PFAS CONTAMINATION OF DRINKING WATER SUPPLY

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Town of Ayer DPW

Massachusetts Environmental Health Association
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What Are PFAS Chemicals?

- Per- and Poly-fluoroalkyls Substances (PFAS) are a group of man-made chemicals
- Used to make carpets, clothing, fabrics for furniture, paper packaging for food, fire fighting foam and industrial processes
- Perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS) and GenX of most concern
- Can travel long distances through soil, groundwater or air
- Found in over 95 percent of people in the US

Potential Health Effects of PFAS

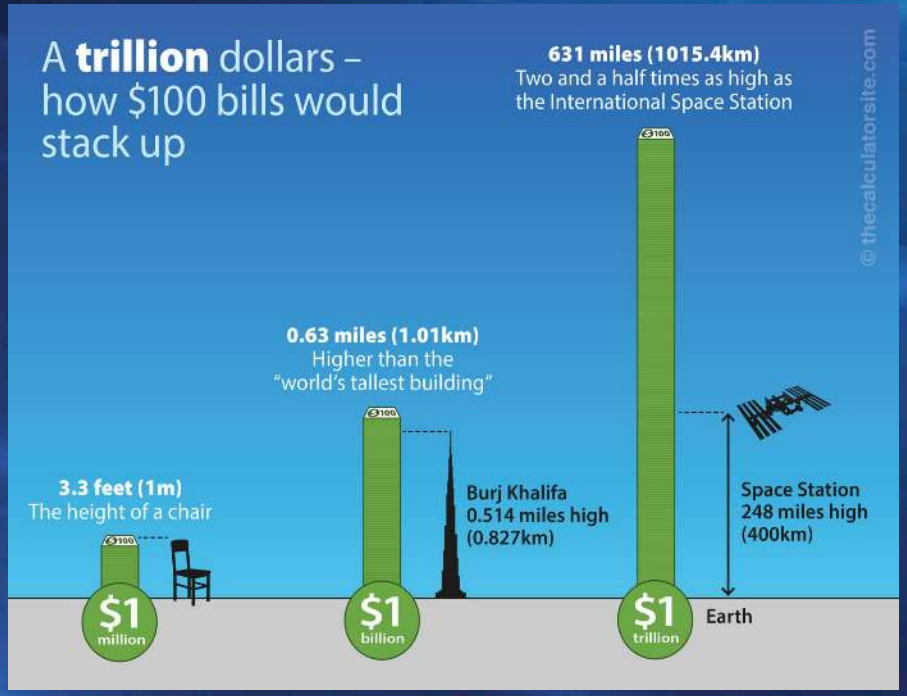
- Testicular cancer
- Kidney cancer
- Ulcerative colitis
- High cholesterol
- Pregnancy-induced hypertension
- Thyroid disruption
- Hormonal changes
- Liver malfunction
- Obesity
- Immunotoxicity, incl. interference with child vaccine response
- Lower birth weight and size
- Delayed puberty, decreased fertility, early menopause
- Reduced testosterone
- Prostate cancer
- Ovarian cancer

PFAS Measured in Parts Per Trillion

One part per million (ppm) equals
- 1 inch in 16 miles
- 1 minute in 2 years
- 1 cent in $10,000
- 1 drop of gasoline in a full-sized car's tank

