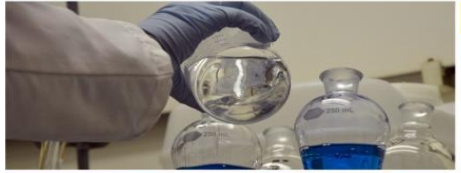

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Introduction to Per and Poly Fluoroalkyl Substances (PFAS)

CAC Meeting

September 17, 2019

Tom Wolf, Governor

Patrick McDonnell, DEP Secretary

What are PFAS?

- Per- and polyfluoroalkyl substances (PFAS)
  - Family of more than 3,000 chemicals
  - Manmade chemicals manufactured and used in thousands of processes and products since the 1940s

- Became popular because they repel oil and water, are temperature-resistant, and reduce friction

- The most-studied substances are perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS)

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Where are they found?

- Found in soil, air and water, and break down slowly in the environment
- Firefighting foams
- Stain-repellant clothing, carpets, upholstery; household products, such as non-stick cookware, polishes, waxes, and food packaging
- Metal plating and wire manufacturing
- Only certain compounds have been phased out

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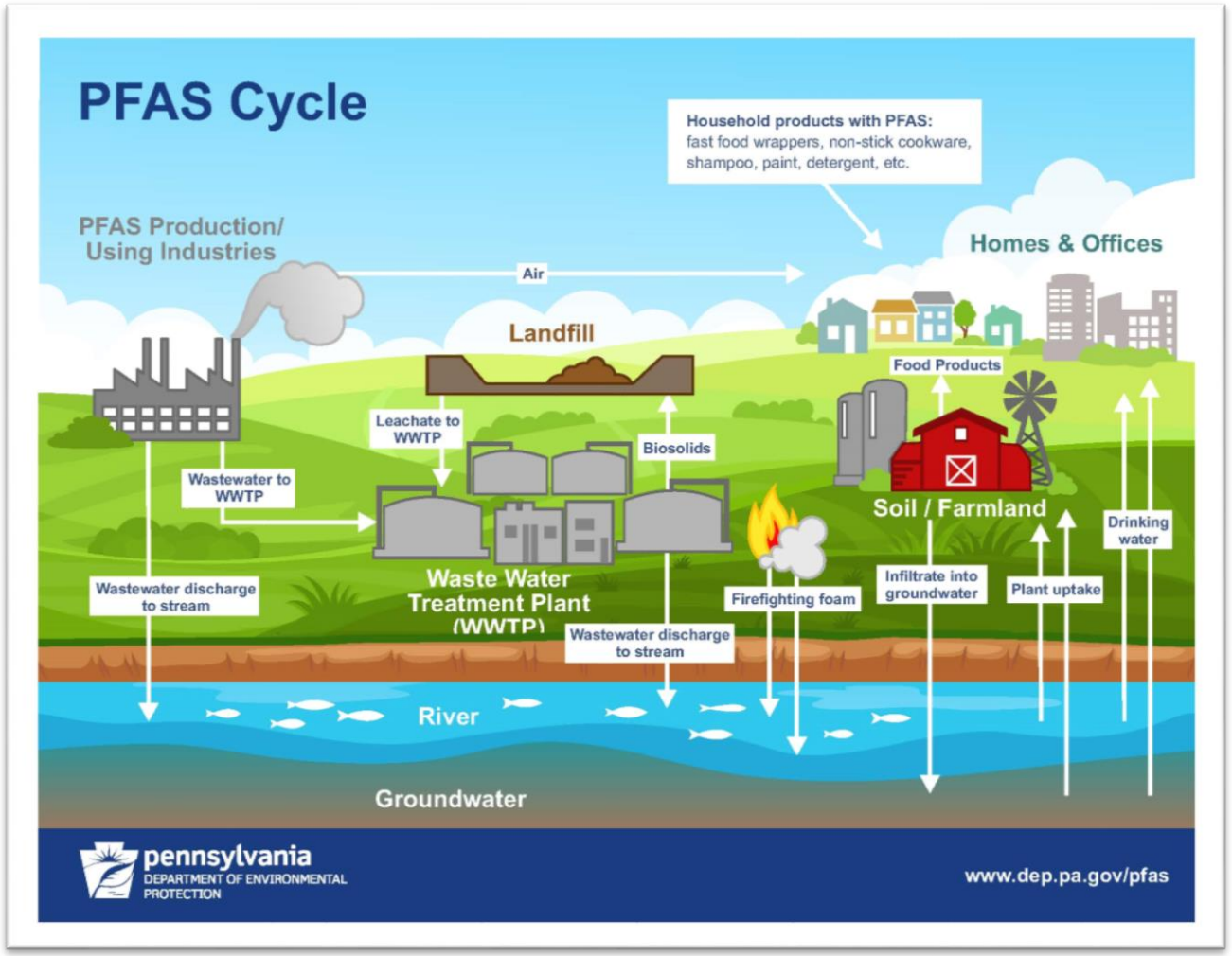
How do people become exposed?



