City of Portsmouth

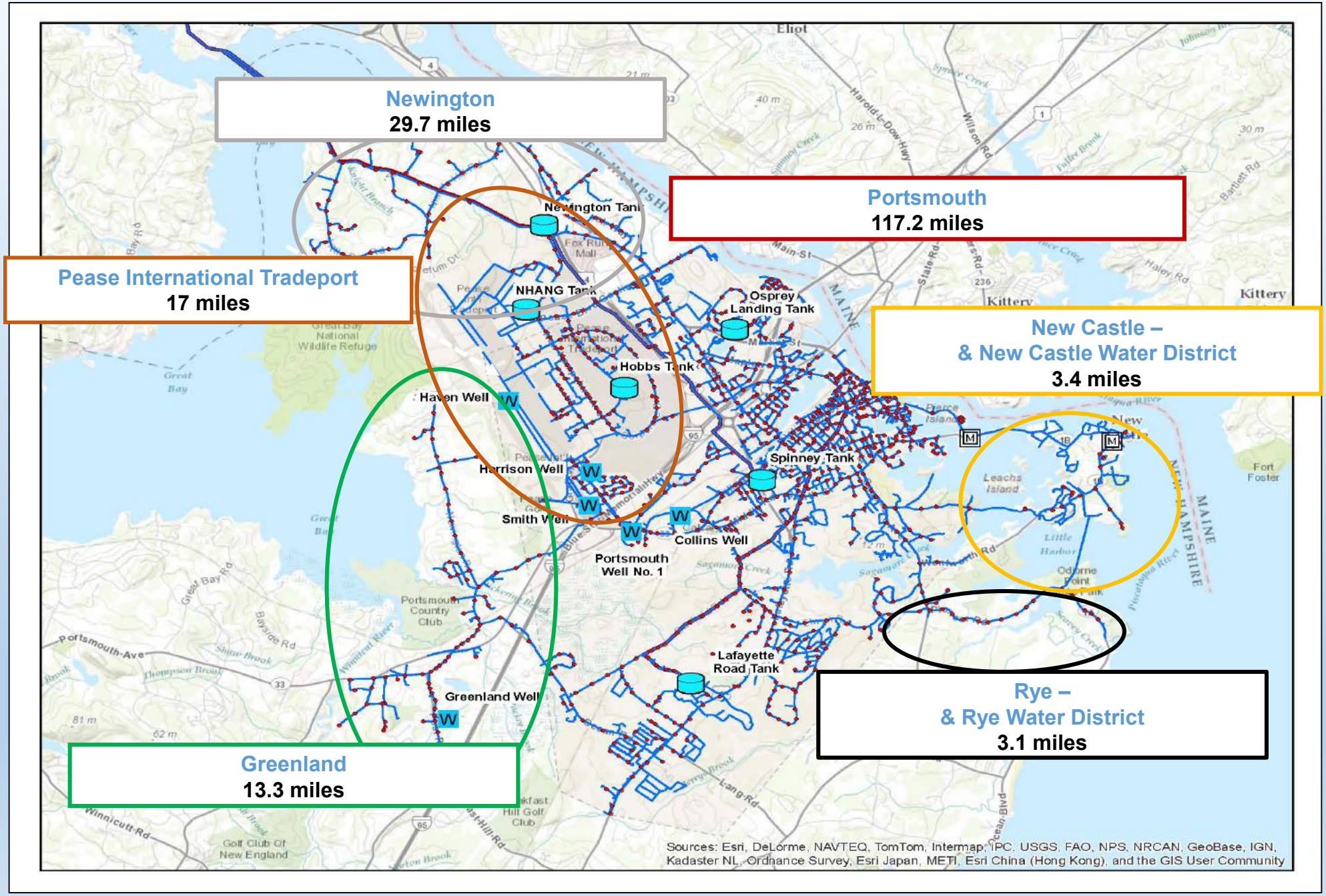
Water System History and Drinking Water Quality Overview

February 2, 2021 Meeting
Updated February 5, 2021
Safe Water Advisory Group (SWAG)

Portsmouth Regional Water System Service Area

Photo: Underwood Engineers

Portsmouth Regional Water System Service Area – Miles of Pipe



Portsmouth Water Division

Portsmouth Regional Water System

- Bellamy Reservoir
- Madbury Surface Water Treatment
- 6 Wells
- 3 Water Storage Tanks
- 173 Miles of Pipe

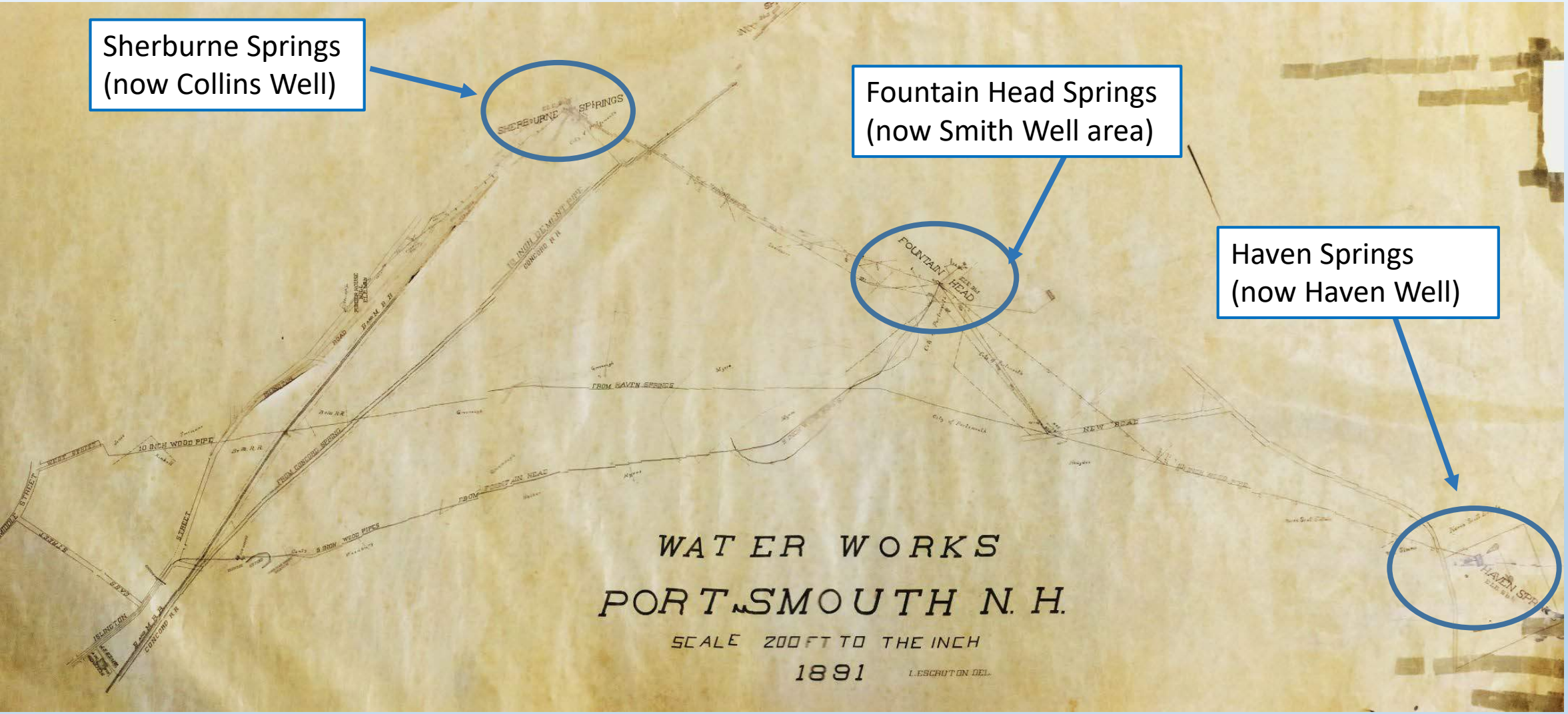
Pease Tradeport Water System

- 3 Wells (Haven out of service)
- Activated Carbon Treatment
- 2 Water Storage Tanks
- 17 Miles of Pipe

History of Portsmouth Water System

- 1797 - Portsmouth Aqueduct Company formed by act of NH Legislature
- Fountain Head Spring Developed (near current Haven Well) and piped to City
- 1867 – Sherburne and Concord Springs added
- 1891 – City takes over system
- 1950’s – Pease Air Base takes over Haven Well and builds new tanks and pipes in Pease area for it’s own, separate water system. Madbury Wells, Bellamy Reservoir and Madbury Water Treatment Facility are built by Air Force to replace water sources for City
- 1990’s – Pease system turned over to Pease Development Authority. City takes over operations.

