

# Overview of EFC Tools for Water Utilities

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UNC  
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[www.sog.unc.edu](http://www.sog.unc.edu)

# UNC Revenue Risk Assessment Tool

- Measure a utility's susceptibility to revenue risk

## Water Utility Revenue Risk Assessment Tool

*How Much Revenue Might Be Lost When Residential Customers Reduce Consumption?*



**Developed by:** The Environmental Finance Center at the University of North Carolina, Chapel Hill  
**Developed for:** Water Research Foundation

[Click here to access a video tutorial on using the tool.](#)

This tool allows utilities and technical assistance providers to quickly determine the proportion of residential revenues from water sales that may be at risk of loss when residential customers change demand patterns. When residential customers reduce demand, whether due to price elasticity effects, or normal weather fluctuations that affect their water demands, or in reaction to shocks (such as new water conservation programs, water shortage periods, change in economic conditions, etc.), utilities collect less revenue from customer sales than anticipated. Utilities often ask how much of their revenues are really and realistically at risk of loss if their customers lower their consumption. This tool allows utilities and their technical assistance providers to quickly determine these estimates based on the utility's own rate structure, customer demand profile and weather conditions.

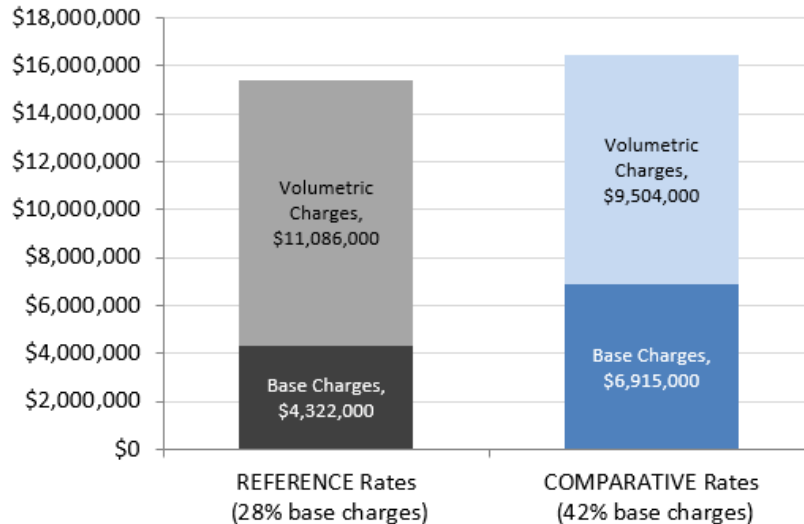
The tool requires only minimal data input and uses simplifying assumptions as well as detailed models developed after analyzing hundreds of thousands of real customer water records to understand how water customers change demand patterns.

This simplified tool is focused solely on revenue projections and assessment. Costs and revenue requirements based on customer classifications are not incorporated into this model. The tool allows the user to compare two different residential rate structures and determine which rate structure offers greater revenue resiliency.

## Comparing Revenues from Reference and Comparative Rates

How do the total revenues compare under both rate structures?

**Total Annual Residential Revenues**



	REFERENCE Rates	COMPARATIVE Rates	Change
Total Annual Revenues	\$15,408,000	\$16,419,000	\$1,011,000
From Base Charges	\$4,322,000	\$6,915,000	\$2,593,000
From Volumetric Charges	\$11,086,000	\$9,504,000	-\$1,582,000

The comparative rate structure is projected to generate \$1,011,000 (6.6%) GREATER revenues than the reference rate structure. This assumes that no change in demand occurs besides residential customers reacting to the rate changes through price elasticity. Thus, no conservation, significant demand fluctuations or weather-related demand changes are modeled in this scenario.

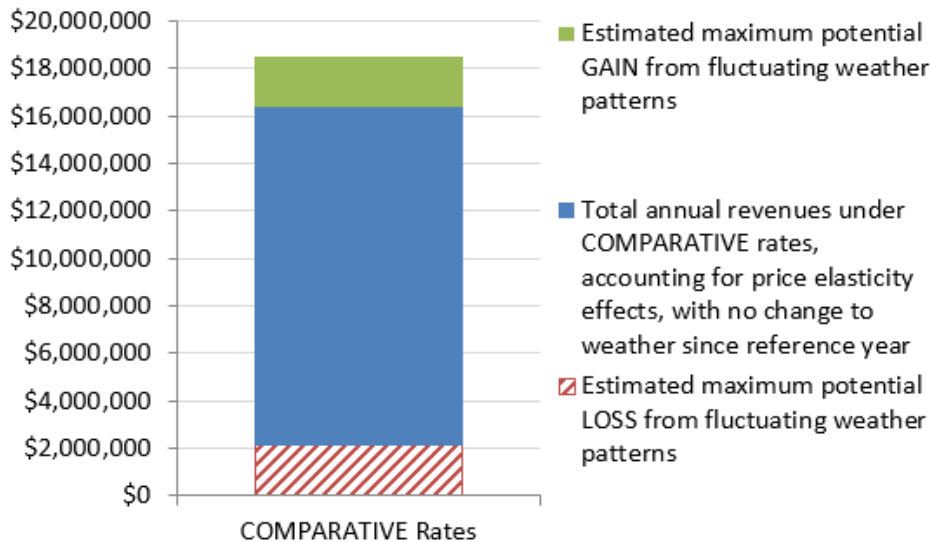
MORE of the revenues would come out of the base charges in the comparative rate structure, increasing revenue resiliency against demand fluctuations.

