



Portsmouth and Pease International Tradeport Drinking Water Status Report 2022 Year in Review – February 2023

Highlights of 2022

The following report provides a summary of the water system operations for the Portsmouth and Pease International Tradeport drinking water systems. Highlights from 2022 for both water systems include:

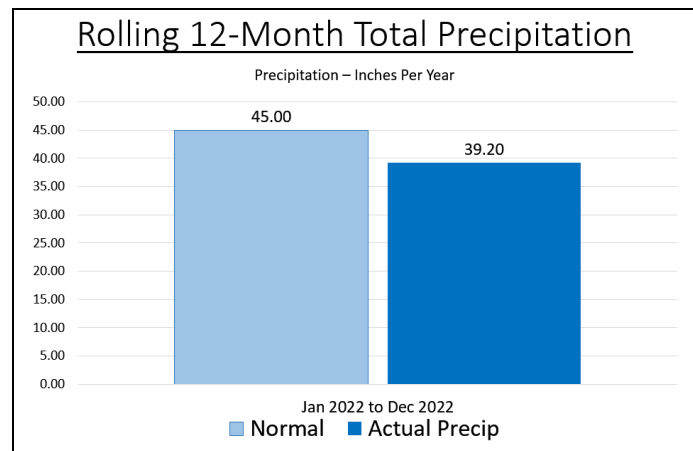
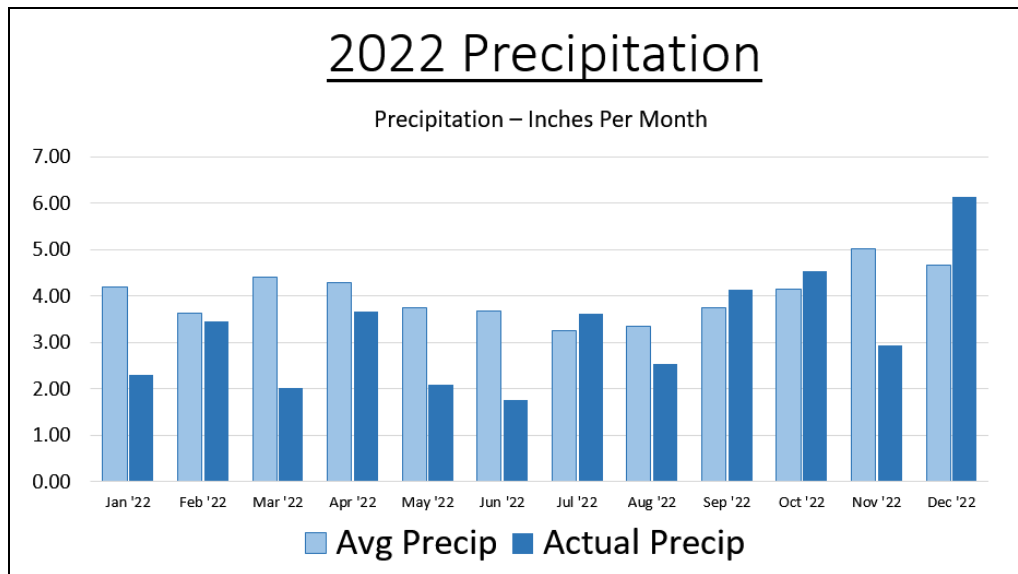
- The Portsmouth and Pease drinking water systems had no drinking water quality violations in 2022.
- Water Production:
 - 3.9 Million Gallons – Average Day
 - 6.1 Million Gallons – Maximum Day
 - 2.5 Million Gallons – Minimum Day
- Dry conditions existed into July when precipitation trended more toward normal conditions. December was very wet.

Water supplied to Portsmouth water system customers comes from a combination of surface water and groundwater sources. The surface water supply is the Bellamy Reservoir, which is located in Madbury and Dover. Water flows from the reservoir to the Water Treatment Facility (WTF) in Madbury, where it is treated before distribution to our regionally served water customers.

Water supplied to Pease Tradeport water system customers comes primarily from the groundwater wells located on the Tradeport (Harrison, Smith and Haven wells). Portsmouth water system can supply additional water to the Pease Tradeport water system as needed.

Precipitation and Weather

At year-end, the overall water supply conditions for the Portsmouth and Pease water systems were doing well. The following graphics show the monthly precipitation as recorded at the Pease NOAA weather station and the cumulative precipitation through the year. The first six months of 2022 were 8 inches below normal, however, from July to December, precipitation was normal, with a wet December receiving 6 inches of precipitation.

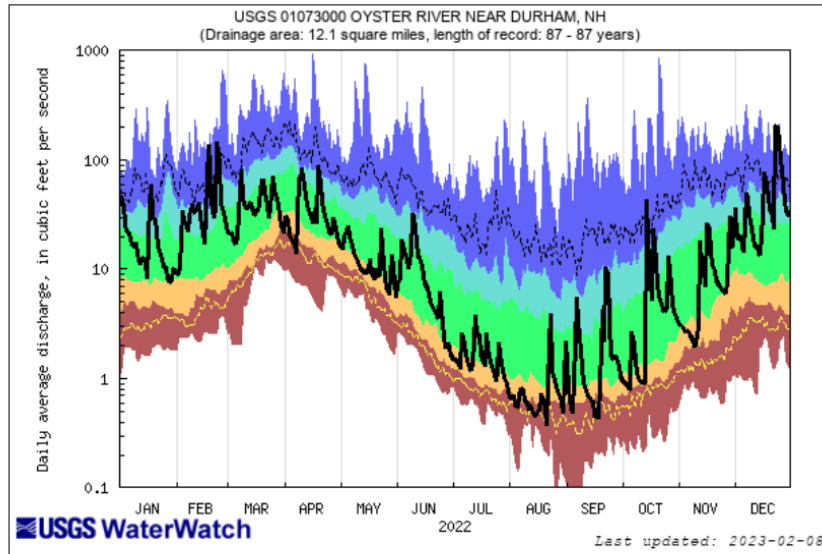


Overall, the weather was also warmer than normal. The following statistics were taken from an annual summary in the Boston Globe:

