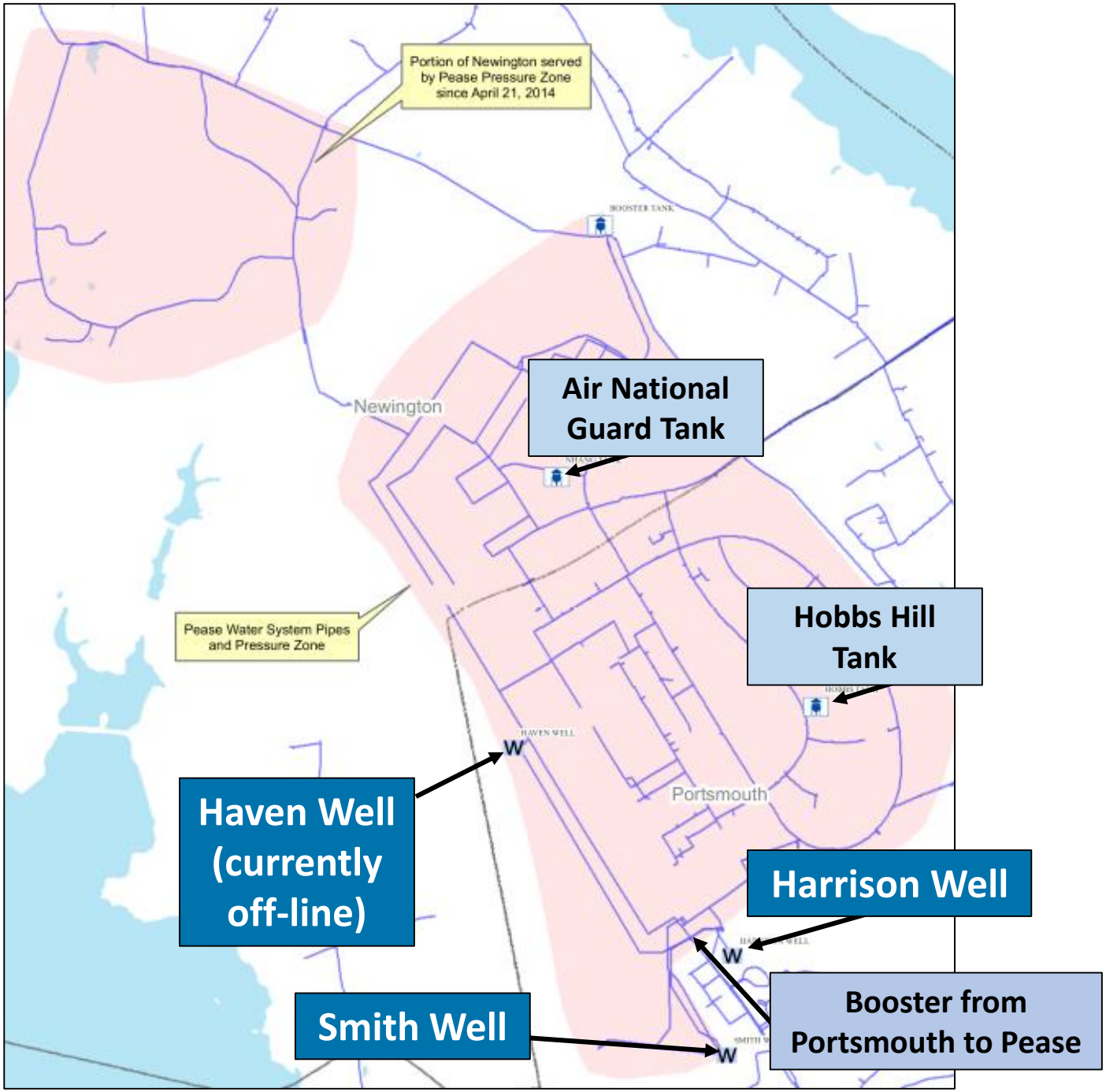
Pease Tradeport Water System: Drinking Water Treatment System Update

City of Portsmouth

Pease RAB
July 26, 2017

Pease Tradeport Water System

- 3 Wells
- 2 Storage Tanks
- Booster from Portsmouth to Pease
- 30 Miles of water main
- 0.4 to 1.0 Million Gallons per Day Usage



Well Treatment – Progress

- **Preliminary Design** – Complete (Feb. 2016)
- **Piloting** – Complete (Sept. 2016)
  - Pilot Report on City Website
- **Demonstration filters for Harrison and Smith Wells** – Current (Online Sept. 2016)
- **Additional preliminary design and assessment of other municipal treatment systems** – Completed June 2017
- **ECT_2 performing a pilot study on resins** – Currently ongoing
- **Final Treatment System Design –** Anticipate August 2017 start (8 month process)

Air Force Agreements to Address the Loss of the Haven Well

- September 2014
  - Hydrogeologic study for replacement well
  - Technical support assistance reimbursement
- November 2015
  - Preliminary Treatment Assessment
- April 2016
  - Treatment Pilot and Demonstration Project – Pilot Complete and Filters were installed Sept 2016
- February 2017
  - Additional Treatment Design Evaluation – “Pease Water Treatment Cost Alternative Report – June 2017”
- July 2017
  - Final Treatment System Design Scope of Work Agreement with Air Force (pending)

Harrison/Smith Well Filters

Pease Tradeport Water System Activated Carbon Treatment Demonstration Project Sampling: June 14, 2017 Results

Source Water: Harrison and Smith Wells

Well	PFOS	PFOA
Combined Influent	0.0190	ND

Filter #1

Filter #1 Effluent

PFOS	PFOA
ND	ND

Filter #2

Water To Distribution System

PFOS	PFOA
ND	ND

Notes: All samples in parts-per-billion (ppb)
ND = Non Detect
All samples collected by Weston & Sampson and analyzed by Maxxam Laboratory

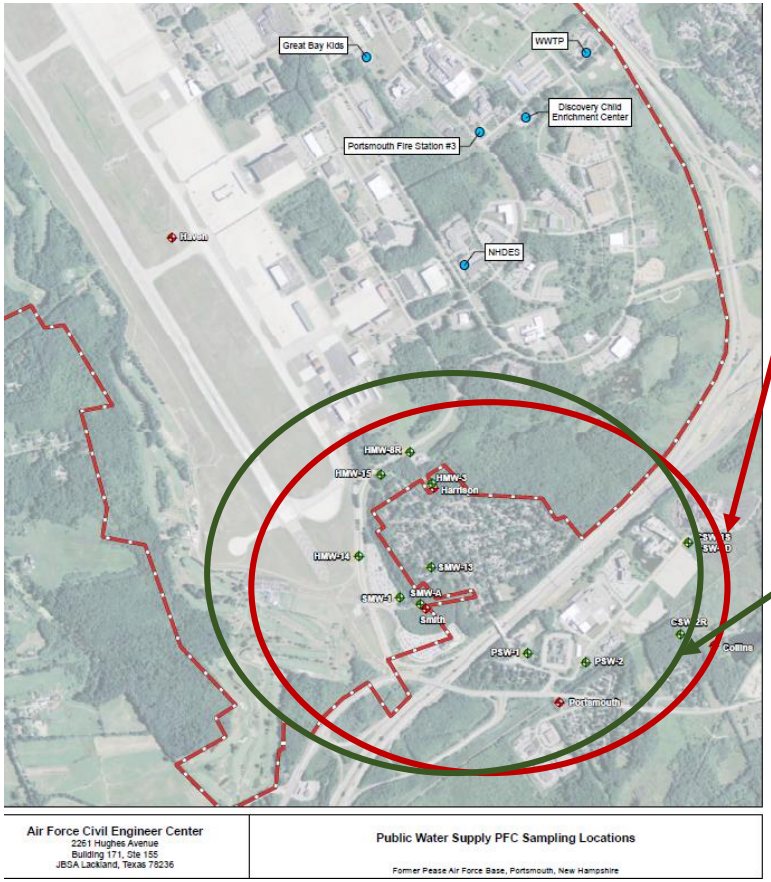
Sample Results – Uploaded to City Website (Testing includes Raw/Well Water Going into Filters)

Table 1
Summary of PFC Analytical Results
Demonstration Project
Former Pease Air Force Base, New Hampshire

Sample Location	Sample ID	Collection Date	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Methyl Perfluorooctane Sulfonamide (MEFOSA)	N-Methyl Perfluorooctane Sulfonamidoethanol (MEFOSE)	Perfluorobutanesulfonic acid (PFBS)	Perfluorobutanoic acid (PFBA)	Perfluorodecane sulfonate (PFDS)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptane sulfonate (PFHpS)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorooctane sulfonamide (PFOSA)	Perfluorooctanesulfonic acid (PFOS)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)	PFOS+PFOA
Combined Raw	RAW	14-Jun-17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0230	0.0063 J	0.0055 J	ND	ND	0.0190 J	0.0068 J	ND	ND	ND	ND
Filter 1 - 25%	PV1-25	14-Jun-17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0052 J	ND	ND	ND	ND
Filter 1 Effluent	PV1-100	14-Jun-17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Filter 2 Effluent	PV2-100	14-Jun-17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

- 21 Rounds of Sampling
- Over 100 million gallons of Harrison/Smith Well Water Filtered to date
- Currently Sampling Raw Water Influent
- June 14, 2017 showed one detection (“J” Flagged as an estimate) of PFPeA at 25% of the first vessel
- Non detections of all PFAS going through second filter

PFAS Monitoring Locations – Air Force Consultant



Production Well Monitoring –
New Schedule with Filters on line:

- Smith – monthly
- Harrison – monthly
- Portsmouth – monthly
- Collins - monthly

Sentry Wells

- 11 Wells - Quarterly

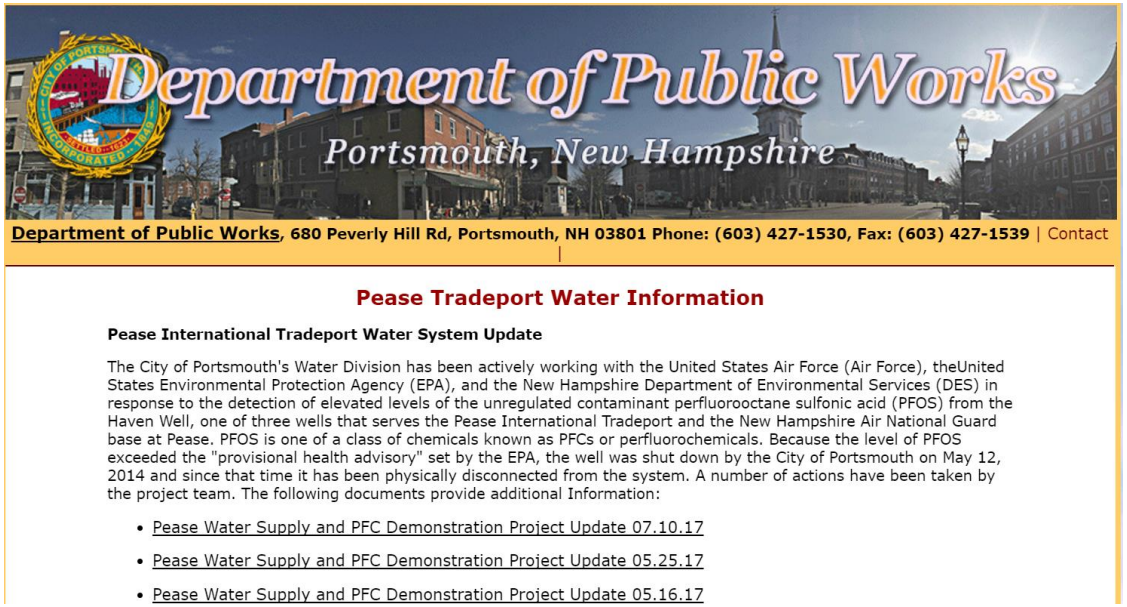
"Sampling data collected since April 2014 shows very consistent concentrations of PFOS/PFOA, no discernible plume movement and no EPA health advisory exceedance." – Air Force Press Release (July 21, 2017)

