

2023 American Water Works Association North American Water Loss Conference



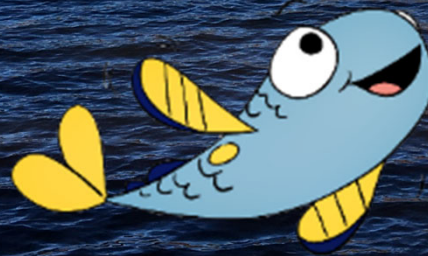
02:45 PM MDT **How A Two Hundred and Twenty Five Year Old Water System Continues to Improve Their Water Balance**

The City of Portsmouth's regional water system was incorporated in 1790. For years, water flowed with little need for accounting for water loss. However, at the turn of the twentieth century, water system managers recognized that good data was necessary to account for their water balance by becoming one of the first water systems in New Hampshire to meter all of their customers. Since then, these efforts have expanded to include water conservation retrofit kits, tiered water rates, radio-read metering, monthly billing, leak detection, water main replacements and water efficiency rebates, together with expanded customer outreach. This presentation will provide an overview of all those efforts.

Speakers: Brian Goetz

The City of Portsmouth, New Hampshire

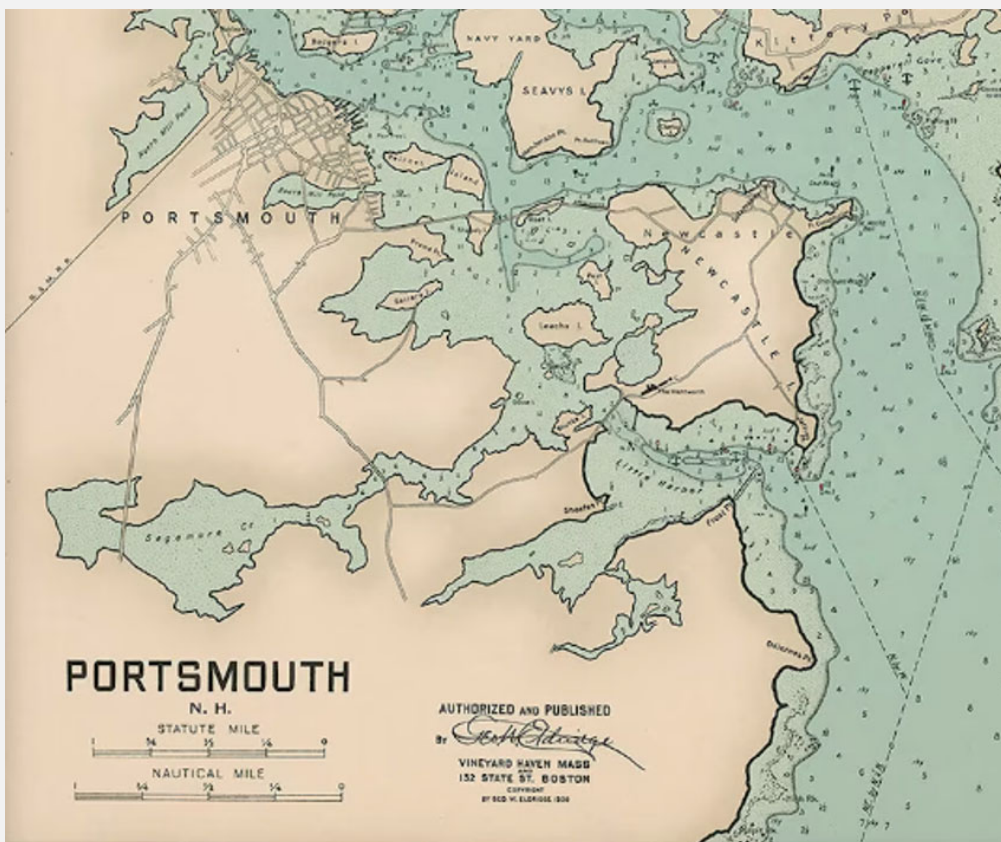
How a 225 year-old water system continues to improve their water balance



Think Blue – What Can You Do?
Water | Wastewater | Stormwater



The Beginnings of Portsmouth's Drinking Water System



By the late 1700s, with dense development in the downtown area and the need for water to serve businesses, the Portsmouth Aqueduct Company was formed in 1797 by an act of the state legislature, the first large public water system in New Hampshire. Soon after, new pipes and additional sources of supply were constructed to supplement the





61 Boring elm water-pump pipes by hand, using an auger supported on a rest; Lugwardine, Herefordshire, about 1900



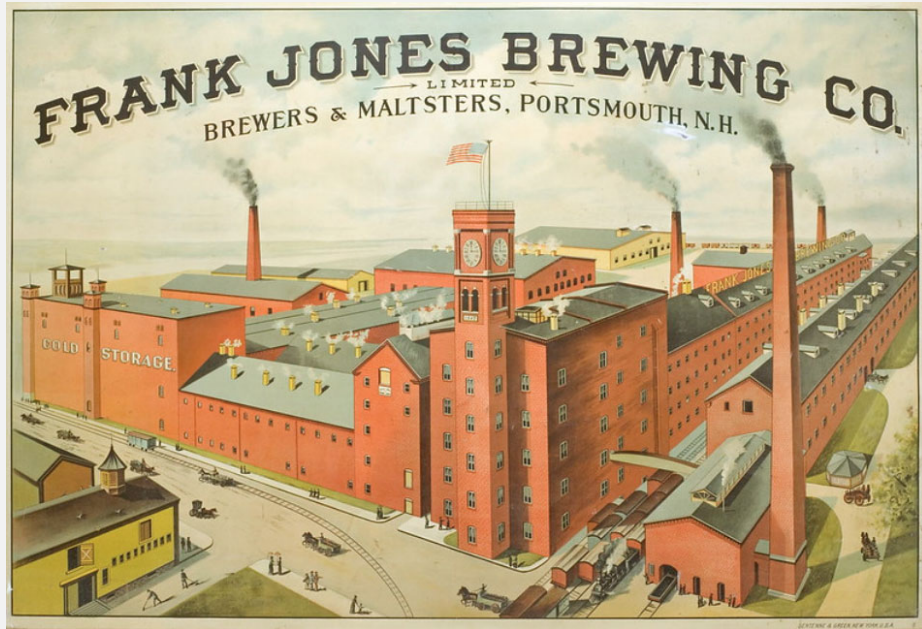
Fires Created Another Need for Water Systems

*The Great Fire
December 22, 1813.
The Third Fire in 11 Years.*



And You Need A Lot Of Water to Make
A Lot Of Beer..





In 1883 “The Western Brewer” (a brewer’s trade journal) listed Frank Jones as the largest ale brewer in the country: they had brewed almost 150,000 barrels of ale in 1882. As a result of his increasing demand, Jones begins to develop local springs as a water supply.

- ~ 250,000 Barrels/Year Combined Production:
- ~ 7.5 Million Gallons of Beer
- To create one barrel, it takes approximately 1,500 gallons of water.
- ~ 375 Million Gallons of Water (1 MGDay)



Eldredge Brewing Company produced 30,000 barrels of beer in 1870 and grew to almost 93,000 barrels of beer by 1892.

