Welcome to PFAS 101 - A Primer on PFAS for Public Health Professionals

We will begin at 8:30AM!

Administrative Announcements

- Microphones and Telephones are muted
- Following each presentation 10 minutes will be allowed for Q&A
  - Feel free to ask questions in chat during the presentation as well
  - Unanswered questions will be answered and answers posted to the PFAS 101 Training website
- Join by telephone: email your questions to *eprtraining@vdh.virginia.gov*
- Verification in TRAIN
- Participant survey for your feedback
  - *https://tinyurl.com/vdhpfas101eval*
- Refer to PFAS 101 Training website for future updates
  - *https://tinyurl.com/vdhpfas*
- Webinar is being recorded

Introduction of Your Presenters

- Brookie Crawford, Public Information Officer – Central Region, Office of Communications, Virginia Department of Health
- Anthony Creech, Environmental Technical Programs Manager, Division of Onsite Water and Wastewater Services, Office of Environmental Health Services, Virginia Department of Health
- Dr. Dwight Flammia, State Public Health Toxicologist, Office of Environmental Health Services, Virginia Department of Health
- Julie Henderson, Director, Office of Environmental Health Services, Virginia Department of Health

Introduction of Your Presenters (continued)

- Dr. Tony Singh, Deputy Director, Office of Drinking Water, Virginia Department of Health
- Jeff Steers, Director of Regional Operations, Virginia Department of Environmental Quality

Training Dedication

This training is dedicated in memory of Lorrie Andrew-Spear, Risk Communications Manager, Office of Communications, Virginia Department of Health

Agenda

Segment	Allotted Time
PFAS Introduction	10 minute presentation / 10 minutes Q & A
PFAS In the Environment	1 hour presentation / 10 minutes Q & A
10 Minute BREAK	
PFAS Regulatory Picture, Communicating the Risks, and PFAS Case Study	1 hour presentation / 10 minutes Q & A

Overarching Learning Objectives

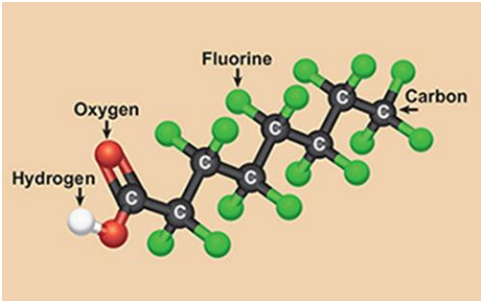
- *PFAS Introduction: Naming Conventions; Physical and Chemical Properties, Production, Uses, Sources; Human Impacts & Risk Assessments*
- PFAS in the Environment: Site Characterization; Fate and Transport; Sampling and Analysis; Treatment and Technology
- PFAS Regulatory Picture, Risk Management and Managing PFAS impacts in your community
- Communicating about the Risks of PFAS and PFAS Case Study

PFAS 101 - A Primer on PFAS for Public Health Professionals

PFAS Introduction

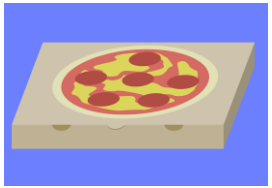
Rise and Fall of Per- and Polyfluoroalkyl Substances (PFAS)

- Discovered in 1938 by Scientist working at DuPont
- Polytetrafluoroethylene (PTFE) trademark name Teflon (1945)

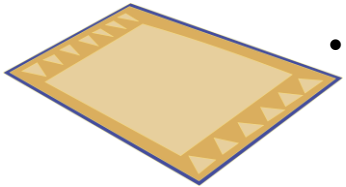


Non-stick cookware

Fire-fighting foam



Food packaging



Stain resistant Carpet

- 1940s-1950s perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) non-stick coatings
- 1950s-1960s PFOS and PFOA used to manufacture stain- and water-resistant products
- 1960s-1970s PFOS used in fire fighting foam

Rise and Fall of PFAS Continued…

1970s-1980s Occupational Exposure Concerns

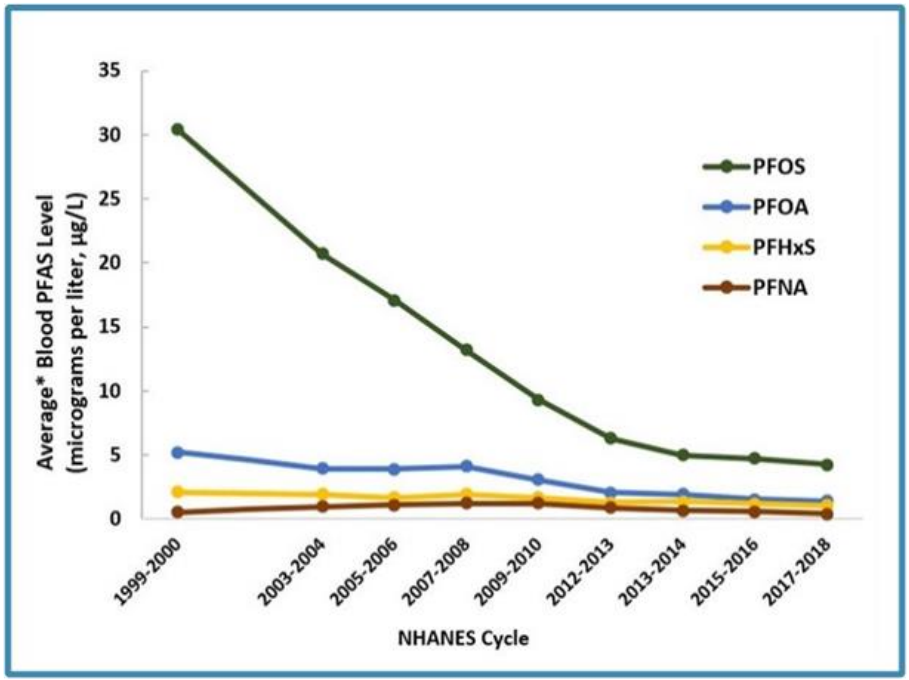
1990s-2000s Lawsuits, widespread in human blood samples, and PFAS Stewardship Program begun

- Found throughout the environment
  - Soil, water, wildlife, fish, etc…
- C8 - Study
- Probable link to a number of diseases

Impact on Health

- Decreased vaccine response in children
- Increased cholesterol levels
- Changes in liver enzymes
- Increased risk of high blood pressure or pre-eclampsia in pregnant women
- Increased risk of kidney or testicular cancer
- Small decreases in infant birth weights

National Health and Nutrition Examination Survey

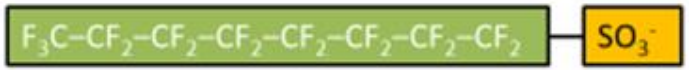


PFAS

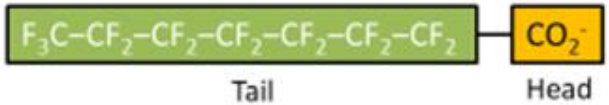
Non-polymer

Perfluorinated

Perfluorooctane sulfonate (PFOS)



Perfluorooctane carboxylate (PFOA)



Polyfluorinated

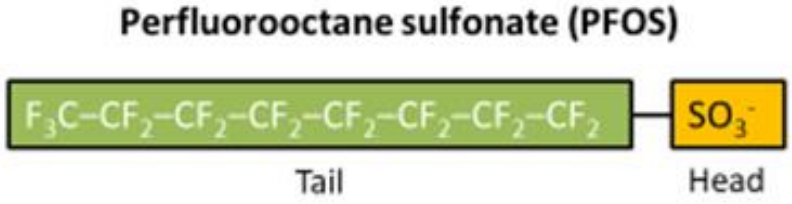
$F_3C\text{-}CF_2\text{-}CF_2\text{-}CF_2\text{-}CF_2\text{-}CF_2\text{-}CF_2\text{-}CF_2\text{-}CH_2\text{-}CH_2\text{-}OH$

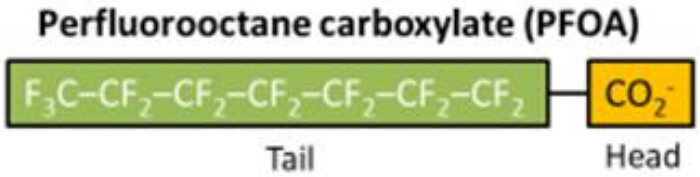
Polymer

Potential precursors

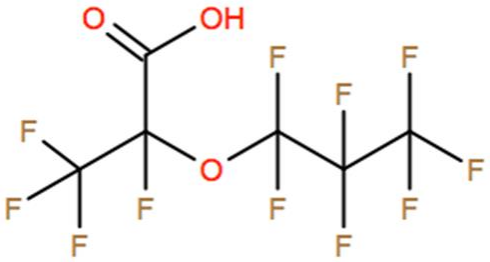
PFAS general properties

- Carbon-fluorine tail
  - Carbon-fluorine strongest covalent bond
  - Electronegative fluorine atom shield carbon
  - Hydrophobic
  - Lipophobic
- Functional head group
  - Polar
  - Hydrophilic
  - Influences environmental fate and transport
- Low volatility
- Perfluorinated acids may be formed by degradation of polyfluoroalkyl.
- Resistant to environmental degradation. Temp >1000°C do degrade
- Linear or branched
  - May affect partitioning and/or bioaccumulation



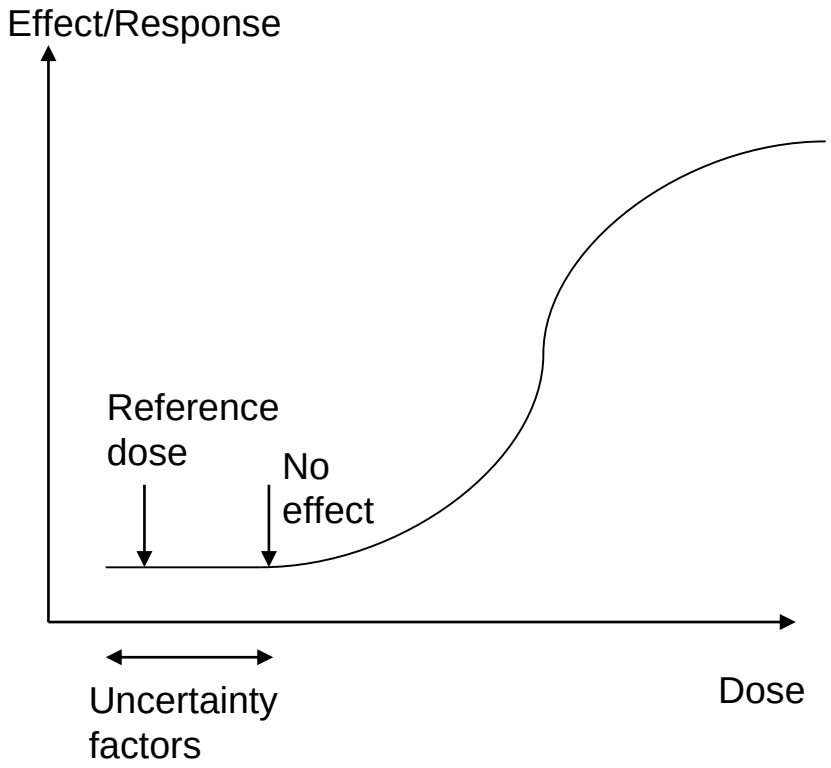


hexafluoropropylene oxide dimer acid (HFPO-DA)



Risk Assessment

- Hazard identification
- **Dose-response**
- Exposure assessment
- Risk characterization



PFOA daily dose

EPA (July 2022)
Reference dose
1.5×10^{-9} mg/kg/day
Suppression of tetanus vaccine in 7 year old children.
Grandjean et al. (2012 & 2018) epidemiological study

EPA (May 2016)
PFOA RfD 2.0×10^{-5} mg/kg/day
Developmental study in rodents
Lau et al. (2006) animal study

ATSDR (May 2021)
Minimal risk level
3.0×10^{-6} mg/kg/day
Skeletal alterations in mice
Koskela et at. (2016) animal study

PFAS in the community

- Drinking water
- Consumer products
- Airports
- Industries that use or manufacture PFAS
- Fish
- Biosolids

Questions?