- Contaminated drinking water
- Contaminated soil
- Food and household products
- Biosolids
- Landfill leachate

Such contamination is typically localized to a specific facility; such as an industrial facility where these chemicals were produced/used to manufacture products, or areas used for firefighting training.

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Why does it matter?

- Bioaccumulate in the body
- There is evidence that exposure to PFOA and PFOS can lead to adverse human health effects.
- Studies show that PFOA and PFOS can cause reproductive and developmental, liver and kidney, and immunological effects in laboratory animals, including:
  - Increased cholesterol levels
  - Low infant birth weights
  - Effects on the immune system
  - Cancer
  - Thyroid hormone disruption

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Governor Wolf Executive Order

- PFAS Action Team created to develop a comprehensive and proactive approach to addressing these emerging contaminants, including:
  - Identifying and developing recommendations to limit or control the sources of PFAS contamination
  - Addressing strategies to deliver safe drinking water and minimize risks from firefighting foam and other PFAS sources, manage environmental contamination, create specific site plans, explore funding for remediation efforts, and increase public education

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Governor Wolf Executive Order

- Led by the secretaries of Environmental Protection, Health, Military and Veteran Affairs, Community and Economic Development, Agriculture, and the State Fire Commissioner

- *Public comment, expert presentations, public meetings, and additional testing can help us develop a clear path forward, including more fully defining state agency roles to ensure we are doing all we can to address this problem.*

  -- Governor Wolf, in establishing Pennsylvania's multi-agency Action Team

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Bureau of Environmental Cleanup & Brownfields

Environmental Cleanup and Brownfields & PFAS

ECB's Role

- Land Recycling (Brownfields) – Voluntary cleanup program (Act 2), soil and groundwater remediation standards
- Site Remediation – State & Federal Superfund, Storage Tank Corrective Action, DoD
- Storage Tanks – AST and UST technical standards, certified tank installers and inspectors, registration, permitting and inspections

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Challenges

- Current regulatory status
- Lack of approved analytical methods
- Risk of cross contamination
- Limited lab capacity
- High analytical costs
- Very little toxicity information
- Lack of standards
- Evolving remedial technologies
- Limited disposal and treatment options

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Remediation Standards

- EPA Maximum Contaminant Level (MCL) or Lifetime Health of Level (HAL) = Act 2 Statewide Health Standard
- Combined EPA Lifetime HAL / Act 2 standard for PFOA/PFOS is 70 ng/L
- Proposing soil and/or groundwater Medium Specific Concentrations for PFOA/PFOS and PFBS

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National Foam Act 2 Site, Chester County

- Manufactured fire-fighting foam from the 1940's to 2016 at 2 acre site in West Chester Borough
- Entered Act 2 program in 2015
- VOC's, SVOC's and heavy metals in soil
- PFAS compounds in soil and groundwater
- PFAS compounds detected in nearby Goose Creek
- Characterization activities are ongoing

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Ridge Run HSCA Site, Bucks County

- Public water supply contained concentrations of PFOA/PFOS > 70 ng/L.
- Another public supply well was found to contain combined concentrations slightly below 70 ng/L
- DEP took immediate steps to investigate the surrounding area

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Ridge Run HSCA Site, Bucks County

- DEP sampled 170 private wells in the vicinity of the contaminated public supply wells.
- 13 properties with concentrations > 70 ng/L are equipped with carbon filtration systems or receiving bottled water.
- DEP's efforts to characterize the extent of contamination and to identify a responsible party is ongoing

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HSCF Revenue & Expenses

- Capital Stock and Franchise Tax (exp. 12/2015) - $40 million
- Act 13 Transfers (start 2014) - $19 million
- Hazardous Waste Fees - $1.7 million
- Penalties, Interest, Cost Recovery - $3 million