NHDES Lab Proficiency Testing

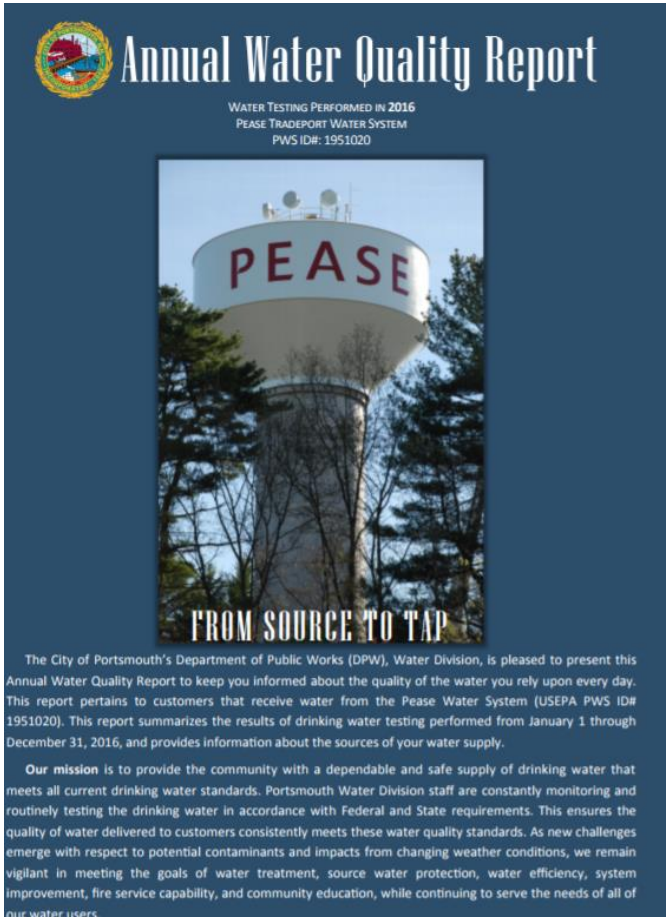
- The City of Portsmouth agreed to participate in the NHDES's Lab Proficiency Testing for PFAS analysis
- Samples of known PFAS compounds were sent to Maxxam Analytics International for testing
- Preliminary results received from Maxxam were good for most of the parameters and compounds
- NHDES will have more information once they have completed their study, which includes sample tests with other laboratories

Public Outreach

- Treatment Design information presented to public at Pease RAB meeting at March 22, 2017 meeting
- Updates on City Website



Annual Water Quality Report



Annual Water Quality Report

WATER TESTING PERFORMED IN **2016**
PEASE TRADEPORT WATER SYSTEM
PWS ID#: 1951020

The City of Portsmouth's Department of Public Works (DPW), Water Division, is pleased to present this Annual Water Quality Report to keep you informed about the quality of the water you rely upon every day. This report pertains to customers that receive water from the Pease Water System (USEPA PWS ID# 1951020). This report summarizes the results of drinking water testing performed from January 1 through December 31, 2016, and provides information about the sources of your water supply.

Our mission is to provide the community with a dependable and safe supply of drinking water that meets all current drinking water standards. Portsmouth Water Division staff are constantly monitoring and routinely testing the drinking water in accordance with Federal and State requirements. This ensures the quality of water delivered to customers consistently meets these water quality standards. As new challenges emerge with respect to potential contaminants and impacts from changing weather conditions, we remain vigilant in meeting the goals of water treatment, source water protection, water efficiency, system improvement, fire service capability, and community education, while continuing to serve the needs of all of our water users.

PER– AND POLYFLUOROALKYL SUBSTANCES (PFAS)

Per- and polyfluoroalkyl substances (PFAS) are currently unregulated by the Safe Drinking Water Act (SDWA); however, the USEPA Health Advisory concentration is 70 parts per trillion (ppt) for perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA). Studies indicate that exposure to PFOA and PFOS over certain levels may result in adverse health effects, including developmental effects to fetuses during pregnancy or to breastfed infants (e.g., low birth weight, accelerated puberty, skeletal variations), cancer (e.g., testicular, kidney), liver effects (e.g., tissue damage), immune effects (e.g., antibody production and immunity), thyroid effects and other effects (e.g., cholesterol changes).

In response to the discovery of PFOS in the Haven Well in May 2014 at levels exceeding the EPA Provisional Health Advisory level (200 ppt at that time), the Haven Well was removed from service. This well has remained disconnected from the system since this finding. 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.

Over the past three years, the Harrison Well and the Smith Well on the Pease Tradeport Water System and Portsmouth #1 Well and Collins Well in the Portsmouth Water System, have been routinely monitored for PFAS by the Air Force. The City of Portsmouth samples all of the other Portsmouth water supply sources routinely. Sample results from 2016 are summarized in the PFAS Table in this report. All of the monitoring data is available on the City of Portsmouth website: www.cityofportsmouth.com in the Drinking Water Quality link.

In September 2016, the City of installed a granular activated carbon (GAC) filtration system to treat the water from the Harrison Well and Smith Well. Testing of this system has demonstrated effective removal of PFAS. The City is currently negotiating with the Air Force for the design and upgrades to the Pease Water Treatment Facility on Grafton Road that will allow for the treatment of all three Pease Wells with a GAC system.

PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

		Water From Portsmouth System Supplied As Needed (0% to 50% of Total Pease Supply)								Pease Sources**		Treated Well Water***
PER- AND POLYFLUOROALKYL SUBSTANCE (concentrations* reported in ng/L or ppt)		PORTSMOUTH #1 WELL	COLLINS WELL	GREENLAND WELL	MADBURY WELL 2	MADBURY WELL 3	MADBURY WELL 4	BELLAMY RESERVOIR	WATER TREATMENT PLANT	SMITH WELL	HARRISON WELL	POST GAC TREATMENT
# of samples in 2016:		11	12	2	1	2	1	2	1	42	24	7
6:2 Fluorotelomer sulfonate (6:2 FTS)	Average	ND	ND	7	ND	ND	ND	ND	ND	ND	ND	ND
	Range	ND	ND	ND to 7	ND	ND	ND	ND	ND	ND	ND	ND
Perfluorobutane-sulfonic acid (PFBS)	Average	4	9	3	4	4	4	4	ND	6	5	ND
	Range	ND to 6	ND to 16	ND to 4	4	ND to 4	4	ND to 4	ND	ND to 10	ND to 10	ND
Perfluorobutanoic acid (PFBA)	Average	8	9	ND	ND	ND	ND	ND	ND	8	9	ND
	Range	ND to 9	ND to 13	ND	ND	ND	ND	ND	ND	ND to 10	ND to 13	ND
Perfluoroheptane sulfonate (PFHpS)	Average	ND	ND	ND	ND	ND	ND	ND	ND	5	7	ND
	Range	ND	ND	ND	ND	ND	ND	ND	ND	ND to 8	ND to 10	ND
Perfluoroheptanoic acid (PFHpA)	Average	6	ND	ND	ND	ND	ND	ND	ND	6	9	ND
	Range	ND to 8	ND	ND	ND	ND	ND	ND	ND	ND to 8	5 to 14	ND
Perfluorohexane-sulfonic acid (PFHxS)	Average	9	6	6	4	ND	ND	ND	ND	14	28	ND
	Range	6 to 12	ND to 8	ND to 6	4	ND	ND	ND	ND	10 to 17	21 to 35	ND
Perfluorohexanoic acid (PFHxA)	Average	7	9	ND	ND	ND	ND	ND	ND	6	9	ND
	Range	ND to 10	ND to 7	ND	ND	ND	ND	ND	ND	ND to 9	5 to 14	ND
****Perfluorooctane-sulfonic acid (PFOS)	Average	6	6	9	ND	ND	ND	ND	ND	11	24	ND
	Range	ND to 8	ND to 7	7 to 14	ND	ND	ND	ND	ND	8 to 18	17 to 29	ND
****Perfluorooctanoic acid (PFOA)	Average	7	6	ND	ND	ND	ND	ND	ND	7	8	ND
	Range	ND to 13	ND to 7	ND	ND	ND	ND	ND	ND	ND to 11	ND to 14	ND
Perfluoropentanoic acid (PFPeA)	Average	8	6	6	ND	ND	ND	ND	ND	7	11	ND
	Range	ND to 10	ND to 9	ND to 7	ND	ND	ND	ND	ND	ND to 10	5 to 19	ND
**** PFOS + PFOA	Average	10	7	9	ND	ND	ND	ND	ND	14	31	ND
	Range	6 to 14	ND to 12	7 to 14	ND	ND	ND	ND	ND	8 to 27	22 to 43	ND

* Due to laboratory analytical method limitations, low concentrations reported for these chemicals are considered estimates unless the amount measured is above 20 ng/L (ppt)

** Pease well sources. Concentrations are from wells supplied to the Pease system until September 21, 2016. Water from these wells was mixed by 50% with Portsmouth system water prior to treatment installation.

*** Concentrations from post-granular activated carbon (GAC) treatment.

**** EPA Health Advisory Level and MADES AGQS for PFOS and PFOA concentration separately or combined is 70 ng/L (ppt)

ND = Not Detected above laboratory method detection limit

PFAS analyzed but not detected in the samples:
8:2 Fluorotelomer sulfonate (8:2 FTS), N-Ethyl perfluorooctane sulfonamide (EtFOSA), N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE), N-Methyl Perfluorooctane Sulfonamide (MeFOSA), N-Methyl Perfluorooctane Sulfonamidoethanol (MeFOSE), Perfluorodecane sulfonate (PFDS), Perfluorodecanoic acid (PFDA), Perfluorododecanoic acid (PFDoA), Perfluorononanoic acid (PFNA), Perfluorooctane sulfonamide (FOSA), Perfluorotridecanoic acid (PFTrDA), Perfluorotetradecanoic acid (PFTeDA), and Perfluoroundecanoic acid (PFUnA)

RAB Question:

Are the (GAC) carbon filters really effective in treating (all the types of) PFCs in our drinking water?
- Weston & Sampson June 4, 2017 Letter:

- Full scale testing/piloting is the most accurate representative of final system performance.
- GAC is the most widely used treatment technique for PFAS removal. GAC will remove all PFASs, with carbon being replaced when the target contaminant begins to breakthrough.
- Resin may be effective for PFAS removal, but current full scale implementation is limited. If over time, resin becomes the preferred treatment technique for PFAS, the proposed treatment facility could move from GAC to resin with minimal modification.
- Membranes, in theory, should effectively remove PFASs, however, it is our current understanding that there are no full-scale membrane facilities built for the purpose of removing PFASs. Membrane facilities are complex and difficult to operate and also produce a highly-concentrated waste stream that may be problematic to dispose of.
- All parties involved with this work, NHDES, the US Air Force, EPA, the City, interested stakeholders, and the design team will continue to work on an effective long-term remedy during the upcoming design phase.

Water Research Foundation (WRF) Study - "Treatment Mitigation Strategies for Poly- and Perfluoroalkyl Substances"

- To test for PFOA, PFOS, and other poly- and perfluoroalkyl substances (PFASs), principal investigators Eric R.V. Dickenson and Christopher Higgins evaluated 15 full-scale water treatment systems throughout the country to see how they were dealing with the contamination.
- The WRF found that aeration, chlorine dioxide, dissolved air flotation, coagulation, flocculation, sedimentation, granular filtration, and microfiltration were all ineffective for removing PFASs including PFOA and PFOS.
- Anion exchange was moderately effective in treating PFOA, highly effective for PFOS, and failed to remove several other PFASs.
- Nanofiltration and reverse osmosis proved to be the most effective methods of removing even the smallest PFASs.
- Granular activated carbon (GAC) was shown to be adept at removing most PFASs and it may be the average utility's best bet for PFOA and PFOS contamination.
- **"In many cases, the most cost-effective treatment for removing PFOA and PFOS will be GAC, though water utilities will need to test GAC to determine site-specific performance," the WRF said.**

Research of other Public Water Systems with PFAS Contamination

	Treatment Date	*Treatment Type*	*PFAS Concentration (ppb)*
Pease (NH)	**2016**	**GAC**	**Blend** **PFOA: 0.155** **PFOS: 1.134**
Aqua America (PA)	N/A	N/A	All PFAS < 0.07
Barnstable (MA)	2015	GAC	PFOA: 0.18 PFOS: 0.11
Bennington (VT)	2016	GAC (POE)	PFOA: 1.0
Hoosick Falls (NY)	2016	GAC	PFOA: 0.45
Horsham (PA)	2016	GAC + Resin	PFOS: 1.0
Issaquah (WA)	2016	GAC	PFOS: 0.40
Joint Base McGuire-Dix-Lakehurt (NJ)	N/A	N/A	Combined PFOA/PFOS<0.07
Little Hocking (OH)	2007	GAC	PFOA: 0.37-21
Merrimack Valley District (NH)	N/A	GAC	PFOA: 0.09
New Castle (DE)	2015	GAC	PFOA: 0.14 PFOS: 1.3
Oakdale (MN)	2006	GAC	PFOA: 0.64 PFOS: 0.71
Oatman (AZ)	-	-	PFOA: 0.032 PFOS: 0.30
Suffolk County (NY)	2016	GAC	PFOA: 0.33 PFOS: 1.7
West Morgan-East Lawrence (AL)	2016	GAC	PFOA: 0.15 PFOS: 0.12
Wurtsmith (MI)	N/A	N/A	Combined PFOA/PFOS<0.07

NEWS > ENVIRONMENT

Air Force sends first $400,000 filter to Fountain to scrub PFC contamination from ground water

By **BRUCE FINLEY** | bfinley@denverpost.com | The Denver Post
PUBLISHED: June 29, 2017 at 2:55 pm | UPDATED: July 3, 2017 at 10:58 am

Bruce Finley, The Denver Post

A water filter system being delivered in Fountain to purge PFC contamination in the town south of Colorado Springs, on Thursday morning.

