgove@bellsouth.net.

MAINTENANCE DEPARTMENT USAGE REPORT FOR MONTH OF February-19

LOCATION	REASON	MINUTES PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	# DAYS	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
62 West	Auto Flushing	210	231.049	48,520		-	-
62 West		270	170.000	45,900		-	-
Old Fredonia Road	Auto Flushing	30	193.233	5,797		-	-
Old Fredonia Road			193.233	-		-	-
Dawson Road	Auto Flushing	210	284.240	59,690		-	-
Dawson Road		300	202.000	60,600		-	-
Sandlick Road	Auto Flushing	360	30.000	10,800		-	-
Sandlick Road			30.000	-		-	-
293 North	Auto Flushing	180	269.280	48,470		-	-
293 North		360	150.000	54,000		-	-
Archie Ortt Road	Auto Flushing	30	59.840	1,795		-	-
Archie Ortt Road			59.840	-		-	-
WAL MART 62 WEST	Auto Flushing	300	135.000	40,500		-	-
WAL MART 62 WEST			135.000	-		-	-
91 SOUTH	Auto Flushing	240	180.000	43,200		-	-
91 SOUTH		360	170.000	61,200		-	-

		Last Meter Reading	Present Meter Reading		
RUTH AVE	Auto flushing			-	-
Giannini Farms	Auto flushing			-	-
E Shepherdson St	Auto flushing			-	-
BETHANY CHURCH RD	Auto flushing			-	-
DOWELL DRIVE		-		-	-
		-	-	-	-
			Subtotal Auto Flushing	**-**	**-**

LOCATION	REASON	DATE		GALLONS USED	CUBIC FT
615 V T	LEAK	2/1/2019		20,000	2,674
MAPLE AVE	NEW 16" WATER MAIN	2/7/2019		288,000	38,503
111 N HIGHLAND	WASHING SEWER	2/14/2019		700	94
323 BALDWIN AVE	LEAK ON SERVICE LINE	2/19/2019		8,000	1,070
320 NORTHFIELD DRIVE	LEAK ON SERVICE LINE	2/25/2019		12,000	1,604
EAGON & V T	LEAK ON VALVE	2/26/2019		13,464	1,800
TREEHOUSE FOODS	TANK FILL	2/14/2019		58,672	7,844
TREEHOUSE FOODS	TANK FILL	2/26/2019		44,004	5,883
JSJ CONSTRUCTION RD PROJECT	FILLING & FLUSHING LINES	2/28/2019		111,000	14,840
					-
					-
					-
					-
					-
					-
					-
					-
					-
			Subtotal Other	**555,840**	**74,310**

Total Maintenance Usage	**555,840**	**74,310**

Enter Data in Highlighted fields only. For Auto Flushing Hydrants, enter # days as long as minutes/day and GPM stay the same
For Leaks and Other Flushing that is metered, enter actual gallons and description
Save File with new date at the end of the file name and email to Tracy @ tracymusgove@bellsouth.net.

MAINTENANCE DEPARTMENT USAGE REPORT FOR MONTH OF March-19

LOCATION	REASON	MINUTES PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	# DAYS	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
62 West	Auto Flushing	210	231.049	48,520		-	-
62 West		270	170.000	45,900		-	-
Old Fredonia Road	Auto Flushing	30	193.233	5,797		-	-
Old Fredonia Road			193.233	-		-	-
Dawson Road	Auto Flushing	210	284.240	59,690		-	-
Dawson Road		300	202.000	60,600		-	-
Sandlick Road	Auto Flushing	360	30.000	10,800		-	-
Sandlick Road			30.000	-		-	-
293 North	Auto Flushing	180	269.280	48,470		-	-
293 North		360	150.000	54,000		-	-
Archie Ortt Road	Auto Flushing	30	59.840	1,795		-	-
Archie Ortt Road			59.840	-		-	-
WAL MART 62 WEST	Auto Flushing	300	135.000	40,500		-	-
WAL MART 62 WEST			135.000	-		-	-
91 SOUTH	Auto Flushing	240	180.000	43,200		-	-
91 SOUTH		360	170.000	61,200		-	-