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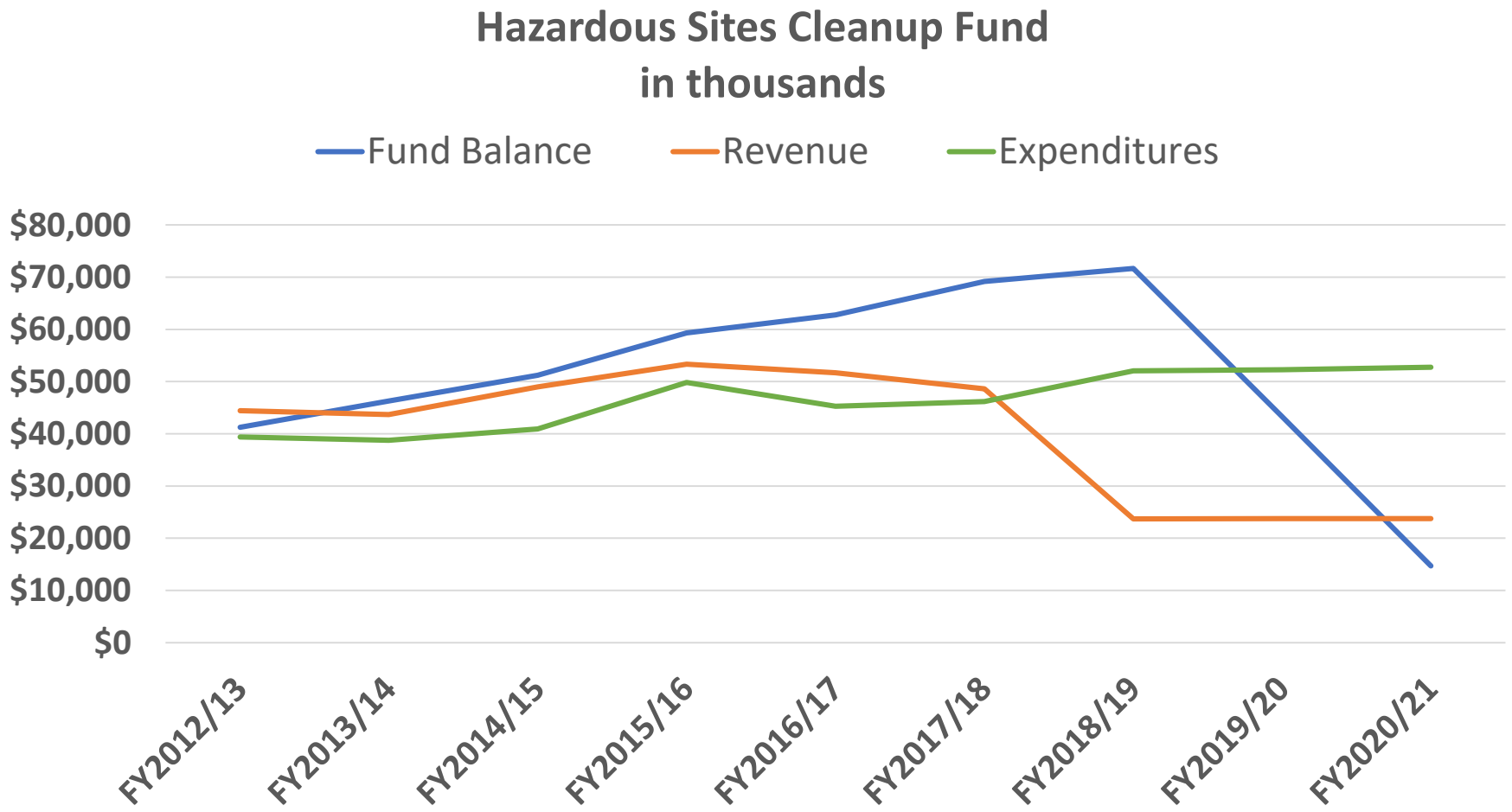
HSCF Status/Projection



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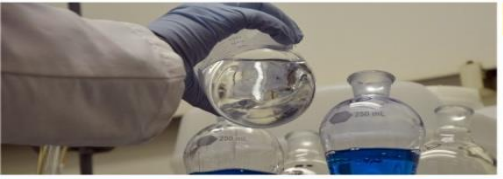


Bureau of Safe Drinking Water & PFAS

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Federal Actions to Address PFAS

- EPA issued a Provisional Health Advisory Level (HAL) in 2009 for PFOS and PFOA of 200 ppt and 400 ppt, respectively.
- Six PFAS were included in EPA's Third Unregulated Contaminant Monitoring Rule.
  - Monitoring was conducted between 2013 – 2015 for PFOS, PFOA, PFNA, PFBS, PFHxS & PFHpA
  - 175 public water systems in PA sampled, 6 had detects for PFAS
- In 2016, EPA set a Combined Lifetime HAL for PFOS and PFOA of 70 ppt.
- EPA issued a PFAS Action Plan in February of 2019, but has not set any specific deadlines for promulgating enforceable standards (MCLs) for PFAS in drinking water. Because of this, several states including PA are taking action at the state level.

State Actions to Address PFAS

- Executive Order from Governor Wolf (Sept. 19, 2018): Established a PFAS Action Team to develop a comprehensive response to identify and eliminate sources of contamination, ensure drinking water is safe, manage environmental contamination, review gaps in data and oversight authority, and recommend actions to address those gaps.
- DEP's state laboratory has installed equipment, trained staff, and is working towards accreditation to test for PFAS in water.
- DEP's Environmental Cleanup Program has been and will continue to address PFAS contamination sites, and is moving forward with proposed amendments to Chapter 250 to establish remediation standards for PFOS, PFOA and PFBS.

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BSDW Actions to Address PFAS

- BSDW is implementing a statewide PFAS Sampling Plan to identify impacted public water systems and generate statewide occurrence data.
- BSDW is moving forward with a contract for toxicology services and will coordinate with the Department of Health to review/evaluate health effects data and studies, and propose toxicity values and draft MCLs for select PFAS.
- BSDW has and will continue to ensure follow-up and corrective actions are taken at public water systems with PFOS/PFOA levels above EPA's HAL of 70 ppt.

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PFAS Sampling Plan

Phase 1 of the Sampling Plan is intended to prioritize sites for PFAS sampling and generate statewide occurrence data.

