NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

NJ Health New Jersey Department of Health

TUESDAY
NOVEMBER 30, 2021
VIRTUAL

PFAS
IN DRINKING WATER SUMMIT

PFAS Overview: Definitions and Sources

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PFAS in Drinking Water Summit
November 30, 2021

What are PFAS?

- PFAS stands for “per- and polyfluoroalkyl substances”.
- PFAS are a large class of synthetic chemicals with unique chemical & physical properties that make many of them extremely persistent and mobile in the environment
- Used since 1940s in wide range of consumer and industrial applications

Source: open access images – bing.com

What are PFAS?

1000s of manufactured compounds.

- *Organic compounds with **at least one totally fluorinated carbon atom**.*
- *Produced for over 70 years.*

Due to structure of molecule:

- *Repel oil & water.*
- *Highly water soluble.*

C-F bond is one of strongest known.

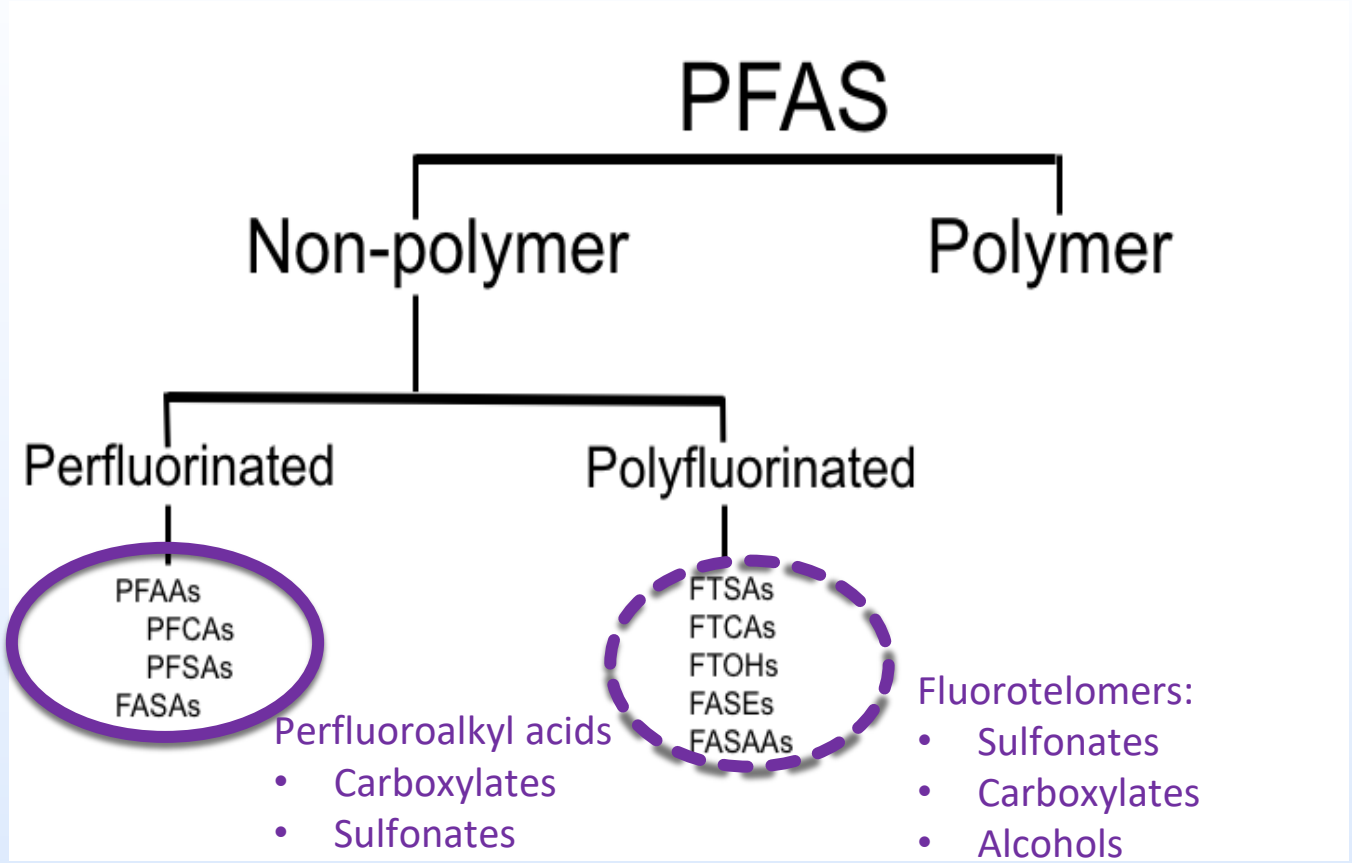
- *Chemically & thermally non-reactive.*

Unique properties are the basis for:

- *Commercial & industrial uses.*
- *Extreme environmental persistence.*

Most have little or no health effects data.

Most not detected by routine lab methods.



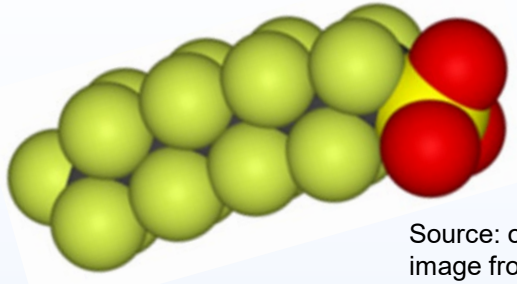
Source: ITRC Naming Conventions and Physical Chemical Properties fact sheet

PFAS Structure and Nomenclature

Perfluoroalkyl acids (PFAAs)

- Fully fluorinated chain (2 or more carbon “tail”)
- Functional group (“head”)
- Examples:
  - PFCAs: Carboxylate group (COO^-) such as PFOA and PFNA
  - PFSAs: Sulfonate group (SO_3^-) such as PFOS

- PFXY
  - PF = perfluoro
  - X = number of carbons
    - Same convention as hydrocarbons
    - Includes C in the carboxylate group
  - Y = functional group
    - S = sulfonate
    - A = carbonate



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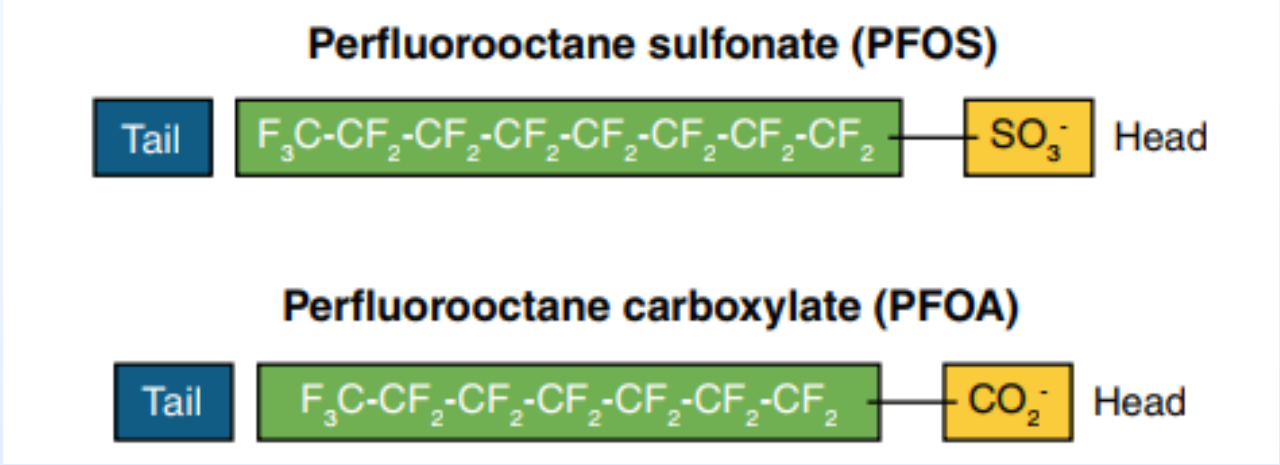
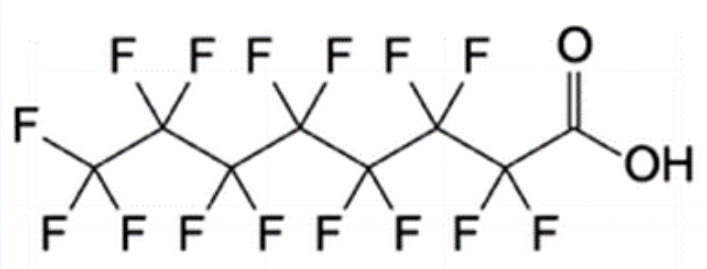


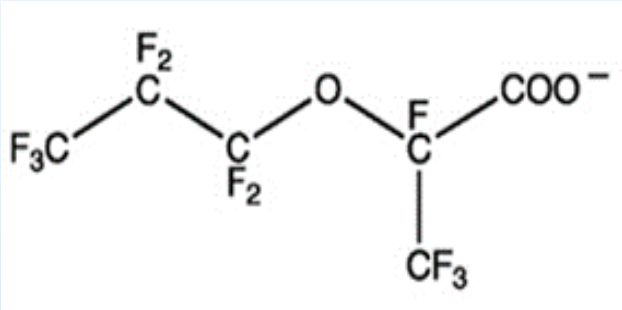
Source: ITRC Naming Conventions and Physical Chemical Properties fact sheet

Perfluoroalkyl Substances

- All carbons are fully fluorinated.
- Do not break down in the environment or the body.



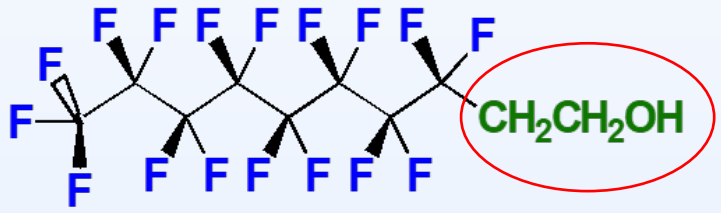
Perfluorooctanoic Acid (PFOA; perfluoroalkyl acid - PFAA)



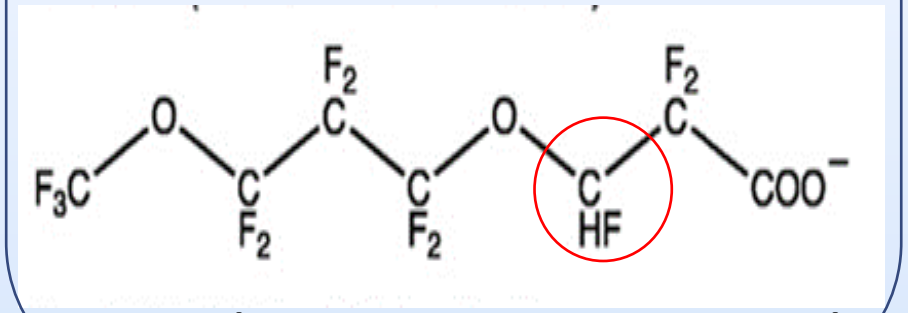
GenX (perfluoroether; PFOA Replacement)

Polyfluoroalkyl Substances

- One or more carbons not fully fluorinated
- Include "precursors" that transform to terminal perfluoroalkyl substances in the environment and the body.



8:2 Fluorotelomer Alcohol (FTOH)



ADONA (polyether; PFOA replacement)

Uses of PFAS

- **Processing aid** in production of fluoropolymer plastics used in:
  - Non-stick cookware
  - Waterproof/breathable clothing
  - Chemical/heat resistant industrial products.
- **Water & stain resistant coatings**
  - For carpets & upholstery
- Grease-proof **food packaging**
- **Aqueous film forming foams** *(AFFF)*

….and many other uses not listed here

Sources of PFAS in Drinking Water

Aqueous Film Forming Foam (AFFF)
- Military installations
- Civilian airports
- Petroleum Refineries
- Fire Fighting Training Areas

Production and Manufacturing
- Surfactants, resins, molds, plastics
- Textiles and leather
- Paper products

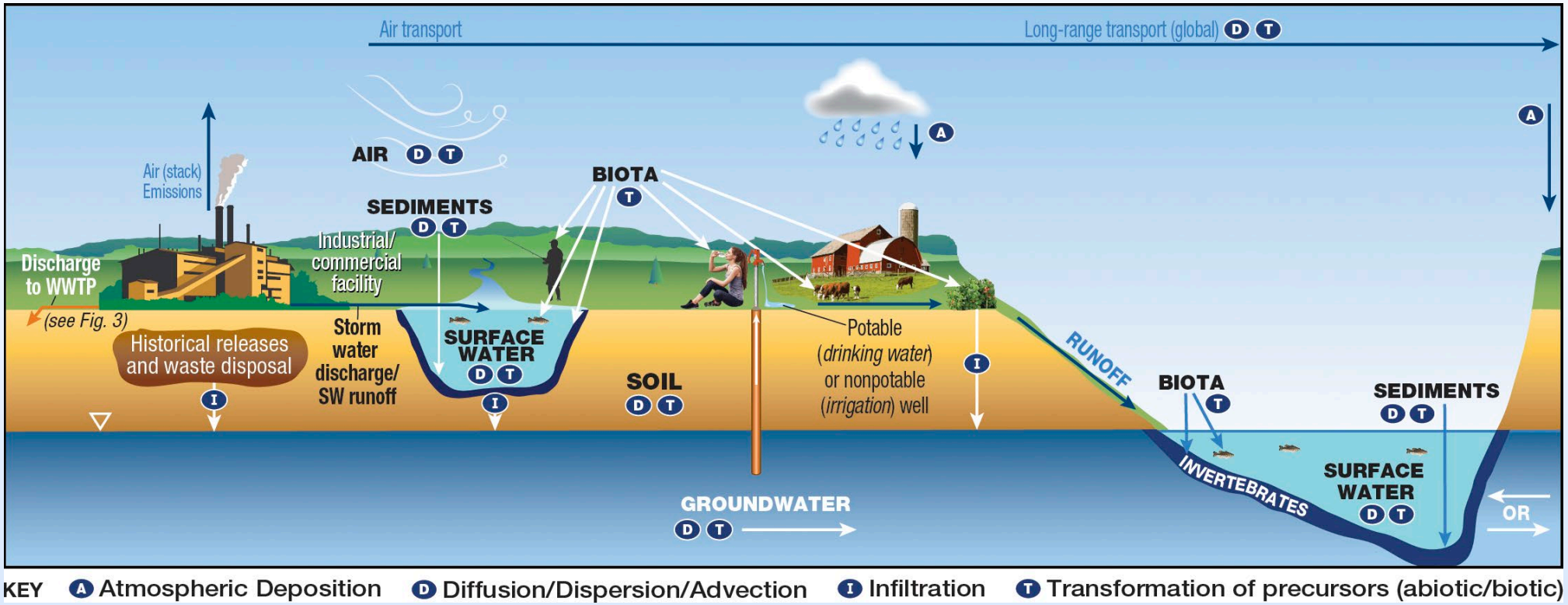
Landfills
- Consumer products
- Industrial waste
- Biosolids from WWTP applied as cover

Wastewater Treatment Plants
- PFAS from industrial or domestic products in influent may not be removed by treatment (and precursor PFAS may be transformed to terminal PFAS) and end up in effluent or biosolids created in treatment process.

…and others

Important Transport Pathways

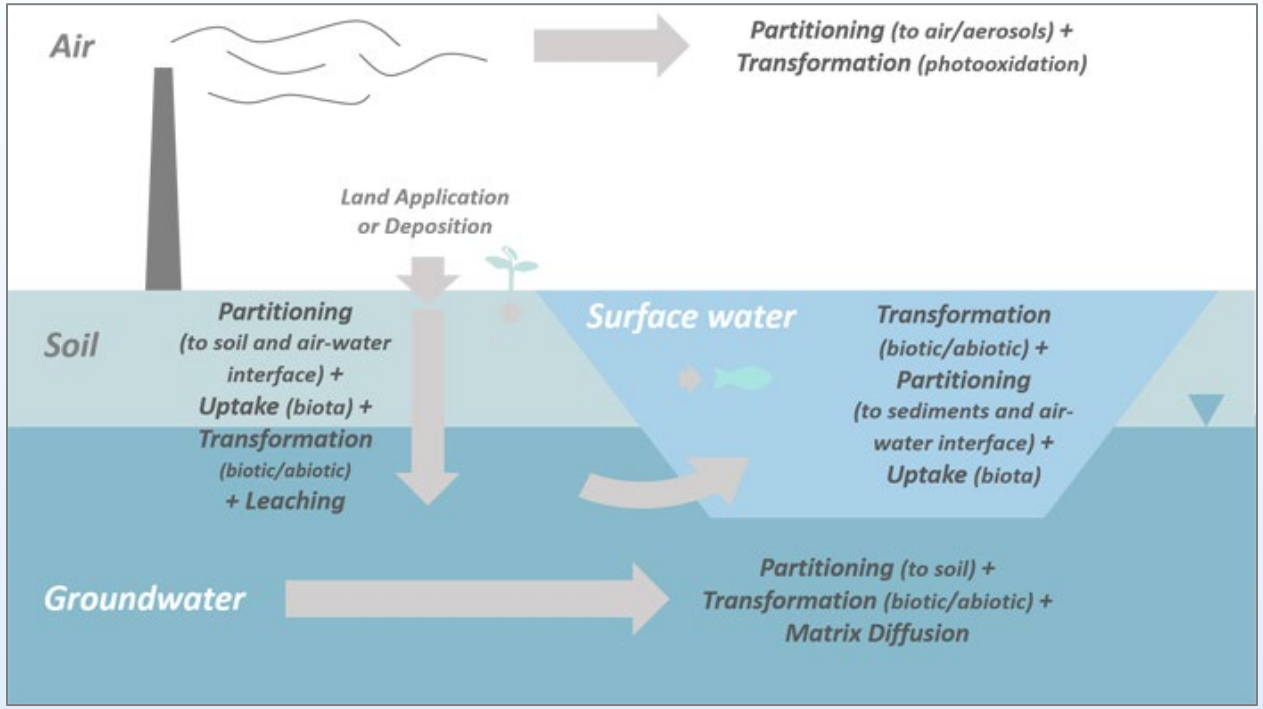
- Air emission and deposition
- Water and process waste discharge w/o PFAS treatment
- Other considerations:
  - Off-site waste disposal areas?
  - Secondary pathways (ex: air deposition may result in contaminated runoff)



Source: Figure 2-16. ITRC Technical/Regulatory Guidance Document CSM for Industrial Sites. *Source: Adapted from figure by L. Trozzolo, TRC, used with permission.*

Relevant Chemical Properties

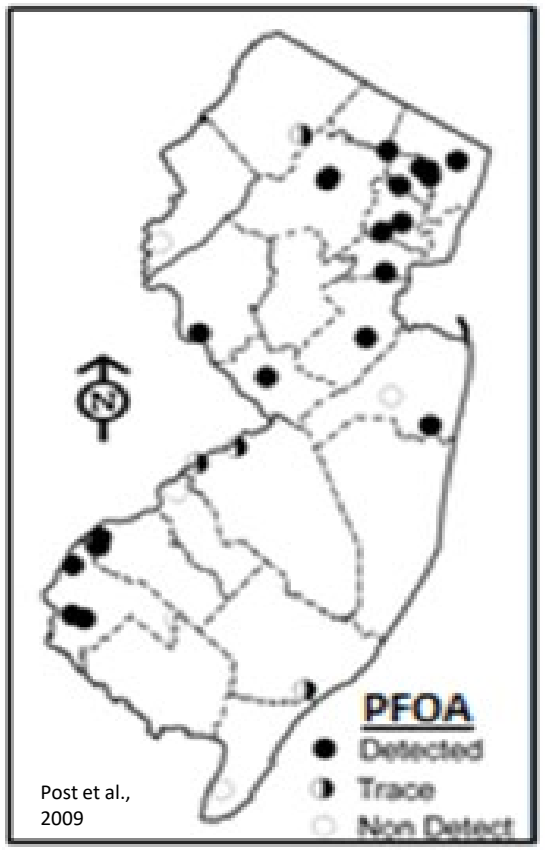
- In general, PFAS are water soluble and can contaminate drinking water
- PFAAs (e.g., PFOA, PFNA, PFOS, and other PFAS with similar structures) generally have low volatility and high solubility
- PFAS with longer carbon chains may partition more to sediments and soils, while shorter chains are more mobile.
- PFAS can be transported through the atmosphere by partitioning to aerosols/particulates



Source: Figure 5-1. ITRC Technical/Regulatory Guidance Document Fate and transport processes relevant for PFAS. *Source: D. Adamson, GSI. Used with permission.*