		Last Meter Reading	Present Meter Reading		
RUTH AVE	Auto flushing			-	-
Giannini Farms	Auto flushing			-	-
E Shepherdson St	Auto flushing			-	-
BETHANY CHURCH RD	Auto flushing			-	-
DOWELL DRIVE		-		-	-
		-	-	-	-
			Subtotal Auto Flushing	**-**	**-**

LOCATION	REASON	DATE	GALLONS USED	CUBIC FT
Beshear ln	flushing	3/7/2019	3,000	401
309 Dollar sr	Washing Sewer	3/8/2019	700	94
512 Maple ave	Washing Sewer	3/28/2019	700	94
various	JSJ Construction	3/29/2019	41,800	5,588
SKYLINE TANK	REHAB TANK	3/29/2019	283,750	37,934
TREEHOUSE	FILL TANK	3/12/2019	51,338	6,863
TREEHOUSE	FILL TANK	3/27/2019	58,672	7,844
				-
				-
				-
				-
				-
				-
				-
				-
				-
				-
				-
		Subtotal Other	**439,960**	**58,818**

Total Maintenance Usage	**439,960**	**58,818**

Enter Data in Highlighted fields only. For Auto Flushing Hydrants, enter # days as long as minutes/day and GPM stay the same
For Leaks and Other Flushing that is metered, enter actual gallons and description
Save File with new date at the end of the file name and email to Tracy @ tracymusgove@bellsouth.net.

MAINTENANCE DEPARTMENT USAGE REPORT FOR MONTH OF April-19

LOCATION	REASON	MINUTES PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	# DAYS	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
62 West	Auto Flushing	210	231.049	48,520		-	-
62 West		270	170.000	45,900		-	-
Old Fredonia Road	Auto Flushing	30	193.233	5,797		-	-
Old Fredonia Road			193.233	-		-	-
Dawson Road	Auto Flushing	210	284.240	59,690		-	-
Dawson Road		300	202.000	60,600		-	-
Sandlick Road	Auto Flushing	360	30.000	10,800		-	-
Sandlick Road			30.000	-		-	-
293 North	Auto Flushing	180	269.280	48,470		-	-
293 North		360	150.000	54,000		-	-
Archie Ortt Road	Auto Flushing	30	59.840	1,795		-	-
Archie Ortt Road			59.840	-		-	-
WAL MART 62 WEST	Auto Flushing	300	135.000	40,500		-	-
WAL MART 62 WEST			135.000	-		-	-
91 SOUTH	Auto Flushing	240	180.000	43,200		-	-
91 SOUTH		360	170.000	61,200		-	-

LOCATION	REASON	Last Meter Reading	Present Meter Reading	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
RUTH AVE	Auto flushing			-	-
Giannini Farms	Auto flushing			-	-
E Shepherdson St	Auto flushing			-	-
BETHANY CHURCH RD	Auto flushing			-	-
DOWELL DRIVE		-		-	-
		-	-	-	-
			Subtotal Auto Flushing	**-**	**-**

LOCATION	REASON	DATE	GALLONS USED	CUBIC FT
V T AND MAPLE AVE	FLUSHING	4/6/2019	12,040	1,610
GROOMS STREET	LEAK	4/12/2019	1,500	201
117 McGOODWIN AVE	LEAK	4/22/2019	1,500	201
469 PERRY CEMT. RD	LEAK	4/23/2019	30,000	4,011
N PLUM AND W LOCUST	LEAK	4/23/2019	30,000	4,011
301 BLUEGRASS	LEAK	4/24/2019	4,000	535
TREEHOUSE	TANK FILL	4/11/2019	29,336	3,922
TREEHOUSE	TANK FILL	4/29/2019	44,004	5,883
JSJ CONSTRUCTION	FLUSHING	4/30/2019	4,100	548
				-
				-
				-
				-
				-
				-
				-
				-
				-
		Subtotal Other	**156,480**	**20,920**

Total Maintenance Usage	**156,480**	**20,920**

Enter Data in Highlighted fields only. For Auto Flushing Hydrants, enter # days as long as minutes/day and GPM stay the same
For Leaks and Other Flushing that is metered, enter actual gallons and description
Save File with new date at the end of the file name and email to Tracy @ tracymusgove@bellsouth.net.