Several factors were considered in developing the plan, including:

- Location of potential sources of PFAS contamination (PSOC)
- Public water supply (PWS) sources located within ½ mile of PSOCs
- Selection of PWS sources to serve as a control group

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PSOCs

The GIS data layer of PSOCs includes the following industries and land uses:

- Military bases
- Fire training schools/sites
- Airports
- Landfills
- Manufacturing facilities (apparel, chemicals, electronics, fabricated metal, paper products, textiles and leather, upholstered furniture)
- HSCA sites and known PFAS-contamination sites

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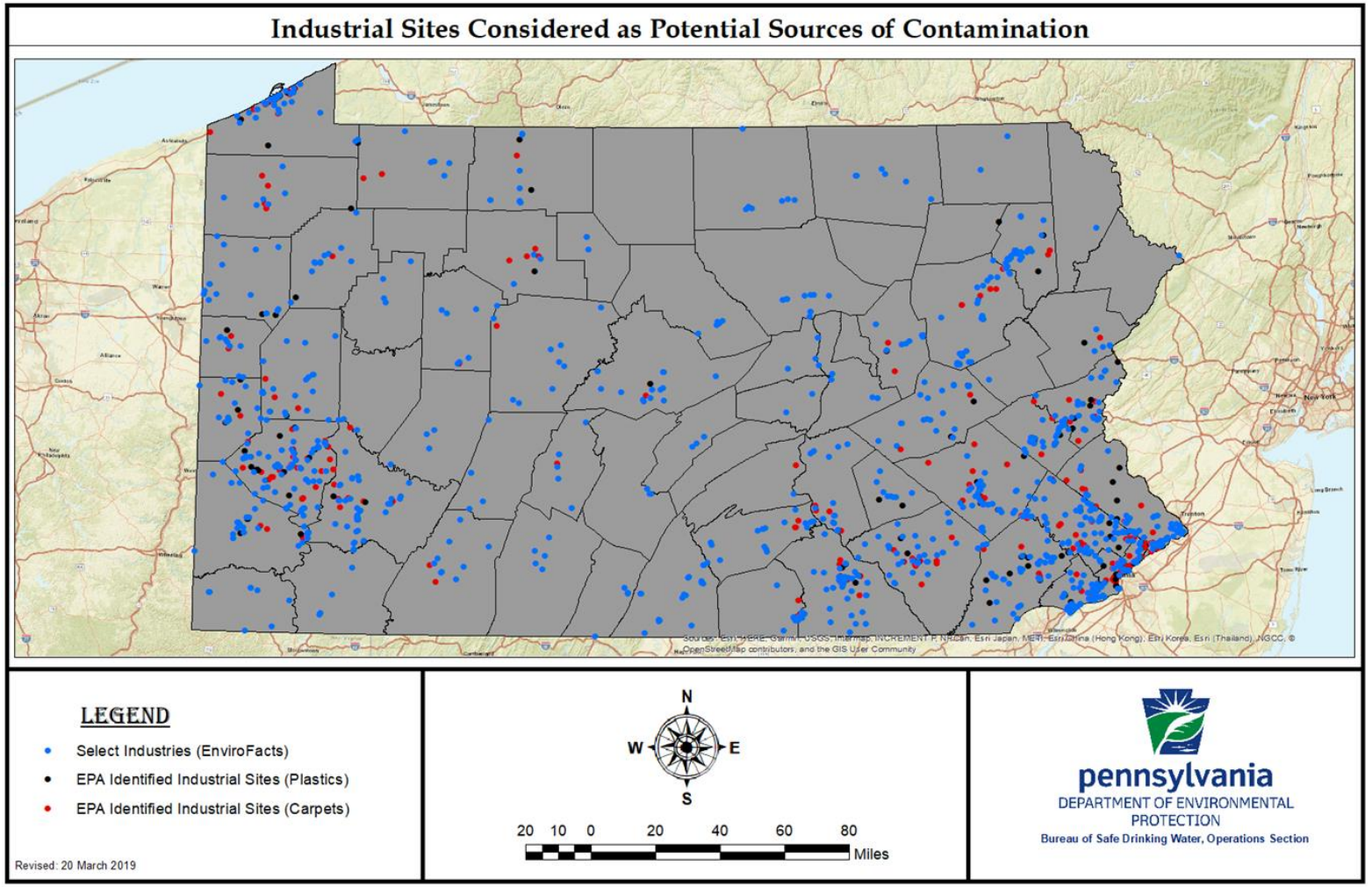
Example of PSOC Map Within Plan



PFAS Sampling Plan

Phase 1 of the PFAS Sampling Plan:

- Sampling began in June and will conclude in ~ a year
- Sampling will include approximately 360 PWS samples from community and nontransient noncommunity water systems located within ½ mile of PSOCs
- Sampling will also include 40 sites from a control group of PWSs to determine baseline
- Note: The list may be updated as new information becomes available regarding potential sources of contamination