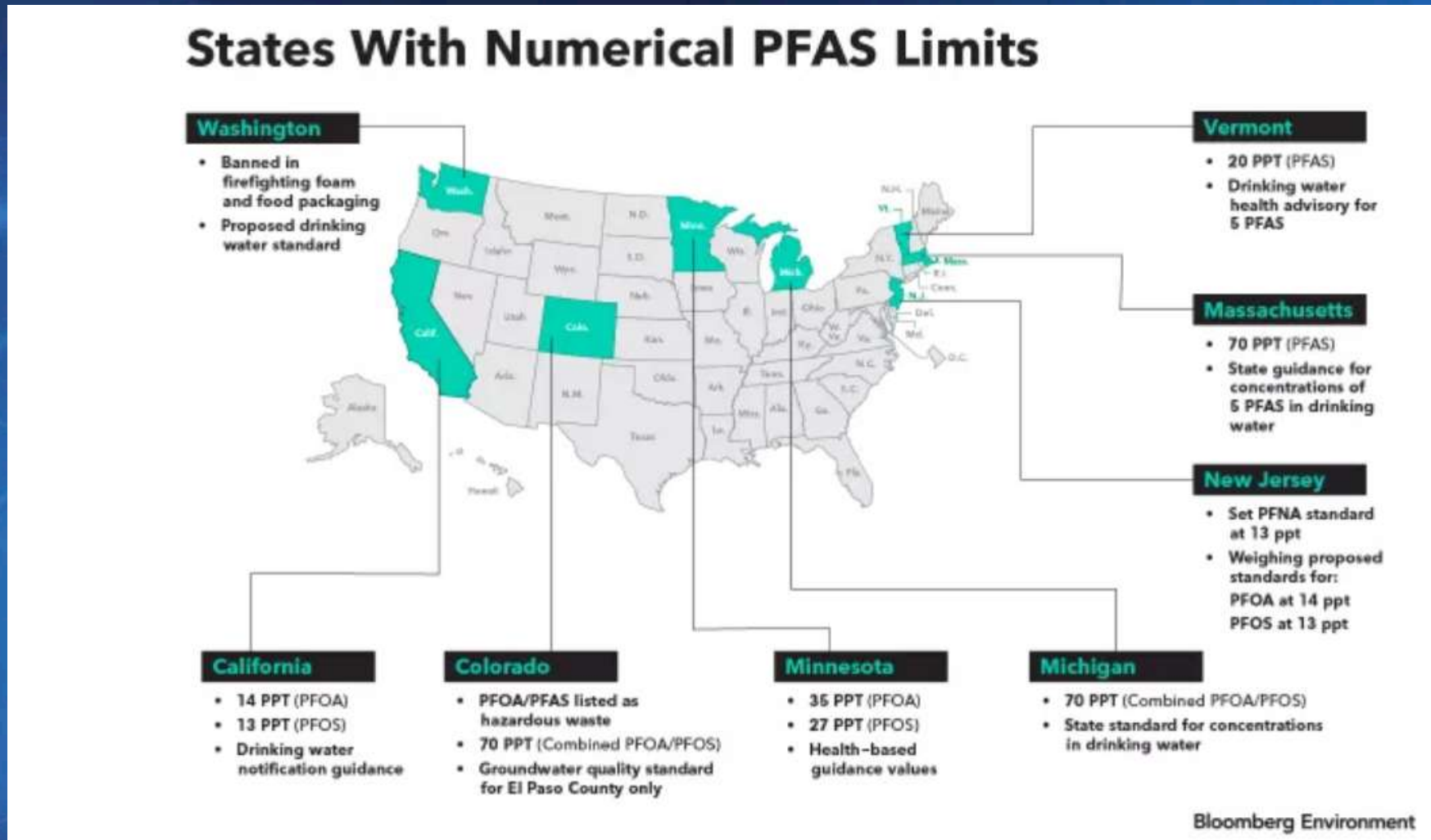
One part per billion (ppb) equals
- 1 inch in 16,000 miles
- 1 second in 32 years
- 1 cent in $10,000,000
- 1 kernel of corn in a silo that is 16 feet in diameter and 45 feet high

One part per trillion (ppt) equals
- 1 inch in 16,000,000 miles
- 1 second in 320 centuries
- 1 cent in $10,000,000,000
- 1 drop of water in a pool covering a football field to a depth of 43 feet



PFAS Regulatory Background (Drinking Water)

- EPA required PFAS sampling of some water supplies under the Unregulated Contaminant Monitoring Rule in 2013 (UMCR3)
- In 2016 EPA issued Health Advisory for PFOA and PFOS limit of 70 ppt
- “States fearing that federal inaction on chemical safety may harm their residents are jumping into the breach”
- Several States have established PFAS drinking water limits / advisories



(Graphic: Bloomberg Environment)