MAINTENANCE DEPARTMENT USAGE REPORT FOR MONTH OF May-19

LOCATION	REASON	MINUTES PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	# DAYS	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
62 West	Auto Flushing	210	231.049	48,520		-	-
62 West		270	170.000	45,900		-	-
Old Fredonia Road	Auto Flushing	30	193.233	5,797		-	-
Old Fredonia Road			193.233	-		-	-
Dawson Road	Auto Flushing	210	284.240	59,690		-	-
Dawson Road		300	202.000	60,600		-	-
Sandlick Road	Auto Flushing	360	30.000	10,800		-	-
Sandlick Road			30.000	-		-	-
293 North	Auto Flushing	180	269.280	48,470		-	-
293 North		360	150.000	54,000		-	-
Archie Ortt Road	Auto Flushing	30	59.840	1,795		-	-
Archie Ortt Road			59.840	-		-	-
WAL MART 62 WEST	Auto Flushing	300	135.000	40,500		-	-
WAL MART 62 WEST			135.000	-		-	-
91 SOUTH	Auto Flushing	240	180.000	43,200		-	-
91 SOUTH		360	170.000	61,200		-	-

		Last Meter Reading	Present Meter Reading		
RUTH AVE	Auto flushing			-	-
Giannini Farms	Auto flushing			-	-
E Shepherdson St	Auto flushing			-	-
BETHANY CHURCH RD	Auto flushing			-	-
DOWELL DRIVE		-		-	-
		-	-	-	-
			Subtotal Auto Flushing	**-**	**-**

LOCATION	REASON	DATE	GALLONS USED	CUBIC FT
315 BALDWIN AVE	LEAK	5/3/2019	158,400	21,176
HAWTHORNE & E LOCUST	SEWER	5/6/2019	600	80
500 MAPLE AVE	FLUSHING HYDRANTS	5/7/2019	25,000	3,342
500 MAPLE AVE	LEAK	5/7/2019	10,500	1,404
717 W LOCUST	SEWER	5/13/2019	700	94
808 W LOCUST	SEWER	5/14/2019	700	94
VARIOUS LOCATIONS	FLUSHING FOR DBP SAMP	5/14/2019	116,640	15,594
OLD FREDONIA RD	FLUSHING HYDRANTS	5/16/2019	6,600	882
408 WHITE STREET	WASHING SEWER	5/16/2019	700	94
VARMINTRACE	FLUSHING FOR BWA	5/22/2019	28,800	3,850
712 W LOCUST	WASHING SEWER	5/22/2019	700	94
VARIOUS LOCATIONS	QUARTLEY SEWERS	5/28/2019	700	94
VARIOUS LOCATIONS	QUARTLEY SEWERS	5/29/2019	2,800	374
606 MARION RD	WASHING SEWER	5/31/2019	700	94
JSJ CONSTRUCTION	RD PROJECT	5/31/2019	24,500	3,275
TREEHOUSE	TANKFILL	5/14/2019	36,670	4,902
TREEHOUSE	TANKFILL	5/26/2019	51,338	6,863
				-
		Subtotal Other	**466,048**	**62,306**

Total Maintenance Usage **466,048** **62,306**

Enter Data in Highlighted fields only. For Auto Flushing Hydrants, enter # days as long as minutes/day and GPM stay the same
For Leaks and Other Flushing that is metered, enter actual gallons and description
Save File with new date at the end of the file name and email to Tracy @ tracymusgove@bellsouth.net.