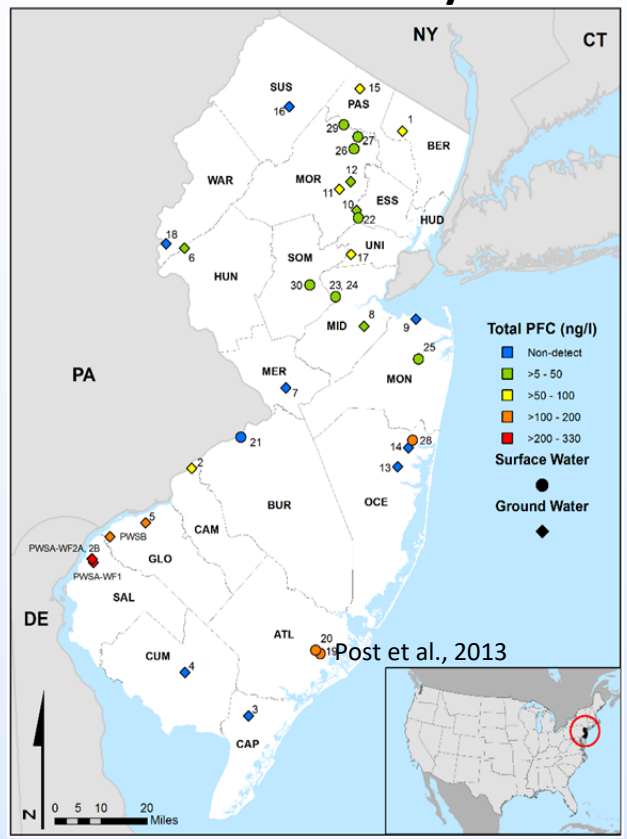
MCLs Were Developed to Address Detections of PFOA, PFOS and PFNA (C9) in NJ Public Water Systems (PWS)

2006 Study



- **First state to conduct statewide PFAS occurrence studies.**
  - ***2006 study:*** 23 water systems - PFOA and PFOS.
    - In response to 2006 detection of PFOA in PWS near NJ industrial site
  - ***2009-10 study:*** 31 water systems – 10 PFAAs.
  - Reporting Levels 4-5 ng/L (ppt)
- **Multiple PFAS** (up to 8) found in many water systems.
  - **PFOA** – most frequent, ~60% of systems.
  - **PFOS** – 30% of systems.
  - **PFNA** – Paulsboro, Gloucester County (Southwestern NJ)
    - *Highest level reported in drinking water worldwide at that time.*
    - *Industrial source was identified.*

2009-10 Study



New Jersey vs. National PFAS Drinking Water Occurrence: 2013-15 EPA Unregulated Contaminant Monitoring Rule 3 (UCMR3)

Compound	*Reporting Level (ng/L)*	*New Jersey Public Water Systems*		*U.S. Public Water Systems Other than NJ*	
		*# Detects**	*% Detects*	*# Detects*	*% Detects*
PFOA (C8)	20	**19/175**	**10.9%**	**98/4745**	**2.1%**
PFNA (C9)	20	**4/175**	**2.3%**	**10/4745**	**0.2%**
PFOS (C8-S)	40	6/175	3.4%	89/4745	1.9%
PFHxS (C6-S)	30	2/175	1.1%	53/4745	1.1%
PFBS (C4-S)	90	0/175	0%	8/4745	0.2%
PFHpA (C7)	10	6/175	3.4%	80/4745	1.7%

- All large (>10,000 users) and a few small U.S. public water systems.
- **Much higher reporting levels than NJDEP studies** but allows for comparison of NJ and national occurrence on same basis.
- **PFOA and PFNA - much more frequent in NJ than nationally; PFOS- somewhat more frequent**
  - *PFNA – Southwestern NJ (Gloucester and Camden Counties).*
  - *PFOA and PFOS – Various locations statewide.*

Overview - NJ Response to PFAS in Drinking Water

- NJDEP scientists recognized PFOA & other PFAS as contaminants of particular concern.
- PFAS stand out from other environmental contaminants for their environmental persistence, bioaccumulation from drinking water, low dose toxicity, and health effects in humans from low exposure levels.
  - This is in contrast to other well-known persistent, bioaccumulative, and toxic (PBT) chemicals such as dioxin and PCBs that have low water solubility. For these compounds, drinking water contamination is not a major issue.

- **2005-2006**: PFOA detected in tap water (2005) and wells (2006) of a NJ public water system (PWS) near an industrial source.
- **2007:** NJDEP issued PFOA **chronic (lifetime) drinking water guidance** of 40 ng/L at request of affected PWS.
- **2006 & 2009**: NJDEP conducted first statewide studies of PFAS in drinking water in the U.S.
- **2013-15:** PFOA and PFNA found much more frequently in NJ public water systems than nationally in national USEPA study (UCMR3).
- **2014:** NJDEP Commissioner asked the Drinking Water Quality Institute (DWQI) to recommend MCLs for PFNA, PFOA & PFOS.
- **2018-2020**: Adopted MCLs for PFNA (13 ng/L), PFOA (14 ng/L), and PFOS (13 ng/L) and added them to Private Well Testing Act (PWTA) after proposal and public comments.
  - New Jersey's PFNA MCL was first MCL for any PFAS in the United States.
- **Present time:** Continuing to evaluate information on other PFAS that may be present in NJ drinking water.
  - UCMR5 will include 29 PFAS (with lower reporting levels than UCMR3).

Phase-Out of Long-Chain PFAS

- Concerns about widespread detection of long-chain PFAS in human blood, and their impact on human health and the environment
  - Long-chain PFAS (8 or more carbons for carboxylates; 6 or more carbons for sulfonates) are more bioaccumulative (longer human half-lives) than short-chain PFAS.

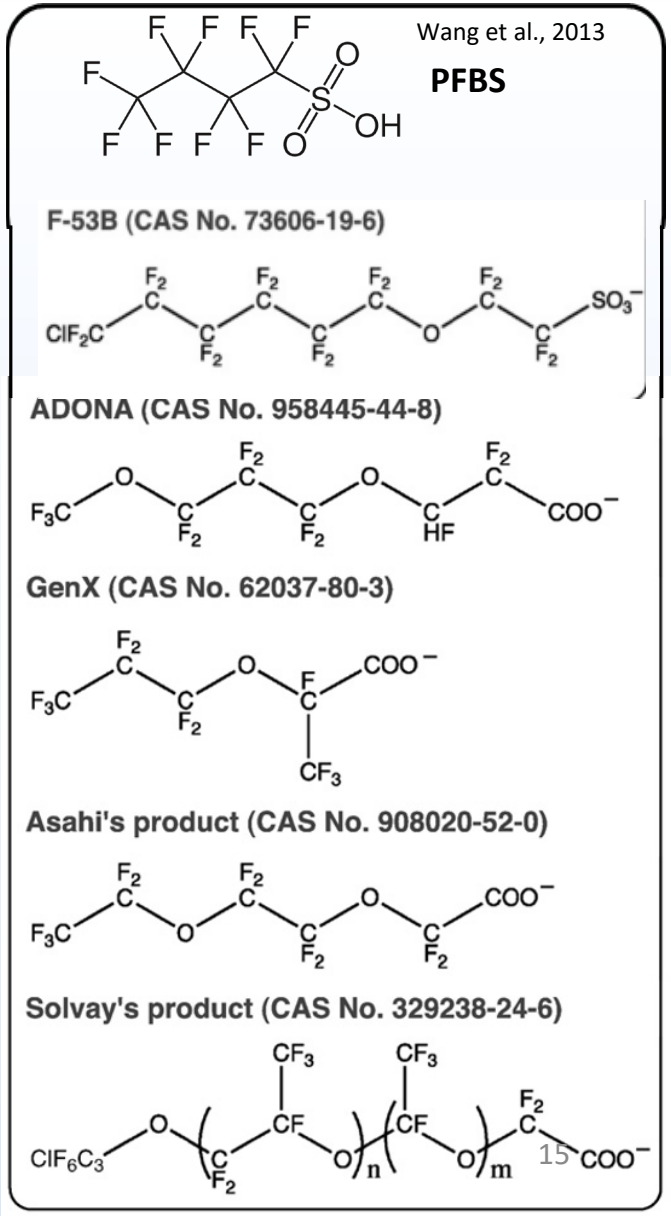
Short-chain PFCAs				Long-chain PFCAs				
PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnA	PFDoA
PFBS	PFPeS	PFHxS	PFHpS	PFOS	PFNS	PFDS	PFUnS	PFDoS
Short-chain PFSAs		Long-chain PFSAs						

- **2002-2008:** 3M voluntarily phased out production of PFOS, PFHxS, PFOA, and related precursors
- **2010-2015:** U.S. manufacturers eliminated production of PFOA, longer-chain PFCAs including PFNA, and their precursors, such as 8:2 fluorotelomer alcohol
- **Exemptions:** USEPA SNURs allow continued, low-volume use in specific applications (semiconductor, etching, metal plating, aviation, and photographic/imaging)
- Production shifted to parts of Asia and Eastern Europe

Source: Table 2-2 ITRC PFAS Tech Reg Document

Current Issue:
Replacements for Phased Out Long-Chain PFAAs

- Long-chain PFAAs (e.g. PFOA, PFNA, PFOS, PFHxS) and their precursors phased out in U.S.
- 100s of new PFAS/replacements approved by USEPA.
- **Most are short-chain PFAAs** (e.g. PFBS) or short-chain PFAS with **other structures (e.g. GenX).**
- Intended advantage is more rapid excretion (shorter half-lives) – less bioaccumulative.
- However, some have similar toxicity to long-chain PFAS.
  - **e.g. GenX – similar toxicological effects in rats and mice, and same tumor types in rats, as PFOA**
  - And, like long-chain PFAS, **do not break down.**
- Additionally, some replacements are not short chain (F-53B: chloroperfluoroether sulfonates; "Solvay's product": chloroperfluoropolyether carboxylates). They are not less bioaccumulative than long-chain PFAAs.
- **Detected in environmental media** in NJ and elsewhere.
- Current topic of major scientific, regulatory, and public interest.



Thank you!

More information

PFAS.nj.gov

Contact

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NJ Health
New Jersey Department of Health

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Identifying and Addressing Sources of PFAS and Impacted Receptors

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Site Remediation and Waste Management Program
New Jersey Department of Environmental Protection

November 30, 2021

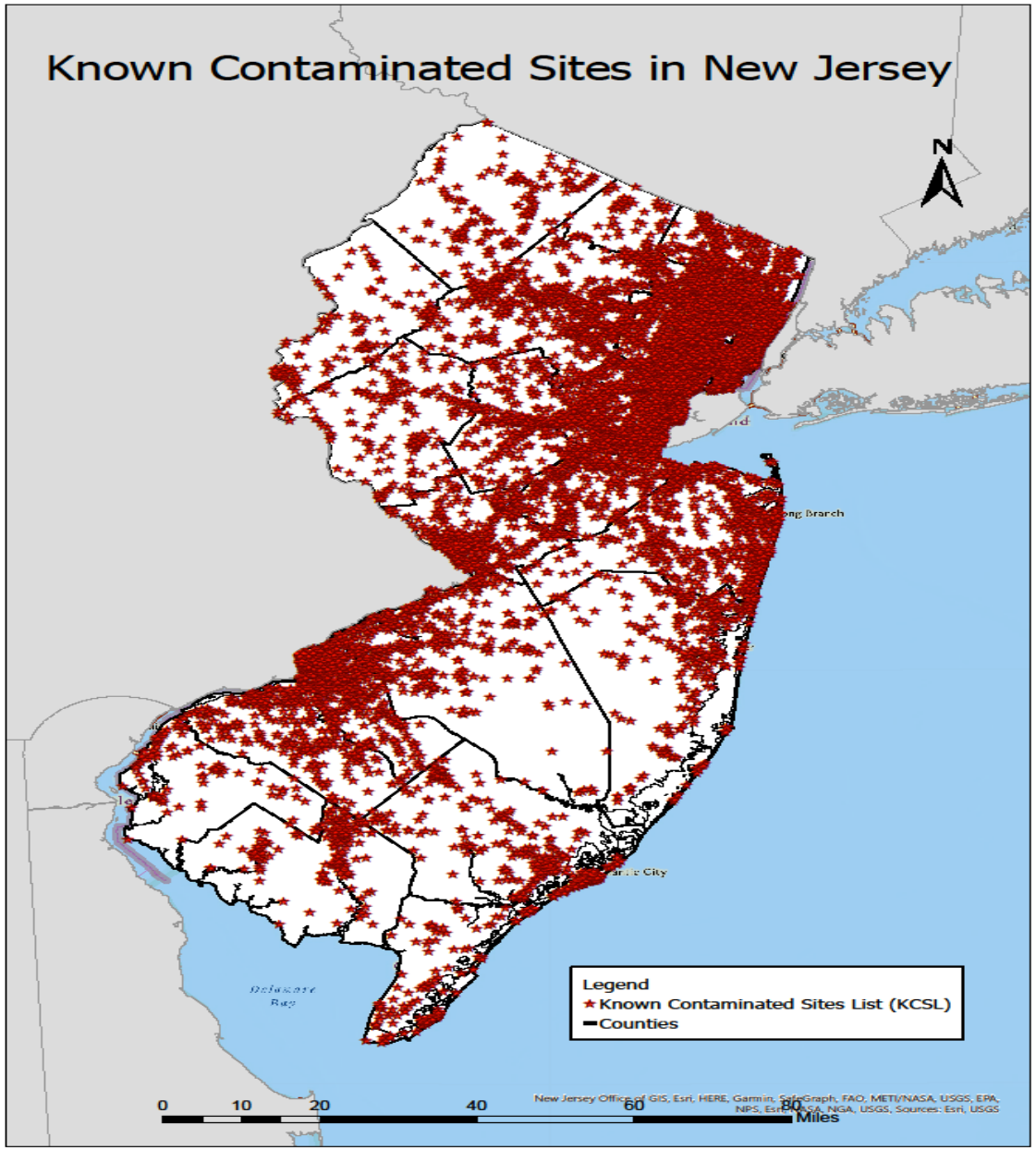
Who is required to conduct remediation?

Under New Jersey Laws and Regulations

- Dischargers of a hazardous substance
- Persons in any way responsible for a hazardous substance
- Owners/operators subject to Industrial Site Recovery Act
- Owners/operators of leaking underground storage tanks

Under Federal Requirements

- Superfund Sites
- Resource Conservation Recovery Act (RCRA) sites
- Department of Defense and other federal facilities


Known Contaminated Sites in New Jersey
N
Legend
Known Contaminated Sites List (KCSL)
Counties
0
10
20
40
60
80
Miles

Requirements for all remediation sites

- Investigate all known/suspected contaminant discharges, including PFAS
  - Receptor Evaluation - public and private water supplies
- Interim response actions
- Long-term mitigation – (treatment, waterline extension, etc.)
- Remediation of contamination - *both on-site and off-site*

How does DEP address PFAS contamination?

- **Remediation conducted by responsible parties**
  - Licensed Site Remediation Professionals (LSRP) required to evaluate and remediate discharges at the majority of sites
  - DEP case managers oversee cases with a federal regulatory component (Superfund, RCRA) federally owned (Department of Defense) and sites subject to Direct Oversight
- **Cleanups conducted by NJDEP using public funds**
  - Responsible party is unable, unwilling or unknown
  - High priority remediation sites
  - Private wells when >5 private wells impacted

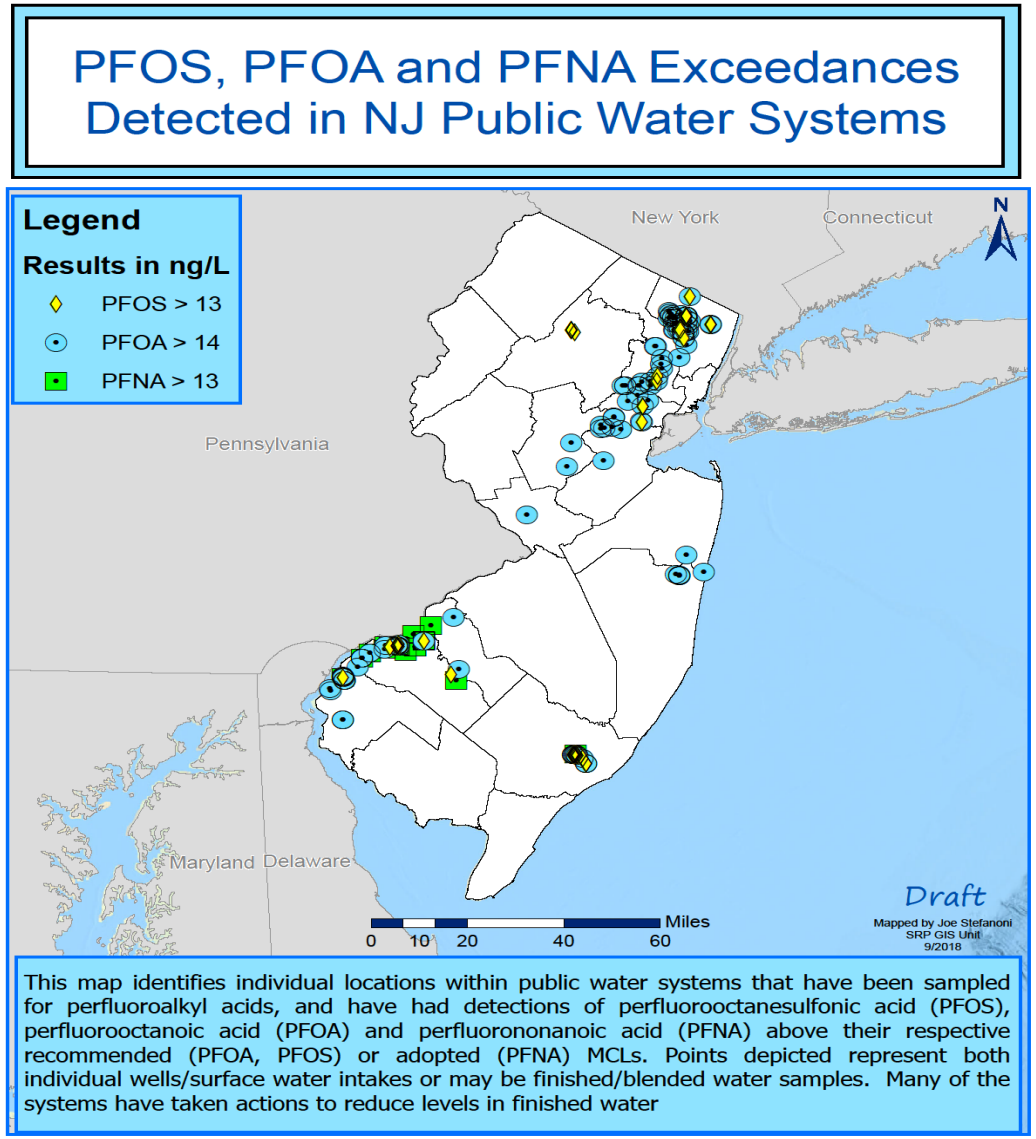
General PFAS Challenges

- Used in manufacturing since the 1950s
- Used in many industrial and commercial applications
- Not previously tracked evaluated/investigated
- Highly water soluble, mobile & persistent
- Pathways of concern
  - Ground water
  - Surface water
  - Industrial air discharges

General PFAS Challenges

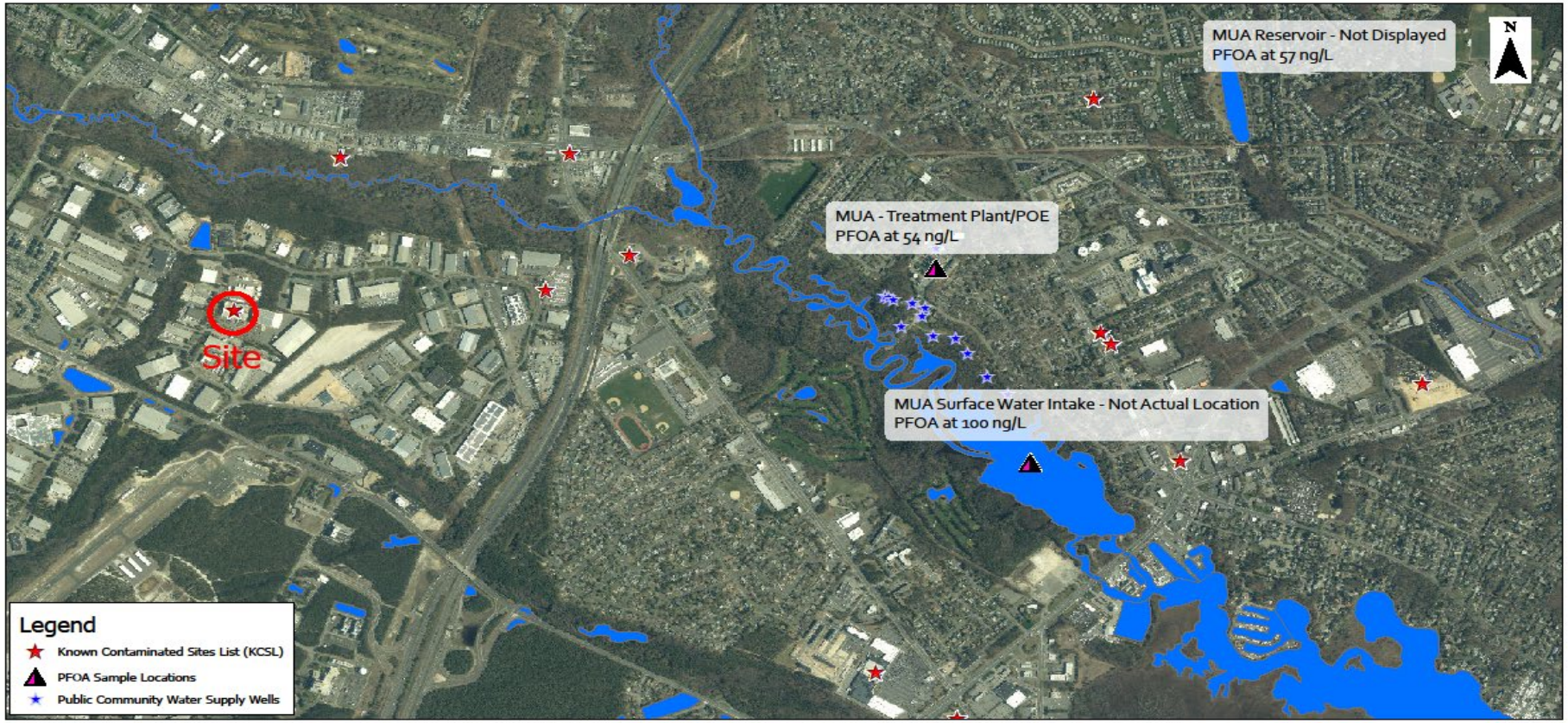
- Science is continuing to evolve:
  - Analytical capabilities and method development
  - Toxicity studies
  - Remediation technologies
  - Ecological impacts
  - Standards required for soil, surface water and air
- USEPA PFAS Strategic Roadmap 2021-2024
  - Research
  - Restrict
  - Remediate

Evaluating PFAS Sources



Track down of PFAS Sources

PFOA Sampling Data Conducted by MUA



Resources

- NJDEP-SRP Contaminants of Emerging Concern - https://www.nj.gov/dep/srp/emerging-contaminants/
  - PFAS Industrial Sectors - https://www.nj.gov/dep/srp/guidance/srra/pfas_handling_industry_sectors.pdf
- ITRC PFAS Technical Resources - https://pfas-1.itrcweb.org/
  - Physical and Chemical Properties
  - Regulations, Guidance, and Advisories
  - History and Use
  - Environmental Fate and Transport
  - Sampling Precautions
  - Laboratory Analytical Methods
  - Remediation Technologies and Methods
  - Aqueous Film Forming Foam

Thank you!

