Pease Tradeport PFAS Contamination Summary

City of Portsmouth, New Hampshire

March 20, 2019

Portsmouth Regional Water System

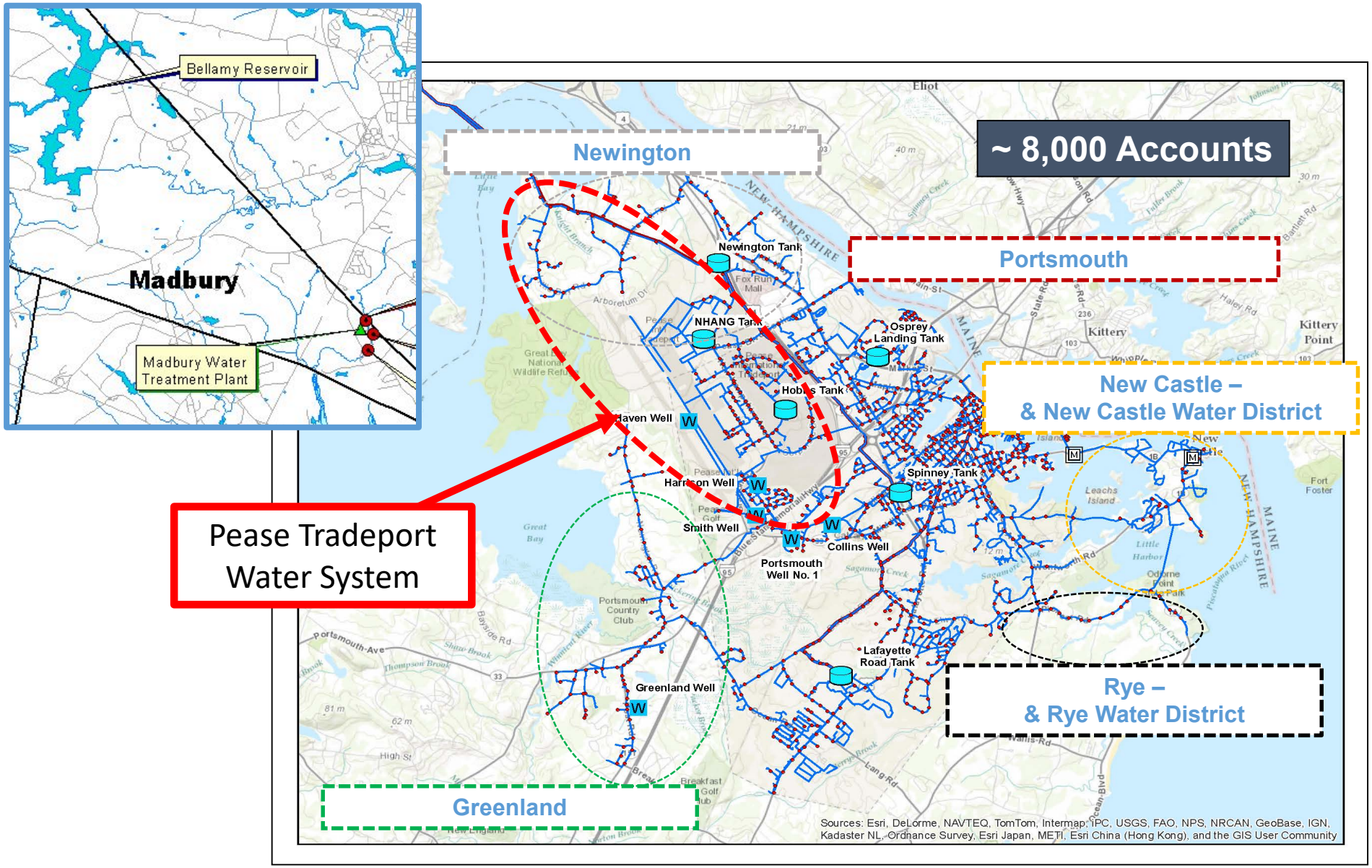
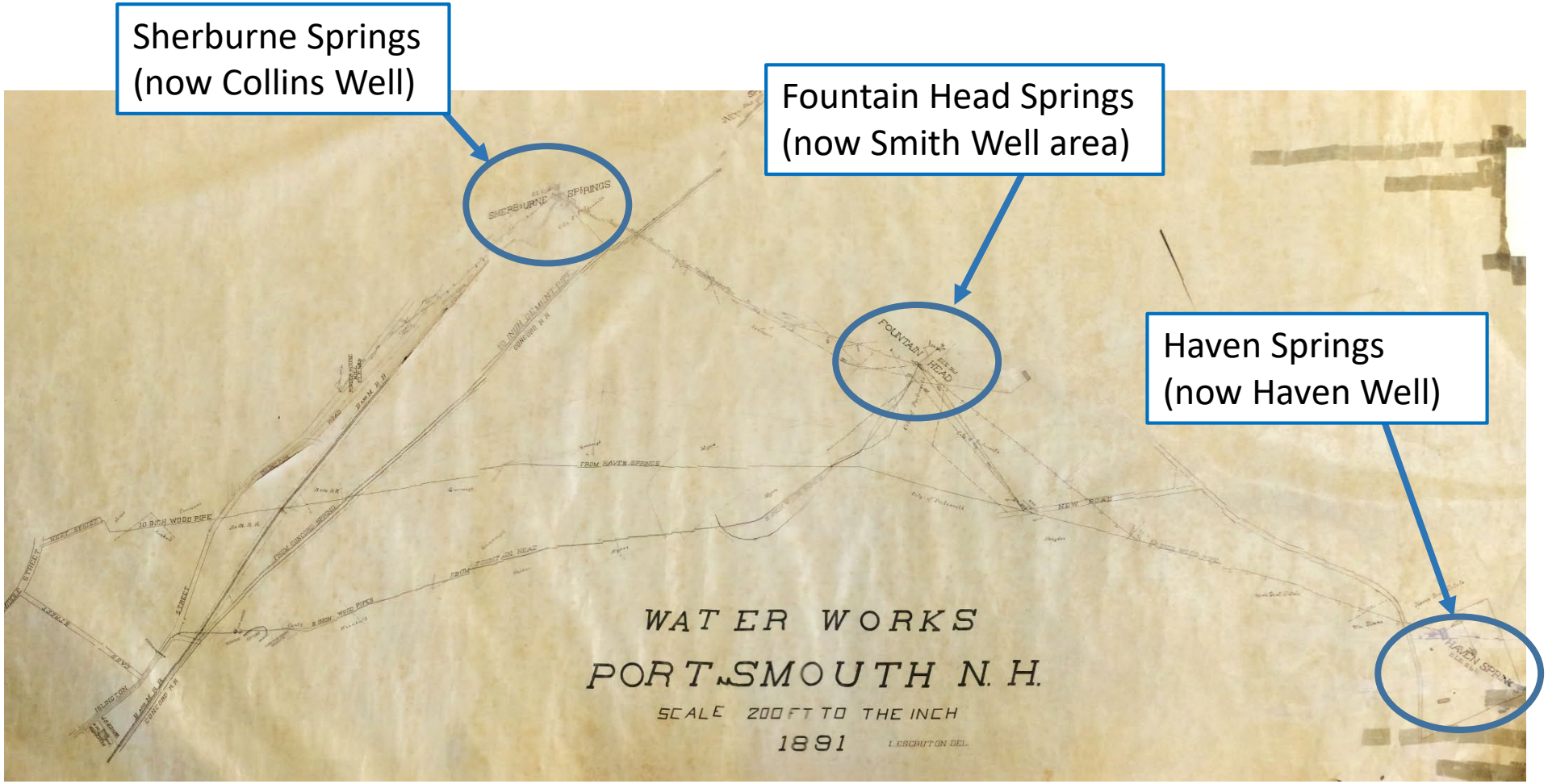


Photo: Underwood Engineers

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.

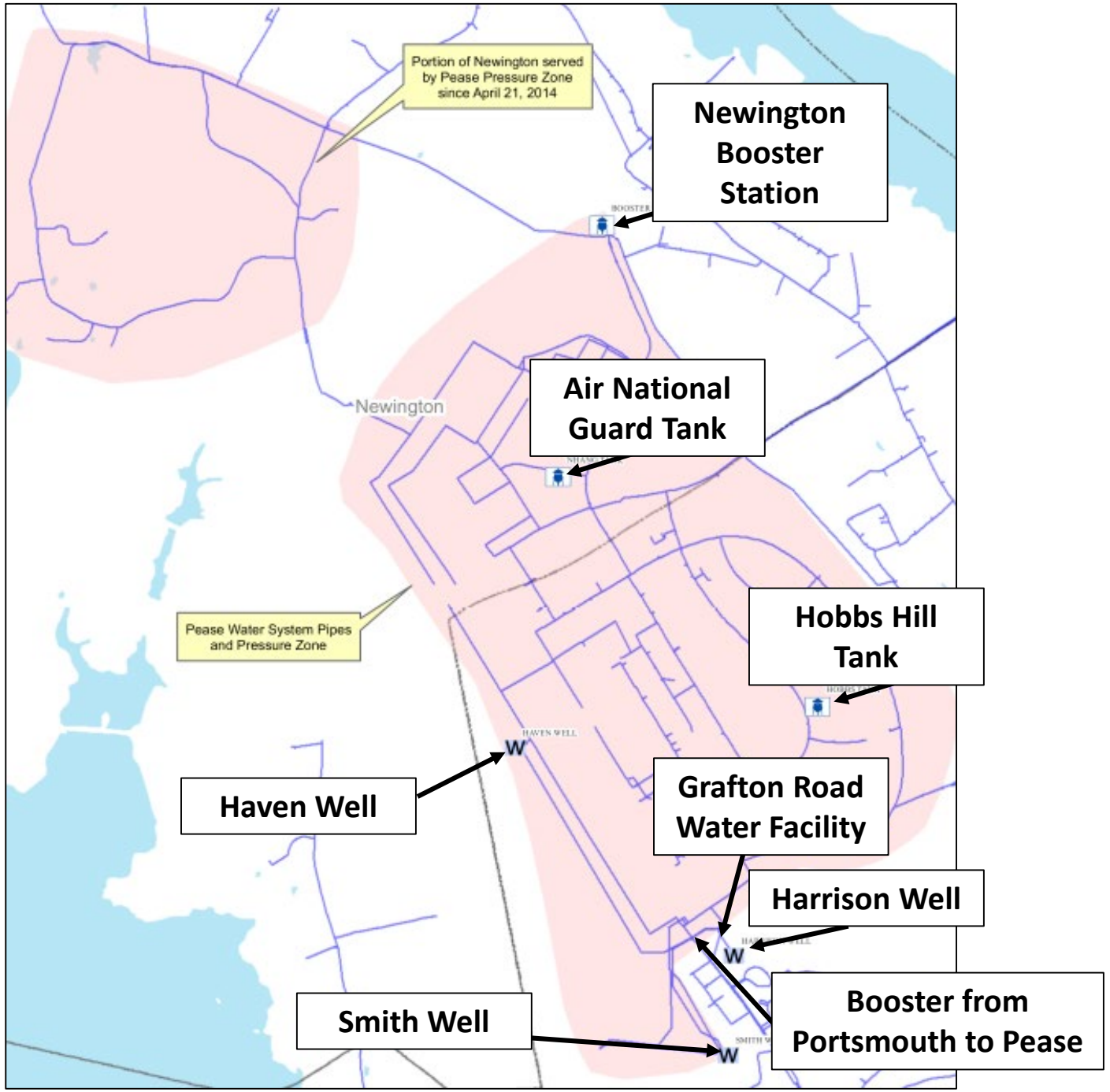
Water Sources in 1891



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 1875 by the City of Portsmouth's water system – currently off-line due to PFAS 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