MAINTENANCE DEPARTMENT USAGE REPORT FOR MONTH OF June-19

LOCATION	REASON	MINUTES PER DAY	GALLONS PER MINUTE	GALLONS PER DAY	# DAYS	TOTAL GALLONS PER MONTH	CUBIC FT PER MONTH
62 West	Auto Flushing	210	231.049	48,520		-	-
62 West		270	170.000	45,900		-	-
Old Fredonia Road	Auto Flushing	30	193.233	5,797		-	-
Old Fredonia Road			193.233	-		-	-
Dawson Road	Auto Flushing	210	284.240	59,690		-	-
Dawson Road		300	202.000	60,600		-	-
Sandlick Road	Auto Flushing	360	30.000	10,800		-	-
Sandlick Road			30.000	-		-	-
293 North	Auto Flushing	180	269.280	48,470		-	-
293 North		360	150.000	54,000		-	-
Archie Ortt Road	Auto Flushing	30	59.840	1,795		-	-
Archie Ortt Road			59.840	-		-	-
WAL MART 62 WEST	Auto Flushing	300	135.000	40,500		-	-
WAL MART 62 WEST			135.000	-		-	-
91 SOUTH	Auto Flushing	240	180.000	43,200		-	-
91 SOUTH		360	170.000	61,200		-	-

		Last Meter Reading	Present Meter Reading		
RUTH AVE	Auto flushing			-	-
Giannini Farms	Auto flushing			-	-
E Shepherdson St	Auto flushing			-	-
BETHANY CHURCH RD	Auto flushing			-	-
DOWELL DRIVE		-		-	-
		-	-	-	-
			Subtotal Auto Flushing	**-**	**-**

LOCATION	REASON	DATE		GALLONS USED	CUBIC FT
203 HOLLY LANE	WASHING SEWER	6/3/2019		700	94
VARIOUS LOCATION	QUARTLY SEWER	6/6/2019		2,800	374
VARIOUS LOCATION	QUARTLY SEWER	6/7/2019		1,400	187
NOBLE AVE	FLUSHING	6/7/2019		13,200	1,765
VARIOUS LOCATION	QUARTLY SEWER	6/13/2019		700	94
SUGAR CREEK OLD CONNECTOR RD	FLUSHING	6/14/2019		39,600	5,294
NOBLE AVE	FLUSHING	6/14/2019		83,250	11,130
BESHEAR LN	FLUSHING	6/18/2019		48,000	6,417
BESHEAR LN	FLUSHING	6/24/2019		34,560	4,620
100 BLOCK LEGION	LEAK	6/24/2019		93,000	12,433
MURIFIELD & TURNBERRY	FLUSHING	6/28/2019		1,000	134
249 SKYLINE DRIVE	LEAK	6/28/2019		18,000	2,406
249 SKYLINE DRIVE	WASHING ROAD OFF	6/28/2019		700	94
JSJ CONSTRUCTION	FLUSHING	6/30/2019		34,000	4,545
TREEHOUSE	TANK FILL	6/12/2019		36,670	4,902
TREEHOUSE	TANK FILL	6/28/2019		51,338	6,863
leak upgrade	leak in jar galvanize	6/28/2019		5,000	668
					-
			Subtotal Other	**463,918**	**62,021**

Total Maintenance Usage **463,918** **62,021**

21. Refer to the Staff's First Request, Item 26. Here, Princeton discusses the sharing of information with other departments and the Water and Wastewater Commission, and with this information, the cost to produce and distribute water is calculated to be $3.36 per 100 cubic feet.

a. Provide all data Princeton used support the $3.36 per cubic feet estimate.

b. Provide all calculations and workpapers in Excel spreadsheet format with formulas unprotected and all rows and columns fully accessible.

Response: Refer to Excel Exhibit PSC 2-21 Unit Cost Worksheet

Witness: Tracy B. Musgove

22. Provide all workpapers that were used to analyze and calculate the proposed wholesale rate in Excel spreadsheet format with formulas unprotected and all rows and columns fully accessible.

Response: Refer to Excel Exhibit PSC 2-21 Unit Cost Worksheet

Witness: Tracy B. Musgove

23. Refer to the Musgove Testimony, page 3. Provide a detailed explanation for the increase in flushing for fiscal year 2014 to fiscal year 2019.

