PFAS 101

November 21, 2019

DEPARTMENT of PUBLIC HEALTH
DEPARTMENT of ENERGY AND ENVIRONMENTAL PROTECTION

Agenda

• Introduction to DPH and DEEP Programs
• PFAS Overview
• PFAS Challenges
• PFAS Situation in CT
• Task Force and Action Plan
CT DEPARTMENTS OF PUBLIC HEALTH AND ENERGY AND ENVIRONMENTAL PROTECTION PROGRAMS
Department of Public Health
Healthy People in Healthy CT Communities

Public Drinking Water
- Implements the Safe Drinking Water Act
- Regulatory Authority for Connecticut’s 2,500 public water systems serving 2.8 million people
- Authority over proactive laws & high quality water that protect human health

DPH Katherine A. Kelley Public Health Laboratory
- Provides drinking water analyses (currently exclusive of PFAS substances)

DPH Environmental Health Section
- Provides Health Assessment, toxicology reviews, and public messaging
- Provides education and outreach for residents

Local Health Districts and Departments
Drinking Water Section

Primacy for Safe Drinking Water Act
- Oversees the 17 rules of the SDWA
- Unregulated Contaminant Monitoring Rule
- Receives 500,000 water sample results every year

Regulates 2500 public water systems
- 82 large community public water systems
- 500 small community public water systems
- 520 non-transient non-community including 430 schools and daycares
- 1,425 transient non-community

Authority over Proactive Laws
- Water supply planning (systems serving >1000 people)
- Water Company Land laws
Connecticut Public Water Supplies

Legend
- Public Water Supply (PWS) Well
- PWS Watershed
- Service Areas of PWSs
Environmental Health Section

- **Toxicology**
  - Performs risk assessments, standard setting, Action Levels for private wells, health guidelines

- **Private Well Program**
  - 325,000 private wells
  - Outreach and education for testing
  - Guidance on best treatment technology

- **Health Messaging**
  - Risk communication; fact sheets, public meetings
Department of Energy and Environmental Protection

Regulating Discharges to the Environment

• Monitors and permits discharges to water, air, and the ground to prevent harm to human health and the environment
• Inspections to ensure compliance with State and Federal environmental laws
• Regulates disposal of wastes

Pollution Prevention

• Recommends ways to prevent or minimize pollution
PFAS 101

Department of Energy and Environmental Protection

- Remediation Standard Regulations
  - Sets standards for the cleanup of soil and groundwater at contaminated sites to protect human health and the environment

- Pollution Source Oversight
  - Authority to require cleanup
  - Authority to require provision of safe drinking water to impacted areas by responsible party or municipality
PFAS OVERVIEW
PFAS Overview: What are PFAS?

PFAS = Per- and Polyfluorinated Alkyl Substances

- Over 4,000 chemicals
- Developed in the 1940s
- Ubiquitous in consumer products and industry
- Common products
  - Non-stick cookware
  - Waterproof apparel
  - Stain-resistant carpet
  - Grease-resistant food packaging
- PFOA and PFOS most well-known
PFAS Overview: What Are PFAS?

PFAS = Per- and Polyfluorinated Alkyl Substances

Translation

- per = carbon chain fully fluorinated
- oct = eight carbon atoms in chain
- sulf = chain ends in sulfur atom

“poly” = some of the fluorine atoms replaced with hydrogen
PFAS Overview: What Are PFAS?

**PFAS** = Per- and Polyfluorinated Alkyl Substances

Water-soluble

Air

Tail
Not soluble in oil or water

Water

Head
Water-soluble
Some PFAS uses
Places Where We Might Find PFAS
PFAS released by point sources can spread throughout the environment

Adapted from ITRC
Problems caused by PFAS

- Health effects on multiple organs and phases of life
- Present in human blood worldwide
- Polluted drinking water supplies worldwide – now issue in US
- Ubiquitous discovery in the environment
- Replacement chemicals also a problem
Health effects linked to PFAS

The main health concerns for PFAS come from studies in laboratory animals.