Overarching Learning Objectives

- PFAS Introduction: Naming Conventions; Physical and Chemical Properties, Production, Uses, Sources; Human Impacts & Risk Assessments
- *PFAS in the Environment: Site Characterization; Fate and Transport; Sampling and Analysis; Treatment and Technology*
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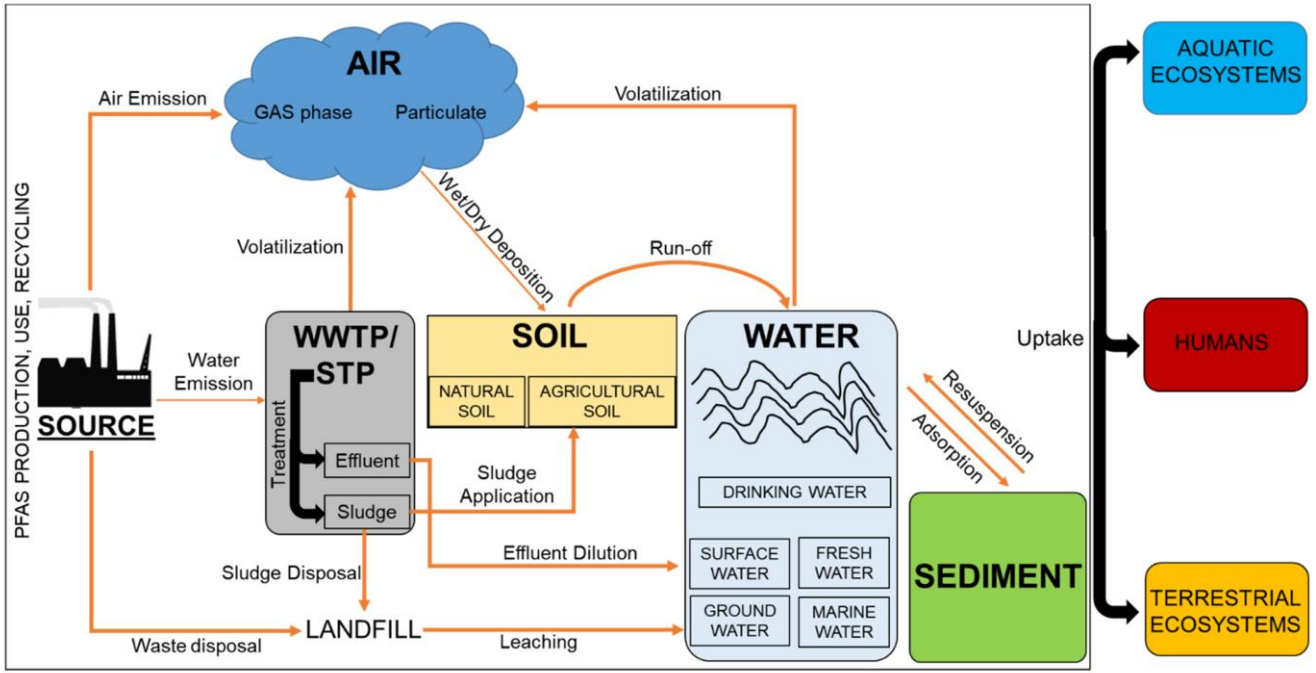
- Communicating about the Risks of PFAS and PFAS Case Study

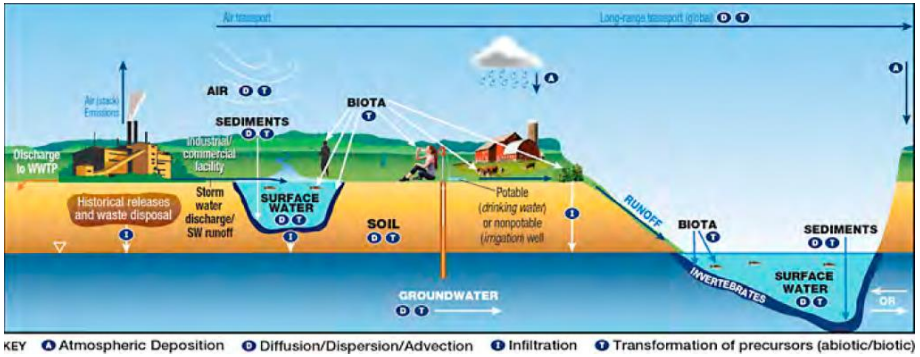
PFAS 101 - A Primer on PFAS for Public Health Professionals

PFAS in the Environment

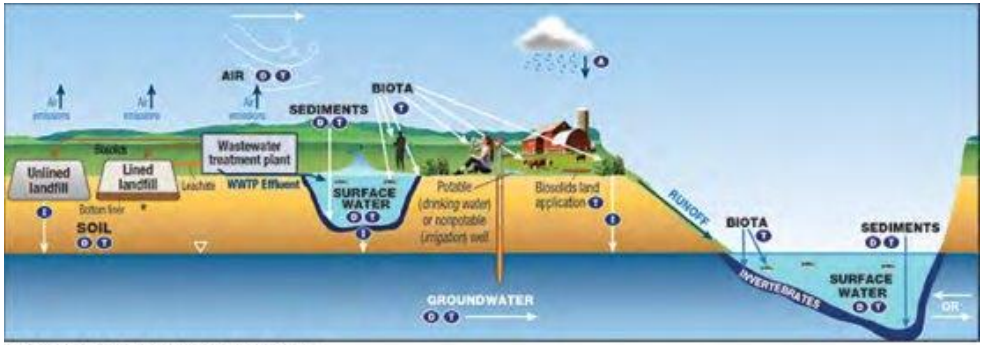
PFAS Environmental Distribution and Exposure Routes



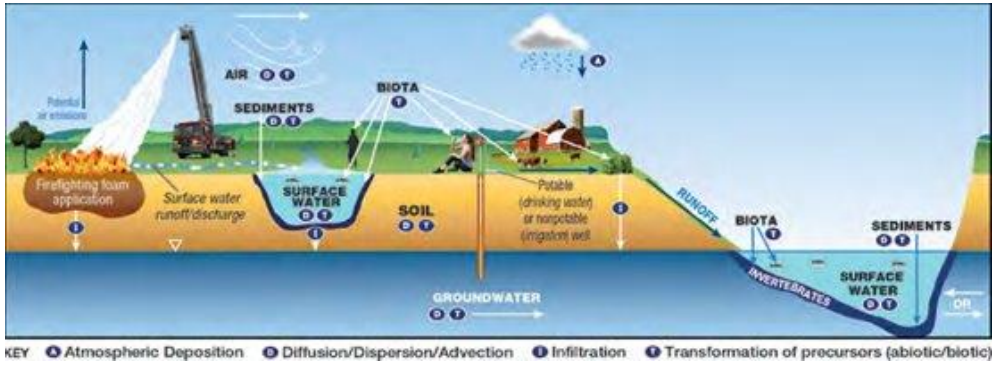
Typical Source Impacts *(Contaminants in Waste)*



Typical Source Impacts *(Landfills and Biosolids)*



Typical Source Impacts *(Firefighting Foams)*



Media-Specific Migration

- Diffusion In and Out of Lower Permeability Materials
  - Contaminant mass in groundwater can diffuse into the pore space of lower permeability soils or bedrock.
  - Back-diffusion out of these low permeability materials may result in the long term persistence of PFAS in groundwater even after source removal and remediation

- Air Transport and Deposition
  - Waste to energy burning of municipal solid waste
  - Industrial processes- stack emissions
  - Incineration of or products of combustion containing PFAS compounds

DEQ Ambient Monitoring Program (2021-2022)

- General Assembly budgeted $320,000 to monitor ambient surface waters and groundwater
- DEQ developing plans to carry out the monitoring
- A subset of DEQ's surface water trend monitoring stations
- Eleven groundwater wells from trend and/or spot programmatic sampling
- Plan to use the State Lab (DCLS - Division of Consolidated Laboratory Services) and Draft Method 1633

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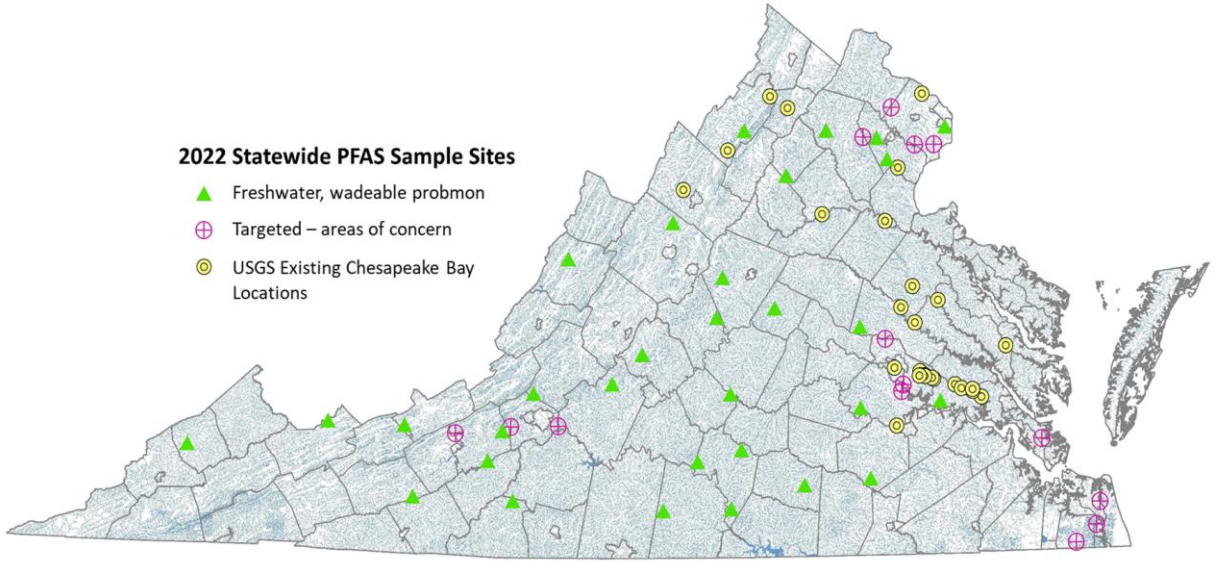

Monitoring Planned for State Fiscal Year 2023

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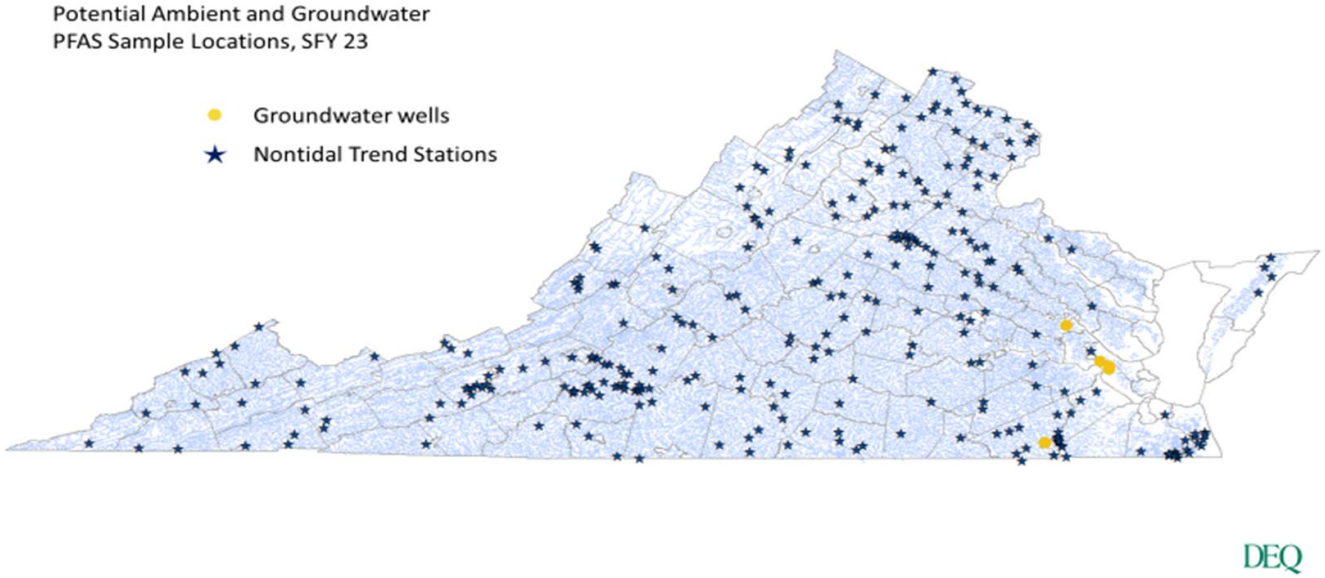
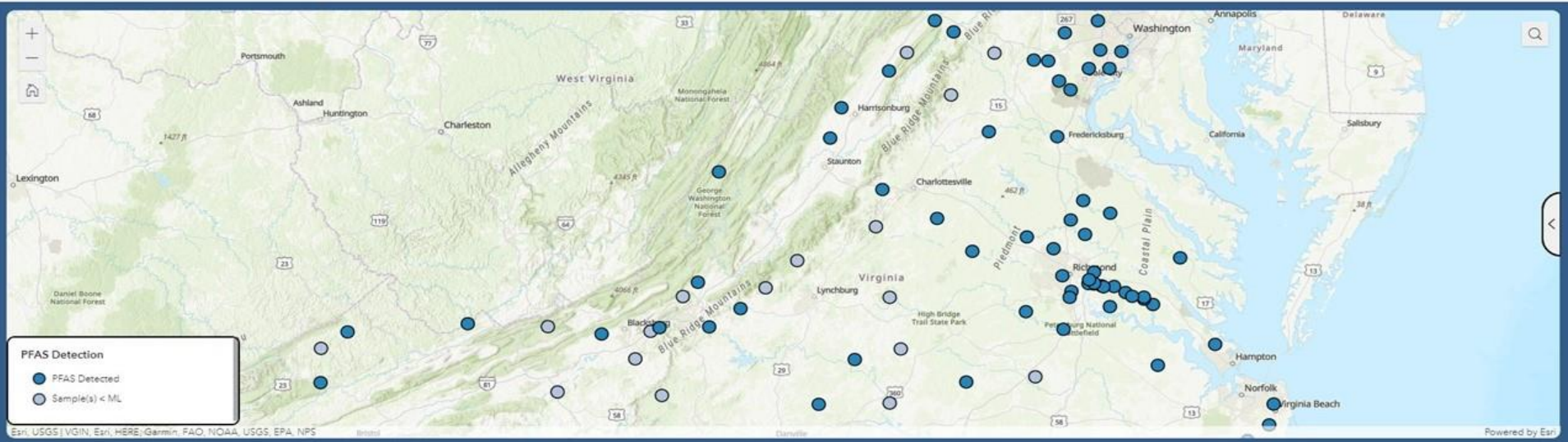