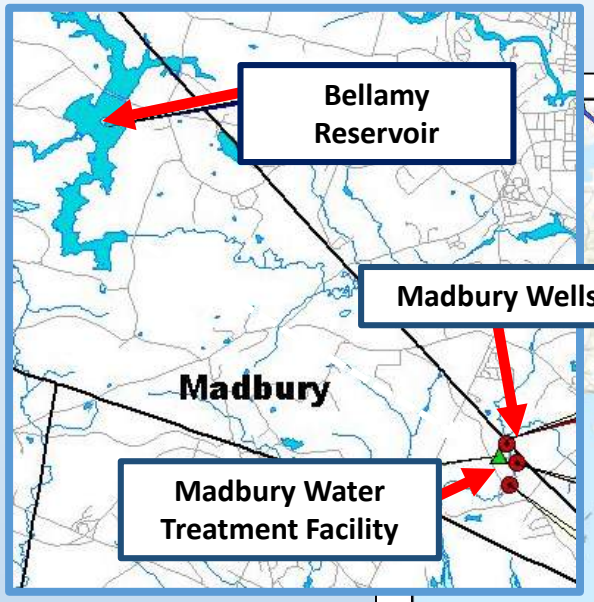
Water Sources in 1891



Wooden Pipes – 1800’s

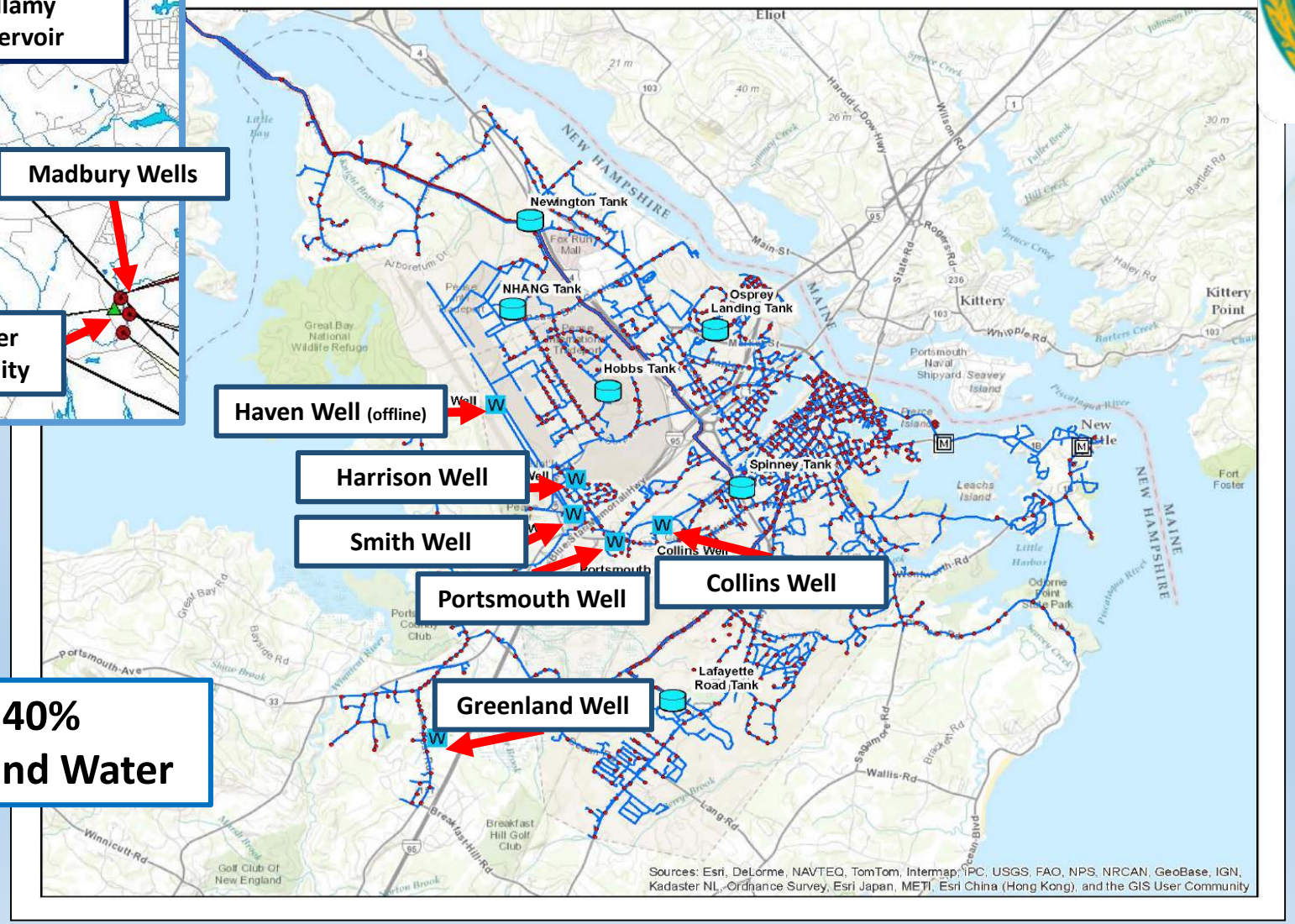
Over 100 Years of Customer Metering

Portsmouth Water – Sources of Supply

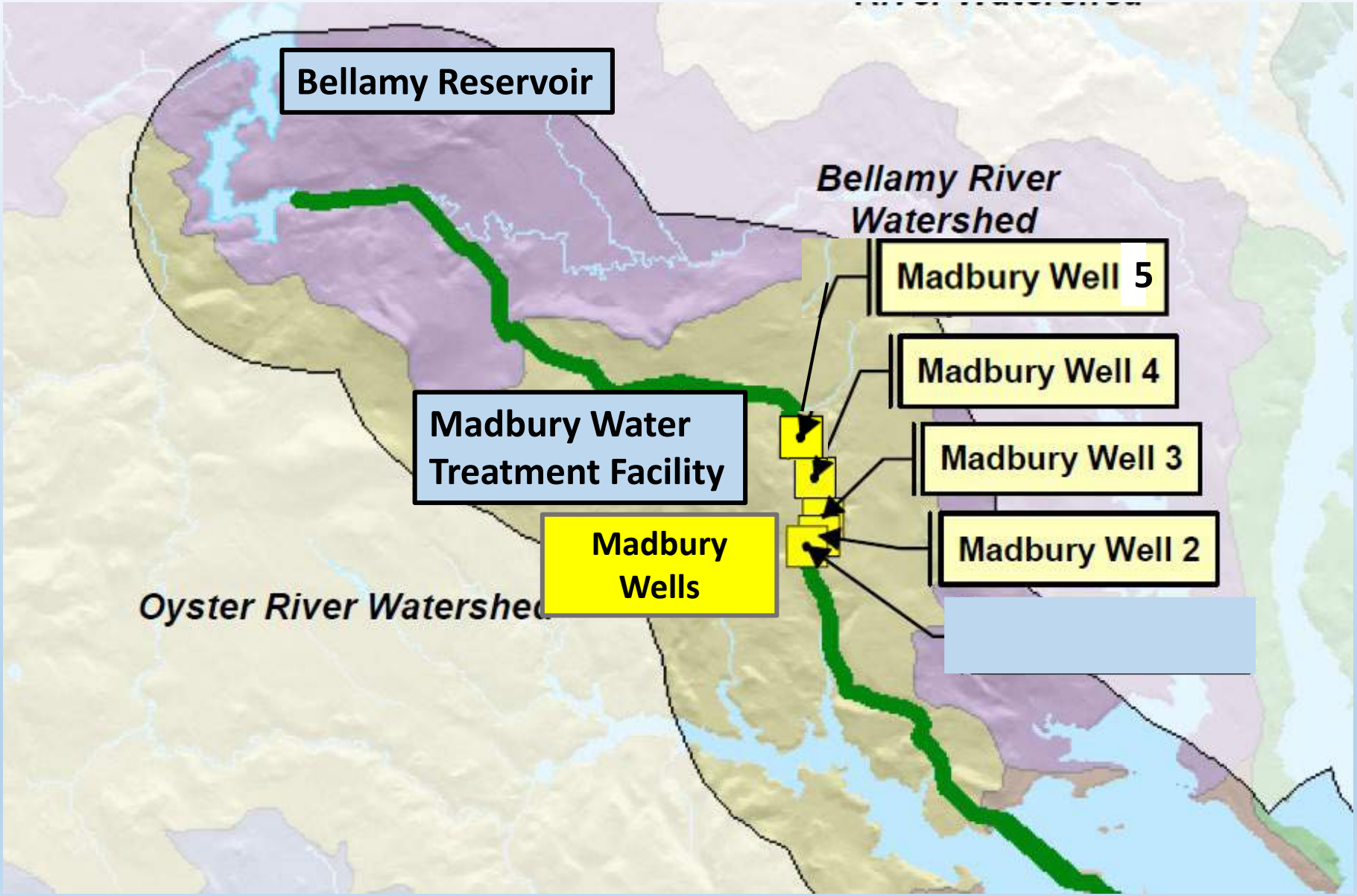


60%
Surface Water

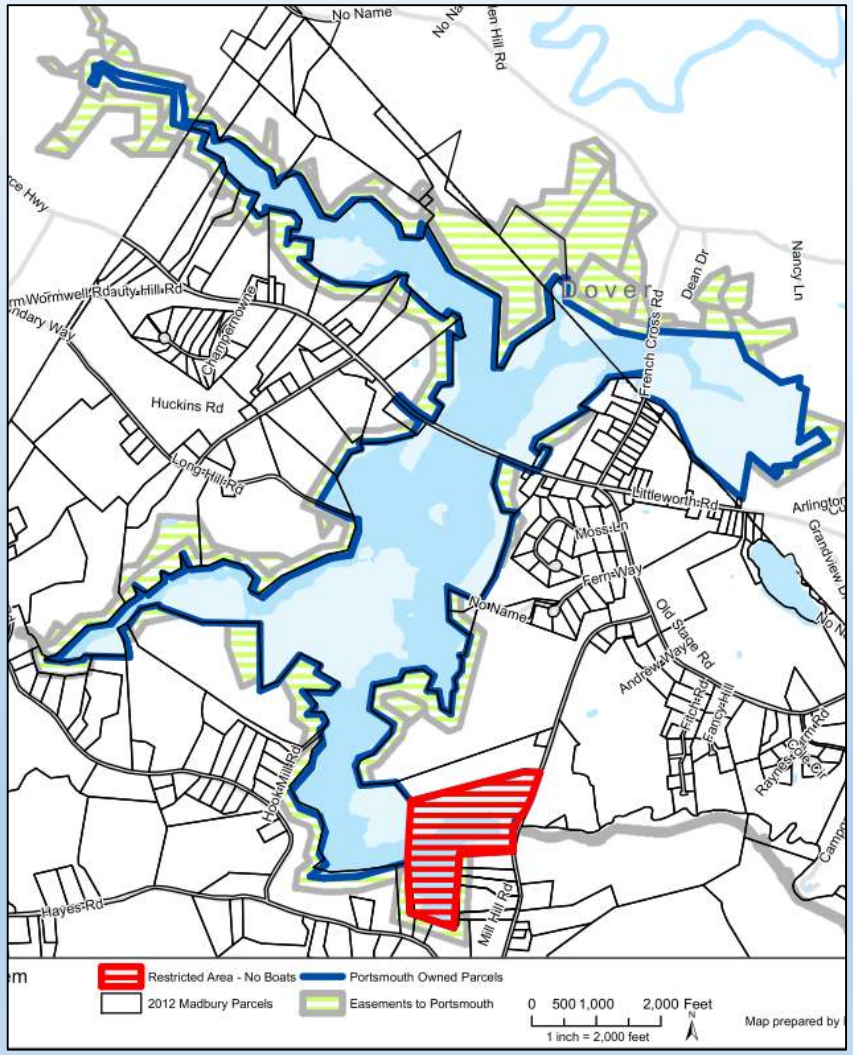
40%
Ground Water



Madbury Surface and Groundwater Sources



Bellamy Reservoir – 1960
888 Million Gallon Capacity



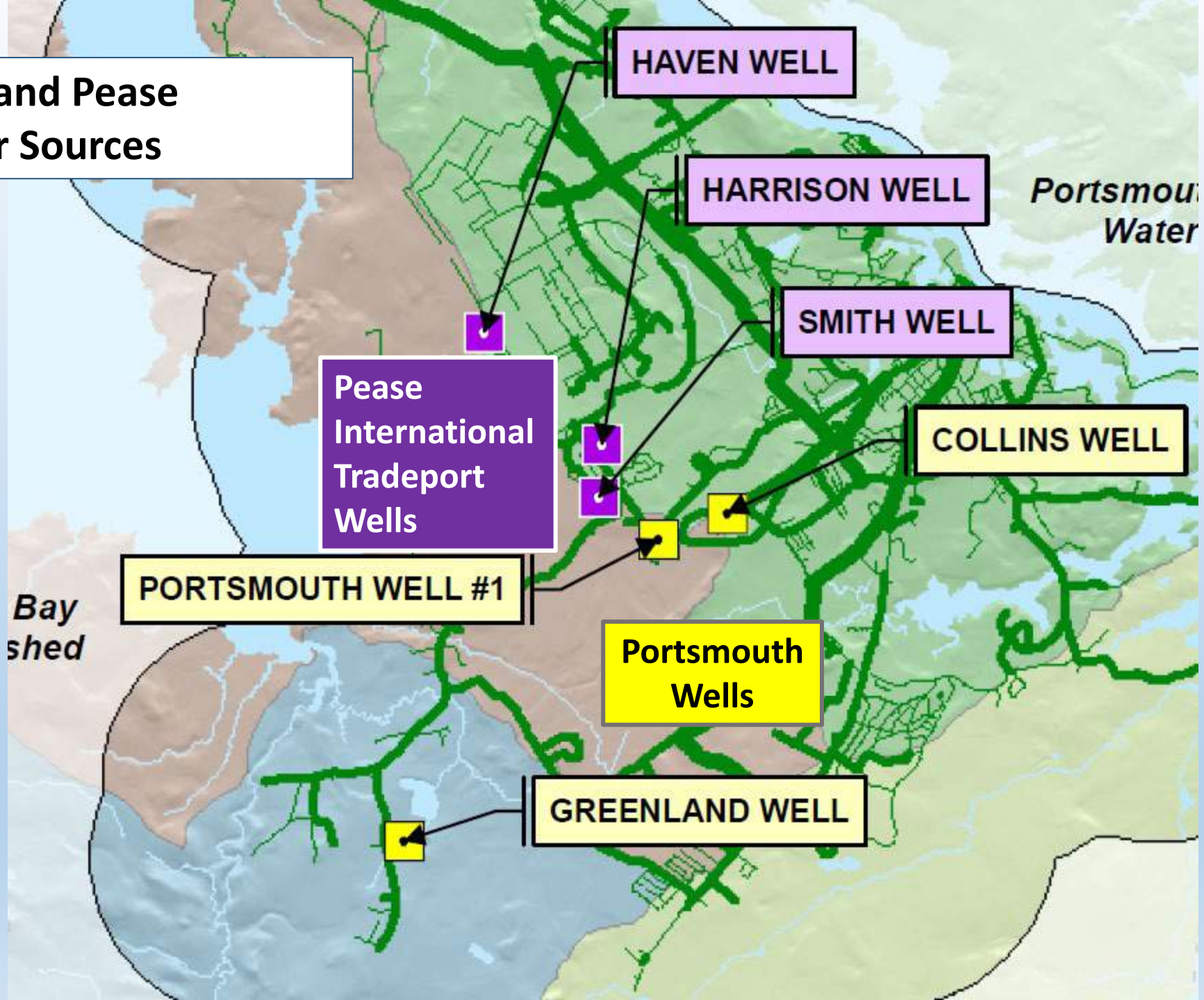
Madbury Water Treatment Facility – 2011
LEED Silver Certification

Three Madbury Wells – 1957

Madbury Well #5 – Permitted in 2016

Construction of Facilities Scheduled for 2021 **720,000 GPDay**

Portsmouth and Pease Groundwater Sources



Portsmouth Well #1

Originally Installed in 1859

500,000 GPDay

Collins Well

Originally Installed in 1889
(Sherburne Springs)

360,000 Gallons Per Day

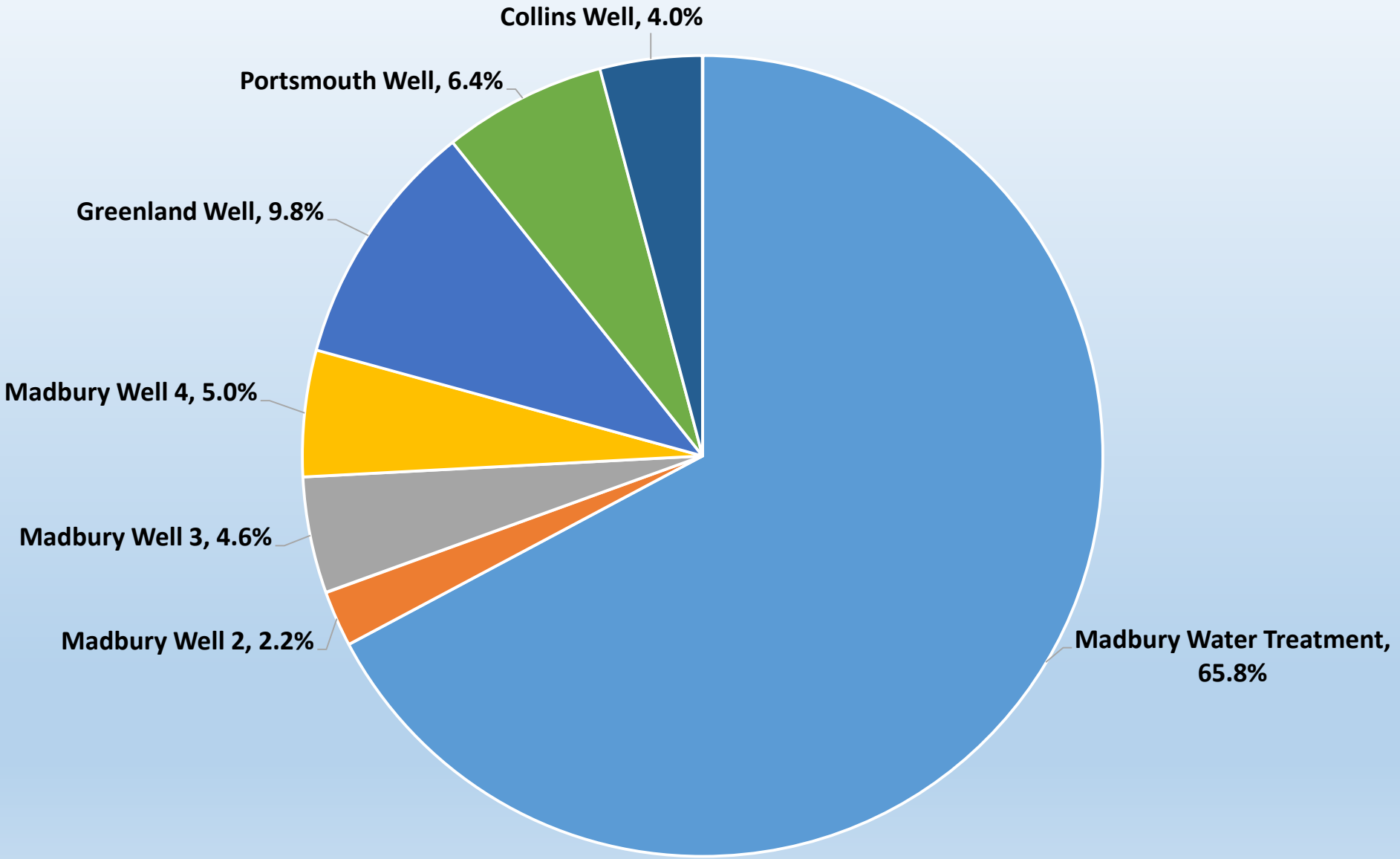
Greenland Well - 1949

Originally installed in 1949

New Facilities in 2016

650,000 GPDay

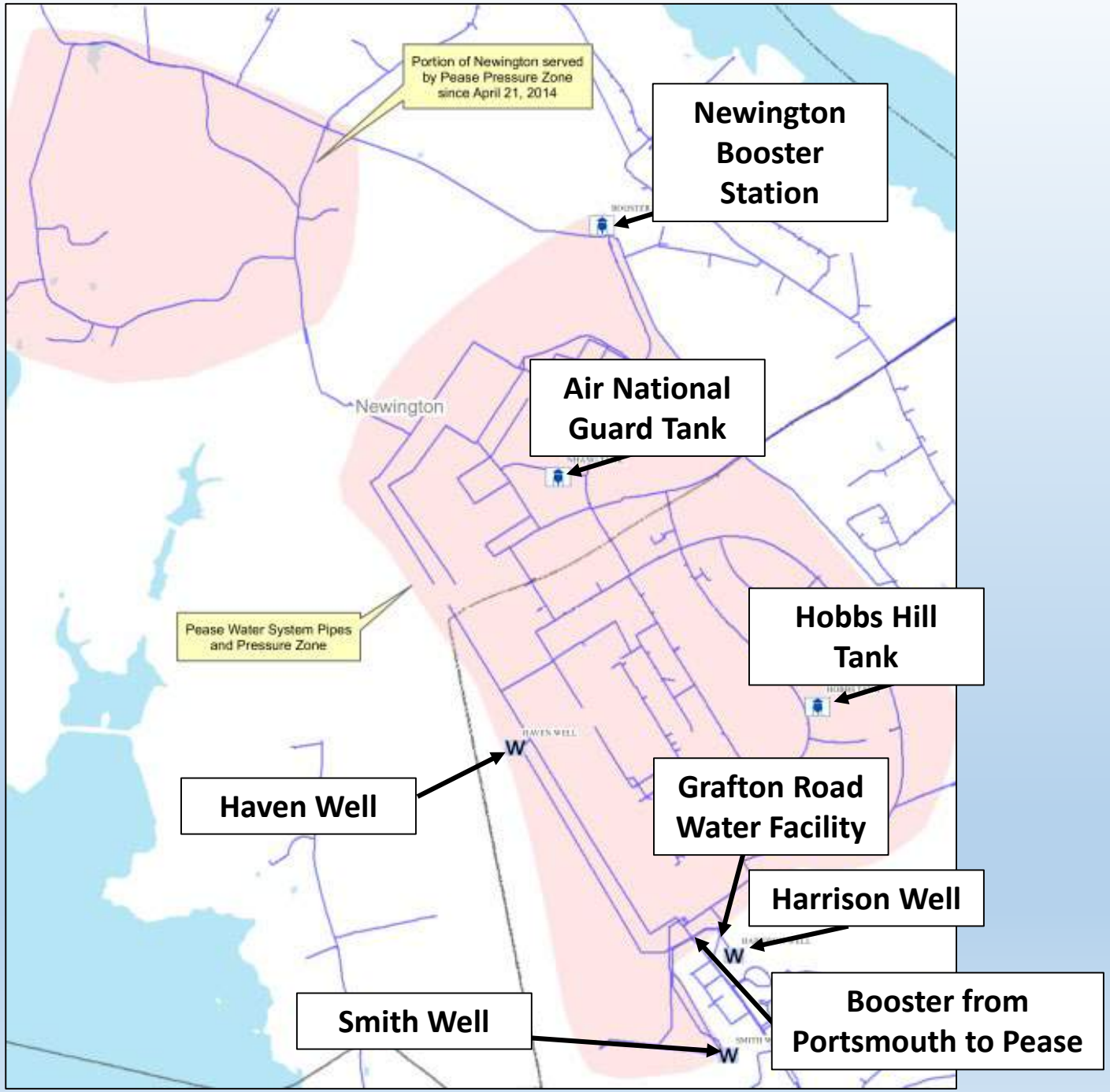
Percent Portsmouth Water Sources
July 2014 to November 2020