Starting in late July, the 500-gallon-per-minute water-filtering systems attached to two of Fountain's four municipal wells will begin to remove PFCs called PFOS and PFOA.

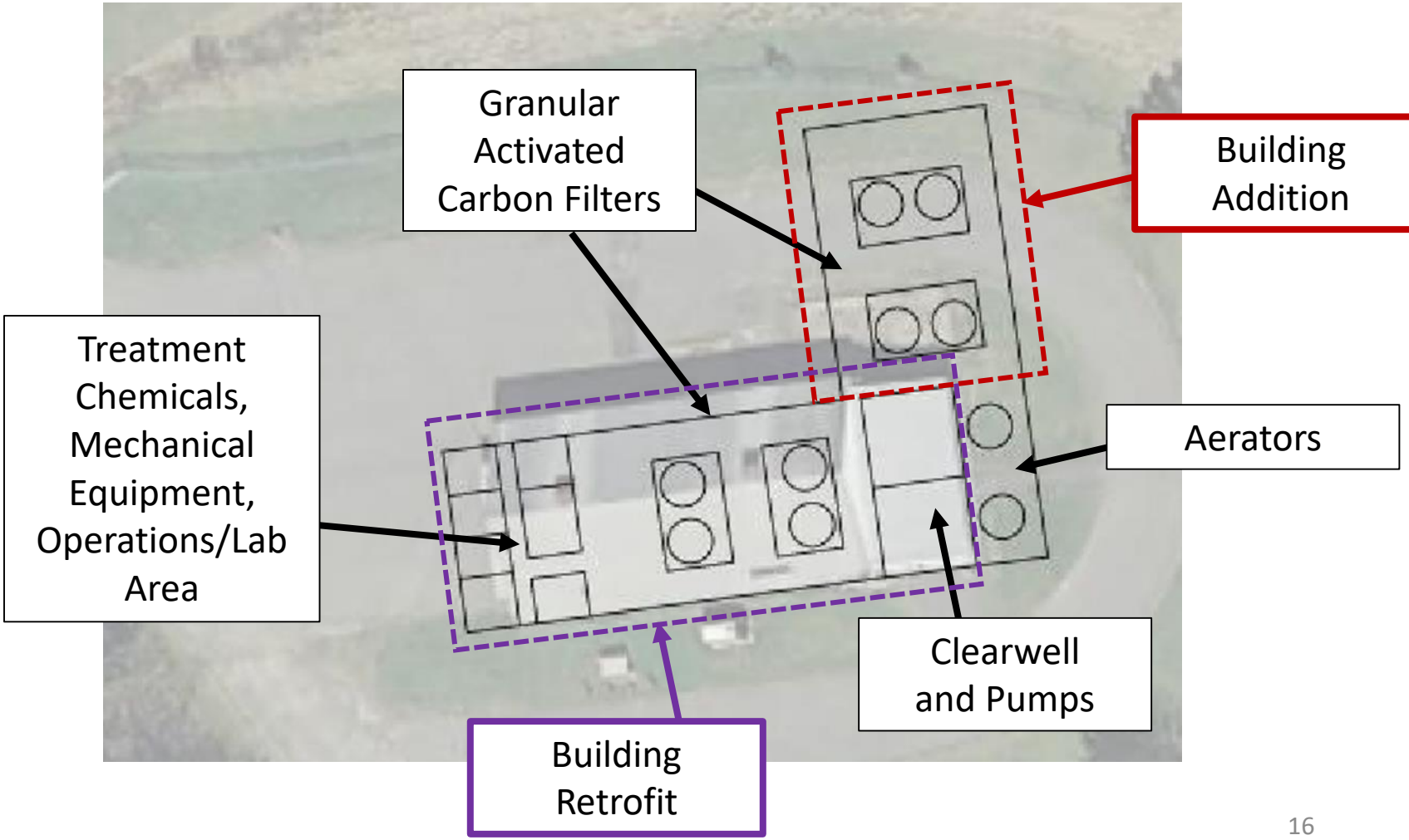
"The EPA has recommended granular activated carbon filtration for PFOS/PFOA treatment, and the Air Force has used GAC systems to successfully treat various contaminants," Kinkade said. "After installation, we monitor the system to ensure it is reducing PFOS/PFOA levels. And we are working with industry and researchers to identify new technologies to improve our ability to protect human health and the environment."

It was unclear whether Fountain's filters would remove PFHxS. Karl Kuching, business development for the Air Force contractor TIGG, said the filters have proved successful removing some of the PFHxS at a site in Washington state.

Removing short-chain PFCs may require more frequent changing of the carbon, which is injected into the tops of tanks in a slurry and, when exhausted, drained out the bottoms, he said. Two tanks are used. When system operators detect a contaminant "breakthrough," one tank still filters out contaminants while carbon in the first tank is replaced.

The effectiveness of carbon filters removing PFCs from contaminated water depends on how frequently the carbon is changed, Colorado School of Mines environmental engineer Chris Higgins said.

Pease Well Treatment System Conceptual Design:



RAB Questions

RAB Questions Regarding Alternative Water Supply Locations:

- **The City routinely performs comprehensive water system master planning**
- These studies looked at:
  - All water system infrastructure
  - Pipeline and water storage needs
  - Water quality and treatment
  - Adequacy of our sources of supply
  - Water Demand Projections
- Recommendations from these studies have been incorporated into the City's long term Capital Improvement Programs (CIP) and many have been completed already.

Water System Master Plans

- 2012
- 2000
- 1994
- 1979

Water Supply Alternatives

- **The activation of the Harrison Well in 2006 to serve the Pease Tradeport System**.
- This well was out of service for a number of years due to mechanical issues. This well was rehabilitated, tested and approved by the NHDES to be reactivated.
- Well has been in service since June 2006.
- It has a design capacity of 286 gallons per minute (412,000 gallons per day).

Harrison Well

Water Supply Alternatives

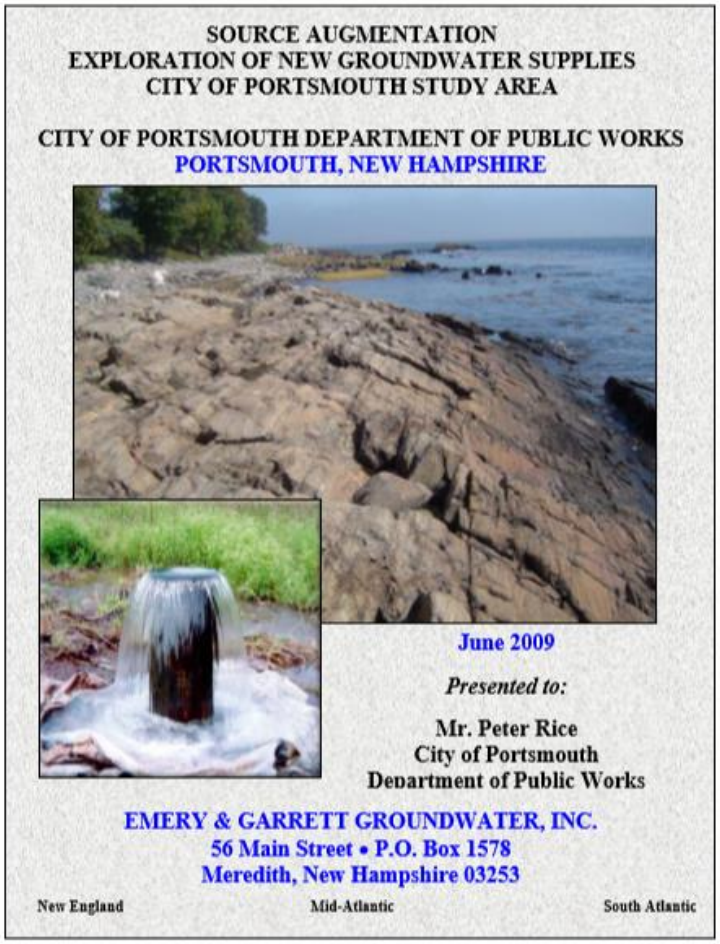
- **The Madbury Surface Water Treatment Facility replacement in 2011.**
- The 2000 master plan study identified the need for the City to upgrade or replace the aging surface water treatment facility, built in 1957.
- A replacement facility was most feasible.
- Dissolved Air Floatation was found to be the best option after studying and piloting various treatment technologies.
- A new facility was constructed adjacent to the existing one.
- It was brought into service in August 2011 and is capable of treating 4 million gallons of water a day.

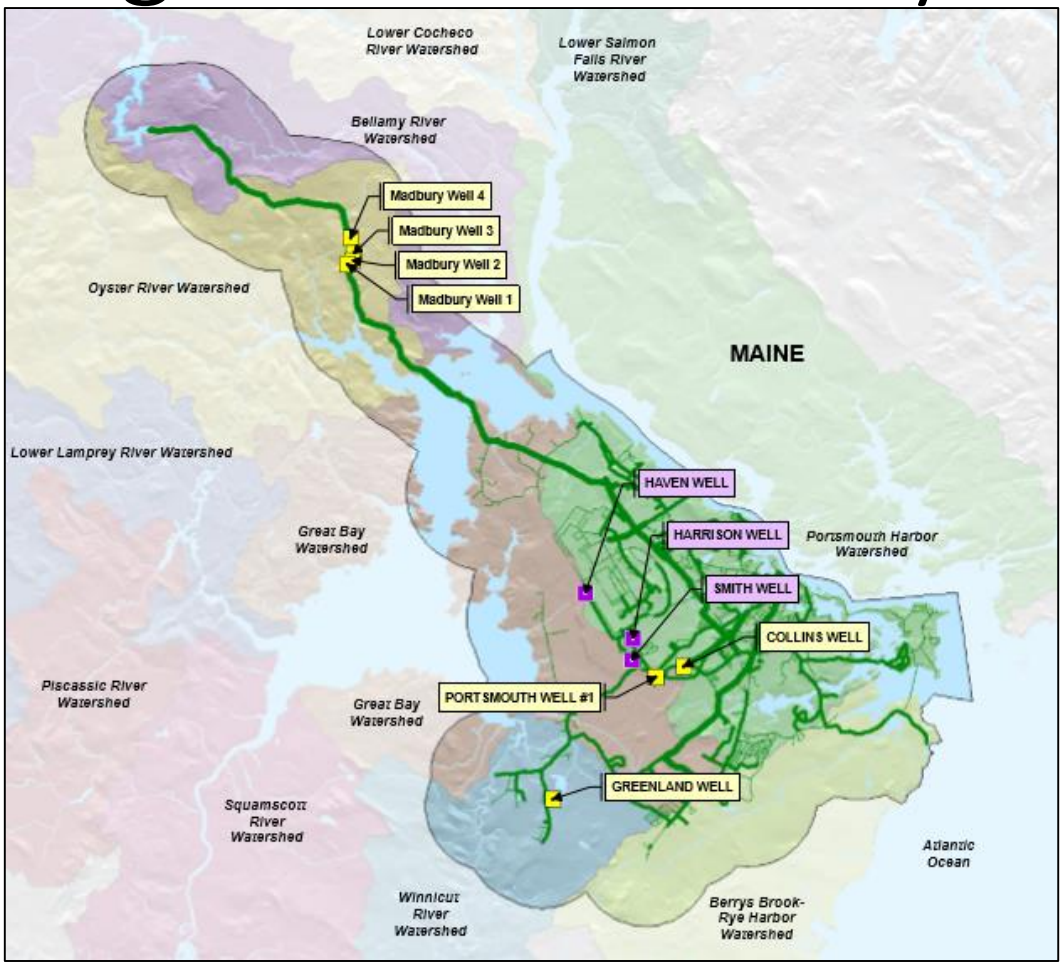
Madbury Water Treatment Facility
LEED Silver Certification (2011)

Water Supply Alternatives

- **Water Supply Augmentation Study.**
- Emery & Garrett Groundwater, Inc. (EGGI) was selected in 2008 to perform a detailed analysis of potential groundwater supplies within the City of Portsmouth's water service area.
- Their findings selected 17 potential bedrock aquifer sites and 13 potential surficial sand and gravel sites for new wells.
- The study also determined that additional water could be derived from existing wells.