PFAS Tracking Tool

- Online tool launched on March 29, 2023, regularly updated as data becomes available
- Fully interactive map integrating DEQ generated data
  - Surface and groundwater ambient monitoring
  - Fish tissue
  - Sediment
- Can filter data by freshwater probable monitoring stations, USGS nontidal stations and special studies
- Future data my include
  - VPDES point source effluent monitoring
  - Virginia Department of Health source water surveillance monitoring
  - Biosolids at land application sites

PFAS Tracking Tool

Landing Page | Surface Water | Fish Tissue | Sediment | Dashboard Data



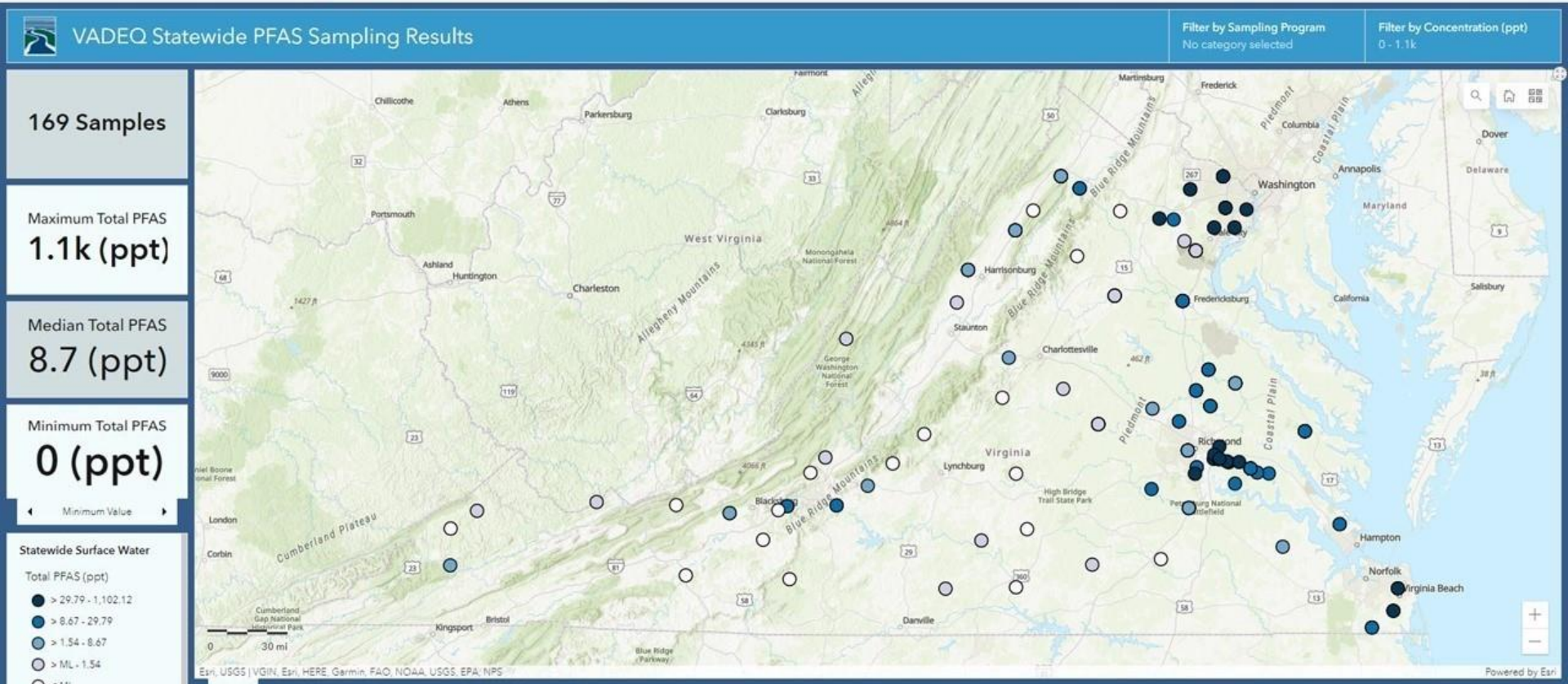
Dashboard Organization | Statewide Summary | PFAS Detection by Sampling Program | Definitions and Context | Data Processing Notes

Statewide Summary

This dashboard contains the results of **193** samples from **80** sites collected by **4** sampling programs: DEQ freshwater probabilistic monitoring (Probmon), special study monitoring in the Middle Chickahominy Watershed and upper Roanoke River basin, USGS Bay Nontidal Network, and select targeted locations. The data presented here are comprised of surface water, sediment, and fish tissue samples that were collected between **11/09/2021** and **6/28/2022**. Samples were analyzed for **40** distinct PFAS analytes using EPA Draft Method 1633. Results indicate that at least one of these analytes was detected above the minimum level of quantitation (ML) at least once at **79**% of sites (n = **63**) and for **88**% of samples (n = **170**).

PFAS Tracking Tool

Landing Page | Surface Water | Fish Tissue | Sediment | Dashboard Data



Demonstration of the PFAS Tracking Tool

https://experience.arcgis.com/experience/5dcd4d69ab184442814cbc0a111d7c96/

Sampling & Analysis

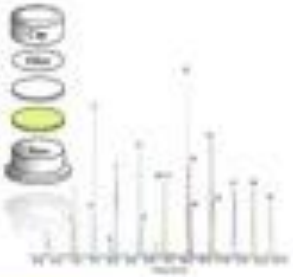
- Cross contamination is very easy; many Do’s and Don’t's
- Different analytical methods vs EPA approved methods
- Different methods for PFAS in drinking water, source water, foods, soil, air and solid waste
- Laboratory capacity & Turnaround Time (TAT)
- Blood serum and human tissue PFAS sampling methods
- Funding available for PFAS public drinking water sampling

PFAS sample collection training (recorded) is available on the VDH-ODW PFAS webpage.

WHAT SHOULD I AVOID?	USE INSTEAD
Passive diffusion bags (PDBs)	
LDPE Hydrasleeves	✓ HDPE Hydrasleeves
Post-It notes during sample handling	
Blue Ice® (chemical ice packs)	✓ Regular ice in Ziploc® bags
Waterproof field books, plastic clipboards and spiral bound notebooks	✓ Field notes recorded on loose paper ✓ Field forms maintained in aluminum or Masonite clipboards
Unnecessary handling of items with nitrile gloves	✓ Personnel collecting and handling samples should wear nitrile gloves at all times while collecting and handling samples or sampling equipment

WHAT SHOULD I AVOID?	USE INSTEAD
Equipment with **Teflon®** (e.g., bailers, tubing, parts in pump) during sample handling or mobilization/demobilization	✓ High density polyethylene (HDPE) or silicone tubing/materials in lieu of Teflon®
Low-density polyethylene (LDPE) or glass sample containers or containers with Teflon-lined lids	✓ HDPE or polypropylene containers for sample storage ✓ HDPE or polypropylene caps
Tyvek® suits and waterproof boots	✓ Clothing made of cotton preferred ✓ Boots made with polyurethane and polyvinyl chloride (PVC)
Waterproof labels for sample bottles	✓ Paper labels with clear tape
Sunscreens, insect repellants	✓ Products that are 100% natural, DEET
Sharpies	✓ Ballpoint pens
Aluminum foil	✓ Thin HDPE sheeting

PFAS analysis



Chromatography / Passive sampling

- *LC-MS-MS*
- *GC-MS*

Semi-quantitative methods TOP/TOF

- *Total oxidizable precursor*
- *Total organic fluorine*

Field deployable methods

- *Colorimetric /Fluorimetric*
- *Electrochemistry /Sensors*

EPA PFAS Analytical Methods

Targeted analysis:

- include methods that are applicable to a specific defined set of known analytes.
- analytical standards exist for quantitation
- methods only measure for analytes on the targeted list
- once the analysis is complete, you can't look for other analytes

Non Targeted analysis:

- analyses include methods that use high resolution mass spectrometry (HRMS) capable of identifying all known and unknown analytes in a sample
- these methods can screen for lists of known suspects and can discover new or unknown analytes.
- HRMS data can be stored and analyzed later for newly identified analytes

EPA PFAS analytical methods

Drinking Water

- Method 537
- Method 537.1
- Method 533

Non-Potable Water and Other Environmental Media

- Method 8327
- Draft Method 1633

Air

- OTM 45
- SW 846
- TO-15

Total PFAS load

- Total Organic Fluorine (TOF),
- Total Organic Precursors (TOP)

Source: EPA Analytical Methods

The big "NINES"

The "Big Nine" of Drinking Water	Fire Fighting Training Areas	Landfill Leachate	Wastewater & Biosolids
PFBS$^-$	X	x	X
PFHxS$^-$	X	x	X
PFOS$^-$	X	x	X
PFPeA$^-$	?	X	X
PFHxA$^-$	X	X	X
PFHpA$^-$	?	X	X
PFOA$^-$	X	X	X
PFNA$^-$	x	x	?
PFDA$^-$	?	?	?
PFAS Precursors	?	X	X

Should you need help….

- Drinking water – Public Water Systems:
  - Office of Drinking Water
- Drinking Water – Private Wells
  - Office of Environmental Health Services
  - Virginia Department of Environmental Quality
- Landfills
  - Virginia Department of Environmental Quality
  - Source Water (Rivers and lakes, reservoirs etc)
- Air
  - Virginia Department of Environmental Quality
- Workplace exposure
  - Virginia Department of Labor and Industry (DOLI)

Treatment Challenges

- Low Volatility (rules out stripping)
- Moderate solubility
- Strength of C-F bond
- Treatment efficiency must be very high because of low (ppt) remediation objectives

Treatment Technologies

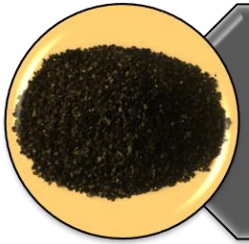
Ex-Situ Technologies

- Sorption/Ion Exchange
  - Carbon (can be effective for some PFAS, but can be inefficient)
  - Ion Exchange Resins (costly)
- Emerging technologies:
  - Reverse Osmosis (RO)
  - Membrane filtration
  - Thermal Treatment
  - SAFF – Surface Activation Foam Fractionation

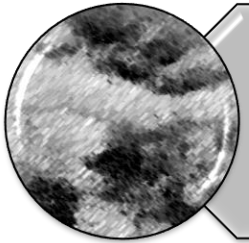
In Situ Technologies

- Emerging(?) technologies:
  - Carbon injection
    - PRB or Source Area
  - Electro-Chemical Oxidation

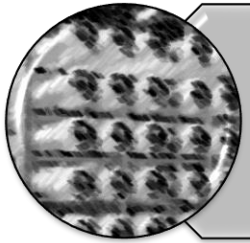
GAC for Drinking Water Treatment



Granular Activated Carbon (GAC)



Anion Exchange (AIX)



High Pressure Membranes

Why GAC is most common:

- ✓ Water quality (e.g., low organics)
- ✓ Compatible with existing treatment
- ✓ Familiarity with GAC operation
- ✓ No regenerant stream of concern
- ✓ Comparatively lower cost (vs. membranes)