# Comparing Revenues Due to Normal Weather Fluctuations

These graphs compare the revenues generated (or lost) when residential customers adjust their demands based on normal, yearly fluctuations of temperature or precipitation. Graphs assess the revenue resiliency of the COMPARATIVE rate structure. Price elasticity effects are also factored in.

## How resilient are the revenues generated from the COMPARATIVE rate structure to normal changes in weather patterns, using the current year's weather as a reference?

**Portions of Annual Revenues under COMPARATIVE Rates that are Vulnerable to Declines/Gains Due to Normal Weather Fluctuations**

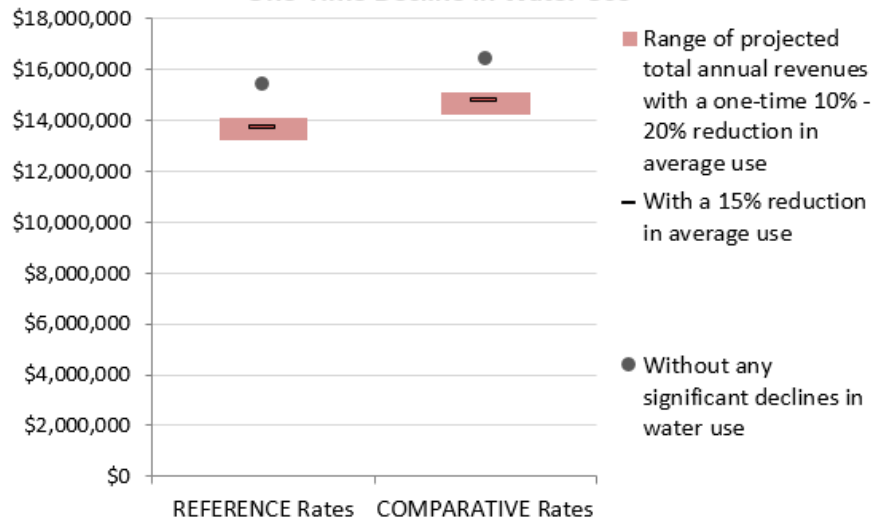


**Projected revenues, gains and losses**

Estimated maximum potential GAIN from fluctuating weather patterns	\$2,059,000
Estimated revenues under the COMPARATIVE rates, assuming no change to weather since reference year	\$16,419,000
Estimated maximum potential LOSS from fluctuating weather patterns	-\$2,133,000

## What is the range of projected total revenues the utility can generate assuming there will be a significant reduction in residential water use under both rate structures?

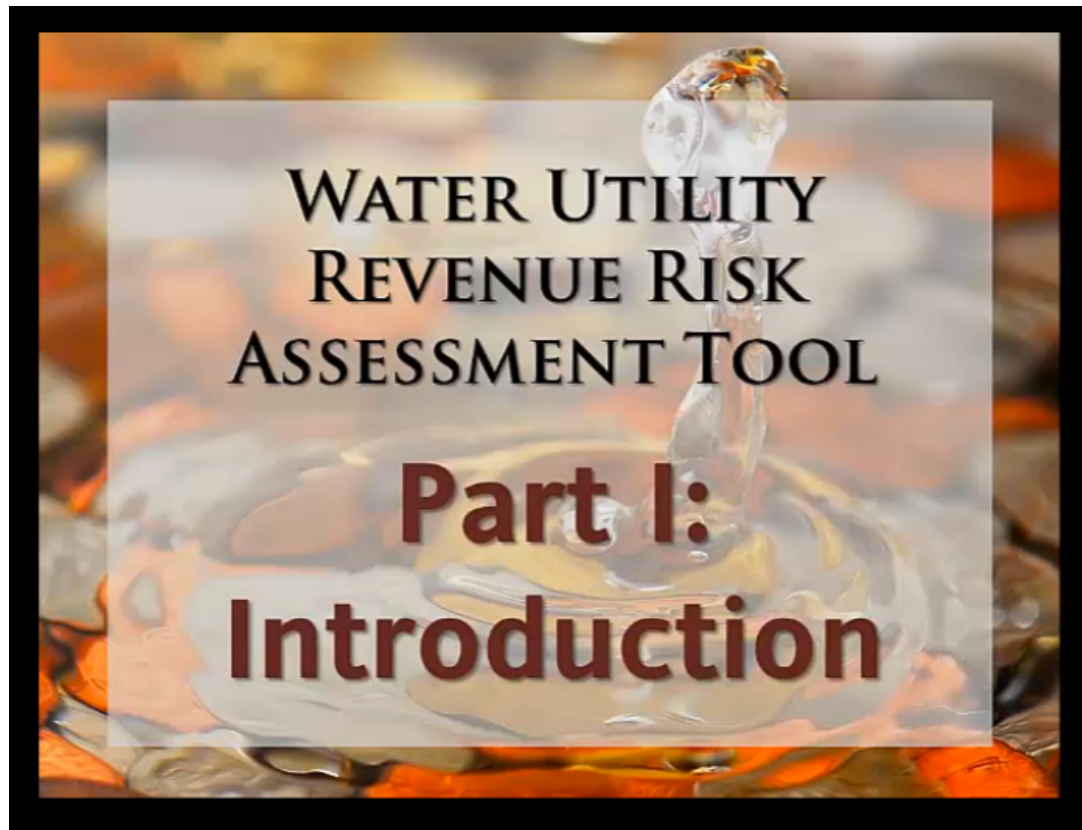
**Estimated Range of Total Annual Revenues under REFERENCE and COMPARATIVE Rates with Significant One-Time Decline in Water Use**