Water Supply Augmentation Study





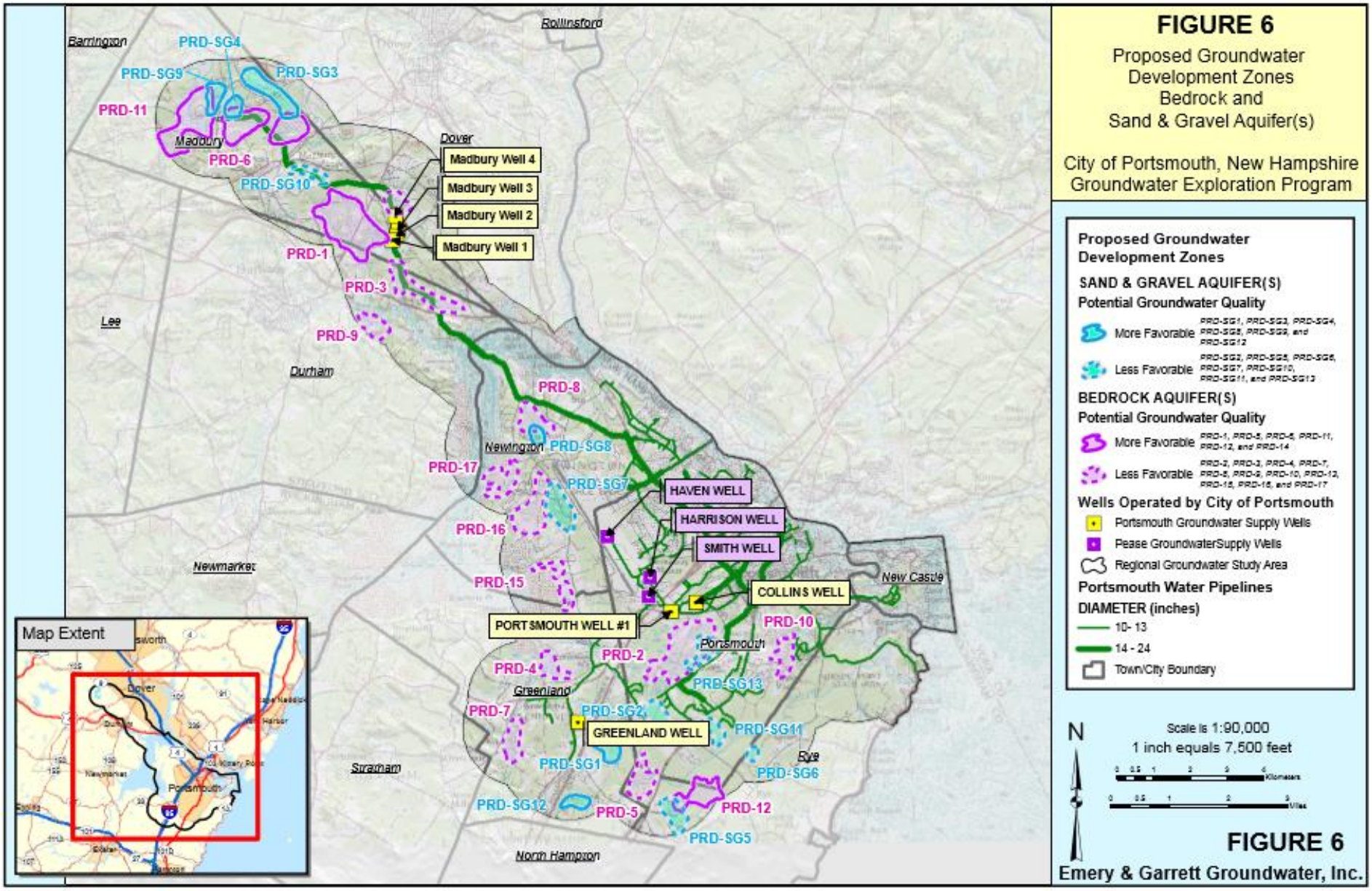


FIGURE 6
Proposed Groundwater Development Zones Bedrock and Sand & Gravel Aquifer(s)
City of Portsmouth, New Hampshire Groundwater Exploration Program
Barrington
Rollinsford
Dover
Madbury
Lee
Durham
Newington
Newmarket
New Castle
Portsmouth
Greenland
Stratham
North Hampton
Rye
PRD-SG4
PRD-SG9
PRD-SG3
PRD-11
PRD-6
PRD-SG10
PRD-1
PRD-3
PRD-9
PRD-8
PRD-SG8
PRD-17
PRD-SG7
PRD-16
PRD-15
PRD-10
PRD-2
PRD-4
PRD-SG13
PRD-7
PRD-SG2
PRD-SG11
PRD-SG1
PRD-SG6
PRD-SG12
PRD-5
PRD-12
PRD-SG5
Madbury Well 4
Madbury Well 3
Madbury Well 2
Madbury Well 1
HAVEN WELL
HARRISON WELL
SMITH WELL
COLLINS WELL
PORTSMOUTH WELL #1
GREENLAND WELL
Map Extent
Proposed Groundwater Development Zones
SAND & GRAVEL AQUIFER(S)
Potential Groundwater Quality
More Favorable
Less Favorable
BEDROCK AQUIFER(S)
Potential Groundwater Quality
More Favorable
Less Favorable
Wells Operated by City of Portsmouth
Portsmouth Groundwater Supply Wells
Pease GroundwaterSupply Wells
Regional Groundwater Study Area
Portsmouth Water Pipelines
DIAMETER (inches)
10- 13
14 - 24
Town/City Boundary
N
Scale is 1:90,000
1 inch equals 7,500 feet
Kilometers
Miles
FIGURE 6
Emery & Garrett Groundwater, Inc.

Water Supply Alternatives

- **Well upgrades have occurred at the Madbury wells.**
- Drilling of a replacement well for Well #4
- Drilling of an entirely new well (Well #5) to improve operating efficiency of the wellfield.