GAC for Drinking Water Treatment

Virginia PFAS Activities

Legislative Bills/Actions **PFAS Occurrence Studies** **PFAS Collaborations**

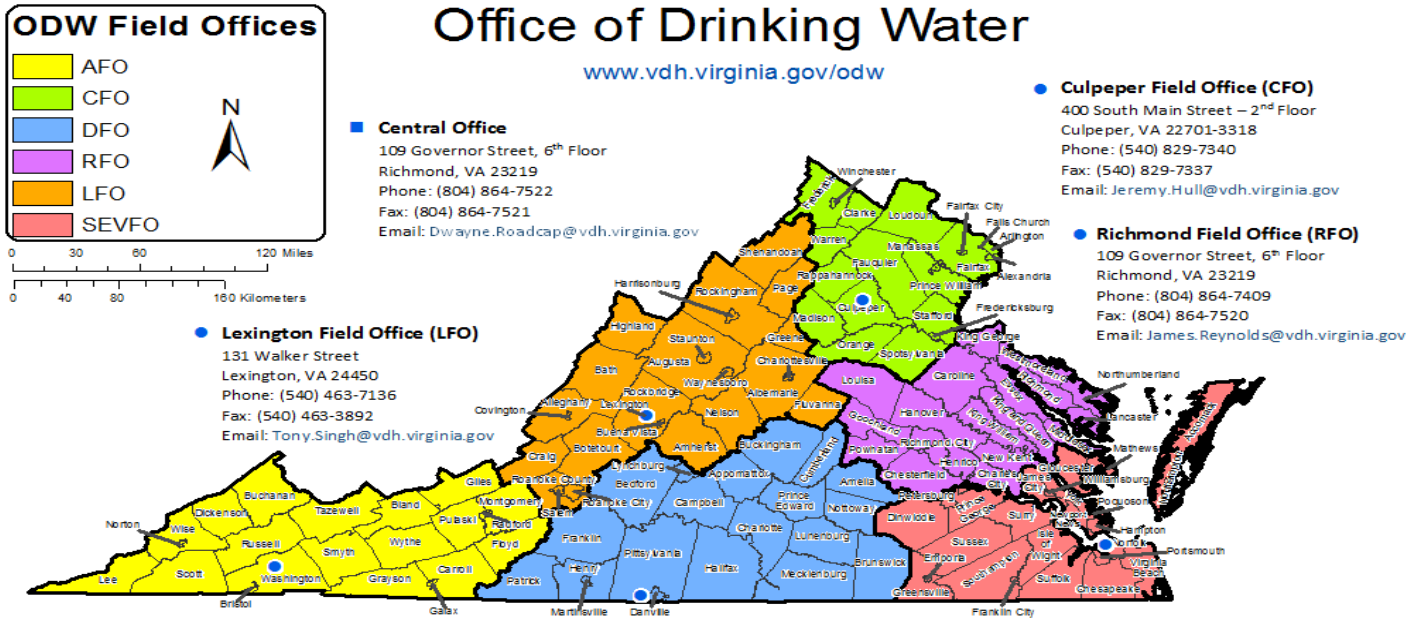
Photo Credit: https://www.linkedin.com/pulse/delicate-balance-between-innovation-regulation-nathalie-ngatia/

Office of Drinking Water

www.vdh.virginia.gov/odw

VDH ODW regulate Drinking Water in Virginia

- 2,800+ Public Water Systems serving more than 6.7 Million Virginians
- Six regional field office and Central office



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The mission of the Office of Drinking Water is to protect public health by ensuring that all people in Virginia have access to an adequate supply of affordable, safe drinking water that meets federal and state drinking water standards.

VA PFAS Phase 1 Sampling Study (HB586 – 2020)

	# Samples	# Systems	Population
Large Waterworks	31	17	4,541,619
GW – Potential High Risk	6		13,329
GW – Potential Medium Risk	13	11	2,124
Major Water Sources	22	22	
Planned Total	**72**	**50**	**4,557,072**
Actual participated	**63**	**45**	**> 4,500,000**

45 waterworks (63 sampling locations) agreed to participate in the Sample Study

- 40 with surface water sources
- 5 with groundwater sources

Phase 1 - PFAS Sampling Study

- PFAS sample collection and analysis: April 2021 – August 2021

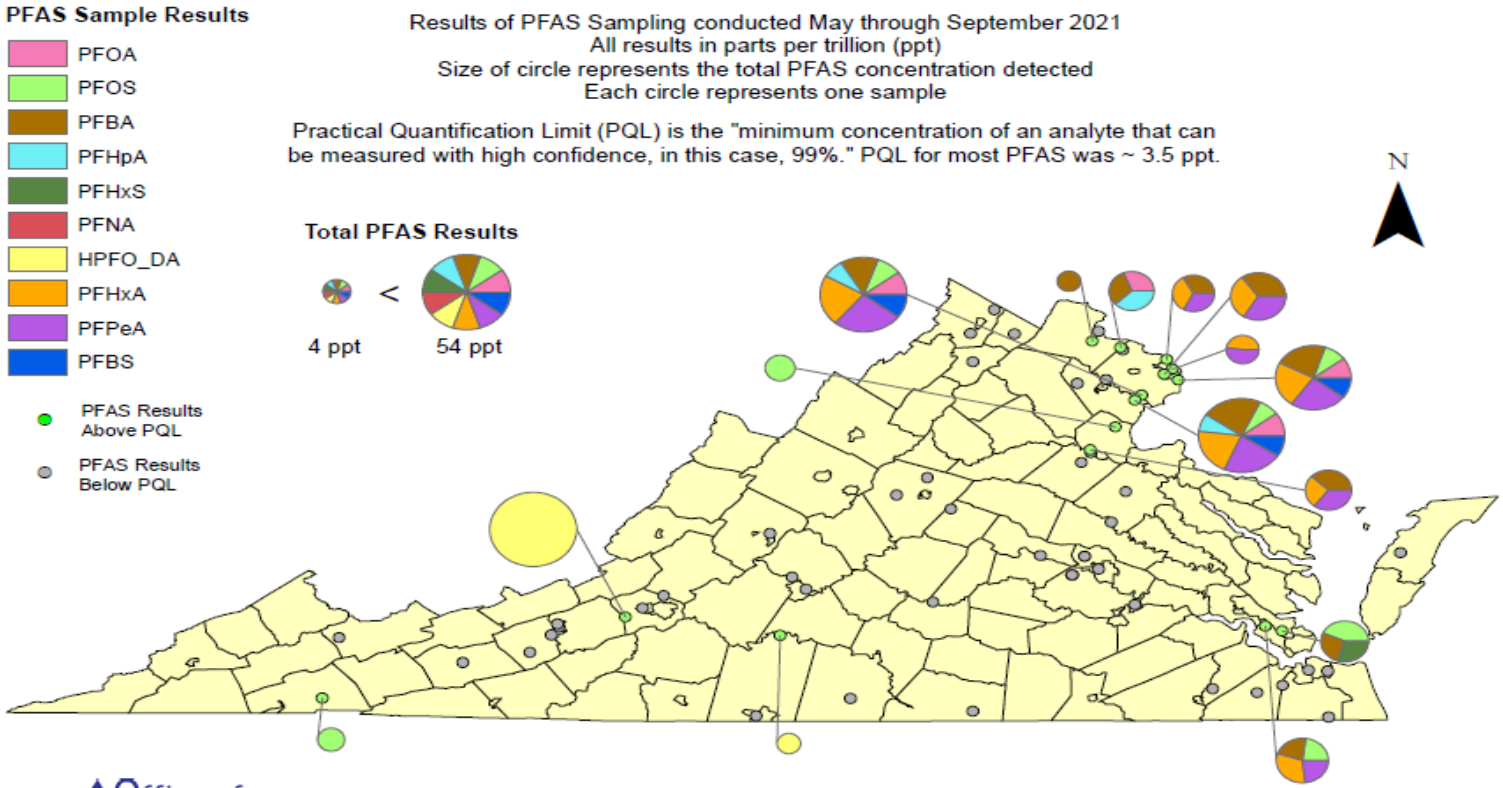
- EPA method 533 (finished water) and DoD method (source water) provided results for 25 PFAS

- PFAS results above Practical Quantitation Level (PQL) were reported
  - (usually above 3.5 parts per trillion)

- VA PFAS Workgroup/subgroup meeting agendas and minutes are available at Virginia Regulatory Town Hall website. PFAS Sampling Study Summary and meeting recordings are available at VDH-ODW PFAS webpage

April – August 2021

VA PFAS Sampling Results



Results of PFAS Sampling conducted May through September 2021
All results in parts per trillion (ppt)
Size of circle represents the total PFAS concentration detected
Each circle represents one sample

Practical Quantification Limit (PQL) is the "minimum concentration of an analyte that can be measured with high confidence, in this case, 99%." PQL for most PFAS was ~ 3.5 ppt.

Office of Drinking Water
Safe Drinking Water for a Healthy Virginia

Data Source: Table 1 and 2 HB586 report -
Virginia Per and Polyfluoroalkyl Substances (PFAS)
in Drinking Water Sample Study Summary,
https:// www.vdh.virginia.gov/drinking-water/pfas/

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

VA PFAS Phase 2 Sampling Logistics

- An external lab is analyzing the samples using EPA method 533
- Sample results will go through appropriate QA/QC before final release
- Waterworks will have an opportunity to review the final results before release

- Sampling focus is on small and medium PWS and PWS where PFAS were detected during Phase 1 sampling.
- VDH ODW staff is leading this sample collection effort

PFAS Sampling Study

	Phase 1	Phase 2
Timeline	Summer 2021	March- July 2023
# of Waterworks	45	~400
# of Sampling Locations	63	~440
Type of Sampling Locations	Entry points & Source waters	Entry points only
Results	15*	In Progress
Report /More Info	RD877 RD681	VDH ODW PFAS Webpage
	*detected at least one PFAS	

VA PFAS Phase 2 Sampling Study ONGOING

- 76 samples collected so far in Phase 2 PFAS sampling so far
- Western Virginia Water Authority: 52 ppt & 2 other HFPO-DA hits
- Sample results will go through appropriate QA/QC before final release
- Recommending 12 re-samples so far (for confirmatory and QA/QC issues)
- More sampling to follow between April- July 2023

Recommendations for VA Public Water Systems

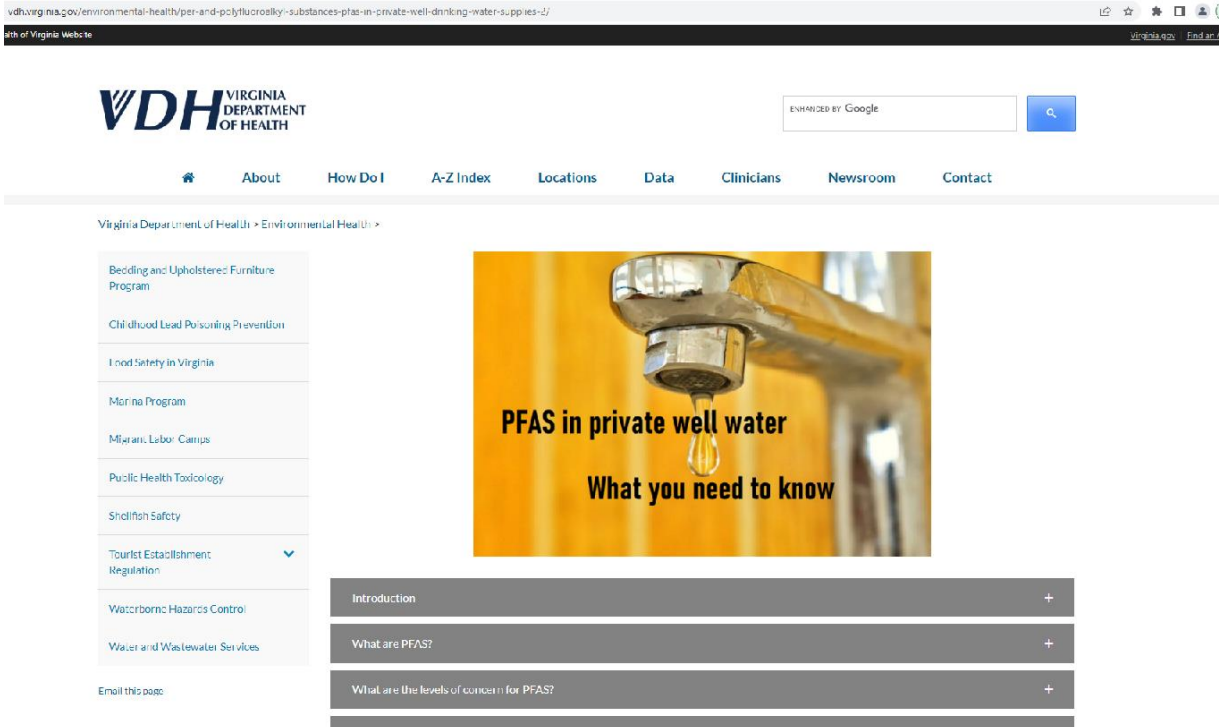
- Sample for PFAs if concerned and have resources
- If they detect PFAS
  - Notify customers
  - Look for ways to reduce the exposure
  - Work with VDEQ and VDH on identifying potential sources
- Public Water Systems to reach out to ODW for technical or financial resources
    - More on EPA PFAS Regulatory processes
        - What about Private Wells?