Pease International Trade Port Water System

- Built in the 1950's for the Pease Air Force Base
- Turned over to Pease Development Authority (PDA) in the 1990's
- Operated by the City of Portsmouth under agreements with PDA since 1992
- Three groundwater sources:
  - Haven Well (originally developed in 1870 by the City of Portsmouth's water system – currently off-line due to PFC contamination)
  - Smith Well (installed in 1958 as part of Air Base water system)
  - Harrison Well (reactivated in 2007)
- Two Elevated Storage Tanks
  - Hobbs Hill Landing – 600,000 gallons
  - Air National Guard – 400,000 gallons

Pease Tradeport Water System



Smith Well

Installed in 1957

500,000 Gallons per Day

Harrison Well

Installed in 1957

Replaced in 2006

325,000 Gallons per Day

Haven Well –
Out of Service Since May 12, 2014

Installed in 1875 (Haven Springs)

Part of Pease Air Base: 1956 to 1992

PDA/Portsmouth: 1992 to 2014

Currently off-line: Shut down in May 2014 due to PFOS contamination

766,000 Gallons per Day

Pease Grafton Road Water Treatment Facility

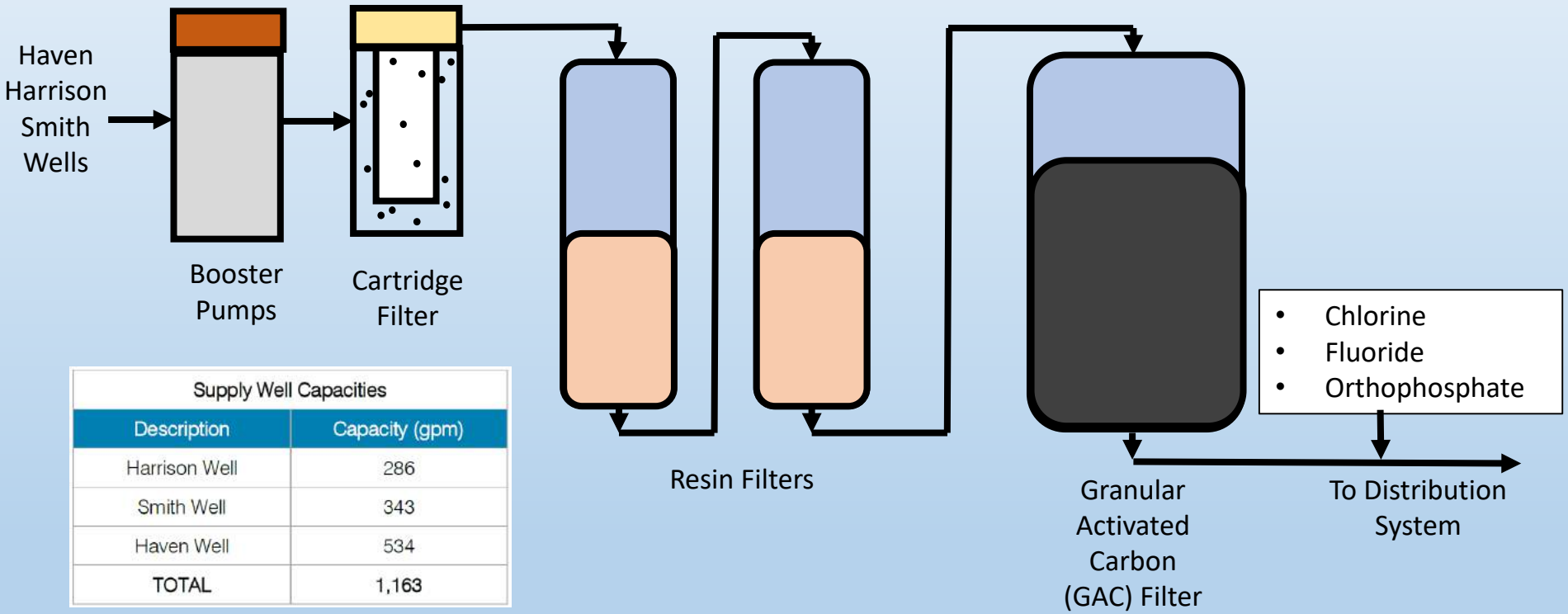
Construction of New Drinking Water Treatment Facility Upgrade – October 2020

Pease Grafton Road Water Treatment Facility

New Granular Activated Carbon (GAC) Filters

IOX Resin Filter Vessels

Grafton Road Water Facility Process Schematic Treatment System



Supply Well Capacities	
Description	Capacity (gpm)
Harrison Well	286
Smith Well	343
Haven Well	534
TOTAL	1,163

System Supply Operations

- Regulated by the Federal Safe Drinking Water Act
- Administered by EPA and NHDES Drinking Water and Groundwater Bureau
- Testing and reporting requirements for all sources of supply
- 24/7 Operations and Oversight

Water Supply Operations Staff

Brian Goetz, Deputy Director of Public Works

Years of Experience: 33

Years with City: 8.5

BS – Technology, Bowling Green State University

MPA – Environmental Policy, Indiana University

Albert Pratt, Water Resource Manager

Years of Experience: 30

Years with City: 5.5

MS – Civil Engineering, University of New Hampshire

BS – Civil Engineering, University of New Hampshire

Water Supply Operations Staff

Mark Young, Chief Operator of WTP

Years of Experience: 25

Years with City: 14.5

NETI – Automotive Technologies

Tim Green, Water Treatment Operations Foreman

Years of Experience: 11

Years with City: 7 Months

A.A. - General Education- Granite State College

Water Supply Operations Staff

Mason Caceres, Water Quality and Resource Protection Specialist

Years of Experience: 1.5

Years with City: 1.5

B.Sc. – Environmental Science – University of New Hampshire

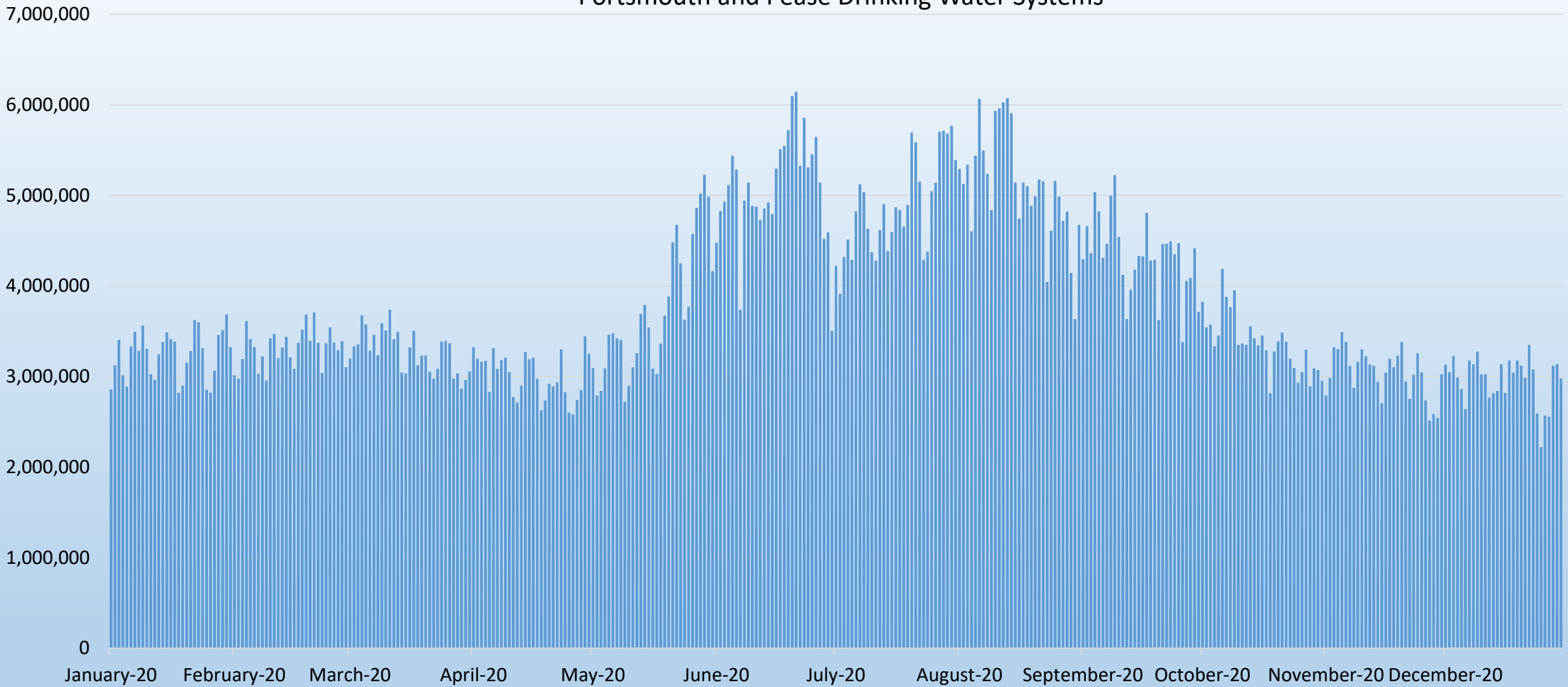
Phoebe Rafferty – Stormwater and Water Quality GIS Specialist

Years of Experience: 4

Years with City: 2

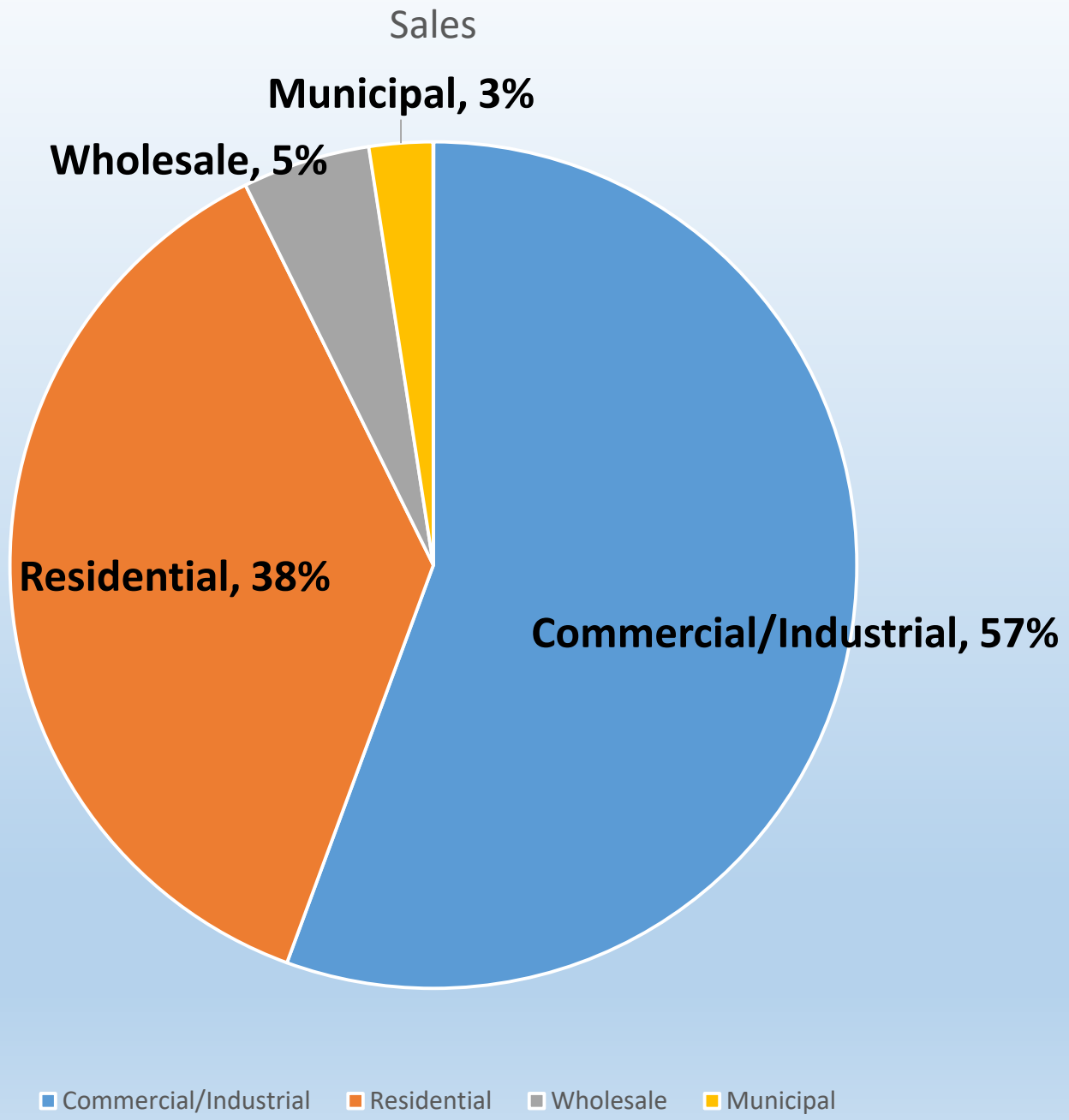
Degrees: Environmental Science, Asian Studies, Biology

2020 Daily Gallons Produced
Portsmouth and Pease Drinking Water Systems



Average Day	3.7 Million Gallons
Maximum Day	6.1 Million Gallons
Minimum Day	2.2 Million Gallons

Customer Water Use:



Portsmouth's Integrated Water Supply Management Strategy:

1. Optimize Surface Water Supply
2. Rest Groundwater Sources for Seasonal and Peak Demands
3. Management and Upgrades of Infrastructure
    1. Asset Management and Capital Improvements
        1. Water main replacements
        2. Water treatment facility upgrades
        3. Well redevelopments
    2. Leak Detection Program
    3. Water Efficiency Program
4. Track Precipitation Trends (12-month rolling average)
5. Public Outreach Through Water Supply Updates

cityofportsmouth.com/publicworks/water/supply-status

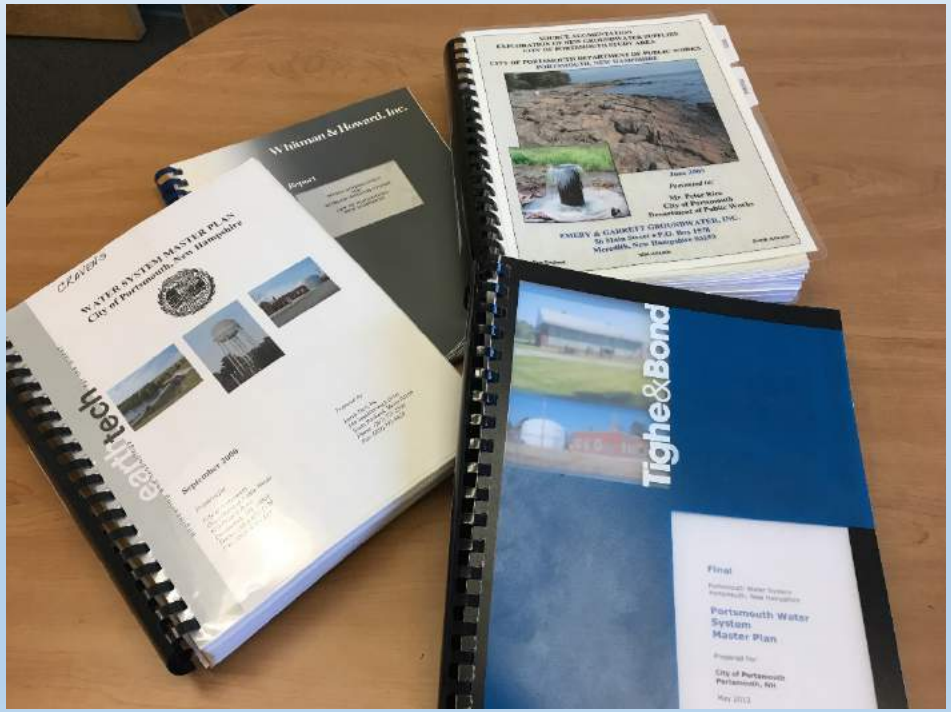
Promoting Water Efficiency In Portsmouth's Water and Wastewater Systems

1. Water Conservation Kits (2006 to 2008)
2. Tiered Water Rates (starting FY07)
3. Rain Barrel Program (2009 to 2011)
4. Automatic Meter Reading Project (2008 to 2010)
5. EPA's WaterSense Program (joined in 2013)
6. Leak Detection Program (ongoing)
7. Water Efficiency Rebate Program (Introduced in 2014)
8. Water Supply Status Report (introduced in 2015)
9. Water Sustainability Award (2015)
10. WaterSense Irrigation Requirements and third tier irrigation rate (adopted in 2016)

Long-Term Planning

Water System Master Plans

- 1979 – Master Plan Study
- 1994 – Distribution System Storage and Pressure Study
- 2000 – Master Plan Study
- 2001 – Surface Water Treatment Study
- 2009 – Groundwater Supply Study
- 2013 – Master Plan Study

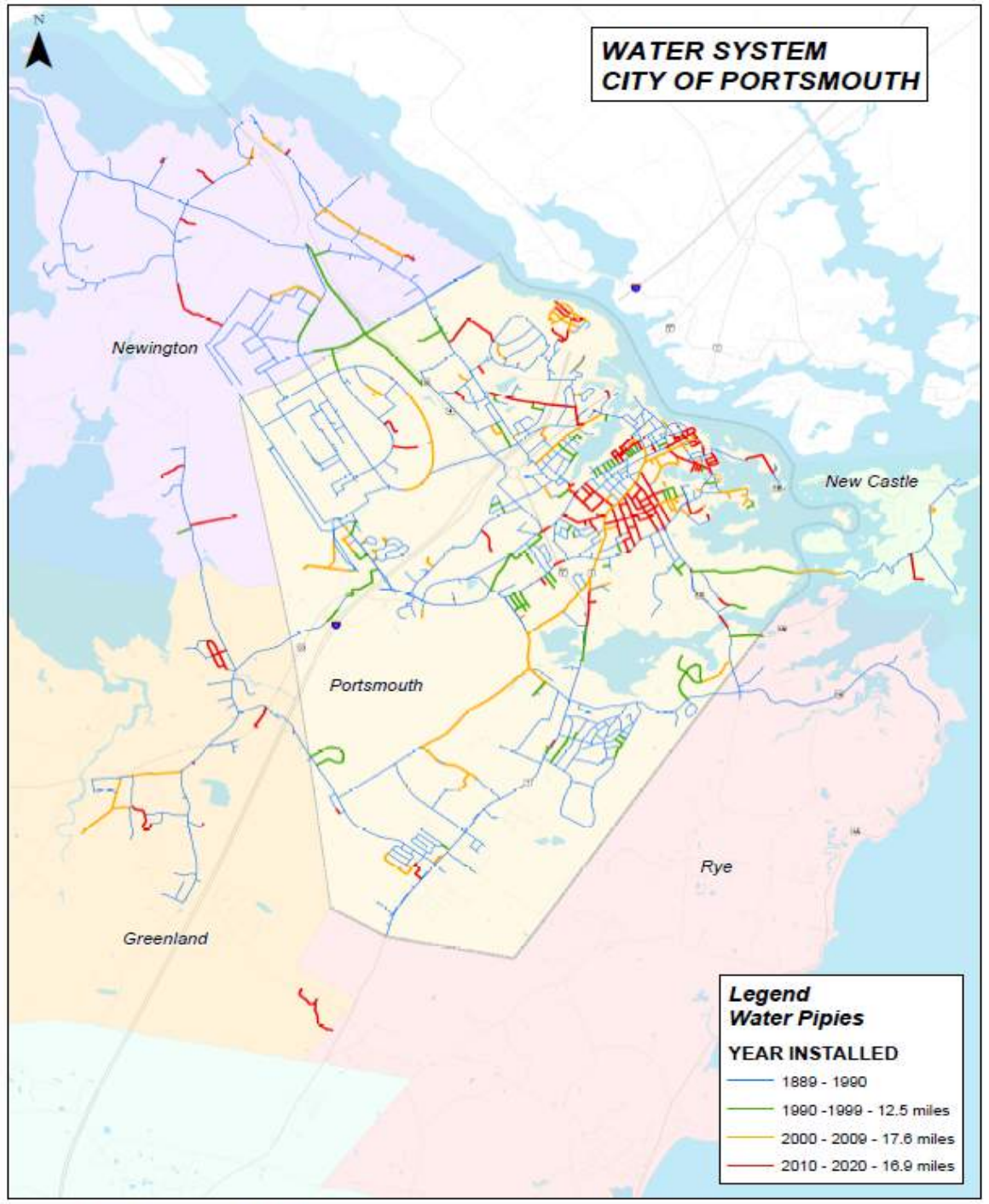


Capital Programs
Addressing Long-Term Supply Needs

- Pease Hobbs Hill Tank Replacement – Complete in 2016
- Greenland Well Upgrade – 2016/2017
- Pease Well Carbon Treatment System – 2016
  - (Air Force Reimbursement)
- Newington Booster Station Upgrade - 2016–2019
- Madbury Well Upgrades and Permitting New Madbury Well #5 – 2016-2021
- Madbury Backwash Tank and Clearwell Upgrade – 2020-2021
- Additional Groundwater Source of Supply Investigations – 2007 to Current
- Little Bay Transmission Main Replacement – 2021-2022

Water Pipe Improvements Since 1990

- **47 Miles of Pipe**
- **Approximately 24% of system**



Updated: January 2021

Source Water Protection

City of PORTSMOUTH New Hampshire

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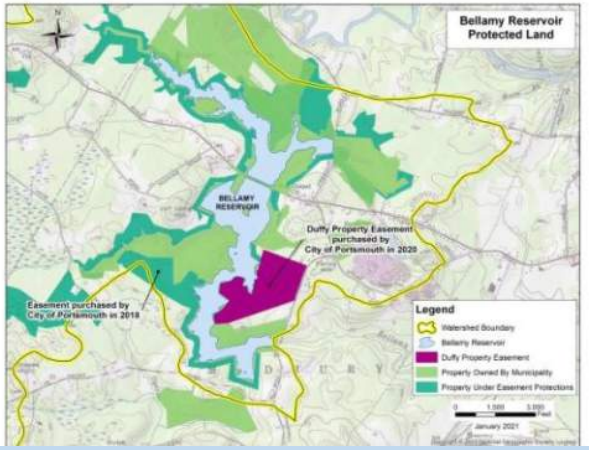
PORTSMOUTH SECURES 107-ACRE CONSERVATION EASEMENT TO PROTECT BELLAMY RESERVOIR WATER SUPPLY

January 12, 2021

Taking another significant step in its effort to protect the City of Portsmouth's surface water supply by conserving lands surrounding the Bellamy Reservoir, the City's Department of Public Works Water Division has partnered with Southeast Land Trust (SELT) to purchase a conservation easement on approximately 107 acres owned by Mary Ellen Duffy, adjacent to the Reservoir. The transaction closed on December 29, 2020.

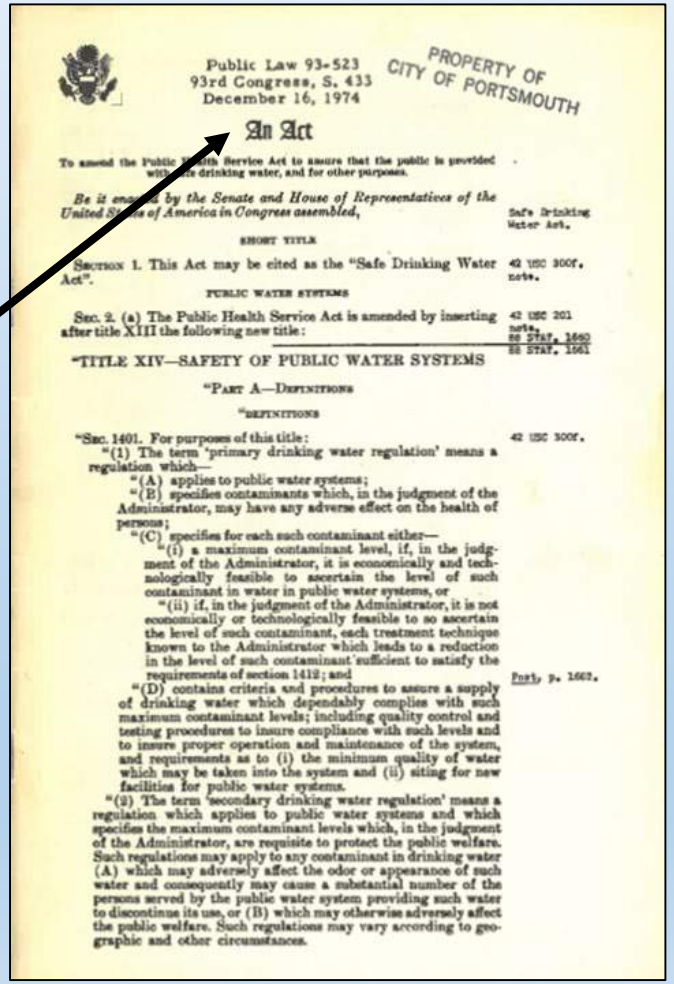
This acquisition complements the conservation easement



Water Quality Analysis and Regulations – Through the Years

Federal Drinking Water Quality Regulations

- 1914 - The first federal drinking water standards were established by the Public Health Service
- 1946 – Revisions to Standards
- 1962 – Revisions to Standards
- 1974 – Safe Drinking Water Act (SDWA)
- 1986 – SDWA Amendments
- 1996 – SDWA Amendments



Public Law 93-523
93rd Congress, S. 433
December 16, 1974

PROPERTY OF CITY OF PORTSMOUTH

An Act

To amend the Public Health Service Act to assure that the public is provided with safe drinking water, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Safe Drinking Water Act.

SHORT TITLE

SECTION 1. This Act may be cited as the "Safe Drinking Water Act". 42 USC 300f, note.

PUBLIC WATER SYSTEMS

SEC. 2. (a) The Public Health Service Act is amended by inserting after title XIII the following new title: 42 USC 201 note. 88 STAT. 1660 88 STAT. 1661

"TITLE XIV—SAFETY OF PUBLIC WATER SYSTEMS

"PART A—DEFINITIONS

"DEFINITIONS

"SEC. 1401. For purposes of this title: 42 USC 300f.

"(1) The term 'primary drinking water regulation' means a regulation which—

"(A) applies to public water systems;

"(B) specifies contaminants which, in the judgment of the Administrator, may have any adverse effect on the health of persons;

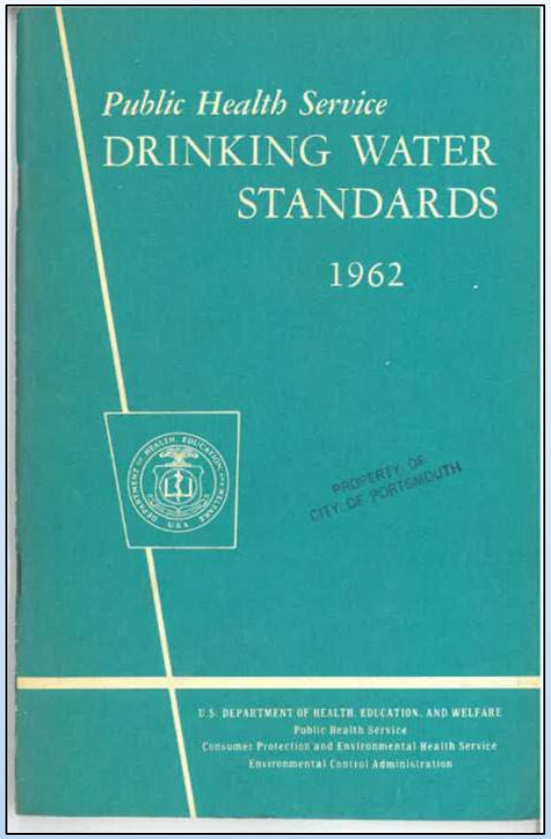
"(C) specifies for each such contaminant either—

"(i) a maximum contaminant level, if, in the judgment of the Administrator, it is economically and technologically feasible to ascertain the level of such contaminant in water in public water systems, or

"(ii) if, in the judgment of the Administrator, it is not economically or technologically feasible to so ascertain the level of such contaminant, each treatment technique known to the Administrator which leads to a reduction in the level of such contaminant sufficient to satisfy the requirements of section 1412; and Post, p. 1662.

"(D) contains criteria and procedures to assure a supply of drinking water which dependably complies with such maximum contaminant levels; including quality control and testing procedures to insure compliance with such levels and to insure proper operation and maintenance of the system, and requirements as to (i) the minimum quality of water which may be taken into the system and (ii) siting for new facilities for public water systems.

"(2) The term 'secondary drinking water regulation' means a regulation which applies to public water systems and which specifies the maximum contaminant levels which, in the judgment of the Administrator, are requisite to protect the public welfare. Such regulations may apply to any contaminant in drinking water (A) which may adversely affect the odor or appearance of such water and consequently may cause a substantial number of the persons served by the public water system providing such water to discontinue its use, or (B) which may otherwise adversely affect the public welfare. Such regulations may vary according to geographic and other circumstances.



5.21 The following chemical substances should not be present in a water supply in excess of the listed concentrations where, in the judgment of the Reporting Agency and the Certifying Authority, other more suitable supplies are or can be made available.

Substance	*Concentration in mg/l*
Alkyl Benzene Sulfonate (ABS)	0.5
Arsenic (As)	0.01
Chloride (Cl)	250.
Copper (Cu)	1.
Carbon Chloroform Extract (CCE)	0.2
Cyanide (CN)	0.01
Fluoride (F)	(See 5.23)
Iron (Fe)	0.3
Manganese (Mn)	0.05
Nitrate [1] (NO_3)	45.
Phenols	0.001
Sulfate (SO_4)	250.
Total Dissolved Solids	500.
Zinc (Zn)	5.