300 GPM Pump

Harrison Well

Installed in 1957

Replaced in 2006

225 GPM Pump

Haven Well

Out of Service Since May 12, 2014

Installed in 1875 at Haven Springs

Served Pease Air Base: 1956 to 1992

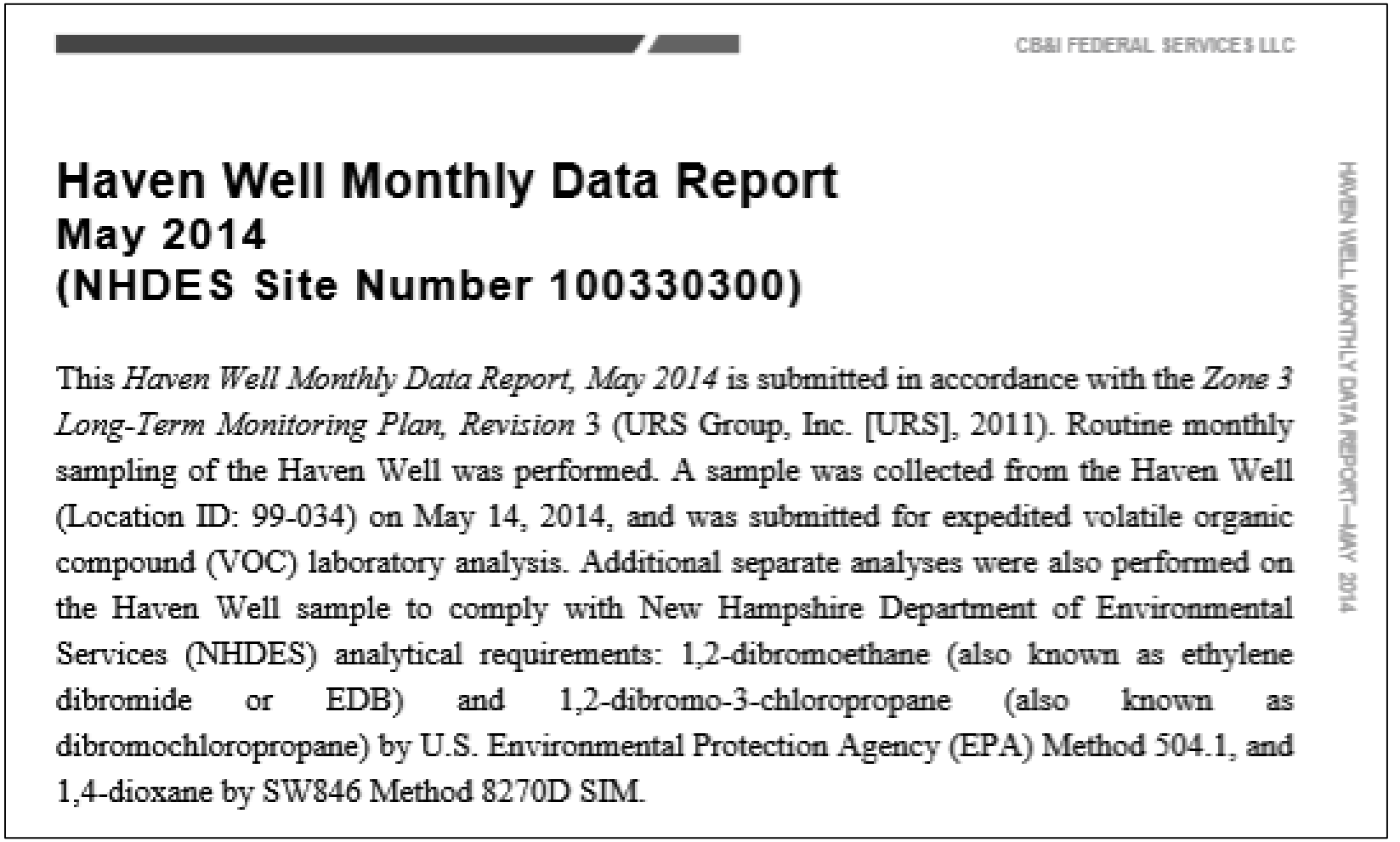
PDA/Portsmouth: 1992 to 2014

500 GPM Pump

Haven Well History

- Elevated nitrates in the 1990's due to urea used for ice control
- Water from Portsmouth booster was used to blend with Pease water to keep nitrates below 5 ppm. An online analyzer was used to regulate flow
- TCE monitoring in place through EPA directives. Well originally had a 300 gallon-per-minute restriction which was lifted around 2010
- Air stripping treatment system installed by Air Force to allow for treatment if monitoring ever triggered the need (never needed)

Haven Well Monitoring – May 2014 Report



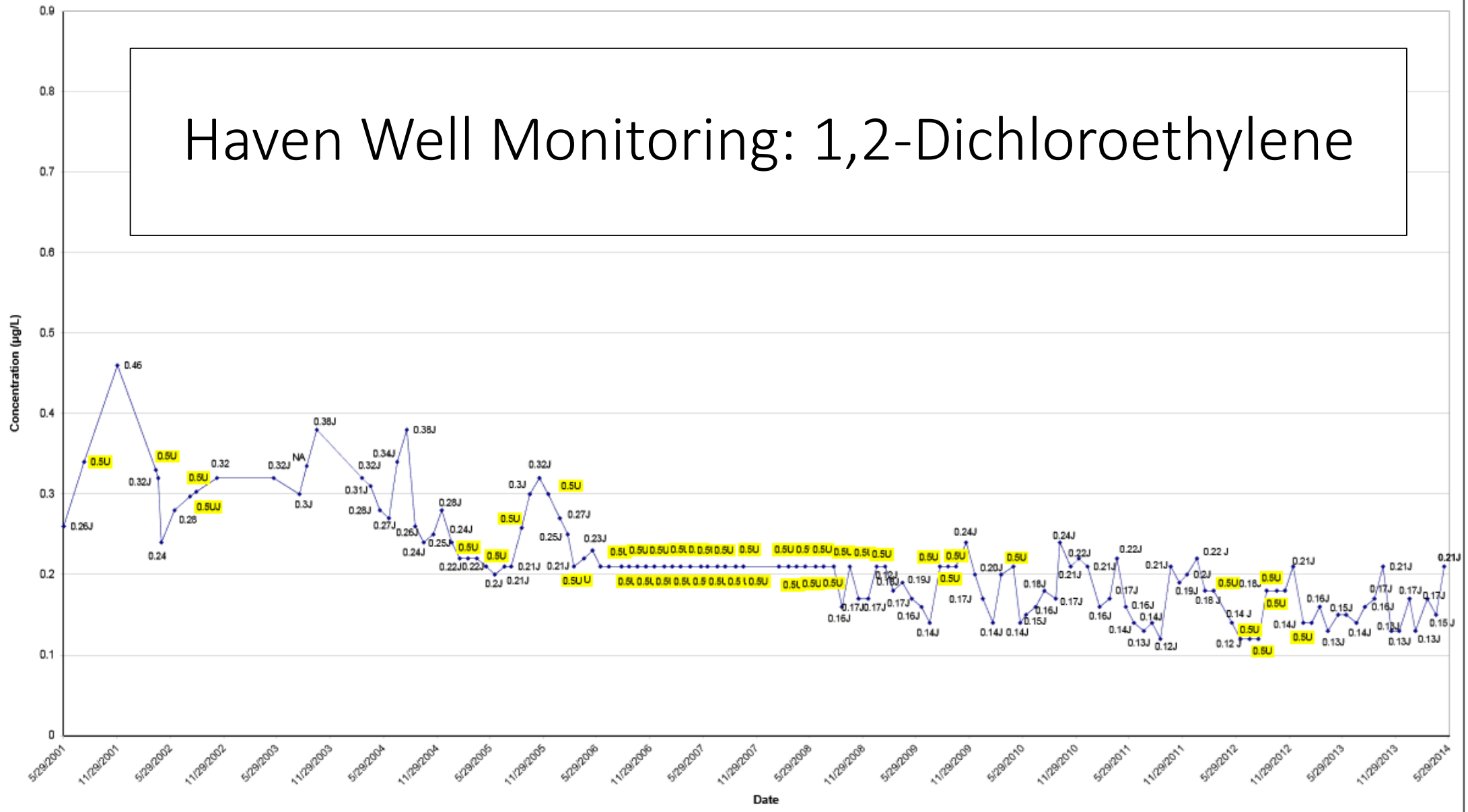
CB&I FEDERAL SERVICES LLC

Haven Well Monthly Data Report
May 2014
(NHDES Site Number 100330300)

This *Haven Well Monthly Data Report, May 2014* is submitted in accordance with the *Zone 3 Long-Term Monitoring Plan, Revision* 3 (URS Group, Inc. [URS], 2011). Routine monthly sampling of the Haven Well was performed. A sample was collected from the Haven Well (Location ID: 99-034) on May 14, 2014, and was submitted for expedited volatile organic compound (VOC) laboratory analysis. Additional separate analyses were also performed on the Haven Well sample to comply with New Hampshire Department of Environmental Services (NHDES) analytical requirements: 1,2-dibromoethane (also known as ethylene dibromide or EDB) and 1,2-dibromo-3-chloropropane (also known as dibromochloropropane) by U.S. Environmental Protection Agency (EPA) Method 504.1, and 1,4-dioxane by SW846 Method 8270D SIM.

HAVEN WELL MONTHLY DATA REPORT—MAY 2014

Haven Well Monitoring: 1,2-Dichloroethylene



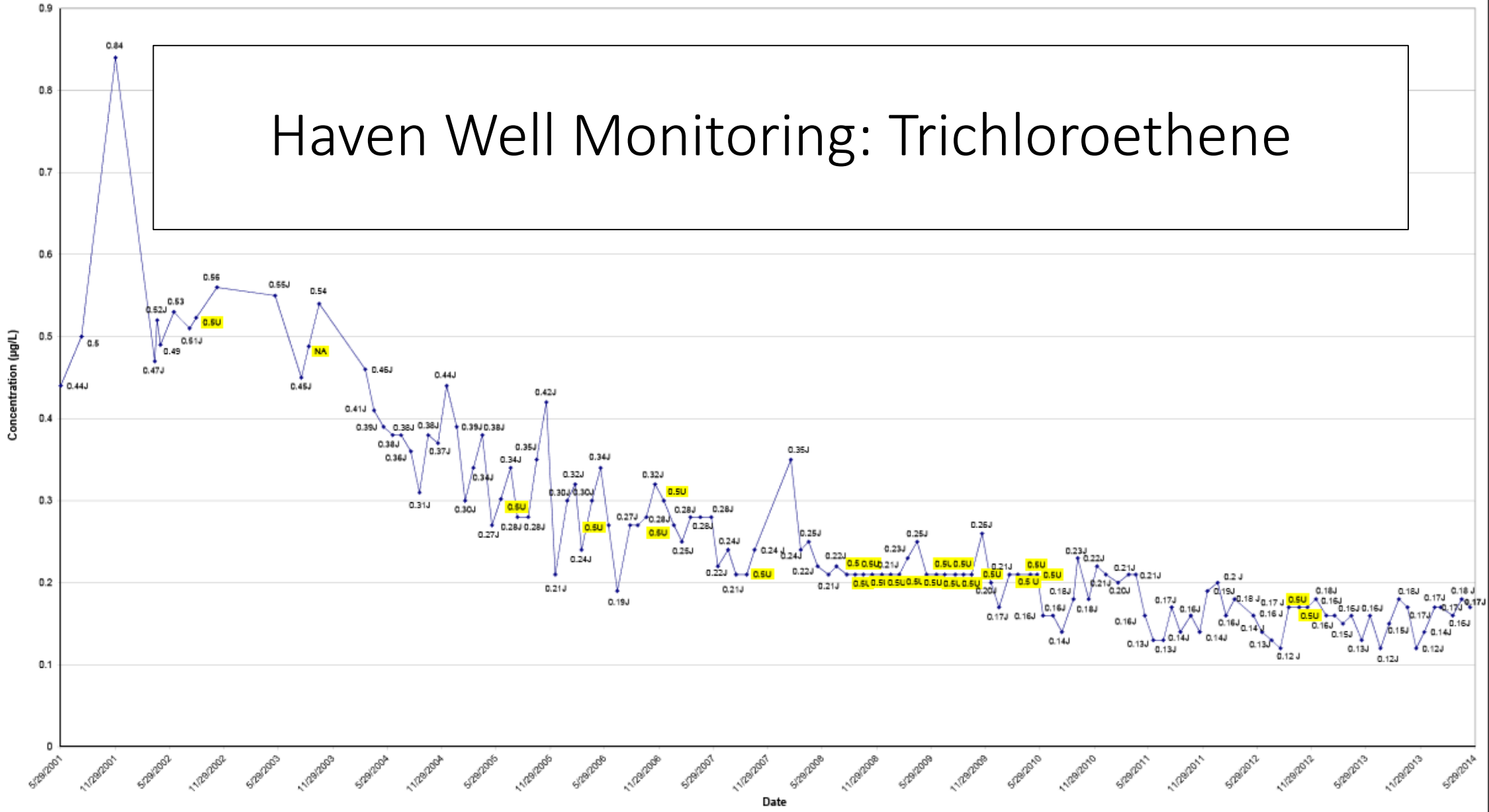
New Hampshire Ambient Groundwater Quality Criteria (NHAGQS) = 70 micrograms per liter (µg/L)

Contingency Threshold (1/2 NHAGQS) = 35 µg/L

Not Analyzed (NA) or non-detect values (0.5U and 0.5UJ) are shown as an interpolated value between previous and successive detection values to aid in assessing data trends.