Water Pipes in 1892

PLAN
OF THE CITY OF
PORTSMOUTH N. H.
WATER WORKS

SCALE 200 FEET TO THE INCH

1892-3

EXPLANATION
STREETS
WATER
LINES

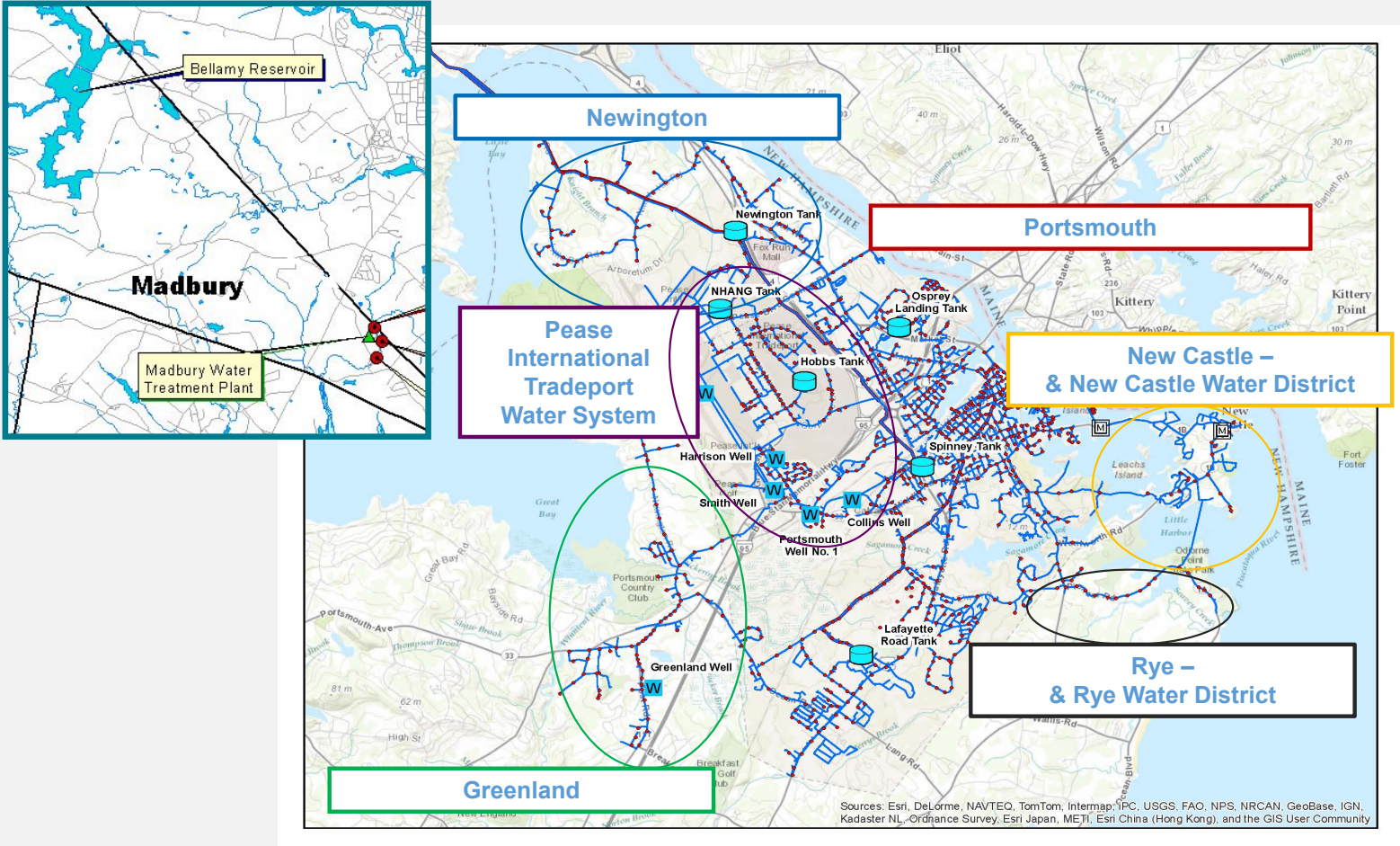
J. A. FARRINGTON ENGINEERS.
L. E. SCHULTON



Service Area

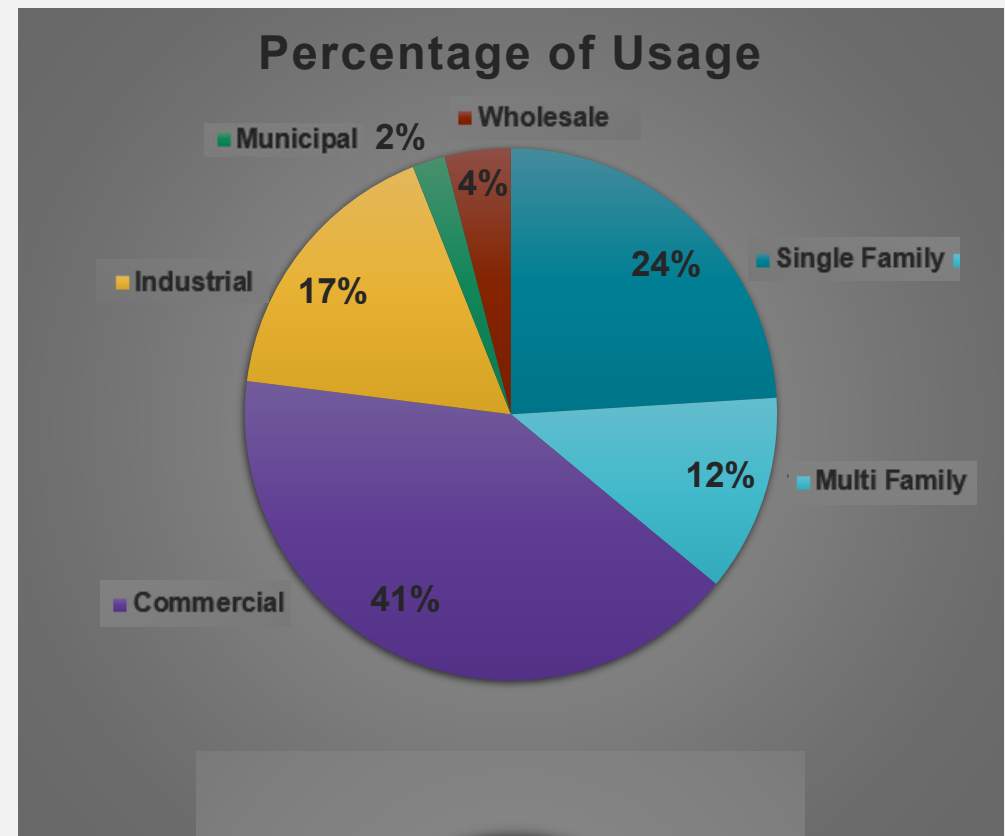


System Infrastructure



Water Use Demographics

Category	Customers	GPDay/Cust
Single Family Residential	6,969	114
Multi-Family Residential	750	532
Industrial	90	6,135
Municipal	87	801
Wholesale	5	25,034



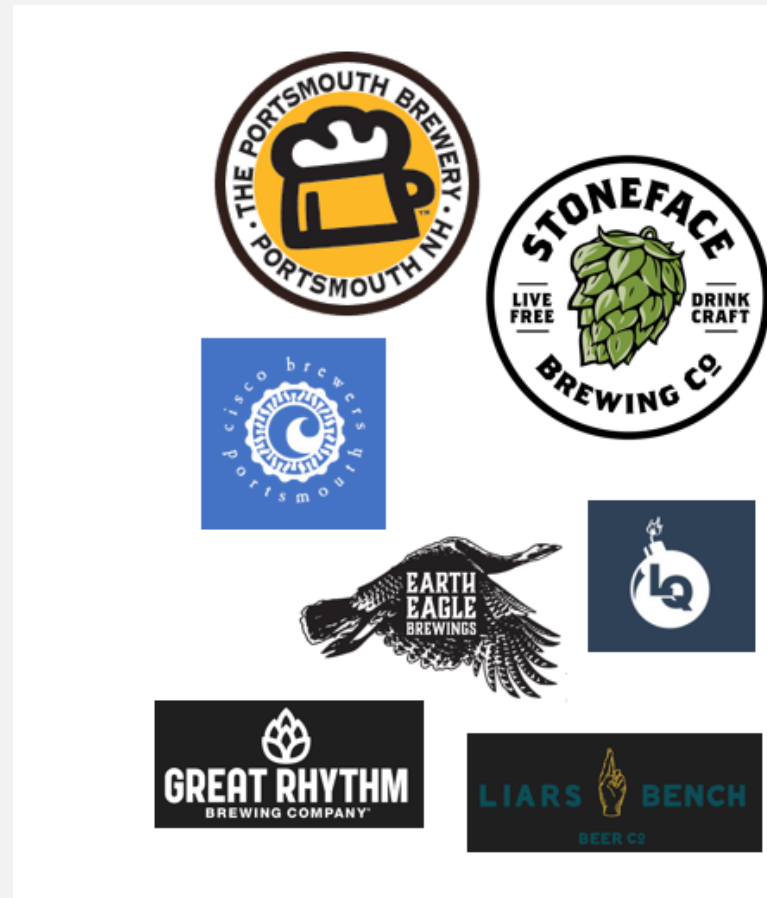
Large User Breakdown:

- Two Power Plants
 - Up to 500,000 GPDay
- Two Golf Courses
 - 250,000 to 400,000 GPDay
- Two Gypsum Plants
 - 250,000 to 400,000 GPDay
- Large Pharmaceutical Manufacturer
 - Up to 450,000 GPDay



Large User Breakdown:

- 🔹 20 Hotels
- 🔹 Lots of Restaurants
 - 🔹 33,000 Seats
- 🔹 7 Micro Breweries!