Massachusetts Drinking Water Advisory

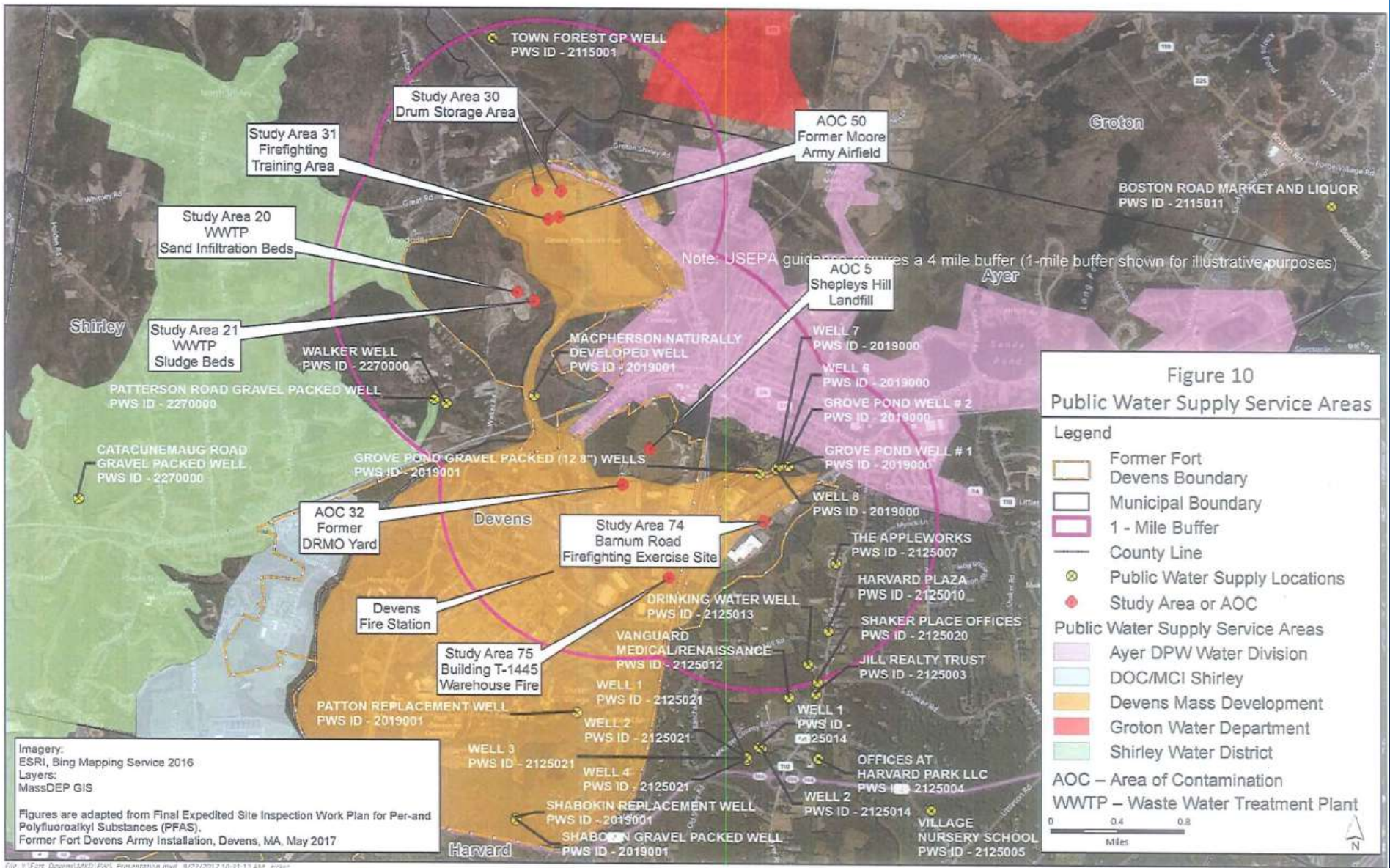
- June 2018, MADEP issued public health guideline to address five PFAS chemicals
- Office of Research and Standards Guideline (ORSG) set limit to protect against adverse health effects for long and short term exposure
  - consumers in sensitive subgroups (pregnant women, nursing mothers and infants) not consume water when the level of the five PFAS substances, individually or in combination, is above 70 ppt
  - public water suppliers take steps expeditiously to lower levels of the five PFAS to below 70 ppt for all consumers.