Haven Well May 2014 Monthly Data Report	
Former Pease Air Force Base, Portsmouth, New Hampshire	
Haven Well Historical *cis* -1,2-Dichloroethylene Data	
CBI	Figure 2

Haven Well Monitoring: Trichloroethene



New Hampshire Ambient Groundwater Quality Criteria (NHAGQS) = 5 micrograms per liter (µg/L)

Contingency Threshold (1/2 NHAGQS) = 2.5 µg/L

Not Analyzed (NA) or non-detect values (0.5 U) are shown as an interpolated value between previous and successive detection values to aid in assessing data trends.

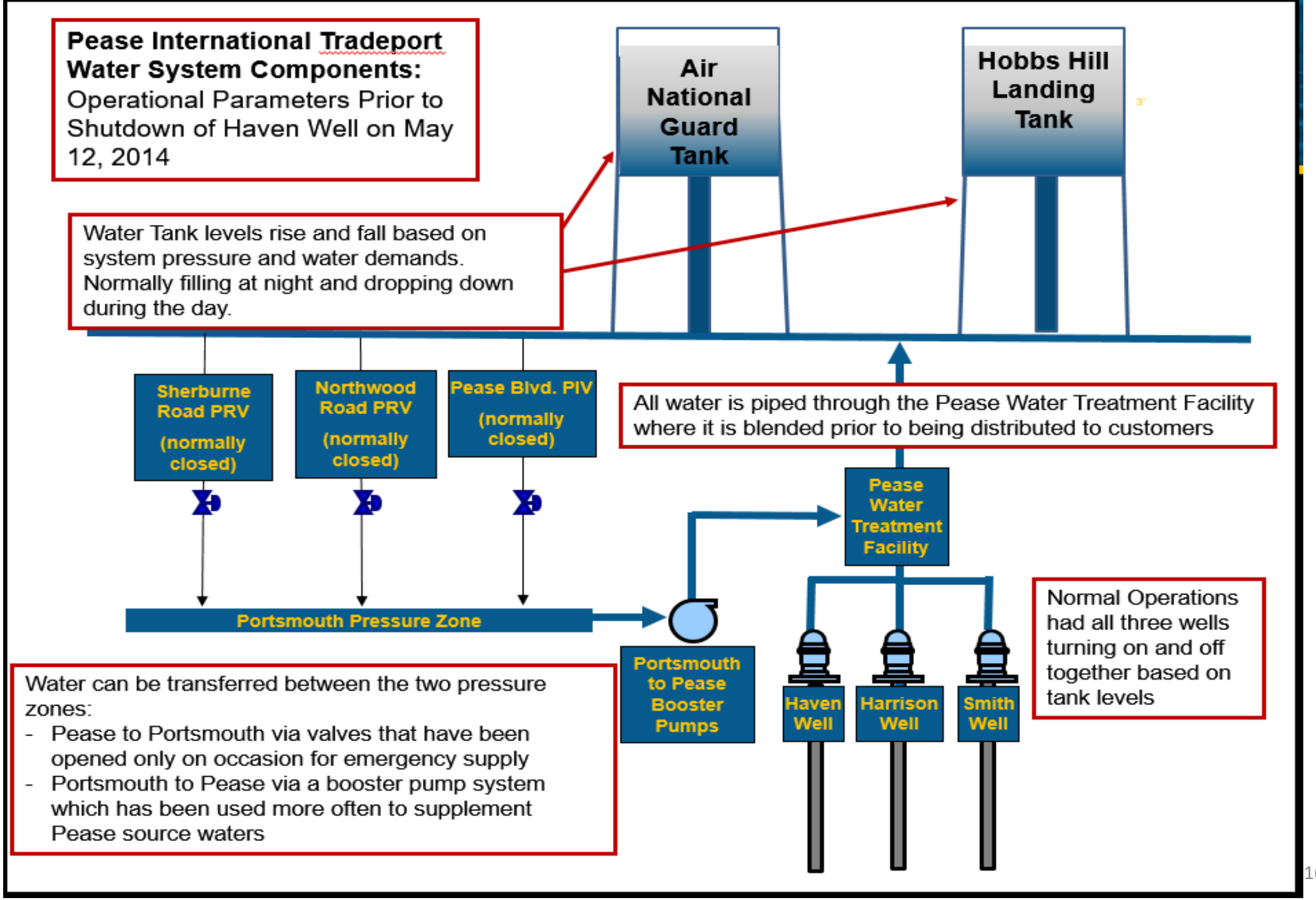
Haven Well May 2014 Monthly Data Report	
Former Pease Air Force Base, Portsmouth, New Hampshire	
Haven Well Historical Trichloroethene Data	
CBI	Figure 3

Pease Booster - Pumps Water from Portsmouth System

Installed in 1990's

Two Pumps

from Portsmouth Water System to Pease

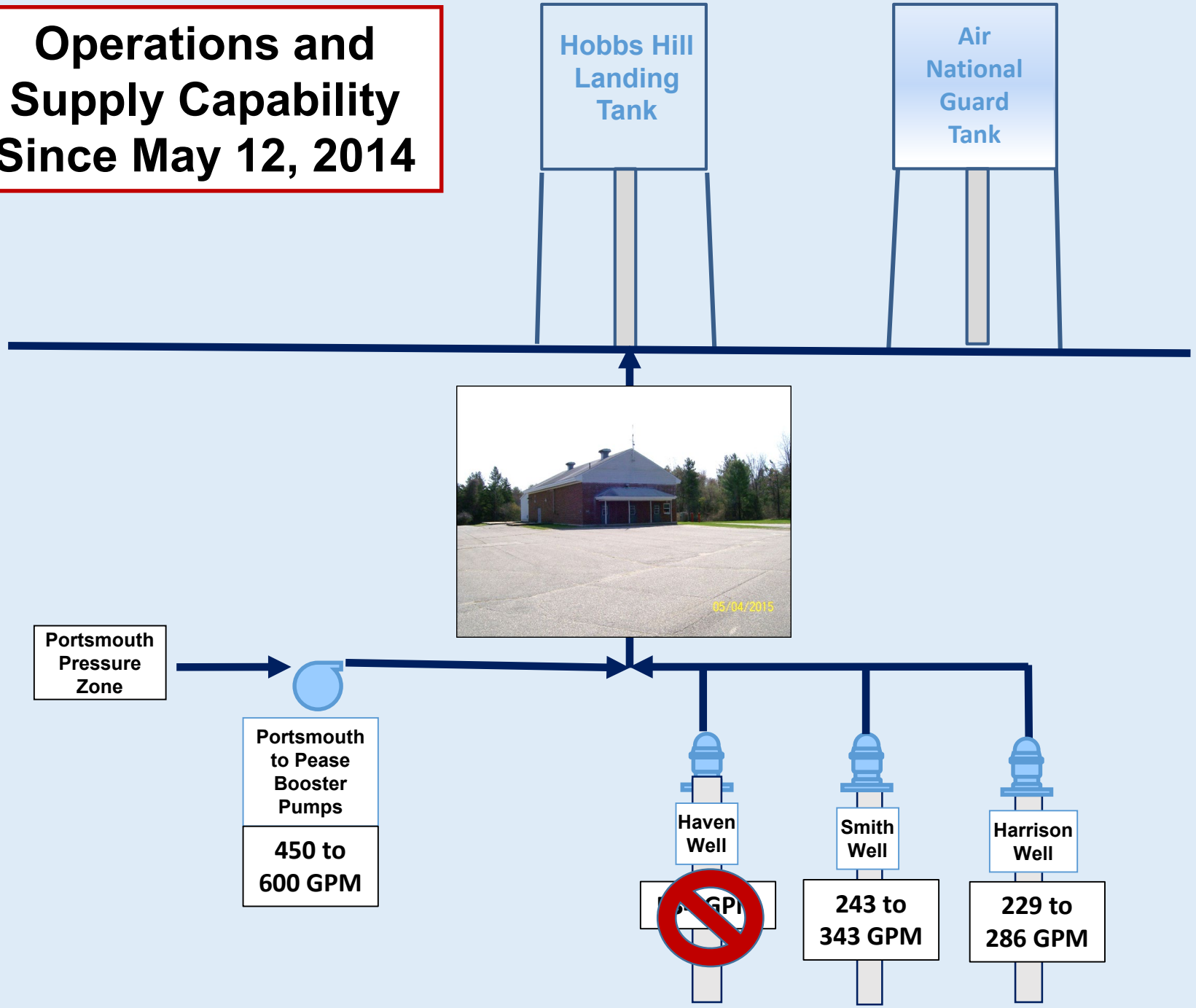

Pease International Tradeport Water System Components:
Operational Parameters Prior to Shutdown of Haven Well on May 12, 2014
Air National Guard Tank
Hobbs Hill Landing Tank
Water Tank levels rise and fall based on system pressure and water demands. Normally filling at night and dropping down during the day.
Sherburne Road PRV (normally closed)
Northwood Road PRV (normally closed)
Pease Blvd. PIV (normally closed)
All water is piped through the Pease Water Treatment Facility where it is blended prior to being distributed to customers
Pease Water Treatment Facility
Portsmouth Pressure Zone
Portsmouth to Pease Booster Pumps
Haven Well
Harrison Well
Smith Well
Normal Operations had all three wells turning on and off together based on tank levels
Water can be transferred between the two pressure zones:
- Pease to Portsmouth via valves that have been opened only on occasion for emergency supply
- Portsmouth to Pease via a booster pump system which has been used more often to supplement Pease source waters

Annual System Pumpage (gallons)

	Haven Well	% Haven	Smith Well	% Smith	Harrison Well	% Harrison	TOTAL Pease Wells
1994	37,634,000	45.9%	44,440,000	54.1%	0	0.0%	82,074,000
1995	49,292,000	66.8%	24,540,000	33.2%	0	0.0%	73,832,000
1996	6,576,000	14.3%	39,540,000	85.7%	0	0.0%	46,116,000
1997	36,726,994	58.5%	26,011,002	41.5%	0	0.0%	62,737,996
1998	38,972,985	57.8%	28,428,000	42.2%	0	0.0%	67,400,985
1999	40,388,000	56.7%	30,808,000	43.3%	0	0.0%	71,196,000
2000	49,750,000	97.4%	1,325,000	2.6%	0	0.0%	51,075,000
2001	52,038,000	80.1%	12,968,000	19.9%	0	0.0%	65,006,000
2002							
2003	71,035,382	52.2%	64,954,967	47.8%	0	0.0%	135,990,349
2004	73,812,574	51.9%	68,433,308	48.1%	0	0.0%	142,245,882
2005	114,582,308	53.3%	100,296,174	46.7%	0	0.0%	214,878,482
2006	84,429,839	48.0%	45,454,922	25.8%	46,112,692	26.2%	175,997,453
2007	74,359,500	46.7%	3,854,842	2.4%	80,863,700	50.8%	159,078,042
2008	68,154,069	41.3%	43,844,000	26.6%	52,843,000	32.1%	164,841,069
2009	80,051,000	50.7%	34,768,000	22.0%	43,055,000	27.3%	157,874,000
2010	76,571,000	44.6%	42,734,000	24.9%	52,442,000	30.5%	171,747,000
2011	64,071,865	38.5%	46,573,950	28.0%	55,781,887	33.5%	166,427,702
2012	73,471,091	46.6%	44,479,353	28.2%	39,645,534	25.2%	157,595,978
2013	99,997,834	52.4%	41,650,052	21.8%	49,241,009	25.8%	190,888,895
2014	25,611,329	20.3%	54,954,603	43.5%	45,759,428	36.2%	126,325,360

