



Analysis of Water Contamination in Massachusetts

Massachusetts Sierra Club
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Introduction and History

The Massachusetts Department of Environmental Protection (MassDEP) is publishing reports on PFAS tests conducted since April 20, 2016 via a portal.¹ As of October 17, 2021, they have published 3,551 test results for 591 public water systems (36% of total)² in 259 municipalities (74% of the state).³ These tests have focused mostly on finished drinking water, but have included water sources (“raw water”) and intermediate processed water.

The purpose of this analysis is to show the amount and degree of environmental contamination from PFAS geographically across the state in ground and surface water. This does *not* represent current finished drinking water quality, and so does not indicate the population that has been or may be exposed to any contaminated water and any associated health risks.

The first communities tested included many that had known sources of PFAS from firefighting (e.g., Barnstable) or industrial sources (e.g., Hudson):

- Barnstable
- Middleton

¹ [Massachusetts EEA Data Portal](#)

² Defined as “Any building with a source of water that serves 25 people or more per day for 60 or more days a year is regulated as a public water system.” There are 1635 public water systems in Massachusetts.

³ There are 351 cities and town but many have regional water districts so this percentage will never reach 100%. The largest, the MWRA, supplies all drinking water for 34 municipalities (9.7% of municipalities). The MWRA is represented in the database only by finished water testing at treatment plants in Marlborough and Ludlow marked as “Boston”, which are sourced at Clinton (Wachusett) and Ware (Quabbin) respectively. Any testing of the raw water at MWRA reservoirs is not available through the EEA portal. Nor is any groundwater or surface water testing generally conducted in these 34 communities under the drinking water program, but they can be presumed to have PFAS contamination levels at similar rates to other communities in the state.



- Ayer
- Bourne
- Hudson
- Groton
- Shirley

Chemicals were originally reported individually, but since Feb. 27, 2018 some are now often reported aggregately as “PFAS6”, which are the six long-chain PFAS that compose the recent additive standard for groundwater and drinking water:

- Perfluorooctane sulfonic acid (PFOS)
- Perfluorooctanoic acid (PFOA)
- Perfluorohexane sulfonic acid (PFHxS)
- Perfluorononanoic acid (PFNA)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorodecanoic acid (PFDA)

While six are currently regulated, up to eighteen different PFAS chemicals have been tested so far.⁴ However, there are thousands of known PFAS so the vast majority has never been tested for.

Note that testing results are dynamic as testing methods improve, and water systems make adjustments to improve the quality of finished water.

⁴ Most communities have been tested using all 18 available chemicals under EPA Method 537.1, but some used only the 14 in the earlier EPA Method 537, and 88 communities tested or reported only the ones in PFAS6.



Analysis of Results

PFAS have been detected in 87% (n=226) of all tested municipalities since 2016.⁵ If you look at the 175 communities that have tested for twelve or more chemicals, this rate rises to 91% (n=159)! *These statistics provide evidence of widespread PFAS contamination across the state.*⁶ What is alarming is that the sites tested have been drinking water sources (as opposed to say industrial sites) and so they would generally be assumed to be high quality. Most of the systems utilize groundwater wells.⁷

The PFAS6 has been found in 100% of the municipalities where PFAS has been detected. PFAS6 detections almost always include PFOS and PFOA, the two most publicized PFAS chemicals due to their high level of past use, persistence and known toxicity. Seventeen of the eighteen chemicals in the current testing method have been detected across the state. Up to thirteen chemicals have been detected in a single community (Ayer). Two unregulated chemicals, PFBS and PFHxA, are also usually present when PFAS is detected. Five unregulated chemicals have been detected in only one or two municipalities (11CL-PF3OUDS, ADONA, HFPO-DA, PFDoA and PFUnA).⁸ Only one chemical has not yet been detected anywhere (9Cl-PF3ONS).