Arsenic (As)	0.05
Barium (Ba)	1.0
Cadmium (Cd)	0.01
Chromium (Hexavalent) (Cr^{+6})	0.05
Cyanide (CN)	0.2
Fluoride (F)	(See 5.23)
Lead (Pb)	0.05
Selenium (Se)	0.01
Silver (Ag)	0.05

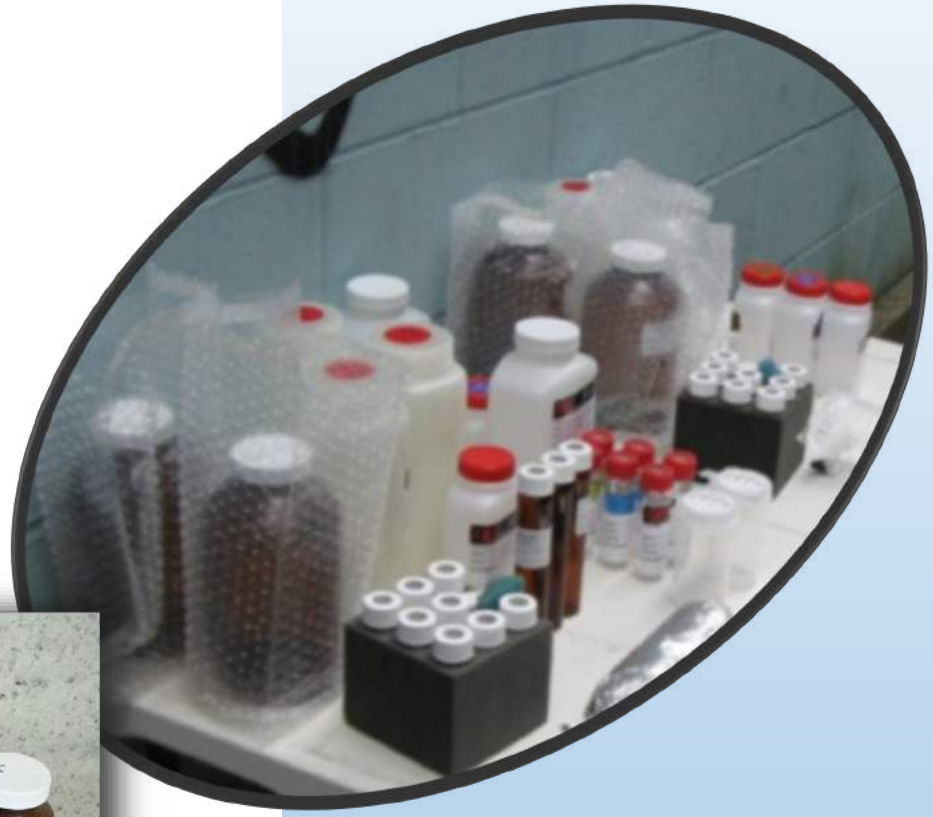
4.2 *Limits.*—Drinking water should contain no impurity which would cause offense to the sense of sight, taste, or smell. Under general use, the following limits should not be exceeded:

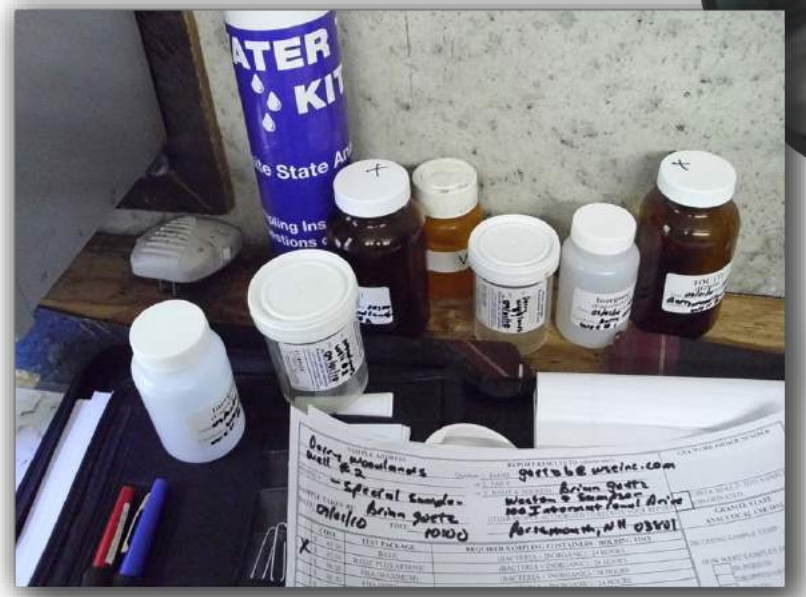
Turbidity	5 units
Color	15 units
Threshold Odor Number	3

1962:
Standards for
23 Compounds

Drinking Water Quality Regulations – Last 25 years:

- EPA Regulations since 1992:
  - Phase II and V rules for VOC, SOC, Inorganics (1991 and 1992)
  - Lead and Copper Rule (1992) – Currently under revision
  - Consumer Confidence Reports (1998)
  - Disinfection By-Product Rule (2002) – Currently under review
  - Arsenic (2001) – lowered standard from 0.50 ppb to 0.10 ppb
  - Groundwater Rule (2006)
  - Radionuclide Rule (pending)
- Emerging Contaminants:
  - MTBE
  - Viruses
  - Pharmaceuticals
  - 1,4 Dioxene
  - PFAS Compounds





Recent Rule Revisions

Arsenic

- EPA Drinking Water Limit (MCL): **10 µg/L** (est. 2001)

Arsenic Standard (NHDES):

- Effective Date: July 1 , 2021
- Enforceable Drinking Water Standard: **5 µg/L**

	Arsenic* (µg/L)
Pending NHDES MCL:	*5*
Madbury WTP	ND <1
Madbury Well 2	ND <1
Madbury Well 3	ND <1
Madbury Well 4	1.5
Portsmouth Well	ND <1
Collins Well	ND <1
Greenland Well	ND <1

*10 year averages

Manganese

- EPA Federal Advisory Limit: **0.3 mg/L** (est. 2004)
- NHDES toxicologist's assessments indicates short-term exposure to elevated levels (0.1 - 0.3 mg/L) is a concern for infants (acute health concerns)

Proposed Manganese Standard (NHDES):

- Effective Date: July 1 , 2022
- Enforceable Drinking Water Standard: **0.3 mg/L**
- Public Notification Requirement: **> 0.1 mg/L**

	Manganese* (mg/L)
Proposed NHDES MCL:	*0.3*
Proposed NHDES Notification:	*0.1*
Madbury WTP	0.011
Madbury Well 2	0.006
Madbury Well 3	0.003
Madbury Well 4	0.037
Portsmouth Well	ND <0.001
Collins Well	0.050
Greenland Well	0.016

*10 year averages

The Purity Paradox

- Treatment standards under the Safe Drinking Water Act are geared solely for the cost-effective protection of public health.
- Yet these stringent and costly standards are used to treat the entire water supply even though only a very small proportion of that water supply is actually used for drinking water.
- A considerable amount of water supply treated to drinking water standards is used to do laundry, flush toilets, irrigate lawns, put out fires, and clean streets.

Portsmouth's Water Quality Monitoring and Compliance

- Reservoir Management

- Process Monitoring
  - Surface Water Treatment Plant
  - Groundwater Well Sources

- Compliance Monitoring

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Water Quality Monitoring and Compliance

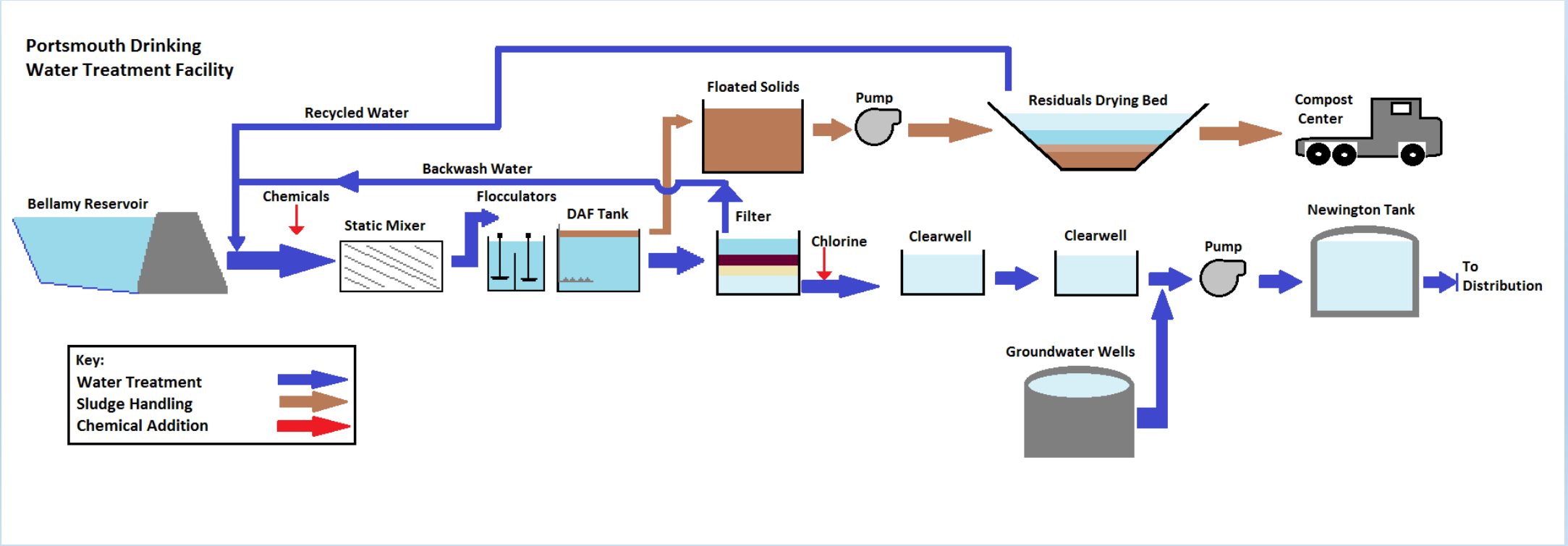
- Reservoir Management

<u>May - October Monitoring During Stratification</u>

- In-Lake & Tributary Sampling
- Dissolved Oxygen & Temperature Profiles
- Iron & Manganese
- Color
- UV 254
- Chlorophyll-a
- Phycocyanin
- Phosphorus
- Flow Rates

Water Quality Monitoring and Compliance

- Process Monitoring
  - Surface Water Treatment Plant
  - Groundwater Well Sources



Water Quality Monitoring and Compliance

- Process Monitoring
  - Surface Water Treatment Plant
  - Groundwater Well Sources

Surface Water Treatment Process Optimization

Continuous Online Monitoring

- pH
- Turbidity
- UV 254
- Streaming Current
- Dissolved Oxygen
- Temperature
- Free Chlorine

Routine Operator Laboratory Tests

- Alkalinity
- Iron
- Manganese
- Aluminum
- Color
- pH
- Turbidity
- UV 254
- Orthophosphate
- Fluoride
- Free Chlorine
- Total Organic Carbon
- Total Coliform
- E. Coli

Water Quality Monitoring and Compliance

- Process Monitoring
  - Surface Water Treatment Plant
  - Groundwater Well Sources

Chemicals Added

Sodium Hypochlorite *(Disinfection)*
Sodium Hydroxide *(Corrosion Control)*
Phosphate *(Corrosion Control)*
Fluoride *(Dental Health)*

Treated Water Continuous Monitoring

Surface Water Treatment Plant

- Turbidity
- Free Chlorine
- Fluoride
- Phosphate
- pH
- Temperature

Groundwater Well Sources

- Free Chlorine
- Fluoride

Water Quality Monitoring and Compliance

- Compliance Monitoring

1. Bacteria (Total Coliform & E. coli)
2. Inorganic Contaminants (IOCs)
3. Volatile Organic Contaminants (VOCs)
4. Synthetic Organic Contaminants (SOCs)
5. Per- and Polyfluoroalkyl Substances (PFAS)
6. Radionuclides
7. Disinfection Byproducts (DBPs)
8. Lead and Copper
9. Unregulated Contaminant Monitoring Rule (UCMR)
10. Long-Term Surface Water Treatment Rules

Portsmouth Water Collects Samples

↓

Accredited Laboratories

↓

Results to NHDES / OneStop Data Portal:
https://www4.des.state.nh.us/DESOnestop/

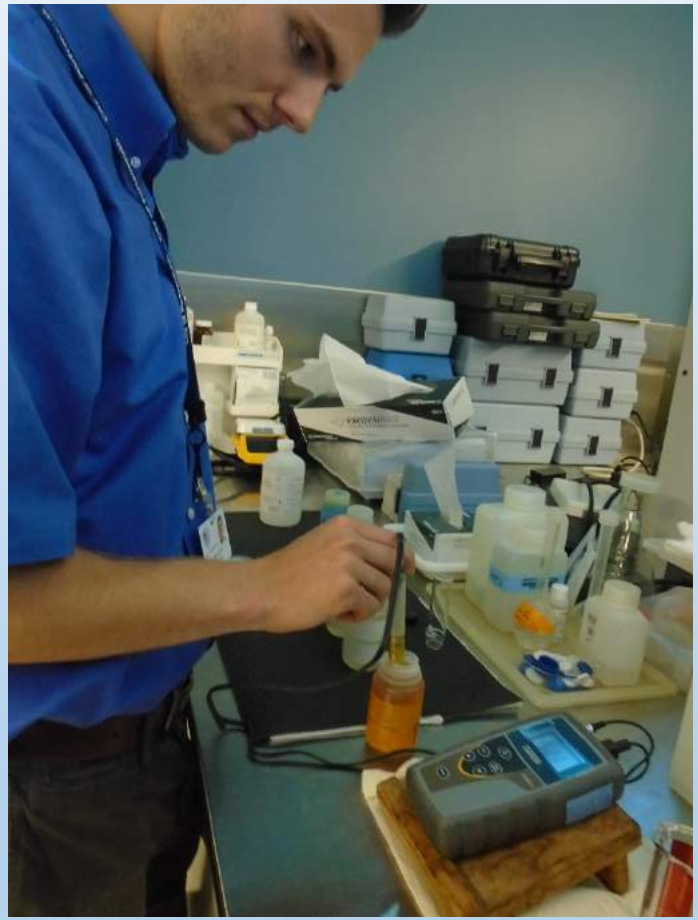
1. Microbiological Monitoring

- Rule: Total Coliform Rule and NHDES Env-Dw 702 & 709
- Sample Locations: 15 Sample Sites throughout Water System
- Frequency: Sampled Twice Per Month

Total Coliform (TC presence/absence test)
- E.coli test if TC is present

Residual Chlorine

Specific Conductivity



2. Inorganic Contaminants (IOCs)

- Rule: EPA Chemical Contaminant Rule and NHDES Env-Dw 704 & 711
- Sample Locations: Supply Sources (WTP Finished Water & Groundwater Supply Wells)
- Frequency: Treated Surface Water: Annually
  Groundwater: Triennially (1x/3 years)

Primary Standard

Antimony
Arsenic
Asbestos
Barium
Beryllium
Cadmium
Chromium
Copper
Cyanide
Fluoride
Lead
Mercury
Nickel
Nitrate
Nitrite
Selenium
Thallium

Secondary Standard

Iron
Sodium
Manganese
Zinc
Chloride
Sulfate

3. Volatile Organic Contaminants (VOCs)

- Rule: EPA Chemical Contaminant Rule and NHDES Env-Dw 705 & 712
- Sample Locations: Supply Sources (WTP Finished Water & Groundwater Supply Wells)
- Frequency: Annually

Regulated VOCs

Benzene	Trans-1,2-Dichloroethylene	Toluene
Carbon tetrachloride	Dichloromethane	1,2,4-trichlorobenzene
Chlorobenzene	1,2-dichloropropane	1,1,1-trichloroethane
o-dichlorobenzene	Ethylbenzene	1,1,2-trichloroethane
p-dichlorobenzene	Methyl tertiary-butyl ether	Trichloroethylene
1,2-dichloroethane	(MTBE)	Vinyl chloride
1,1-dichloroethylene	Styrene	Xylenes
cis-1,2-dichloroethylene	Tetrachloroethylene	