Response: Refer to Excel Exhibit PSC 2-23 Flushing Comparison 2014 – 2019. There are many factors that have resulted in increased flushing over the last few years. PWWC maintenance has a list of known areas of concern that we monitor periodically throughout the spring, summer, and fall months. PWWC uses these readings to determine the settings for the auto flushers. In 2014, we did not turn on auto flushers until the month of June. PWWC had three locations that we did not flush all year and two locations were not set to flush every day. The run times did not increase for any locations through the year. We had six auto flushers in service in 2014 with August being the month with the highest amount of water flushed during the year. In 2015, PWWC began running auto flushers in late April. Maintenance crews did increase the flushing time during the year to maintain good chlorine residuals. PWWC had only six auto flushers in service for 2015. June 2016, we increased locations to seven and by the end of August we had nine auto flushers in place. This increased flushing was in large part due to former Superintendent Joseph Anderson requesting that PWWC staff keep the chlorine residuals well above compliance levels in an attempt to help CCWD meet requirements for DBP sampling set by the DOW. CCWD was having trouble meeting the DBP limits and DOW was told it was PWWC's fault even though PWWC was not violating regulatory standards. In 2017, PWWC added three more locations increasing the number of sites from nine to twelve. In 2018, PWWC increased the locations to fourteen. Also, in 2018, PWWC's water treatment plant had an issue with chlorine equipment that caused the chlorine residuals leaving the plant to be lower than the average 2ppm. This equipment failure resulted in chlorine residuals throughout the distribution system to be low resulting in the decision to flush larger amounts of water in order to remain in compliance. In 2019, we reduced our storage capacity by .5MG when contractors began the rehab on our Skyline Tank, which was removed from service for several months during the summer. This left us maintaining our high-level system using VFD's pumping water from our low-level system. Due to our limited storage capacity, we flushed less. We also started using Chlorine Dioxide at the plant in efforts to help CCWD meet their DBP limits. This, along with newer water, helped in maintaining good chlorine readings throughout the system; hence, lower flushing in 2019 than what would have otherwise been required.

Witness: James A. Noel and Tracy B. Musgove

24. Refer to the Musgove Testimony, page 7.

a. Explain why the cost to produce water is the same across all customer classifications.

b. Provide support for the assumption that a customer being served by a 5/8-Inch meter with usage of 4,000 gallons a month places the same demand and is served with the same facilities as a customer with a 4-Inch meter with usage of 100,000 gallons a month.

Response:

(a) Support for a uniform rate can be found in the M1 Manual of Water Supply Practices – Principles of Water Rates, Fees, and Charges, 5th Ed, Chapter 10 Uniform Rates, which states "A uniform, uniform-volume, or uniform-commodity rate is a constant unit price for all metered volumetric units of water consumed on a year-round basis. Unlike flat fees or charges, uniform rates require metered service and can be applied to all customer or service classifications, such as residential, commercial, industrial, wholesale and so on." (p.85)

PWWC was simply trying to move from a more complicated rate structure that was put in place at a time when the population and growth of the community was more robust. The uniform rate structure seemed to be an easier method to understand from both an internal and external perspective.

The M1 manual also states:

> "A uniform water rate is expressed as constant cost per thousand gallons or cost per hundred cubic feet. Potential cost-of-service differentials among customer or service classifications are not recognized when designing a uniform rate applicable to all general water service customers. In order to capture class-based, cost-of-

service. The rate usually accompanies a fixed charge per billing period, defined as a customer charge, meter service charge, or administrative charge." (p.85)

"Uniform rates are relatively simple for water utilities to implement and for customers to understand. A uniform rate also sends customers a usage-based price signal. In comparison to block rates(…)the uniform rate also implies that all increments of water provided are associated with the same unit cost of service. Simplicity and customer understanding of the rate structure are valued highly." (p.86)

(a) No demand data was utilized

Witness: Tracy B. Musgove

25. If a COSS, using industry accepted methods, has ever been performed for Princeton's water operations, provide a copy of the study, state when the study was performed, and provide the author of the study.