More information
www.nj.gov/dep/pfas

Contact
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NJ Health New Jersey Department of Health

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

PFAS in Drinking Water and Health

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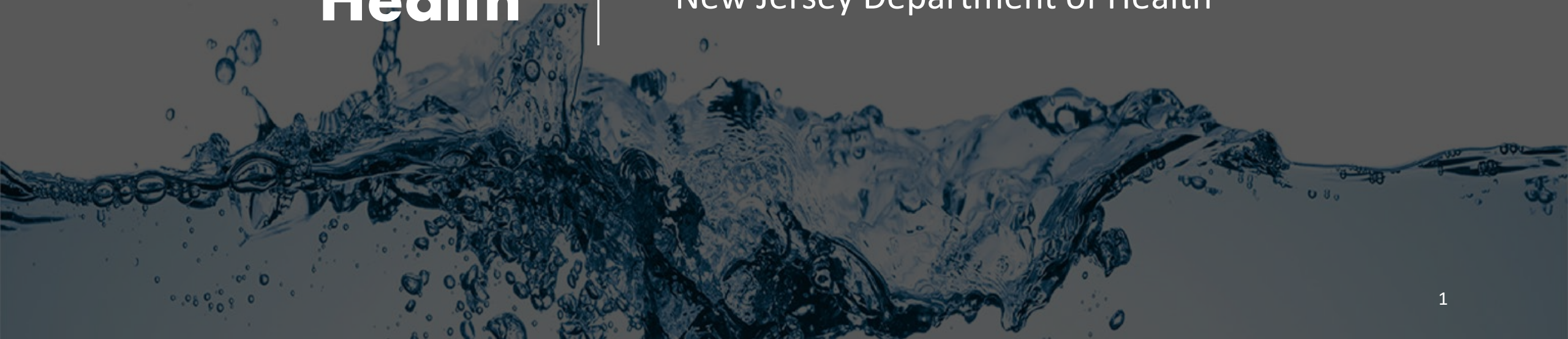
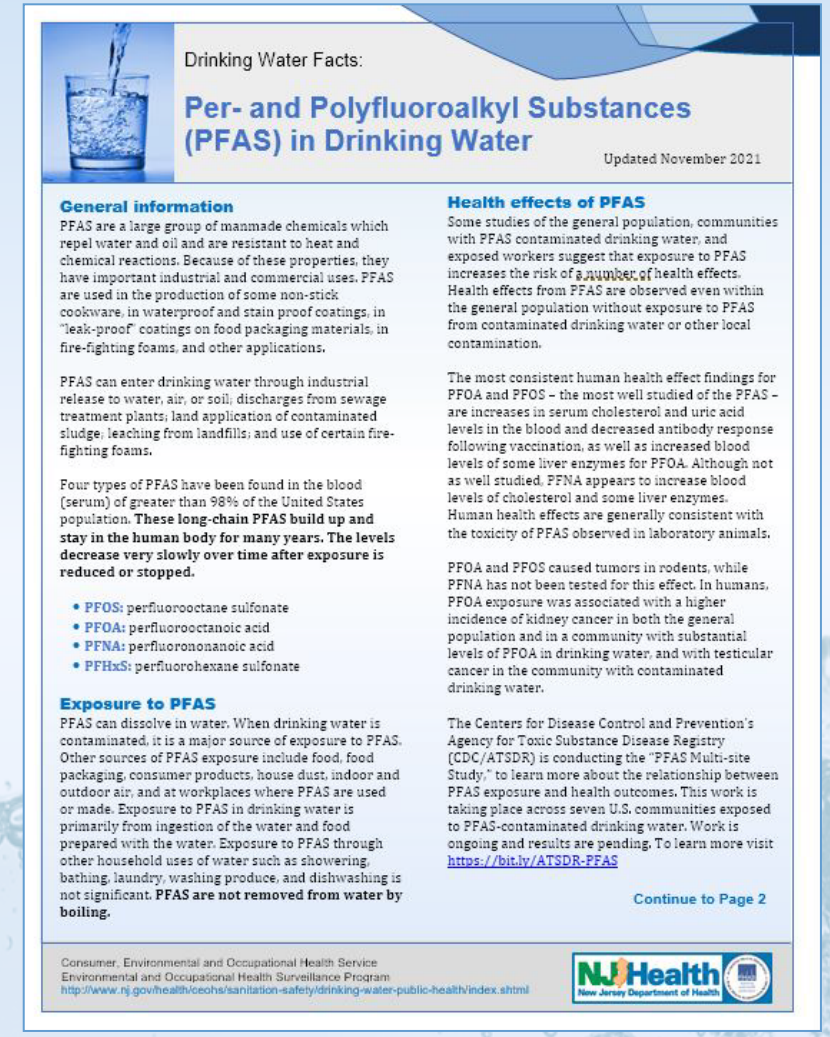
New Jersey Department of Health



New Jersey Department of Health PFAS Factsheet



Drinking Water Facts:

Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water

Updated November 2021

General information

PFAS are a large group of manmade chemicals which repel water and oil and are resistant to heat and chemical reactions. Because of these properties, they have important industrial and commercial uses. PFAS are used in the production of some non-stick cookware, in waterproof and stain proof coatings, in "leak-proof" coatings on food packaging materials, in fire-fighting foams, and other applications.

PFAS can enter drinking water through industrial release to water, air, or soil; discharges from sewage treatment plants; land application of contaminated sludge; leaching from landfills; and use of certain fire-fighting foams.

Four types of PFAS have been found in the blood (serum) of greater than 98% of the United States population. **These long-chain PFAS build up and stay in the human body for many years. The levels decrease very slowly over time after exposure is reduced or stopped.**

- **PFOS:** perfluorooctane sulfonate
- **PFOA:** perfluorooctanoic acid
- **PFNA:** perfluorononanoic acid
- **PFHxS:** perfluorohexane sulfonate

Exposure to PFAS

PFAS can dissolve in water. When drinking water is contaminated, it is a major source of exposure to PFAS. Other sources of PFAS exposure include food, food packaging, consumer products, house dust, indoor and outdoor air, and at workplaces where PFAS are used or made. Exposure to PFAS in drinking water is primarily from ingestion of the water and food prepared with the water. Exposure to PFAS through other household uses of water such as showering, bathing, laundry, washing produce, and dishwashing is not significant. **PFAS are not removed from water by boiling.**

Health effects of PFAS

Some studies of the general population, communities with PFAS contaminated drinking water, and exposed workers suggest that exposure to PFAS increases the risk of a number of health effects. Health effects from PFAS are observed even within the general population without exposure to PFAS from contaminated drinking water or other local contamination.

The most consistent human health effect findings for PFOA and PFOS – the most well studied of the PFAS – are increases in serum cholesterol and uric acid levels in the blood and decreased antibody response following vaccination, as well as increased blood levels of some liver enzymes for PFOA. Although not as well studied, PFNA appears to increase blood levels of cholesterol and some liver enzymes. Human health effects are generally consistent with the toxicity of PFAS observed in laboratory animals.

PFOA and PFOS caused tumors in rodents, while PFNA has not been tested for this effect. In humans, PFOA exposure was associated with a higher incidence of kidney cancer in both the general population and in a community with substantial levels of PFOA in drinking water, and with testicular cancer in the community with contaminated drinking water.

The Centers for Disease Control and Prevention's Agency for Toxic Substance Disease Registry (CDC/ATSDR) is conducting the "PFAS Multi-site Study," to learn more about the relationship between PFAS exposure and health outcomes. This work is taking place across seven U.S. communities exposed to PFAS-contaminated drinking water. Work is ongoing and results are pending. To learn more visit https://bit.ly/ATSDR-PFAS

Continue to Page 2

Consumer, Environmental and Occupational Health Service
Environmental and Occupational Health Surveillance Program
http://www.nj.gov/health/ceohs/sanitation-safety/drinking-water-public-health/index.shtml

- Focus is on PFOA, PFOS, and PFNA – the three PFAS with NJ MCLs.
- Updated regularly to include new information on regulations, state of the science, responses to frequently asked questions, and new resources.
- November 2021 update is online.
- Posted at the same web link as earlier version:

https://www.nj.gov/health/ceohs/documents/pfas_drinking%20water.pdf

Exposure to PFAS

- PFOA, PFOS and PFNA dissolve in water.
- When drinking water is contaminated, it is a major source of exposure to PFAS.
- Other sources of PFAS exposure include food, food packaging, consumer products, house dust, indoor and outdoor air, and at workplaces where PFAS are used or made.
- Exposure to PFAS in drinking water is primarily from ingestion.
- **PFAS are not removed from water by boiling.**
- Exposure from even low levels of PFAS in drinking water can be higher than exposure from other common sources.
- Exposure to PFAS through other household uses of water such as showering, bathing, laundry, dishwashing, and rinsing produce is not significant.

Health Effects of PFAS

- PFOA (largest number of available studies)
  - increases in serum cholesterol, some liver enzymes, and uric acid levels; decreased antibody response following vaccination
- PFOS
  - increased serum cholesterol and uric acid levels; decreased antibody response following vaccination
- PFNA (fewer studies – largely from the general population)
  - increases in cholesterol and some liver enzymes

PFAS and Cancer

- PFOA and PFOS caused tumors in rodents.
  - PFNA has not been tested for this effect.
- In a community with substantial exposure to PFOA through drinking water, PFOA exposure was associated with higher incidence of kidney and testicular cancers.
- PFOA was also associated with increased risk of kidney cancer in the general population in a recent study conducted by the National Cancer Institute.

ATSDR/CDC Multi-site PFAS Study

- The Centers for Disease Control and Prevention's Agency for Toxic Substance Disease Registry (CDC/ATSDR) is conducting the "PFAS Multi-site Study,"
- Goal is to learn more about the relationship between PFAS exposure and health outcomes.
- Work is taking place across seven U.S. communities exposed to PFAS-contaminated drinking water.
- Work is ongoing and results are pending.
- To learn more visit https://bit.ly/ATSDR-PFAS

Impact of PFAS on Children

- Exposure to PFAS from contaminated drinking water may be higher in infants and children than in adults.
  - PFAS are transferred to breastmilk from the mother.
  - Infants and children consume more fluid (e.g., formula, breast milk, water) per body weight than older individuals.
- They may also be more sensitive to the effects of PFAS.
- In humans, exposure to PFAS before birth, infancy, or in early childhood may result in health effects including:
  - decreased birth weight
  - decreased response to vaccinations
  - increased risk of infectious disease
- In laboratory animals, PFAS, including PFOA, PFOS, and PFNA, cause developmental delays.

New Jersey Drinking Water Standards for PFAS

- In 2018, NJ became the first state to establish an enforceable drinking water standard for any PFAS when it adopted a Maximum Contaminant Level (MCL) for PFNA
- Adoption of MCLs for PFOA and PFOS followed in 2020

NJ MCLs for PFAS	
PFNA	13 ppt
PFOA	14 ppt
PFOS	13 ppt

Abbreviations:
ppt=parts per trillion;
ppt = ng/L = nanograms per liter

How were the PFAS MCLs developed?

- The NJ Drinking Water Quality Institute (DWQI), a scientific advisory body that recommends MCLs in NJDEP, evaluated both the cancer and the non-cancer health effects of PFAS.
- NJ MCLs for carcinogens, such as PFOA and PFOS, are based on a 1 in 1 million risk of cancer from lifetime consumption.
- The non-cancer health effects of PFAS may occur over a shorter period of time (less than a lifetime) at the levels detected in NJ water systems that exceed the MCL.
- The DWQI also determined that PFOA, PFOS, and PFNA can be measured and removed from drinking water to the MCL levels.

Why is the NJ MCL for PFOA and PFOS below the EPA Health Advisory?

- The U.S. Environmental Protection Agency (EPA) issued a non-enforceable drinking water Lifetime Health Advisory for PFOA and PFOS of 70 ppt individually or when combined in 2016.
- The NJ DWQI concluded that the EPA Lifetime Health Advisory is not scientifically supportable or sufficiently health protective.
- EPA has announced that it will finalize national primary drinking water standards (e.g., MCLs) for PFOA and PFOS by Fall 2023.
- EPA recently asked their Science Advisory Board to review draft documents on the basis of the MCLGs (health-based goals) for the PFOA and PFOS MCLs.
  - Draft classification of PFOA as Likely Human Carcinogen – MCLG would be zero.
  - Drafts concluded that non-cancer effects occur at much lower levels than current assessments.
- Final EPA MCLs would consider other factors in addition to MCLGs.
- Health-based drinking water levels for PFOA and PFOS based on these new draft values would be much lower than the current EPA Health Advisory and the NJ MCLs.

Should residents drink bottled water when they learn PFAS are in their drinking water?

- PFOA, PFOS and PFNA build up in the body over time, and it takes many years for the levels of these PFAS in the body to decrease after exposure has ended.
- If PFAS is present in drinking water, using bottled water or a home water filter designed to remove these PFAS will reduce exposure.
- Specific recommendations for certain populations follow –

Should residents drink bottled water when they learn PFAS are in their drinking water?

For bottle-fed babies:

Bottled water should be used to prepare infant formula. Bottled water should also be used when giving infants plain water and to prepare juice made from concentrate for infants.

For nursing (breastfed) babies:

PFAS are present in breast milk and can be transferred to nursing babies. Despite this exposure, mothers who are breastfeeding should continue to nurse. The extensive information on the health benefits of breastfeeding outweigh potential risk of additional PFAS exposure.

Should residents drink bottled water when they learn PFAS are in their drinking water?

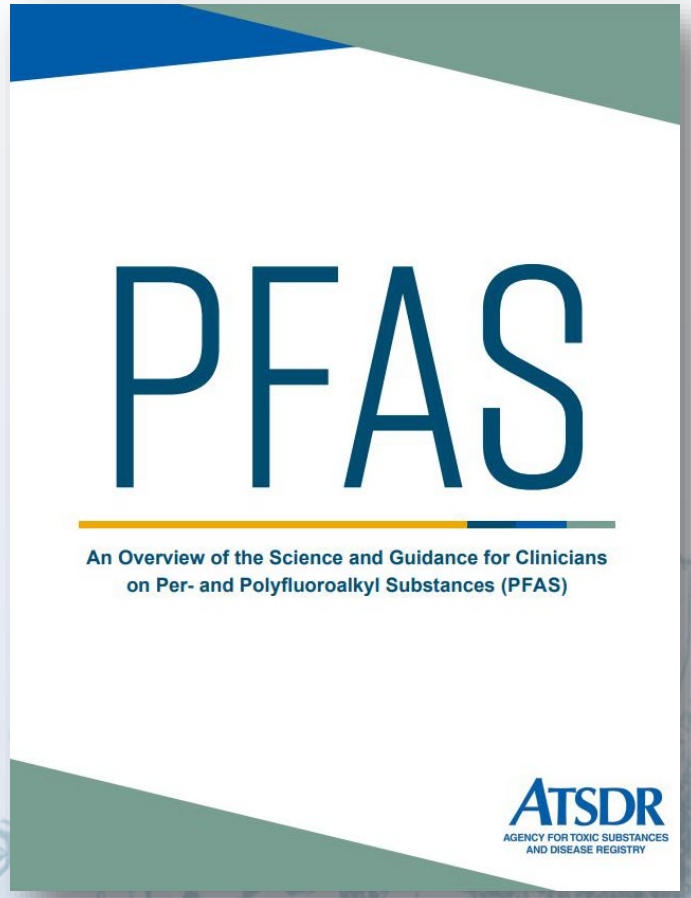
For pregnant women, nursing women and women considering or planning on having a child:

Switching to bottled water or using a home water filter for drinking and cooking will reduce PFAS exposure. However, PFAS are slowly excreted from the body. Therefore, risk reduction will not be immediate, as exposure to the fetus and nursing infant is influenced by the mother's past exposure.

For older children and adults:

If a public water utility notifies consumers that a PFAS exceeds the NJ MCL, they are required to promptly take actions to reduce these levels. Individuals who wish to reduce exposure to PFAS while the water utility is taking actions to reduce levels can consider switching to bottled or home filtered water for drinking and cooking.

Information for Healthcare Providers



https://www.atsdr.cdc.gov/pfas/docs/clinical-guidance-12-20-2019.pdf

- Individuals concerned about their health should consult with their personal healthcare provider.
- Healthcare providers can find more information on PFAS health effects and exposure from CDC's Agency for Toxic Substances and Disease Registry at the link below.

Blood Testing for PFAS

- Laboratory tests are available to measure PFAS in blood serum, but this is not a routine test.
- Health insurance may not cover the cost of this testing.
- Individuals should consult with their healthcare provider to make this decision.
- Additional information on what this testing can and cannot tell you follows -

Blood Testing for PFAS

What blood testing *can* tell.

- Blood tests can be compared to national monitoring data.
- For example, if a person's blood serum concentration is above the 95th percentile, this means that it is higher than the concentration found in 95% of the U.S. population.

	Mean (geometric)	50th percentile	95th percentile
PFOS	4.25	4.30	14.6
PFOA	1.42	1.47	3.77
PFNA	0.41	0.40	1.40
PFHxS	1.08	1.10	3.70

Units: ppb=parts per billion
Data Source: NHANES 2017-2018

What blood testing *cannot* tell.

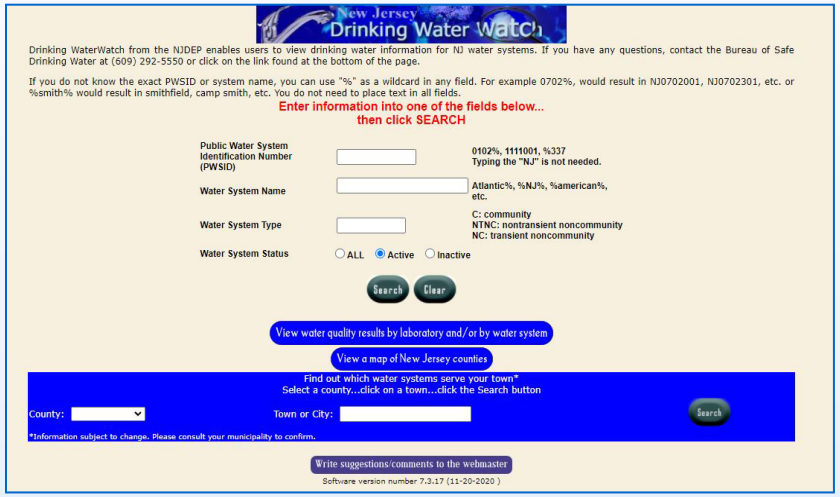
- While exposure to PFAS can increase the risk of certain health effects, a blood test cannot be used to predict whether or not a person will experience health effects or if PFAS exposure caused any health problems that they may have.
- Test results alone cannot be used to identify the source of exposure.
- There is no accepted treatment to reduce levels of PFAS in the blood.

How can NJ residents find out if PFAS are in their drinking water?

Public water users:

- NJ public water systems were required to begin monitoring for PFNA in 2019 or 2020 and for PFOA and PFOS in 2021.
- Earlier results from the USEPA Unregulated Contaminant Monitoring Rule (UCMR3) are also available for large systems and some smaller systems.
- Results are reported in utility Consumer Confidence Reports (CCRs) mailed to homes or available online

Monitoring results are available on NJDEP's Drinking Water Watch -



https://www9.state.nj.us/DEP_WaterWatch_public/

How can NJ residents find out if PFAS are in their drinking water?