Projected annual revenues with	REFERENCE Rates	COMPARATIVE Rates	Difference
No reduction in avg use	\$15,408,000	\$16,419,000	\$1,011,000
10% reduction in avg use	\$14,097,000	\$15,100,000	\$1,003,000
15% reduction in avg use	\$13,706,000	\$14,744,000	\$1,038,000
20% reduction in avg use	\$13,227,000	\$14,252,000	\$1,025,000

# Tutorial Video

- <http://www.efc.sog.unc.edu/reslib/item/water-utility-risk-assessment-tool>



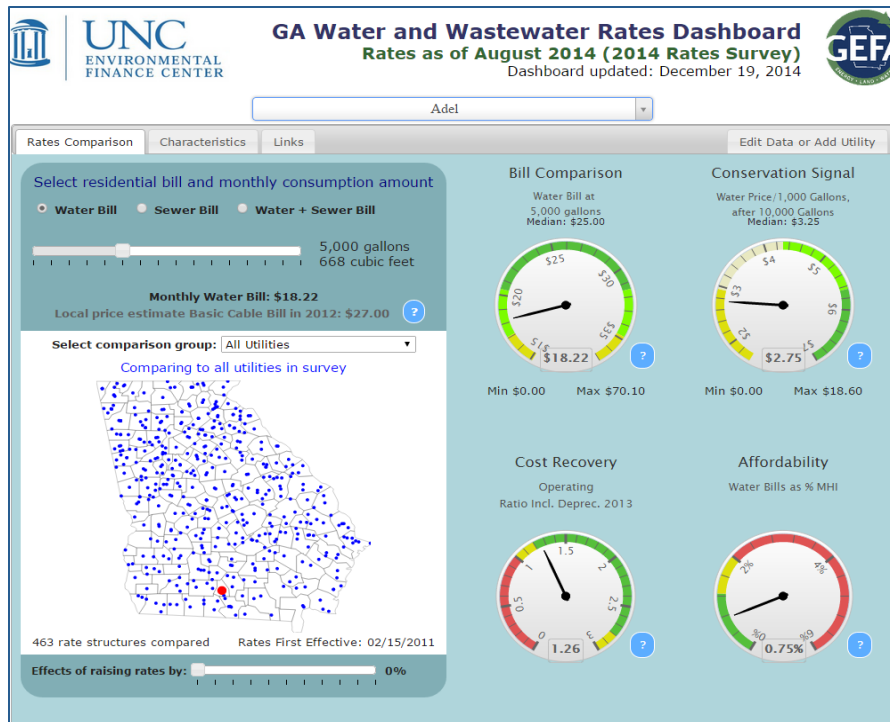


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# Laying the Groundwork for Rate Adjustments Staff to Board Communication Tools

# EFC Rates Dashboards

- **Rates Dashboards** to help assess a utility's financial performance and benchmark rates to other utilities and to the board



<http://www.efc.sog.unc.edu/project/utility-financial-sustainability-and-rates-dashboards>





Hendersonville

Rates Comparison

Financial Benchmarks

Characteristics

Links

Edit Data or Add Utility

Select residential bill and monthly consumption amount

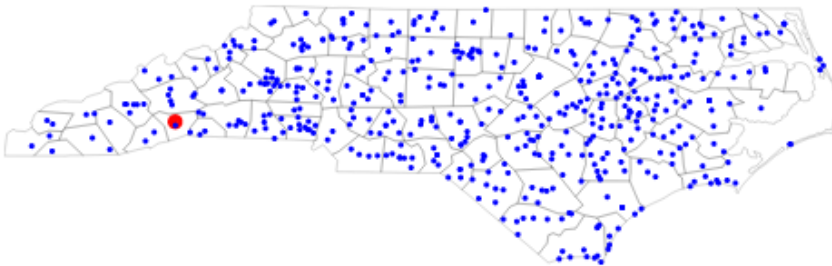
Water Bill  Sewer Bill  Water + Sewer Bill