**The most sensitive effects**
- Developmental (e.g., growth, low birth weight)
- Reduced immune system function

**At higher doses**
- Changes in liver, kidney, and thyroid
- Disturbs natural hormones and lipids (e.g., cholesterol)
- Causes cancer
Health effects linked to PFAS

At present, the health effects in humans are unclear.

Some, but not all, studies in humans exposed to elevated levels of PFAS have shown that certain PFAS may:

- Decrease antibody response to vaccines
- Affect growth, learning, behavior of infants & older children
- Interfere with the body’s natural hormones
- Increase risk of cancer (testicular & kidney) at very high exposure
PFAS is present in human blood worldwide

![Blood Levels in People Who Were Exposed to PFAS](chart.png)

Source: CDC PFAS in US population 8/21/17
How do we protect human health?

Risk Assessment
• A multi-step process using science and judgment

Toxicity Value
• For example, EPA Reference dose (RfD): 0.00002 mg/kg-d

Health-based Drinking Water Guideline
• For example, EPA Health Advisory of 70 ppt
EPA Action on PFAS

May 2018 – PFAS National Leadership Summit

February 2019 – National PFAS Action Plan

1. Initiate Maximum Contaminant Level (MCL) process for PFOA and PFOS in drinking water

2. Enforcement Strategy
   • Process for listing PFOA/PFOS as “hazardous substances” under CERCLA
   • **Rely on States’ regulatory enforcement authority first**

➢ **States in our region are acting in advance of EPA**
  - VT, NH, MA, RI, NY, NJ, and others nationwide
## Drinking water standards in the Northeast

<table>
<thead>
<tr>
<th>State</th>
<th>Standard/Guidance Nomenclature</th>
<th>Drinking Water Level (ppt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>Action Level (currently under review by DPH)</td>
<td>$70 \sum (\text{PFOA, PFOS, PFNA, PFHxS, PFHpA})$</td>
</tr>
<tr>
<td>Maine</td>
<td>Health Advisory</td>
<td>$70 \sum (\text{PFOA, PFOS})$</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>Proposed Groundwater Quality Standard (currently in rulemaking process)</td>
<td>$20 \sum (\text{PFOA, PFOS, PFNA, PFHxS, PFHpA, PFDA})$</td>
</tr>
</tbody>
</table>
| New Hampshire | Maximum Contaminant Level (MCL)/ Ambient Groundwater Quality Standards | $12 \text{PFOA}$  
                             |                                                  | $15 \text{PFOS}$  
                             |                                                  | $18 \text{PFHxS}$  
                             |                                                  | $11 \text{PFNA}$  |
| New Jersey    | Drinking Water Quality Institute recommended MCL (PFNA accepted; PFOS, PFOA currently in rulemaking process) | $13 \text{PFOS, PFNA}$  
                             |                                                  | $14 \text{PFOA}$  |
| New York      | Drinking Water Quality Council recommended MCL (currently in rulemaking process) | $10 \text{PFOA}$  
                             |                                                  | $10 \text{PFOS}$  |
| Rhode Island  | Groundwater Quality Standard                                     | $70 \sum (\text{PFOA, PFOS})$                   |
| Vermont       | Health Advisory                                                  | $20 \sum (\text{PFOA, PFOS, PFNA, PFHxS, PFHpA})$ |
PFAS CHALLENGES
Unique PFAS management challenges

**Public Drinking Water**
- No Safe Drinking Water Act enforceable standards
- Sampling is challenging
- Treatment options are limited and expensive

**Health Standards**
- Published research into health effects is moving faster than the government can act

**Remediation**
- No EPA lab methods for PFAS testing in media other than drinking water
- Sampling is expensive and challenging (cross-contamination)
- Limited cleanup options
EPA-Validated Methods for PFAS Analysis