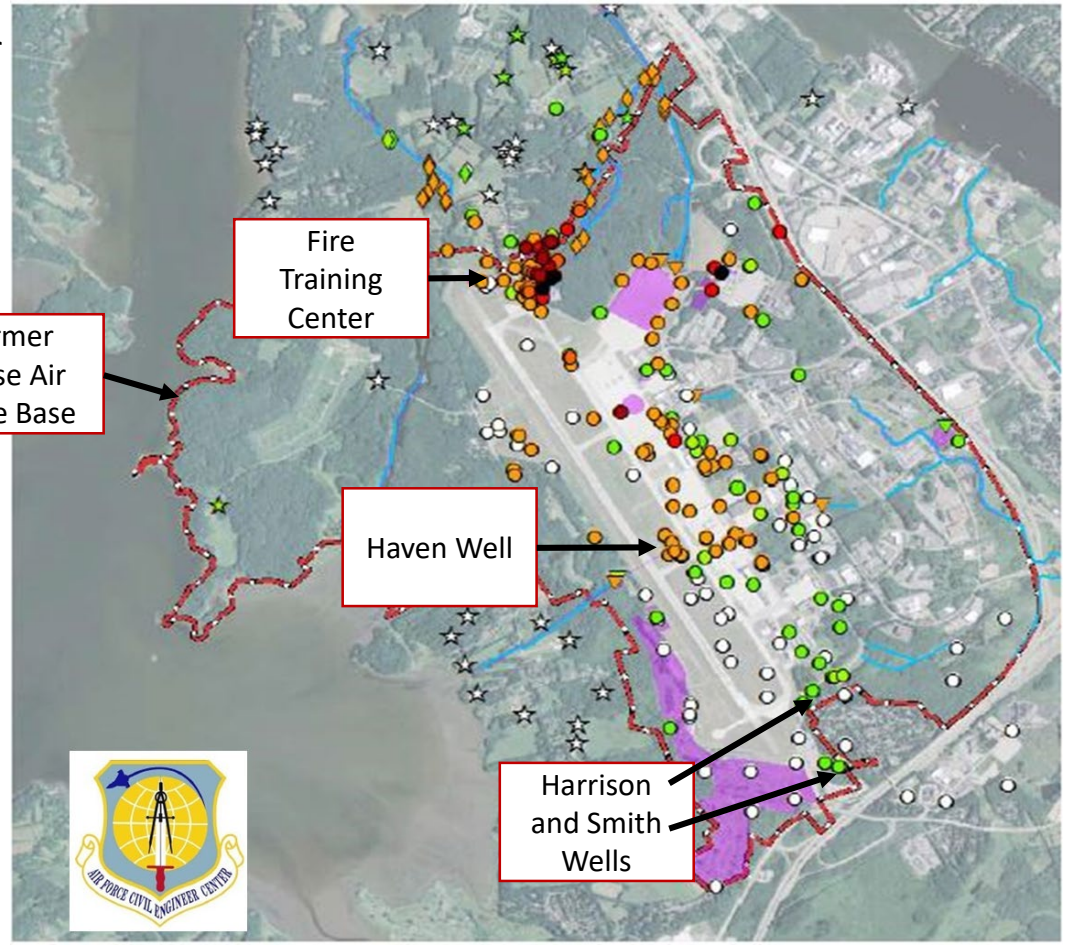
- Harrison Well – Replaced and reactivated in June 2006
- Source data from 1994 to 1999 was derived from “Water System Master Plan” by Earth Tech, Inc. Sept 2000
- 2002 operating report data incomplete
- Flows of boosted water from Portsmouth into Pease were not tracked by system operations – Note the reduction in Pease total gallons for 2014, when water from Portsmouth provided 50% of supply after May 2014

Operations and Supply Capability Since May 12, 2014



Pease Tradeport Water System PFAS Contamination

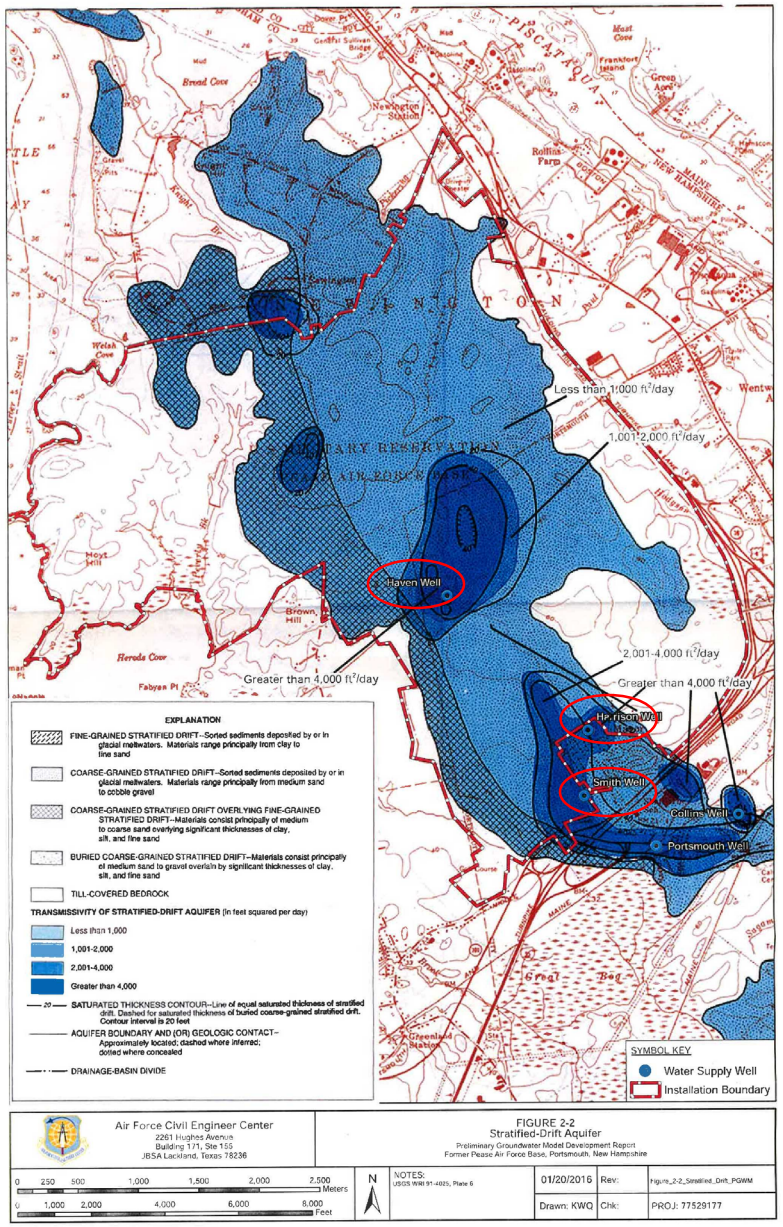
- **April 2014** – NHDES contacts City of Portsmouth to sample the three Pease Tradeport water system wells for PFAS due to detections at former Fire Training Center and past use of AFFF
- **May 12, 2014** – City staff are notified that PFAS levels in Haven Well exceeded the EPA's Health Advisory Standard for PFOS
  - 2,500 ppt (Preliminary Health Advisory = 200 ppt)
- **May 12, 2014**
  - Haven Well is shut down
  - Portsmouth water supplements water lost from Haven Well
  - Smith and Harrison wells remain in service
- Extensive Monitoring of PFAS by the Air Force's consultant
- **July 2015** – EPA Order to Air Force to treat aquifer and wells
- **2015 and 2016** – Preliminary treatment design and treatment piloting studies
- **September 2016** – Activated Carbon Filters on Harrison and Smith Wells
- **2017-2018** – Design of treatment system for all three Pease wells
- **March 18, 2019** – Notice for Contractor to proceed with construction
- **April 2019- January 2021** – Construction of treatment facility



Drinking Water Sources

Well	Flow Rate (gpm)	PFOA+PFOS (µg/L)
Harrison	286	0.029
Smith	343	0.012
Haven	534	1.495

Average PFOA+PFOS concentrations, Harrison and Smith: 2016-2017, Haven: 2016



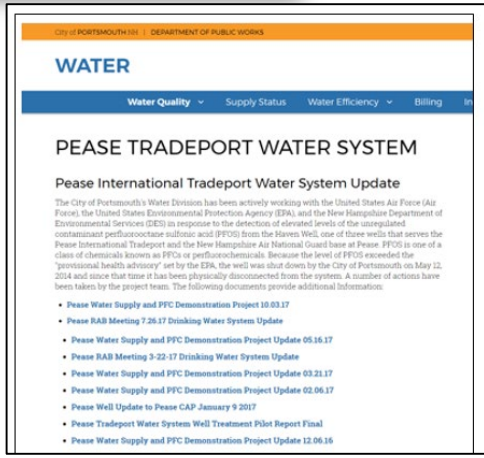
Public Involvement and Outreach:

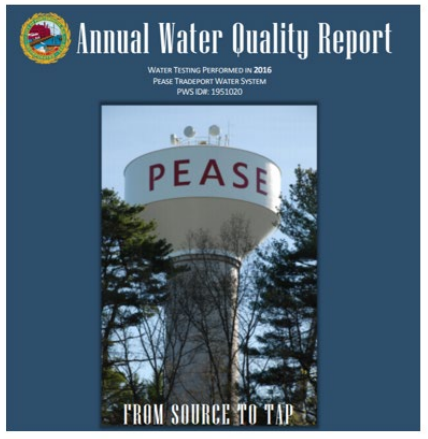
- Press Releases by NHDES and City
- Public Meeting at Pease – May 28, 2014
- Presentations to Portsmouth City Council and Other Groups
- Federal and State delegation involvement
- “Testing for Pease” Facebook Group Forms
- Haven Well Community Advisory Board
  - 14 public meetings in 2014
- Blood Testing
  - March 31st, 2015 – Public Meeting where NHHS Announces Protocol for Pease Blood Testing
  - Three public meetings announcing blood test results
- ATSDR Community Assistance Panel (CAP)
  - Formed in 2016 to address long-term health concerns
- Pease Restoration Advisory Board (RAB)
  - Reestablished in 2016 – Meets every quarter
- Extensive Information by City and State:
  - www.cityofportsmouth.com/publicworks/water/pease-tradeport-water-system
  - Full page dedicated to PFAS in Annual Water Quality Report
- “A lot” of News Coverage!