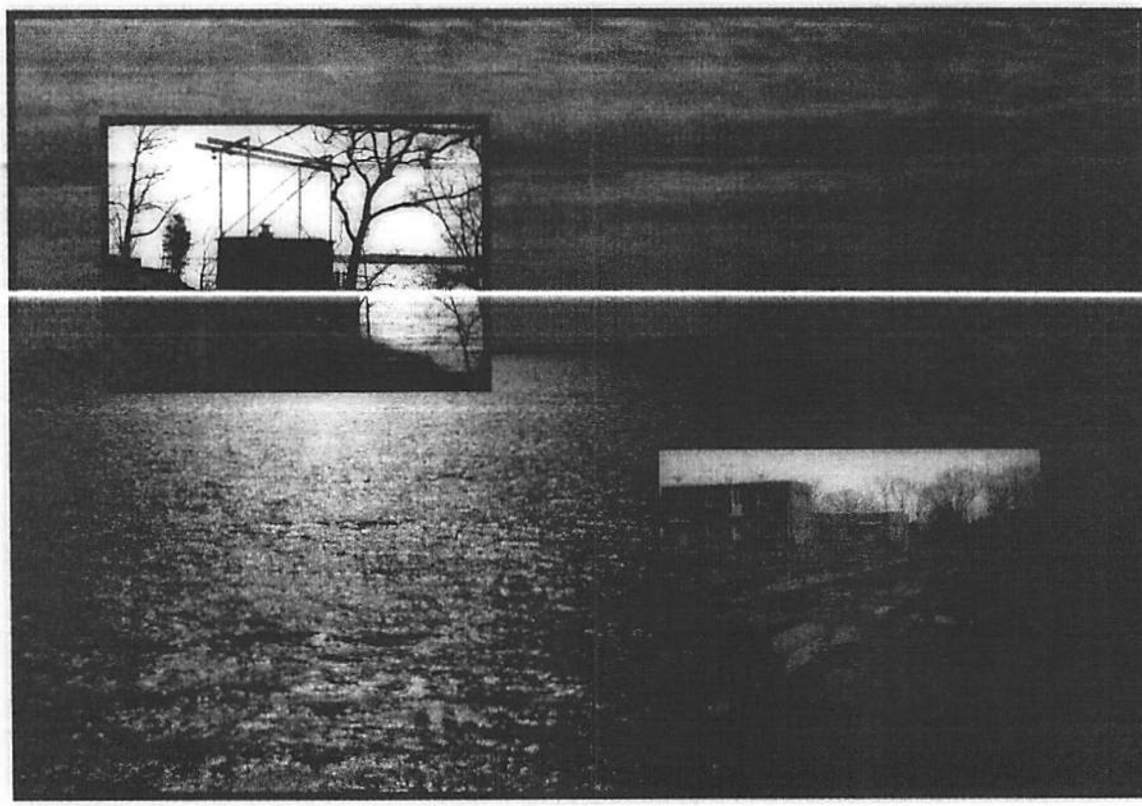
Response: Minutes of a Special Called Commission meeting held October 7, 1998 reference a presentation by Quest Engineering regarding the Water Treatment Plant Expansion and Upgrade. See relevant pages from this presentation attached as Exhibit PSC 2-25 Quest Engineering Plant Analysis. A search through old filing cabinets has turned up nothing more and none of the management or board members from that time are still around. There has been no COSS since May 2004, when the longest serving board member joined the PWWC.

Witness: Tracy B. Musgove

Exhibit PSC 2-25
Quest Engineering
Plant Analysis

Water Treatment Plant Expansion and Upgrade

Evaluation of Treatment Options



Princeton Water & Wastewater Commission
Princeton, Kentucky

September 1998

Quest

Residual Solids Pumping Station

Residual Solids Storage

WTP PERFORMANCE

Parameter	1995	1996	1997	1998
• Flow (MGD[1] / % Capacity)				
- Average Daily	1.16 / 58.0	1.33 / 66.5	1.37 / 68.5	1.27 / 63.5
- Peak Daily	1.78 / 89.0	1.90 / 95.0	2.00 / 100.0	1.79 / 89.5
• Turbidity (NTU)				
- Raw (Average / Peak)	5.9 / 22.0	8.2 / 58.0	10.6 / 148.0	9.1 / 55.0
- Finished[2]	0	0	0	0