Private well users:

- PFNA, PFOA and PFOS have been added to the NJ Private Well Testing Act (NJ PWTA).
- Private wells at homes being sold in NJ must be tested by a certified laboratory for these three PFAS (and other required contaminants) starting December 1, 2021.
- Other private well owners not selling or buying a home should contact a certified laboratory.
- https://www13.state.nj.us/DataMiner

NJ Private Well Testing Act
Consumer information law established in 2002 that requires private wells to be tested by a certified laboratory during real estate transfer and requires landlords to test well water supplied to tenant every five years and provide results.

Home Water Filters

- Water treatment devices utilizing granular or powdered activated carbon filters, reverse osmosis, ion exchange resins and other specialized treatment media can reduce the level of PFAS in drinking water.
- It is important to follow the manufacturer's guidelines for maintenance and operation.
- NSF International, an independent and accredited organization, certifies products proven effective for reducing PFOA and PFOS to below the EPA Lifetime Health Advisory Levels of 70 ppt
  - However, NSF does not certify the removal down to the lower NJ MCLs for PFOA and PFOS (14 and 13 ppt).
- Some studies have demonstrated up to 50% removal of PFAS by pitcher or refrigerator filters.

Questions

- Acknowledgements

NJ Drinking Water Quality Institute

Dr. Gloria Post, NJDEP Division of Science and Research

NJ Department of Environmental Protection partners

Thank you!

More information

www.nj.gov/dep/pfas

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NJ Health New Jersey Department of Health

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Regulation of PFAS Chemicals in New Jersey

Filina Poonolly
Environmental Engineer
Bureau of Water System Engineering
NJ Department of Environmental Protection

Overview

- Drinking Water Standards
- Private Well Testing Act
- Ground Water Quality Standards
- NJPDES
- DPHS List of Hazardous Substances

Drinking Water Standards

Maximum Contaminant Levels or MCLs

- The highest level of a contaminant that is allowed in drinking water.
- Set at Federal and/or State level
  - States may not adopt standards less stringent than Federal standards
- 90+ biological, chemical, and radiological contaminants

Regulation of PFAS Chemicals – State Level

1977

- New Jersey Legislature enacts the New Jersey Safe Drinking Water Act

"The Legislature finds and declares that it is a paramount policy of the State to protect the purity of the water we drink and that the Department of Environmental Protection shall be empowered to promulgate and enforce regulations to purify drinking water…"

How does NJ set Drinking Water Standards?

Drinking Water Quality Institute (DWQI)

- Advisory board established under 1984 Amendments to New Jersey SDWA.
- Charged with developing and recommending MCLs to NJDEP.
- Membership includes NJDEP, NJ Department of Health, and representatives from the academic and scientific community, and the public with background in environmental health, and water purveyors.

DWQI Subcommittees

Health Effects Subcommittee

Responsible for recommending health-based levels.

Testing Subcommittee

Responsible for reviewing appropriate analytical methods to measure levels as close to the health-based levels as possible.

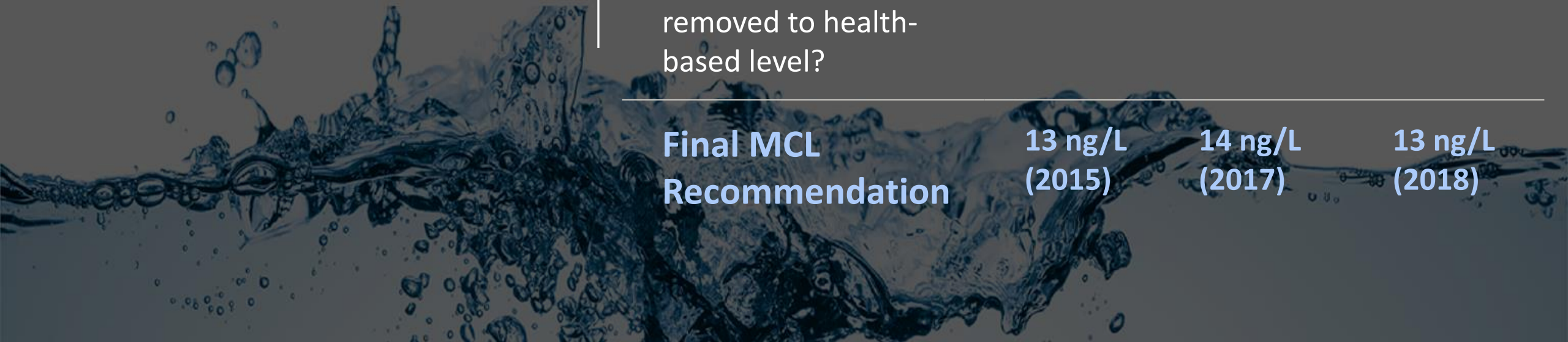
Treatment Subcommittee

Responsible for evaluating best available treatment technologies for removal of contaminants from drinking water.

Meeting information at:
http://www.nj.gov/dep/watersupply/g_boards_dwqi.html

DWQI Final Recommendations

	PFNA	PFOA	PFOS
Health Based Level	13 ng/L	14 ng/L	13 ng/L
Practical Quantitation Level (PQL)	5 ng/L	6 ng/L	4.2 ng/L
Can contaminant be removed to health-based level?	Yes	Yes	Yes
Final MCL Recommendation	**13 ng/L (2015)**	**14 ng/L (2017)**	**13 ng/L (2018)**



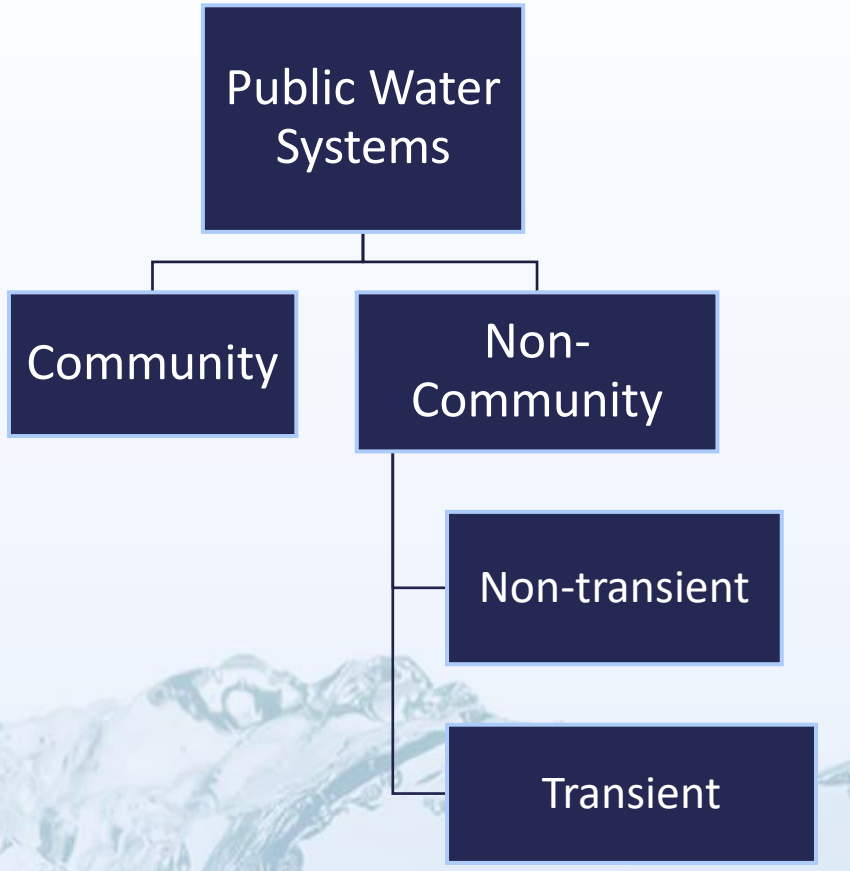
NJDEP Rulemaking Process

- Internal and External Stakeholdering
- Proposal of Rule Amendments (April 2019)
- 60 Day Public Comment Period
- Adoption of Rule Amendments (June 2020)

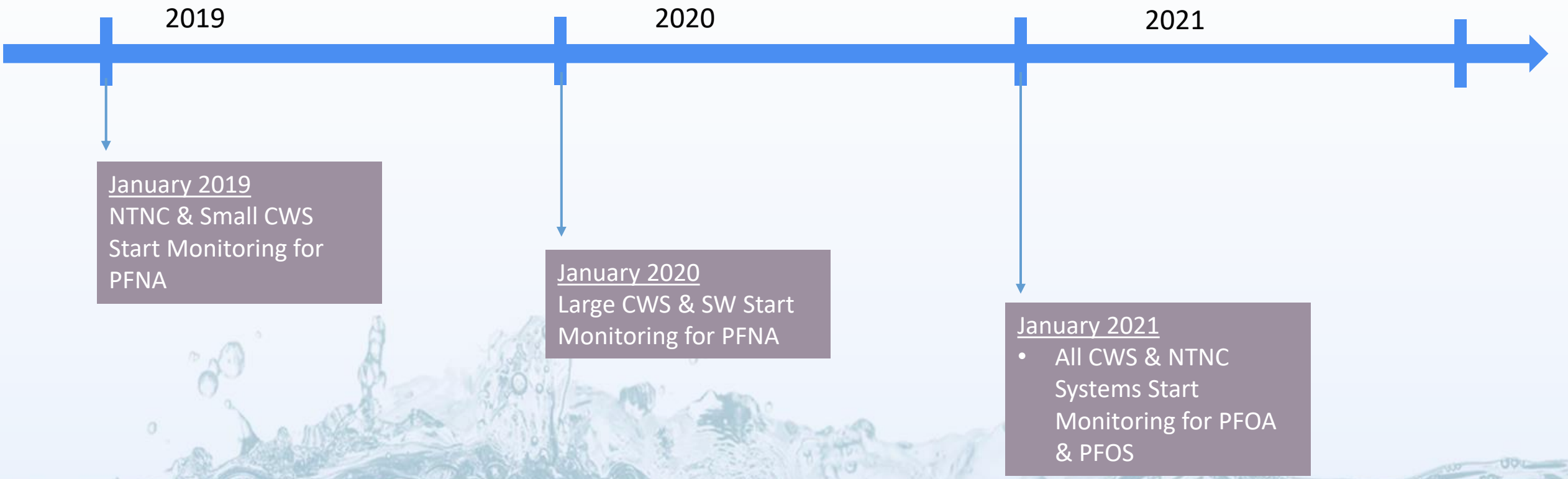
MCLs for PFNA, PFOA, and PFOS

- Apply to public water systems
  - Community Water Systems (490 systems)
  - Non-Transient Non-Community Water Systems (670 systems)
  - **Does not apply to Transient Non-Community**
  - **Does not apply to 100% bulk purchasers**

- Requirements:
  - Routinely monitor for these contaminants
  - Take steps to eliminate regulated PFAS from the water delivered to customers if found at levels exceeding the MCLs



Timeline of Monitoring



Monitoring Requirements for MCLs

- All systems initially performed four consecutive quarters of sampling
- Samples taken at point at which water enters the distribution system (leaves the treatment plant)
- MCL violations are determined by the running annual average of four consecutive quarters of results.

Monitoring Requirements for MCLs

- If a system has treatment installed for PFAS, they must continue to monitor quarterly.
- If no treatment and results are reliably and consistently below the MCL for all three PFAS, system can monitor annually.
- Additionally, if a system does not have treatment and has no detections after three years of sampling, system can sample once every three years.

MCL Exceedances

- If MCL is exceeded, NJDEP issues a Notice of Noncompliance.
- Tier 2 Violation requiring a Public Notice (PN)
- Up to one year to bring the system into compliance.

MCL Exceedances – Public Notice

- Must be issued as soon as practical, but no later than 30 days
- Notice must be approved by NJDEP
  - Templates available on NJDEP's website here: https://www.state.nj.us/dep/watersupply/dws-sampreg.html
- Should be sent in a form and manner reasonably calculated to reach all persons served
  - Residential, transient, and non-transient users
  - Not just bill-paying customers
  - Sensitive populations
  - Multilingual requirements
- Keep consistent messaging across all platforms
  - Recommend consulting with us on all PN materials

Private Well Testing Act

- Testing requirements for individual private wells prior to sale or lease of real property to ensure that purchasers and tenants of properties are aware of the quality of their drinking water.

2020 Rulemaking:

- Private wells subject to sale or lease will be required to be tested for PFOA, PFOS, and PFNA starting December 1, 2021.

Ground Water Quality Standards

- Establish the designated uses for all ground waters of the State
- Classify the ground waters based on their designated uses
- Specify the ground water quality criteria that must be met to support the designated uses.
- The GWQS require that, when an MCL has been promulgated by the Department, the health-based level for the MCL is the specific ground water quality criterion for the same constituent.
    - Only human health risk (ground water quality criteria) and analytic capabilities (measured as practical quantitation levels, or PQLs) are considered in deriving the ground water quality standards. Unlike with MCLs, treatment removal is not considered.

2018 & 2020 Rulemakings:

- Established specific ground water quality standards for PFNA, PFOA, and PFOS of 13 ng/L, 14 ng/L, and 13 ng/L, respectively.

Ground Water Quality Standards

- GWQS are implemented primarily through the NJPDES - DGW program and the Site Remediation Program.
  - Serve as the minimum standards for the remediation of contaminated ground water (in accordance with the Remediation Standards)
  - Used to set effluent limits for discharges to ground water (DGW) under the New Jersey Pollutant Discharge Elimination System (NJPDES) Rules.

New Jersey Pollutant Discharge Elimination System (NJPDES) Rules

- Establish the requirements for a permit approval from the Department and set limits.
- Establish the monitoring requirements for NJPDES permits, which are organized by industrial category, pollutant type, and testing method.

2020 Rulemaking:

- Added PFOA, PFOS, and PFNA to the Permit Application Testing Requirements/Pollutant Listings and the Requirements for Discharges to Ground Water.
- Affected dischargers to ground water subject to monitoring for PFOA, PFOS, and PFNA.
- Applicable clean-up activities subject to limits established through the GWQS

Discharges of Petroleum and Other Hazardous Substances (DPHS) Rules

- List of Hazardous Substances:
  - Appendix A of the DPHS Rules lists all substances that are considered hazardous substances under the Spill Act, in addition to petroleum and petroleum products
- The Spill Act:
  - Establishes a comprehensive scheme to control the transfer and storage of hazardous substances
  - Provides strict liability for cleanup and removal costs (including the costs of remediation and natural resource damages) resulting from any discharge of a hazardous substance.
  - Provides a fund for compensating businesses and other persons damaged by a discharge of a hazardous substance, provided the person meets certain criteria.
  - Any person liable under the Spill Act, including the discharger of a hazardous substance or a person in any way responsible for a hazardous substance that is discharged, is required to remediate the discharge of the hazardous substance. (under the Brownfield and Contaminated Site Remediation Act)

2018 & 2020 Rulemakings:

- Added PFNA, PFOA, and PFOS to the List of Hazardous Substances
- Designated these compounds as hazardous substances
- Gave NJDEP additional authority to respond to a discharge or threat of a discharge
- Compels a person in any way responsible respond to a discharge or threat of discharge
- Provide an affirmative obligation for owners and operators of industrial establishments to report, investigate, and remediate these substances. (under Industrial Site Recovery Act)

Thank you!

More information
www.nj.gov/dep/pfas

Contact
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NJ Health New Jersey Department of Health

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Public Water System Treatment for PFAS

Patricia Stelmaszczyk
Bureau of Water System Engineering
Division of Water Supply and Geoscience

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

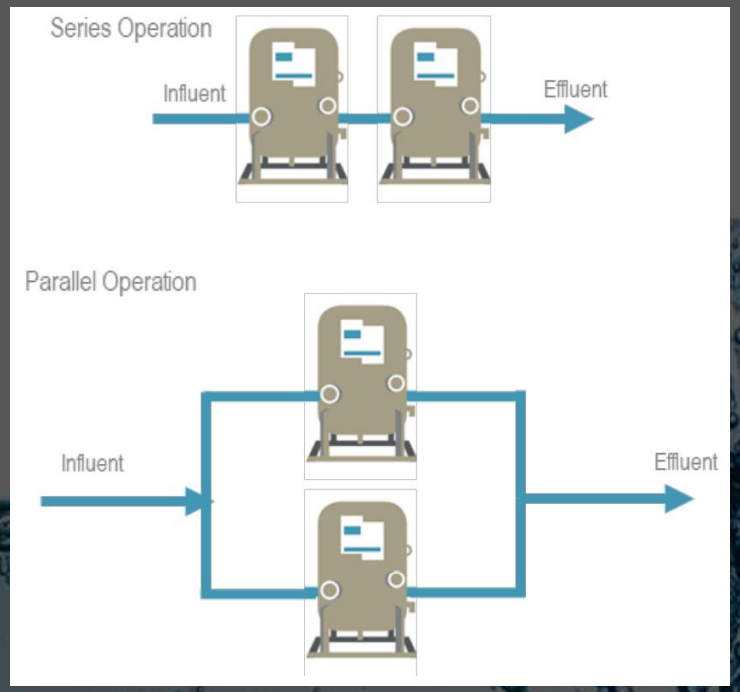
NJ PFAS Regulations

PFNA MCL of 13 ng/L
PFOA MCL of 14 ng/L
PFOS MCL of 13 ng/L

Common Approved Treatment

- GAC
- Ion Exchange
- Reverse Osmosis

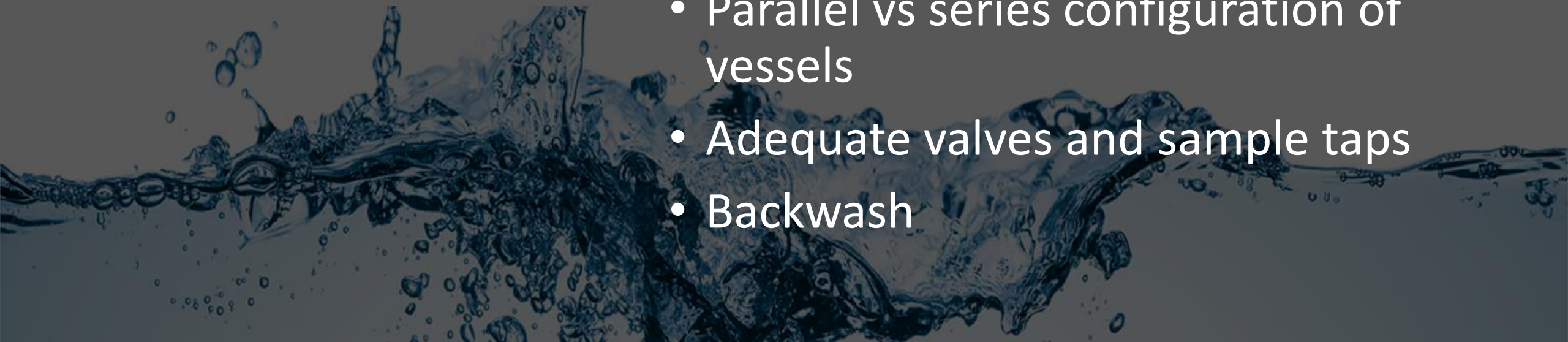
Granular Activated Carbon – The Basics



- Made up of organic materials with high carbon contents
  - Wood, lignite, coal
- Adsorbs contaminants into the pores and onto the surface of the media
- Stored in vessels configured in series or parallel

Design Considerations

- Utilizing certified materials for drinking water as per N.J.A.C. 7:10-8.2
- Sizing in relation to flow
  - Typical empty bed contact time of 20 minutes total
- Parallel vs series configuration of vessels
- Adequate valves and sample taps
- Backwash



GAC and PFAS Removal

Table 7 – PFAS Compound Removal Performance with GAC Treatment (USEPA, 2014)

PFAS COMPOUND	MAXIMUM REMOVAL
PFBA	99%
PFBS	98%
PFPeA	90%
PFHxS	98%
PFHxA	95%
PFHpA	90%
PFHpS	82%
PFOA	98%
PFOS	99%
PFNA	93%
PFDA	97%
6:2 FTS	77%
8:2 FTS*	88%
PFOSA	90%
PFDoA	90%
PFTriA†	90%
PFUnA‡	90%