Shaheen Questions Nominee to Serve as Under Secretary of the Air Force on Pease Well Contamination

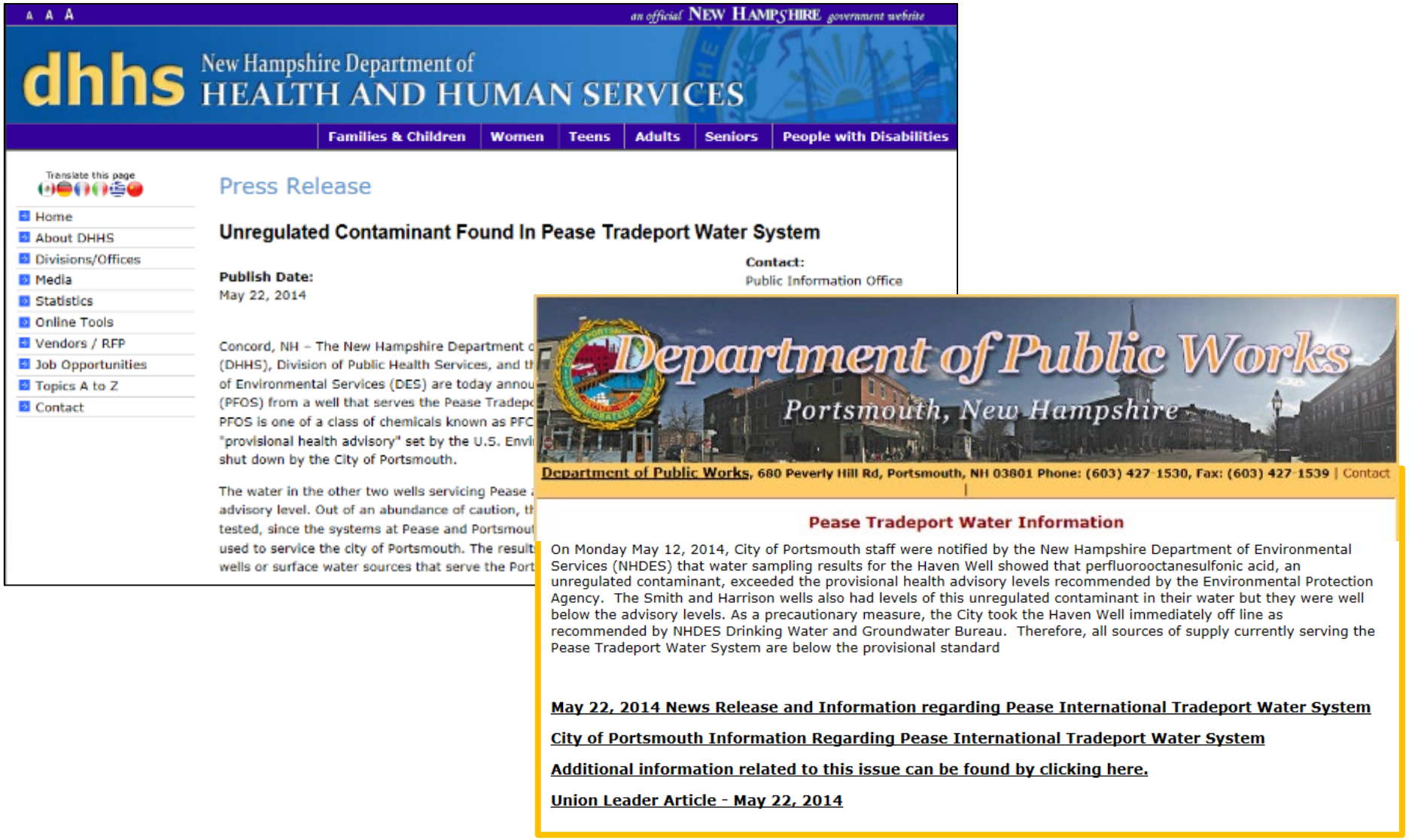
SenatorShaheen Subscribe 171

23 views





Inform the Public – 2014 Press Releases



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dhhs New Hampshire Department of HEALTH AND HUMAN SERVICES

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Press Release

Unregulated Contaminant Found In Pease Tradeport Water System

Publish Date:
May 22, 2014

Contact:
Public Information Office

Concord, NH – The New Hampshire Department o
(DHHS), Division of Public Health Services, and th
of Environmental Services (DES) are today annou
(PFOS) from a well that serves the Pease Tradepo
PFOS is one of a class of chemicals known as PFC
"provisional health advisory" set by the U.S. Envi
shut down by the City of Portsmouth.

The water in the other two wells servicing Pease
advisory level. Out of an abundance of caution, th
tested, since the systems at Pease and Portsmou
used to service the city of Portsmouth. The result
wells or surface water sources that serve the Port

Department of Public Works
Portsmouth, New Hampshire

Department of Public Works, 680 Peverly Hill Rd, Portsmouth, NH 03801 Phone: (603) 427-1530, Fax: (603) 427-1539 | Contact

Pease Tradeport Water Information

On Monday May 12, 2014, City of Portsmouth staff were notified by the New Hampshire Department of Environmental Services (NHDES) that water sampling results for the Haven Well showed that perfluorooctanesulfonic acid, an unregulated contaminant, exceeded the provisional health advisory levels recommended by the Environmental Protection Agency. The Smith and Harrison wells also had levels of this unregulated contaminant in their water but they were well below the advisory levels. As a precautionary measure, the City took the Haven Well immediately off line as recommended by NHDES Drinking Water and Groundwater Bureau. Therefore, all sources of supply currently serving the Pease Tradeport Water System are below the provisional standard

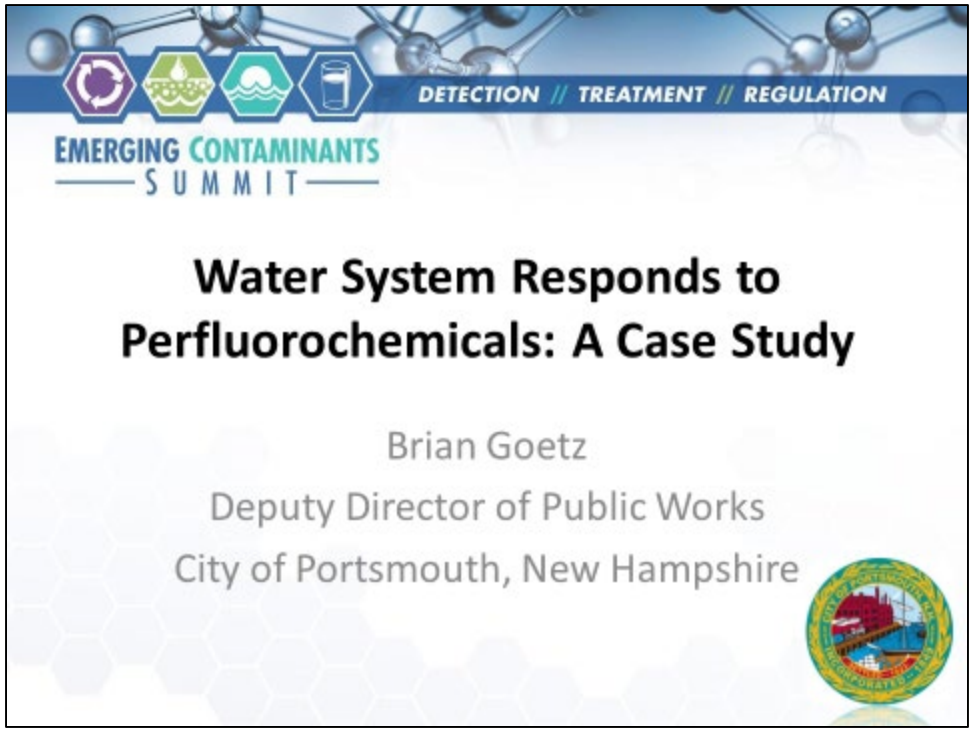
May 22, 2014 News Release and Information regarding Pease International Tradeport Water System

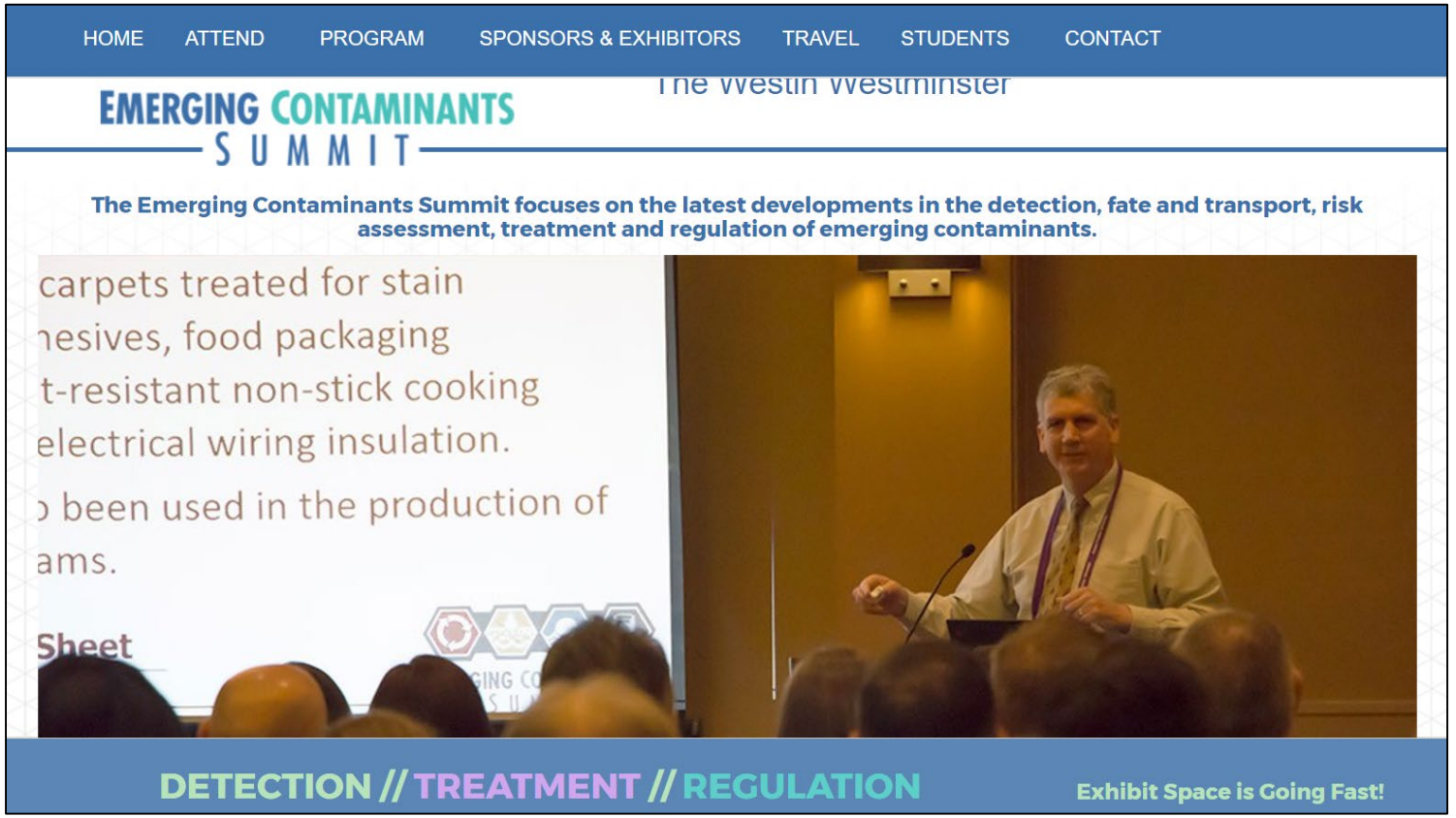
City of Portsmouth Information Regarding Pease International Tradeport Water System

Additional information related to this issue can be found by clicking here.