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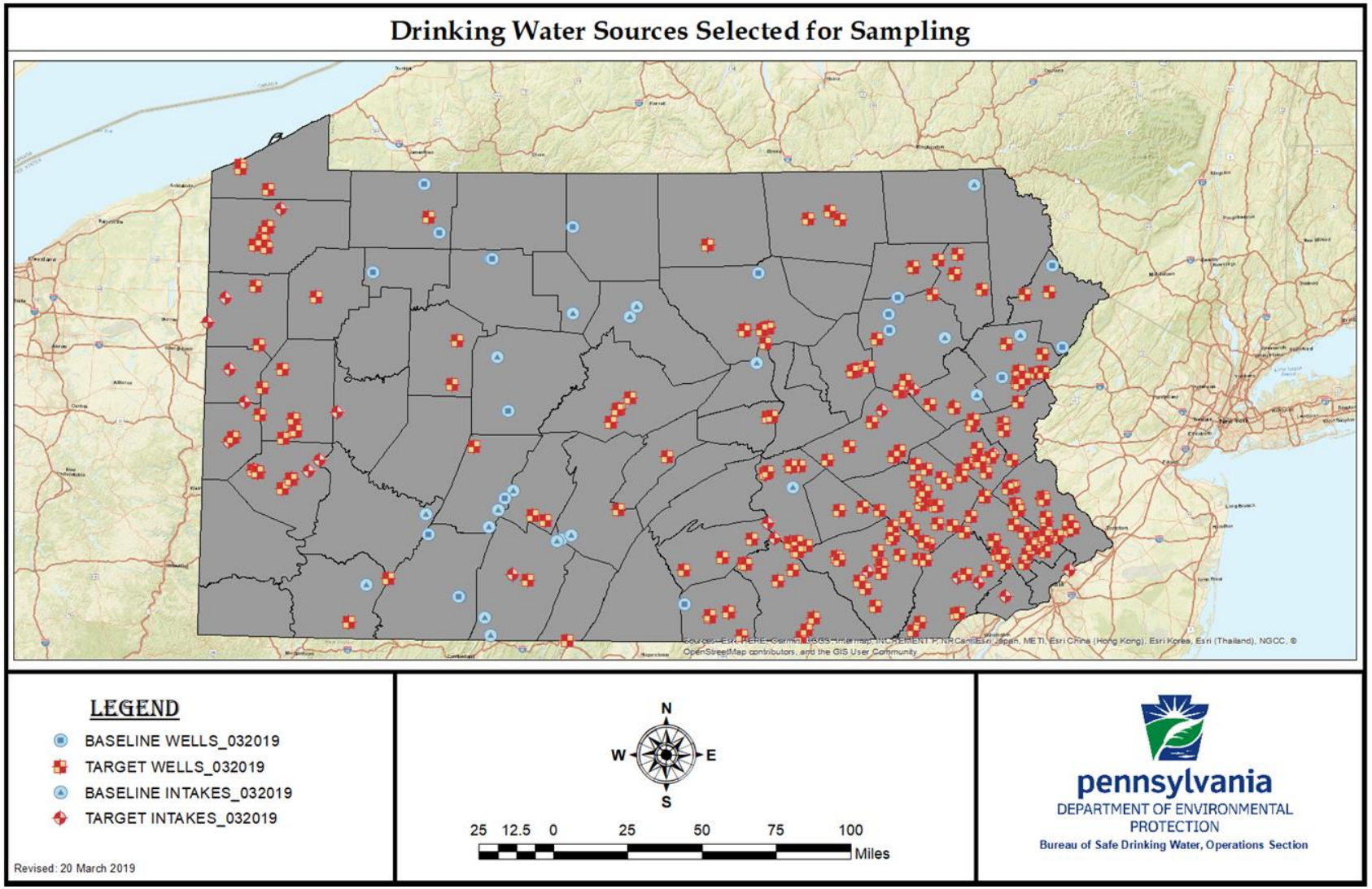
Areas of State Included in Sampling Plan



Authority to Require Actions

DEP's authority under PA SDWA and Chapter 109 regulations to require actions to address unregulated contaminants:

- § 109.4 General requirements
- § 109.203 Unregulated contaminants
- § 109.302 Special monitoring requirements
- § 109.409 Tier 2 public notification requirements
- § 109.701(a)(3) One-hour reporting requirements

DEP's long-standing guidance and protocols for addressing unregulated contaminants:

- *Health Effects and Risk Management Guidance* (DEP #383-0400-104)

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Follow-up and Corrective Actions

Follow-up and corrective actions for an exceedance of a HAL may include:

- One-hour reporting of sample results to DEP
- Collection of confirmation samples
- Issuance of Tier 2 PN
- Quarterly monitoring at the entry point
- If levels continue to exceed the HAL, additional actions may be needed including taking sources off-line, blending sources, installing treatment, etc.