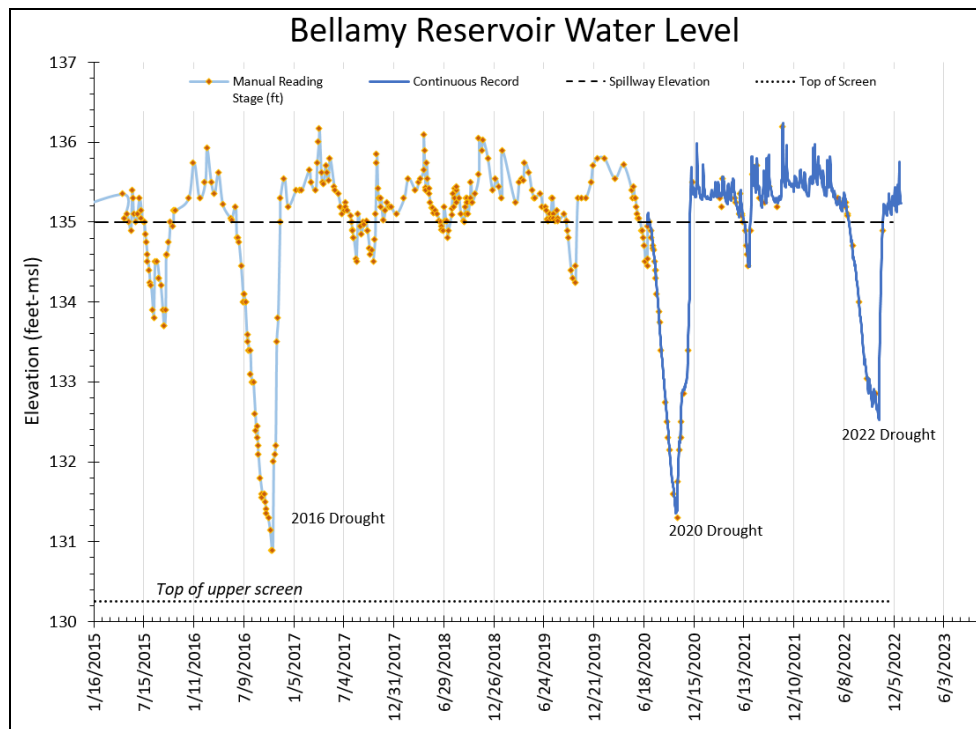
- The average temperature was 53.7 degrees – 1.7 degrees above normal
- Fifth warmest year since 1872
- Third warmest July, Third warmest August, and seventh warmest November

River Flows and Reservoir Levels

The following graphic shows the flow trend, according to the gauged Oyster River, which we use to assess the flow into the Bellamy Reservoir, for 2022. Low flow conditions started in late June and continue off and on until December, when the watershed experienced over six inches of precipitation.



Explanation - Percentile classes							
lowest-10th percentile	5	10-24	25-75	76-90	95	90th percentile - highest	Flow
Much below Normal		Below normal	Normal	Above normal		Much above normal	