Ayer Background

- Municipal water supply to 7600 residents and several large food/beverage industries
- Grove Pond Wellfield provides 60% of Town's water
- Due to proximity to Fort Devens, MassDEP required Ayer to test Grove Pond Well water for **unregulated** contaminants PFOA and PFAS in September 2016
- Wells tested positive and GP Well 8 was over the 70 ppt level

Site Locus- Grove Pond Wellfield

Municipal Water Supply Well



Ayer DPW Action to Date

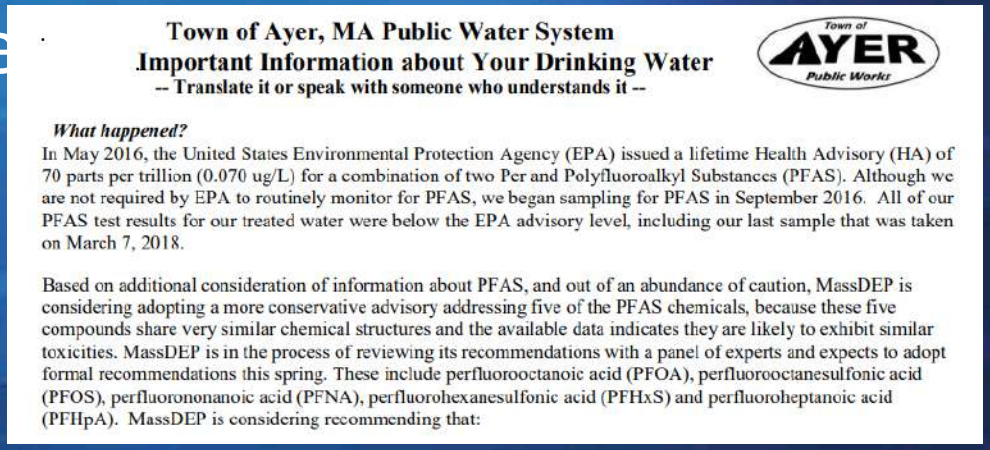
- Blended Well 8 with two other wells to keep levels of PFOA and PFOS below 70 ppt
- DPW stopped using Well 8 in late February 2018
- DPW issued public notification to all residents on March 29, 2018
- Completed preliminary treatment study in
- Re-activated Grove Pond Well 1 for summer demand
- Completed construction of Spec Pond Well 2 replacement – tested at 900 gpm
- Cleaned and redeveloped Spec Pond Well 1A
- Cleaned filter media at both WTPs

Ayer DPW Action (continued)

- Continue quarterly sampling of Grove Pond Wells
- Town Meeting Approved $4.2M for construction of PFAS removal treatment system
- Completed bench scale rapid column testing
- Started design of treatment system
- Pumping Well 8 to waste to (hopefully) intercept contaminant plume
- Constructing new interconnection with Devens

Public Notification

- Coordinated with MADEP with specific language and fact sheet
- Mailed to all water customers
- Posted on social media (Town web site, email notifications, Facebook, Twitter)
- Received approx. a dozen calls with questions
- Provide regular updates at Selectmen's mee



Town of Ayer, MA Public Water System
Important Information about Your Drinking Water
-- Translate it or speak with someone who understands it --

Town of AYER Public Works

What happened?

In May 2016, the United States Environmental Protection Agency (EPA) issued a lifetime Health Advisory (HA) of 70 parts per trillion (0.070 ug/L) for a combination of two Per and Polyfluoroalkyl Substances (PFAS). Although we are not required by EPA to routinely monitor for PFAS, we began sampling for PFAS in September 2016. All of our PFAS test results for our treated water were below the EPA advisory level, including our last sample that was taken on March 7, 2018.