Volatile Organic Contaminants (VOCs)

EPA Method 524.3 Analytes

1,1,1,2-tetrachloroethane
1,1,1-trichloroethane
1,1,2,2-tetrachloroethane
1,1,2-trichloroethane
1,1-dichloroethane
1,1-dichloroethene
1,1-dichloropropene
1,2,3-trichlorobenzene
1,2,3-trichloropropane
1,2,4-trichlorobenzene
1,2,4-trimethylbenzene
1,2-dichlorobenzene
1,2-dichloroethane
1,2-dichloropropane
1,3-dichlorobenzene
1,3-dichloropropane
1,4-dichlorobenzene
2-chlorotoluene
4-chlorotoluene
4-isopropyltoluene
benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
bromomethane
carbon disulfide
carbon tetrachloride
chlorobenzene
chlorodifluoromethane
chloroform
chloromethane
cis-1,2-dichloroethene
cis-1,3-dichloropropene
dibromochloromethane
dibromomethane
dichlorodifluoromethane
diethyl ether
diisopropyl ether (DIPE)
ethyl methacrylate
ethylbenzene
hexachlorobutadiene
hexachloroethane
isopropylbenzene
methyl acetate
methyl iodide
methylene chloride
methyl-t-butyl ether (MtBE)
m-xylene
naphthalene
n-butylbenzene
n-propylbenzene
o-xylene
pentachloroethane
p-xylene
sec-butylbenzene
styrene
t-amyl ethyl ether (TAEE)
t-amyl methyl ether (TAME)
t-butyl alcohol (TBA)

4. Synthetic Organic Contaminants (SOCs)

- Rule: EPA Chemical Contaminant Rule and NHDES Env-Dw 705 & 712
- Sample Locations: Supply Sources (WTP Finished Water & Groundwater Supply Wells)
- Frequency: Annually

Regulated SOCs

Alachlor (Lasso)	Di(ethylhexyl)-adipate	Hexachlorobenzene
Aldicarb (Temik)	Di(ethylhexyl)-phthalate	Hexachlorocyclo-pentadiene
Aldicarb sulfoxide	Dinoseb	Lindane
Alicarb sulfone (aldoxycarb)	Dioxin (2,3,7,8-TCDD)	Methoxychlor
Atrazine	Diquat	Oxamyl
Benzo(a)pyrene (PAH)	Endothall	Polychlorinated biphenyls (PCBs)
Carbofuran	Endrin	Pentachlorophenol
Chlordane	Ethylene dibromide (EDB)	Picloram
2,4-D	Glyphosate	Simazine
Dalapon	Heptachlor	Toxaphene
1,2-dibromo-3-chloropropane (DBCP)	Heptachlor epoxide	2,4,5-TP (Silvex)

5. Per- and Polyfluoroalkyl Substances (PFAS)

- Rule: NHDES Env-Dw 705 & 712
- Sample Locations: Supply Sources (WTP Finished Water & Groundwater Supply Wells)
- Frequency: Quarterly

Regulated MCLs in NH

Perfluorohexane sulfonic acid (PFHxS)

Perfluorononanoic acid (PFNA)

Perfluorooctane sulfonic acid (PFOS)

Perfluorooctanoic acid (PFOA)

Additional Substances Analyzed (Method 533)

- Perfluorobutanoic acid (PFBA)
- Perfluoropentanoic Acid (PFPeA)
- Perfluorohexanoic Acid (PFHxA)
- Perfluoroheptanoic Acid (PFHpA)
- Perfluorodecanoic Acid (PFDA)
- Perfluoroundecanoic Acid (PFUnA)
- Perfluorododecanoic Acid (PFDoA)
- Perfluorobutanesulfonic acid (PFBS)
- Perfluoropentanesulfonic acid (PFPeS)
- Perfluoroheptanesulfonic acid (PFHpS)
- 4:2 Fluorotelomer sulfonic acid
- 6:2 Fluorotelomer sulfonic acid
- 8:2 Fluorotelomer sulfonic acid
- 2,3,3,3-tetrafluoro-2-[heptafluoropropoxy] -propanoic acid (HFPO-DA)
- 4,8-dioxa-3h-perfluorononanoic acid (ADONA)
- 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
- 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid
- Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)
- Perfluoro (2-ethoxyethane) sulfonic acid (PFEESA)
- Perfluoro-4-methoxybutanoic acid (PFMBA)
- Perluoro-3-methoxypropanoic acid (PFMPA)

Per- and Polyfluoroalkyl Substances (PFAS) - New Hampshire Regulated Compounds

Portsmouth Water Supply Sources
Quarter 4 2020 – Annual Rolling Average PFAS

ROLLING AVERAGE 2020 Q4		NH MCL	RAW	MADBURY WTP FINISHED	MADBURY WELL 2	MADBURY WELL 3	MADBURY WELL 4	PORTSMOUTH WELL	COLLINS WELL	GREENLAND WELL
Perfluorohexanesulfonic acid(PFHxS)	ng/L	**18**	ND	ND	ND	ND	ND	**6**	**1**	**1**
Perfluorooctanesulfonic acid (PFOS)	ng/L	**15**	ND	ND	ND	ND	ND	**3**	**2**	**1**
Perfluorooctanoic acid (PFOA)	ng/L	**12**	**1**	**2**	**1**	**2**	**2**	**4**	**3**	**3**
Perfluorononanoic acid (PFNA)	ng/L	**11**	ND	ND	ND	ND	ND	ND	ND	ND

ND = Not-Detected Above Reporting Limit

All Sources of Supply have been sampled periodically for PFAS since May 2014

6. Radionuclides

- Rule: EPA Radionuclides Rule and NHDES Env-Dw 704 & 710
- Sample Locations: Supply Sources (WTP Finished Water & Groundwater Supply Wells)
- Frequency: Gross Alpha and Uranium every 9 years; Radium 226+228 every 6 years.

Regulated Contaminants

- Combined Radium 226 + 228
- Compliance Gross Alpha
- Uranium

	Radium 226/228 (PCI/L)	Compliance Gross Alpha (PCI/L)	Uranium (µg/L)
Drinking Water MCL:	*5*	*15*	*30*
Madbury WTP	2	ND	ND
Madbury Well 2	ND	1	ND
Madbury Well 3	ND	ND	ND
Madbury Well 4	ND	1	ND
Portsmouth Well	ND	1	1.6
Collins Well	ND	1	1.1
Greenland Well	2	ND	ND

7. Disinfection Byproducts (DBP)

- Rule: EPA Stage 1 & Stage 2 Disinfection and Disinfection Byproducts Rule and NHDES Env- Dw 705 & 715
- Sample Locations: Four Locations in Portsmouth Distribution System
- Frequency: Quarterly

Total Trihalomethanes (TTHMs)

Chloroform
Bromodichloromethane
Dibromochloromethane
Bromoform

Haloacetic Acids (HAA5)

Monochloroacetic acid
Dichloroacetic acid
Trichloroacetic acid
Bromoacetic acid
Dibromoacetic acid

7. Disinfection Byproducts (DBP)

- **Total Organic Carbon + Chlorine = DBPs**

Violation: TTHM > 80 ppb in New Castle Water System 2016 - 2018

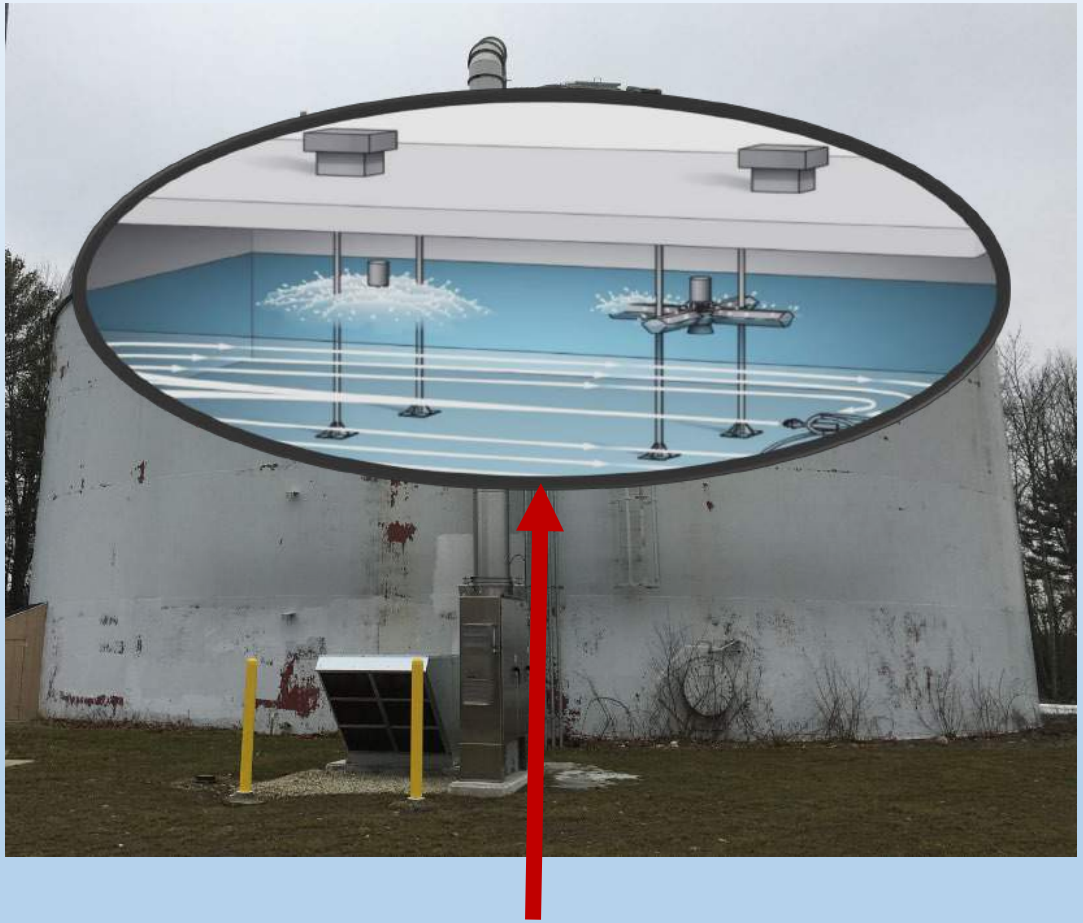
Reasons:

- New Castle is most distant from Madbury WTP and TTHM formation increases over time
- New Castle had old water mains (bio-film organics)

Solutions:

- New Castle replaced water main through town (2020)
- Newington Booster Pumping Station Upgrade (2019)
  - Reroute flow through tank
  - Installed aeration
  - Installed tank mixer
- Madbury Treatment Plant Process Optimization (2018)
  - TOC removal improved from 63% to 70% average (50% required by EPA Rule)

Newington Booster Station Upgrade and Aeration System

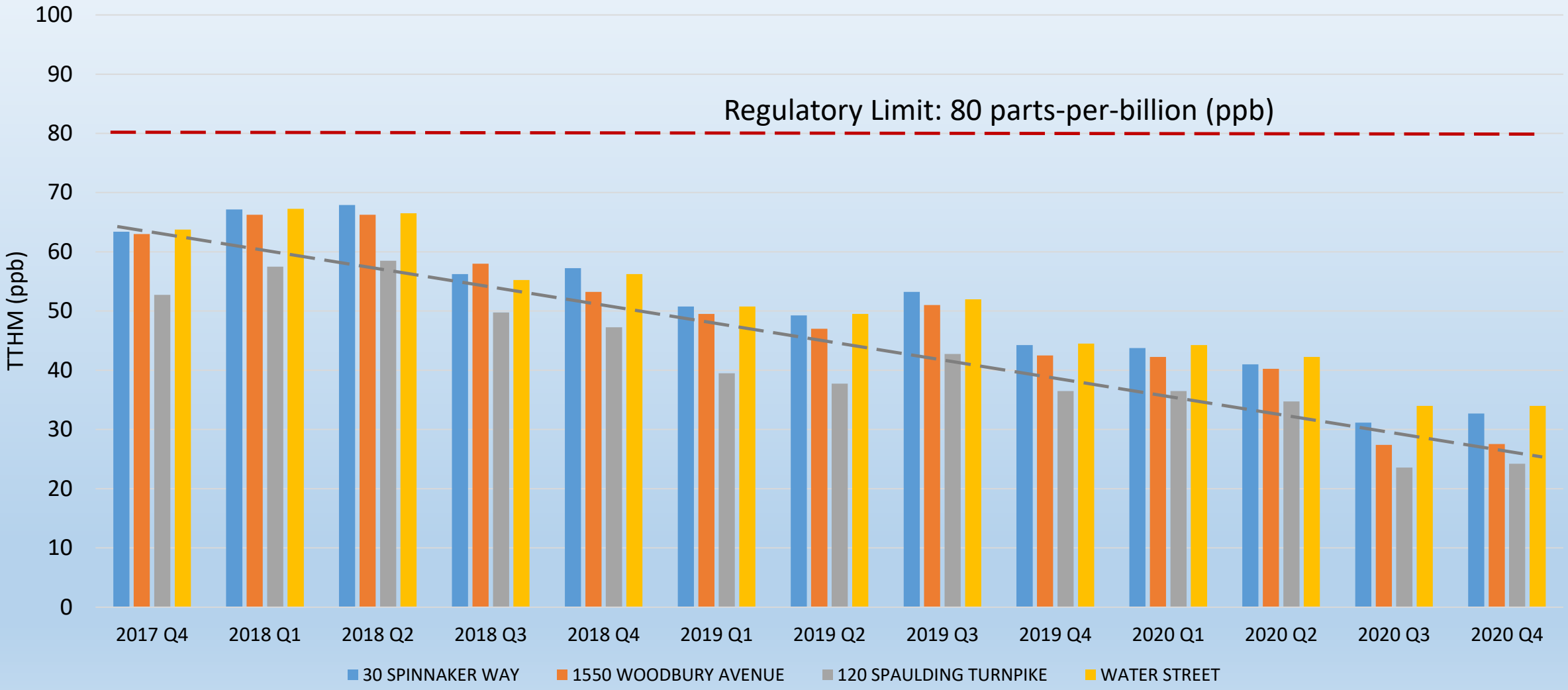


- **Aeration system for Total Trihalomethane (TTHM) Treatment**

- Building Upgrades
- New Booster Pumps and Motor Controls

Total Trihalomethanes (TTHMs)