Draft Method 8327 (direct injection-LC/MS/MS)
- 24 compounds, higher detection limits than 537.1

Method 537 Rev. 1.1 → Method 537.1 (SPE-LC/MS/MS)
- 14 → 18 compounds, reduction in detection limits
- Four commercial labs currently approved by DPH for 537.1
- Typical cost: $250-400/sample
Potable Water Sample Collection

High potential for cross-contamination → Collect PFAS samples first

- Sample Container – 250 mL polypropylene bottles & caps, Trizma preservative
- Wash hands, wear nitrile gloves & change often
- Need for field reagent (pour) blanks
- Put samples in individual sealed plastic bags
- Recommendations for follow-up sampling

EPA EIASOP-EPA537-0
Potable Water Sample Collection Precautions

• PLAN AHEAD!
• Fabrics in vehicles may contain PFAS—contact with sample supplies or cooler will contaminate samples
• Do not bring coolers into the facility in which you are collecting the samples
• Zip bags and sample containers should not be placed onto carpet or anything soft or fabric coated
• Do not wear “breathable fabrics”
• Use the labels supplied by the lab, they have been tested as PFAS free and should also be waterproof.
Drinking Water Treatment Options

• Conventional treatment is mostly ineffective.
  ➢ Clarification, filtration, disinfection.
  ➢ Oxidation and biodegradation not effective.
Established Drinking Water Treatment Options

- Reverse Osmosis Filtration (RO)
  - Very fine filter to stop PFAS from going through.

- Granular Activated Carbon (GAC)
  - Adsorption using porous material.

- Ion Exchange (IX)
  - Adsorption using ion charged resins.
POE and POU Treatment

- RO and GAC treatment filters have been shown to be very effective at removal of PFAS.
- RO best for Point of Use (POU)
- GAC best for Point of Entry (POE)
- Consult local health department and treatment professional.
- National Sanitation Foundation (NSF) maintains list of certified PFAS removal filters.
Remediating PFAS-Contaminated Soil

Remediation Methods

• Capping
• Excavation and disposal
• Sorption and stabilization (e.g., PlumeStop™)
• Thermal treatment (>1000 °C for breakdown)

https://larcusa.org/technology/soil-capping/
PFAS Situation in Connecticut
Evolution of PFAS Knowledge in CT

- EPA-mandated testing of large public drinking water systems; no PFAS detections reported
- Contamination in Westchester County, NY

2013-2015

- DPH requires testing at proposed public wells and bottled water sources
- DEEP samples near MIRA landfills
- AFFF release at Bradley Airport hangar
- DESPP and DEEP issue AFFF Use Bulletin
- AFFF deployed during tragic Bradley B-17 crash
- CT Interagency PFAS Action Plan

2017

- EPA Health Advisory and CT DPH Drinking Water Action Level
- EPA testing at two Superfund sites

2016

- Testing & public outreach in Greenwich
- Windham fire training area tested
- DPH requires land use risk assessments by 80 PWS
- DESPP and DEEP form committee to select alternative to AFFF

2018

- EPA-mandated testing of large public drinking water systems; no PFAS detections reported
- Contamination in Westchester County, NY

2019
CT agency actions: DEEP

Initial Identification of Possible Sites
- AFFF use – Airports, fire training areas
- SIC/NAICS codes by industry
- Landfills

Cleanup Criteria for Remediation Sites
- Soil and groundwater cleanup goals available for use

Outreach and Coordination
- LEPs and regulated community
- Involvement in Regional and National workgroups
- UConn
- DESPP
Remediation Standard Regulations

• If PFAS are COCs based on site history/operations, they should be included in site characterization.