Monthly Water Bill: \$19.22

Select comparison group: All Utilities

Comparing to all utilities in survey

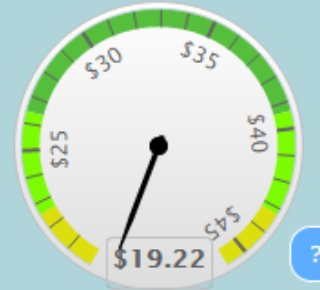


510 rate structures compared

Effects of raising rates by: 0%

### Bill Comparison

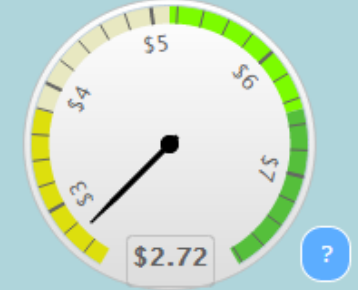
Water Bill at  
5,000 gallons  
Median: \$31.38



Min \$10.00 Max \$107.70

### Conservation Signal

Water Price/1,000 Gallons,  
after 10,000 Gallons  
Median: \$4.50



Min \$0.00 Max \$20.00

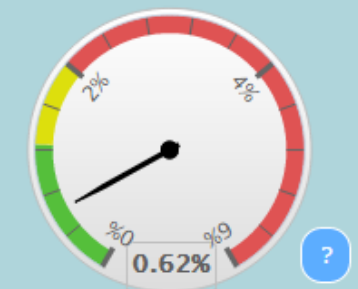
### Cost Recovery

Operating  
Ratio Incl. Deprec. 2014



### Affordability

Water Bills as % MHI



### Select residential bill and monthly consumption amount

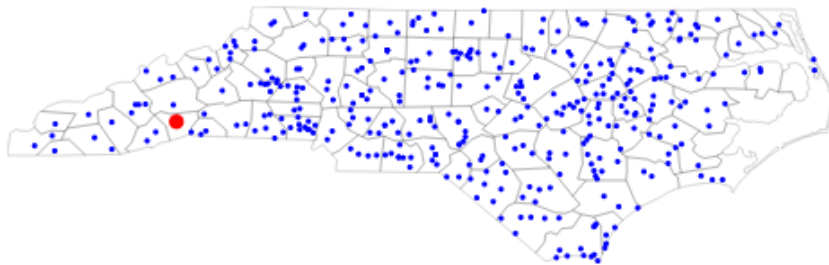
- Water Bill
- Sewer Bill
- Water + Sewer Bill