Portsmouth Water System



8. Lead and Copper

- Rule: EPA Lead and Copper Rule and NHDES Env-Dw 714

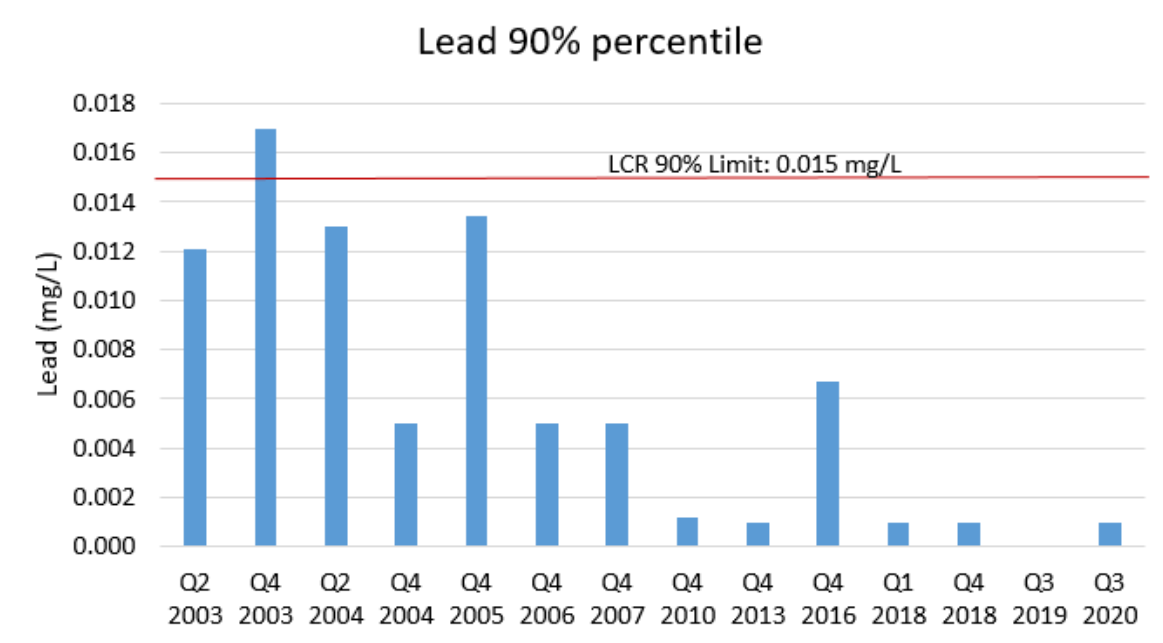
  Note: Revised EPA Lead and Copper Rule Adopted December 2020
- Sample Locations: Currently 122 Sample Sites -Customer Taps Throughout Distribution System
- Frequency: 30 Sites Tested Annually

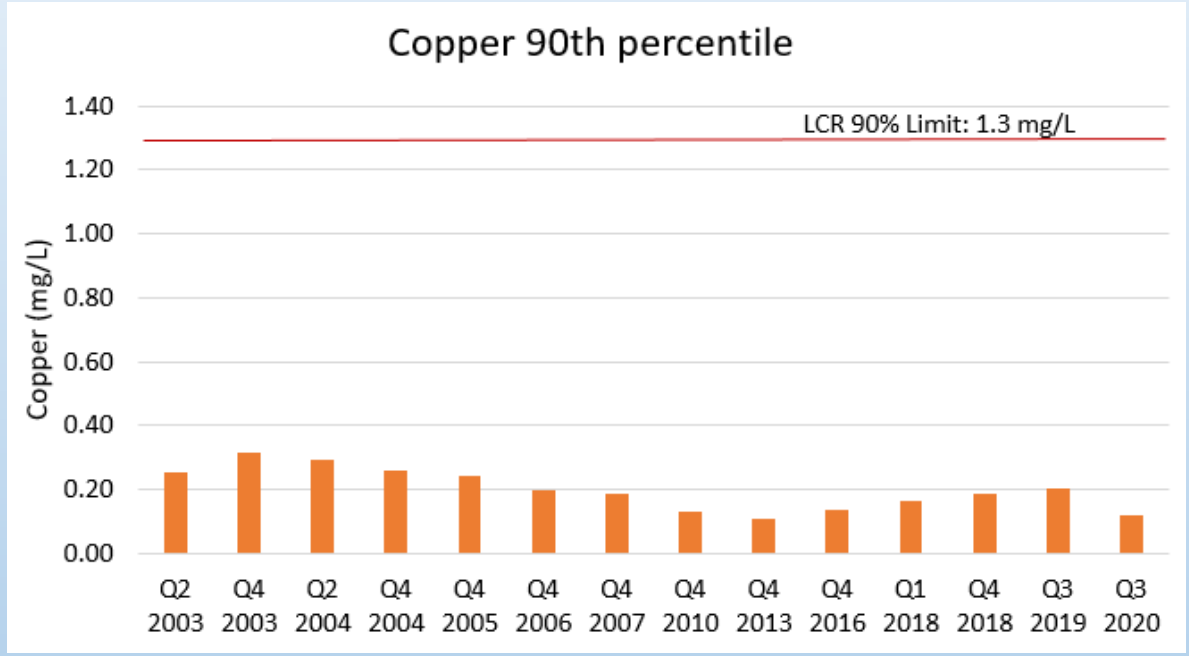
Corrosion Control Monitoring

- Sample Locations: Seven Distribution System Sites and Eight Source Sites
- Frequency: Quarterly
- Parameters:
  - Conductivity
  - pH
  - Alkalinity
  - Hardness
  - Orthophosphate
  - Chloride
  - Free Chlorine
  - Iron
  - Manganese

Lead and Copper

Portsmouth Water System





9. Unregulated Contaminant Monitoring Rule

- Rule: EPA Unregulated Contaminant Monitoring Rule (UCMR)
- Sample Locations: Supply Sources
- Frequency: Every 5 years

UCMR 1 (2001 – 2003)

2,4-dinitrotoluene
2,6-dinitrotoluene
Acetochlor
DCPA mono-acid degradate
DCPA di-acid degradate
4,4'-DDE
EPTC
Molinate
MTBE
Nitrobenzene
Perchlorate
Terbacil

UCMR 2 (2007 – 2011)

Dimethoate
Terbufos sulfone
2,2',4,4'-tetrabromodiphenyl ether (BDE-47)
2,2',4,4',5-pentabromodiphenyl ether (BDE-99)
2,2',4,4',5,5'-hexabromobiphenyl (HBB)
2,2',4,4',5,5'-hexabromodiphenyl ether (BDE-153)
2,2',4,4',6-pentabromodiphenyl ether (BDE-100)
1,3-dinitrobenzene
2,4,6-trinitrotoluene (TNT)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)

Unregulated Contaminant Monitoring Rule

- Rule: EPA Unregulated Contaminant Monitoring Rule
- Sample Locations: Supply Sources and Distribution System

UCMR 3 (2012 – 2016)

1,2,3-trichloropropane	**Strontium**
1,3-butadiene	**Chromium**
Chloromethane (methyl chloride)	**Chromium-6**
1,1-dichloroethane	**Chlorate**
Bromomethane (methyl bromide)	Perfluorooctanesulfonic acid (PFOS)
Chlorodifluoromethane (HCFC-22)	Perfluorooctanoic acid (PFOA)
Bromochloromethane (halon 1011)	Perfluorononanoic acid (PFNA)
1,4-dioxane	Perfluorohexanesulfonic acid (PFHxS)
Vanadium	Perfluoroheptanoic acid (PFHpA)
Molybdenum	Perfluorobutanesulfonic acid (PFBS)
Cobalt	

UCMR 3 Results

	Strontium *µg/L*	**Chromium** *µg/L*	**Chromium 6** *µg/L*	**Chlorate** *µg/L*
Madbury Sources	46	0.18	0.02	63
Portsmouth Well	380	0.64	0.46	88
Collins Well	255	0.38	0.17	140
Greenland Well	163	0.52	0.38	< 20

Values are average concentrations in samples collected between July 2014 and April 2015

Unregulated Contaminant Monitoring Rule

- Rule: EPA Unregulated Contaminant Monitoring Rule
- Sample Locations: Supply Sources and Distribution System

UCMR 4 (2017 – 2021)

total microcystin	ethoprop
microcystin-LA	oxyfluorfen
microcystin-LF	profenofos
microcystin-LR	tebuconazole
microcystin-LY	total permethrin (cis- & trans-)
microcystin-RR	tribufos
microcystin-YR	**HAA5**
nodularin	**HAA6Br**
anatoxin-a	**HAA9**
cylindrospermopsin	1-butanol
germanium	2-methoxyethanol
manganese	2-propen-1-ol
alpha-hexachlorocyclohexane	butylated hydroxyanisole
chlorpyrifos	o-toluidine
dimethipin	quinolone

UCMR 4 Results

Sample Site	**HAA5** *µg/L*	**HAA6Br** *µg/L*	**HAA9** *µg/L*
120 Spaulding Turnpike	21	3	24
1550 Woodbury Plaza	34	6	40
30 Spinnaker Way	37	6	43
Water Street	37	6	43

	Manganese *mg/L*
Madbury Sources	0.061
Portsmouth Well	0.003
Collins Well	0.021
Greenland Well	0.003

Unregulated Contaminant Monitoring Rule

- Rule: EPA Unregulated Contaminant Monitoring Rule
- Sample Locations: Supply Sources
- Frequency: Every 5 years

UCMR 5 (2022 – 2026)

- 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)
- 9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)
- 4,8-dioxa-3H-perfluorononanoic acid (ADONA)
- hexafluoropropylene oxide dimer acid (HFPO-DA)
- nonafluoro-3,6-dioxaheptanoic acid (NFDHA)
- perfluorobutanoic acid (PFBA)
- perfluorobutanesulfonic acid (PFBS)
- 1H,1H, 2H, 2H-perfluorodecane sulfonic acid (8:2FTS)
- perfluorodecanoic acid (PFDA)
- perfluorododecanoic acid (PFDoA)
- perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)
- perfluoroheptanesulfonic acid (PFHpS)
- perfluoroheptanoic acid (PFHpA)
- 1H,1H, 2H, 2H-perfluorohexane sulfonic acid (4:2FTS)
- perfluorohexanesulfonic acid (PFHxS)
- perfluorohexanoic acid (PFHxA)
- perfluoro-3-methoxypropanoic acid (PFMPA)
- perfluoro-4-methoxybutanoic acid (PFMBA)
- perfluorononanoic acid (PFNA)
- 1H,1H, 2H, 2H-perfluorooctane sulfonic acid (6:2FTS)
- perfluorooctanesulfonic acid (PFOS)
- perfluorooctanoic acid (PFOA)
- perfluoropentanoic acid (PFPeA)
- perfluoropentanesulfonic acid (PFPeS)
- Perfluoroundecanoic acid (PFUnA)
- N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)
- N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)
- perfluorotetradecanoic acid (PFTA)
- perfluorotridecanoic acid (PFTrDA)
- Lithium

10. Long Term Surface Water Treatment Rules

- 1989 – Surface Water Treatment Rule
- 1998 – Interim Enhanced Surface Water Treatment Rule
- 2001 – Filter Backwash Recycling Rule
- 2002 – Long Term 1 Enhanced Surface Water Treatment Rule
- 2006 – Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)

LT2ESWTR

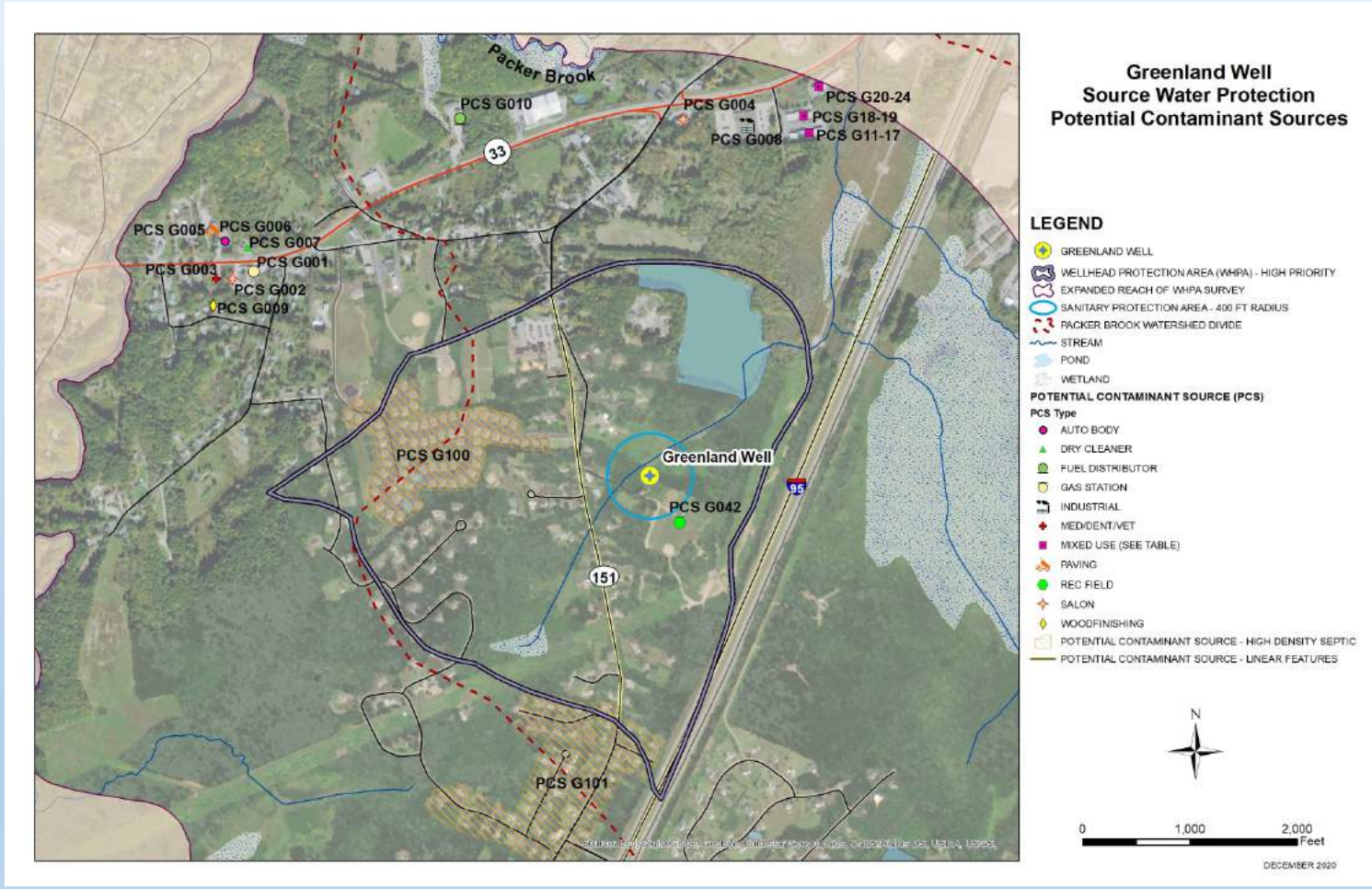
- Sample Locations: Surface Water Supply Source (Bellamy Reservoir)
- Test Duration: Two year monthly testing for Cryptosporidium (2016-2018)
- Purpose: Determine if additional treatment is required to protect public from risk of exposure to Cryptosporidium.
- Results: No Cryptosporidium were detected in source water (untreated)

Recent Contaminants of Concern for Public Drinking Water and Portsmouth Water Division's Assessment of Concerns Related to Our Supplies

		Portsmouth Water's Concerns		
Contaminant	**Source**	**Low**	**Medium**	**High**
PFAS	Fire Fighting Foam, Consumer Products			X
Lead	Old plumbing with lead content in pipes/fixtures		X	
Chloride	Roadway winter salting		X	
Phosphorus	Fertilizers, septic systems		X	
Cyanobacteria/algae	Warming waters		X	
Legionella	Large building plumbing		X	
TTHMs	Disinfection Byproducts		X	
HAA5s	Disinfection Byproducts		X	
1, 4 Dioxane	Consumer Products	X		
Arsenic	Naturally occurring in bedrock	X		
Fluoride	Added to Portsmouth water	X		
Manganese	Naturally occurring	X		

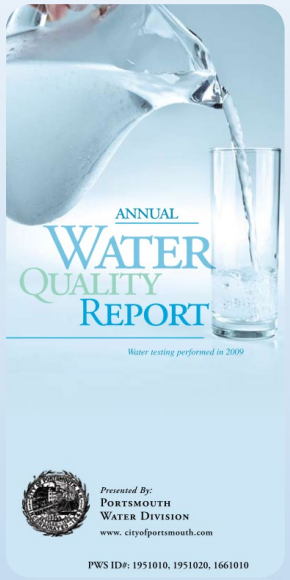
Potential Contaminant Sources

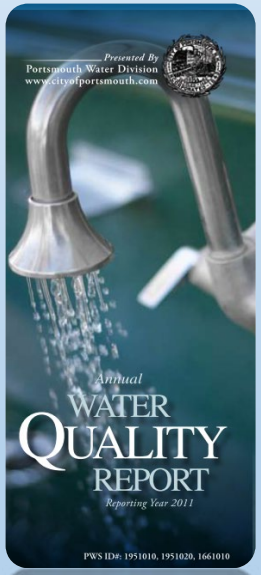
- Known PFAS sites:
  - Former Pease Air Base
- Landfills
  - Tolend, Coakley
- Septic Systems (Unsewered Areas)
- Agricultural / Recreation Fields
- Roads (Salt & Accidents)
- Vehicle Washing Facilities
- Categorical Industrial Facilities
- Hazardous Waste Facilities (RCRA)
- Gas Stations
- Fuel Storage Facilities
- Dry Cleaners
- Vehicle Repair/Detailing/Body Shops
- Medical / Dental / Veterinary Facilities
- Salons