• PFAS must be addressed as **Additional Polluting Substances** at Remediation Sites.
  • Utilize EPA’s RfD of 0.00002 mg/kg/day
  • Soil Direct Exposure Criteria – use equations in RSR Section 22a-133k-2(b)(5)
  • Groundwater Protection – Adopts CT DPH’s DWAL of 70 ppt for $\Sigma$ PFOA, PFOS, PFHxS, PFNA, and PFHpA

• **OR** Calculate Site-Specific Criteria for DEEP review and approval
## Additional Polluting Substance Criteria

<table>
<thead>
<tr>
<th>Remediation Standard</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Direct Exposure Criterion</td>
<td>1.35 mg/kg</td>
</tr>
<tr>
<td>Industrial/Commercial Direct Exposure Criterion</td>
<td>41 mg/kg</td>
</tr>
<tr>
<td>GA Pollutant Mobility Criterion</td>
<td>1.4 µg/kg</td>
</tr>
<tr>
<td>GB Pollutant Mobility Criterion</td>
<td>14 µg/kg</td>
</tr>
<tr>
<td>Groundwater Protection Criterion (adopting DPH’s Drinking Water Action Level for ∑ PFOA, PFOS, PFHxS, PFNA, and PFHpA)</td>
<td>70 ng/L</td>
</tr>
<tr>
<td>Surface Water Protection Criterion</td>
<td>In Development</td>
</tr>
</tbody>
</table>

Criteria apply to ∑ PFOA, PFOS, PFHxS, PFNA, & PFHpA
Significant Environmental Hazards

CGS Section 22a-6u(c) – Drinking Water Well has Contamination Detected at Any Level

After July 1, 2015, if a TEP in the course of investigating and remediating pollution on or emanating from a parcel determines pollution has affected a public or private drinking water supply well...with any substance from the release for which there is no RSR criterion,

• TEP shall notify client and owner of property within 7 days of finding well contamination.

• Owner of parcel that is source of pollution to a drinking water well shall
  1. Notify Commissioner in writing within 30 days of becoming aware, and
  2. Perform confirmatory sampling of well and submit report to Commissioner with a plan for further action within 30 days.
## CT agency actions: DPH

### Drinking Water Section
- Requires large public water systems to assess PFAS risk
- Requires testing of new public drinking water sources
- Encourages testing at all sources

### Public Health Laboratory
- Assessing feasibility for testing

### Environmental Health Section
- Set Drinking Water Action Level for 5 PFAS
- Prepared health messaging and fact sheets
- Outreach to private well owners and local health departments
Circular Letter 2018-19

• Sent to all Public Water Systems, Directors of Health, Chief Elected Officials and Certified Water System Operators on September 27, 2018

• Notified the public that the DWS is using the DPH Drinking Water Health Advisory

• Notified the public that the DWS is requiring all proposed sources of public drinking water supply to test for PFAS prior to receiving approval for use.

• Let the public know that the DWS has experience sampling and working with public water systems at risk for PFAS contamination.
Land Use Assessments

• Collaborated with the CT Section of the American Water Works Association’s Source Protection Committee

• Using the PFAS Fact Sheet series developed by the Interstate Technology Regulatory Council for reference material
Windsor

State officials seek to reassure public on health risks from Farmington River chemical spill
The CT Interagency PFAS Task Force

- Established by Governor Lamont on July 8, 2019
- Co-led by DEEP and DPH

Participating State agencies & entities
Timeline of Task Force Actions

- **Governor Lamont orders formation of Task Force**: 7/8
- **Meeting 1**: Convene Task Force and establish committees
  - **Meeting 2**: Working session: review committee progress and provide input
  - **Meeting 3**: Review and assemble final Action Plan draft
- **Task Force chairs submit Draft PFAS Action Plan to Governor Lamont**: 10/1
- **Final PFAS Action Plan to Governor Lamont**: 11/1

**Week of 8/12**: Committees meet to outline proposed actions

**Week of 9/9**: Committees draft Action Plan sections

**Public comment period**: 10/15 through 10/31
Task Force Committees

- **Human Health**: Minimize human health risk for Connecticut residents
- **Pollution Prevention**: Minimize future releases of PFAS to the environment
- **Remediation**: Identify, assess, and clean up historic releases of PFAS to the environment
PFAS Action Plan overview