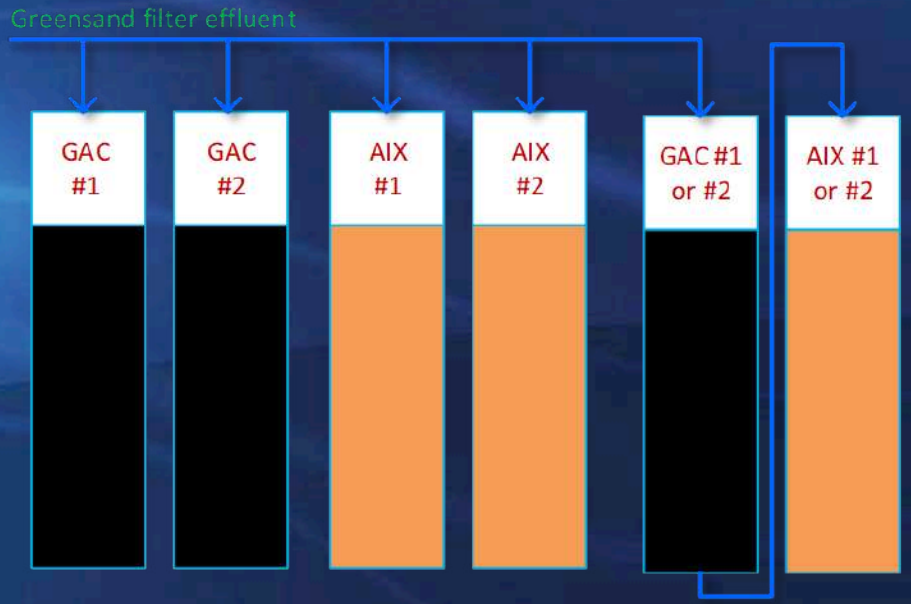
Based on additional consideration of information about PFAS, and out of an abundance of caution, MassDEP is considering adopting a more conservative advisory addressing five of the PFAS chemicals, because these five compounds share very similar chemical structures and the available data indicates they are likely to exhibit similar toxicities. MassDEP is in the process of reviewing its recommendations with a panel of experts and expects to adopt formal recommendations this spring. These include perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS) and perfluoroheptanoic acid (PFHpA). MassDEP is considering recommending that:

Is This Why My Water is Rusty?

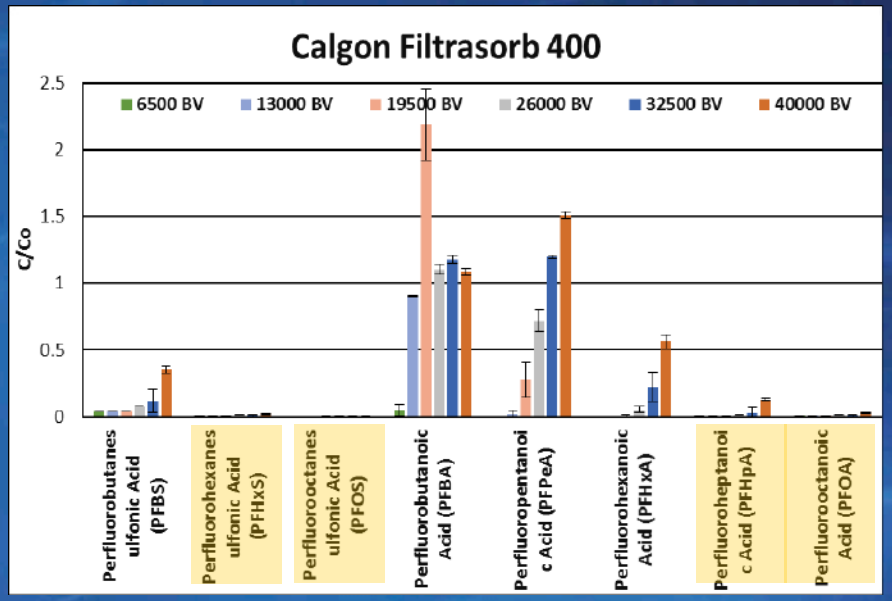
- The answer is mostly NO
- We have two water treatment plants to remove iron and manganese from our water
- For several reasons, we have had to adjust chemicals, well operations and delay maintenance – resulting in rusty water in the distribution system
- Water is safe to drink
- We have cleaned the filters and started our flushing program
- Hopefully the problem is fixed