Well #4 Drilling

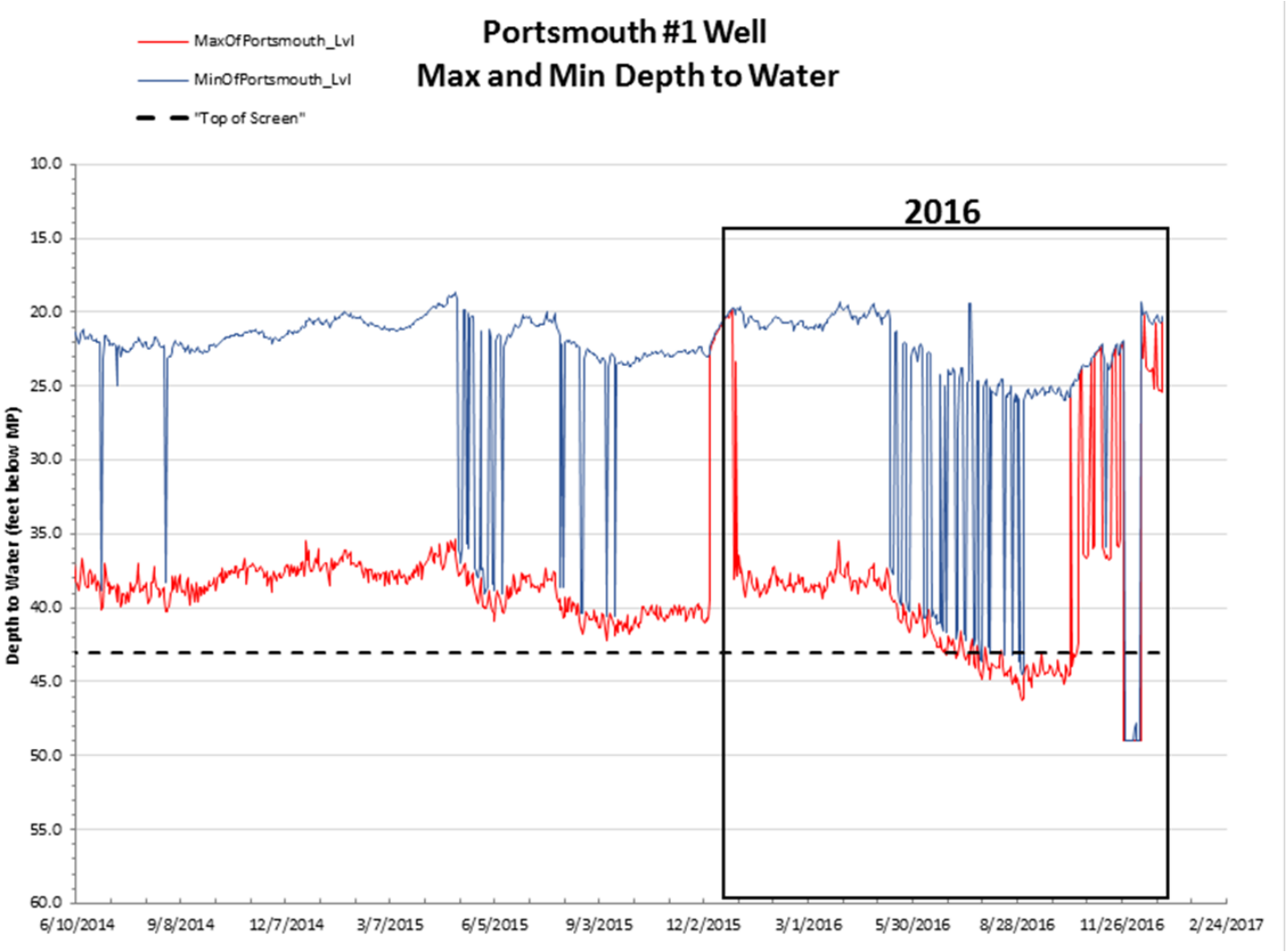
Madbury Well #5 Public Hearing

Madbury Well #5 Permitting - Ongoing
Madbury Public Hearing – February 2017

Greenland Well Replacement

New Well in 2015
Pump Station replacement in 2017

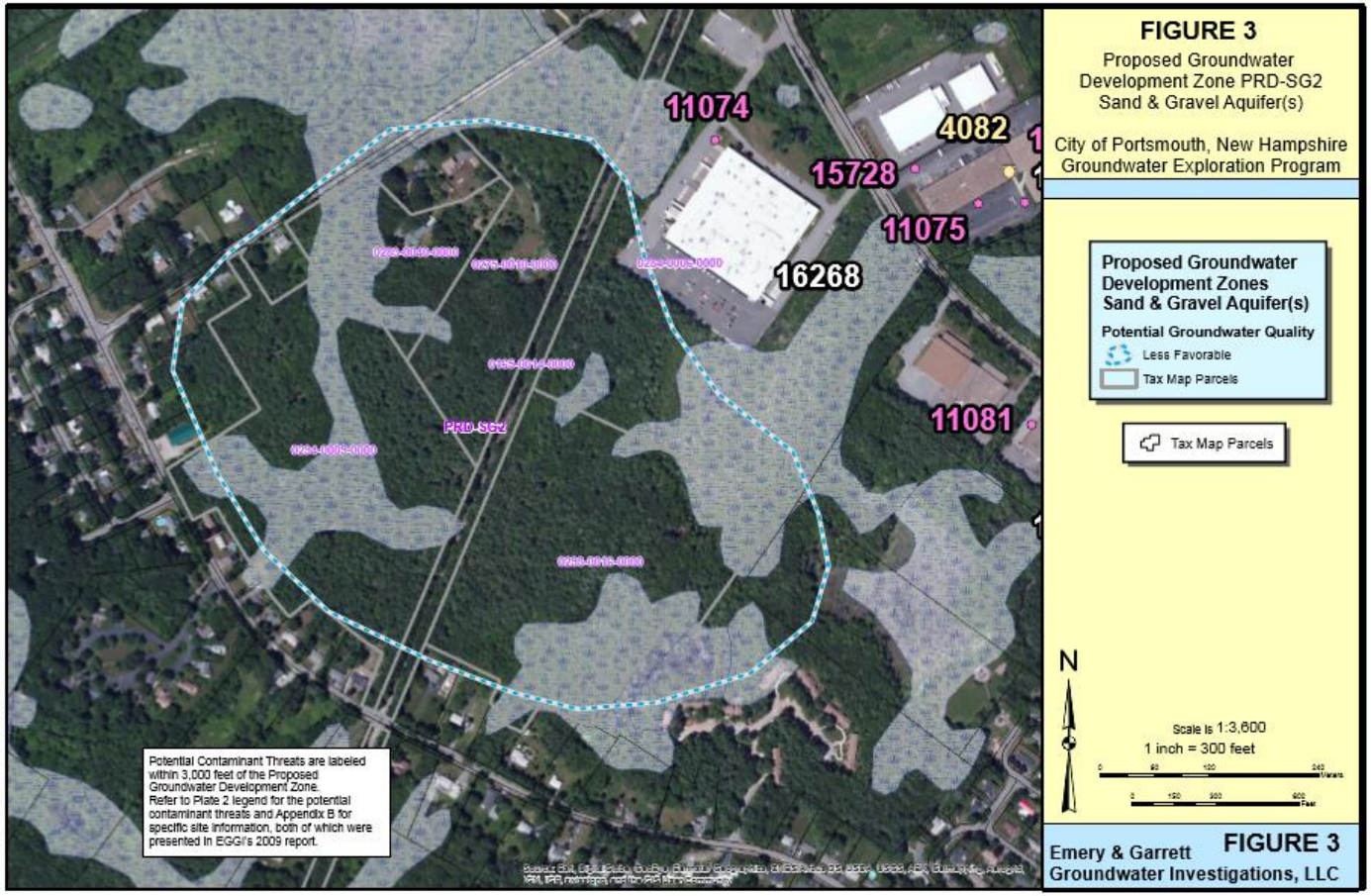
Well Maintenance – Well Cleaning



Water Supply Alternatives

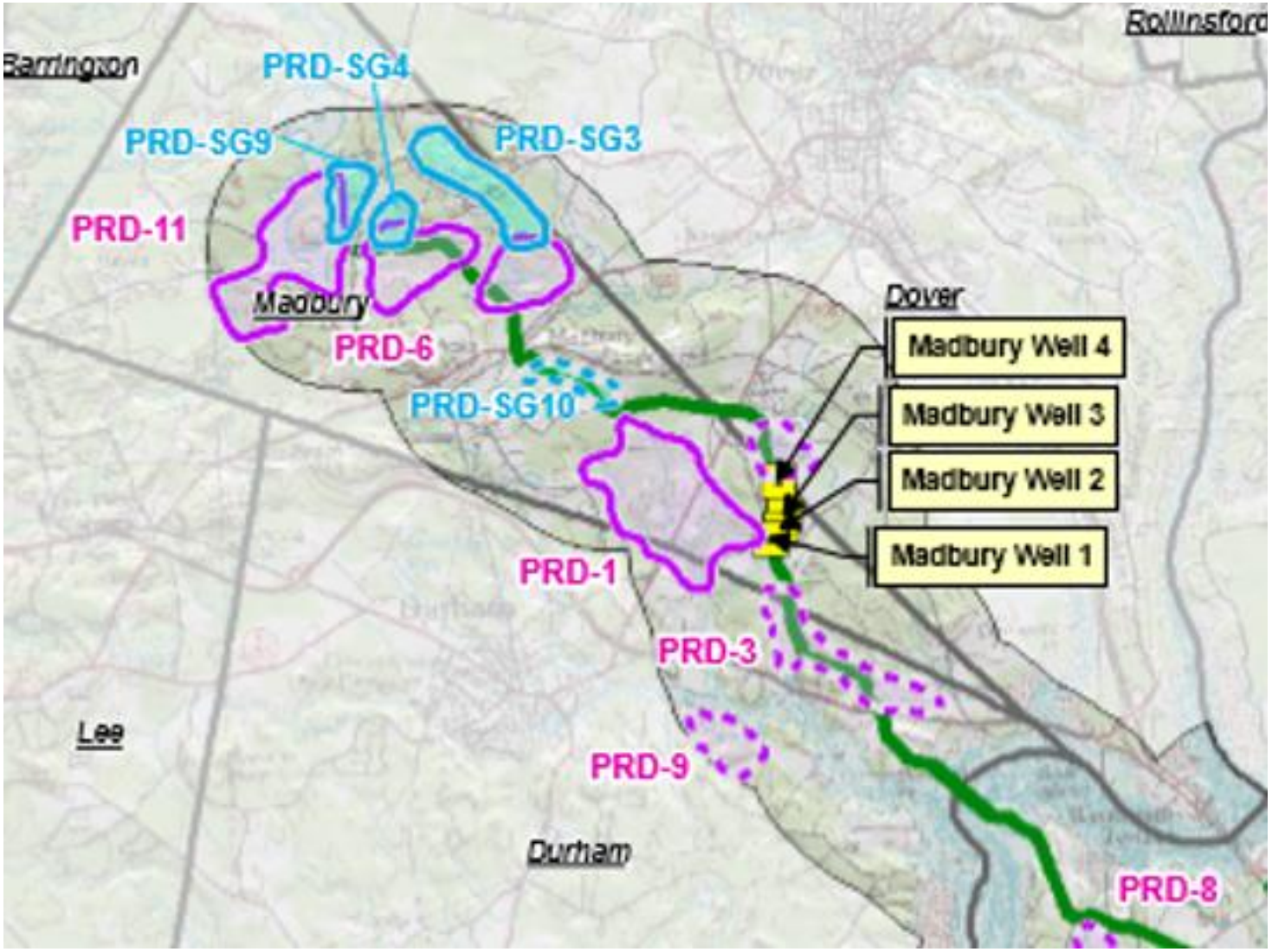
- **Water Supply Augmentation Study – 2014-2016 work associated with the Haven Well contamination.**
- Following the contamination of the Haven Well in 2014, the Air Force agreed to fund additional study on the sites previously identified by EGGI in their 2008 report. The focus of this study was to conduct further evaluation and groundwater testing program, for the purposes of assessing the overall groundwater availability, in the following proposed Groundwater Development Zones: PRD-1, PRD-2, and PRD-SG13.
- Field investigations of these sites took place in late 2014 and early 2015. A report of their findings was issued in May 2015. A follow-up Request for Proposals for performing a test well investigation was issued in 2016. EGGI was again selected to perform this work.

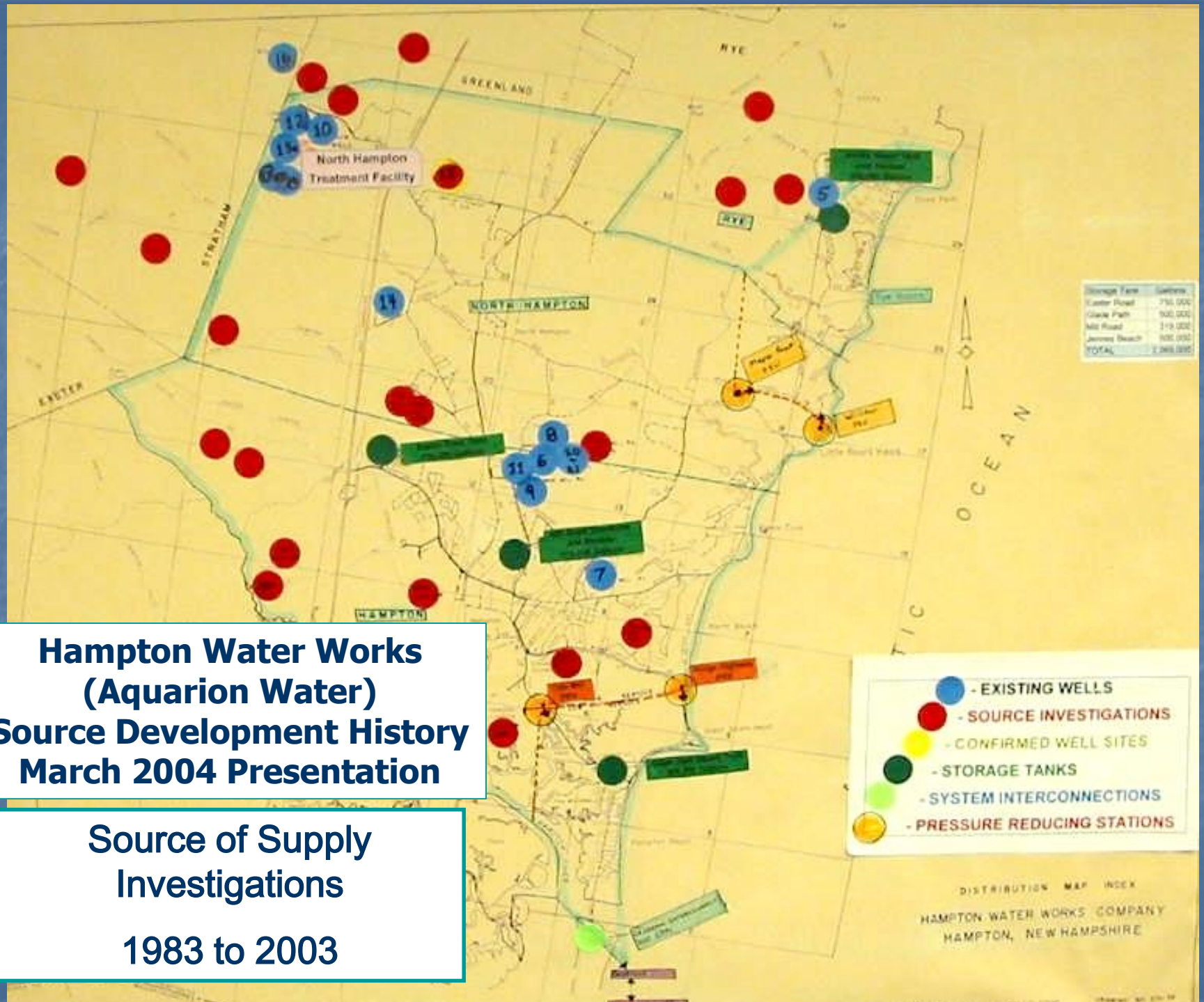
2014 – 2016 Hydrogeologic Study



- A site located on City of Portsmouth conservation land adjacent to Banfield and Ocean Roads was selected, however this was prior to the Coakley Landfill concerns.
- Test drilling has been put on hold and City will work with EGGI to identify other test well sites to proceed.

The next test well site?