PFAS and Private Wells

- VDH DOES NOT have a program for sampling and testing water quality in private wells
- Nor can VDH REQUIRE well owners to test
- Life cycle actions, including water quality testing, of private wells is entirely at the discretion of the well owner

PFAS and Private Wells

Your first reference is this webpage (external website):



https://www.vdh.virginia.gov/environmental-health/per-and-polyfluoroalkyl-substances-pfas-in-private-well-drinking-water-supplies-2/

VDH Recommendations for private well testing

VDH recommends that private drinking water wells be tested for PFAS contamination. Especially when a private well is located near a known source of PFAS or of other water supplies where PFAS have been detected

- Airfields where firefighting foams were used
- PFAS manufacturing sites
- PFAS impacted water supplies
- Documented PFAS release sites
- *DEQ Statewide PFAS Sampling Dashboard*

VDH Recommendations for private well testing

Citizens can use commercial laboratories for testing well water for PFAS

Unfortunately, analytical costs at commercial laboratories typically will cost several hundred dollars per sample

At present, VAHWQP is not testing PFAS

SERCAP and similar financial aid organizations *may* be options...

VDH Recommendations for Private Well Testing

Citizens can use commercial laboratories for testing well water for PFAS

- EPA Method 537, 537.1, or 533
- Laboratories Approved by EPA to Support UCMR 5

https:/www.epa.gov/system/files/documents/2022-01/ucmr5-approved-lab-list.pdf

VDH Recommendations for private well testing

Citizens can use commercial laboratories for testing well water for PFAS

Use VDH recommended PFAS sample collection procedures or those provided by the laboratory doing the analysis

https://www.vdh.virginia.gov/content/uploads/sites/20/2022/11/PFAS-FIELD-SAMPLING-GUIDELINES.pdf

VDH Recommendations for Private Well Testing

If the initial testing does not detect PFAS at concentrations of concern, VDH recommends additional testing only when:

- The EPA proposed MCLs are lower than what was previously detected
- A new PFAS release is documented in the vicinity, especially if the well is downstream or downhill
- Advised by EPA or state or local agency

Understanding the Test Results

Ways local health districts can help well owners understand the results

- Certificate of analysis will include many PFAS – not just the "bad ones"
- EPA MCLs technically apply to public water supplies, but are often referenced for private well water quality

Understanding the Test Results

- EPA's proposed MCLs for PFOS and PFOA are each 4 ppt.
- The proposed "Hazard Index" for PFNA, PFHxS, PFBS, and HFPO-DA (GenX) will be confusing for well owners. Private well PFAS webpage has calculator
- The CDC Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRL) are useful screening levels

Understanding the Test Results

Ways staff can help well owners understand the results

CDC MRLs

PFAS Chemical	Adult	Child
PFOA	78 ppt	21 ppt
PFOS	52 ppt	14 ppt
PFHxS	517 ppt	140 ppt
PFNA	78 ppt	21 ppt

Risk of confusing well owners

Obviously there are differences between proposed EPA MCLs and CDC MRLs

PFAS and Private Wells

And don't forget

which is updated for PFAS

Treating PFAS in Private Well Water

- Don't rely on bottled water
- Concern is with drinking and cooking
- Less concern with showering, irrigation, toilet flushing, and laundry
- Boiling is ineffective
- Point-of-Use treatment device
- Point-of-Entry treatment device
- National Sanitation Foundation (NSF)
- Retest after installation/Use

Treating PFAS in Private Well Water

Although Point-of-Use and Point-of-Entry treatment devices are not (yet) specifically designed to meet EPA proposed MCLs for PFAS, there are systems that have been designed to reduce the sum of PFOS and PFOA to below EPA's former Health Advisory of 70 ng/L.

It will take time for industry to "catch up" to EPA MCLs, but that is no reason to postpone treatment efforts.

Home treatment systems are not "install and forget" devices. Filter changes are critical!

Treating PFAS in Private Well Water

EPA Researchers Investigate the Effectiveness of Point-of-use/Point-of-entry Systems to Remove Per- and Polyfluoroalkyl Substances from Drinking Water

In summary

- VDH has always encouraged well owners to regularly test water quality, and PFAS are added to our recommendations
- MCLs are not enforceable in private wells. CDC MRLs provide another option for comparison, but this can be confusing
- Point-of-Use and Point-of-Entry treatment systems meeting NSF standards are effective in reducing PFAS in well water – but O&M is critical
- Frequent changes occur. OEHS is committed to maintain and update the PFAS and Private Well webpage and the Be Well Informed Virginia tool as needed

Questions?

5 Minute Break

Overarching Learning Objectives

- PFAS Introduction: Naming Conventions; Physical and Chemical Properties, Production, Uses, Sources; Human Impacts & Risk Assessments
- PFAS in the Environment: Site Characterization; Fate and Transport; Sampling and Analysis; Treatment and Technology
- *PFAS Regulatory Picture, Risk Management and Managing PFAS impacts in your community*
- *Communicating about the Risks of PFAS and PFAS Case Study*

PFAS 101 - A Primer on PFAS for Public Health Professionals

PFAS Regulatory Picture

The Regulatory Picture

VDH Office of Drinking Water (ODW)

- Public Water Supplies

VDH Office of Environmental Health Services (OEHS)

- Private Wells
- Milk
- Shellfish
- Retail Food

VA Department of Environmental Quality (DEQ)

- Surface water (sources,
- Landfills
- Storm water
- Biosolids
- Air

Federal Agencies

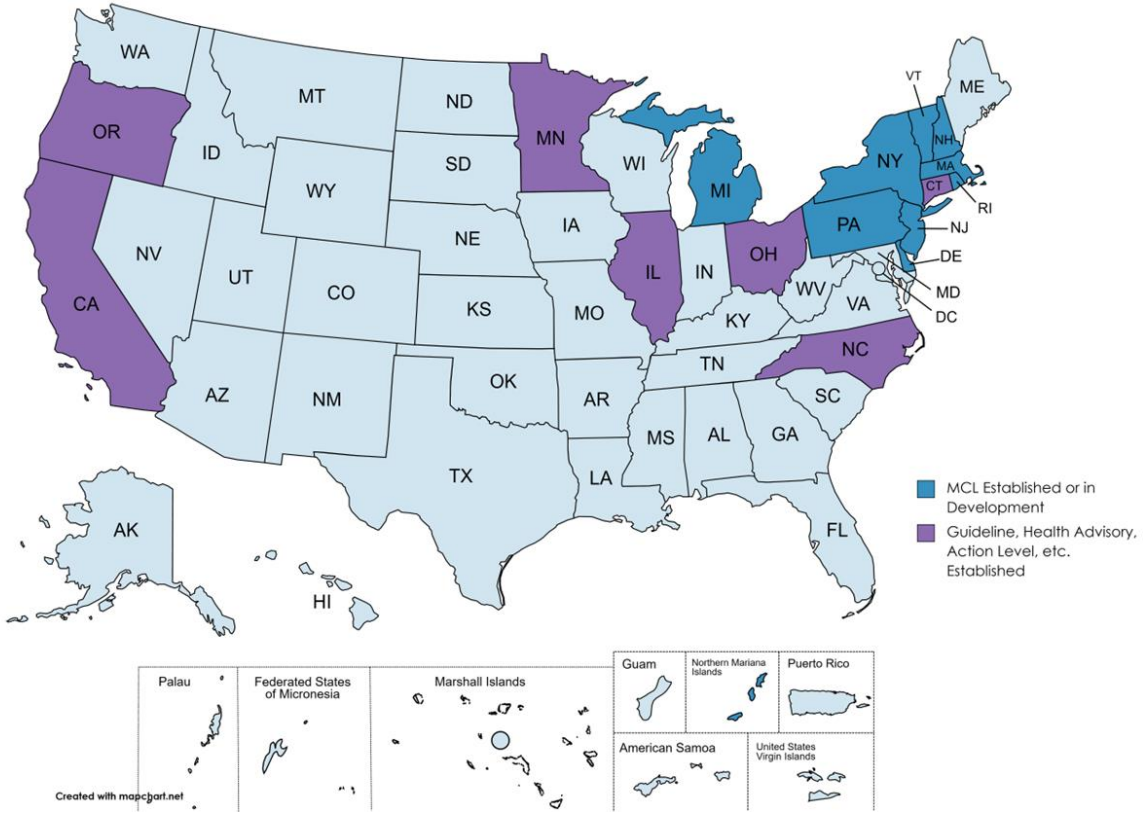
- Food and Drug Administration (FDA)
- Agency for Toxic Substances and Disease Registry (ATSDR)
- U.S. Geological Survey (USGS)
- U.S. Environmental Protection Agency (EPA)

PFAS Regulatory status in the US Drinking Water

State	PFAS (MCL parts per trillion - ppt)
Massachusetts	Sum of PFOA, PFOS, PFNA, PFHxS, PFHpA, PFDA (20 ppt)
Michigan	PFOA (8 ppt), PFOS (16 ppt), PFNA (6 ppt), PFHxS (51 ppt), PFBS (420 ppt), PFHxA (400,000 ppt), and GenX (70 ppt)
New Hampshire	PFOA (12 ppt), PFOS (15 ppt), PFHxS (18 ppt), and PFNA (11 ppt)
New Jersey	PFNA (13 ppt), PFOA (14 ppt), and PFOS (13 ppt)
New York	PFOA (10 ppt) and PFOS (10 ppt)
Pennsylvania	PFOA (14 ppt) and PFOS (18 ppt)
Rhode Island*	Sum of PFOA, PFOS, PFHxS, PFNA, PFHpA, and PFDA (20 ppt)
Vermont	Sum of PFOA, PFOS, PFNA, PFHxS, PFHpA (20 ppt)
Wisconsin	Sum of PFOA and PFOS (70 ppt)
N. Mariana Islands	Sum of PFOS, PFOS, and PFNA (70 ppt)

*Rhode Island's MCL is an interim drinking water standard.

Credit: ASDWA



U.S. EPA Actions on Regulating PFAS in Drinking Water

- **2009**: Provisional Health Advisories (PFOA and PFOS)
- **2013 -15**: UCMR 3 sampling
- **2016**: New Health Advisories (PFOA and PFOS)
- **2021**: PFAS Strategic Roadmap issued
- **2022**: Lowered and developed new Lifetime Health Advisories for 4 PFAS
- **2023**: Proposed first ever National Primary Drinking Water standard (NPDWR) for PFAS in public drinking water
- **2024**: Planned Final PFAS regulation

EPA's approach…

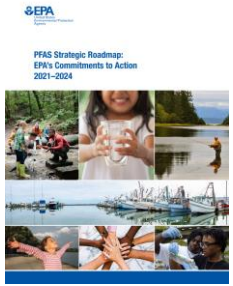
- Consider the lifecycle of PFAS
- Get upstream of the problem
- Hold polluters accountable
- Ensure science-based decision-making
- Prioritize protection of disadvantaged communities

… which is focused on three goals

1. Research
2. Restrict
3. Remediate

US EPA's PFAS Strategic Roadmap

- Undertake nationwide monitoring for PFAS in drinking water
- Publish final toxicity assessment for GenX and five additional PFAS (PFBA, PFHxA, PFHxS, PFNA, PFDA)
- Publish health advisories for GenX and PFBS
- Establish a national primary drinking water regulation for PFOA and PFOS
- Restrict PFAS discharges from industrial sources through Effluent Limitations Guidelines program
- Leverage National Pollutant Discharge Elimination System permitting to reduce PFAS discharges to waterways
- Publish final recommended ambient water quality criteria for PFAS



Reference: https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024

Lifetime Health Advisories (LHA) - Timelines

	2009	2016	2022
PFOA	400 ppt*	70 ppt	0.004 ppt**
PFOS	200 ppt*		0..02 ppt**
HFPO-DA			10 ppt
PFBS			2000 ppt
	*Provisional (2009)	EPA Fact sheet (2016)	**Interim LHA

- EPA's health advisories (HA) are non-enforceable and non-regulatory and provide technical information to states agencies and other public health officials on health effects, analytical methodologies, and treatment technologies associated with drinking water contamination.

HA vs MCLG vs MCL

EPA develops health advisories **to provide information on contaminants that can cause human health effects** and are known or anticipated to occur in drinking water.

- Non-enforceable

The MCLG is the maximum level of a contaminant in drinking water at which **no known or anticipated adverse effect** on the health of persons would occur, allowing an adequate margin of safety.

- MCLGs are non-enforceable public health goals.

The MCLs are **legally enforceable primary standards** and treatment techniques that apply to public water systems.