Notes: 1) Design Capacity – 2.0 MGD
2) Number of Times 0.5 NTU or Greater

Project Costs

Cost Comparison

Category	Alt 1 CT	Alt 2 BF	Alt 1A CT	Alt 2A BF
Construction	$2,867	$3,141	$2,867	$3,141
Project / Contingency	663	717	663	717
Total	3,530	3,858	3,530	3,858
Grants	900	900	1,400	1,400
Loans	2,630	2,958	2,130	2,458
Annual Debt Service	151	169	124	142
Annual O&M	623	600	623	600
Total	$774	$769	$747	$742

Preliminary Rates

Category	Alt 1 CT	Alt 2 BF	Alt 1A CT	Alt 2A BF
Outstanding Debt	$129	$129	$129	$129
New Debt	151	169	124	142
Coverage	16	20	10	14
Annual O&M	623	600	623	600
Required Revenue	919	918	886	885
Current Revenue	(710)	(710)	(710)	(710)
Additional Revenue Req.	209	208	176	175
Avg. Percentage Increase	29.4	29.3	24.8	24.6
Current Avg. Monthly Bill[1]	$11.25	$11.25	$11.25	$11.25
Required Avg. Monthly Bill[1]	$14.55	$14.55	$14.05	$14.00

Note: 1) Based Upon 650 Ft^3/Month Usage

Conclusions

Table 3
Estimated Project Rate Analysis
Princeton Water Treatment Plant
Princeton, Kentucky

Category	*$900,000 Grant*				*$1,400,000 Grant*			
	Alternative 1 Conventional Technology		*Alternative 2 Ballasted Flocculation Technology*		*Alternative 1A Conventional Technology*		*Alternative 2A Ballasted Flocculation Technology*	
Project Costs[1]								
Raw Water Intake	$	288	$	288	$	288	$	288
Water Treatment Plant Expansion/Upgrade		2,579		2,853		2,579		2,853
Total Construction	**$**	**2,867**	**$**	**3,141**	**$**	**2,867**	**$**	**3,141**
Contingency @ 10%		287		314		287		314
Project Costs		376		403		376		403
Total Project Costs	**$**	**3,530**	**$**	**3,858**	**$**	**3,530**	**$**	**3,858**
Project Financing[1]								
Total Project Cost	$	3,530	$	3,858	$	3,530	$	3,858
Grants								
• Economic Development Administration		0		0		500		500
• Rural Development		900		900		900		900
Subtotal Grants	**$**	**900**	**$**	**900**	**$**	**1,400**	**$**	**1,400**
Low-interest Loans	$	2,630	$	2,958	$	2,130	$	2,458
Debt Service								
• Rural Development @ 4.5%	$	1,130/61	$	1,458/79	$	630/34	$	958/52
• DWSRF[2] @ 1.8%		1,500/90		1,500/90		1,500/90		1,500/90
Subtotal Debt Service	**$**	**2,630/151**	**$**	**2,958/169**	**$**	**2,130/124**	**$**	**2,458/142**
Preliminary Rates[1]								
Outstanding Debt	$	129	$	129	$	129	$	129
New Debt		151		169		124		142
Coverage		16		20		10		14
Operation and Maintenance		623		600		623		600
Subtotal Required Revenue	**$**	**919**	**$**	**918**	**$**	**886**	**$**	**885**
Current Revenue		(710)		(710)		(710)		(710)
Additional Revenue Required	**$**	**209**	**$**	**208**	**$**	**176**	**$**	**175**
Average Percentage Increase	29.4%		29.3%		24.8%		24.6%	
Current Average Monthly Bill[3]	$11.25		$11.25		$11.25		$11.25	
Required Average Monthly Bill	$14.55		$14.55		$14.05		$14.00	

Notes: [1]In thousands
[2]DWSRF - Drinking Water State Revolving Loan Fund
[3]Average monthly bill based on 650 cubic feet/month usage