Portsmouth's Efforts to Improve Water Balance Through the Years:

1. Metering and Billing Upgrades
2. Water Rate Adjustments
3. Leak Detection
4. Water Main Replacements
5. Operating System Upgrades
6. Water Efficiency Outreach
 - 💧 Retrofit Kits
 - 💧 Outreach
 - 💧 Water Efficiency Rebates



1 - Metering

The City began metering all water customers starting in 1911.

By 1920, the entire water system had meters, with a total customer base of 3,073.

Reports showed that consumption had decreased by 72 million gallons a year or 65 gpd per customer



2010 – Conversion to AMI - Automatic Meter Reading System

**Billing
System**



Radio



Meter

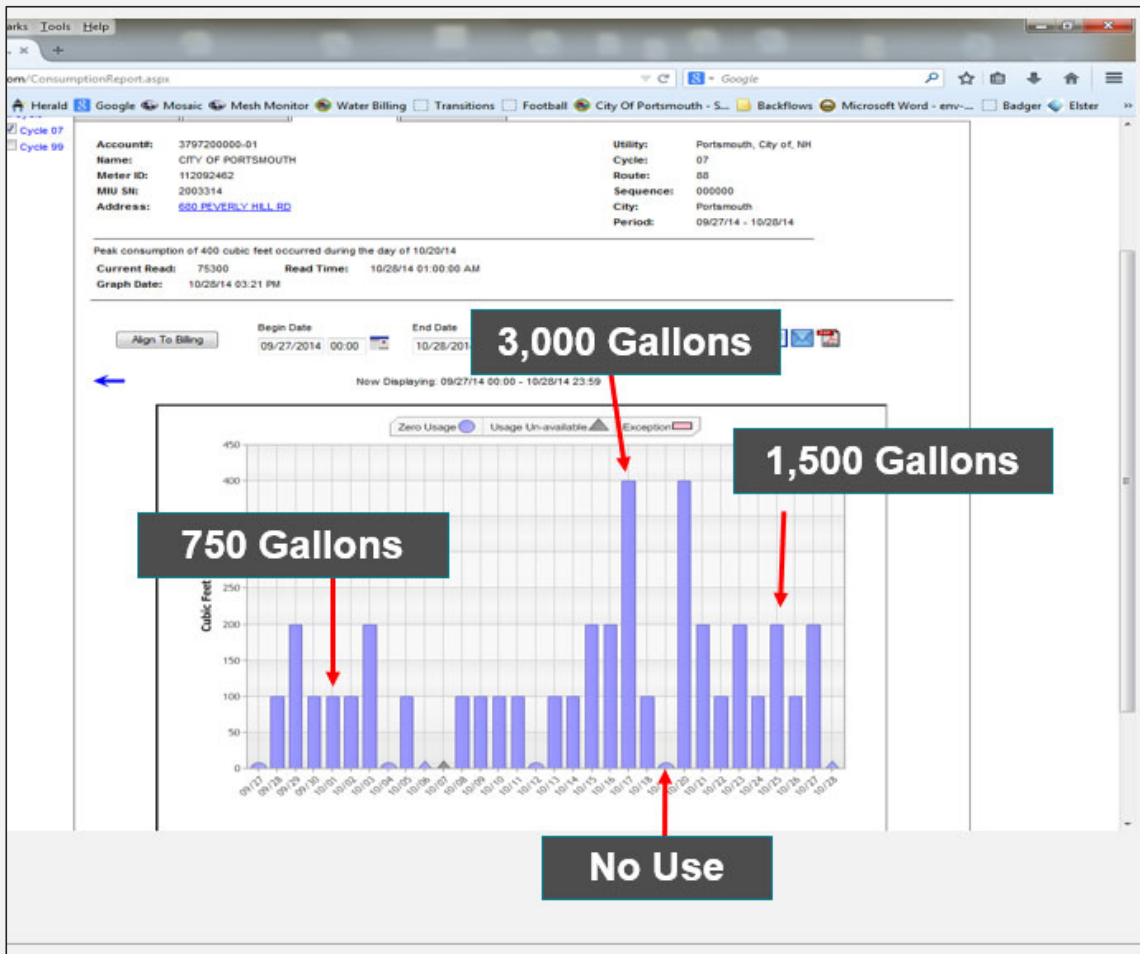


Benefits of AMI

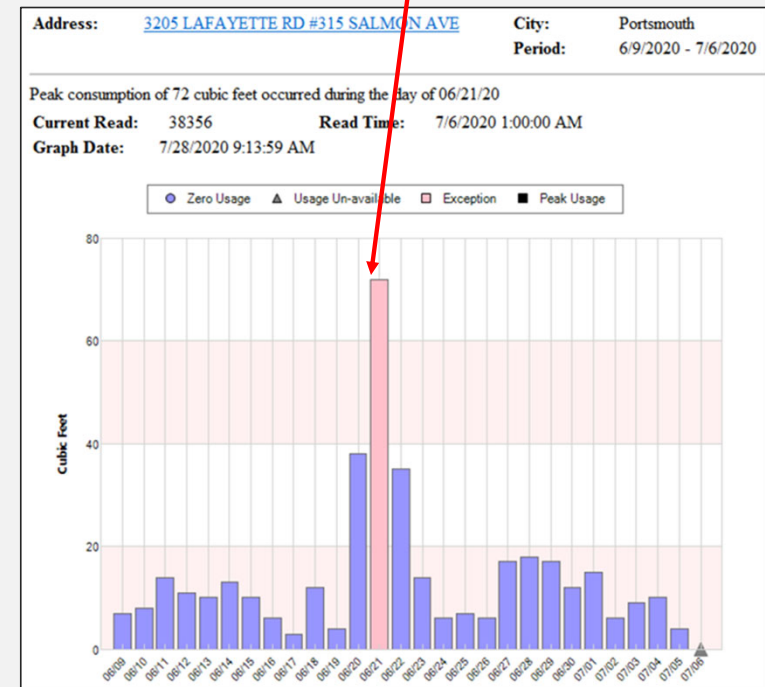
- Billing cycle went from 3x/year to 12x/year
- Identify high consumption and leaks
- Staff can focus on meter changeouts and upgrades



Daily Reads and Leak Codes



High Usage Triggers Leak Code



Customer Feedback:

■ August 21, 2019 Call to Water Billing Department:

- “I wanted to share a wonderful conversation I just had with the water customer at 296 Peverly Hill Rd. He wanted to express his appreciation for the City’s “Water Conservation Initiative”. He stated that a “wonderful person” stopped at his home and informed him he may have a leak. He discovered that a toilet he thought he had fixed was still leaking and he was able to correct it. He asked me to pass along his appreciation for the City implementing this program and the positive experience he had.”

■ February 24, 2020 Email to City’s webmaster:

- address: 188 Union St Portsmouth
- comments: I had a situation where my January water bill seemed way too high. I went into the Water Works Office un-announced. The receptionist called Jim who came down, greeted me and had me up to his office. He had me sit beside him as he went through a day by day, hour by hour, review of my account. He made me feel like I was the only person in Portsmouth who mattered. He spent a solid 45 minutes with me. He diagnosed what the problem was and sent me home with printed graphs showing it. Please pass this to Jim's superiors. He was awesome.