Rapid Small-Scale Column Testing

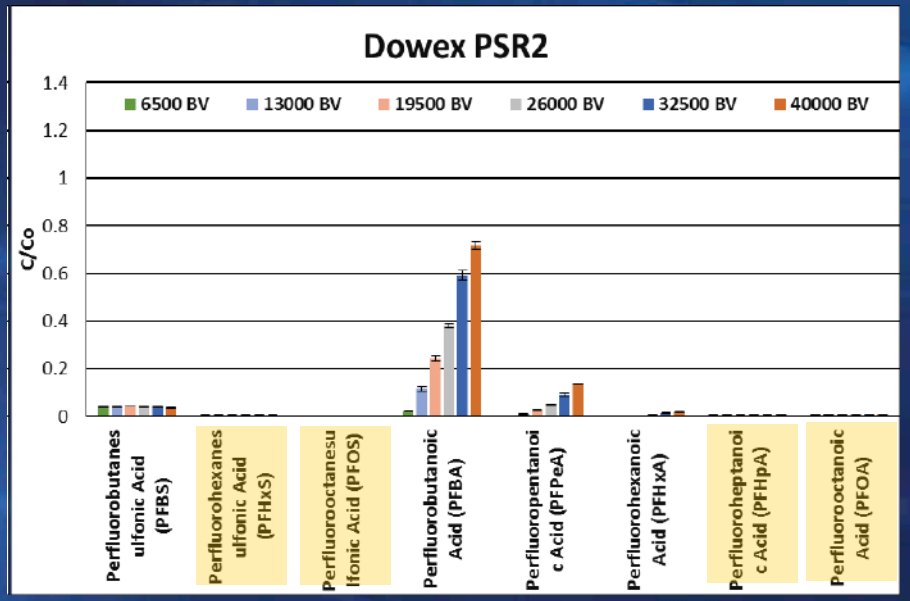
- Tested 2 types of GAC and 2 types of Ion exchange (IX) resin
- Tested effects of chlorine removal on treatment efficiency
- Tested GAC and IX in series
- Dowex Resin was most effective media



Calgon GAC vs. Dowex IX



GAC

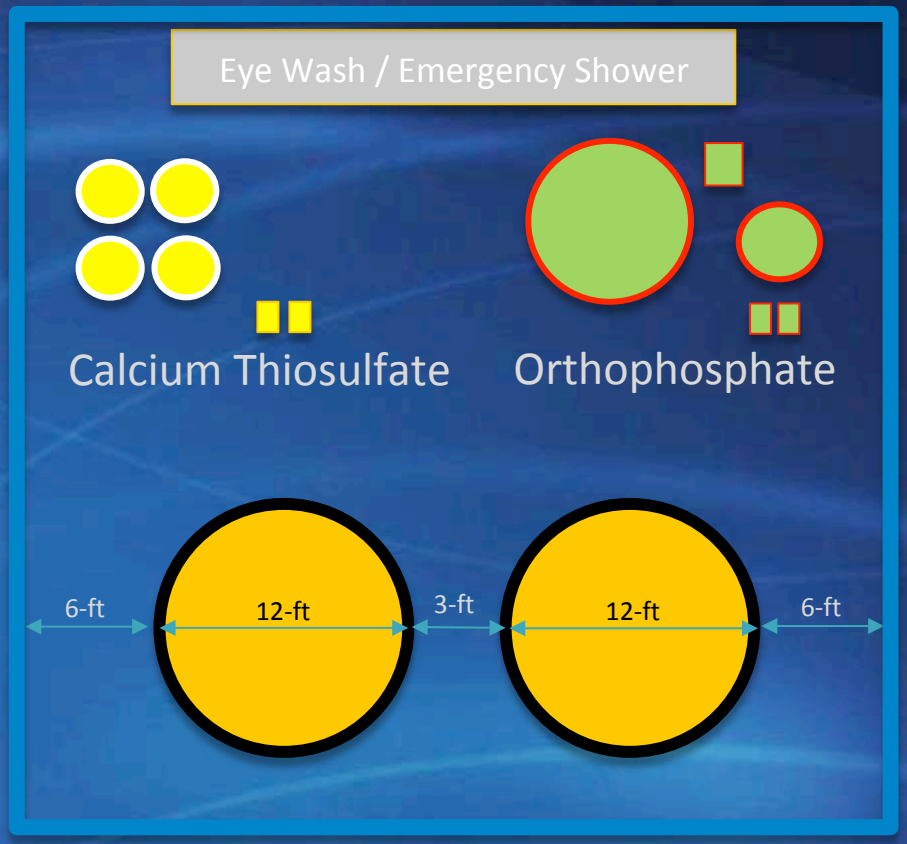


IX

Other Water Quality Impacts

- Lead and Copper Rule – High Chloride to Sulfate Ratio (CSMR) associated with galvanic corrosion of lead solder in copper piping
- IX resin tends to remove sulfate increasing the CSMR so additional corrosion control included in design
- De-chlorination and re-chlorination are required for improved PFAS removal and protection of resin integrity