**8:2 Fluorotelomer Sulfonate. †Perfluorotridecanoic acid. ‡Perfluoroundecanoic acid.*

Figure from AWWA's *Drinking Water Treatment for PFAS Selection Guide*

Ion Exchange (IX) – The Basics

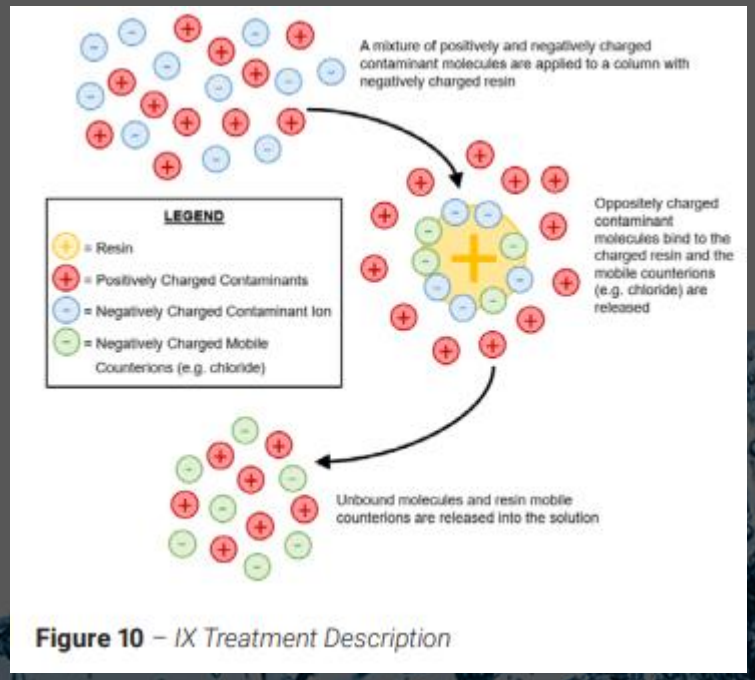
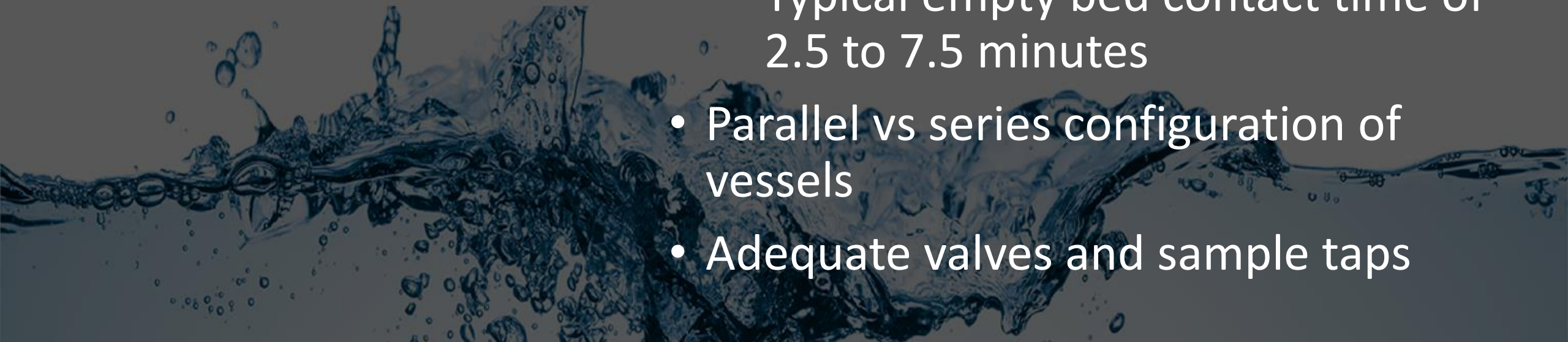


Figure 10 – *IX Treatment Description*

- Tiny beads made up of hydrocarbons
  - Material referred to as resin
- Resin material removes contaminants by attracting and holding molecules of the opposite charge
  - Resulting in cationic or anionic exchanges
- Stored in vessels configured in series or parallel

Design Considerations

- Utilizing anion exchange for PFAS removal
- Utilizing certified materials for drinking water as per N.J.A.C. 7:10-8.2
- Sizing in relation to flow
  - Typical empty bed contact time of 2.5 to 7.5 minutes
- Parallel vs series configuration of vessels
- Adequate valves and sample taps



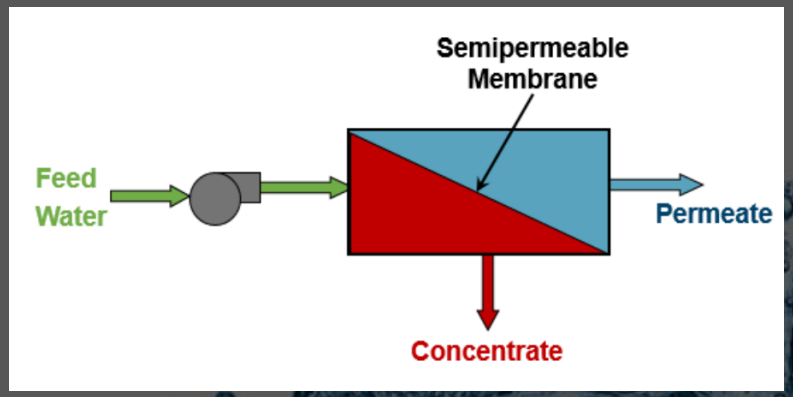
IX and PFAS Removal

Table 11 – PFAS Compound Removal Performance with IX Treatment (USEPA, 2014)

PFAS COMPOUND	MAXIMUM REMOVAL
PFBA	97%
PFBS	98%
PFPeA	90%
PFHxS	99%
PFHxA	97%
PFHpA	94%
PFHpS	99%
PFOA	97%
PFOS	99%
PFNA	98%
PFDA	98%
6:2 FTS	89%
8:2 FTS	99%
PFOSA	90%
PFDoA	90%
PFTriA	90%
PFUnA	90%

Figure from AWWA's *Drinking Water Treatment for PFAS Selection Guide*

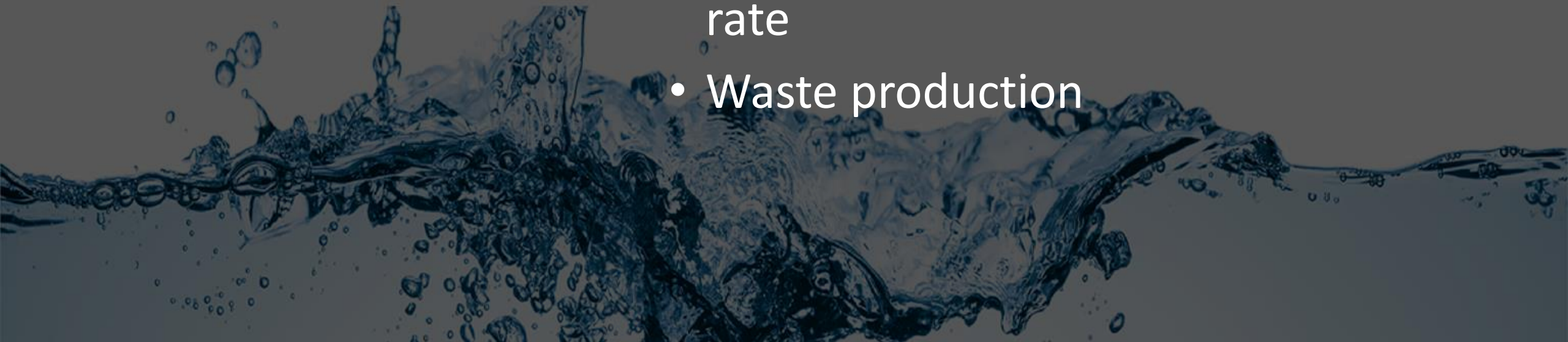
Reverse Osmosis (RO) – The Basics



- Water is pushed through a semipermeable membrane
- Contaminants are thereby removed by size exclusion, adsorption, and electrostatic interactions

Design Considerations

- Utilizing certified materials for drinking water as per N.J.A.C. 7:10-8.2
- Sizing in relation to flow and recovery rate
- Waste production



RO and PFAS Removal

Table 15 – PFAS Compound Removal Performance with NF and RO Membrane Treatment (USEPA, 2014)

PFAS COMPOUND	MAXIMUM REMOVAL
PFBA	99.9%
PFBS	99.8%
PFPeA	99%
PFHxS	99%
PFHxA	99.2%
PFHpA	99%
PFOA	99%
PFOS	99%
PFNA	99%
PFDA	99%
PFDS	99%
6:2 FTS	99.5%
PFOSA	98.5%
PFDoA	87%
PFUnA	99%
NMeFOSAA*	84%

**N-methyl perfluorooctane sulfonamidoacetic acid.*

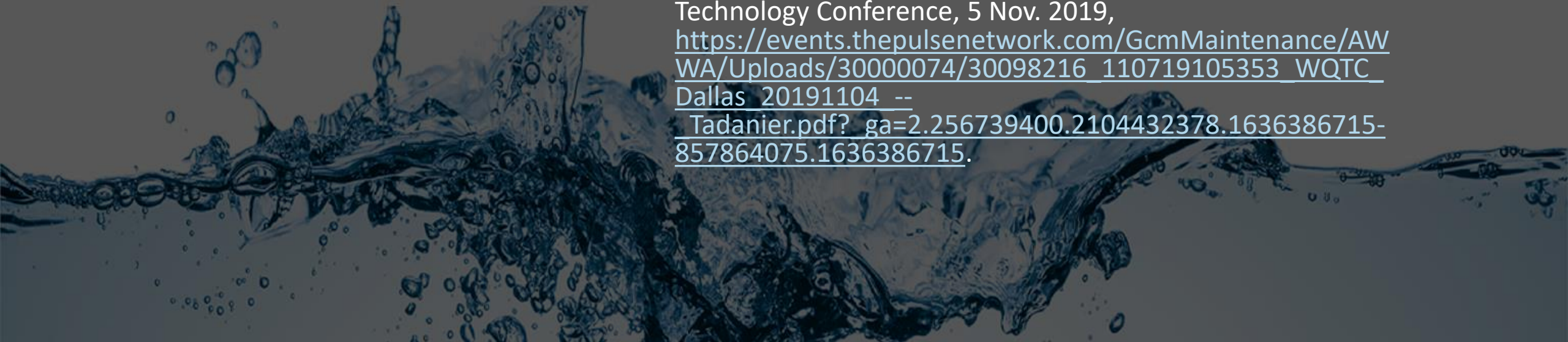
Figure from AWWA's *Drinking Water Treatment for PFAS Selection Guide*

Additional References

Drinking Water Treatment for PFAS Selection Guide, American Water Works Association, AWWA Source Water Protection.

Per- and Polyfluoroalkyl Substances (PFAS) Treatment, American Water Works Association, https://www.awwa.org/Portals/0/AWWA/ETS/Resources/Per-%20and%20Polyfluoroalkyl%20Substances%20(PFAS)%20-%20Treatment.pdf?ver=2020-09-22-072333-547.

Tadanier, Dr. Christopher J. "A PFAS Primer for Utilities." Water Quality Technology Conference. Water Quality Technology Conference, 5 Nov. 2019, https://events.thepulsenetwork.com/GcmMaintenance/AWWA/Uploads/30000074/30098216_110719105353_WQTC_Dallas_20191104_--_Tadanier.pdf?_ga=2.256739400.2104432378.1636386715-857864075.1636386715.



Thank you!

More information
www.nj.gov/dep/pfas

Contact
watersupply@dep.nj.gov

NJ Health New Jersey Department of Health

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

PWTA & PFAS: What you need to know?

Bradley K. Koffler
Bureau of Safe Drinking Water
Division of Water Supply & Geoscience

New Jersey Private Well Testing Act - Summary

- Authority - PWTA Law - N.J.S.A. 58:12A-26 et seq.
- Signed into Law March 23, 2001.
- September 14, 2002 - Effective Date of Law Codified at N.J.A.C. 7:9E.
- Rules finalized Sept. 16th, 2002 - NJ Register - Effective Date of State Regulations.
- Website: www.nj.gov/dep/pwta.

The PWTA Rule

- Establishes regulations governing:
  - The addition of parameters for testing.
  - Sample collection & analysis (OQA).
  - Reporting of results by certified labs.
  - Criteria for notifying nearby property owners.
  - Does not prevent or void a sales transaction.

PWTA Rule -Who is Subject?

Applies to: Buyers and Sellers of Real Property where...

- **Potable water supply is a Private Well OR**
- **Well has <15 service connections OR**
- **Well does not serve avg. of 25 individuals daily at least 60 days/year**
  - **So many NTNC/TNC PWS's would be subject to the PWTA requirements.**

Contracts of sale must contain provision to test potable water supply for certain parameters.

Buyer and Seller Requirements

- **Buyer & Seller must certify in writing that they have received and reviewed the water test results at closing of title of sale**

PWTA Rule-Lessor Provision

- Testing was due to be performed by March 14th, 2004.
- After 3-14-04, Lessor of real property with (subject) private well must test water supply at least once every 5 years thereafter (if well is not subject to other State laws). Test again by 3/14/2009, etc.
- Lessor must provide written results to tenant within 30 days of testing.
- Lessor must provide copy of results to any new tenant.

PFAS Parameters and the PWTA

- **Under the adopted rule amendments, private wells subject to sale or lease will be required to be tested for PFOA, PFOS, and PFNA with all real estate closings on or after December 1, 2021.**

- **The PWTA Rules require testing at the time of a real estate transaction, or every five years for rental properties, and notification to potential buyers and tenants.**

- **The new testing requirements for PFAS parameters under the PWTA apply to ALL counties in the state of New Jersey.**

Well Test Parameters

- ***Total coliform bacteria*Nitrate, Iron, Manganese, pH, Iron, all volatile organic compounds (VOC's) with established Maximum Contaminant Levels (MCLs), Lead, Arsenic, and Gross Alpha particle activity*** **are required by PWTA regulations for all counties**

- **The following 3 synthetic organic compounds (SOCs): 1,2,3-trichloropropane, ethylene dibromide, and 1,2-dibromo-3-chloropropane are also required to be sampled.**

- **The following 3 per-and polyfluoroalkyl substances: Perfluorononanoic acid (PFNA), perfluorooctanoic acid(PFOA), and Perfluorooctanesulfonic acid (PFOS)are also required to be sampled.**

**** E.coli - test is also required in State Regulations <u>only</u> if Total Coliform test is positive.***

Well Test Parameters Continued

Mercury and Uranium:

- **Added in State PWTA based on property location within New Jersey.**
- **For Mercury, the following counties are required to sample:**
  - **Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Monmouth, Ocean, and Salem**
- **For Uranium, the following counties are required to sample:**
  - **Bergen, Essex, Hudson, Hunterdon, Mercer, Middlesex, Morris, Passaic, Somerset, Sussex, Union, and Warren**

Analytical Results

- **All test Results are valid for 1 Year, *except Coliform***
- **Coliform Results (Total, E.coli) valid for 6 months.**
- **All results must be submitted by the reporting lab electronically to DEP as one "complete package".**
- **All results must be provided to client by lab within 5 days of completion of analyses on the *NJ Private Well Water Test Reporting Form.***

NJ Private Well Water Test Reporting Form

- **Contains pertinent info about lab, well, property, analytical results, MCLs, etc.**
- **Rule requires well location via Global Positioning Satellite (GPS) System in accordance with existing DEP standards. Mapping grade GPS receivers are allowed by lab, surveyor, inspector, etc.**
- **Includes remediation funding alternatives, health effects information.**
- **Contains written certification by lab manager that analyses meet requirements of N.J.A.C.** 7:18.

Current Electronic Data Submission Process

- Rule requires Electronic Data Submission to DEP via web-based portal.
  - The PWTA Program uses the E2/COMPASS System (electronic delivery/electronic storage).

- DEP either “accepts” or “rejects” data electronically & lab notified electronically.
  - Lab must resubmit PWTA information w/in 5-day timeframe after completion of analyses.

Reporting of PFAS Parameters Under the PWTA

As stated previously, private wells will be required to be tested for PFOA, PFOS, and PFNA for all real estate closings on or after December 1, 2021 for all counties.

- **A new PWTA E2 Excel template that includes the new parameters is available for labs to use when uploading the data.**

- **A new PWTA Reporting Form has also been developed that includes the new PFAS parameters for labs to give to the perspective buyers/sellers.**

Thank you!

More information
www.nj.gov/dep/pfas

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NJ Health New Jersey Department of Health

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

NJ PWTA Data Analysis

Heidi O’Neill, MA
Research Scientist
Division of Science and Research
New Jersey Department of Environmental Protection

PFAS PWTA Data

- December 1st 2021:
  PFOA, PFOS, and PFNA

Private Wells in New Jersey

- NJ Population: 8.9 million
  - About 87% receive drinking water from highly regulated public water systems
  - About 13% of the population (1,150,000 people) receive drinking water from private wells

Private Well Background

- Drinking water can be contaminated by:
  - Natural sources in the rock or soil
  - Man-made sources like agricultural or industrial run-off

- Naturally occurring substances in the groundwater
  - Can cause illness
  - Can cause unpleasant taste, smell, or appearance of your well water
  - Can stain clothes and plumbing

- Contamination to regional groundwater, lakes, or rivers can impact well water

PWTA Data Uses

- Summarized for public display
- Develop vulnerability maps through identification of trends
- Helps public outreach efforts
- Inform the public about the quality of their drinking water

PWTA Data

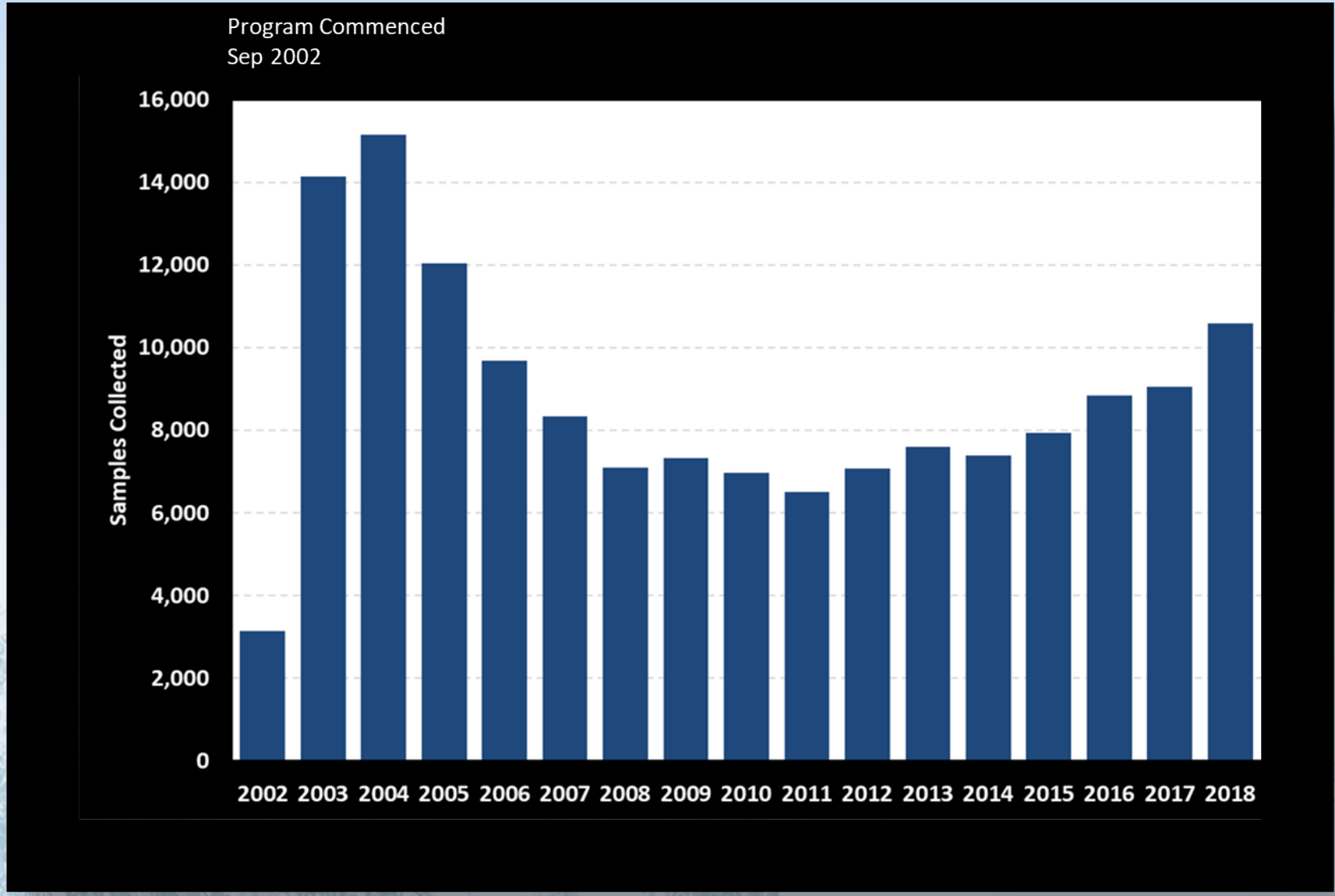
- Data are submitted by 35 labs
- September 2002-December 2018
- 111,011 unique wells have been sampled

PWTA Data Sharing

- Data are shared with:
  - NJDEP Site Remediation Program
  - NJ Geological and Water Survey (NJDEP)
  - NJ DOH-CDC grant outreach efforts
  - Local Health Departments