- Enforceable Standard

EPA Proposed MCL and Hazard Index

Hazard Index (HI)

- Used to evaluate potential health risks from exposure to chemical mixtures.
- This approach has been used in other EPA programs, such as CERCLA but this is the first time it has been used for a drinking water standard.

PFAS	MCLG	MCL
PFOA	Zero	4 ppt
PFOS	Zero	4 ppt
PFBS	1.0 (unitless) Hazard Index	1.0 (unitless) Hazard Index
PFNA		
GenX		
PFHxS		

Hazard Index calculation

Step 1. Divide the measured concentration of Gen X by the health-based value of 10 ppt
Step 2. Divide the measured concentration of PFBS by the health- based value of 2000 ppt
Step 3. Divide the measured concentration of PFNA by the health-based value of 10 ppt
Step 4. Divide the measured concentration of PFHxS by the health-based value of 9 ppt
Step 5. Add the ratios from steps 1, 2, 3 and 4 together

Equation

$$\text{Hazard Index} = \left(\frac{[\text{GenX}_{\text{water}}]}{[10\text{ ppt}]}\right) + \left(\frac{[\text{PFBS}_{\text{water}}]}{[2000\text{ ppt}]}\right) + \left(\frac{[\text{PFNA}_{\text{water}}]}{[10\text{ ppt}]}\right) + \left(\frac{[\text{PFHxS}_{\text{water}}]}{[9.0\text{ ppt}]}\right)$$

Step 6. To determine HI compliance, repeat steps 1-5 for each sample collected in the past year and calculate the average HI for all the samples taken in the past year.
Step 7. If the running annual average HI greater than 1.0, it is a violation of the proposed HI MCL.

From EPA's Fact Sheet: Understanding the PFAS National Primary Drinking Water Proposal Hazard Index

Hazard Index (HI)

- If the combination of those four ratios is above 1.0, then water systems will be expected to reduce the levels of these PFAS.
- Depending on the level of contamination found, water systems may need to take action even if only one of the four PFAS is present.
- EPA will be creating a webpage with a calculator tool for water systems to determine their Hazard Index.

Next Steps

- Published in the *Federal Register*, on March 29, 2023
- The public have 60 days to provide comments (May 30, 2023)
- VDH plans to submit comments through State or ASDWA
- Planned release the final PFAS regulation by end 2023/early 2024
- VA will have 3 years to implement the rule
- Once finalized applicable to Community Water Systems (CWS) and Non Transient Non Community (NTNC) systems

What this means to Virginia Drinking Water

- All CWS and NTNC required to perform 4 quarters of compliance sampling
- If Running Annual Average concentration exceed the MCL or HI:
  - Notify the customers
  - Look for ways to reduce the exposure via drinking water
  - Install treatment

What is happening at the Commonwealth level?

HB586 Acts of Assembly Chapter 611 July 2020	HB1257 Acts of Assembly Chapter 1097 July 2020	HB919 Acts of Assembly Chapter 585 July 2022
Patron: Delegate Guzman (GA 2020) • Convened a PFAS workgroup, • Conducted a detailed investigation on current literature and what other states are doing, • Conducted PFAS occurrence study at no more than 50 waterworks and source waters, • Submitted report: Due12/01/2021	Patron: Delegate Rasoul (GA 2020) • Establish MCLs for PFOA, PFOS, and other PFAS compounds, 1,4-Dioxane, and Chromium (VI) • Submitted report in November 2021 * October 01, 2022 • Effective : 01/01/2022: • NOIRA published 02/2022; • Public comment period ended on 03/16/2022	Patron: Delegate Orrock (GA 2022) • Adopt EPA MCLs; • VDH continue with their regulatory process; • Follow EPA SDWA process for rulemaking; (A Workgroup; Conduct an occurrence study; Analysis of health effects; Cost benefit analysis) • Effective Date: 07/01/2022

PFAS Occurrence in VA Drinking Water

- Phase 1 and Phase 2 PFAS Occurrence Studies
- EPA UCMR 3 and UCMR 5 sampling (2023-25)
- Department of Defense (DoD) and DEQ collected Data
- Literature Review and Waterworks

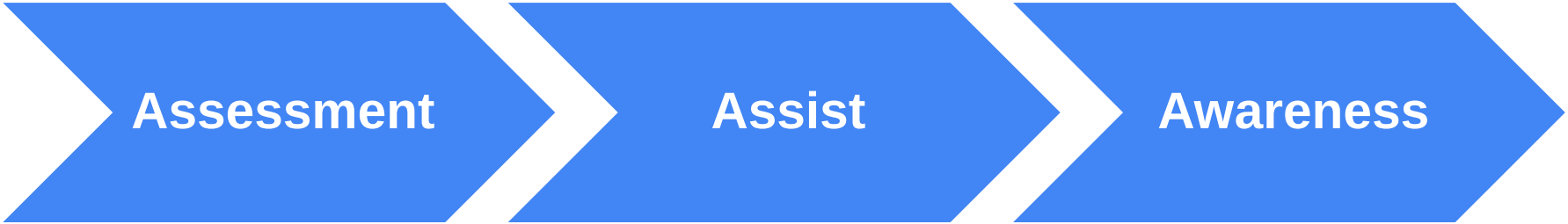
A more comprehensive PFAS monitoring project is planned for 2023-24

Role of VDH-ODW in Virginia PFAS Strategy

VDH-ODW PFAS Surveillance Program

Financial Assistance - PFAS funding - Waterworks & VDH

Training – Training for Health Professionals, Water staff and Waterworks



Technical Assistance – Resources for stakeholders (how/why/where/when/what)

Public Education/Awareness and stakeholder engagement –

- Educating communities on the - ECs Stakeholders Engagement & Feedback

Bipartisan Infrastructure Law Funding

$10 billion nation-wide to address emerging contaminants over the next 5 years

- Drinking Water State Revolving Fund - Emerging Contaminants with focus on PFAS

$800 million per year, FY22-26

- Emerging Contaminants Grant Assistance for Small and Disadvantaged Communities

$1 billion per year, FY22-26

- Clean Water State Revolving Fund

$100 million for FY22

$225 million per year, FY23-26

Emerging Contaminants (ECs) Funding

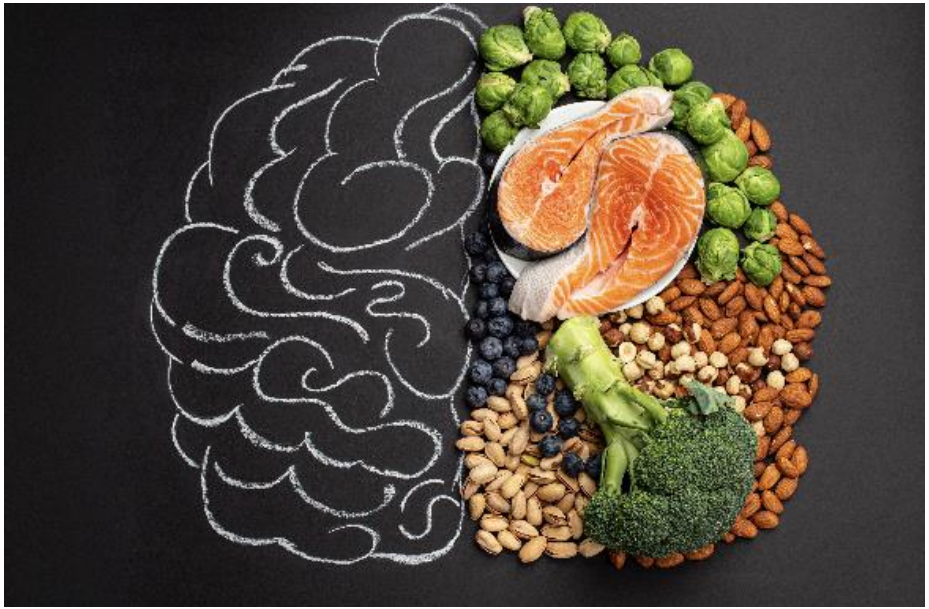
- Virginia is expected to receive ~ $12.3 Million per year through 2026 for PFAS (and other ECs).
  - Virginia has awarded $12.3 M for 3 projects under this program.

- $27.2 Million is expected to come to Virginia for the ECs in Small or Disadvantaged Communities (EC-SDC) Grant Program in 2023.*
  - Grant Implementation Guide is available here

*Actual funding amount may change

Private Drinking Water Wells

Foods and Food Packaging



Grade A Milk

There is no defined Action Level for PFAS. The presence of PFAS would be adulteration and would potentially require additional sampling and testing to support a formal Health Risk Assessment conducted by FDA.

Bivalve Molluscan Shellfish

The Division of Shellfish Safety and Waterborne Hazards

The National Shellfish Sanitation Program

The Regulatory Picture

2021-2024 PFAS Federal Actions Watchlist

2021

- Denial/Withdrawal of TSCA LVEs
- More Stringent Existing & New Chemical Manufacturing, Importation, and End-Use
- TSCA Reviews, Inventory Re-reviews, Rules, and Orders
- TSCA Section 4 Test Orders
- PFAS Categories Identification
- Final Toxicity Assessment for PFBS & GenX
- Increased Enforcement/Oversight via RCRA, TSCA, CWA, SDWA, CERCLA
- Total Adsorbable Fluorine (TAD) Method for Wastewater

2022

- National Ambient Water Quality Criteria for Aquatic Life
- Health Advisories for PFBS & GenX
- Voluntary Stewardship Program for Industry
- Hazardous Air Pollutant Designation
- Expanded TRI Reporting/Chemicals of Special Concern Designation
- Soil Leaching Analytical Method
- Multimedia Test Methods for 40 PFAS
- IRIS Assessments for PFBA, PFHxS, PFHxA, PFNA, PFDA
- Annual Progress Report on PFAS Strategic Roadmap
- Final ELG Plan 15
- National Fish Tissue Surveys
- Drinking Water Treatment Technologies

2023

- CERCLA Hazardous Substance Designation/Cost Recovery
- TSCA 2011 Retroactive Reporting
- UCMR 5 Implementation
- Additional Health Advisories
- NPDES Permitting
- Update Guidance on Destroying & Disposing PFAS
- Fish Consumption Advisory PFAS List

2024

- National Primary Drinking Water Regulations
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Role of DEQ in Virginia's PFAS Strategy

- Provide support to VDH's surveillance program
- Currently no Virginia regulatory specific requirements for reporting, controlling discharges of PFAS or the establishment of surface water quality criteria
- Monitor ambient water quality for presence of PFAS compounds
- Use existing authorities to require self-monitoring of effluent discharges, both industrial and municipal
- Conduct investigations into sources where known releases to surface or groundwater have occurred

Strategic Concepts for DEQ's Response to PFAS

Goal: To protect Virginia's air and water resources from PFAS levels that negatively impact human health and the environment.

Ambient Monitoring

Source Identification

Risk Assessment

Control (Reduce/Remediate Sources)

Monitor

Prioritize Areas of Concern

Source Inventory

Survey Follow-up

NAICS/SIC Code Review Focus

DEQ Surveillance and Confirmatory Sampling Efforts

Drinking Water Surveillance Monitoring Review

Follow-up on Industrial User Surveys with Utilities

Leverage Compliance Inspection to Include PFAS Reviews During Air, Waste and Water Inspections

Source Self Monitoring

Risk Based Strategy to Identify Sources

- Review of ambient water quality data, identifying hot spots and permitted outfalls nearby
- Require municipalities to survey their industrial users on past and current use of PFAS compounds
- Based on surveys, require municipal Publicly Owned Treatment Works to conduct indirect discharge monitoring
- Require at least semi annual monitoring of municipal and industrial VPDES permittees as permits come up for renewal
    - Increase or decrease monitoring based on results

WQ: Aquatic Life Criteria - Draft

	Acute 1-Hour Average		Chronic 96-Hour Average	Instantaneous		
	Fresh water (mg/L)	Salt water* (mg/L)	Fresh water (mg/L)	Invertebrate Whole Body (mg/kg ww)	Fish Whole Body (mg/kg ww)	Fish Muscle (mg/kg ww)
PFOA	49	7	0.094	1.11	6.10	0.125
PFOS	3	0.55	0.0084	0.937	6.75	2.91

*New Approach Method – Available toxicity data and modeled estimates

- Chronic criteria designed to be protective from bioaccumulation
- Published May 3, 2022 – currently under public comment period
- Chronic FW and Tissue criteria are independently applicable
- Consumption of fish

Water Quality: Human Health Criteria

- Difficult to establish criteria because it's difficult to determine health effects for several reasons
  - Use the latest science to determine what is protective of human health
  - Rapidly evolving
  - Route of exposure (ingestion of water and fish consumption); Duration and Frequency; Age
  - Many PFAS compounds
- Expected Fall of 2024

NPDES: Eliminating PFAS Prior to Discharge

- The National Pollutant Discharge Elimination (NPDES) will be leveraged to reduce PFAS discharges to waterways
  - Additional guidance to come about NPDES permits for PFAS.
  - Applicable to POTWs, stormwater permits, and the following industries:
    - Organic chemicals, plastics & synthetics, metal finishing & electroplating, landfills, pulp, paper & paperboard, leather tanning, plastics molding, textile mills, paint formulating, airports.
  - NPDES Permits

April 28, 2022 Memorandum: "Addressing PFAS Discharges in EPA-Issued NPDES Permits and Expectations Where EPA is the Pretreatment Control Authority"

Regulatory Action Regarding Firefighting Foams

Virginia Department of Fire Programs and the Virginia Fire Services Board assist municipal fire departments to transition to fluorine-free foams, where possible.