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Ongoing Challenges and Concerns

- Federal vs. state-led efforts to address PFAS or set MCLs – inconsistency and lack of public confidence
- For state-led efforts, lack of expertise and resources
- Lack of available analytical methods (for additional matrices, additional PFAS); lack of national certification program
- Limited lab capacity and high analytical costs
- Lack of national design, construction and efficacy standards for PFAS treatment – states are on their own
- Lack of data/studies regarding proper disposal methods
- Due to long-term, widespread and ongoing use in commerce, there is no easy solution

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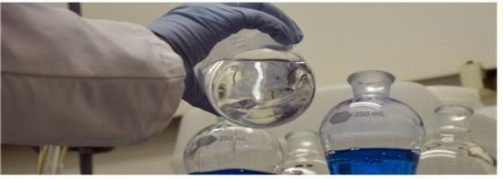

Bureau of Clean Water
PFAS – Surface Water Monitoring

Bureau of Clean Water - PFAS

- Currently, there is no guidance from EPA regarding surface water quality standards for PFAS compounds.
- Currently, there is no implementation of water quality standards through permitting or assessment of surface waters.
- While there is some localized PFAS surface water data, there is no statewide, comprehensive dataset to inform the development and implementation of a statewide monitoring strategy, water quality standards, assessment methods or permitting.

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Bureau of Clean Water - PFAS

- Limited guidance from EPA regarding PFAS compounds related wastewater.
- Presentation will address two areas DEP Bureau of Clean Water is currently addressing:
  - Biosolids
  - Water Quality Monitoring

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PFAS in Biosolids

- PFAS is typically found in biosolids
- Minimal information on quantities of PFAS in biosolids
- Minimal research on fate and transport of PFAS in biosolids that are land applied
- EPA working on method for quantifying PFAS in biosolids, wastewater and soil matrices
- Pilot testing of biosolids treatment for PFAS
  - Incineration at 1000^{o} C

PFAS in Biosolids - EPA

- CWA Requirements
  - Review of biosolids regs every 2 years
  - Goal of report – Identify additional pollutants of concern
- EPA OIG Report
  - Reporting obligation is unfulfilled
  - EPA program response
    - 352 unregulated pollutant in biosolids (includes PFAS)
    - Completion of risk assessment and recommendation on additional pollutants by 12/31/2022
- Any new PFAS Fed biosolids requirements should be incorporated into PA biosolids Regs

Monitoring or Data Collection

- Data Collection Protocol Development
- Water Quality Standards Development
- Assessment Method Development
- Permitting and Compliance
- Protected Use Assessments
- Monitor Temporal Water Quality Trends

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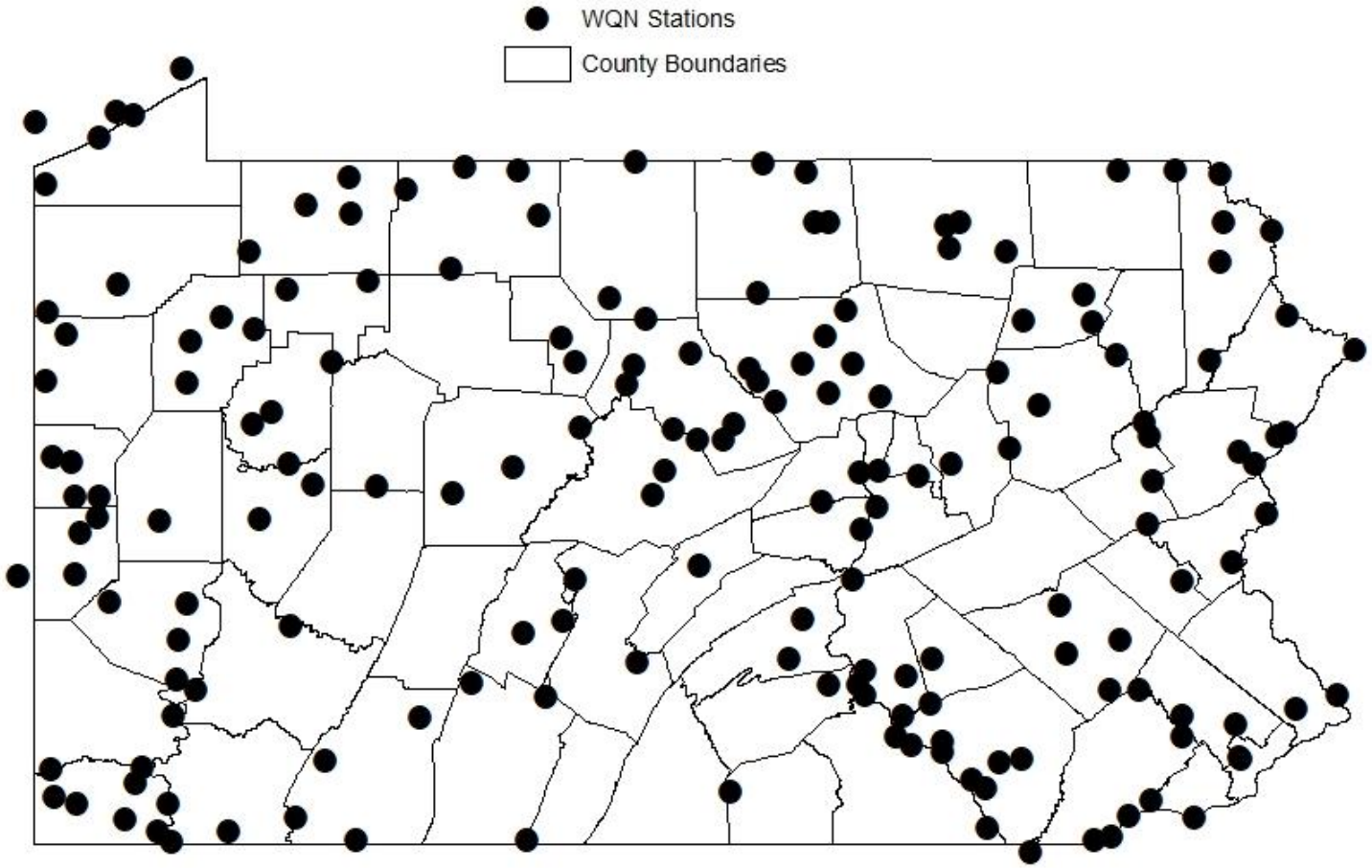
Water Quality Network (WQN)