26. Princeton proposes to increase the monthly customer service charge for each meter serving the wholesale customers from $4.00 to $6.00. Provide the cost justification for this 50 percent increase.

a. Provide all calculations and workpapers in Excel spreadsheet format with formulas unprotected and all rows and columns fully accessible.

b. State and support all assumptions relied upon in determining this increase

Response: (a) In the M54 Manual of Water Supply Practices, Developing Rates for Small Systems, Chapter 4 Rate Design (p.35) "A basic distinction about the charges within a rate structure relates to whether the charges are fixed or variable. This distinction flows from the cost causation principles – some costs of serving customers do not vary with the amount of water consumed. …. These costs typically include meter reading, billing, accounting, collection expenses, and maintenance and capital costs related to meters. These costs are generally recovered through a fixed charge per billing period per customer or meter that does not vary with consumption… Because they are based on the costs of servicing customers, fixed charges are also referred to as customer charges or service charges."

Princeton proposes to increase the monthly customer service charge for each meter serving each customer, including wholesale customers. The initial calculations for the $6.00 customer service charge is found in the Excel file attached in response to PSC 2-21 above and summarized below. Administration expenses net of the salaries and benefits of the Superintendent and the Director of Finance are not recouped through any volumetric rate and are recouped in this manner by using the number of meters in service. Refer to the response in Question 19 and to Exhibit PSC 2-1 Pro Forma

	Final 2019 Fiscal Year Operations	ProForma Adjustments	ProForma Operations
Total Administration Exp	$ 433,549	$ 17,816	$ 451,365
LESS: Superintendent & Finance Director Sal&Bene	-$187,356		- $132,996
Adjusted Admin Exp	$ 246,193		$318,369
# Customer Meters in Use	3,386		3,386
Annual Cost per Customer	$ 72.71		$ 94.03
Monthly Cost per Customer	$ 6.06		$ 7.84

(b) The hiring of a new full time office employee to aid in the replacement of the retiring Director of Finance was a FY 2020 decision and added to the overall costs of the administrative department. Also, wages have been increased already from the FY2019 test period by increases effective July 1, 2019. Furthermore, the CERS rate was increased 12% which adds to the known and measurable expenses of FY2021 and includes another 12% CERS mandated increase along with a 2.5% COLA increase for employees. Had these increases been factored into the analysis prior to setting the rate at $6.00 per month, the rate may have been set higher to the $7.84 that is shown in the Pro Forma column.

Witness: Tracy B. Musgove

27. Refer to Princeton response to Staff's First Request, Item 18.c. Clarify the status of the two master meters abandoned by Caldwell District. Who is responsible for the maintenance and testing of these master meters?

Response: Because they meters were abandoned, no maintenance and testing are done on these meters. The CCWD Dawson Road (62 East) master meter was taken out of service in 2000. CCWD completed a project that allowed them to abandon an underground pump station that was utilized to pressurize their system. CCWD switched their feed from this Dawson Road master meter to CCWD master meter on 139 South. This switch allowed them to gravity feed by using elevated tanks. Similarly, the CCWD 62 West master meter was taken out of service in 2006. The explanation for this was that the feed to the CCWD customers was going to be redirected from the 62 West meter to the Grooms Lane meter in order to achieve greater pressure. Both decisions, while beneficial and feasible to CCWD, has left PWWC with two dead end mains that require heavy flushing in the summer months to maintain adequate chlorine levels.

The LCWD Buena Vista master meter was abandoned in 2011 due to a leak under Lake Barkley. LCWD feed was switched from the Buena Vista master meter to the 293 & 93S master meter. This meter being off our transmission main had no effect to PWWC.

Witness: James A. Noel

Case No. 2019-00444
Princeton Water and Wastewater Wholesale Water Rates Increase
Responses to Commission Staff's Second Information Requests

28. Provide the information in the chart below for each of the master meters serving Princeton's wholesale customers.

Wholesale Customer	Meter Size	Date Installed	Date last Tested	Location

Response: See Exhibit PSC 2-28 Wholesale Meter Info

Witness: Tracy B. Musgove and James A. Noel

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