Current Meters



2023		
Size	Meters	%
5/8	7221	81.3%
1	1156	13.0%
1.5	179	2.0%
2	99	1.1%
2 C	129	1.5%
3	9	0.1%
3 C	36	0.4%
4	19	0.2%
4 C	9	0.1%
6	14	0.2%
6 C	0	0.0%
8	9	0.1%
8 C	2	0.0%
10 C	1	0.0%
	8883	

Right Sizing Meters

- Major effort to downsize meters
- 2000 – 9% of meters were 2” or larger
- 2023 – 5% of meters are 2” or larger



Removed	Installed	Total
4"	3"	4
4"	2"	8
3"	2"	18
3"	1.5"	1
2"	1.5"	29
2"	1	112
2"	5/8"	34
1.5"	1	193
1.5"	5/8"	35
1	5/8"	109
	TOTAL Downsized	543

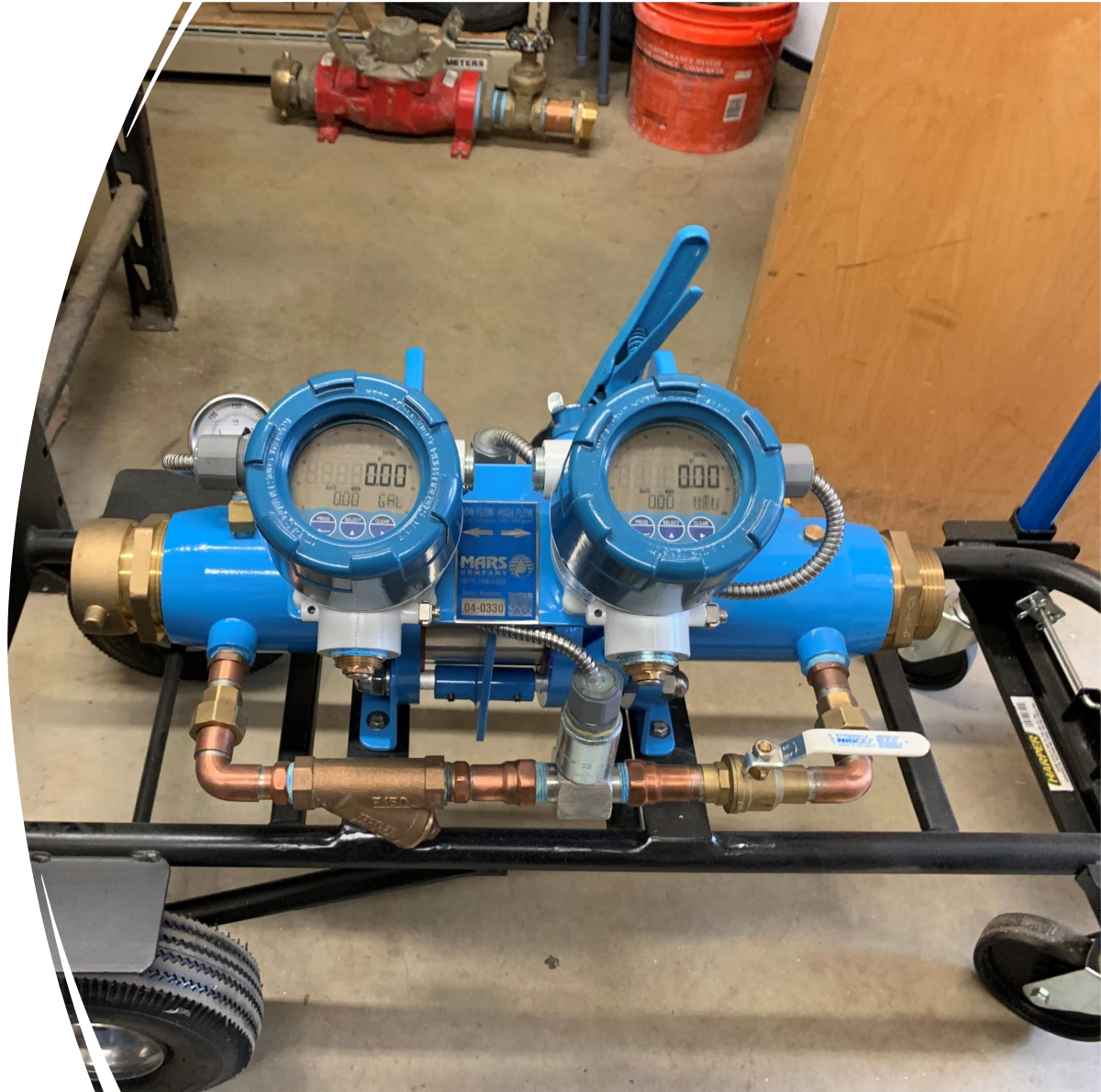
Right Sizing Meters

- 💧 Eliminated need for compound meters
- 💧 2000 – 366 compounds
- 💧 2023 – 177 compounds
- 💧 2025 Goal – less than 50



Large Meter Testing

- 💧 Annual Testing of all Large Meters
- 💧 Used to contract this service – Now do it in-house



2 - Tiered Water Rates

Inclining Block Tiered Rates implemented in 2007

Tier 1: First 10 units of water consumed will be billed at a rate of \$4.74 per unit.

Tier 2: Consumption above 10 units of water will be billed at \$5.70 per unit.

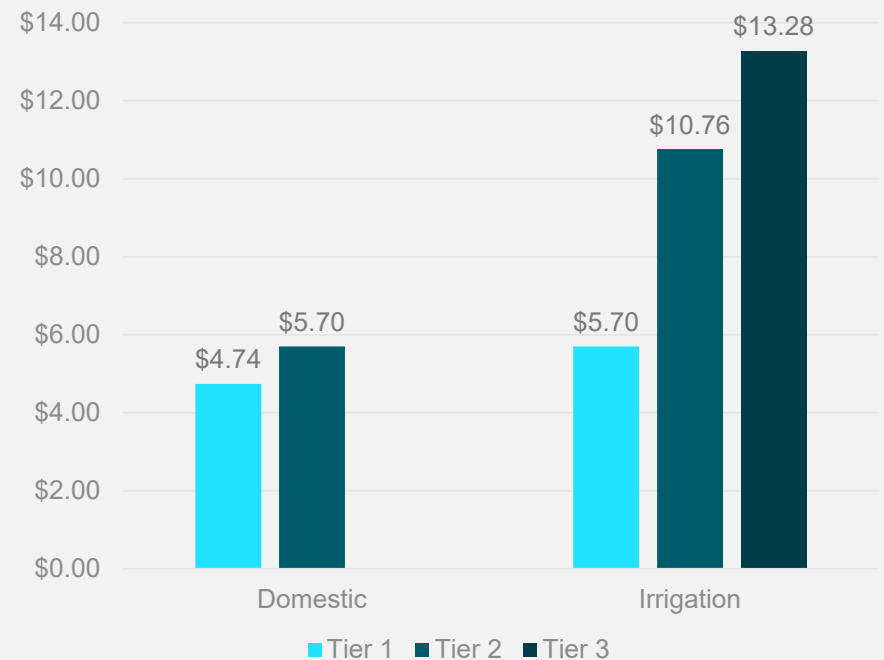
Irrigation Rates implemented in 2017

Tier 1: First 10 units of consumption will be billed at the rate of \$5.70 per unit.

Tier 2: Consumption above 10 units and up to 20 units will be billed at the rate of \$10.76 per unit.

Tier 3: Consumption above 20 units will be billed at the rate of \$13.28 per unit.

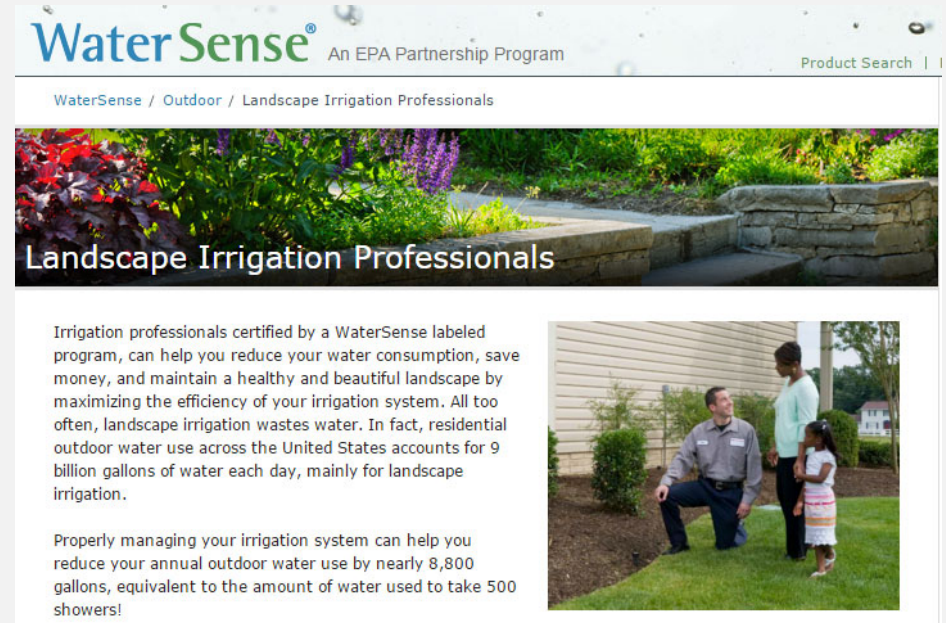
Portsmouth Water Rates – FY24



* In New Hampshire the majority (76%) of residential water and waste - water rate structures use a uniform rate to charge for volume. 2018 New Hampshire Water & Wastewater Rates Report

WaterSense Irrigation

- 💧 New Irrigation Customers –
 - Require a Certified WaterSense System



The screenshot shows the top portion of a website page. At the top left is the "WaterSense" logo in blue and green, followed by "An EPA Partnership Program" in smaller text. To the right is a "Product Search" link. Below the logo is a breadcrumb trail: "WaterSense / Outdoor / Landscape Irrigation Professionals". The main heading "Landscape Irrigation Professionals" is overlaid on a photograph of a garden path. Below this is a paragraph of text explaining the benefits of certified irrigation professionals, and a smaller photograph of a professional kneeling on a lawn talking to a woman and a child.