Effective January 2020, Virginia law bans the discharge or use of PFAS containing Aqueous Film Forming Foam for testing or training unless the facility has implemented containment, treatment, and disposal measures to prevent release to the environment.

PFAS 101 - A Primer on PFAS for Public Health Professionals

Risk Communication and PFAS

Risk Communication Goals

- Enhance knowledge and understanding
- Build trust and credibility
- Encourage appropriate attitudes, behaviors and beliefs

Health Communication Obstacles

- Uncertainty, complexity
- Distrust (Government, Science, youth, age, etc.)
- Conflicting evidence
- Selective/Biased reporting by the news media
- Rumors, Misinformation, Disinformation
- Emotion overcomes logic
- Language & culture

Crisis Communications

- Public Perception of Risk
- People perceive risk differently and do not believe that all risks are of the same type, size or importance.
- Perceptions of risk are different for the technical and lay audiences – Ex. The “one in a million” technical answer will be personalized by the public; that “one person” may be someone they know.

Staying on Message

- “On Message” is a form of artful repetition, but not word-for-word every time you answer a question.
- No more than three key messages.
- State your key message upfront and return to it often (reiterate at the end).
- Repeat your key message enough so the audience understands what you want them to hear.

Risk Communication Tips

- Acknowledge Uncertainty - admit what we don't know at present
- Specify corrective and protective actions to take to protect self and family
- "Here's what you can do"

PFAS in the News

PFAS Talking Points

- What are they?
- How are individuals exposed?
- What health concerns result from PFAS contact?
- How do I know if PFAS is in my water? Is water testing necessary? What is the process for testing?
- What is VDH doing?
- What steps can be taken to reduce risk or limit exposure?
- What are the state standards/proposed federal limits for levels of PFAS?

Key Message 1	Key Message 2	Key Message 3
Per- and polyfluoroalkyl substances (PFAS) are a group of more than 9,000 synthetic chemicals that have been used in industry and consumer products, worldwide, for more than 80-90 years.	PFAS are emerging contaminants of concern.	Exposure to PFAS may be harmful to human health.
Support Point 1.1	Support Point 2.1	Support Point 3.1
PFAS are used in many different industrial and consumer products, including stain-resistant textiles, food-handling materials, firefighting foam, medical devices, paints, personal care products, construction materials, and industrial processing aids.	Many PFAS, including perfluorooctane sulfonic acid (PFOS) perfluorooctanoic acid (PFOA),HFPO-DA, PFNA, PFHxS, and PFBS are a concern because they: • do not break down in the environment • can move through soils and contaminate drinking water sources • build up (bioaccumulate) in fish and wildlife.	Research involving humans suggests that high levels of certain PFAS may lead to the increased cholesterol levels, changes in liver enzymes, decreased vaccine response in children, high blood pressure during pregnancy, and kidney and testicular cancer.
Support Point 1.2	Support Point 2.2	Support Point 3.2
Community exposure to PFAS may occur through drinking water, air, soil, food, or consumer products.	Both government and private laboratories can now effectively measure 29 PFAS.	Due to widespread use of PFAS in consumer products most individuals will have a measurable level in their blood. Therefore, testing is not recommended in most situations.
Support Point 1.3	Support Point 2.3	Support Point 3.3
A person's industry, occupation, and work activities can affect the specific PFAS they are exposed to, how much they are exposed to, and how they are exposed. Some occupations that are known to be exposed more include: • Chemical manufacturing workers • Firefighters • Ski wax technicians	EPA released the proposed National Primary Drinking Water Standard for PFAS in March 2023 and expect to release the final regulation by end of 2023/early 2024. Public comments period ends on May 30 on the EPA proposed PFAS regulation.	Given the scientific understanding at this time, the benefits of breastfeeding outweigh any potential risks of PFAS exposure through breast milk.

VDH & EPA Roles - Drinking Water Messages

- The VDH Office of Drinking Water is working closely with water utility providers to monitor the water that is provided to Virginia residents.
- Current "health advisories" are not enforceable and are provided so that state agencies can make informed decisions.
- EPA will issue a final PFAS National Primary Drinking Water Regulation after reviewing public comments provided on the proposed one. EPA anticipates finalizing the regulation by the end of 2023/early 2024.

Health Questions

- PFAS are present in the environment, air, water and many consumer products. Many industries have stopped using PFAS, or are phasing out their use. Learning about the potential presence of PFAS in consumer products and avoiding or limiting exposure to these products can help reduce PFAS exposures.
- A person will not be able to see, smell, or taste PFAS in his or her drinking water. Analysis of a water sample at a laboratory certified to test for PFAS is the only way to show whether drinking water has been contaminated with PFAS. Your water utility may have information about your water.
- Exposure to PFAS does not always mean a person will have health effects. Variables include how long (duration), how often (frequency), and how much (dose) they were exposed to as well as personal factors like age, lifestyle, and other illnesses. Like many health issues, it is difficult to identify cause.

PFAS Communication Resources

- VDH: www.vdh.virginia.gov/drinking-water/pfas/

  www.vdh.virginia.gov/environmental-health/per-and-polyfluoroalkyl-substances-pfas-in-private-well-drinking-water-supplies-2/

- DEQ: www.deq.virginia.gov/get-involved/the-environment-you/per-and-polyfluoroalkyl-substances-pfas

- EPA: www.epa.gov/sdwa/drinking-water-health-advisories-pfoa-and-pfos

- FDA: www.fda.gov/food/chemicals/and-polyfluoroalkyl-substances-pfas

PFAS Subject Matter Experts & PIOs

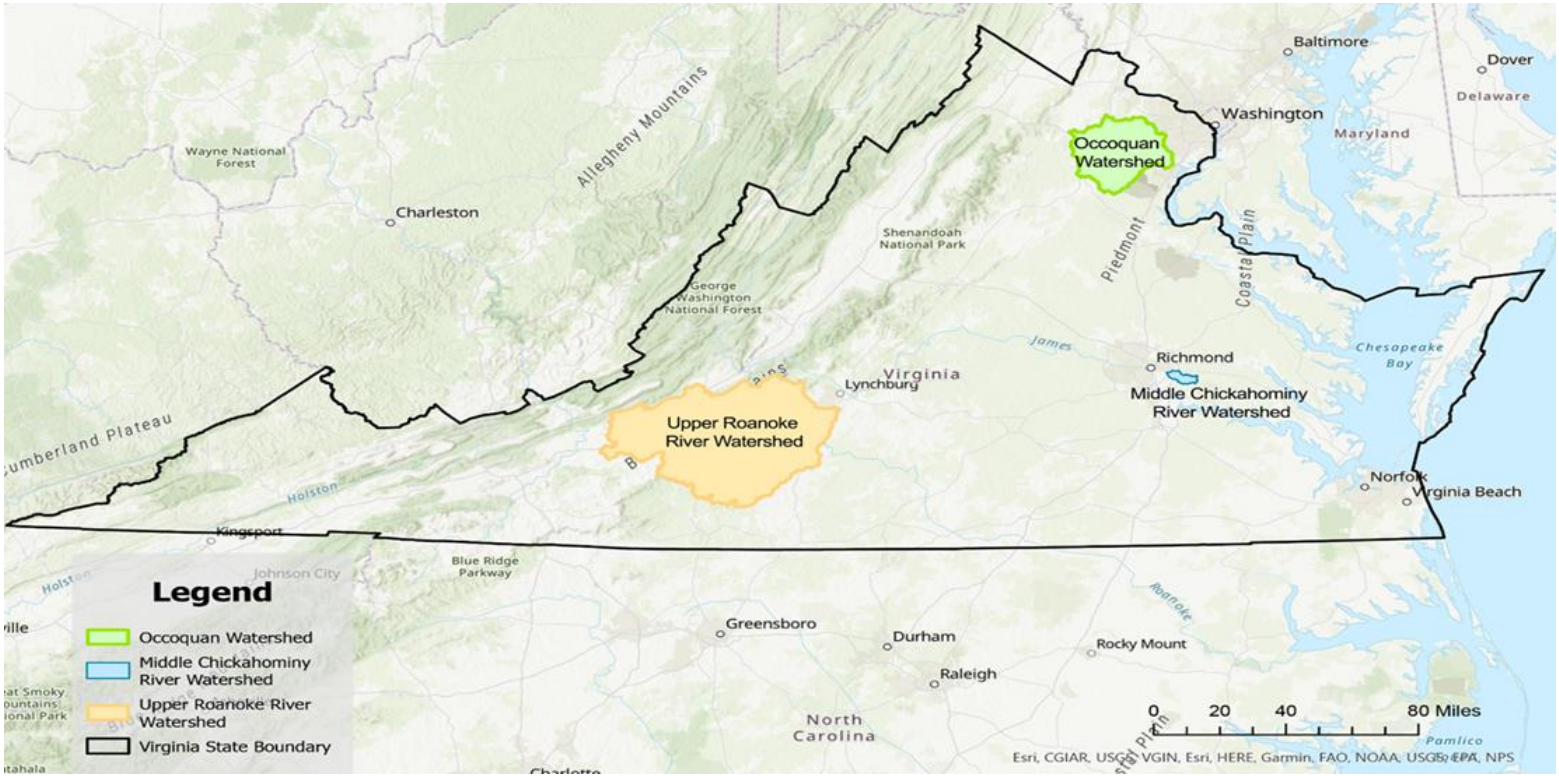
VDH SMEs
- Dwayne Roadcap
- Tony Singh
- Julie Henderson
- Dwight Flammia
- Anthony Creech

VDH PIOs
- Brookie Crawford
- Linda Scarborough
- And other Regional/Central Office PIOs