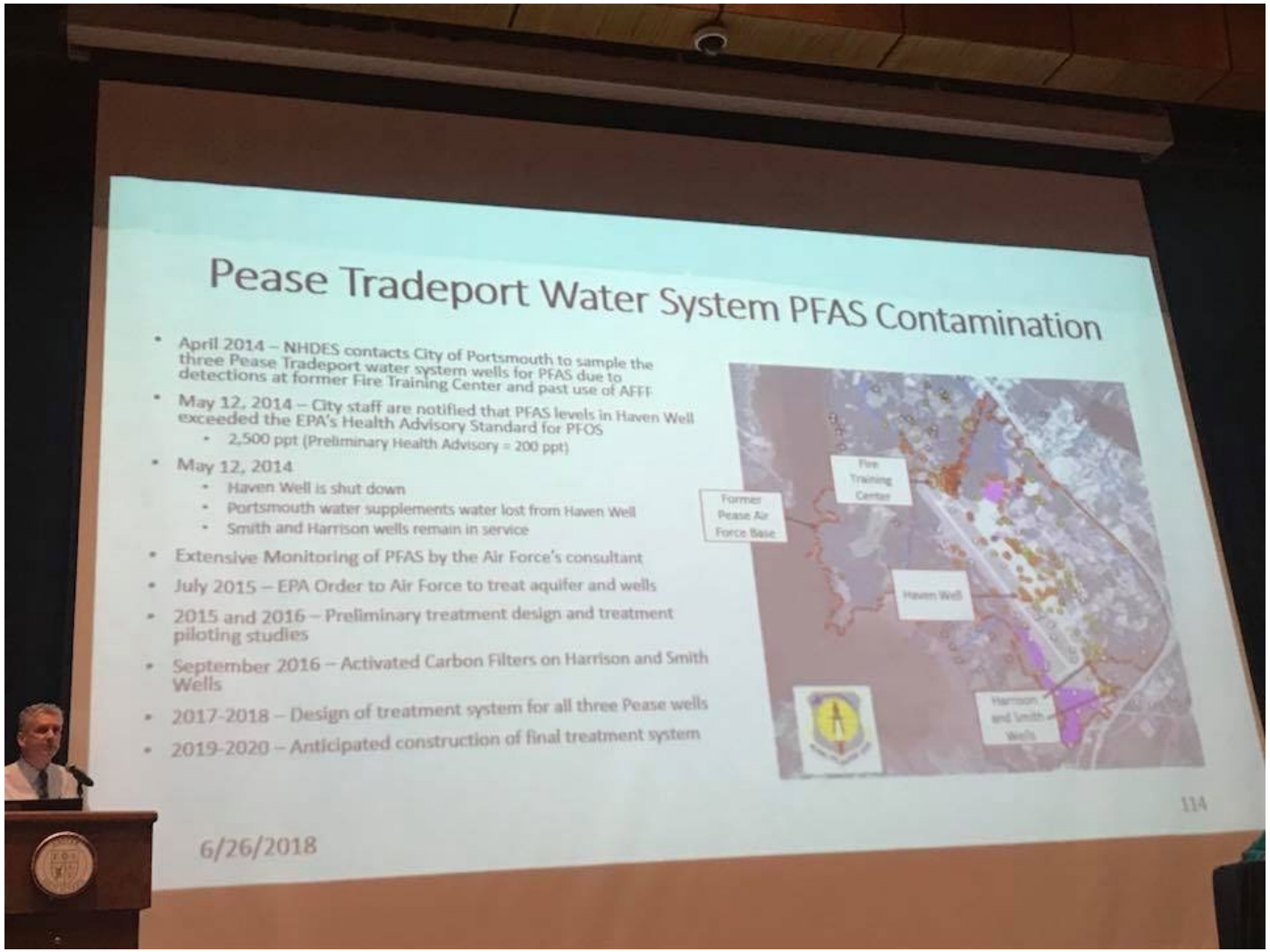
Union Leader Article - May 22, 2014

2016 Emerging Contaminants Summit
Denver, Colorado





EPA Region 1 PFAS Summit



Public Outreach – Comprehensive Website and Water Quality Report Updates:

City of PORTSMOUTH NH | DEPARTMENT OF PUBLIC WORKS

WATER

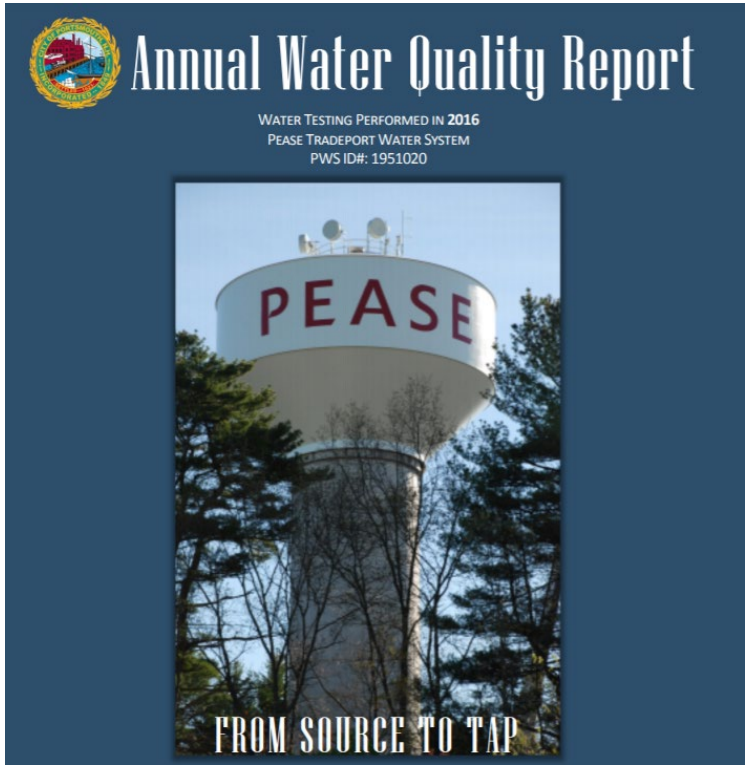
Water Quality | Supply Status | Water Efficiency | Billing | In

PEASE TRADEPORT WATER SYSTEM

Pease International Tradeport Water System Update

The City of Portsmouth's Water Division has been actively working with the United States Air Force (Air Force), the United States Environmental Protection Agency (EPA), and the New Hampshire Department of Environmental Services (DES) in response to the detection of elevated levels of the unregulated contaminant perfluorooctane sulfonic acid (PFOS) from the Haven Well, one of three wells that serves the Pease International Tradeport and the New Hampshire Air National Guard base at Pease. PFOS is one of a class of chemicals known as PFCs or perfluorochemicals. Because the level of PFOS exceeded the "provisional health advisory" set by the EPA, the well was shut down by the City of Portsmouth on May 12, 2014 and since that time it has been physically disconnected from the system. A number of actions have been taken by the project team. The following documents provide additional information:

- Pease Water Supply and PFC Demonstration Project 10.03.17
- Pease RAB Meeting 7.26.17 Drinking Water System Update
- Pease Water Supply and PFC Demonstration Project Update 05.16.17
- Pease RAB Meeting 3-22-17 Drinking Water System Update
- Pease Water Supply and PFC Demonstration Project Update 03.21.17
- Pease Water Supply and PFC Demonstration Project Update 02.06.17
- Pease Well Update to Pease CAP January 9 2017
- Pease Tradeport Water System Well Treatment Pilot Report Final
- Pease Water Supply and PFC Demonstration Project Update 12.06.16
- Drinking Water Health Advisories
- Portsmouth announces upgraded water filtration at Pease Tradeport
- Pease Water Supply Update 09_08_16
- Pease Water Treatment System and Piloting Overview RAB Tour 07.14.16
- Pease Water Supply Update 06_30_16
- Portsmouth Signs Agreement with Air Force to Proceed with Pease Tradeport Well Treatment System Project
- Haven Well Update to City Council March 12 2016



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)

PER- AND POLYFLUOROALKYL SUBSTANCE (concentrations* reported in ng/L or ppt)		Water From Portsmouth System Supplied As Needed (0% to 50% of Total Pease Supply)								Pease Sources**		Treated Well Water***
		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 22, 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 NHDES AGQS for PFOS and PFOA concentration separately or combined is 70 ng/L (ppt)

ND = Not Detected above laboratory method detection limit

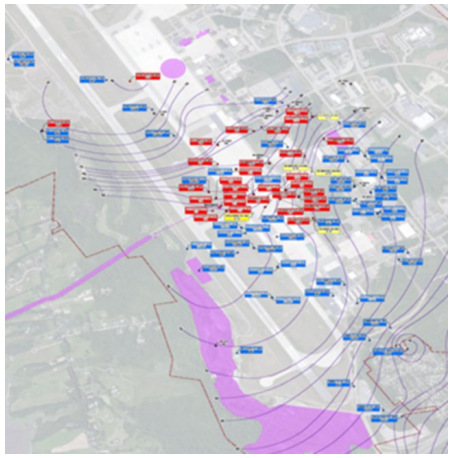
PFAS analyzed but not detected in the samples:
8:2 Fluorotelomer sulfonate (8:2 FTS), N-Ethyl perfluorooctane sulfonamide (EtFOSA), N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE), N-Methyl Perfluorooctane Sulfonamide (MeFOSA), N-Methyl Perfluorooctane Sulfonamidoethanol (MeFOSE), Perfluorodecane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

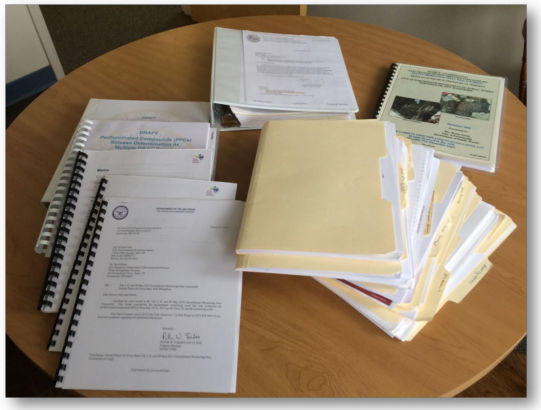
Staff Commitment – May 2014 to Now…

- Water system adjustments – Compounded in 2016 by the driest summer in 82 years
- Technical research
- Technical meetings
- Water quality summaries
- Changing water quality health advisories and standards
- Negotiations with Air Force
- Contracts
- Public outreach and meetings
- Complex, Evolving, Stressful … Five years now

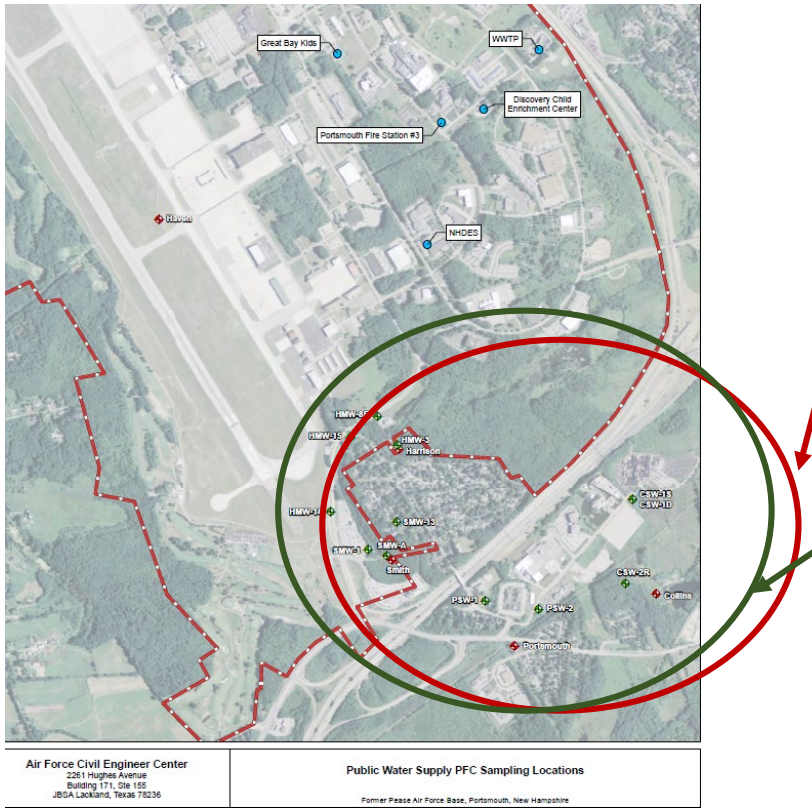
Pease Tradeport PFAS Investigation

- Technical Team
  - Air Force Civil Engineering
  - Air Force Engineering Consultants
  - EPA Region 1
  - NHDES Waste Division
  - NHDES Drinking Water and Groundwater Program
  - Pease Development Authority
  - City of Portsmouth Staff and Consultants





Monitor –
PFAS Monitoring Locations around Pease and Portsmouth Drinking Water Wells



Production Wells - Monthly:

- Smith
- Harrison
- Portsmouth
- Collins

Sentry Wells

- 11 Wells - Quarterly

Haven Well PFAS Results - 2014

Date	Sampler	6:2 Fluoro telomer sulfonate	8:2 Fluoro telomer sulfonate	Perfluoro butane sulfonate	Perfluoro butanoic Acid	Perfluoro pentanoic Acid	Perfluoro hexane sulfonate	Perfluoro hexanoic acid	Perfluoro heptane sulfonate	Perfluoro heptanoic acid	Perfluoro octane sulfonate	Perfluoro octanoic acid	Perfluoro heptanoic acid	PFOS + PFOA
		6:2 FTS	**8:2 FTS**	**PFBS**	**PFBA**	**PFPeA**	**PFHxS**	**PFHxA**	**PFHpS**	**PFHpA**	**PFOS**	**PFOA**	**PFNA**	
4/16/2014	Air Force	-	-	0.051	-	0.27	0.83	0.33	-	0.12	2.50	0.35	0.017	2.85
5/14/2014	Air Force	-	-	0.051	-	0.26	0.96	0.35	-	0.12	2.40	0.32	0.017	2.72
5/16/2014	NHDES	-	-	ND	-	-	0.80	-	-	0.12	1.90	0.297	ND	2.20
AVERAGE PPB				0.051		0.265	0.86	0.34		0.12	2.27	0.32233	0.017	2.59
AVERAGE PPT				**51**		**265**	**864**	**340**		**118**	**2267**	**322**	**17**	**2589**