WaterSense® An EPA Partnership Program [Product Search](#) |

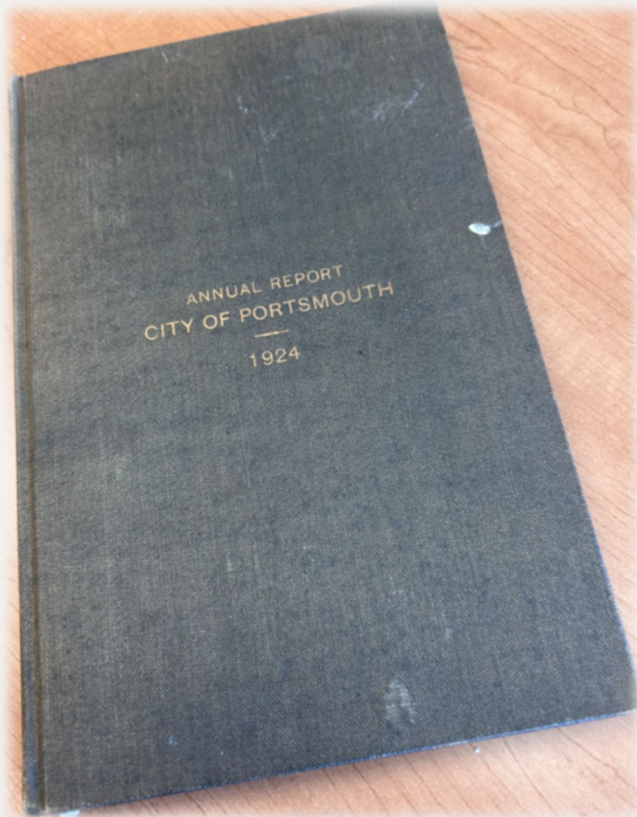
[WaterSense](#) / [Outdoor](#) / [Landscape Irrigation Professionals](#)

Landscape Irrigation Professionals

Irrigation professionals certified by a WaterSense labeled program, can help you reduce your water consumption, save money, and maintain a healthy and beautiful landscape by maximizing the efficiency of your irrigation system. All too often, landscape irrigation wastes water. In fact, residential outdoor water use across the United States accounts for 9 billion gallons of water each day, mainly for landscape irrigation.

Properly managing your irrigation system can help you reduce your annual outdoor water use by nearly 8,800 gallons, equivalent to the amount of water used to take 500 showers!

3 - Leak Detection

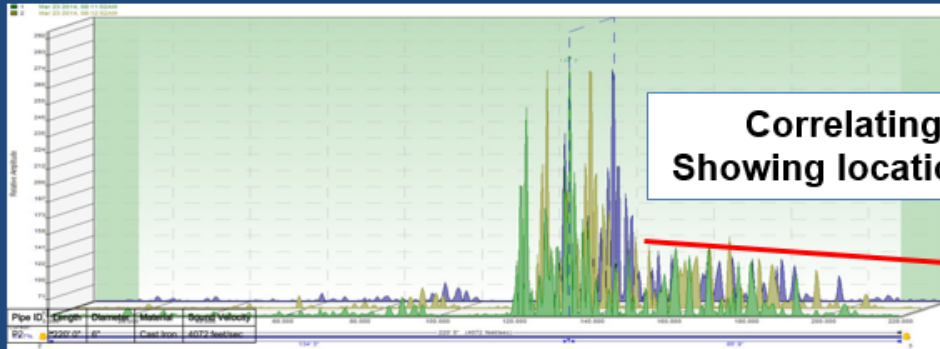


- 💧 100 Years Ago...
 - 💧 Page 86 of the City's 1924 Annual Report:
 - "The Pitometer Survey Company was here for six weeks and located leaks which totaled a waste of 165,000 gallons daily."

Leak Detection Today:

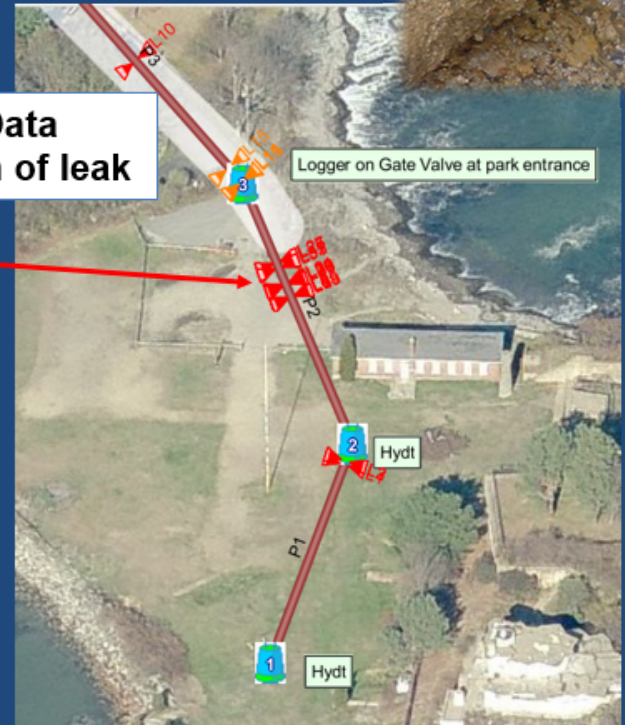


Correlating Data
Showing location of leak



Pipe ID	Length	Diameter	Material	Flow Velocity
B2	2207.0'	6"	Cast Iron	4072.8feet/sec

Leak ID	Leak Position	Correlation Between	Confidence	Recording Time
L4	304' 7" from 1	1->3	85.8%	Mar 23 2014, 08:11:52AM
L5	304' 2" from 1	1->3	86.8%	Mar 23 2014, 08:12:52AM
L6	304' 2" from 1	1->3	85.5%	Mar 23 2014, 08:11:52AM
L7	134' 3" from 2	2->3	83.7%	Mar 23 2014, 08:11:52AM
L8	122' 9" from 2	2->3	83.0%	Mar 23 2014, 08:12:52AM
L9	133' 9" from 2	2->3	84.5%	Mar 23 2014, 08:13:52AM
L25	152' 8" from 2	2->4	80.9%	Mar 23 2014, 08:11:52AM
L26	152' 10" from 2	2->4	81.1%	Mar 23 2014, 08:12:52AM
L27	152' 10" from 2	2->4	77.2%	Mar 23 2014, 08:13:52AM
L28	134' 3" from 2	2->3	83.7%	Mar 23 2014, 08:11:52AM
L29	122' 9" from 2	2->3	83.0%	Mar 23 2014, 08:12:52AM
L30	133' 9" from 2	2->3	84.5%	Mar 23 2014, 08:13:52AM
L31	660' 2" from 4	4->2	80.7%	Mar 23 2014, 08:11:52AM
L32	659' 9" from 4	4->2	81.0%	Mar 23 2014, 08:12:52AM
L33	659' 9" from 4	4->2	77.2%	Mar 23 2014, 08:13:52AM
L34	85' 4" from 3	3->2	83.7%	Mar 23 2014, 08:11:52AM
L35	96' 10" from 3	3->2	83.0%	Mar 23 2014, 08:12:52AM
L36	85' 9" from 3	3->2	84.5%	Mar 23 2014, 08:13:52AM
L37	134' 3" from 2	2->3	83.7%	Mar 23 2014, 08:11:52AM



10 Years of Identifying and Tracking Leaks



Water Leak Reporting Via City's Click N' Fix Tool on Website and Apps

City of PORTSMOUTH, NH

DEPARTMENT OF PUBLIC WORKS

Operations Services Resources Projects MapGeo Contact

City of Portsmouth > Public Works Home > Portsmouth Click N' Fix

PORTSMOUTH CLICK N' FIX

Welcome! The Portsmouth Click N' Fix application enables you to request public works maintenance service. Please be advised that this citizen service request form is for non-emergency service issues only.