Hampton Water Works (Aquarion Water) Source Development History March 2004 Presentation

Source of Supply Investigations

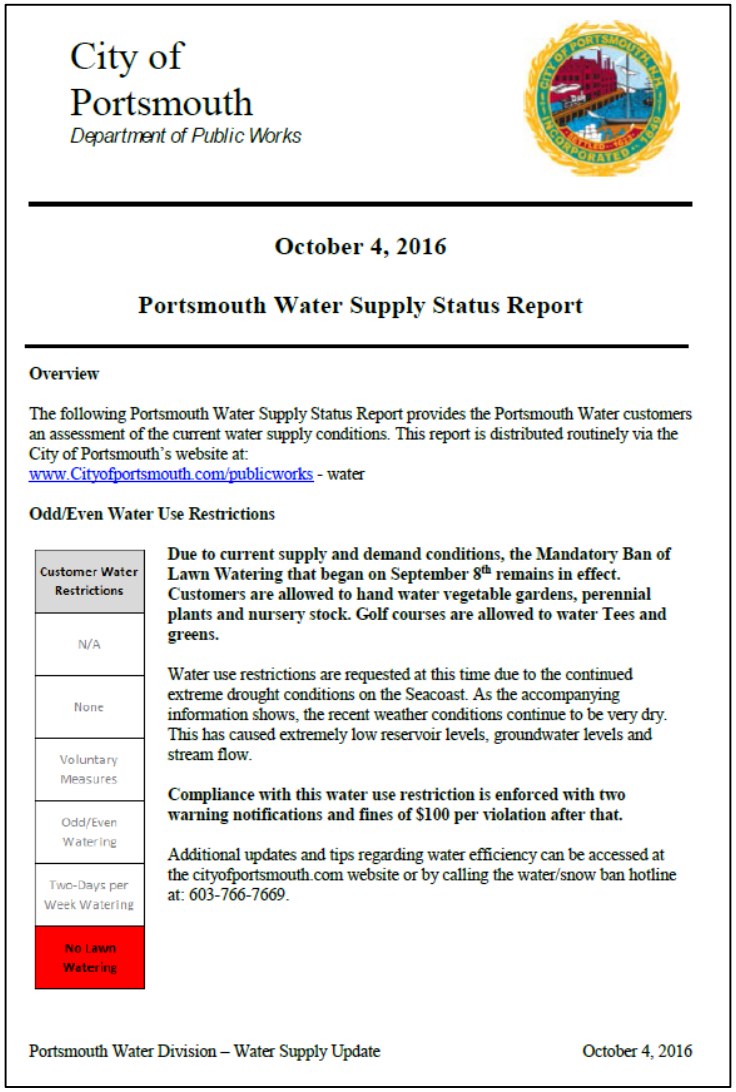
1983 to 2003

Water Supply Alternatives

- **Integrated management of system.** For a number of years, the Water Division's staff has implemented an integrated management plan for its water supply. By tracking historic and available supply resources, operations staff are able to adjust sources of supply to optimize sustainability –
  - Maximizing the use of surface water when quantity and quality is good, resting groundwater resources during that period of time and then relying more on the wells when surface water resources are stressed.
  - These efforts helped the water system manage throughout the historic drought during the summer of 2016 even with the loss of the Haven Well.

Water Supply Status Report

- Introduced in 2014
- Monthly Evaluation of Supply
- Public Education of Water Supply Status
- Public Notification of Water Use Restrictions



City of
Portsmouth
Department of Public Works

October 4, 2016

Portsmouth Water Supply Status Report

Overview

The following Portsmouth Water Supply Status Report provides the Portsmouth Water customers an assessment of the current water supply conditions. This report is distributed routinely via the City of Portsmouth's website at:
www.Cityofportsmouth.com/publicworks - water

Odd/Even Water Use Restrictions

Customer Water Restrictions
N/A
None
Voluntary Measures
Odd/Even Watering
Two-Days per Week Watering
No Lawn Watering

Due to current supply and demand conditions, the Mandatory Ban of Lawn Watering that began on September 8th remains in effect. Customers are allowed to hand water vegetable gardens, perennial plants and nursery stock. Golf courses are allowed to water Tees and greens.

Water use restrictions are requested at this time due to the continued extreme drought conditions on the Seacoast. As the accompanying information shows, the recent weather conditions continue to be very dry. This has caused extremely low reservoir levels, groundwater levels and stream flow.

Compliance with this water use restriction is enforced with two warning notifications and fines of $100 per violation after that.

Additional updates and tips regarding water efficiency can be accessed at the cityofportsmouth.com website or by calling the water/snow ban hotline at: 603-766-7669.

Portsmouth Water Division – Water Supply Update October 4, 2016

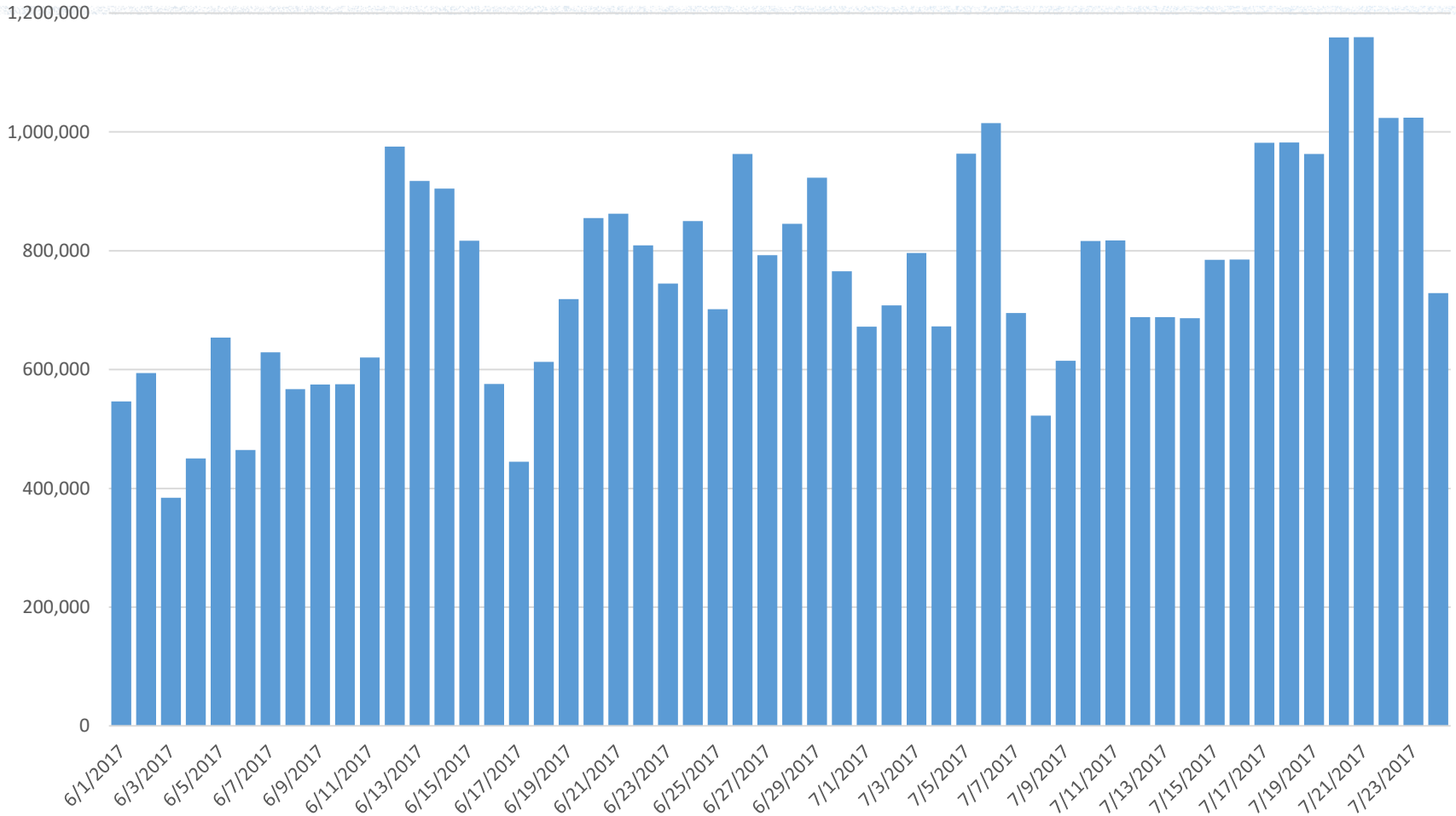
Water Supply Is Really Two Things:

1. Quality
2. Quantity

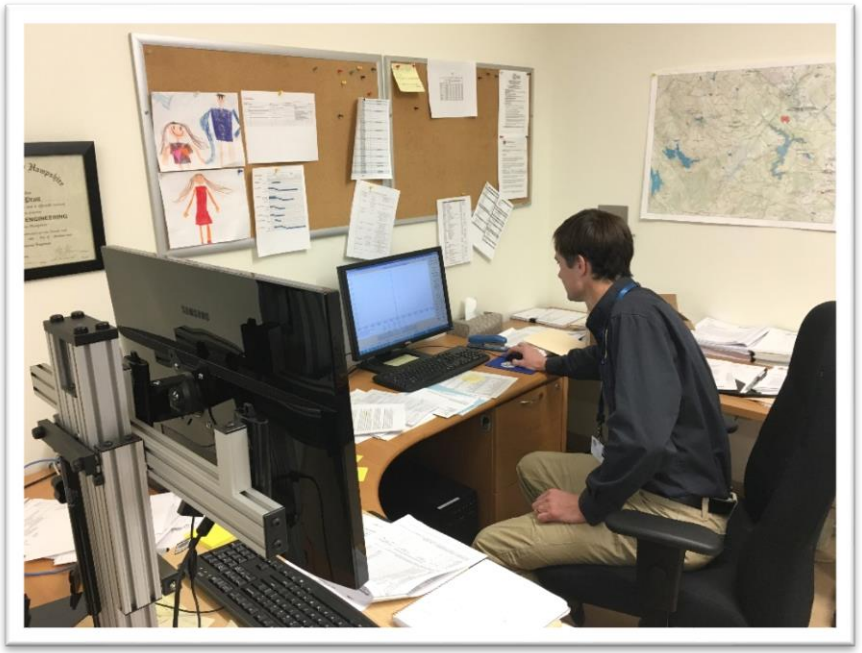
State Street Saloon Fire – April 9, 2017

- Pumpage to system
  - **(4,200 Gallons per Minute)**
- 10,000 Gallons-per-Minute delivered at peak of fire fighting
- 800,000 gallons estimated for duration of fire

Meeting Peak Water Demand
Pease Daily Demand – Summer 2017



Portsmouth Water Supply Team…



Pease PFAS Response Team Hydrogeologists… NHDES, AMEC, CBI, City of Portsmouth

Water Supply Alternatives

- **The City continued to implement water efficiency measures throughout 2016.** These measures included:
  - Submitting an **updated Water Conservation Plan** to the New Hampshire Department of Environmental Services pursuant to Env-Wq 2101 "Water Conservation Standards." This plan will guide the water division's efforts to continue to improve water efficiency.
  - The City continues with its **Water Efficiency Rebate Program** which allows qualifying residential water and sewer customers a rebate for installing high efficiency toilets and washing machines. The rebates are $100 for qualifying toilets and $150 for qualifying washing machines. Portsmouth was the first water system in New Hampshire to offer rebates of this nature. As of April 2017, over 500 toilet and 100 washing machine rebates have been issued. Analysis of customer savings show that this program is saving approximately 25% of the indoor water use.
  - Continue to utilize the services of a **leak detection** firm to survey and identify areas of the water system that may have leaks. Intent is to cover the entire water system every three years. Leaks are now tracked in the City's Electronic Asset Management Database, where the information is utilized by City staff to assess, justify and schedule capital replacements.
  - **Requiring new irrigation meters to have systems that are EPA *WaterSense* certified**. An additional third inclining block irrigation rate was also implemented in 2016 which provides an economic incentive for water users to be as efficient as possible with irrigation usage.
  - **Implementing water restrictions when necessary and continue to update the public and our water customers about the water supply and demand status**.