Monthly Water & Sewer Bill: \$47.15

Select comparison group: All Utilities

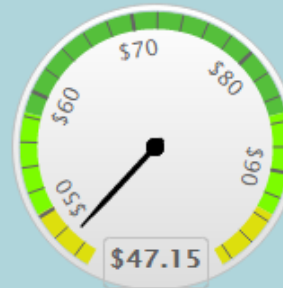
Comparing to all utilities in survey



Effects of raising rates by: 0%

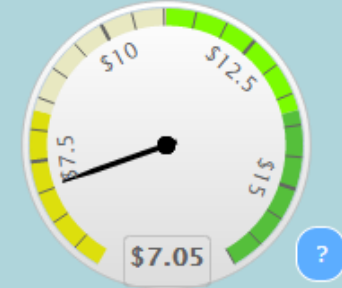
### Bill Comparison

Water & Sewer Bill at  
5,000 gallons  
Median: \$67.98



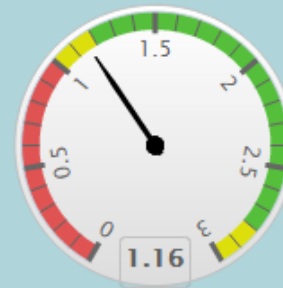
### Conservation Signal

Water & Sewer Price/1,000  
Gallons, after 10,000 Gallons  
Median: \$10.00



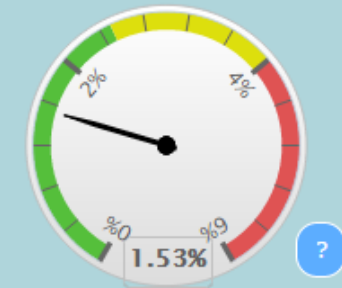
### Cost Recovery

Operating  
Ratio Incl. Deprec. 2014



### Affordability

Water & Sewer Bills as % MHI



Select residential bill and monthly consumption amount

- Water Bill
- Sewer Bill
- Water + Sewer Bill



Monthly Water Bill: \$30.00

Comparing to all utilities in survey

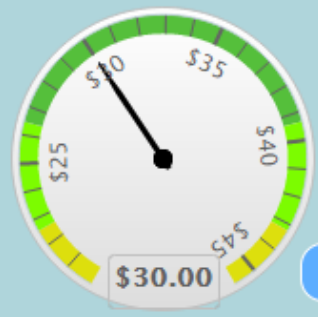


510 rate structures compared

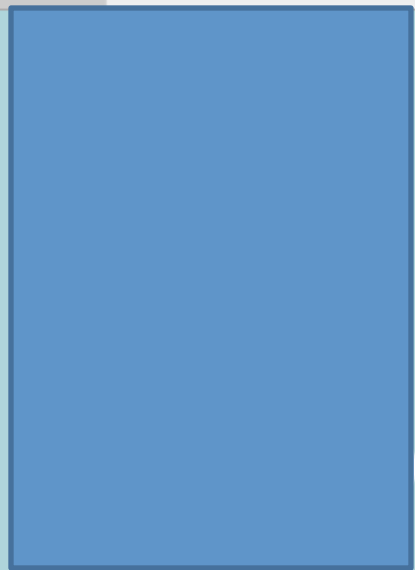


### Bill Comparison

Water Bill at  
5,000 gallons  
Median: \$31.38



Min \$10.00      Max \$107.70



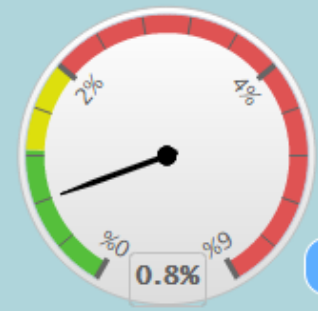
### Cost Recovery

Operating  
Ratio Incl. Deprec. 2014



### Affordability

Water Bills as % MHI



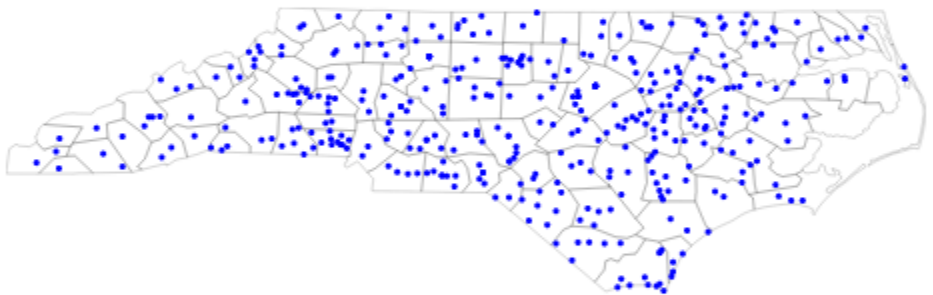
### Select residential bill and monthly consumption amount

- Water Bill
- Sewer Bill
- Water + Sewer Bill



Monthly Water & Sewer Bill: \$74.10

Comparing to all utilities in survey

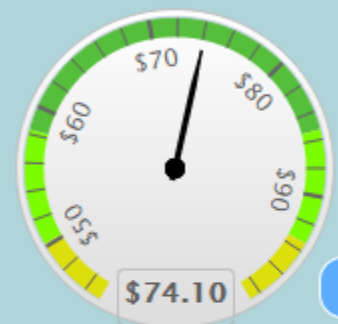


387 rate structures compared



### Bill Comparison

Water & Sewer Bill at  
5,000 gallons  
Median: \$67.98



Min \$23.17 Max \$190.20

### Cost Recovery

Operating  
Ratio Incl. Deprec. 2014



### Affordability

Water & Sewer Bills as % MHI



# Texas Dashboard

- <http://www.efc.sog.unc.edu/reslib/item/texas-water-and-wastewater-rates-dashboard#>

# RateCase Tool

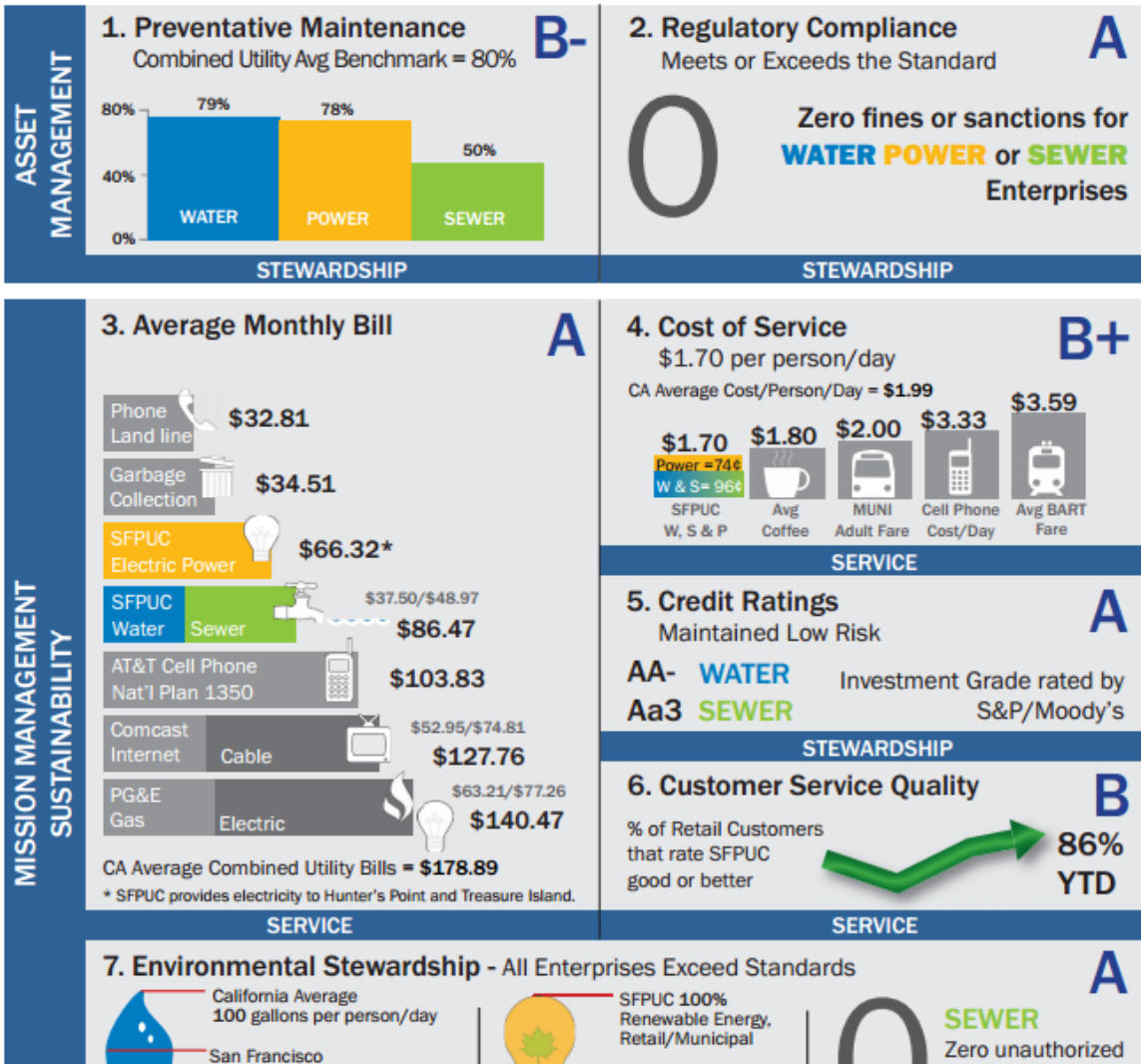
- Audience: Utility governing boards via water utility/ administrative staff
- Objective: Provide snapshot of the utility's key metrics
- Inspiration: SFPUC Ratepayer Assurance Scorecard