Please include your contact information in order to ensure a timely response, location accuracy and additional communication if necessary. After you submit your request, you will receive an email with a Service Request ID for reference purposes. City personnel will review your request and respond as resources allow. If you want to check on the status later, you'll need the Service Request ID. A [tutorial video](#) has been created to show you it's features.

DOWNLOAD THE APP

[iTunes](#)

[Google Play](#)

- 💧 People can report problems, including water main breaks, any time on City's website or through downloadable apps
- 💧 Information is forwarded to appropriate staff for a response

Click N'Fix Submission: Leaking Water Main

- Reported and Acknowledged on June 21, 2019
- Repaired on June 25, 2019



#6069932

Leaflet | Powered by Esri | City of Portsmouth, NH, Esri, HERE, Garmin, INCREMENT P, NGA, USGS
43.0729908217146, -70.7745037033673 [Edit Location](#)

Water Created Date: 06/21/2019 7:07 PM

63-199 Pine St Portsmouth 03801, United States

Details

Water main dumping water



City of Portsmouth | Verified Official

Acknowledged

The City of Portsmouth has received this issue. It is registered as service request #0621196.

06/21/2019 7:08 PM



City of Portsmouth | Verified Official

Closed

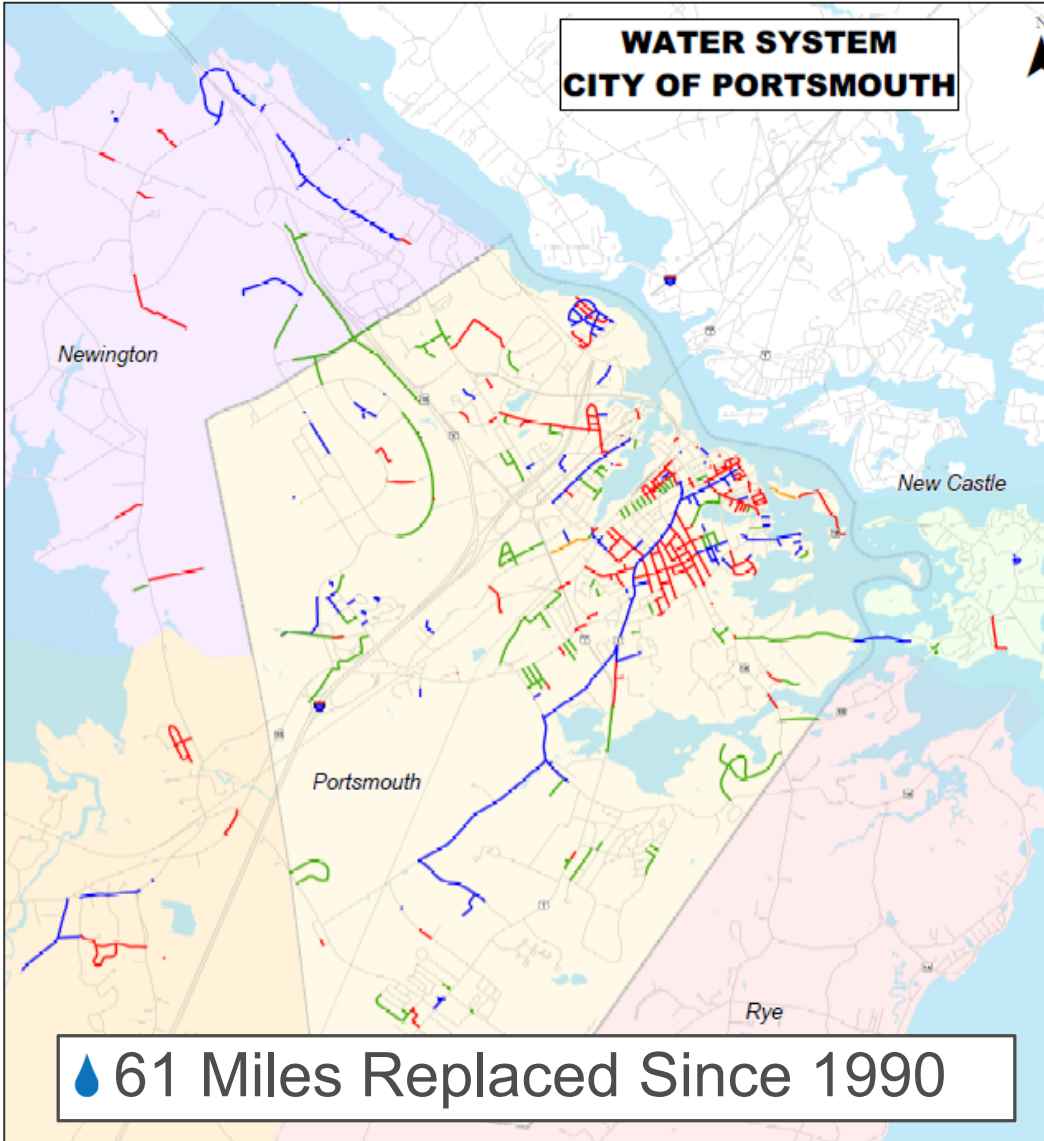
The City of Portsmouth has addressed this issue, service request #0621196.

06/25/2019 2:40 PM

4 – Water Main Replacements



- 1990 - 2000 - 17.1 miles
- 2001 - 2010 - 18.6 miles
- 2011- 2020 - 24.9 miles
- 2021- 2022 - 0.75 miles