Haven Well PFAS Results - 2016

Date	Sampler	6:2 Fluoro telomer sulfonate	8:2 Fluoro telomer sulfonate	Perfluoro butane sulfonate	Perfluoro butanoic Acid	Perfluoro pentanoic Acid	Perfluoro hexane sulfonate	Perfluoro hexanoic acid	Perfluoro heptane sulfonate	Perfluoro heptanoic acid	Perfluoro octane sulfonate	Perfluoro octanoic acid	Perfluoro heptanoic acid	PFOS + PFOA
		6:2 FTS	**8:2 FTS**	**PFBS**	**PFBA**	**PFPeA**	**PFHxS**	**PFHxA**	**PFHpS**	**PFHpA**	**PFOS**	**PFOA**	**PFNA**	
11/16/2016	W&S	0.22	0.037	0.043	0.075	0.25	0.83	0.29	0.054	0.12	1.00	0.27	0.018	1.27
11/28/2016	W&S	0.22	0.031	0.038	0.071	0.25	0.81	0.3	0.045	0.13	1.40	0.32	0.017	1.72
AVERAGE PPB		0.22	0.034	0.0405	0.073	0.25	0.82	0.295	0.0495	0.125	1.2	0.295	0.0175	1.495
AVERAGE PPT		**220**	**34**	**40.5**	**73**	**250**	**820**	**295**	**49.5**	**125**	**1200**	**295**	**17.5**	**1495**

Haven Well PFAS Results – 2017-2018

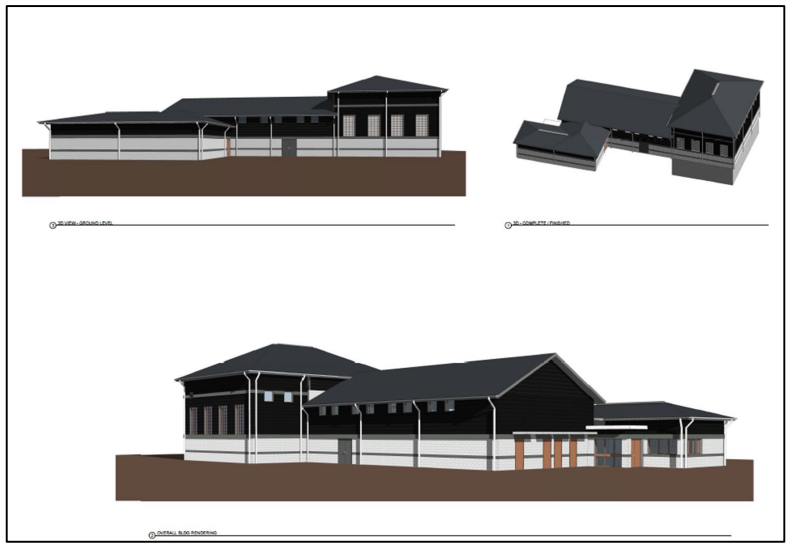
Date	Sampler	6:2 Fluoro telomer sulfonate	8:2 Fluoro telomer sulfonate	Perfluoro butane sulfonate	Perfluoro butanoic Acid	Perfluoro pentanoic Acid	Perfluoro hexane sulfonate	Perfluoro hexanoic acid	Perfluoro heptane sulfonate	Perfluoro heptanoic acid	Perfluoro octane sulfonate	Perfluoro octanoic acid	Perfluoro heptanoic acid	PFOS + PFOA
		6:2 FTS	8:2 FTS	PFBS	PFBA	PFPeA	PFHxS	PFHxA	PFHpS	PFHpA	PFOS	PFOA	PFNA	
11/1/2017	ETC2	0.18	0.035	0.048	0.063	0.20	0.60	0.26	0.045	0.10	1.50	0.24	0.02	1.74
11/15/2017	ETC2	0.19	0.027	0.039	0.063	0.24	0.75	0.29	0.04	0.11	1.30	0.25	0.017 J	1.55
11/29/2017	ETC2	0.17	0.022	0.046	0.066	0.24	0.81	0.29	0.039	0.11	1.30	0.22	0.017 J	1.52
12/14/2017	ETC2	0.2	0.026	0.034	0.062	0.24	0.76	0.27	0.032	0.096	1.30	0.24	0.015 J	1.54
1/3/2018	ETC2	0.17	0.029	0.037	0.064	0.22	0.67	0.25	0.033	0.092	1.4	0.26	0.016 J	1.66
1/18/2018	ETC2	0.16	0.03	0.042	0.056	0.22	0.55	0.23	0.039	0.085	1.2	0.19	0.019 J	1.39
1/25/2018	ETC2	0.19	0.024	0.044	0.067	0.26	0.75	0.3	0.045	0.200	1.2	0.26	0.018 J	1.46
2/22/2018	ETC2	0.16	0.031	0.042	0.06	0.23	0.66	0.26	0.038	0.110	1.2	0.24	0.017 J	1.44
4/9/2018	ETC2	0.18	0.035	0.048	0.064	0.25	0.72	0.31	0.048	0.110	1.4	0.25	0.021	1.65
4/27/2018	ETC2	0.18	0.031	0.045	0.068	0.24	0.72	0.31	0.042	0.110	2.0	0.27	0.017 J	2.27
5/21/2018	ETC2	0.17	0.024	0.04	0.058	0.23	0.71	0.27	0.038	0.100	1.6	0.26	0.010 J	1.86
6/8/2018	ETC2	0.15	0.024	0.041	0.054	0.2	0.66	0.25	0.038	0.088	1.2	0.21	0.012 J	1.41
6/28/2018	ETC2	0.14	0.021	0.034	0.055	0.18	0.52	0.22	0.03	0.076	1.3	0.18	0.010 J	1.48
AVERAGE PPB		0.17	0.03	0.04	0.06	0.23	0.68	0.27	0.04	0.11	1.38	0.24	0.016	1.61
AVERAGE PPT		172	28	42	62	227	683	270	39	107	1377	236	16	1613

Haven Well PFAS Results – All Samples

Sample Label	Sampler	Samples	6:2 Fluoro telomer sulfonate	8:2 Fluoro telomer sulfonate	Perfluoro butane sulfonate	Perfluoro butanoic Acid	Perfluoro pentanoic Acid	Perfluoro hexane sulfonate	Perfluoro hexanoic acid	Perfluoro heptane sulfonate	Perfluoro heptanoic acid	Perfluoro octane sulfonate	Perfluoro octanoic acid	Perfluoro heptanoic acid	PFOS + PFOA
			6:2 FTS	**8:2 FTS**	**PFBS**	**PFBA**	**PFPeA**	**PFHxS**	**PFHxA**	**PFHpS**	**PFHpA**	**PFOS**	**PFOA**	**PFNA**	
2014 Sampling	Air Force	2			51		265	895	340		120	2,450	335	17	2,785
2014 Sampling	NHDES	1			ND			801			115	1,900	297	ND	2,197
2016 Sampling	City/Weston & Sampson	2	220	34	41	73	250	820	295	50	125	1,200	295	18	1,495
Haven Resin GAC Pilot	ECT2	13	172	28	42	62	227	683	270	39	107	1,377	236	16	1,613

Pease Tradeport Water System PFAS Contamination - Treatment Options

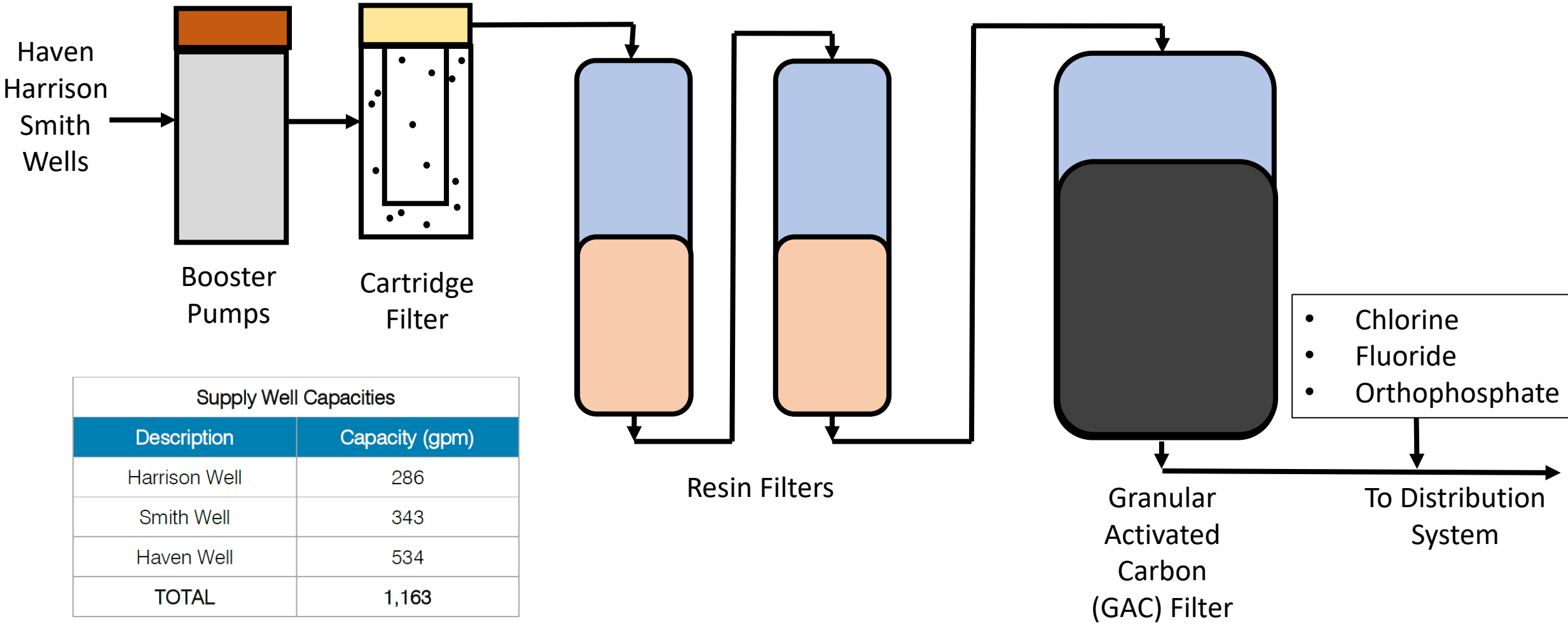
- Investigated other public water systems that treat PFAS
- Piloted Granular Activated Carbon (GAC) System
- Installed Calgon F-400 Carbon filters on Harrison and Smith wells to Demonstrate effectiveness
- Piloted alternative treatment – resins
- Current design includes resin and carbon filters