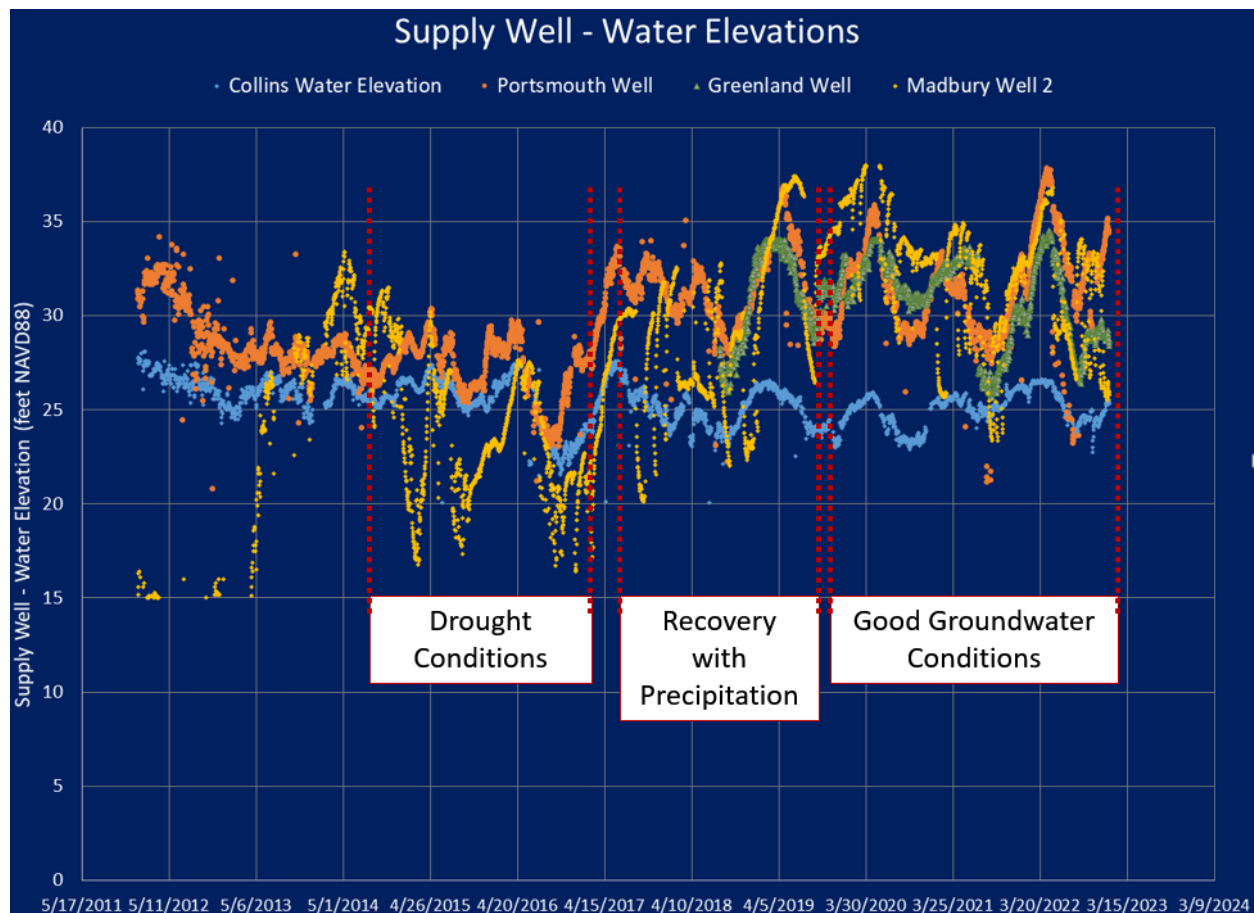


The reservoir trend also tracked similar to the weather, with low flow conditions occurring until June 2022, when the river recovered from the previous dry weather. The trends also show the extreme drought experienced in 2016 as well as the 2020 drought, which was almost as dry as 2016.

Groundwater Levels and Status

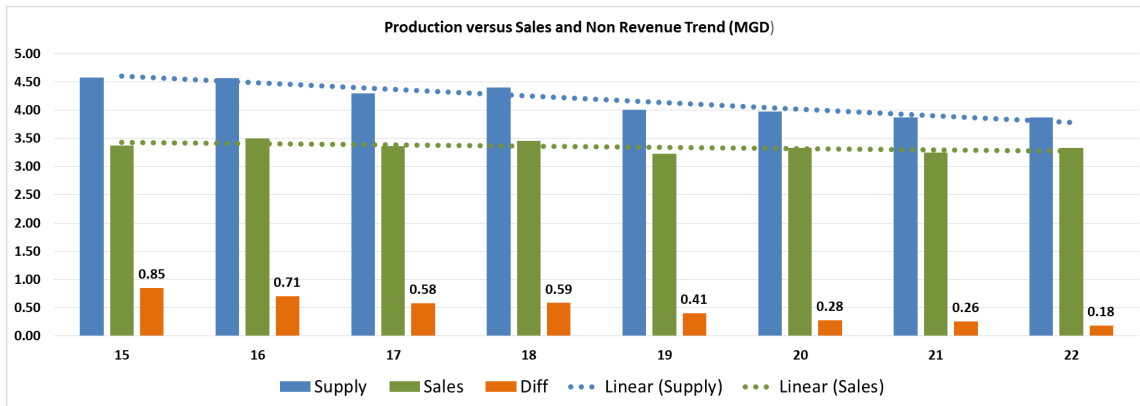
Groundwater levels in most of our water sources are much better than normal. In fact, some of the well levels are higher than they have been in years. This can be somewhat attributed to the way we received precipitation, however, it can also be attributed to our water operations staff's optimization of the use of surface water versus groundwater. Cutting back our groundwater withdrawals has allowed well levels to be maintained in a sustainable manner and more water availability for the system to meet peak demand. Each well has a continuous water level meter and the water pumped is also metered. This allows system operators the capability of assessing groundwater level trends and we are able to determine overall source of supply capability.

The following graphic shows the overall well trend of a number of the water supply sources over time:

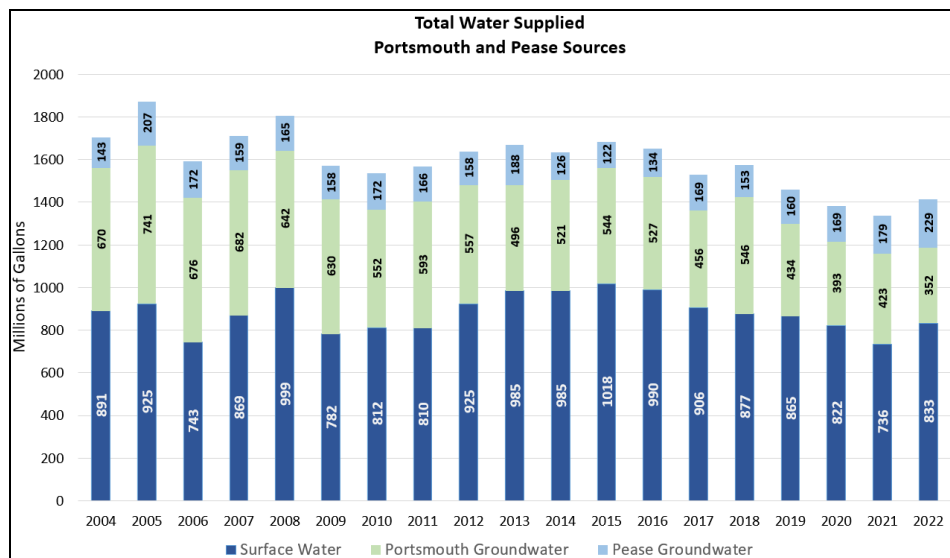


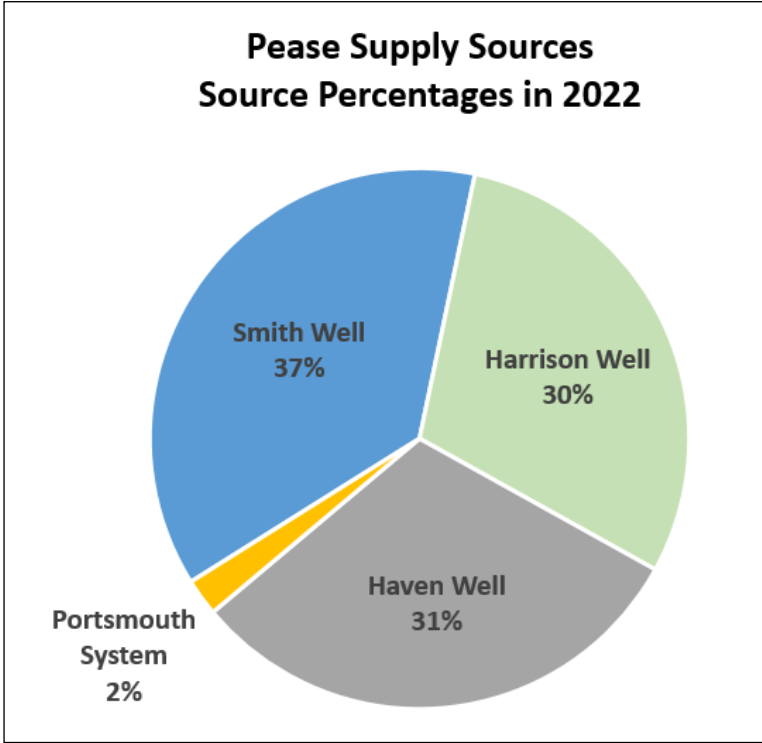
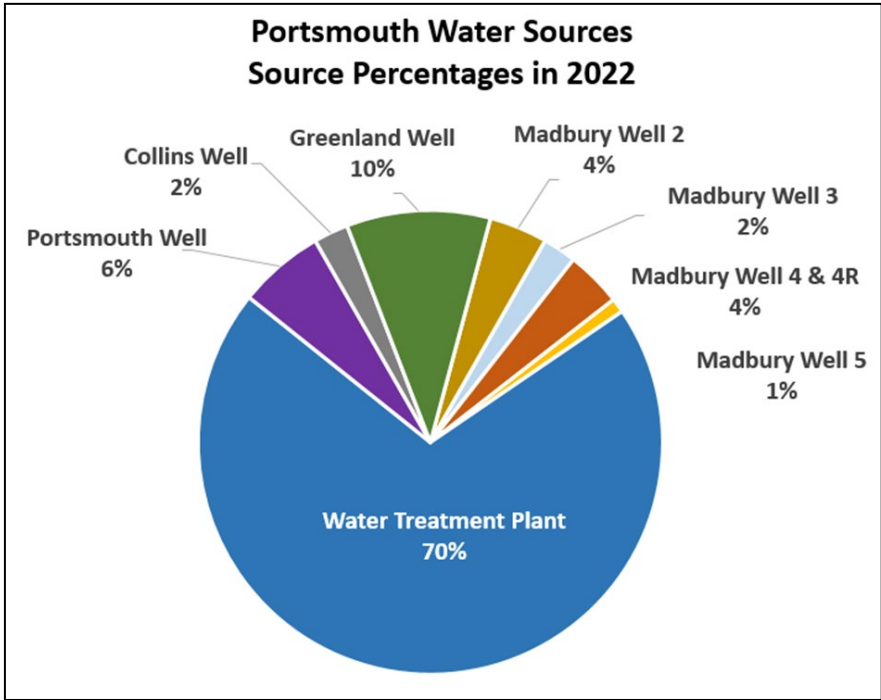
Water Production

The water produced by the combined Portsmouth/Pease water system averaged 3.9 million gallons per day. This is below historical demands. WE can attribute this to our water efficiency efforts, including our water efficiency rebates. We can also attribute this to our diligent management of our water distribution system and service pipelines where we have been able to identify and fix a number of leaking pipes. The reduction of water lost in these pipes has reduced the overall water production needs in the systems. It is now standard practice for our staff to continually inspect our water system for leaks. With 200 plus miles of water pipelines this is a lot of effort. The following graphics show the monthly and annual trends in water supply production for the Portsmouth and Pease Tradeport water systems. The following graphic shows the trend in water produced versus water delivered through customer meters and how the balance between these two has been significantly reduced:



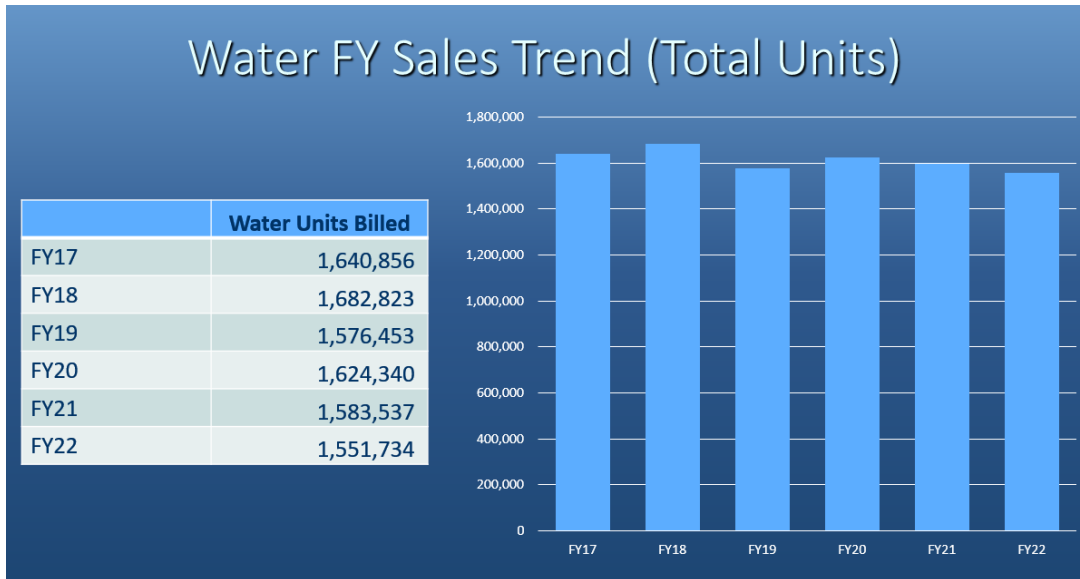
The following graphics provide a breakdown of the supply sources for our surface and groundwater systems together with graphics showing the percentage of supply sources serving Portsmouth and Pease customers:





Water Sales

Water sales remained fairly consistent with past years. Re-development and additional customers on the system are generally efficient water users, with newer, low-flow fixtures. The radio-read system for customer water meters allows daily access to water use trends and also allows staff the ability to notify any users that have excessive water use, noting potential leaks within customer plumbing. The following graphic shows the water sales trend for the last 6 years. The table shows the efforts by the metering staff to change out older meters and notify customers of potential leaks. We continue to change out at least 10% of meters in the system and are also downsizing meters where appropriate, which helps to increase system accuracy.



Item	2022 Annual Totals
Meter Installations	1,022
Radio-read replacements	123
Leak Code Tags	562

Water Efficiency Rebates

The City also continues to offer water efficiency rebates of \$100 per low flow toilet and \$150 for the purchase of a high efficiency washing machine. These are available to all residential customers, including multi-family customers. To date, over 1,000 rebates have been issued. According to the NHDES we are currently the only public water system in New Hampshire offering these rebates.

Additional information on this program can be obtained from the City’s water billing department or from the City’s website:

<https://www.cityofportsmouth.com/publicworks/water-efficiency-rebate-program>

The following graphic shows a summary of all the rebates through FY22:

City of Portsmouth - Water and Sewer Division Water Efficiency Rebate Program - Status Report										
Date: 6/20/2022										
Total Rebates Issued as of: June 30, 2021										
Rebate Type	FY16	FY17	FY18	FY19	FY20	FY21	FY22	TOTAL	Rebate/ each	Total Rebates
Low-Flow Toilet	253	368	161	79	102	98	87	1148	\$100	\$114,800
High-Efficiency Washing Machine	34	24	26	36	68	95	65	348	\$150	\$52,200
	287	392	187	115	170	193	152	1496		\$167,000

We intend to continue with the rebate program and expand our outreach efforts to focus on ways that customers can be more efficient with summertime water use for irrigation and cooling needs.

Water System Operations

Other daily staffing items regarding work performed in 2022 are shown in the following table:

Item	2022 Annual Totals
Dig Safe Locating Requests	2,944
Dig Safe Locating Labor Hours	1,534
Backflow Tests (High Hazard Locations)	1,519
Backflow Tests (Low Hazard Locations)	874
Small Meter Testing (In-House)	814
Large Meter Testing (Contractor)	74
New Water Service	256
New Sewer Service	150
Water Main Breaks	8
Hydrant Flushing (weeks)	8
Total Water Produced (Portsmouth and Pease)	1,413 million gallons
Total Water Sales	1,213 million gallons
Bulk Water Sales	14 million gallons
Flushing, Maintenance, Fire Use, Other	141 million gallons
Water Balance (Unaccounted-for water)	3.2 %

Water Quality Information

The Portsmouth Water Division routinely monitors water quality parameters and performs water quality sampling and analysis as directed by the Federal Safe Drinking Water Act and the New Hampshire Department of Environmental Services. Water sources are monitored for radioactive, biological, inorganic, volatile organic, or synthetic organic contaminants. Critical water treatment parameters for turbidity, pH, chlorine, orthophosphate and fluoride are continually monitored and tracked by our system operators. The regulations require us to monitor for certain substances less often than once per year because the concentrations of these substances do not change frequently. In these cases, the most recent sample data are reported, along with the year in which the sample

was taken. Annual Water Quality Reports for both water systems detail these efforts and are mailed to each water system customer annually. They are also available on the City's website at:

<https://www.cityofportsmouth.com/publicworks/water/drinking-water-quality>

- **PFAS Tracking**

Our efforts to track and treat the PFAS contamination at the Pease International Tradeport continue. PFAS stands for a broad group of perfluoroalkyl and polyfluoroalkyl substances, produced and found in many commercial products and also used in firefighting foam. Per- and polyfluoroalkyl substances (PFAS) are currently unregulated by the Safe Drinking Water Act. However, the EPA Health Advisory concentration standard is 70 parts per trillion (ppt) for perfluorooctane-sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA). In response to the discovery of PFOS in the Haven Well in May 2014 at levels that exceeded the EPA Provisional Health Advisory (200 ppt at that time), the Haven Well was removed from service. With the completion of the new Pease Water Treatment Facility with resin and activated carbon filters, the Haven Well was reactivated in August 2021. The source of the PFAS at the Tradeport was aqueous film-forming foam that had been used to extinguish fires and in training exercises at the former Air Force Base. Since 2014, the Harrison Well and Smith Well on the Pease Tradeport water system, and Portsmouth Well #1 and Collins Well in the Portsmouth water system, have been routinely monitored for PFAS by the Air Force.