**SFPUC Ratepayer Assurance Scorecard**  
**CITY AND COUNTY OF SAN FRANCISCO**  
**OFFICE OF THE CONTROLLER**

**A-**

FY 2012-13









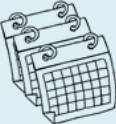









		  			Utility Name			
		Data Inputs	Snapshot					
Include on Dashboard		Data Inputs	Rate Year 3	Rate Year 2	Rate Year 1	Reference Year	Proposed Rate	Notes
Financial Sustainability	<input type="checkbox"/>	Date of Last Rate Increase						
	<input type="checkbox"/>	Total Amount of Utility Long-Term Debt						
	<input type="checkbox"/>	Number of Utility Customers						
	<input type="checkbox"/>	Charge for _____ thousand gallons (or hundred cubic feet) of water for residential customers for the last three years						
	<input type="checkbox"/>	Charge for _____ thousand gallons (or hundred cubic feet) of water for commercial customers for the last three years						
Financial Health	<input type="checkbox"/>	Total Operating Revenues						
	<input type="checkbox"/>	Total Operating Expenditures						
	<input type="checkbox"/>	Depreciation and Amortization						
	<input type="checkbox"/>	Most Recent Bond Rating						
Affordability	<input type="checkbox"/>	Total Number of Utility Customers						
	<input type="checkbox"/>	Median Household Income						
Environmental Protection	<input type="checkbox"/>	Real Water Loss as a Percent of Total Treated						
	<input type="checkbox"/>	Average Household Water Use						
Service Quality	<input type="checkbox"/>	Replacement Value of Current Assets						
	<input type="checkbox"/>	Total Capital Assets + Accumulated Depreciation						<a href="#">Upload Image</a>
	<input type="checkbox"/>	Total Capital Budget Dedicated to Repair and Replacement						
	<input type="checkbox"/>	Number of Line Breaks						
Reliability	<input type="checkbox"/>	Peak Day Water Demand (MGD)						

# Frame 1: Data Inputs



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Data Inputs | Snapshot | Utility Name

Financial Sustainability	<b>Year of Last Rate Increase</b> <h1>2009</h1> Number One Billboard Hit in 2009 <b>"Boom Boom Pow"</b> <small>Black Eyed Peas</small>	<b>Debt as Percent of Capita</b> <h1>1%</h1>  Current Customers Owe <h1>\$1,000</h1> <small>in utility debt</small>	<b>Trends in Pricing</b>     <small>Residential Commercial</small>	
	<b>Financial Health</b> In <b>2013</b> <b>98%</b> <b>Collected</b> <b>2014</b> <b>102%</b>  <small>of its expenditures</small>	<b>Most Recent Bond Rating</b> <h1>Aa</h1>	<b>Days Cash on Hand</b>  <h1>270</h1>	
Affordability	 <b>Water Costs</b> <h1>\$0.50</h1> <small>per day per customer</small>	 <b>2%</b> <small>of the Median Household Income is Spent on the Average</small>	System	 <b>Peak Day Demand as a Percent of Water Treatment Plant Capacity</b>
	<b>Environmental Protection</b>  <b>Water Loss</b> <h1>8%</h1> <small>of total water treated is lost</small>	<b>Average Monthly Water Use Per Household</b> 		<b>Cost Efficiency</b> <b>Water Costs</b> <h1>\$1.00</h1> <small>per gallon to deliver</small>
Service Quality	At the current rate of replacement, it will take <h1>350</h1>  <small>to replace our current assets</small>	<b>Line Breaks Last Year:</b> <h1>12</h1> 	<b>Major Capital Project</b>  	