There is a wide range in detection results in tested communities. Most of the 33 communities where no PFAS has been detected to date are in Western Massachusetts. 63% (n=142) of all tested municipalities exceed 10 ppt⁹ across all tested chemicals. 48% (n=108) have detected at total levels for all tested chemicals that are higher than 20 ppt (which is the state standard for PFAS6).¹⁰ Twelve municipalities (5% of total communities

⁵ This figure also does not always include so-called “estimated” values that are above the MDL but below the RL. Estimated values will therefore account for most of the many low-level detections (generally 0.5-2.0 ppt). However, many estimated values have not been reported which could be undercounting towns with detected PFAS.

⁶ This conclusion is further buttressed by the [2020 study](#) by Mass. DPH and NOAA that found 100% of 27 rivers tested were contaminated with PFAS. Note that river systems are regional and include several municipalities.

⁷ Some surface water was tested such as Simmons Pond in Hyannis, and “Merrimack River - Raw Water” for Methuen.

⁸ Of these only HFPO-DA (“GenX”) is currently regulated anywhere in the U.S.

⁹ New York state is regulating chemicals individually at 10 ppt.

¹⁰ For example, this includes Holden, which is low (only 3 ppt) for PFAS6, but quite high when you include 88 ppt for PFBS in the same 2019 test sample, it is over 90 ppt for 4 chemicals! (The toxicology of PFBS may be different than PFAS6 but this augmented statistic still demonstrates high levels of contamination that may be otherwise overlooked.) A similar situation exists in Bolton (PFHxA) and Shrewsbury (mainly PFBS). Note this



tested) are below 20 ppt for PFAS6 but above 20 ppt when you include all chemicals. On average, the additional non-PFAS6 chemicals add 10 ppt or 27% more ppt per test than PFAS6 alone. These statistics further highlight the need to test beyond PFAS6 in order to consider potential health impacts and future regulation. The degree and amount of contamination is underestimated since so many chemicals are not part of any given test suite.

The highest level of PFAS observed was in May, 2019 in raw water at Cranberry Well, Hudson, with a value of 630 ppt of PFOA. Hudson is home to a Teflon coating plant (which agreed to pay for the town's drinking water filtration system). Other towns with combined measurements for all water systems that are *more than ten times the current state level* are Princeton (mainly due to PFHxS), Barnstable (PFOS & PFHxS), Ayer (PFHxA, PFHpA, PFBS & PFOS), Mashpee (PFOS), and Westfield (PFOS and PFHxS). The actual levels of PFAS in any given community's ground or surface water may be higher since only drinking water sources were tested and these are often protected.

The finished water in some of these drinking water systems have since been remediated by shutting down wells (e.g., Westfield), filtering (e.g., Hudson), and blending sources. In general, removal of the contamination at the *source* (usually groundwater) is difficult (e.g., pump and treat), and has rarely been done to date for PFAS alone in Massachusetts. In some cases, activities that produce PFAS have been halted such as firefighter training with fluorinated firefighting foams (AFFF) at Barnstable. So even though the drinking water no longer exceeds the state Maximum Contaminant Level (MCL) MCL, given the extreme persistence of these "forever" chemicals, the contamination likely remains in the ground or the water body.

The largest and perhaps best-protected source in the state is the MWRA's Quabbin Reservoir. There was a round of testing of finished MWRA water testing data in 2019 which indicates no detection in the data, since the results are below the minimum reporting limit. However, the MWRA's own report¹¹ shows very low but detectable levels of PFAS (3 ppt of PFAS6 at the Marlborough treatment plant, downstream from the Wachusett Reservoir; and 1 ppt further upstream and closer to Quabbin Reservoir at Ludlow). This is consistent with the next set from 2021. The data suggests that Wachusett Reservoir could have higher PFAS levels than Quabbin.

includes one town (Uxbridge) at 20.16 ppt while under the state rule the actual MCL is 20.5 ppt.

¹¹ <http://www.mwra.com/watertesting/pfas/results/2019-08-PFAS.pdf>