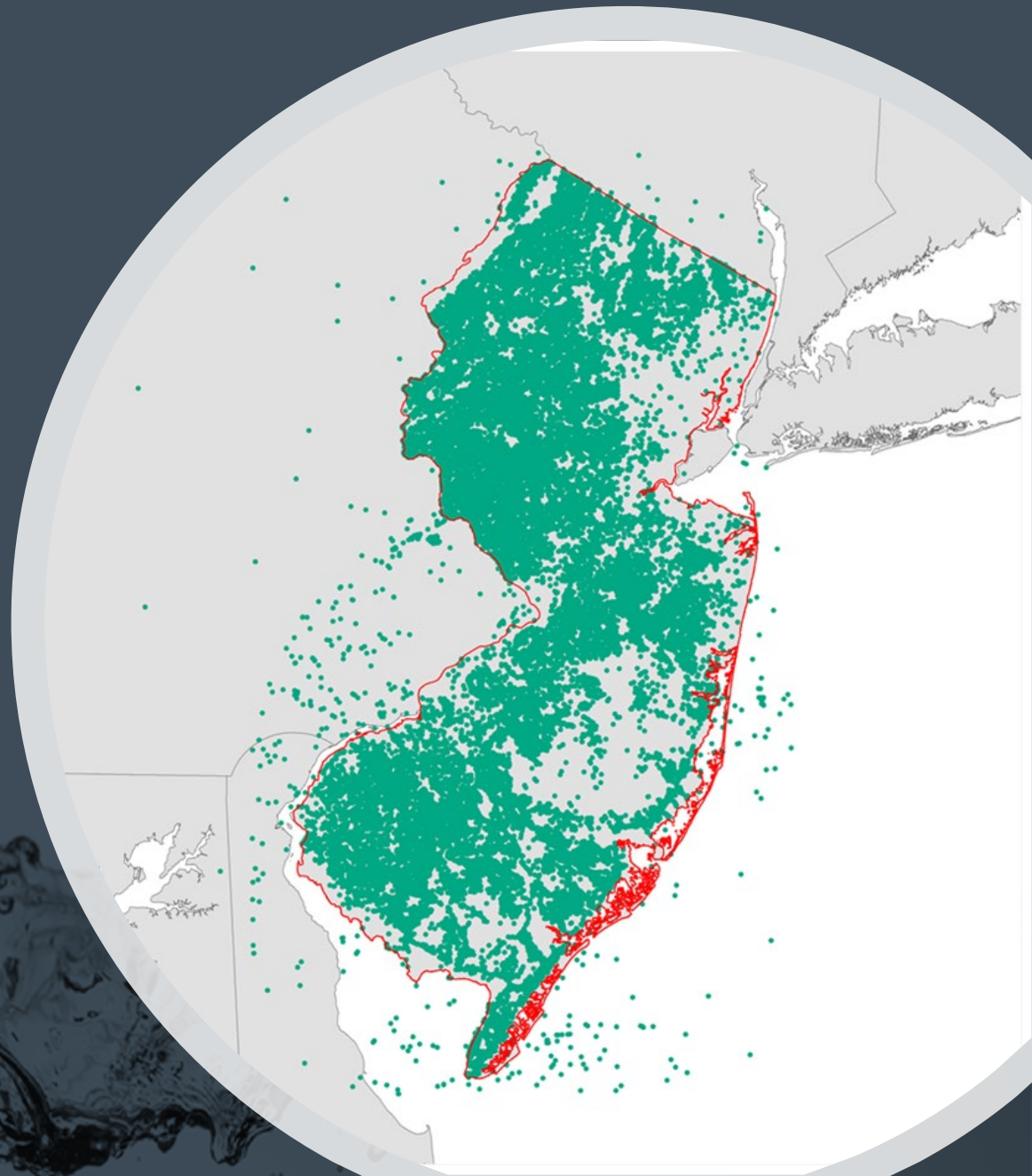
- Data are cooperatively reported to:
  - NJ DOH – NJ State Health Assessment Data (SHAD)
    - Public health data resource

Number of wells sampled per year



PWTA Location Correction

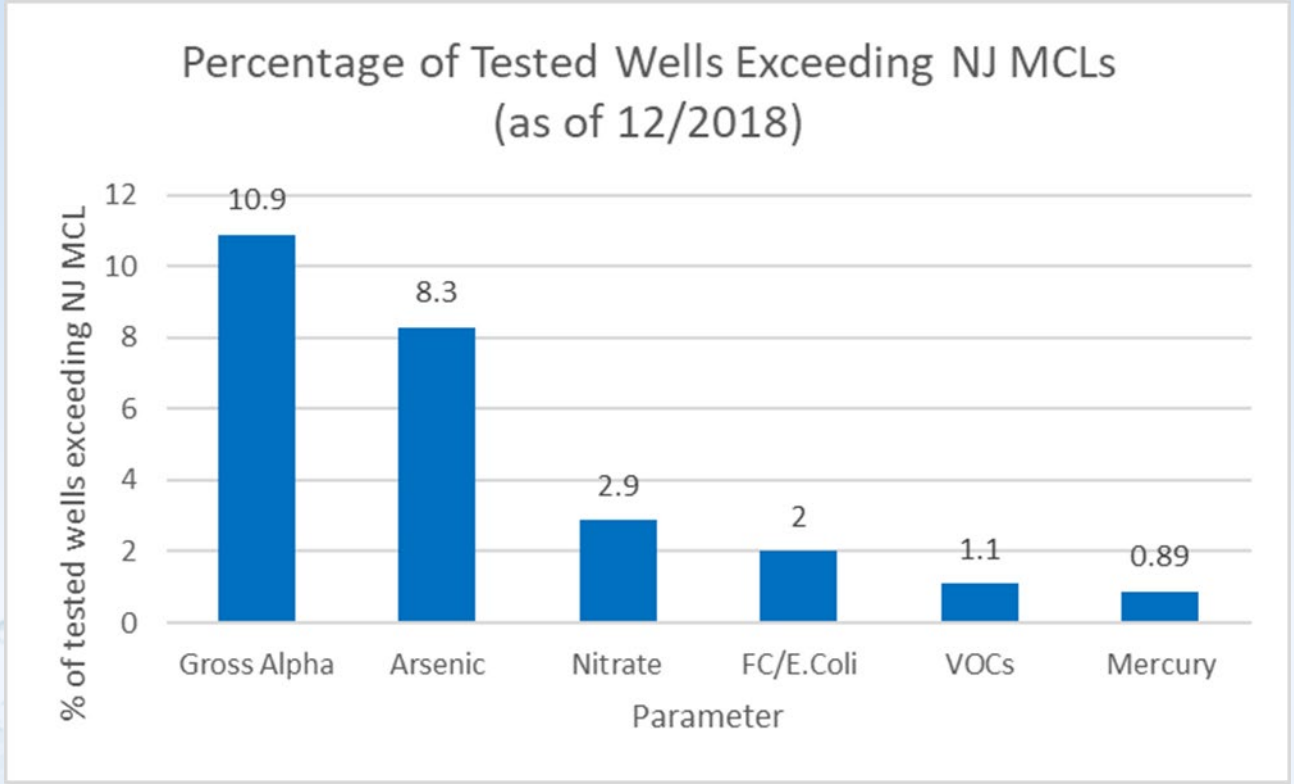
- **Sources of errors:**
  - Reversed block and lots
  - Reversed X & Y coordinates
  - Entry errors
  - Several towns changed their block and lot numbering systems



PWTA Data Analysis

- Any analysis must protect confidentiality of the homeowner
- Data were summarized by:
  - County
  - Municipality
  - 2 mile x 2 mile grid
- A minimum sample size of 10 wells per grid
  - Retention of 98% of all wells sampled for statewide parameters

Percentage of wells exceeding specific NJ MCLs



NJ Private Well Testing Act Data Summary (Sep. 2002 to Dec. 2018)

New Jersey Department of Environmental Protection

Click a tab for more information then click a location on the map for data.

Background | Counties | Municipalities | Grids | Arsenic | Fecal coliform or E. coli | Gross Alpha | Iron | Manganese | Mercury | Nitrate | pH | Volatile Organic Compounds (VOCs)

Click on a county for PWTA data.

PWTA data are summarized to show the the percent of wells that exceeded a maximum contaminant level (MCL) for each parameter and the number of wells sampled. Data is not reported in counties where less than 10 wells were sampled.

Please visit the PWTA webpage for additional information.

LEGEND

Percent of Exceedances (Number of wells tested under PWTA)

COUNTY	OCEAN
Nitrate	0.6%, (7276 wells sampled)
Arsenic	0.4%, (226 wells sampled)
Iron	26.5%, (7276 wells sampled)
Manganese	15.3%, (7276 wells sampled)
Gross Alpha	5.2%, (6314 wells sampled)
Mercury	0.3%, (7276 wells

NJ Private Well Testing Act Data Summary (Sep. 2002 to Dec. 2018)

New Jersey Department of Environmental Protection

Click a tab for more information then click a location on the map for data.

Background | Counties | Municipalities | Grids | Arsenic | Fecal coliform or E. coli | Gross Alpha | Iron | Manganese | Mercury | Nitrate | pH | Volatile Organic Compounds (VOCs)

Click on a town for PWTA data.

PWTA data are summarized to show the the percent of wells that exceeded a maximum contaminant level (MCL) for each parameter and the number of wells sampled. Data is not reported in municipalities where less than 10 wells were sampled.

Please visit the PWTA webpage for additional information.

LEGEND

Percent of Exceedances (Number of wells tested under PWTA)

Municipality	Colts Neck Township, Monmouth County
Nitrate	0.0%, (1085 wells sampled)
Arsenic	0.0%, (17 wells sampled)
Iron	83.0%, (1085 wells sampled)
Manganese	15.4%, (1085 wells sampled)
Gross Alpha	0.2%, (941 wells sampled)

NJ Private Well Testing Act Data Summary (Sep. 2002 to Dec. 2018)

New Jersey Department of Environmental Protection

Click a tab for more information then click a location on the map for data.

Background | Counties | Municipalities | Grids | Arsenic | Fecal coliform or E. coli | Gross Alpha | Iron | Manganese | Mercury | Nitrate | pH | Volatile Organic Compounds (VOCs)

Click on a grid for PWTA data.

PWTA data are summarized within 2 mile x 2 mile grids to show the the percent of wells that exceeded a maximum contaminant level (MCL) for each parameter and the number of wells sampled. Data is not reported in grids where less than 10 wells were sampled.

Areas not covered by a grid are areas where no wells were tested as part of the PWTA.

Please visit the PWTA webpage for additional information.

LEGEND

Percent of Exceedances (Number of wells tested under PWTA)

Grid Number	1,821
Nitrate	0.7%, (149 wells sampled)
Arsenic	Less than 10 wells sampled
Iron	46.3%, (149 wells sampled)
Manganese	30.9%, (149 wells sampled)
Gross Alpha	21.2%, (132 wells sampled)
Mercury	0.0%, (149 wells

Esri, HERE, Garmin, FAO, USGS, EPA, NPS | NJDEP, DSREH

NJ Private Well Testing Act Data Summary (Sep. 2002 to Dec. 2018)

New Jersey Department of Environmental Protection

Click a tab for more information then click a location on the map for data.

Background | Counties | Municipalities | Grids | Arsenic | Fecal coliform or E. coli | Gross Alpha | Iron | Manganese | Mercury | Nitrate | pH | Volatile Organic Compounds (VOCs)

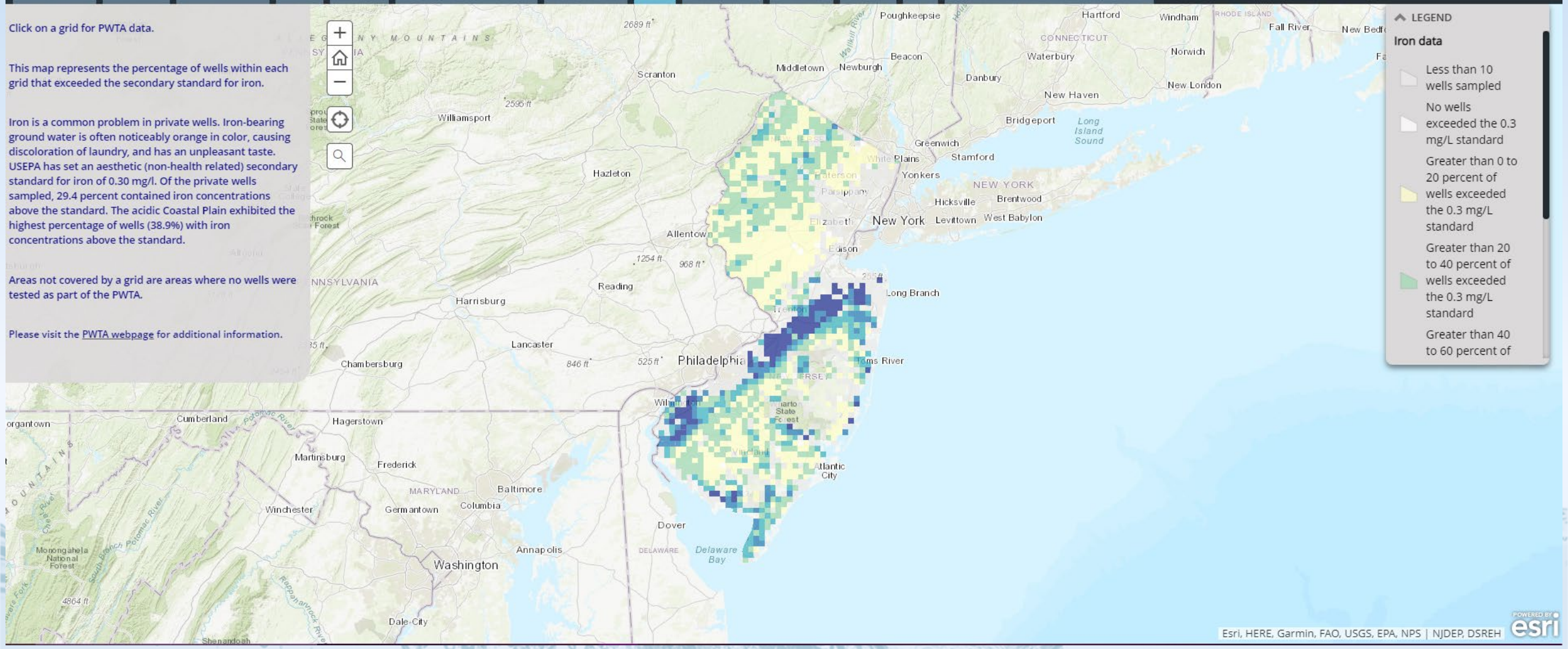
Click on a grid for PWTA data.

This map represents the percentage of wells within each grid that exceeded the secondary standard for iron.

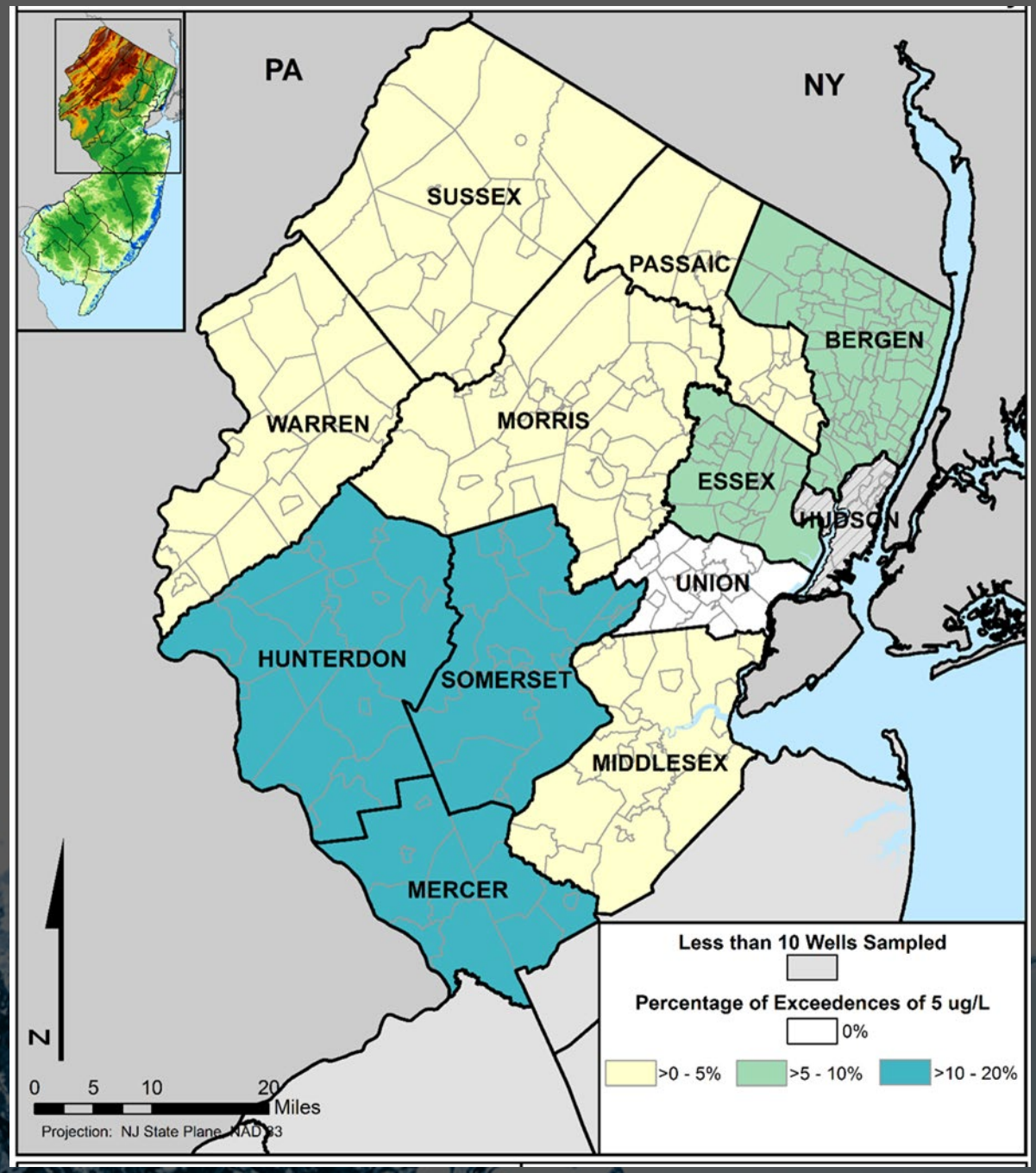
Iron is a common problem in private wells. Iron-bearing ground water is often noticeably orange in color, causing discoloration of laundry, and has an unpleasant taste. USEPA has set an aesthetic (non-health related) secondary standard for iron of 0.30 mg/l. Of the private wells sampled, 29.4 percent contained iron concentrations above the standard. The acidic Coastal Plain exhibited the highest percentage of wells (38.9%) with iron concentrations above the standard.

Areas not covered by a grid are areas where no wells were tested as part of the PWTA.

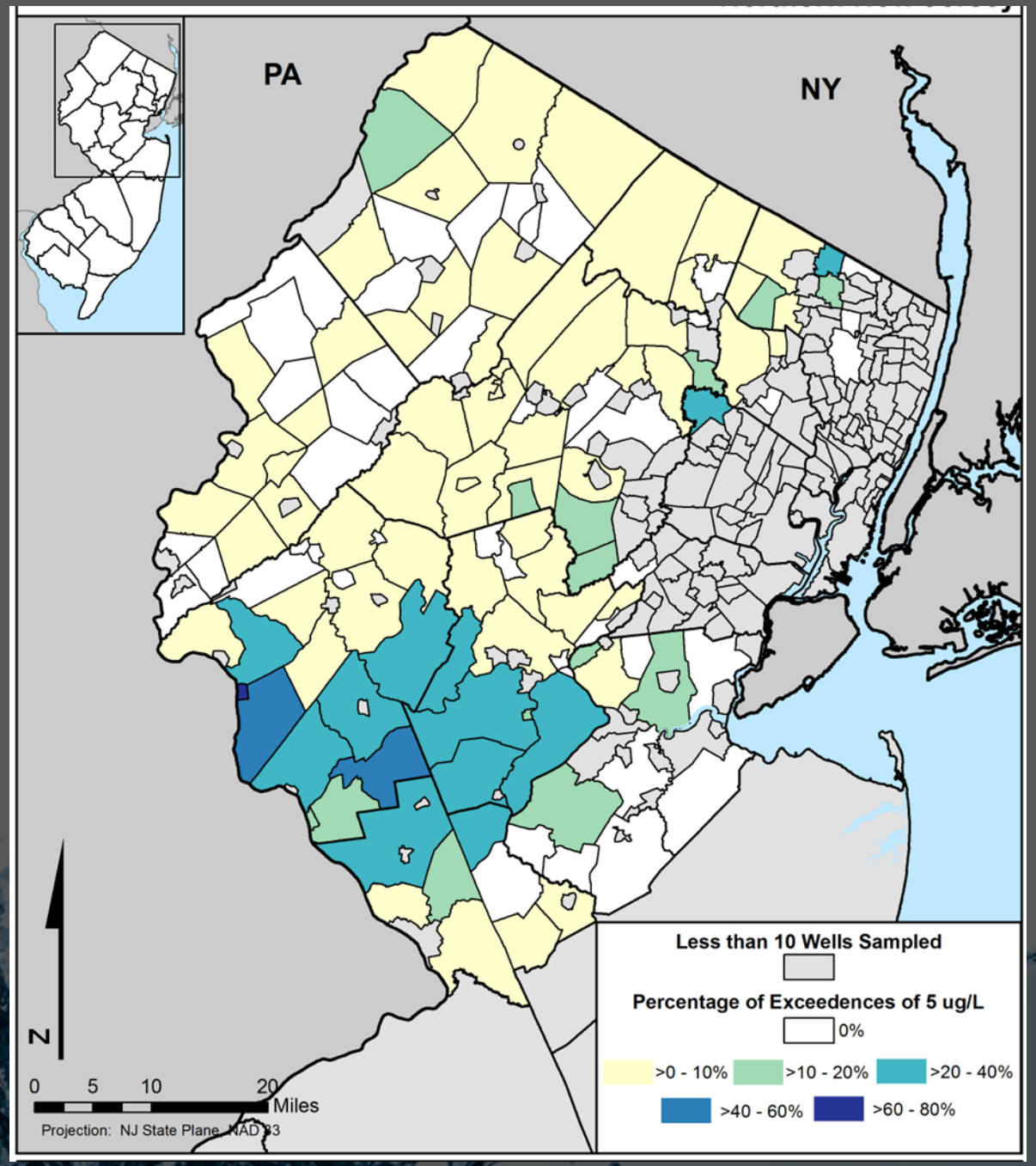
Please visit the PWTA webpage for additional information.