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WQN - Objectives

- Monitor temporal water quality trends in major surface waters throughout the state
- Monitor temporal water quality trends in reference waters
- Monitor the trends of nutrient and sediment loads in the major tributaries entering the Chesapeake Bay
- Monitor temporal water quality trends in Pennsylvania lakes

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WQN Data

- Chemical
  - Metals and Ions
  - Nutrients
  - “Emerging Contaminants”
- Biological
  - Benthic Macroinvertebrates
  - Fishes
  - Algal Communities
- Physical
  - Habitat
  - Flow/Discharge

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Emerging Contaminants

Contaminants of emerging concern (CECs) are those that were either not detected previously or are now found in higher concentrations than the past (https://www.wqa.org/Whats-in-Your-Water/Emerging-Contaminants).

They are NOT necessarily “new” compounds. These include many categories of chemicals.

WQN – Emerging Contaminants

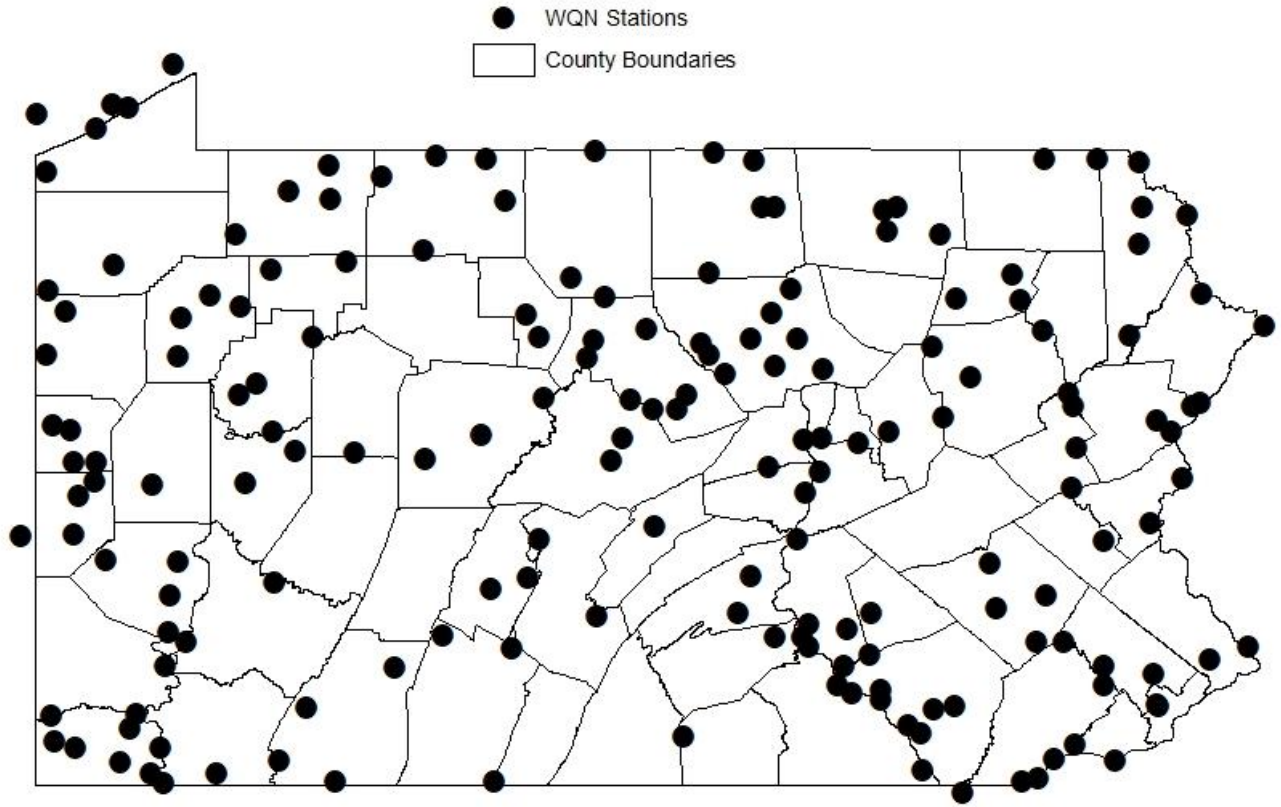
- Hormones
- Wastewater Compounds
- Pharmaceuticals
- Pesticides
- PCBs – Polychlorinated biphenyls
- PBDEs – Polybrominated diphenyl ethers
- PAHs - Polycyclic Aromatic Hydrocarbons