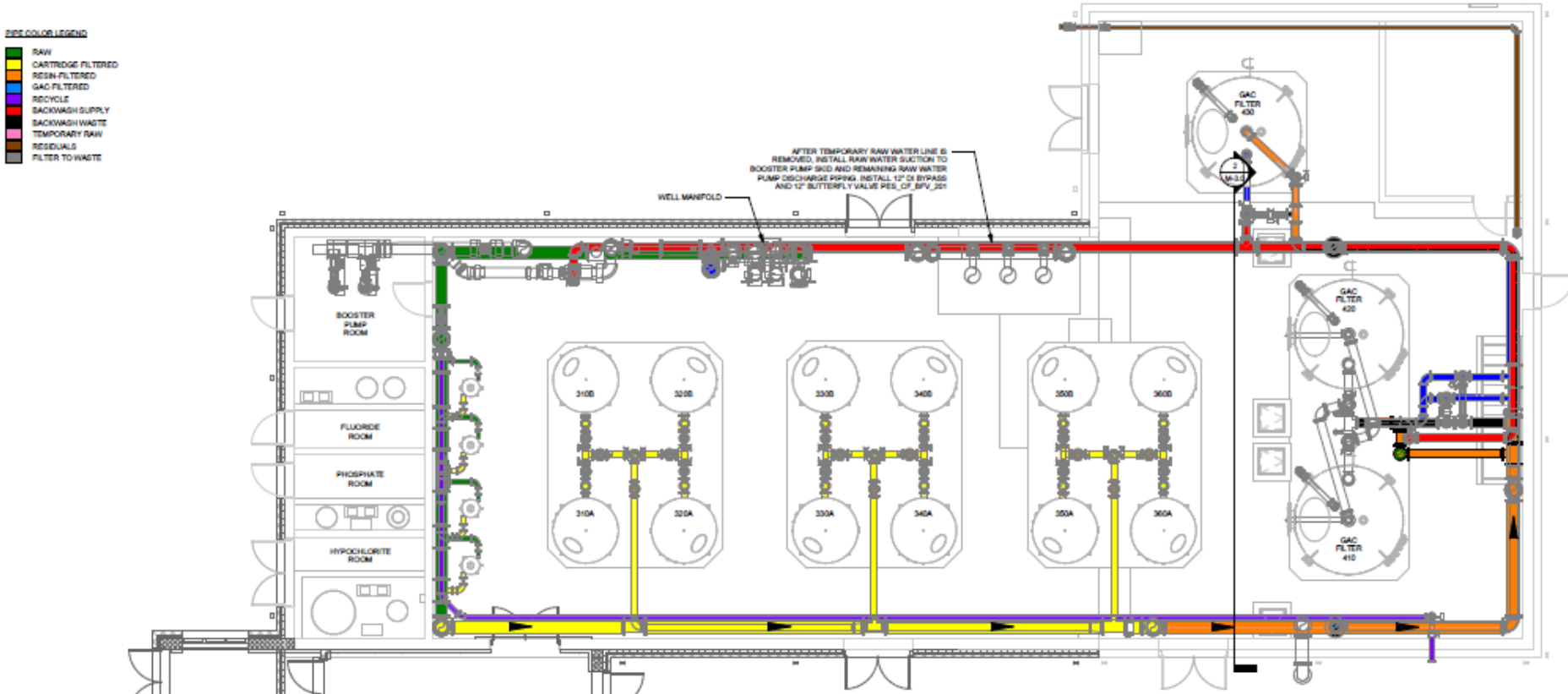
Pease Well PFOA/PFOS Response – Demonstration Filters in Service Since September 2016

Haven Well Pilot Study

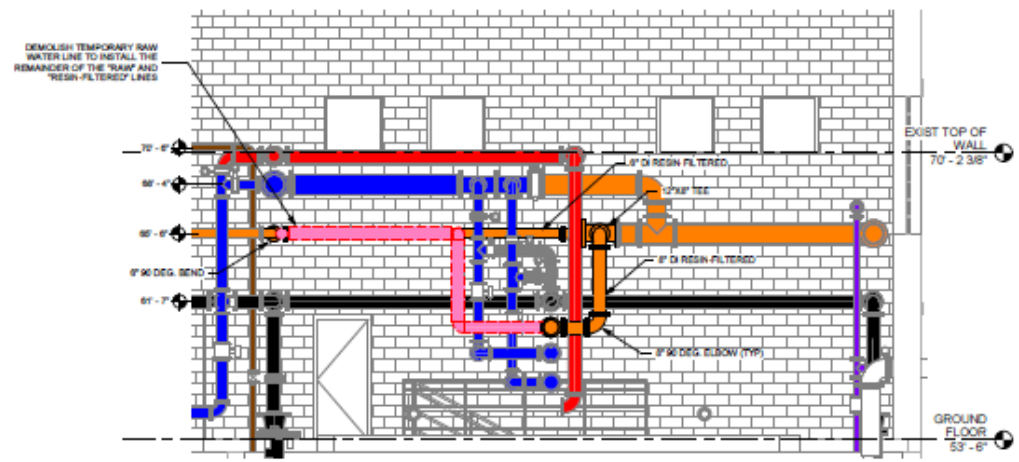
Grafton Road Water Facility Process Schematic
Current Treatment System Design



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

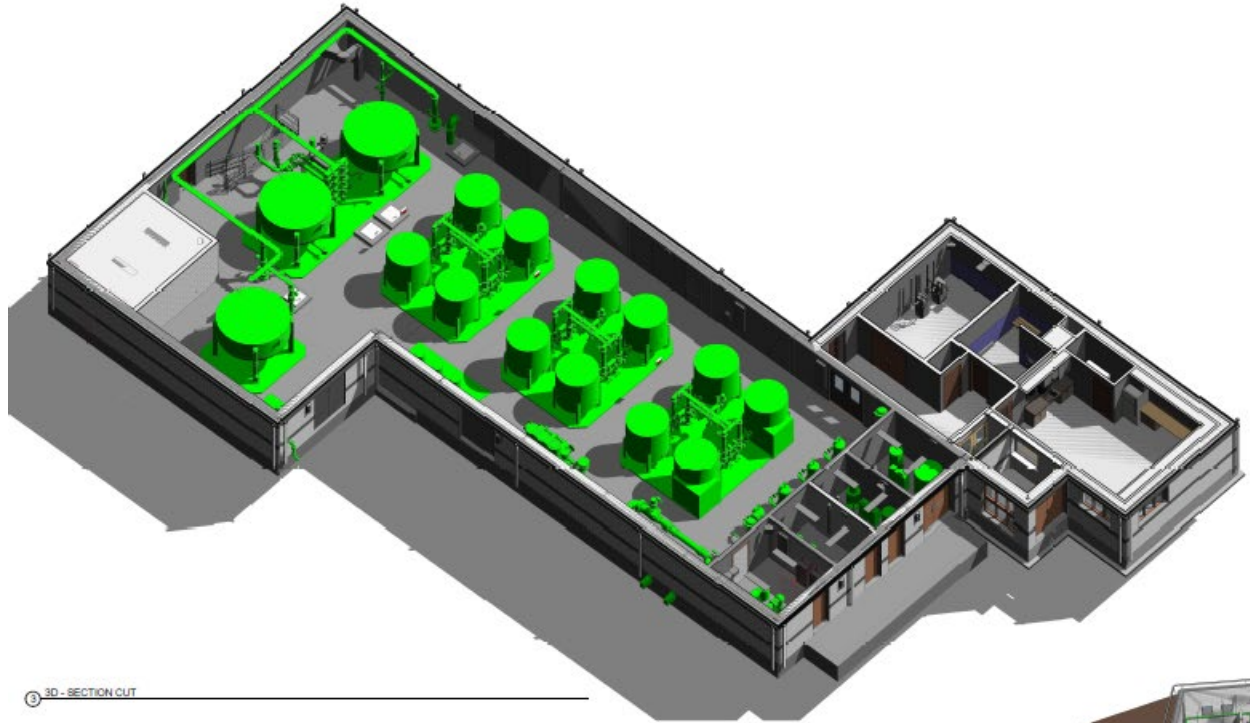


1 PROCESS FLOOR PLAN - PHASE 3 NEW
3/16" = 1'-0"

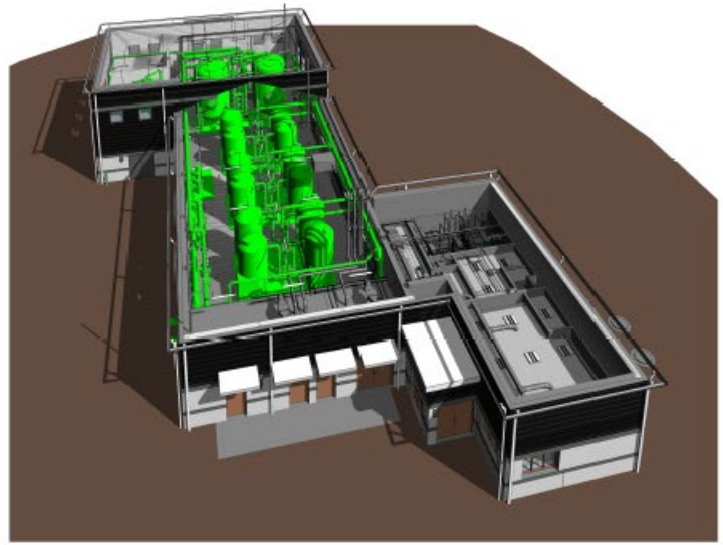


2 FINAL EAST WALL SECTION
1/4" = 1'-0"

NOTES:
1. FOR CLARITY, THIS SHEET BEST VIEWED IN COLOR



3 3D - SECTION CUT

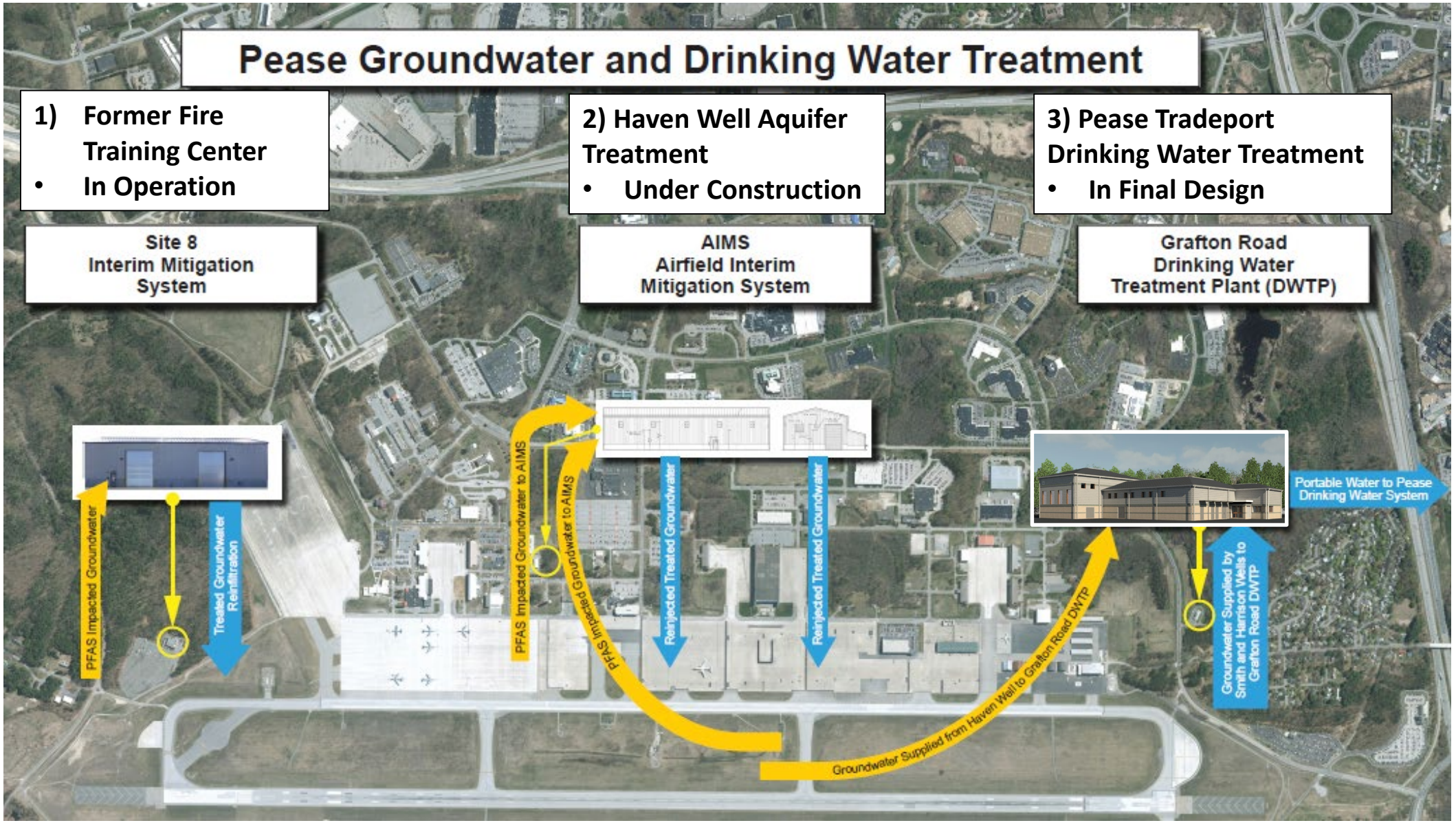


1 3D - SECTION PERSPECTIVE

SCALE: AS NOTED

Current Rendering – Grafton Road Water Treatment Facility

Pease PFOA/PFOS Treatment Systems:



Pease Tradeport PFAS Contamination Summary

City of Portsmouth, New Hampshire

March 20, 2019