Activated carbon filters treated the Harrison and Smith wells at Pease from 2016 to 2021 while an entirely new treatment facility was constructed to treat those two wells together with the reactivation of the Haven well. PFAS tracking of the other Portsmouth surface and groundwater drinking sources continues on a quarterly basis and all data is posted on the city's website.

The State of New Hampshire promulgated maximum contaminant level (MCL) regulations for four compounds in 2019 – PFOA, PFOS, PFHxS and PFNA. The City has been sampling quarterly according to these regulations and periodically posts that data on the City's website at: www.cityofportsmouth.com/publicworks/water. The following graphic provides a summary of the rolling average of the quarterly sampling of the Portsmouth water supply sources:

PEASE WATER TREATMENT FACILITY
PFAS RESULTS - POST TREATMENT

SAMPLED	PFAS*	Gallons Treated
4/27/2021	ND	2,717,039
5/4/2021	ND	4,354,049
5/11/2021	ND	6,387,665
5/12/2021	ND	6,830,373
5/18/2021	ND	9,391,617
6/15/2021	ND	23,133,046
7/19/2021	ND	41,445,555
8/4/2021	ND	52,901,428
8/5/2021	ND	53,782,078
8/11/2021	ND	58,558,918
8/18/2021	ND	64,975,798
8/25/2021	ND	69,830,038
9/15/2021	ND	86,914,498
10/13/2021	ND	106,446,219
11/17/2021	ND	123,708,814
12/14/2021	ND	135,102,720
1/12/2022	ND	145,754,577
2/10/2022	ND	160,343,640
2/16/2022	ND	163,485,793
3/16/2022	ND	174,946,090
4/13/2022	ND	189,692,270
5/17/2022	ND	207,992,500
6/16/2022	ND	228,834,350
7/18/2022	ND	256,890,179
8/16/2022	ND	287,679,548
9/20/2022	ND	315,416,836
10/19/2022	ND	332,261,840
11/16/2022	ND	345,721,188
12/14/2022	ND	359,024,412

* NH Regulated PFAS (PFOA, PFOS, PFHxS & PFNA)
ND = None Detected at Method Detection Limit (2 ppt)

Pease Water PFAS Treatment System Performance



PFAS Average – 12 Month Rolling New Hampshire Regulated Compounds - All Sources In Compliance (January-December 2022)

	Parts Per Trillion (PPT)	NH MCL	RAW*	MADBURY WTP FINISHED	MADBURY WELL 2	MADBURY WELL 3	MADBURY WELL 4	PORTSMOUTH WELL	COLLINS WELL	GREENLAND WELL	PEASE WTP
PFHxS	ng/L	18	0	0	0	0	0	7	2	1	0
PFOS	ng/L	15	0	0	0	0	0	5	3	4	0
PFOA	ng/L	12	3	2	4	3	0	5	3	4	0
PFNA	ng/L	11	0	0	0	0	0	0	0	0	0

- **Total Trihalomethanes (TTHMs)**

Total Trihalomethanes (TTHMs) are disinfection byproducts (DBPs) which are created when natural organic matter in the water. On average, the Water Treatment Facility in Madbury removes about 71% of the total organic carbon (TOC) through the treatment process. The EPA Disinfectants and Disinfection Byproducts Rules (Stage 1 and Stage 2) requires TOC removal of 50% for the type of water that is typical from the Bellamy Reservoir. The TOC that remains in the water after treatment reacts with the chlorine and creates DBPs. Historically the TTHM concentration in the Portsmouth Water System has averaged 56 parts per billion (ppb).

A storage tank mixer and aeration system were installed at the Newington Booster Pumping Station as part of the upgrade to that facility. These systems became operational in September 2019. These improvements were designed to reduce the concentrations of trihalomethanes in the water distribution system. The average TTHM in the distribution system since this system has been in operation is 38 ppb. During July of 2021, extreme precipitation events caused higher than normal levels of organics in the Bellamy Reservoir. This resulted in an increase in TTHMs in the system over the summer and through the fall of 2021. TTHM levels averaged around 52 ppb during this time. Average TTHM levels in 2022 were 32 ppb.

Modifications to the Bellamy Reservoir oxygen management system were performed during the summer of 2022. These included the replacement of the hypolimnetic curtain and the installation of an additional air diffuser platform.

- **Lead Sampling**

Both of the water systems were sampled for lead in 2022, and they are all in compliance with the requirements for lead concentrations. The results from our lead sampling program in 2022 were below the lead action level of 15 parts-per-billion (ppb) at the 90th percentile value in each of the Portsmouth, and Pease Tradeport water systems. Samples were not required from the New Castle system in 2022. Of the 30 residential samples collected in the Portsmouth system in 2022, 26 had no detected lead, and 4 had less than 5 ppb. In the Pease water system, there were 37 of the 42 samples that had no lead detected, and 5 samples that had less than 5 ppb measured.