WQN – Emerging Contaminants

- Surface Water Samples
- Sediment Samples
- Passive Sampler Deployment

WQN - PFAS

- Single surface water collection at each of the 178 WQN station locations



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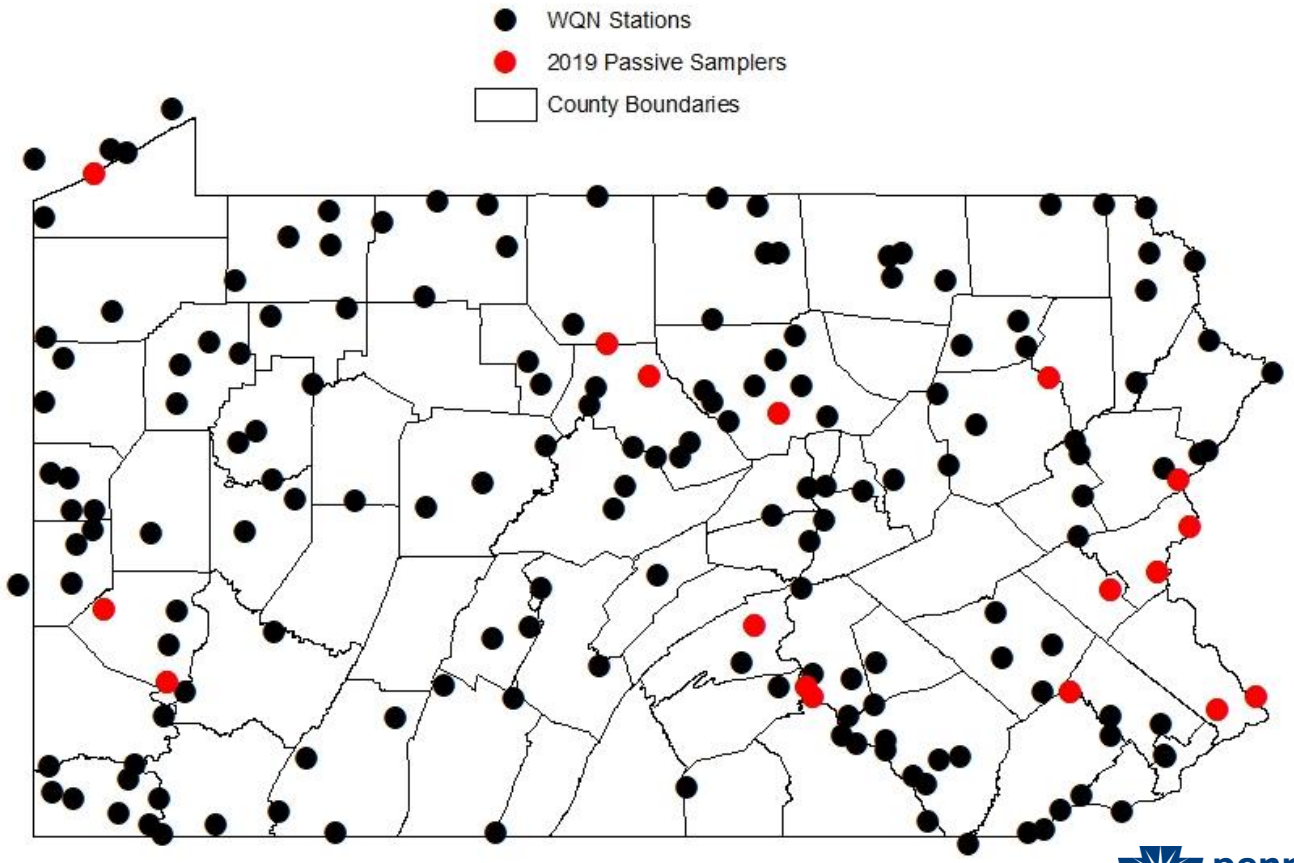
WQN - PFAS

- 21 passive samplers deployments that will include PFAS



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WQN - PFAS

- All PFAS surface water samples and passive sampler membranes will be analyzed by SGS AXYS Analytical Services for analysis (Sidney, British Columbia, Canada)
- 33 compounds, including:
  - GenX, ADONA, both fractions of F-53B and total oxidizable precursors (TOP)
- Replicate samples will be sent to USGS – National Water Quality Laboratory in Denver and the PA DEP Laboratory in Harrisburg
- Results will inform future data collection strategies and potentially inclusion of the PFAS analytical suite as a routine water quality monitoring and assessment objective

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