# Frame 2: The \$napshot

# Factual Report and Data Tables

<http://efc.sog.unc.edu> – Find it in Programs / Drinking Water

Or <http://nclm.org>

**Water and Wastewater Rates and Rate Structures in North Carolina**  
First Published: February 10, 2015

TABLES OF RATE STRUCTURES AND COMPUTED BILLS

Please click on the following hyperlinks to one of 11 tables in this document. This document contains 145 pages:

List of Participating Utilities and Rate Structures: [Table](#)

Rate Structure Details	Computed Monthly Equivalent Rate
Residential Water	<a href="#">Rate Table 1</a> / <a href="#">Rate Table 2</a>
Residential Wastewater	<a href="#">Rate Table 3</a> / <a href="#">Rate Table 4</a>
Residential Irrigation	<a href="#">Rate Table 5</a> / <a href="#">Rate Table 6</a>
Commercial/Non-Residential Water	<a href="#">Rate Table 7</a> / <a href="#">Rate Table 8</a>
Commercial/Non-Residential Wastewater	<a href="#">Rate Table 9</a> / <a href="#">Rate Table 10</a>

These tables complement a report written at the conclusion of a survey of FY 2014-15 water, irrigation and wastewater rates and rate structures conducted by the North Carolina League of Municipalities and the Environmental Finance Center at the UNC School of Government. Rates and rate structures are analyzed for 496 local government and non-local government utilities throughout the State. To download the report, use interactive Rate Structure Dashboard designed to allow you to compare rates using multiple selection criteria, and to view one sheet of individual utilities, please visit: <http://www.efc.sog.unc.edu/efc/research/nc-water-and-wastewater-rates-and-rate-structures>

be justified and necessary to protect public health.