5 – Operating System Upgrades



💧 1968



💧 2023

6 - Water Efficiency Outreach



Watersense Appreciation



Water Conservation Kits



Water Sustainability Award

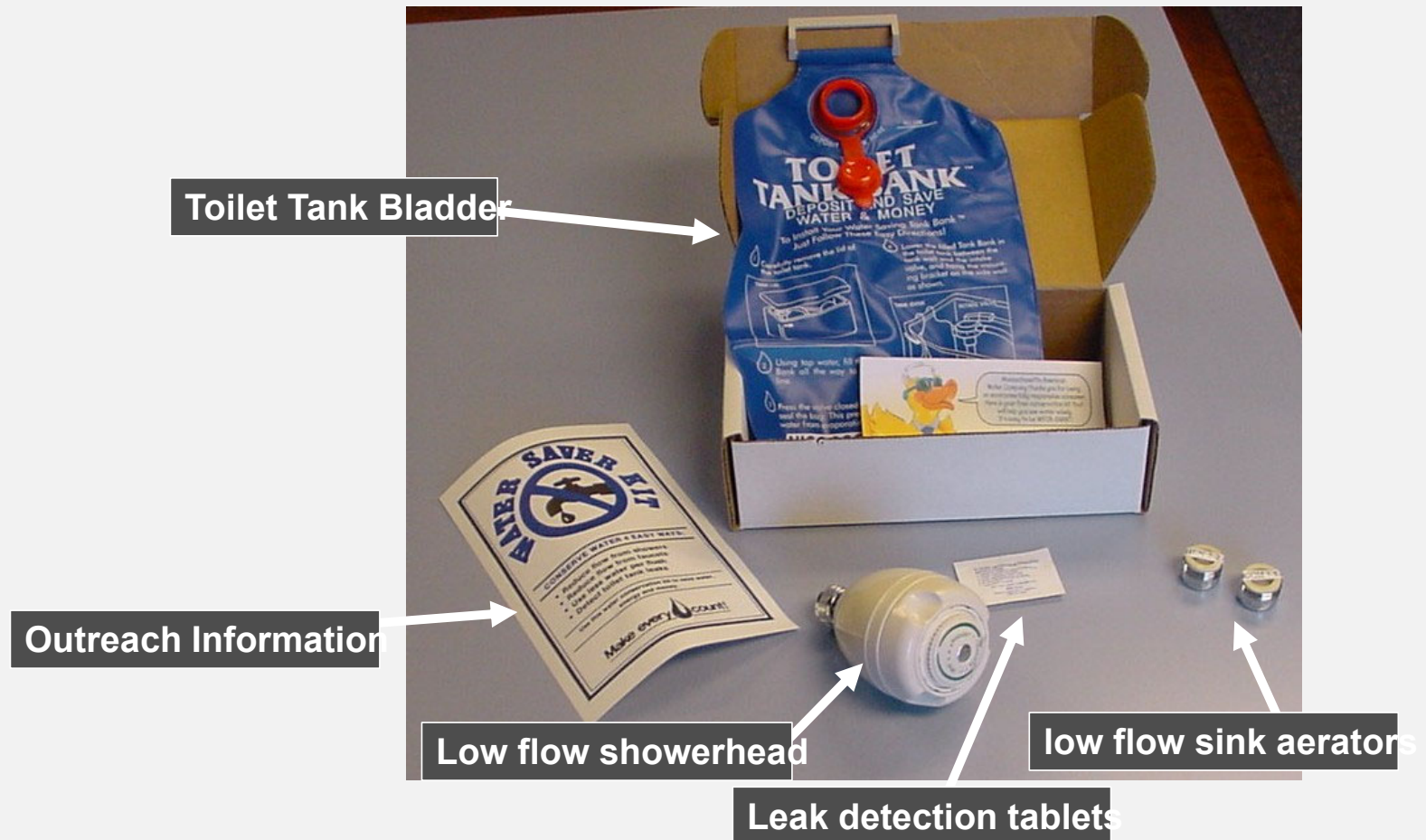


Public Outreach Award



Distinguished Public Involvement Award

2008 - Low-flow Retrofit Kits - Distributed to over 1,500 customers



Water Efficiency Rebate Program

Introduced in 2015

The First and Only Program in New Hampshire



\$100



\$150



Residential Toilet and Washing Machine Rebate Program Additional Information

Q. Why is Portsmouth offering toilet and washing machine rebates?

A. We are offering this program to our customers as an incentive to replace older, inefficient toilets and washing machines with high efficiency models. This is another step toward making our water and sewer systems as efficient as possible. When customers use less water then we have to produce and treat less water and wastewater, which saves water and money for everyone in the long run.

Rebates for Toilets and Washing Machines - 1,619 Rebates since 2015

- 1218 Toilets
- 401 Washing Machines

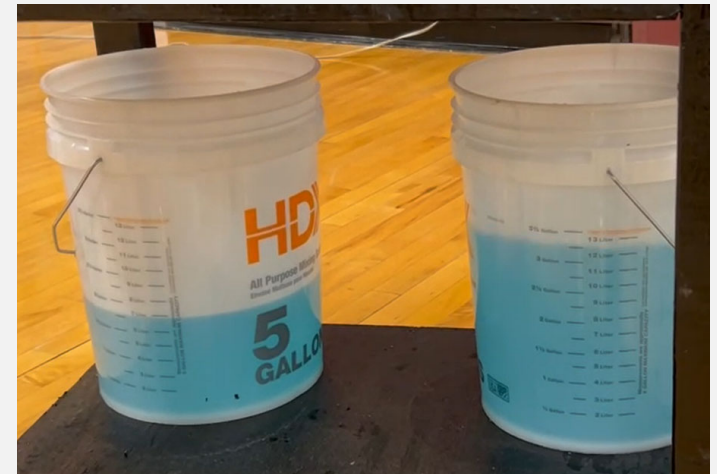
City of Portsmouth - Water and Sewer Division Water Efficiency Rebate Program - Status Report



Total Rebates Issued as of: June 30, 2023

Rebate Type	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	TOTAL	Rebate/ each	Total Rebates
Low-Flow Toilet	253	368	161	79	102	98	87	70	1218	\$100	\$121,800
High-Efficiency Washing Machine	34	24	26	36	68	95	65	53	401	\$150	\$60,150
	287	392	187	115	170	193	152	123	1619		\$181,950

Earth Day 2023 – Low Flow Toilet Example



Public Outreach:

City Website, Mailers and Brochures:


City of PORTSMOUTH, NH | DEPARTMENT OF PUBLIC WORKS

WATER

Quality & Status | Billing | Information | New Services | Projects | **Water Efficiency** | Contact

City of Portsmouth > Public Works Home > Water > Water Efficiency

WATER EFFICIENCY



Think Blue

WATER EFFICIENCY PROGRAM PROGRESS

We recognize that a gallon of water saved is a gallon that the City doesn't have to find, produce, treat and test the City's water and wastewater systems. Therefore, we have been implementing water efficiency efforts for over ten years now. These efforts have included:



Save Water for Earth Day 2016



This April 22nd marks the 46th anniversary of Earth Day, and what better way to celebrate than saving water in the great outdoors? You can get started with some of the outdoor water-saving tips below while you reconnect with nature and give back to the earth by saving water in your lawn or garden this spring.

Here are six simple tips to preserve this precious resource:

- Check the time:** Water your yard in the morning or evening to avoid losing water to evaporation in the heat of the day.
- Get in the "hydro" zone:** Group the plants in your garden to their water needs, also known as using "hydrozones," which reduce the risk of over watering your plants.
- Use mulch:** Adding mulch in your garden helps reduce evaporation, inhibit weed growth, moderate soil temperature, and prevent erosion.
- Keep control:** Upgrade to a WaterSense labeled controller. It acts like a thermostat for your sprinkler system using actual local conditions to tailor your watering schedule.
- Compost:** Instead of sending organic waste from your kitchen to the garbage disposal with water, add them to a compost pile. Use the compost as nutrient-rich soil to add to your garden.





Commit to save water! **WaterSense**

Take the US EPA Watersense "I'm for Water" pledge and use the **"2016 monthly resolutions checklist"** to extend your Earth Day celebration to a year-round effort at: epa.gov/watersense/pledge

For more information please visit the City's water website at: www.cityofportsmouth.com

Protecting Your Pipes this Winter

Quick Tips to Prevent Water Line Freeze-ups:

- Insulate pipes in unheated areas.
- Open kitchen and bathroom cupboard doors to allow more heat to reach pipes in very cold weather.
- If possible drain and shut off the water supply to the outside spigot/faucet. Wrapping outside spigots/faucets with fiberglass or molded foam-insulating covers offer good protection against freeze-ups.
- Shut off and drain any pipes that won't be used for extended periods.
- Make sure you know where your water line shutoff valve is located and test it at least once a year to make sure that it works.
- Run a faucet at a slow drip if they are in an unheated area indoors and it is very cold out.

Winters in Portsmouth can be very cold for extended periods of time. This can result in numerous water customer freeze-ups. In anticipation of another cold winter, the City of Portsmouth's water and sewer billing department is sending this notice out to help our customers prepare:

- The City is responsible for water services from the water main to the customer's shutoff valve which is usually at the property line.
- The customer is responsible for the water line from the shutoff valve into the building and for assuring that the water meter is protected from damage caused by freezing and/or snow.
- **PROTECT YOUR OUTSIDE SPIGOTS:** Outside spigots can leak in cold weather. Check them often to make sure that they are not leaking. The City will not issue sewer bill rebates for spigots damaged due to freezing or snow pileups.
- New high-efficiency furnaces do not create the same heat in basements and crawl spaces that used to get heat from the older furnaces. Please check to make sure that these areas are protected from freeze-up problems.

If you have any questions, feel free to contact:
 City of Portsmouth Water/Sewer Billing
 Finance Department
 1 Junkins Avenue | Portsmouth, NH, 03801
 Phone: (603) 610-7248

For further information please visit the City's water billing website at: www.cityofportsmouth.com

Public Outreach: Water Supply Updates

Website Updates

City of PORTSMOUTH, NH | DEPARTMENT OF PUBLIC WORKS

WATER

Quality & Status | Billing | Information | New Services | Projects | Water Efficiency | Contact

Water Operations

PORTSMOUTH DRINKING WATER SUPPLY UPDATE (AUGUST 5, 2022)

August 5, 2022

Seacoast Area Now in Severe Drought

The New Hampshire Drought Monitor recently upgraded the Seacoast area to Severe Drought conditions due to the lack of significant precipitation this summer. This is predominantly due to low snowfall over the winter and the fact that since January the Seacoast has received only 70% of normal precipitation.

The recent hot and dry weather has intensified these already dry conditions, resulting in rapid development of drought. While the drought report has prompted other communities to put watering restrictions in place, **the City of Portsmouth and Pease Drinking Water Systems are**

Map released: Thurs, August 4, 2022
Data valid: August 2, 2022 at 8 a.m. EDT

Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

Authors
United States and Puerto Rico Authority
Curtis Niggles, National Drought Mitigation Center
Pacific Islands and Virgin Islands Authority
Richard Hayes, NCEM/USCG

The Drought Monitor tracks on-ground water conditions. Local conditions may vary, and accompanying map is subject to frequent updates.

News

Seacoastonline.com

Portsmouth asks residents to limit water use

Posted Aug 25, 2020 at 5:26 PM

BUY PHOTO | HIDE CAPTION

PORTSMOUTH — The state Drought Management Task Force last week elevated drought conditions in the Seacoast from moderate to severe.

