## Standards and guidance values for PFAS in groundwater and drinking water.

| State/Agency         | Agency/Dept. | Year | Standard / Guidance | Type | Promulgated Rule | Notes | PFOA | PFOS | PFNA | PFBA | PFBS | PFHxS | PFPeA | PFHpA | PFOSA | PFDA | 6:2 FTS | Gen-X |
|----------------------|--------------|------|----------------------|------|------------------|-------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|
| **UNITED STATES**    |              |      |                      |      |                  |       |      |      |      |      |      |       |       |       |       |       |       |       |       |
| USEPA                | Office of Water | 2016 | HA                   | DW   | No               | a     | 0.07 | 0.07 |      |      |      |      |       |       |       |       |       |       |       |       |
| Connecticut          | DPH          | 2016 | AL                   | GW   | No               | b     | 0.07 | 0.07 | 0.07 | 0.07 | 0.07 | 0.07  |       |       |       |       |       |       |       |       |       |
| Colorado (CO)        | DPHE         | 2017 | HA                   | DW   | No               |       | 0.07 | 0.07 |      |      |      | 0.07  |       |       |       |       |       |       |       |       |
| Minnesota (MN)       | MDH          | 2017 | Short-term HBV       | GW   | No               | c     | 0.035| 0.027|      |      |      | 7     |       |       |       |       |       |       |       |       |
|                      |              |      | Subchronic HBV       | GW   | No               | c     | 0.035| 0.027|      |      |      | 7     | 9(P)  |       |       |       |       |       |       |       |
|                      |              |      | Chronic HBV          | GW   | No               | c     | 0.035| 0.027|      |      |      | 7     | 7(P)  |       |       |       |       |       |       |       |
| New Jersey (NJ)      | DEP          | 2015 | ISGWQC               | GW   | Yes              |       | 0.010|      |      |      |      |      |       |       |       |       |       |       |       |       |
|                      |              | 2017 | GWQS                 | GW   | Pending          |       | 0.010|      |      |      |      |      |      |       |       |       |       |       |       |       |
|                      | DWQI         | 2017 | MCL                  | DW   | Pending          |       | 0.013|      |      |      |      |      |      |       |       |       |       |       |       |       |
|                      | DWQI         | 2017 | MCL                  | DW   | Yes              |       | 0.014|      |      |      |      |      |      |       |       |       |       |       |       |       |
| North Carolina       | DENR         | 2006 | IMAC                 | GW   | Yes              |       | 2    |      |      |      |      |      |      |       |       |       |       |       |       |       |
|                      | NCDHHS       | 2017 | Health goal          | DW   | No               |       | 0.14 |      |      |      |      |      |      |       |       |       |       |       |       |       |
| Vermont (VT)         | DEC/DOH      | 2016 | PGWES                | GW/DW| Yes              | a     | 0.02 | 0.02 |      |      |      |      |      |       |       |       |       |       |       |       |
| Denmark              | EPA          | 2015 | Health-based         | DW/GW| d                | 0.1   | 0.1  | 0.1  | 0.1  | 0.1  | 0.1  | 0.1  | 0.1  | 0.1  | 0.1  | 0.1  | 0.1  | 0.1  | 0.1  |       |       |
| Netherlands          | RIWT         | 2011 | Health-based         | DW   |                  | 0.53  |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |
|                      |              | 2011 | Administrative       | DW   |                  | 0.0053|      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |
| Sweden               | NFA          | 2014 | Health-based         | DW   |                  | 0.09  |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |
|                      |              | 2014 | Administrative       | DW   | e                | 0.09  | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |

**Abbreviations:**
- DW = drinking water
- GW = groundwater
- AL = private well action level
- HA = lifetime health advisory
- HBV = health-based value
- ISGWQC = interim specific groundwater quality criterion
- GWQS = groundwater quality standard
- MCL = maximum contaminant level
- IMAC = interim maximum allowable standard
- PGWES = primary groundwater enforcement standard

**Notes:**
- a. Applies to the individual results for PFOA and PFOS, as well as the sum of PFOA + PFOS.
- b. Applies to the individual results for PFOA, PFOS, PFHpA, PFNA, and PFHxS as well as the sum of concentrations of these 5 PFAS.
- c. HBVs just published May 2017 and full promulgation of HRLS anticipated in 2018.
- d. Applies to the individual results for PFOA, PFOS, PFNA, PFBA, PFBS, PFHxS, PFHxA, PFPeA, PFHpA, PFOSA, PFDA, AND 6:2 FTS as well as the sum of concentrations of these 12 PFAS.
- e. Administrative value is for the sum of eleven PFAS found in drinking water: PFBS, PFHxS, PFOS, 6:2 FTS, PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, and PFDA. PFOS is considered to be the most toxic. Water can still be used at up to 0.09 µg/L.
## Summary of Planning Level Cost Opinions

<table>
<thead>
<tr>
<th></th>
<th>GAC Contactors Post Filtration</th>
<th>Deep Bed GAC Contactors Post Filtration</th>
<th>Ion Exchange Vessels Post Filtration</th>
<th>RO/NF Post Filtration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Cost</strong></td>
<td>$29M</td>
<td>$36M</td>
<td>$33M</td>
<td>$118M</td>
</tr>
<tr>
<td><strong>Annual Operating Cost</strong></td>
<td>$3.3M – $6.3M</td>
<td>$2.9M – $3.1M</td>
<td>$1.4M – $2.3M</td>
<td>$3.3M</td>
</tr>
<tr>
<td><strong>Present Worth of Annual Costs</strong></td>
<td>$45M – $86M</td>
<td>$39M – $42M</td>
<td>$19M – $31M</td>
<td>$45M</td>
</tr>
<tr>
<td><strong>Total Present Worth</strong></td>
<td>$74M – $115M</td>
<td>$75M – $78M</td>
<td>$52M – $64M</td>
<td>$163M</td>
</tr>
</tbody>
</table>
Column 3 (GAC)

Tested for expanded list of PFCs

Bed Volumes Treated

Percent Breakthrough ($C_i/C_0$)

- TOC
- Total PFAS* (33)
- Total PFAS (20)
- Total PFAS (9)
- PFPrOPPrA/GenX
- PFHxA (C6)
- PFHpA (C7)
- PFOA (C8)
- PFNA (C9)
- PFBS (C4)
- PFHxS (C6)
- PFOS (C8)
Column 3 (GAC)

Effluent Concentration (ng/L) vs. Bed Volumes Treated

- Total PFAS* (33)
- Total PFAS (20)
- Total PFAS (9)
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- PFPrOPrA/GenX
- PFHxA (C6)
- PFHpA (C7)
- PFOA (C8)
- PFNA (C9)
- PFBS (C4)
- PFHxS (C6)
- PFOS (C8)

Tested for expanded list of PFCs
Tested for expanded list of PFCs
Column 6 (IX)

- Effluent Concentration (ng/L)
- Bed Volumes Treated

- Tested for expanded list of PFCs

- Total PFAS* (33)
- Total PFAS (20)
- Total PFAS (9)
- PFPrOPrA/GenX
- PFHxA (C6)
- PFHpA (C7)
- PFOA (C8)
- PFNA (C9)
- PFBS (C4)
- PFHxS (C6)
- PFOS (C8)
Column 6 (IX)

- PFPrOpPrA/GenX
- PFHxA (C6)
- PFHpA (C7)
- PFOA (C8)
- PFNA (C9)
- PFBS (C4)
- PFHxS (C6)
- PFOS (C8)

Effluent Concentration (ng/L) vs. Bed Volumes Treated (in thousands).