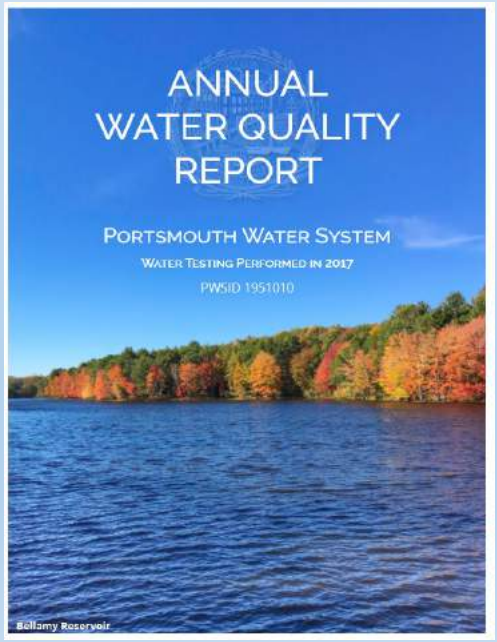


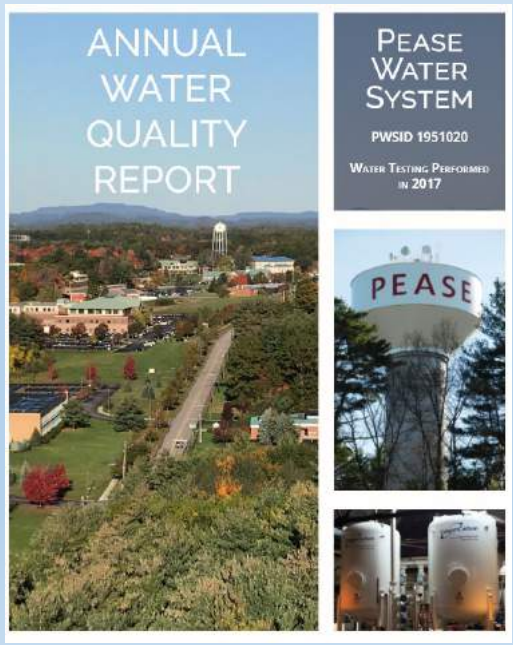
Annual Water Quality Reporting

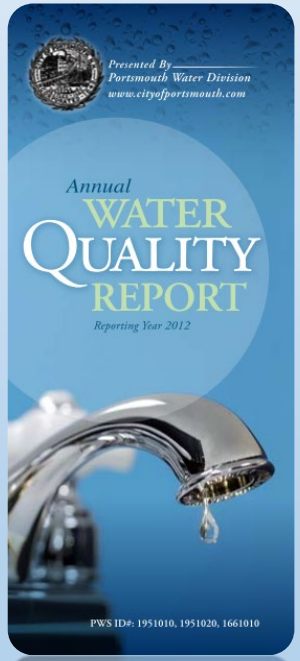
- Provided annually to all customers of the Portsmouth and Pease water systems through the Portsmouth Water Division's Annual Water Quality Report

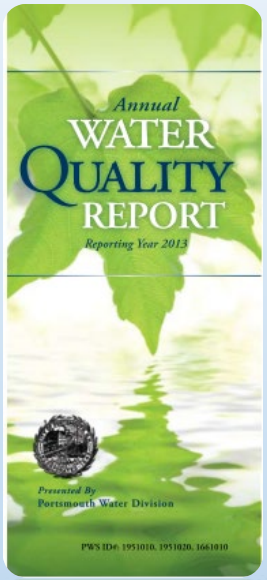




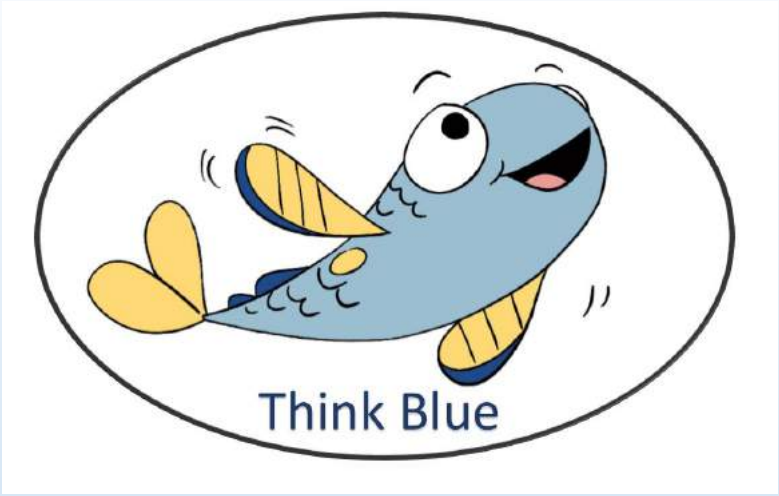








Outreach




City of Portsmouth

Water Quality in Commercial Buildings

Public water systems are responsible for the delivery of water to customers' private water lines or facilities. However, once that water enters a private facility, it is the owner's responsibility to assure that water quality is maintained throughout their pipes and plumbing. It is important that you and your facility managers are aware of all of your internal plumbing in order to assess whether not conditions exist that may degrade water quality.

The City of Portsmouth's public drinking water system se over 8,500 regional water customers in the New Hamp Seacoast. Water operations staff take great measures to e that the drinking water delivered is of ample quantity that all current drinking water regulatory standards. Water information is summarized annually in our water quality sent to all customers and posted on the City's websit system maintenance includes twice-a-year flushing of fire to clear any buildup or debris in the water lines. The P Health Department provides Environmental Health s the protection of Portsmouth residents and visitors. T Inspection Department is responsible for the review a of building, electrical, plumbing and mechanica specifications.

Degraded water quality, including bacteria like Legio in plumbing that is not properly maintained. Lead when water comes in contact with pipes and plum contain lead. Lead sources and lead levels vary b so it is important to identify and remove any le building. Bacteria can grow in warm, stagn shower heads, dead-end water lines and othe flushed and maintained may cause this growt cooling towers must also be properly main A good management resource for plumbin found at: https://www.cdc.gov/legionella/w

Make sure that your plumbing is up to cod has adopted the 2009 International Amendments. If your facility has whirlpo should take additional measures to en maintained and operated.


City of PORTSMOUTH NH | DEPARTMENT OF PUBLIC WORKS

WATER

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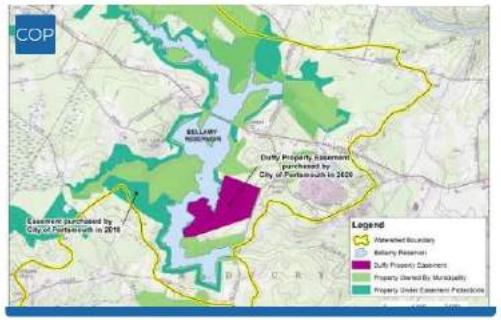
Water Operations

WATER NEWS



WATER SUPPLY STATUS REPORT 2020 YEAR IN REVIEW

January 26, 2021

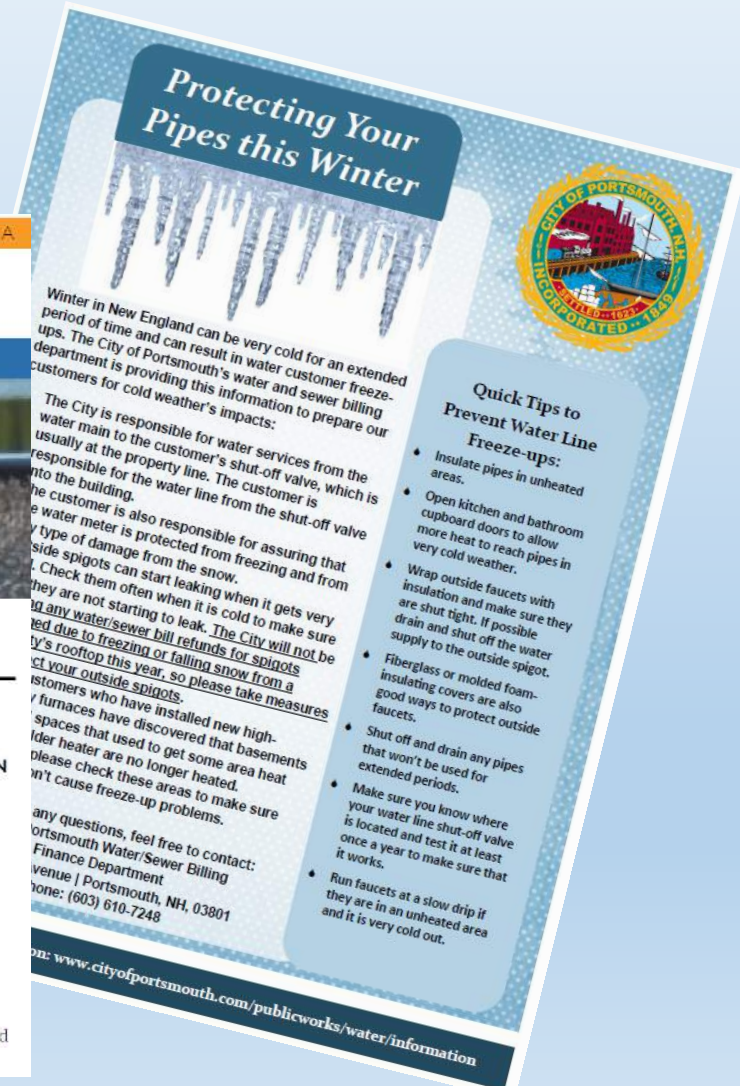
Portsmouth & Pease International Tradeport Water Supply Status Report 2020 Year in...

Read More ›

LEAD & COPPER CORROSION CONTROL PROGRAM UPDATE

October 19, 2020

PROTECT YOUR TAP: 10-minute lead test The U.S. EPA and NHDES created the Protect Your Tap: 10-minute lead t...


Protecting Your Pipes this Winter

Winter in New England can be very cold for an extended period of time and can result in water customer freeze-ups. The City of Portsmouth's water and sewer billing department is providing this information to prepare our customers for cold weather's impacts:

The City is responsible for water services from the water main to the customer's shut-off valve, which is usually at the property line. The customer is responsible for the water line from the shut-off valve into the building.

The customer is also responsible for assuring that the water meter is protected from freezing and from any type of damage from the snow.

Side spigots can start leaking when it gets very cold. Check them often when it is cold to make sure they are not starting to leak. The City will not be ing any water/sewer bill refunds for spigots ed due to freezing or falling snow from a ty's rooftop this year, so please take measures ct your outside spigots.

stomers who have installed new high-furnaces have discovered that basements spaces that used to get some area heat lder heater are no longer heated. please check these areas to make sure n't cause freeze-up problems.

any questions, feel free to contact: ortsmouth Water/Sewer Billing Finance Department venue | Portsmouth, NH, 03801 hone: (603) 610-7248

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.
- Wrap outside faucets with insulation and make sure they are shut tight. If possible drain and shut off the water supply to the outside spigot.
- Fiberglass or molded foam-insulating covers are also good ways to protect outside faucets.
- Shut off and drain any pipes that won't be used for extended periods.
- Make sure you know where your water line shut-off valve is located and test it at least once a year to make sure that it works.
- Run faucets at a slow drip if they are in an unheated area and it is very cold out.

on: www.cityofportsmouth.com/publicworks/water/information

PFAS Outreach

City of
Portsmouth
Department of Public Works

November 10, 2020

PEASE TRADEPORT WATER SUPPLY UPDATE

Construction of New Drinking Water Treatment Facility Upgrade – October 2020

Construction of the final treatment system, which includes both resin and activated carbon filtration systems, began in April 2019. Recent work includes the installation of new Activated Carbon (GAC) vessels and delivery of the IOX Resin Filter vessels. Work installing new piping, pumps and controls is underway.

New Granular Activated Carbon (GAC) Filters

IOX Resin Filter Vessels

City of
Portsmouth
Department of Public Works

November 30, 2020

PORTSTMOUH WATER PFAS UPDATE

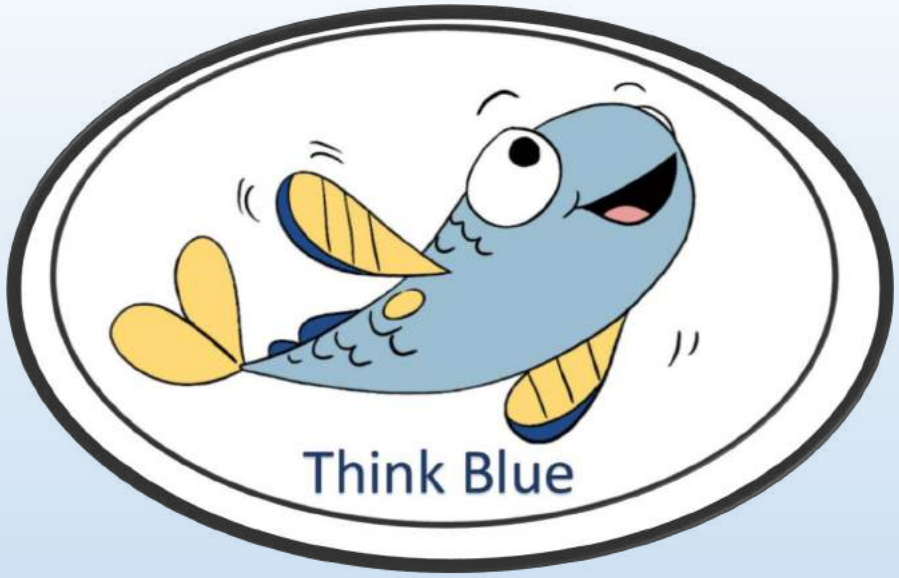
The City of Portsmouth's water system is testing for PFAS in all of our sources of supply quarterly in accordance with the NH drinking water quality rule for PFAS which was recently signed into law. This regulates drinking water testing, Maximum Contaminant Levels (MCLs), and compliance for four PFAS compounds: PFOA, PFOS, PFHxS and PFNA.

The following table provides a summary of the most recent Portsmouth water system testing results performed October 30, 2020.

Additional results from samples collected since 2014 are accessible on
https://www.cityofportsmouth.com/publicworks/water/portsmouth-water-system-pfas-update

Currently all of Portsmouth Water's sources are in compliance with the New Hampshire MCLs.
PFAS Results from October 30, 2020 Samples (533 – EPA Approved Method)

Sample Point	PFHxS	PFNA	PFOS	PFOA
NH MCL in Parts per Trillion (PPT)	**18**	**11**	**15**	**12**
Madbury Water Treatment	0.4	0.5	1.1	2.6
Madbury Well 2	0.7	ND	1.4	2.3
Madbury Well 3	0.9	ND	1.4	2.7
Madbury Well 4	0.6	ND	1.2	3.6
Collins Well	2.7	ND	4.2	3.2
Greenland Well	2.5	ND	4.4	3.8
Portsmouth Well	8.0	0.6	4.8	5.1



Thank You