Recommended Design

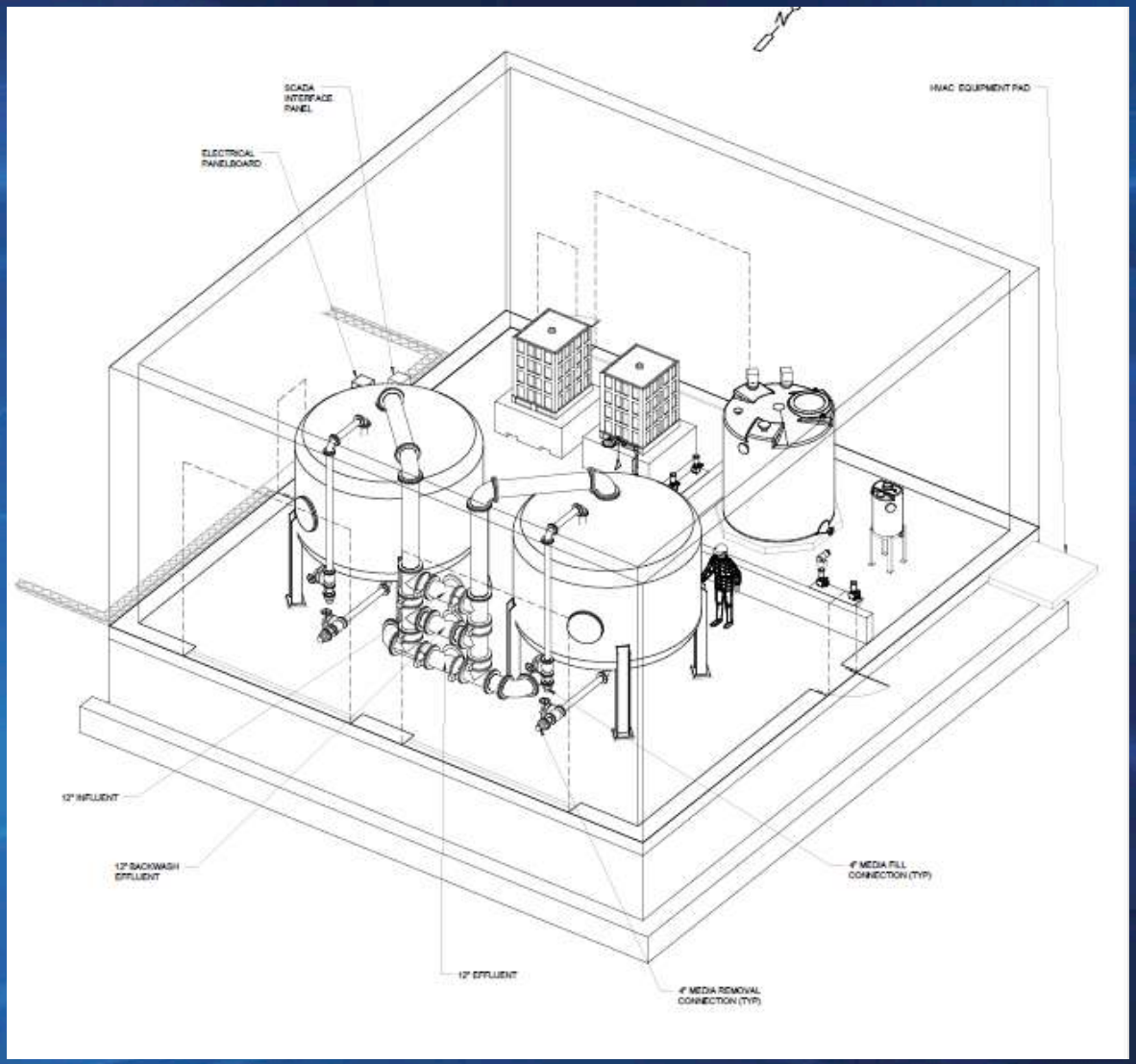


- Average production 1 mgd
- Addition to existing iron and manganese treatment plant
- Two 12 ft ion exchange pressure filters
- Calcium Thiosulfate for de-chlorination
- Orthophosphate for corrosion control (LCR)

Rely upon existing plant for:

- Electrical
- Laboratory
- Lavatory
- Mechanical (HVAC, plumbing) Room

Proposed PFAS Treatment



Funding

- Town Meeting approved $4.2 M for funding the construction of the Grove Pond PFAS Water Treatment Addition
- DPW applied for Drinking Water SRF Funding
  - Zero interest short term borrow
  - Low interest long term borrow
  - May bridge the financing until contamination responsibility is determined
- Working with EPA and MADEP to attempt to recover costs from US Army Devens Superfund Site
- Long term costs for resin replacement – depending on PFAS levels and limits

What Else?