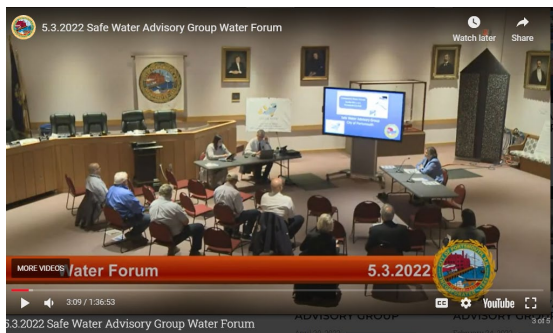
Due to the upgrades of the Pease Water Treatment Facility, at least 40 lead and copper samples were required for compliance during the first 6 months of operation. This was double the number of samples typically required for this system. The Pease Tradeport system samples resulted in 37 of the 42 samples having no detected lead, and 5 samples with less than 5 ppb measured. These results are typical of what have been measured over the past 17 years since our corrosion control program has been in effect. This is an annual sampling program, and we will be sampling 40 sites again in the Pease System between July 1 and September 30, 2023 and 60 sites in the Portsmouth System twice throughout 2023.

Lead is not present in the water when it leaves our treatment and well facilities, or in the water mains that run below the streets. However, lead can be present in old service line connections

that tie homes to the water system or plumbing inside homes and businesses. Due to the age of many homes in Portsmouth and surrounding towns, and the associated potential for leaded plumbing components, we encourage customers to have their water tested by a certified laboratory, especially if there are children under six or pregnant women in the household. We actively adjust the water chemistry at the treatment facility and well facilities according to our Corrosion Control Program, to reduce the potential for lead in households to dissolve into the water and end up at the tap. But if lead is present in your plumbing system, and is in contact with water, some risk remains. Information about our Corrosion Control Program can be accessed online: cityofportsmouth.com/publicworks/water.

- **Safe Water Advisory Group (SWAG)**

The Safe Water Advisory Group was created with the approval of City Council on October 5, 2020. Its mission is to review and communicate the latest science on the health and environmental effects of drinking water contaminants (with a heavy focus on PFAS), to monitor federal and state level legislative changes, and to anticipate policy changes that could impact the city of Portsmouth. The SWAG met four times in 2022 and discussed topics including PFAS regulations, extent, treatment, and testing programs; legislative items associated with drinking water, private well studies, climate change, and community organizing. The group also held a Water Forum at City Hall in May. This forum was a hybrid meeting where attendees could participate in the meeting in-person and also online via Zoom. Videos of the water system components, water quality, as well as presentations on contaminants, including PFAS and lead, were covered.



Water Forum Agenda

- In person – City Council Chambers
- Zoom – participants will be muted but will have opportunity to participate during polling and during Question & Answer Session
- Event will be recorded and will be available on City's YouTube channel
- PowerPoint presentations
- Videos of water system history, sources and components
- Interactive Polling #1
- Videos on water quality
- Contaminants of concern
- Additional resources and information
- Question and Answer Session
- Interactive Polling #2

Video recordings SWAG meetings are posted on the City’s website and YouTube channel:

<https://www.cityofportsmouth.com/citycouncil/safe-water-advisory-group>

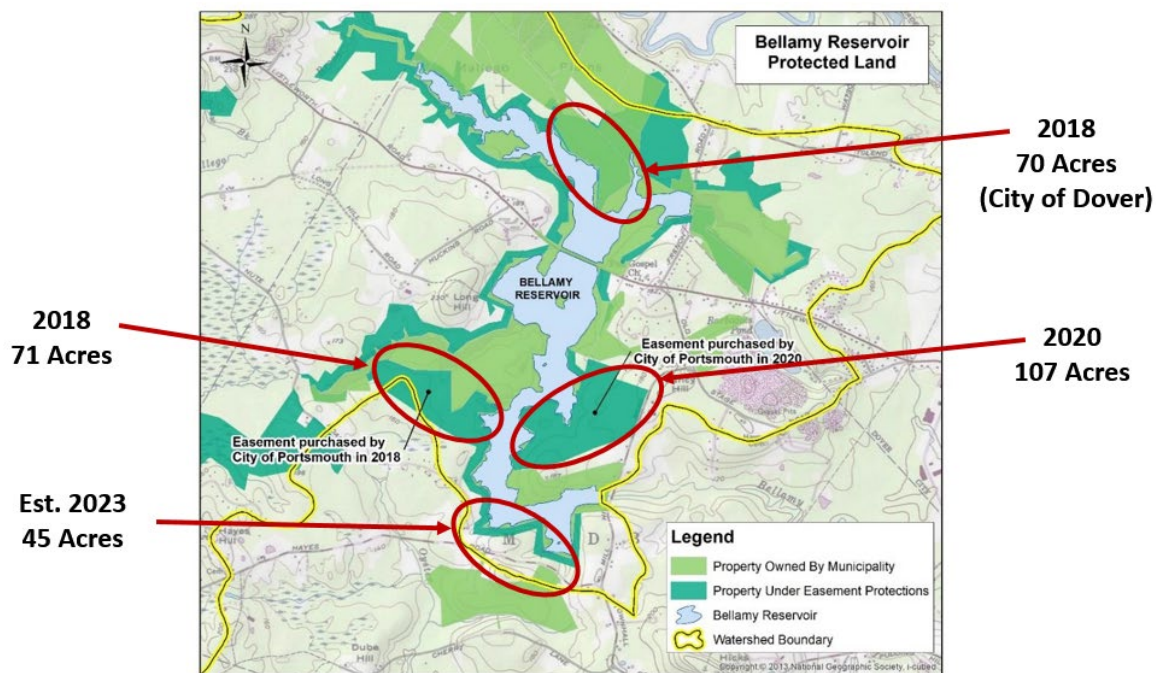
The 2022 Portsmouth City Council voted to reinstate the SWAG for two more years. The public is invited to attend meetings and encouraged to be involved with the community and informed of all aspects of the City’s water supply.