DEQ Contact/SME
- Jeff Steers

DEQ Contact/PIO
- Irina Calos

Special PFAS Studies



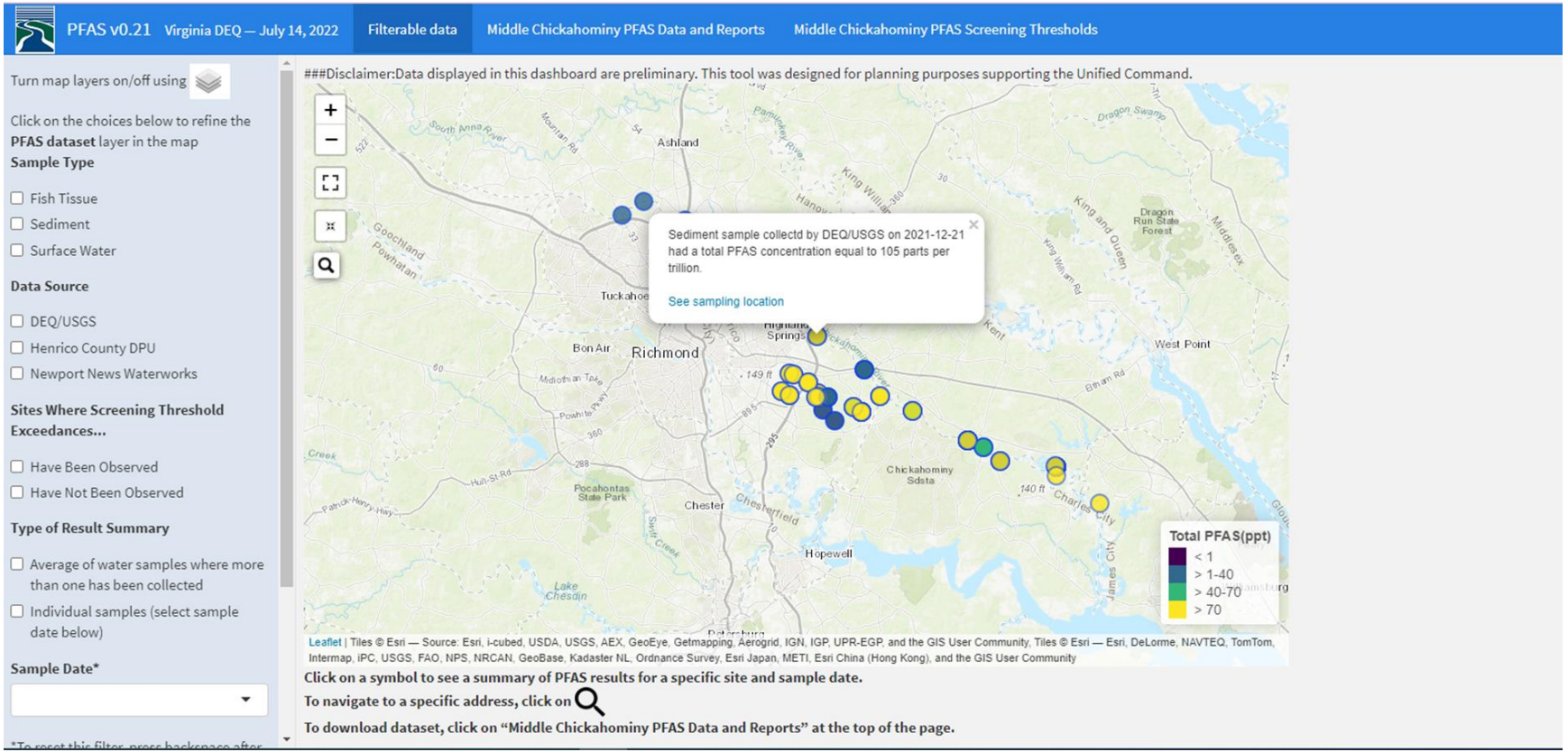
Managing PFAS Impacts in your Community

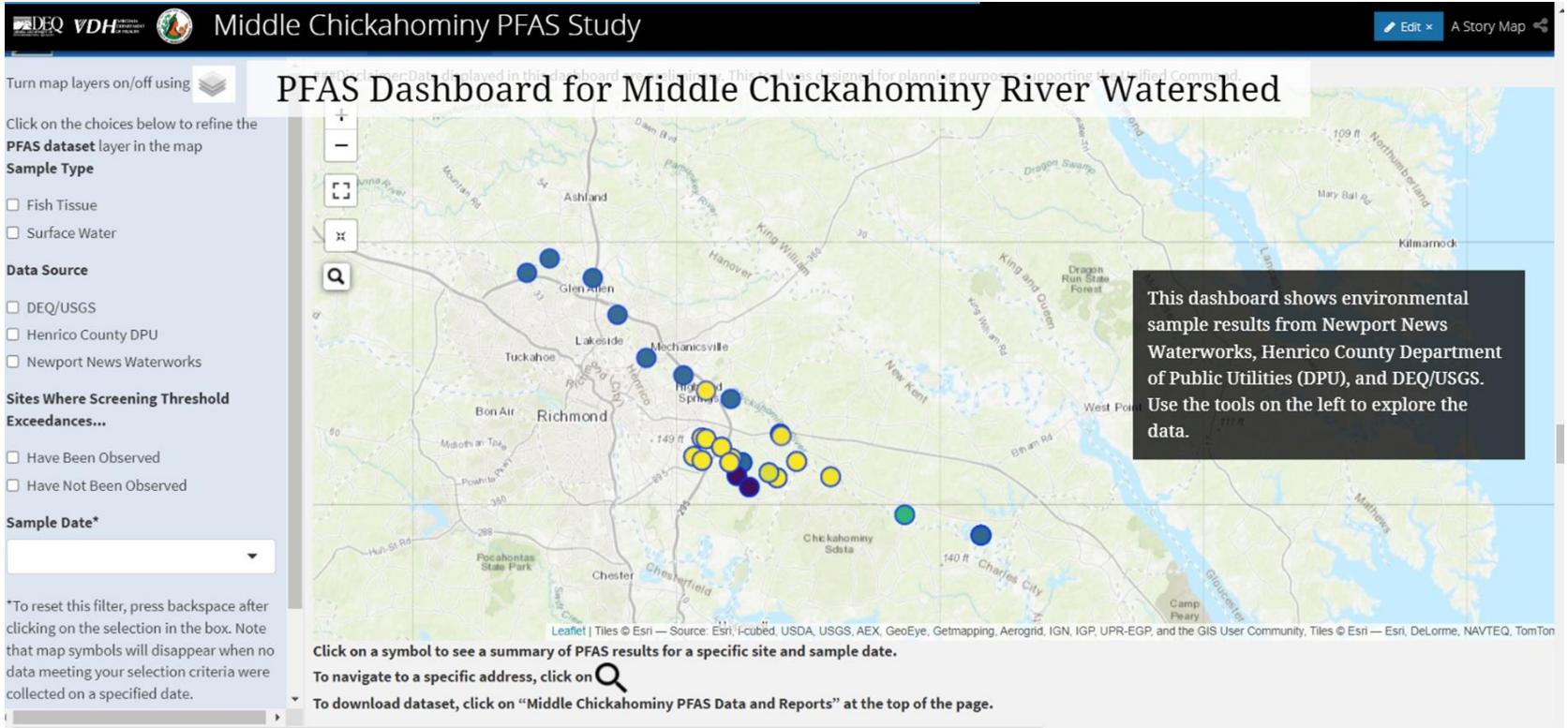
(Middle Chickahominy Watershed Investigation)

- Coordinated Response with DEQ/VDH/Henrico County Using Unified Command Structure
  - Sampling of local water bodies in and near the Richmond International Airport
  - Sampling of private and public water wells
  - Sampling of sediment and fish tissue
- Development of a Communications Plan
- Identification of Potential Responsible Parties RPs


Edit
A Story Map
Middle Chickahominy PFAS Study
A Collaborative Effort of the Virginia Department of Environmental Quality, Virginia Department of Health, and Henrico County


Middle Chickahominy PFAS Study
Edit
A Story Map
VDH VIRGINIA DEPARTMENT OF HEALTH
To protect the health and promote the well-being of all people in Virginia
ENHANCED BY Google
About
How Do I
A-Z Index
Locations
Data
Clinicians
Newsroom
Contact
Virginia Department of Health > Newsroom > Elevated PFAS Levels Found in the Chickahominy River Watershed
ELEVATED PFAS LEVELS FOUND IN THE CHICKAHOMINY RIVER WATERSHED
FOR IMMEDIATE RELEASE — October 28, 2021
Media Contacts:
Lorrie Andrew-Spear, Virginia Department of Health, Lorrie.Andrew-Spear@VDH.Virginia.gov
Greg Bilyeu, Virginia Department of Environmental Quality, Greg.Bilyeu@DEQ.Virginia.gov
Elevated PFAS Levels Found in the Chickahominy River Watershed
Multi-agency PFAS webinar will provide additional information
(Richmond, Va.) – The Virginia Department of Environmental Quality (DEQ) has received information from Newport News Waterworks (NNWW) regarding results from a Per- and Polyfluoroalkyl Substances – also known as "PFAS" – sampling of source water in the Chickahominy River watershed. DEQ and the Virginia Department of Health (VDH) are developing a plan to verify and expand on the results NNWW provided to DEQ.
PFAS are widely used, long-lasting chemicals with components that do not break down naturally over time. The science regarding PFAS in the
Explore
Toolkits
Email this page
In October of 2021, Newport News Waterworks alerted the Virginia Department of Environmental Quality (DEQ) to elevated PFAS concentrations in the Middle Chickahominy River watershed and pinpointed the White Oak Swamp watershed as the possible origin of the PFAS. DEQ, the Virginia Department of Health (VDH), and Henrico County immediately formed a team effort process–a Unified Command–to develop a joint response focused on identifying any potential risks to public health.
Use the "explore" button to read the initial press release.


PFAS v0.21 Virginia DEQ — July 14, 2022
Filterable data
Middle Chickahominy PFAS Data and Reports
Middle Chickahominy PFAS Screening Thresholds
Turn map layers on/off using
Click on the choices below to refine the PFAS dataset layer in the map
Sample Type
Fish Tissue
Sediment
Surface Water
Data Source
DEQ/USGS
Henrico County DPU
Newport News Waterworks
Sites Where Screening Threshold Exceedances...
Have Been Observed
Have Not Been Observed
Type of Result Summary
Average of water samples where more than one has been collected
Individual samples (select sample date below)
Sample Date*
###Disclaimer:Data displayed in this dashboard are preliminary. This tool was designed for planning purposes supporting the Unified Command.
Sediment sample collectd by DEQ/USGS on 2021-12-21 had a total PFAS concentration equal to 105 parts per trillion.
See sampling location
Ashland
Richmond
Bon Air
West Point
Chester
Hopewell
Chickahominy Sdsta
Pocahontas State Park
Total PFAS(ppt)
< 1
> 1-40
> 40-70
> 70
Leaflet | Tiles © Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community, Tiles © Esri — Esri, DeLorme, NAVTEQ, TomTom, Intermap, iPC, USGS, FAO, NPS, NRCAN, GeoBase, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community
Click on a symbol to see a summary of PFAS results for a specific site and sample date.
To navigate to a specific address, click on
To download dataset, click on "Middle Chickahominy PFAS Data and Reports" at the top of the page.


Middle Chickahominy PFAS Study
Edit
A Story Map
PFAS Dashboard for Middle Chickahominy River Watershed
Turn map layers on/off using
Click on the choices below to refine the PFAS dataset layer in the map
Sample Type
Fish Tissue
Surface Water
Data Source
DEQ/USGS
Henrico County DPU
Newport News Waterworks
Sites Where Screening Threshold Exceedances...
Have Been Observed
Have Not Been Observed
Sample Date*
*To reset this filter, press backspace after clicking on the selection in the box. Note that map symbols will disappear when no data meeting your selection criteria were collected on a specified date.
This dashboard shows environmental sample results from Newport News Waterworks, Henrico County Department of Public Utilities (DPU), and DEQ/USGS. Use the tools on the left to explore the data.
Ashland
Glen Allen
Lakeside
Mechanicsville
Tuckahoe
Bon Air
Richmond
Chickahominy Sdsta
Chester
Pocahontas State Park
Kilmarnock
Leaflet | Tiles © Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community, Tiles © Esri — Esri, DeLorme, NAVTEQ, TomTom
Click on a symbol to see a summary of PFAS results for a specific site and sample date.
To navigate to a specific address, click on
To download dataset, click on "Middle Chickahominy PFAS Data and Reports" at the top of the page.

Questions?

Helpful PFAS Website Resources Recap

- PFAS Tracking Tool (VA Statewide PFAS Sampling Dashboard)
  https://experience.arcgis.com/experience/5dcd4d69ab184442814cbc0a111d7c96/
- VDH PFAS IN Drinking Water
  https://www.vdh.virginia.gov/drinking-water/pfas/
- EPA PFAS Analytical Methods Development and Sampling Research
  https://www.epa.gov/water-research/pfas-analytical-methods-development-and-sampling-research
- VA Regulatory Town Hall Meetings and Public Hearings
  https://townhall.virginia.gov/L/meetings.cfm?time=future
- VDH PFAS in Private Well Water
  https://www.vdh.virginia.gov/environmental-health/per-and-polyfluoroalkyl-substances-pfas-in-private-well-drinking-water-supplies-2/

Helpful PFAS Website Resources Recap (continued)

- VDH PFAS Field Sampling Guidelines
  https://www.vdh.virginia.gov/content/uploads/sites/20/2022/11/PFAS-FIELD-SAMPLING-GUIDELINES.pdf
- EPA Effectiveness of Point-of-use/Point-of-entry Systems to Remove Per- and Polyfluoroalkyl Substances from Drinking Water
  https://www.epa.gov/sciencematters/epa-researchers-investigate-effectiveness-point-usepoint-entry-systems-remove-and
- EPA Understanding the PFAS National Primary Drinking Water Proposal Hazard Index
  https://www.epa.gov/system/files/documents/2023-03/How%20do%20I%20calculate%20the%20Hazard%20Index._3.14.23.pdf

Helpful PFAS Website Resources Recap (continued)

- Laboratories Approved by EPA to Support UCMR 5
  https://www.epa.gov/system/files/documents/2022-01/ucmr5-approved-lab-list.pdf
- DEQ PFAS
  www.deq.virginia.gov/get-involved/the-environment-you/per-and-polyfluoroalkyl-substances-pfas
- Middle Chickahominy PFAS Study
  https://storymaps.arcgis.com/stories/1d68144adf54432198e7d56229862d31
- Henrico County Well-Testing Initiative
  https://henrico.us/utility/well-testing/
- EPA Drinking Water Health Advisories for PFOA and PFOS
  http://www.epa.gov/sdwa/drinking-water-health-advisories-pfoa-and-pfos

Helpful PFAS Website Resources Recap (continued)

- FDA Per- and Polyfluoroalkyl Substances (PFAS)
  http://www.fda.gov/food/chemicals/and-polyfluoroalkyl-substances-pfas
- PFAS 101 - A Primer on PFAS for Public Health Professionals
  https://www.vdh.virginia.gov/emergency-preparedness/training-education/pfas/