Water Efficiency Rebate Program
Water and Sewer Enterprise Fund

Low-Flow Toilets (561 total):

- 200 rebates issued in 2015
- 219 rebates issued in 2016
- 142 rebates through April 2017

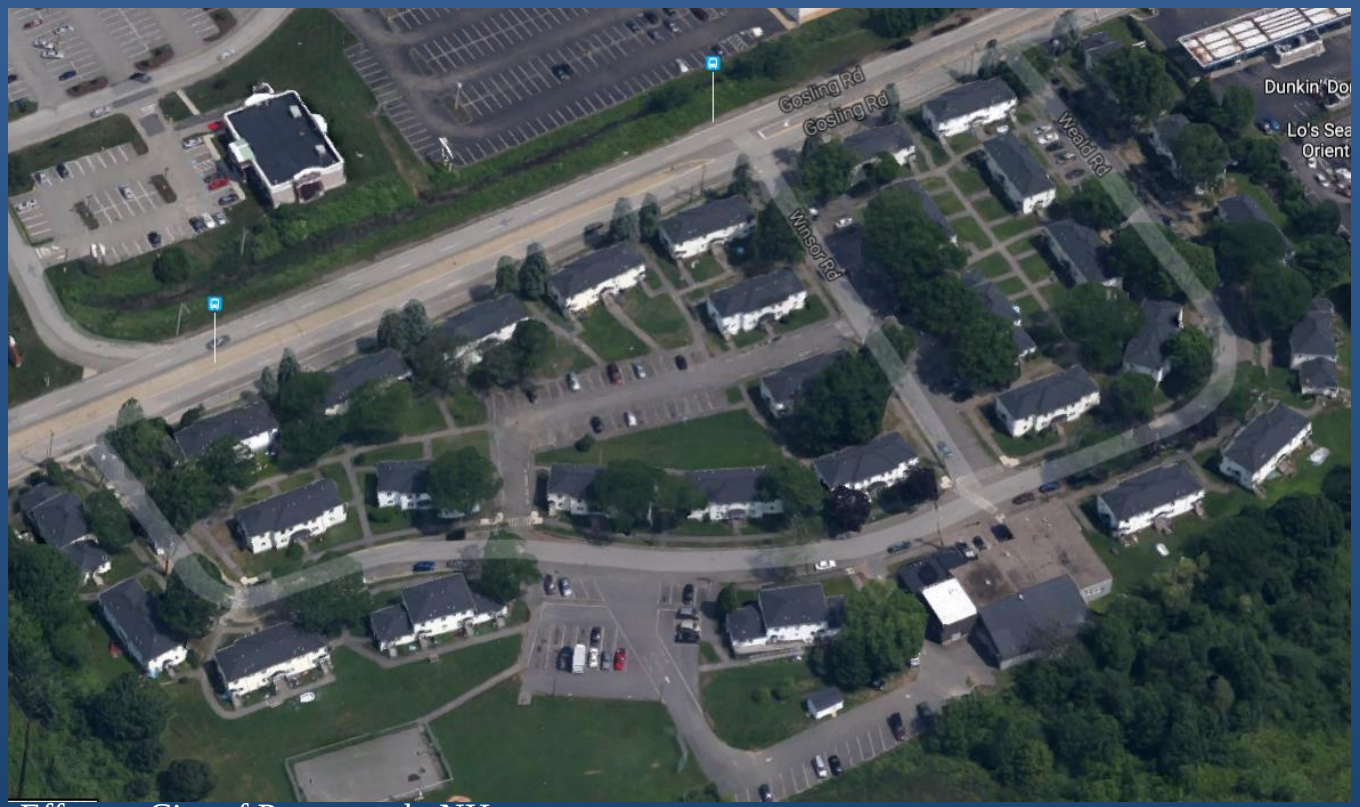
High Efficiency Washing Machines (105 total):

- 71 rebates issued in 2015
- 16 rebates issued in 2016
- 18 rebates through April 2017

Portsmouth Housing Authority
Gosling Meadows Retrofit:

- 33 Buildings
- 118 Toilets replaced
- **19% Reduction in water usage**
- 3,119 gallons/day water savings

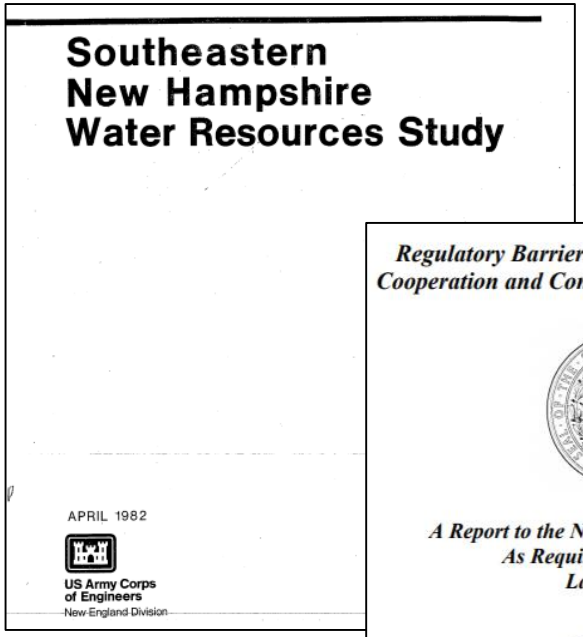
(As of April 2017)

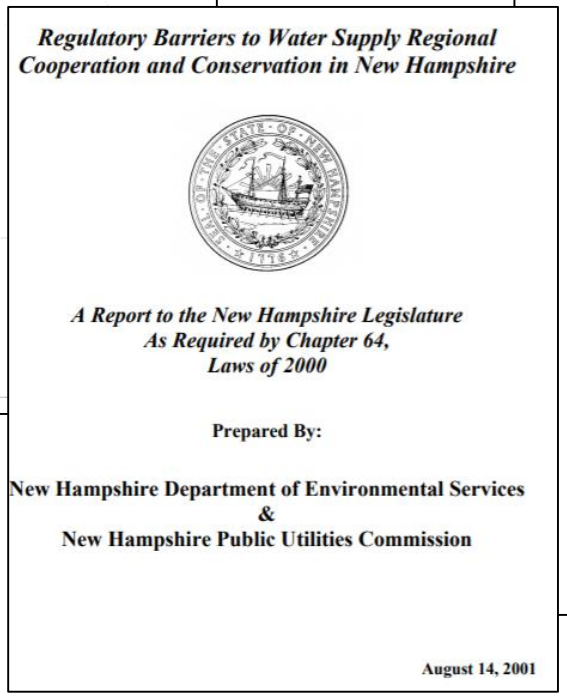


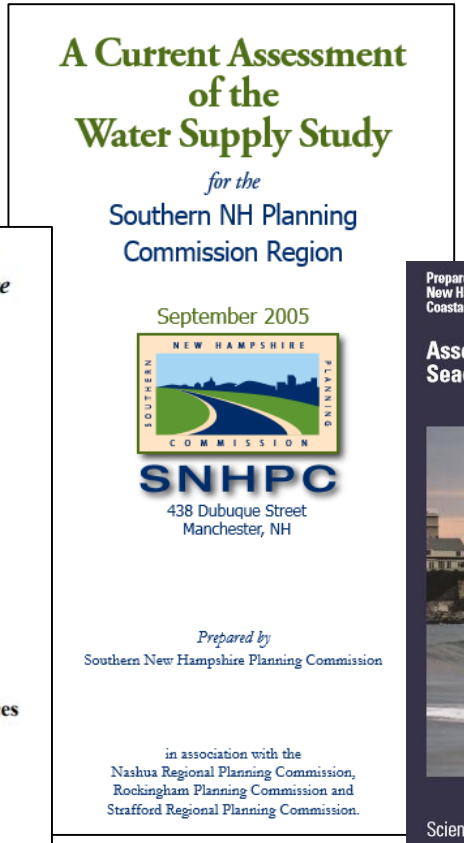
RAB Questions Regarding Regional Options

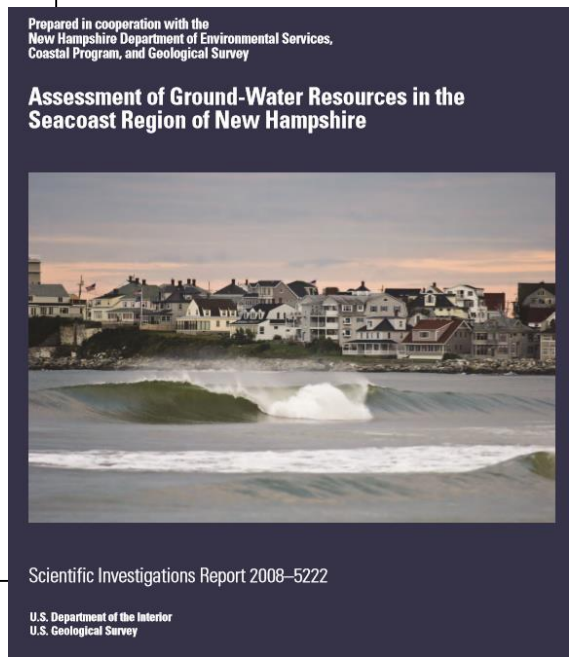
- [What about a] NHDES-mandate for adjacent [Seacoast] water systems to cooperate for the betterment of the State?
- Does Dover Point area have public water [that could be interconnected with Portsmouth]?