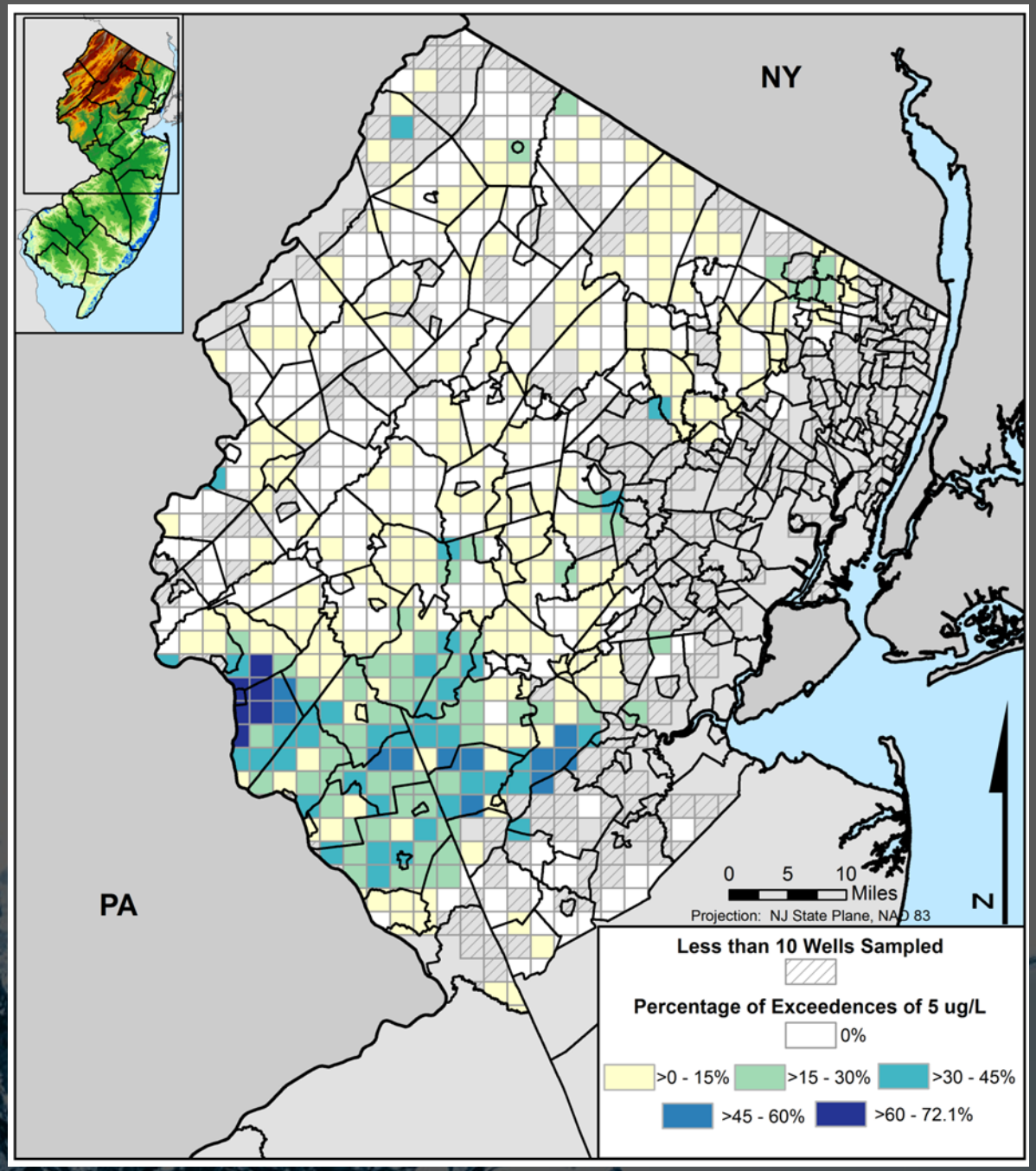
Arsenic by County



Arsenic by Municipality



Arsenic by 2x2 mile grid



PFAS PWTA Data

- December 1st 2021:
  PFOA, PFOS, and PFNA

Thank you!

More information

https://www.nj.gov/dep/pfas/
http://arcg.is/1CPkHyC
www. nj.gov/dep/watersupply/pw_pwta.html

Contact

Heidi O'Neill
heidi.oneill@dep.nj.gov

NJ Health New Jersey Department of Health

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Private Potable Well Investigation and Treatment.

Ronald Trauger

Bureau of Environmental Measurements and Site Assessment

Immediate Concern Unit (ICU)

Summary.

- Learn the steps in NJDEP's Immediate Concern Unit (ICU) receptor investigation for private potable wells

- The process of providing treatment to the area of contamination

- Types of treatment and why NJDEP chooses these methods

PFAS and Private Well Testing Act (PWTA)

- Homeowners that have a potable well and sell their house must test that well for a list of contaminants pursuant to the PWTA. That list will be updated effective 12/1/21 to include PFAS contaminates.
- There are three (3) contaminants belonging to the PFAS family of chemicals known as PFNA, PFOS and PFOA for which NJDEP has established a Maximum Contaminant Level (MCL).
- If one of these 3 chemicals is detected above the MCL in a potable well the local health department needs to be informed and the NJDEP is notified via the local health officer
- Because NJDEP categorizes PFAS exceeding an MCL as an Immediate Environmental Concern (IEC) the department will open a receptor investigation to determine if additional wells are contaminated
- Simultaneously NJDEP will prevent exposure by informing effected homeowners to use bottled water as an interim remedy and evaluate further treatment system options

Publicly Funded Response Investigation

- Each IEC is assigned to a case manager from the ICU to develop a sampling plan, keep track of the laboratory data and manage the treatment to effected wells

- The case manager will “step out” and sample all potable wells within a 500-foot radius of a contaminated well and continue to sample until no other wells exceed the MCL or there are no more wells to sample

- Each resident sampled will receive a letter with a results summary. Those with a contaminated potable well will be given further to stop exposure, such as using bottled water for drinking and cooking

- When sampling is completed the case manager together with local officials will then evaluate the data and develop a project area boundary so to evaluate further treatment options

Results Letters

Residents who are sampled receive a results letter that reports whether their well exceeded a standard or not:

The letter will list:

- Name of the site and Public Interest (PI#)
- Contaminants of Concern (COCs) and analytical method used to test for them
- The concentration of each contaminant detected
- If a contaminant exceeds a standard instructions are provided regarding next steps (e.g. filing spill fund claim)

For: Case Cross Roads Ground Water Contamination
NJDEP Program Interest (PI) #: 000001

Dear Mr. Smith,

The New Jersey Department of Environmental Protection (NJDEP) is writing to provide you with analytical results for an untreated water sample collected from your drinking water (potable) well on February 13th, 2020. Your well was sampled as part of NJDEP's investigation of ground water contamination at Cross Roads Ground Water Contamination site...

The potable water sample collected on February 13th, 2020 was analyzed for Per- and Polyfluoroalkyl Substances (PFAS) by USEPA Method 537.1. The primary contaminants of concern associated with the Road Ground Water Contamination site that could affect the quality of your drinking water are Perfluorononanoic Acid (PFNA), Perfluorooctanoic Acid (PFOA), and Perfluorooctanesulfonic Acid (PFOS). Summarized in the table below are the contaminants that were detected in the water sample collected from your well, along with their applicable standards. NJDEP's Site Remediation & Waste Management Program currently uses the Ground Water Quality Standards (GWQS) when evaluating drinking water quality. The GWQS for PFNA and PFOS is 13 parts per trillion (ppt), and 14 ppt for PFOA. Any potable well sampling result that exceeded the applicable standard is presented in bold type.

Analytical Results of Untreated Potable Water Sample (ppt)

Compound/Element	Concentration	Standard
Perfluorooctanoic Acid (PFOA)	45.1	14
Perfluorooctanesulfonic Acid (PFOS)	7.92	13
Perfluorobutanesulfonic Acid (PFBS)	4.54	N/A
Perfluorohexanoic Acid (PFHxA)	19.2	N/A
Perfluoroheptanoic Acid (PFHpA)	17.2	N/A
Perfluorohexanesulfonic Acid (PFHxS)	6.63	N/A

Footnotes: ppt – Parts Per Trillion N/A – Not Applicable

Potable Well Treatment Process

When NJDEP confirms the extent of PFAS contamination. The next step is to perform a Remedial Alternatives Analysis (RAA) to determine the most cost effective long term remedy:

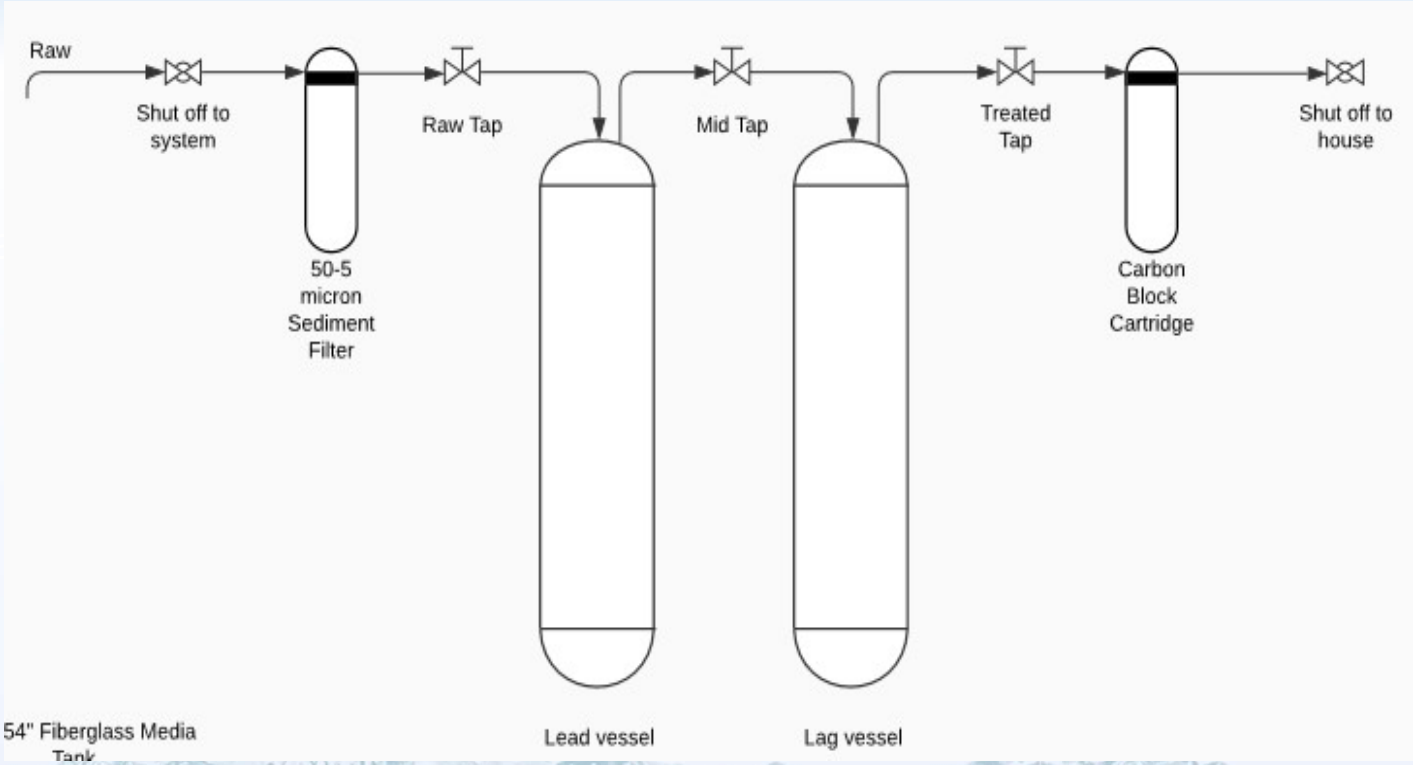
1. Bottled Water- A interim solution for quick protection for affected residences until a more permanent solution is done

2. Point Of Entry Treatment or POET - Connecting the water from the well to a system designed to filter out to the contaminants found in the well

3. Public Water- Connecting residences with contaminated wells to a public water supply. If no supply exists installation of water line is considered

- The department will evaluate these options based on the type on contaminant and effected area.

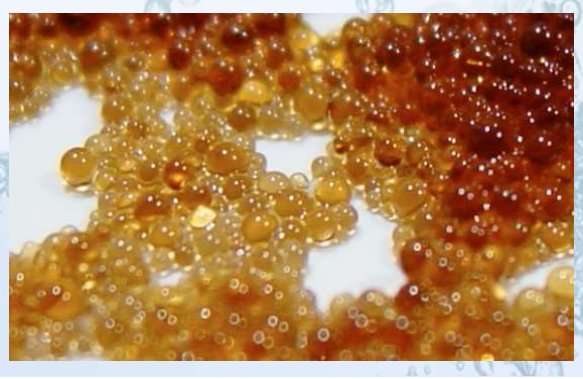
POET Design



- The treatment system consists of a pre-treatment filter, two media tanks, a post treatment filter and plumbing needed for regular inspection and maintenance
- The POET system is designed to filter out contaminants but does require periodic maintenance and testing

PFAS POET Media

- NJDEP POET specifications include the use of resin for most wells with PFAS contamination
- PFAS ion exchange resin chemically bonds to PFAS molecules
- The resin is a Strongly Basic Anion (SBA) Type II Ion Exchange Resin. It is effective for all PFAS at concentrations up to 2000 parts per trillion
- Granular Activated Carbon (GAC) is a general adsorption media that NJDEP uses in POETs for organic contaminants including PFAS
- GAC media will be used in scenarios such as a potable well that has multiple contaminants or if the contaminated well can connect to a public water supply in a short period of time



Thank you!

More information

www.nj.gov/dep/pfas

Contact Immediate Concern Unit
DEPSRP_ICU@dep.nj.gov

IEC Guidance:
www.nj.gov/dep/srp/guidance/IEC/

Certified Lab:
www.state.nj.us/dep/watersupply/pwta/pwta_lablist.htm

Contact

Ron Trauger, BEMSA, ICU
Ronald.trauger@dep.nj.gov

NJ Health New Jersey Department of Health

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

New Jersey Spill Compensation Fund

November 30, 2021

Kristin Infanti
New Jersey Department of Environmental Protection
Site Remediation and Waste Management Program

Spill Compensation Fund

- New Jersey Spill Compensation and Control Act (Spill Act) enacted 1977 (N.J.S.A. 58:10-23.11 et seq.)
- Spill Fund created by Spill Act in 1977 (N.J.S.A. 58:10-23.11i)
- Administered by Environmental Claims Administration (ECA) within the Site Remediation & Waste Management Program (SRWMP) of the New Jersey Department of Environmental Protection (NJDEP)
- Implemented through the "*Processing of Damage Claims Pursuant to the Spill Compensation and Control Act*" rules, N.J.A.C. 7:1J

Spill Compensation Fund

- **Non-lapsing, revolving fund made available to the residents, municipalities, and businesses in New Jersey through damage claims filed with NJDEP**

- **Revenues for the Fund provided by tax levied on transfer of petroleum and other hazardous substances from major facilities**

Spill Fund Claims – N.J.A.C. 7:1J

- **Reimbursement – One must actually incur damages - speculative damages are not eligible**
- **Take steps to mitigate your loss**
- **Ineligible if Claimant knew or should have known about the discharge.**
- **Responsible parties are ineligible**
- **"Fund of last resort" - must exhaust all other sources of funding - including potential responsible party(ies)**

Prioritization of Claims

- **N.J.A.C 7:1J-2.2 (b) The administrator shall prioritize the categories of claims that are eligible for compensation in the following order:**

- **1. Homeowner claims: Potable water restoration at residential properties;**

- **2. Schools/Child Care Facilities - Potable water restoration at schools and child care facilities; and**

- **3. All other categories of claims.**

Claims Procedures

- Submittal of claim within one-year after date of discovery of the damage
- All appropriate forms and data are completed and returned to the ECA for review and processing
- ECA reviews forms for completeness and eligibility
- Claims are investigated by the ECA or under the supervision of the ECA for eligibility
- Claimants are notified of claim validity and amount eligible

Guidelines for Homeowner Potable Well Water Claims

- **Provide copies of INITIAL and CONFIRMING water test results from a NJ certified water-testing laboratory.**
- **Include a copy of CURRENT TAXBILL or DEED.**
- **If a waterline is available, provide THREE (3) ESTIMATES from plumbers to HOOK-UP and THREE (3) ESTIMATES from CERTIFIED well sealer to SEAL the well.**
- **If NO waterline is available, provide THREE (3) ESTIMATES for a Point-of-Entry Treatment (POET) system.**
- **Submit claim by CERTIFIED MAIL, or by other means that provides a receipt showing date of mailing and date of delivery**

POET Referrals

- **Private Well Testing Act Sampling**
- **NJDEP Hotline calls**
- **Routine Homeowner sampling (Certified laboratory results)**
- **Referrals from other NJDEP programs**

POETs

- Provides whole house treatment and maintenance
- Maintenance eligibility ends when house is sold (N.J.A.C. 7:1J-2.5(C))
- Previous owner is NOT eligible for Property Value Diminution
- Well sealing is required if the home is connected to public water (if water line is available)

PUBLIC SUPPLY WELLS

- **Claim is directly associated with damages to repair or replace a contaminated drinking water supply.**
- **Must exceed Maximum Contaminant Level (MCL), not Ground Water Remediation Standard (GWQS)**
- **Must be damaged - Bureau of Safe Drinking Water (BSDW) violation (Notice of Non-Compliance)**
- **Cost effective - Alternatives Analysis required**
- **Work with the NJDEP before Remedial Measure is selected**
- **Spill Fund is a Fund of Last Resort. You must exhaust all other sources of revenue before a Spill Fund claim will be considered**

Thank you!

More information on Spill Claims:

www.nj.gov/dep/srp/finance/eca.htm

Spill Fund Contact

Phone: 609-984-2076

Email: srp_Spillfund_gq@dep.nj.gov

NJ Health New Jersey Department of Health

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Funding for PFAS – State Revolving Fund

Kristin Tedesco, Chief
Bureau of Water System Engineering
NJ Department of Environmental Protection
kristin.tedesco@dep.nj.gov

New Jersey Water Bank Financing Program

Partnership between the New Jersey Department of Environmental Protection and the New Jersey Infrastructure Bank

Water Bank Objectives

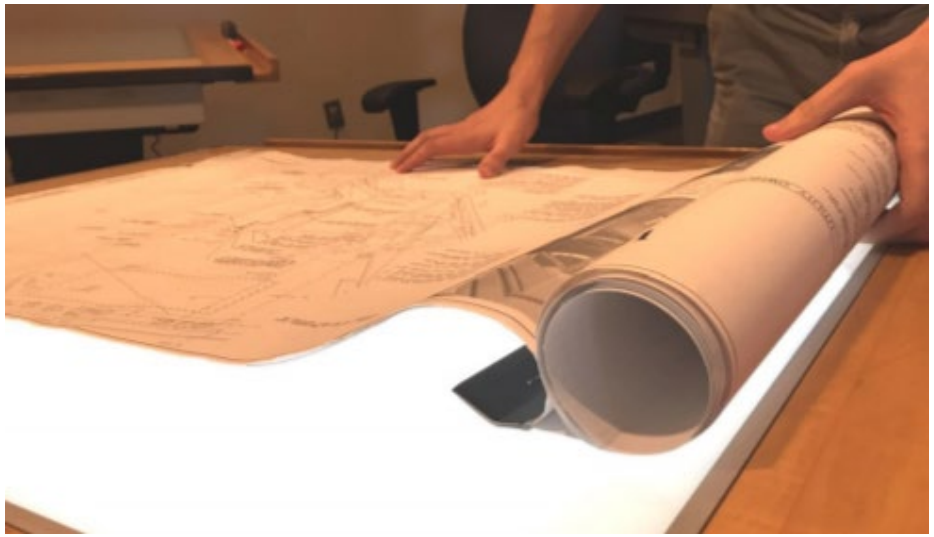
- To incentivize and facilitate the investment required to sustain and improve NJ's aging environmental infrastructure systems.
- To provide low-cost financing for projects that improve water quality and protect public health.
- To act as a fiduciary and steward NJ's SRF financing program for future participants in perpetuity.