The Seacoast has received only 8 inches of precipitation since the beginning of May, compared to the 14-inch average for that time. The task force advises public water systems including Portsmouth's to implement outdoor restrictions as needed.

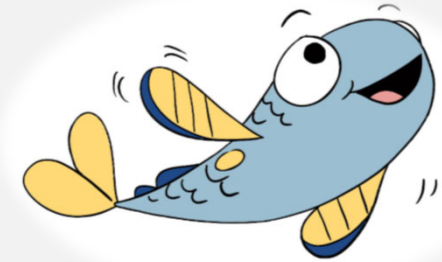
Based on the severe drought conditions and the state's recommendation, the city is encouraging voluntary restrictions. Customers are requested to restrict their use of water for outdoor irrigation, to be as efficient as possible and refrain from outdoor watering between 10 a.m. and 6 p.m.

"Although our groundwater levels remain fairly good, according to data tracked by the city's water operations staff, river levels are very low for this time of year and the reservoir is also lower than normal," said Deputy Director of Public Works Brian Goetz. "While we've had recent rain events, they have not produced much volume and it will take additional rainfall to recover from drought conditions."

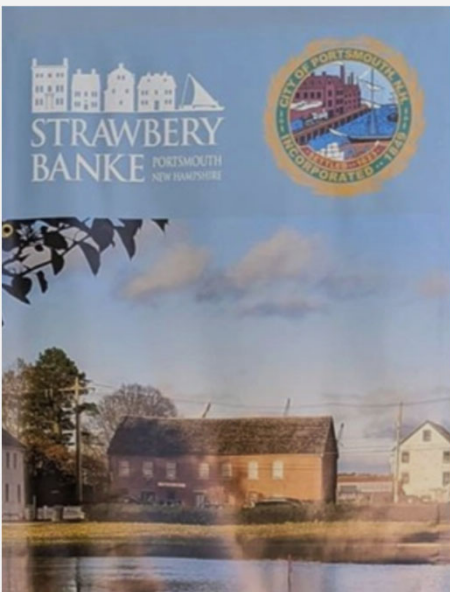
Goetz said it is important that customers be efficient with their water use.

"If we can get good compliance with voluntary measures, and some precipitation," he said, "then we may not need to increase the restrictions."

Strawbery Banke Museum – “Water Has A Memory” Exhibit with “Think Blue!”



Think Blue – What Can You Do?
Water | Wastewater | Stormwater



Brian Goetz is deputy director of Portsmouth's Department of Public Works. In a way, his role is a government descendent of one of Portsmouth's original colonists.

Saving Plastic Too Public Drinking Fountains

Parks and City Facilities



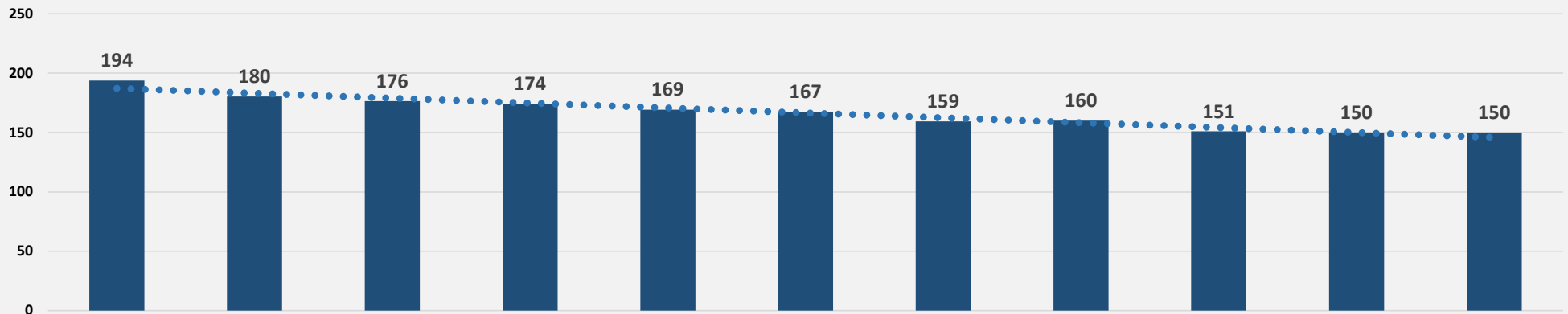
Saving 45,000 Bottles at City Hall
alone (3 drinking fountains)



Water Efficiency Timeline



Trend - Average Residential Water Use Average (gallons per day)



Water Balance Trend – Pumped versus Sales and Non Revenue

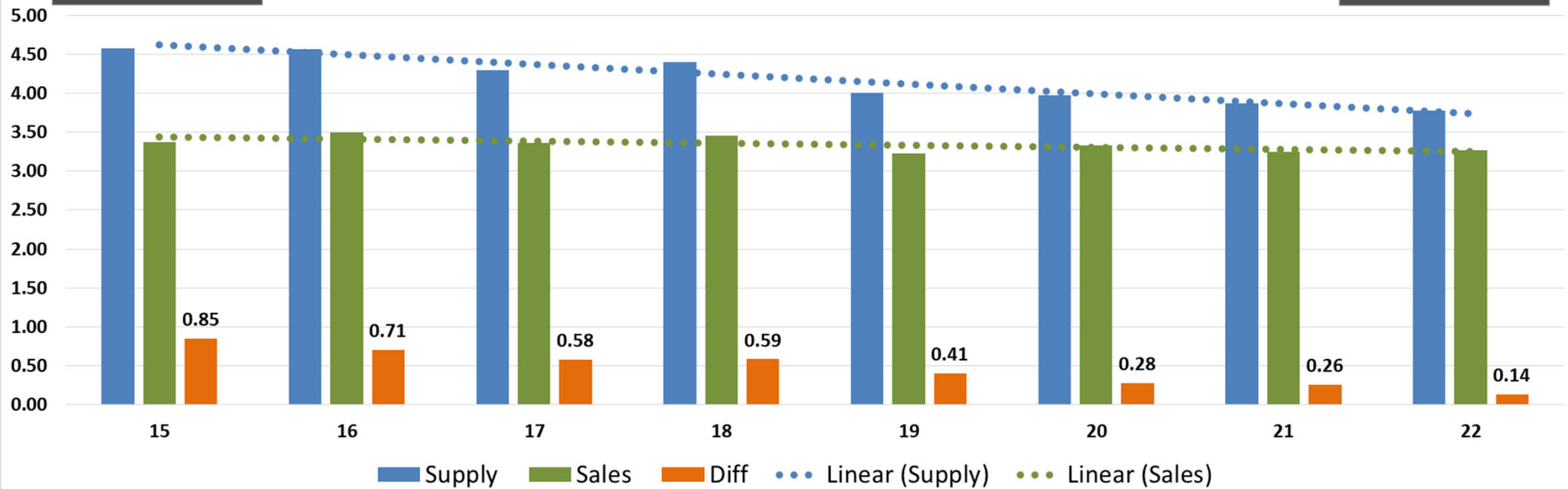
15%

850,000
Gallons/Day

3%

140,000
Gallons/Day

Production versus Sales and Non Revenue Trend (MGD)



Couldn't Do This Without Great Staff! - Through All Seasons

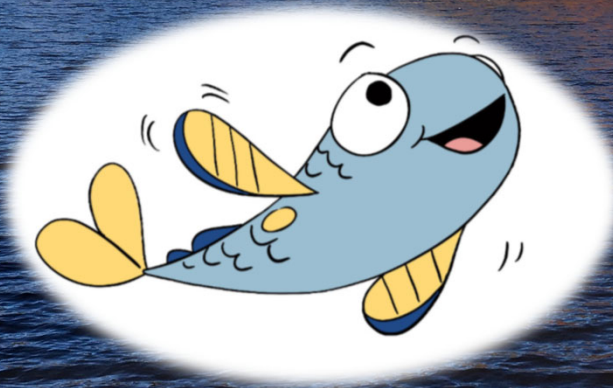


Future Water Efficiency Efforts



- Continue to offer Water Efficiency Rebates
- Customer Outreach regarding water use and efficiency – Update Billing Data
- Bill in Cubic Feet instead of Units
- Promote more efficient irrigation practices through EPA's WaterSense Irrigation Certification

Thank You!



Think Blue – What Can You Do?
Water | Wastewater | Stormwater