- **Recommended actions** – *Short-term vs. intermediate*
  1. Protect human health
  2. Minimize PFAS releases
  3. Identify, assess, and remediate historical release
  4. Enhance education, outreach, and communication on PFAS

- **Potential legislative opportunities** to support recommended actions
Strategic Focus 1: Human Health

Ongoing and short-term

- **Test drinking water** for PFAS
  - Public water systems (phased approach)
  - Private wells (support State funding for testing), and
  - Bottled water

- Establish a Safe Drinking Water Advisory Council to advise potential MCL development

- Support **financial assistance for infrastructure improvements** to public water systems

- **Enhance State laboratory capacity** for PFAS analysis
Strategic Focus 1: Human Health

Intermediate

- Assess other sources of human exposure to PFAS
  - e.g., Fish/shellfish, agricultural products, and food service ware
- Minimize occupational exposure in workplaces where PFAS are used or manufactured
Strategic Focus 2: Pollution Prevention

Ongoing and short-term

- **Reduce or prevent future AFFF releases** to the environment
  - Best management practices for handling AFFF
  - Legislation limiting AFFF use
  - AFFF **take-back program** for state agencies and municipal fire departments
  - Evaluation, selection, and procurement of PFAS-free **alternatives**

- **Identify other sources** of PFAS pollution
  - Operations and processes
  - Consumer products

- **Enhance State agency procurement of PFAS-free consumer products**
**Strategic Focus 2: Pollution Prevention**

**Intermediate**

- **Evaluate and address other sources** of PFAS pollution
  - Evaluate the levels of PFAS that reach *wastewater treatment plants, biosolids, and compost*
  - Establish **standards and discharge limits** in air and water
  - Convene ad hoc group to review research and nationwide actions on food packaging, consumer products, and packaging/product recycling
  - Educate residents, businesses, and local officials on best management practices to **minimize PFAS discharges to septic systems**
Strategic Focus 3: Remediation

Ongoing and short-term

- **Identify potential areas of concern**
  - Develop interagency GIS database identifying the universe of potential sources of PFAS pollution and threatened receptors, including drinking water sources and sensitive ecosystems

- **Test environmental media** at sites where AFFF has been stored or released
  - Airports, fire departments, and firefighting training areas

- **Continue using existing statutory authority to compel environmental investigation and cleanup** of PFAS releases
  - Support financial assistance for municipalities addressing publicly owned sites
Strategic Focus 3: Remediation

Intermediate

- **Identify impacted areas** and ambient PFAS levels
  - Develop and implement a strategy for large-scale random and targeted environmental sampling

- **Test environmental media at landfills** and surrounding areas
  - Tiered approach prioritizing landfills that pose a risk to human health

- Establish PFAS **cleanup standards** for soil, groundwater, surface water, and aquatic biota

- Establish an academic roundtable to enhance State knowledge of the impacts of PFAS on aquatic life and other wildlife
Strategic Focus 4: Education & Outreach

- Establish a **public outreach team** to improve communication with affected communities and other stakeholders
- Collaborate with local emergency response personnel to efficiently and effectively disseminate information to the public about events involving PFAS
- Support initiatives to enhance notification of PFAS releases to potentially threatened receptors
- Continue state agency participation in regional/national workgroups and training opportunities to maintain knowledge and capacity for addressing PFAS
Establish an AFFF take-back program
Reduce future releases of AFFF to the environment through other measures such as a ban on firefighting training with AFFF
Establish a Safe Drinking Water Advisory Council to make recommendations regarding MCLs for emerging contaminants
Require all water bottlers that sell bottled water in Connecticut to test their products for PFAS
Evaluate whether the State can require manufacturers to disclose PFAS content on Safety Data Sheets and product labels
For more information

Visit the Task Force webpage:

https://www.ct.gov/CTPFASTaskForce
Thank You

Questions?