- Levels at Grove Pond Wellfield are increasing and may need to shut off additional wells
- MADEP may lower the limit from 70 ppt to 20 ppt
- Interconnections with Devens and Littleton may be required to meet demands
- Continue to monitor PFAS in Spec Pond Water Supply and in water distribution system (water tanks)

Discussion / Questions

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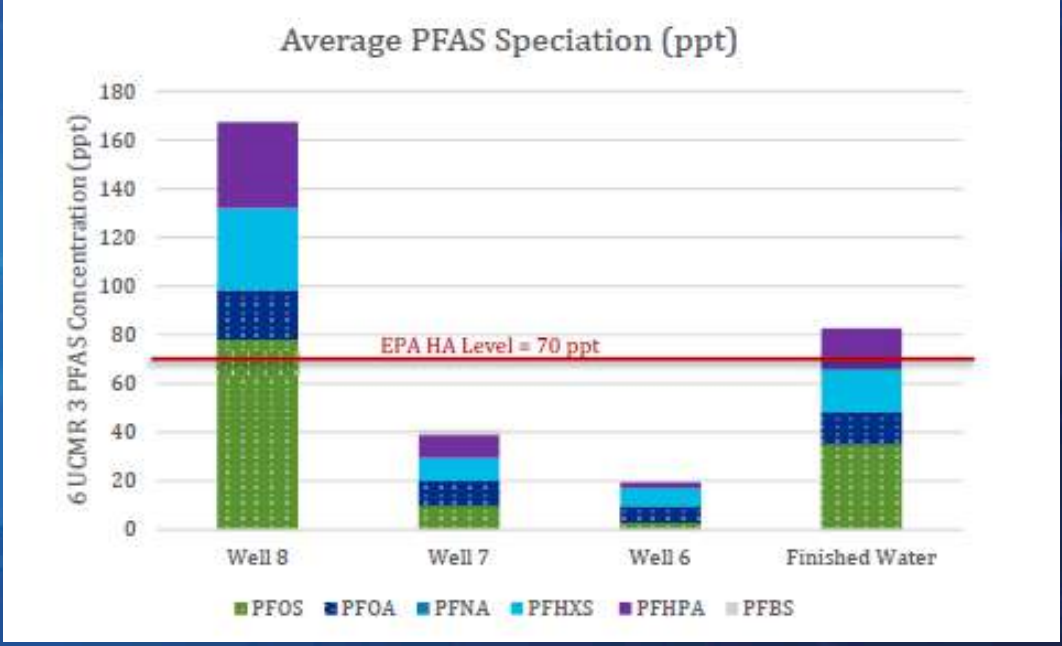
Town of AYER Public Works

ARTICLE 14

BORROW AUTHORIZATION FOR GROVE POND WATER TREATMENT PLANT – IMPROVEMENTS FOR REMOVAL OF PERFLUORINATED ALKYL SUBSTANCES (PFAS) To see if the Town will vote to authorize the Treasurer, with the approval of the Board of Selectmen, to borrow the sum of $4,170,000 for the purposes of funding the construction of the Grove Pond Water Treatment Plant



MassDEP

- MassDEP is developing a State water quality limit
- Proposed – 5 “long chain” PFAS total cannot exceed 70 ppt
- MassDEP required the Town to stop using Well 8 in late February
- Town issued a public notification to all residents on March 29
- Not all Massachusetts Public Water Supplies have been tested for PFAS

Devens Study Area

What is Devens Doing?

- US Army Corp performed testing on existing monitoring wells and determined locations of potential sources of contamination and extent
- Public meeting in Ayer on April 12 to present findings to date
- Currently doing additional testing in Grove Pond Well area
- PACE and Ayer DPW are working closely with USACE to monitor the work and conclusions

Bench-Scale Testing Approach

Recommended Treatments for Testing:

- **GAC** (two vendor products)
- **IX** (two vendor products)
- **Sequential GAC-IX** (one vendor product for each)
  - Emerging treatment approach being evaluated in academia and industry
  - May be beneficial for Ayer by removing active chlorine residual upstream of IX.

- **IX with brine regeneration**
  - PFBA is likely to substantially limit IX longevity. The efficacy of regeneration will be tested at the bench scale.