Source Water Protection

- **Bellamy Reservoir**

The City continues to work with the communities of Madbury and Dover to monitor and track the land within the Bellamy Reservoir watershed. The City of Portsmouth's water division either owns or has easements around the entire reservoir. This provides a protective water quality buffer for the surface water that is piped to and treated at the Madbury Water Treatment Facility. In addition to these buffers, the water division, in cooperation with the Town of Madbury and the New Hampshire Department of Environmental Services, has historically restricted activities in and around the reservoir. The following activities are not permitted; swimming, motor boats and campfires. Kayaks, canoes and other non-motorized boats are permitted on the reservoir.

Portsmouth – Bellamy Reservoir Source Water Protection Efforts



The City has acquired conservation easements in 2018 and 2020 of properties that abut the Bellamy Reservoir. Easements on these parcels, totaling 179 acres, were obtained through the combined efforts of the City, Southeast Land Trust and the Town of Madbury to coordinate due diligence activities and prepare the easement documents. The City received approximately \$487,000 in grant funds for these easements from the New Hampshire Groundwater and Drinking Water Trust Fund and approximately \$14,500 from the Great Bay Resource Protection Partnership. We are currently working on acquiring a 45 acre parcel near our surface water intake.

SOURCE WATER PROTECTION LAND AND EASEMENT PURCHASE RECORD														
SOURCE	PARCEL/ PROJECT NAME	DATE PROTECTED	PROTECTION	PORTSMOUTH ROLE	BOOK & PAGE	ACRES	PROXIMITY TO SOURCE	CITY FUNDS	DWGTG	GBRPP	OWNER FUNDS	TOWN FUNDS	TOWN	
Harrison Well	Sherburne Rd Property	5/21/2003	City Property	Owner	4035-2172	4.34	Adjacent to Harrison Well Parcel							
Bellamy Reservoir	Souther Property	3/15/2018	Dover Owned	None	1506-295	69.3	Adjacent to Reservoir	\$0				\$125,000	Dover	
Bellamy Reservoir	Olson Easement	12/18/2018	Conservation Easement	Easement Holder	4624-0179	70.8	Adjacent to Reservoir	\$223,130	\$200,000				Madbury	
Bellamy Reservoir	Haley-Rubinstein-Goodwill	2/21/2020	Conservation Easement	None	4735-874	210	Watershed	\$10,000	?			?	Barrington	
Bellamy Reservoir	Duffy Easement	12/29/2020	Conservation Easement	Easement Holder	4851-456	107	Adjacent to Reservoir	\$271,403	\$283,600	\$11,504	\$1,000	\$0	Madbury	
Greenland Well	Chick Property	11/6/2020	Portsmouth Property	Owner	6191-124	3.11	Within 400 ft SPA of Well	\$220,000					Greenland	
Bellamy Reservoir	Fernald Property		Conservation Easement	Easement Holder		45	Adjacent to Reservoir						Madbury	

The protection of the Bellamy Reservoir is a high priority for the City of Portsmouth because the Reservoir is the primary water supply for the City. The Bellamy surface water is treated at the City’s Water Treatment Facility in Madbury and delivered to regional communities around the seacoast. Conserving land within the watershed and areas that abut the reservoir and surrounding wetlands, rivers, and streams, protect the water quality from the pressures of development and helps the municipal water system provide quality drinking water.

The City of Dover continues to update our water system staff about their efforts to track and remediate their closed landfill, which is in the Bellamy Reservoir watershed. Dover must comply with EPA and DES requirements regarding the level of remediation they need to perform to protect all water sources around their site. We anticipate a report from Dover’s staff will be presented to the SWAG at an upcoming 2023 meeting.

Water Supply Infrastructure Projects

- **Madbury Wells Upgrade Project**

In 2022, Well #4R, which is the replacement for the original Well 4 in Madbury, was activated along with the new Well 5. A new building was constructed to house the metering and chemical system associated with these wells. Through the permitting of these wells, the Madbury well field was allocated a total daily capacity of 1.5 million gallons per day. Since these new wells went on line in August 2022, the well field production has averaged 0.42 MGD.

- **New Water Transmission Main Under Little Bay**

This project is in final design and awaiting agreements from abutting land owners. After negotiations with the abutting land owners are complete, the project can go through the final permitting through the NHDES which includes a public hearing. This project needs to go out to bid by early summer 2022 so the selected contractor can begin to order the materials for the construction and have them delivered in time for the acceptable construction period. The construction must occur during the winter (December – April) to minimize impacts to the tidal ecosystem and fisheries.

- **Collins Well #2**

After investigating the geology in the area of the existing Collins Well through the drilling and construction of test wells, a hydrogeologically favorable location was identified for the

construction of a new well, Collins Well #2. This well is intended to provide mechanical redundancy to the existing source as well as allow the water yield capacity to be recovered to the 450 gallons per minute that were originally available from the Collins Well. Over time the withdrawal rate from the Collins Well has declined and routine cleaning of the well screen and redevelopment of the gravel pack has resulted in only moderate recovery of the well yield.

Collins Well 2 has been drilled and constructed, and the City’s consultant, Emery & Garrett Groundwater Investigations (EGGI), conducted a pumping test in October 2022. The results of this test will be submitted to the NHDES for their evaluation in the permitting process. An extensive network of monitoring wells has been established in the area and will be used to assess the effect of the Collins Wells on the aquifer.



Further Updates and Information

This information will be distributed electronically on the City of Portsmouth’s website in the Department of Public Works > Operations > Water section. If anyone needs additional information or has questions contact Al Pratt, Water Supply Operations Manager at 520-0622 or Brian Goetz, Deputy Director of Public Works at 766-1420.