Past Regional Water Resource Studies

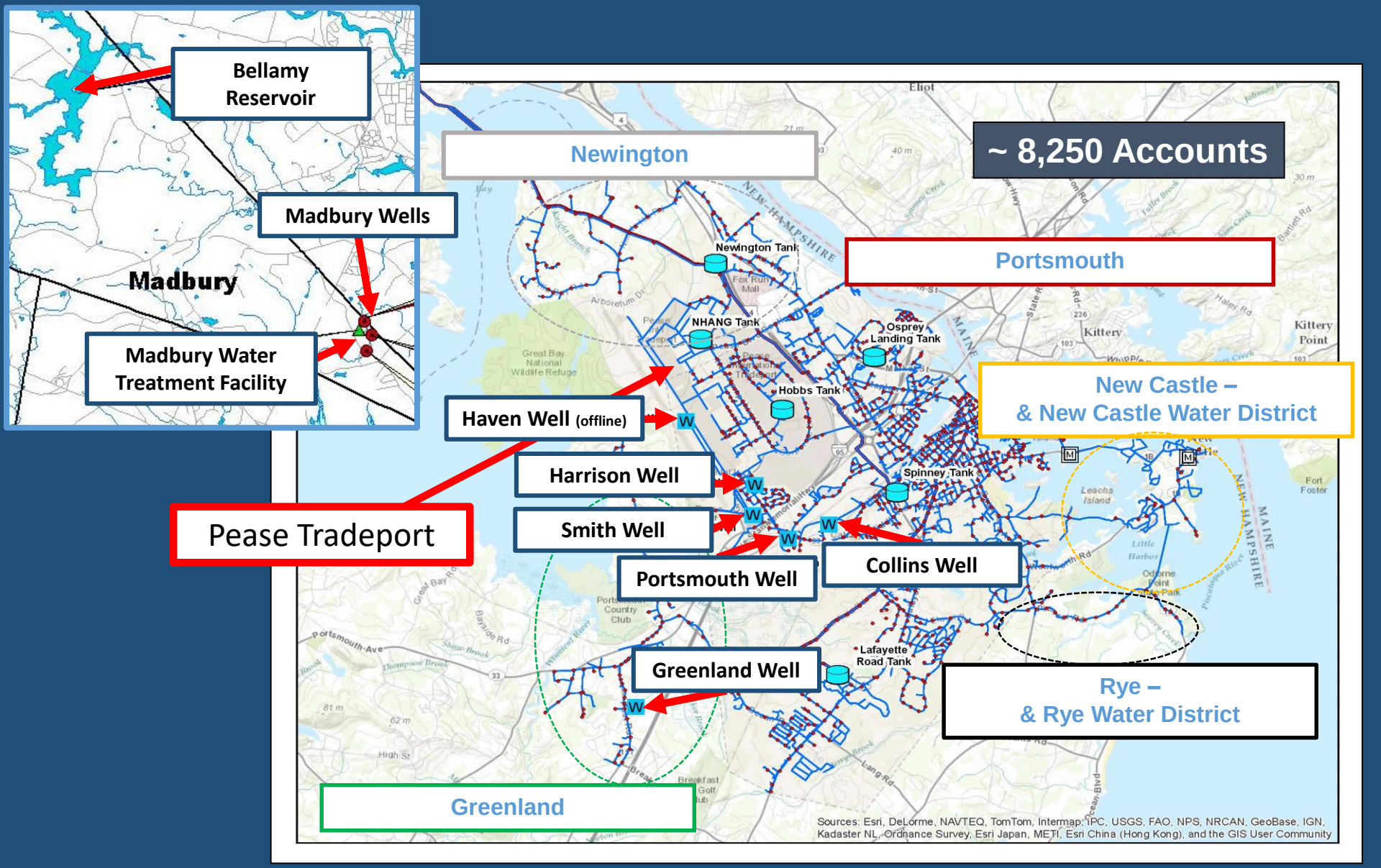








Portsmouth Regional Water System



Portsmouth Water System

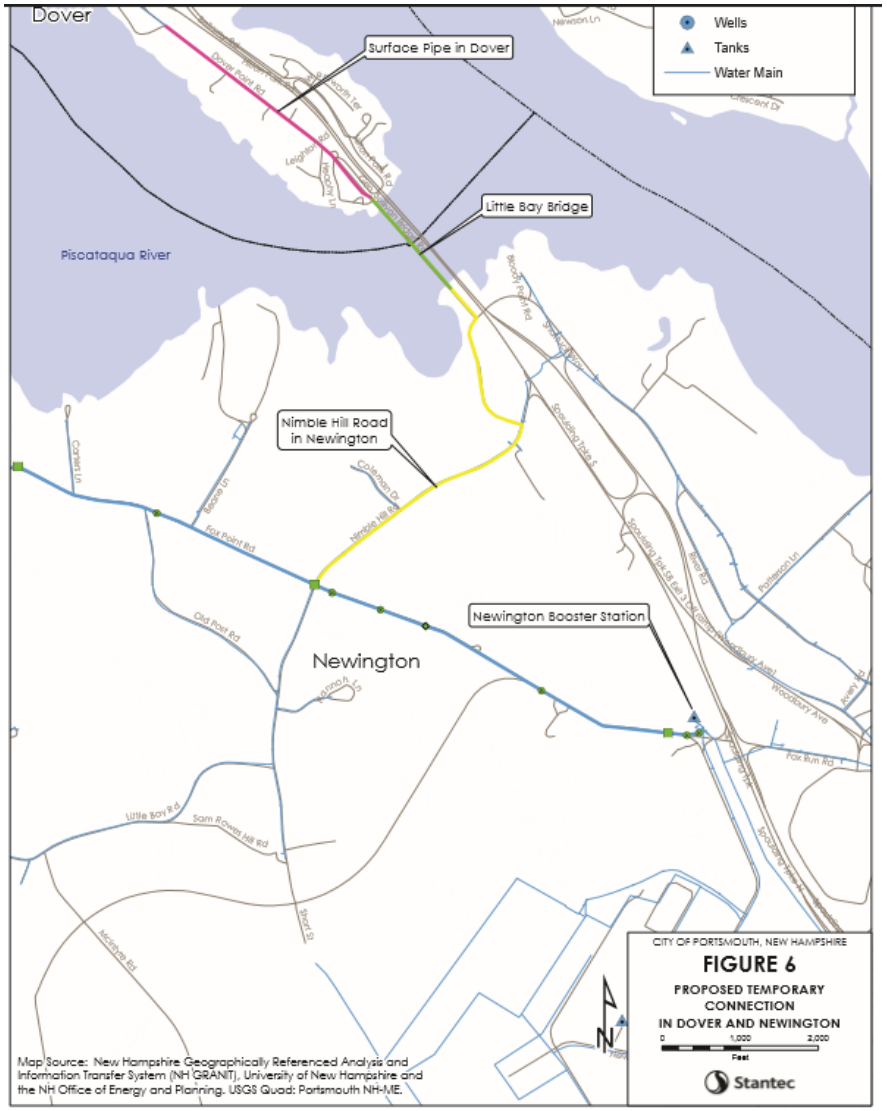
- Bellamy Reservoir
- Madbury Water Treatment Facility
- 8 Wells (Haven off-line)
- 5 Storage Tanks
- Two Pressure Zones
- 3.5 to 6.5 Million Gallons a Day

- 189 miles of pipe
- 972 Public Fire Hydrants
- 2,840 Valves
- 8,203 Meters/Customers
- Serve 5 Communities and portions of 3 others

Regional Interconnections

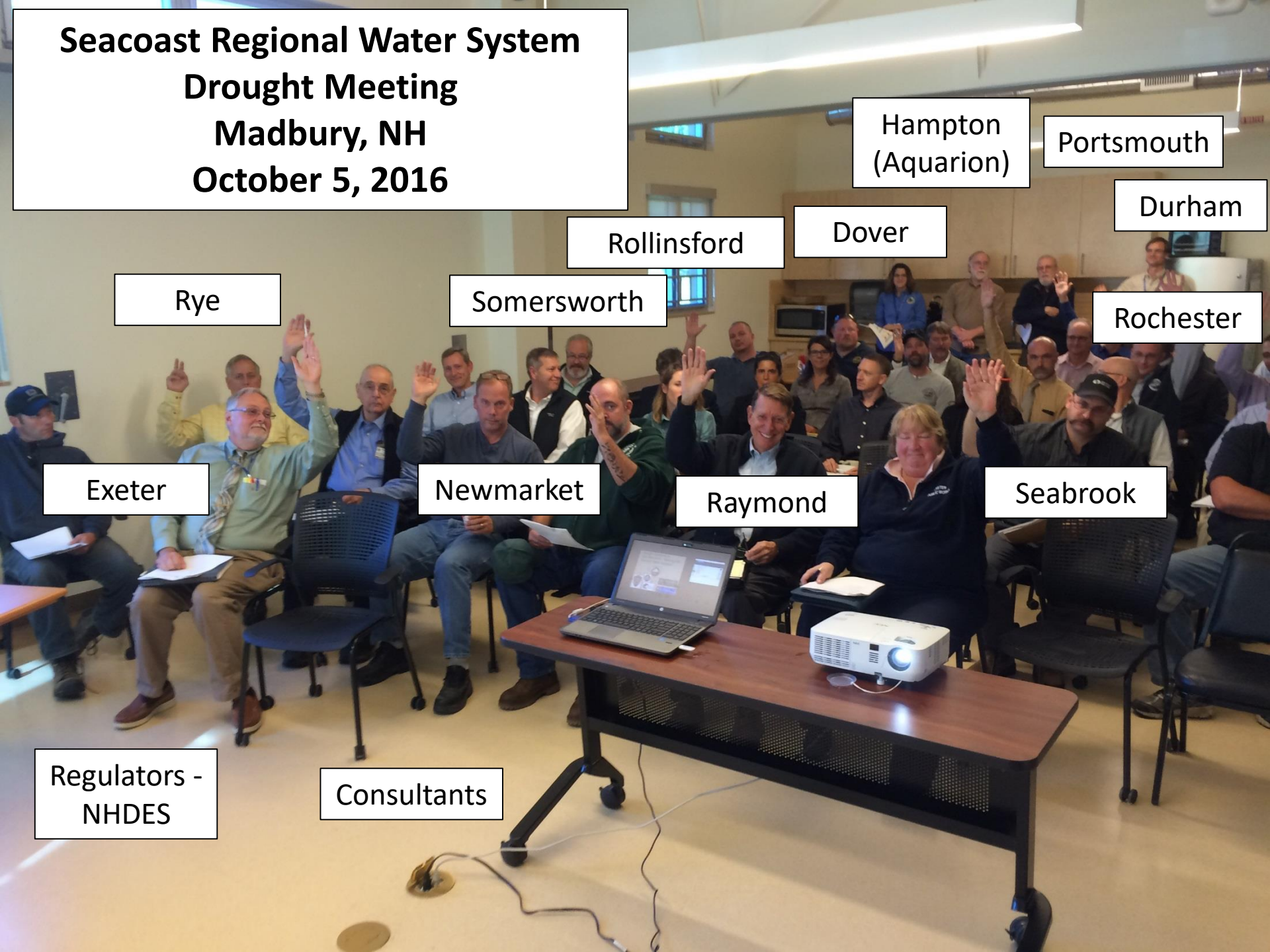
- Seacoast Interconnection Study by NHDES
- Portsmouth is interconnected with Rye Water District – water can be transferred during emergencies
- Portsmouth currently working with Dover on interconnection potential for emergencies (Portsmouth hired consultant in 2015-2016 to perform alternatives analysis)

Dover Interconnection Study

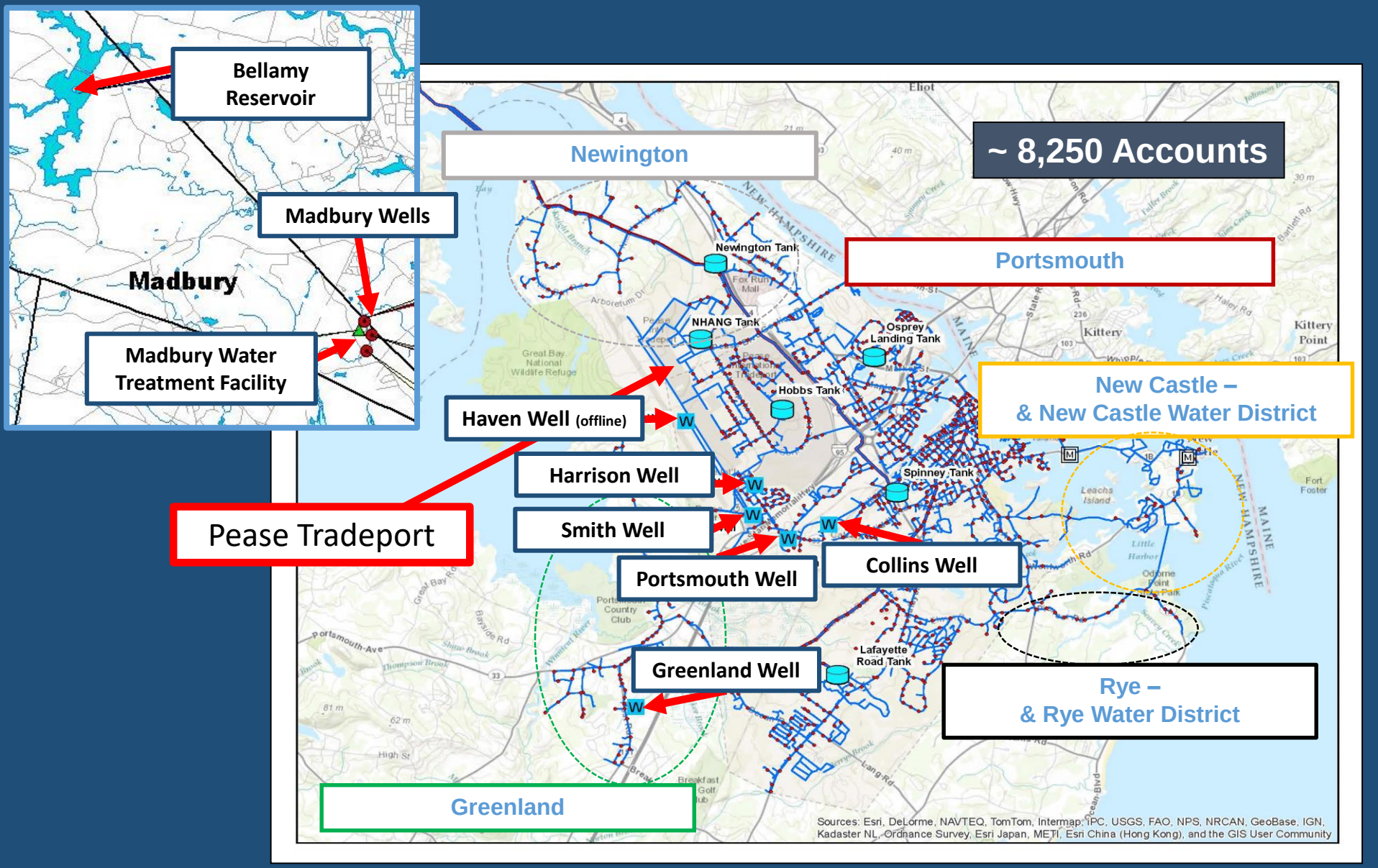


Regional Cooperation - Ongoing and Future

- Southeast Watershed Alliance – Portsmouth is a member community
- Soon to be formed Seacoast Water Quality Study Commission


Seacoast Regional Water System
Drought Meeting
Madbury, NH
October 5, 2016
Hampton (Aquarion)
Portsmouth
Durham
Rollinsford
Dover
Rye
Somersworth
Rochester
Exeter
Newmarket
Raymond
Seabrook
Regulators - NHDES
Consultants

Questions?


Bellamy Reservoir
Madbury Wells
Madbury
Madbury Water Treatment Facility
Newington
~ 8,250 Accounts
Portsmouth
New Castle –
& New Castle Water District
Haven Well (offline)
Harrison Well
Smith Well
Pease Tradeport
Portsmouth Well
Collins Well
Greenland Well
Rye –
& Rye Water District
Greenland
Newington Tank
NHANG Tank
Osprey Landing Tank
Hobbs Tank
Spinney Tank
Lafayette Road Tank
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, iPC, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community