### WATER Bills at Various Consumption Levels (Includes Base Charges)

	3,000 Gallons (401 cf)		4,000 Gallons (535 cf)		5,000 Gallons (668 cf)		10,000 Gallons (1,337 cf)		15,000 Gallons (2,005 cf)	
	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside	Inside	Outside
\$34.43	\$20.37	\$50.95	\$23.89	\$59.75	\$27.41	\$68.54	\$44.99	\$112.53	\$62.57	\$156.51
\$37.44	\$22.14	\$11.75	\$11.75	\$31.92	\$63.84	\$32.33	\$57.80	\$32.33	\$57.80	\$83.26
\$37.44	\$28.62	\$57.24	\$39.25	\$49.06	\$46.00	\$70.44	\$51.72	\$103.44	\$68.22	\$136.44
\$23.75	\$32.50	\$40.63	\$32.00	\$47.00	\$37.00	\$57.50	\$79.75	\$99.69	\$113.50	\$141.88
\$23.00	\$27.00	\$41.00	\$41.00	\$47.00	\$45.50	\$53.00	\$67.00	\$88.00	\$97.00	\$123.00
\$37.70	\$17.00	\$27.00	\$17.00	\$27.00	\$50.95	\$29.00	\$23.00	\$39.00	\$38.95	\$49.00
\$27.00	\$17.00	\$27.00	\$42.45	\$39.60	\$18.00	\$29.00	\$93.45	\$65.00	\$69.90	\$121.80
\$33.95	\$33.95	\$32.40	\$19.80	\$39.60	\$42.45	\$23.90	\$45.15	\$85.80	\$157.50	\$85.00
\$25.20	\$18.20	\$32.40	\$47.50	\$38.80	\$57.50	\$43.00	\$39.00	\$64.00	\$63.00	\$86.95
\$37.50	\$19.40	\$34.60	\$22.00	\$38.80	\$25.00	\$43.00	\$107.50	\$72.86	\$86.95	\$88.16
\$22.00	\$19.40	\$34.60	\$42.69	\$38.80	\$47.71	\$43.00	\$63.80	\$64.96	\$101.24	\$106.49
\$30.33	\$37.34	\$36.58	\$37.12	\$41.76	\$49.44	\$47.71	\$75.34	\$79.24	\$88.16	\$101.42
\$25.08	\$32.48	\$44.26	\$44.26	\$51.99	\$41.76	\$49.44	\$64.96	\$64.96	\$113.75	\$227.50
\$27.84	\$38.73	\$46.54	\$37.12	\$42.88	\$48.02	\$90.00	\$78.25	\$152.50	\$118.20	\$106.65
\$33.20	\$40.73	\$37.12	\$42.88	\$80.00	\$45.00	\$90.00	\$68.85	\$137.70	\$106.65	\$213.30
\$34.92	\$32.48	\$40.00	\$40.00	\$70.00	\$44.70	\$65.20	\$68.85	\$137.70	\$67.50	\$108.10
\$27.84	\$37.34	\$35.00	\$37.35	\$70.00	\$32.60	\$38.80	\$46.05	\$73.45	\$66.81	\$156.96
\$32.00	\$30.00	\$30.00	\$25.98	\$51.96	\$24.60	\$38.80	\$46.05	\$73.45	\$78.48	\$156.96
\$12.74	\$25.48	\$16.02	\$24.94	\$20.31	\$26.21	\$48.76	\$51.68	\$103.36	\$84.00	\$168.00
\$3.15	\$4.15	\$18.09	\$22.15	\$39.04	\$24.88	\$49.76	\$70.00	\$81.00	\$103.00	\$119.50
\$496.1	\$12.00	\$14.16	\$19.52	\$36.04	\$43.00	\$66.00	\$46.25	\$92.50	\$70.00	\$101.00
\$395.1	\$8.80	\$17.60	\$43.00	\$66.00	\$30.40	\$48.80	\$37.00	\$42.50	\$61.67	\$81.50
\$437.1	\$34.00	\$68.00	\$23.80	\$27.70	\$31.96	\$42.00	\$36.47	\$53.00	\$54.00	\$108.00
\$405.1	\$10.60	\$11.70	\$7.45	\$31.00	\$21.00	\$42.00	\$26.50	\$53.00	\$63.32	\$99.22
\$5203.1	\$19.00	\$20.00	\$15.50	\$31.00	\$29.00	\$43.36	\$34.72	\$62.67	\$47.79	\$64.54
\$950.1	\$6.12	\$6.12	\$3.28	\$34.05	\$27.69	\$31.04	\$31.04	\$54.13	\$108.25	\$77.88
\$2248.1	\$17.64	\$20.88	\$41.75	\$25.63	\$51.25	\$30.38	\$60.75	\$35.00	\$45.00	\$45.00
\$17021.1	\$15.00	\$21.00	\$21.00	\$23.00	\$23.00	\$33.05	\$31.70	\$36.15	\$56.20	\$69.65
\$12267.1	\$16.00	\$27.77	\$18.42	\$32.61	\$20.84	\$37.45	\$23.26	\$42.29	\$35.36	\$66.49
\$61191.1	\$18.50	\$37.00	\$20.88	\$41.75	\$25.63	\$51.25	\$30.38	\$60.75	\$68.75	\$96.44
\$61191.1	\$15.00	\$21.00	\$21.00	\$23.00	\$23.00	\$33.05	\$31.70	\$36.15	\$56.20	\$69.65
\$61191.1	\$17.00	\$20.85	\$18.42	\$32.61	\$20.84	\$37.45	\$23.26	\$42.29	\$35.36	\$66.49
\$2445.1	\$16.00	\$27.77	\$18.42	\$32.61	\$20.84	\$37.45	\$23.26	\$42.29	\$35.36	\$66.49
\$2443.1	\$29.05	\$36.90	\$34.01	\$44.34	\$38.98	\$51.78	\$43.94	\$59.23	\$68.75	\$96.44

Page 2

NC League of Municipalities and UNC Environmental Finance C



Funding for the 2015 rates survey and this report has been provided by the Public Water Supply Section, Division of Water Resources, of the North Carolina Department of Environment and Natural Resources.

## Water and Wastewater Rates and Rate Structures in North Carolina

David Tucker, Sha di Eskaf, and Alex Clegg: Environmental Finance Center  
Chris Nida: North Carolina League of Municipalities

February 2015

Click on any of the following questions:

- Tools for Comparisons**
  - What is this study?
  - How many and which utilities and types of rates are analyzed in this report?
  - Where can I find tools and tables I can use to help me evaluate our rates?
- Current Rate Structure Designs**
  - What are the utilities' base charges?
  - How much consumption is included in these base charges?
  - What are the most common rate structure types in North Carolina?
  - How do rate structures differ between commercial and residential customers?
  - How do rate structures differ between indoor and irrigation/outdoor rates?
  - For block rate structures, how much consumption is included in the first block?
  - How much do utilities charge per 1,000 gallons near the average consumption level?
  - What does the State recommend for residential rate structures?
- Current Rates**
  - How much is charged for residential consumption?
  - How much is charged for commercial consumption?
  - How much is charged for residential irrigation water?
  - How do rates differ based on utility size, utility type or river basin?
  - How do rates differ for customers inside or outside municipal boundaries?
- How Rates Changed Last Year**
  - How often do utilities change their rates?
  - How did residential rate structures change in the past year?
  - By how much did utilities raise their residential rates last year?
  - Did the price for high levels of consumption increase last year?
- Affordability**
  - What does the average North Carolinian pay for water and/or wastewater service?
  - How affordable are utility rates in North Carolina?
- Promoting Conservation**
  - What can utilities do with their rates to encourage conservation?
  - Click here to download the *NC State Water Infrastructure Commission Recommended Guidance for North Carolina Utilities Attempting to Support Water Conservation in the Long-Term through Rate Structure Design and Billing Practices*.
- Financial Sustainability**
  - Do prices reflect the true cost of water services in North Carolina?
  - Are high rates always bad?