Drinking Water State Revolving Fund (DWSRF)

Sources of funds:

- Annual Cap Grant from USEPA ($15/20M per year)
- Loan repayments (“Revolving fund”)
- Market rate funds from NJ I-Bank
- Transfer of funds from CWSRF
- State appropriations

EPA: *How the Drinking Water State Revolving Fund Works*
www.epa.gov/drinkingwatersrf/how-drinking-water-state-revolving-fund-works#tab-1



Drinking Water Infrastructure Needs Survey and Assessment

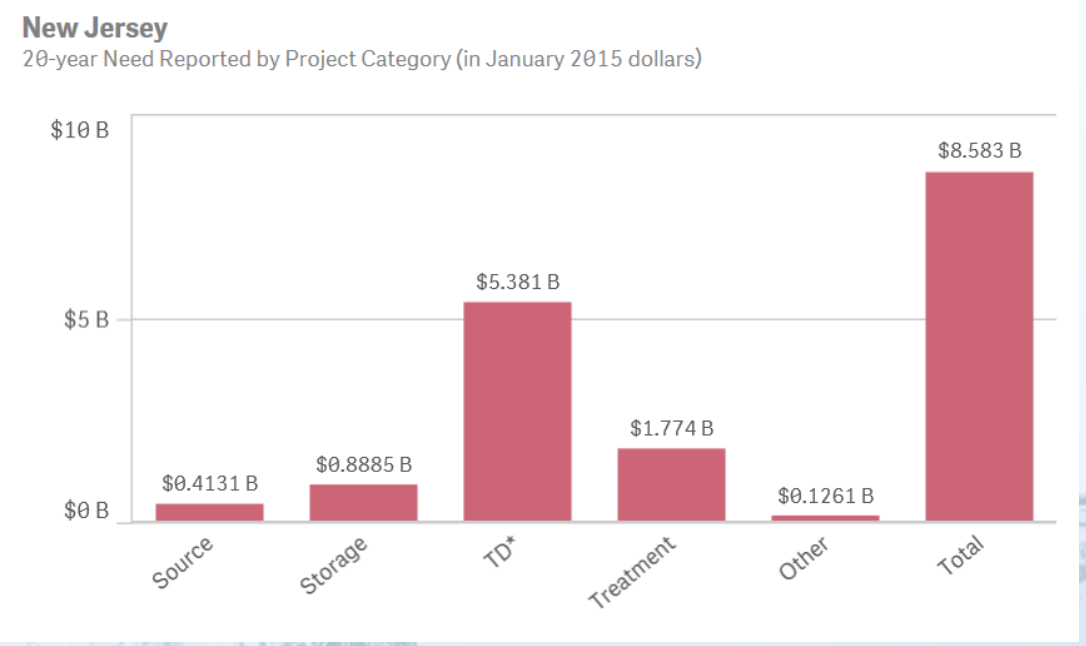
The 1996 Safe Drinking Water Act Amendments mandated that EPA conduct an assessment of the nation's public water systems' infrastructure needs every four years and use the findings to allocate DWSRF capitalization grants to state

Current Survey

- Will establish need for the 20-year period from January 1, 2021 through December 31, 2040

- NJ's share of the National allotment has decreased steadily

FY97 – FY01: 2.44%
FY02 – FY05: 2.30%
FY06 – FY09: 2.21%
FY10 – FY13: 2.14%
FY14 – FY16: 1.90%
FY17 – FY19: 1.71%



Infrastructure Investment and Jobs Act Funding

- $20+ billion for safe drinking water.
- $15 billion in dedicated funding to replace lead pipes.
- $12+ billion to ensure clean water for communities.
- $1.8 billion to protect regional waters.
- $135 million for additional water improvements.

e Drinking Water

15 billion	**Lead Service Line Replacement through the Drinking Water State Revolving Funds** 49% of funds will be provided to communities as grants or principal forgiveness loans. 51% of funds will be available to communities for low-interest loans. State match is not required.
$11.7 billion	**Drinking Water State Revolving Funds** 49% of funds will be provided to communities as grants or principal forgiveness loans. 51% of funds will be available to communities for low-interest loans. State match is reduced to 10%.
$4 billion	**Addressing Emerging Contaminants through the Drinking Water SRF** Can be used to remediate PFAS in drinking water. All funds provided to communities as grants or principal forgiveness loans. State match is not required.
$5 billion	**Addressing Emerging Contaminants in Disadvantaged Communities** Funding through Small, Underserved, and Disadvantaged Communities Grants Can be used to remediate PFAS in drinking water. Provided as grants. State match is not required.

Clean Water for Communities

$11.7 billion	**Clean Water State Revolving Funds (CWSRF)** 49% of funds will be available for grants or principal forgiveness loans. 51% of funds will be available for low-interest loans. State match is reduced to 10%.
$1 billion	**Addressing Emerging Contaminants** Funding through Clean Water State Revolving Funds. All funds provided as grants or principal forgiveness loans. State match is not required.

Protecting Regional Waters

$1.7 billion	**Geographic Programs** Funding directed to 12 federally recognized geographic programs.
$132 million	**National Estuary Program (NEP)** Funding to be distributed across 28 Federally recognized estuaries to restore vulnerable coastal areas and communities.

Additional Investments in Water

$60 million	**Gulf of Mexico Hypoxia Task Force (HTF)** Funding to be divided equally across 12 Hypoxia Task Force states.
$50 million	**Underground Injection Control Grants (UIC)** Funding to support states' efforts to attain Class VI primacy. 100% of funding provided as grants. State match is not required.
$25 million	**Permitting Class VI Wells (Class VI Wells)** Support to EPA for carbon sequestration programs.

Eligibility

DWSRF funding is available to community and not for profit noncommunity water systems

Eligible Projects

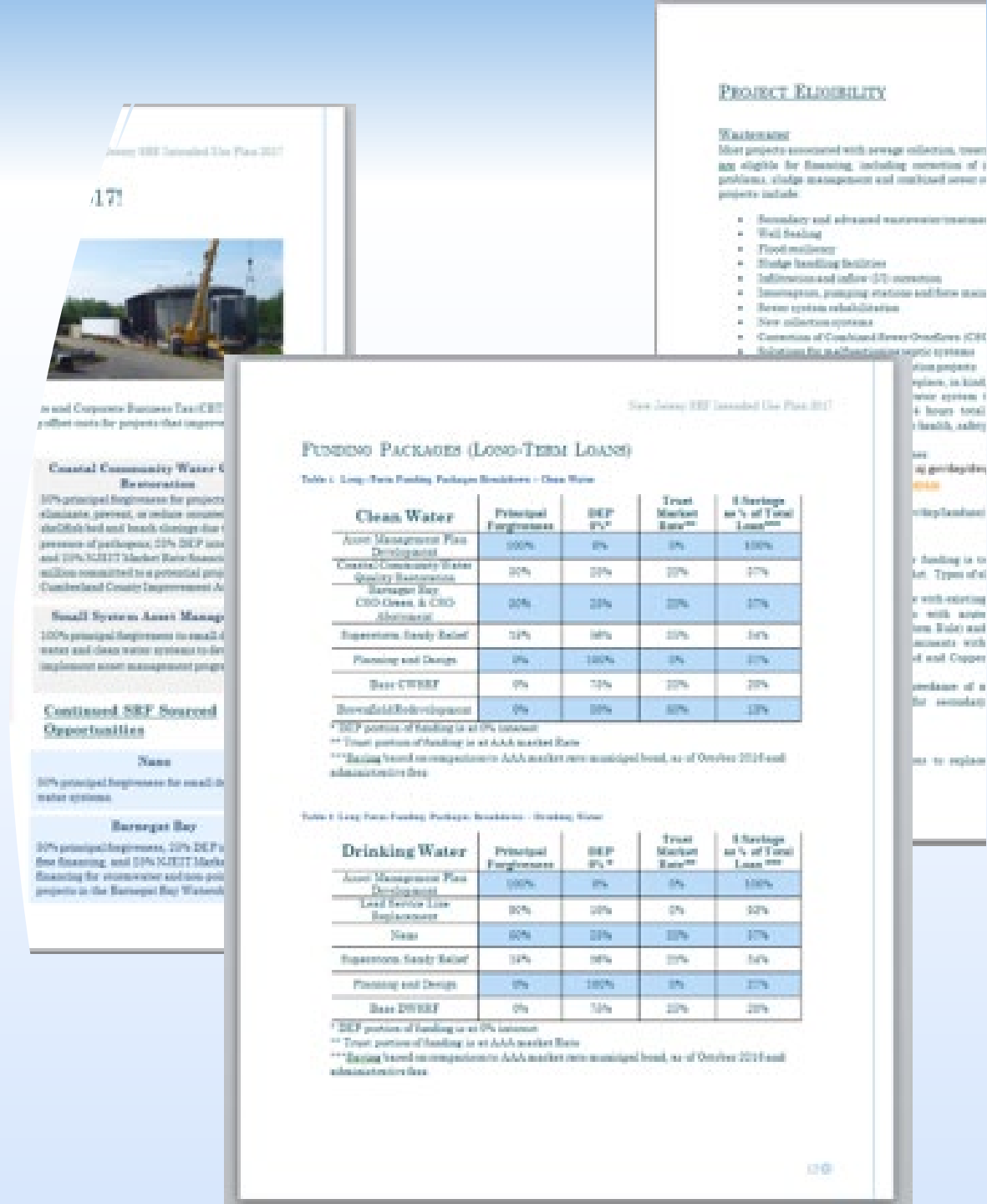
- Rehabilitate contaminated sources
- Lead Lines
  - Locating and replacement
- Funding for treatment (**PFAS**, unregulated contaminants, etc.)
- Treatment facilities – new and rehabilitation/upgrade of existing
- Construction, replacement, or rehabilitation of lines
- Purchase or consolidation (i.e., restructuring) of a water system that is unable to maintain compliance for technical, financial, or managerial reasons

Intended Use Plan

EPA requirement where NJ describes the use of the annual Capitalization Grant for drinking water loans:

- Loan Terms
- List of Ranked Projects
- Ranking Methodology

Federal Fiscal Year 2021 (State Fiscal Year 2022) IUP is available at: https://www.nj.gov/dep/dwq/cwpl.htm



Drinking Water Loan Structure

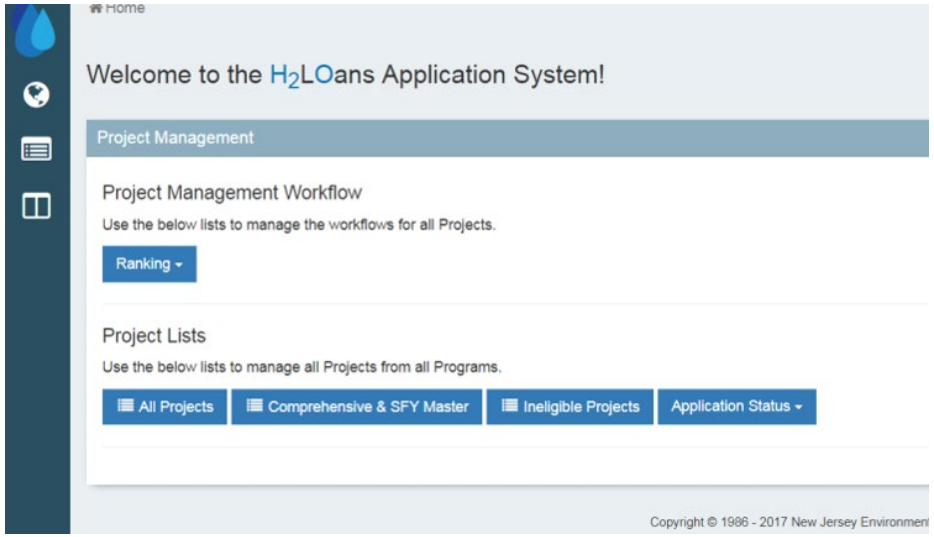
- Rolling Application Submittal – no application deadlines
- Rolling Loan awards based upon Priority Ranking for projects in the fundable range
- S-T Construction loans for P&D, soft costs, and construction costs
  - Limited out of pocket payments during construction
- L-T Loans, transition from S-T loan upon construction completion
  - Maximum loan terms = Lesser of “Useful life” or 30 Years
  - Multiple Bond Sales per year

H2LOans

Web portal for applicants/staff

- Online submittal of forms
- Upload documents for mobile access
- Information on project milestones
- Collaborator access
- Requisition submissions

www.h2loans.com



Priority Ranking Methodology

Points are assigned in five categories: 1) Compliance & Public Health; 2) Water Supply Plan/Status; 3) State Designations; 4) Affordability; 5) Population

Priority Ranking:

Note that priority is given to water systems in non-compliance

1. Surface water treatment rule violations (uncovered reservoirs) – 500 points
2. GUDI systems with surface water treatment rule violations – 350 points
3. Acute MCL – 300 points
4. MCL Violation (PFAS, arsenic) or ALE – 250 points
5. Treatment Plant rehabilitation (no MCL violation) – 100 points
6. Water Main replacement – 75 points
7. New Storage Tanks – 75 points

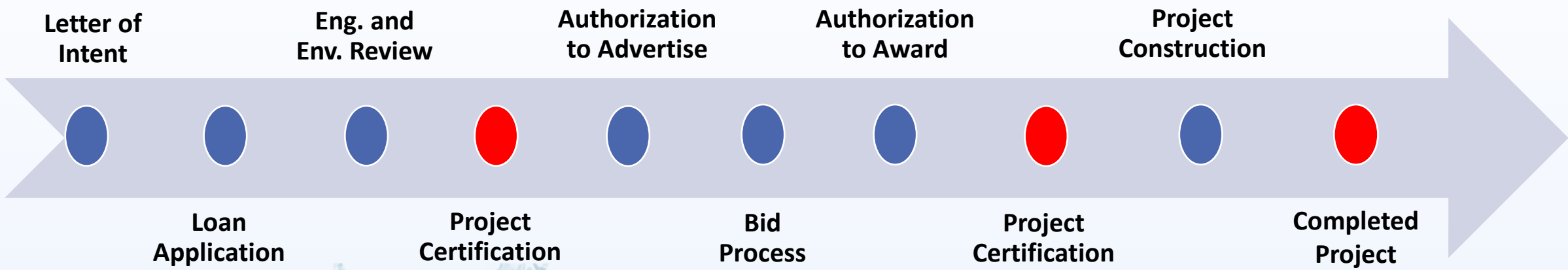
FFY2021 Funding Packages

Drinking Water	Blended Interest Rate I-Bank Market Rate for Non-Principal Forgiveness Share of Loan[1]	Principal Forgiveness Share	Funding Cap
Base DWSRF – Public	50%	0%	$25 million[2] (remainder at I-Bank market rate as capacity allows)
Base DWSRF – Investor-owned	75%	0%	$25 million[2] ($10 million per project) (remainder at I-Bank market rate as capacity allows)
Nano ≤ 10,000 customers	50%	50%	$1 million (remainder at base)
Affordability (publicly-owned water systems only)[3]	25%	0%	$10 million (Remainder at base)
Small Systems (≤1,000): Engineering Contract[4]	N/A	100%	$750,000 (Remainder at base)
Small Systems (≤500): Community Engineering Corp	N/A	100%	$750,000 (Remainder at base)

Lead Remediation Funding Packages

Drinking Water	Principal Forgiveness Share[5]	Total Project Costs[6]
Lead Line Replacement[7]	50% of project costs up to:	
>5,000 known lead service lines	$18M	$36M
≥ 1,000 and ≤ 5,000 known lead service lines	$5M	$10M
< 1,000 known lead service lines	$1M	$2M
Lead Remediation[8]	100% project costs up to $1M	$1M

Loan Process



Key Program Resources

New Jersey Infrastructure Bank
www.njib.gov/

H2L0ans
www.h2loans.com

DWSRF IUP
www.nj.gov/dep/dwq/cwpl.htm

Division of Water Supply & Geoscience
www.nj.gov/dep/watersupply

Thank you!

More information
www.nj.gov/dep/pfas

Contact
kristin.tedesco@dep.nj.gov

NJ Health New Jersey Department of Health

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TUESDAY
NOVEMBER 30, 2021
VIRTUAL

PFAS
IN DRINKING WATER
SUMMIT

Risk Communication and PFAS

Kerry Kirk Pflugh
NJ DEP Director
Local Government Assistance

Adapted from the ITRC Risk Communication Resources

Risk Communication Definition

The process of informing people about potential hazards to their person, property, or community.

Scholars define risk communication as a science-based approach for communicating effectively in situations of high stress, high concern or controversy.

https://www.epa.gov/risk/risk-communication

Principles of Risk Communication

- Establishing dialogues early and continuing through to resolution.
- Including the community in the decision-making process.
- Presenting accessible and clear information.
- Addressing uncertainties head on - communicate what is known and what is unknown.
- Listening, acknowledging, and following up on specific concerns.
- Communicating the context for the risk to help audiences decide how to respond.

Key Aspects of Risk Communication

1. How Communities See Risk
2. Building Trust and Credibility
3. Releasing Information Effectively
4. Interacting with Communities
5. Explaining Risk and Management Strategies

1. How Communities See Risk

ACCEPTABLE

- Voluntary risk
- Individual control
- Fair
- Info from trusted sources
- Morally right
- Natural
- Familiar
- Assoc. w/ catastrophes

UNNACEPTABLE

- Imposed risk
- Government control
- Unfair
- Info from strangers
- Unethical practices
- Artificial
- Unfamiliar
- Associated with daily life

Adapted from USEPA 2007. Communicating Radiation Risks. EPA-402-F-07-008. Washington, D.C.: Office of Radiation and Indoor Air US Environmental Protection Agency
NJDEP 1991.

2. Building Trust and Credibility

- Pay attention to and explain processes
- Involve the public early
- Listen to concerns
- Follow up with accurate information
- Only make promises you can keep
- Provide information that meets agency and public needs
- Use local partners for support

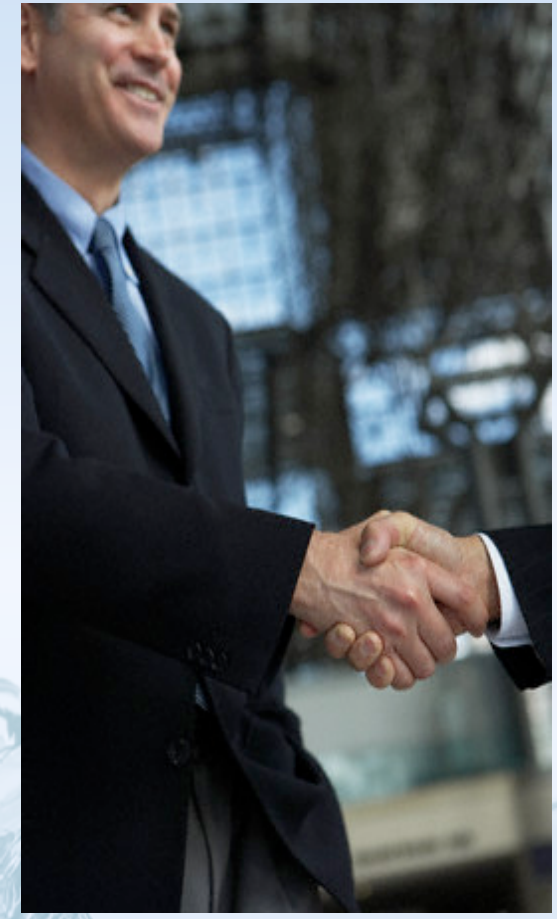
NJDEP. 2014. Establishing Dialogue: Planning for Successful Environmental Management. New Jersey Department of Environmental Protection.

3. Releasing Information Effectively

- Act - Don’t wait
- Share what you know or don’t know
- Share with affected public first before a general release
- Talk procedures
- Preliminary data
- Release in context

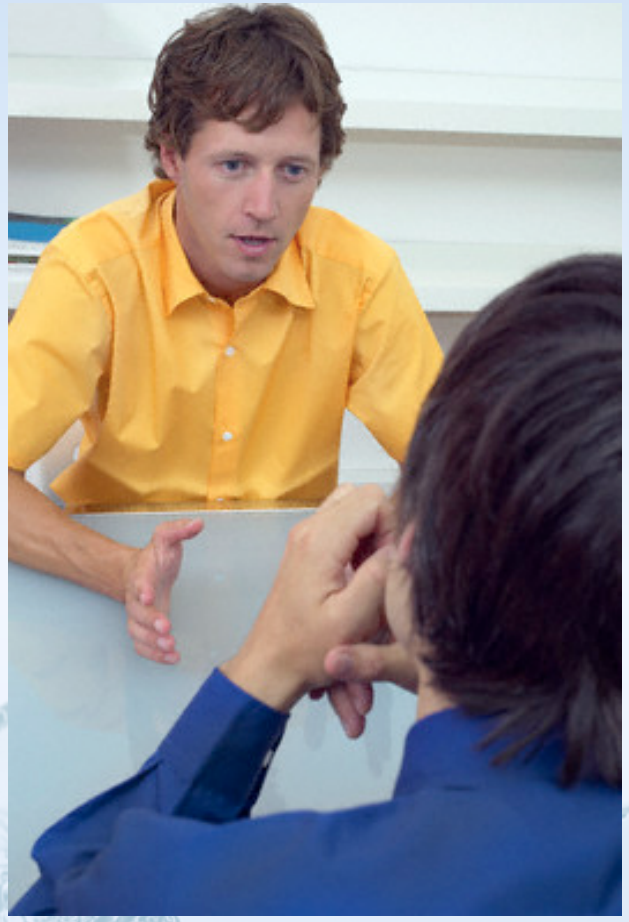
4. Interacting With Communities

- Involve the public
- Use appropriate forums
- Communicate with many different audiences
- Acknowledge and deal with values and feelings expressed
- Respond personally
- Choose appropriate speakers



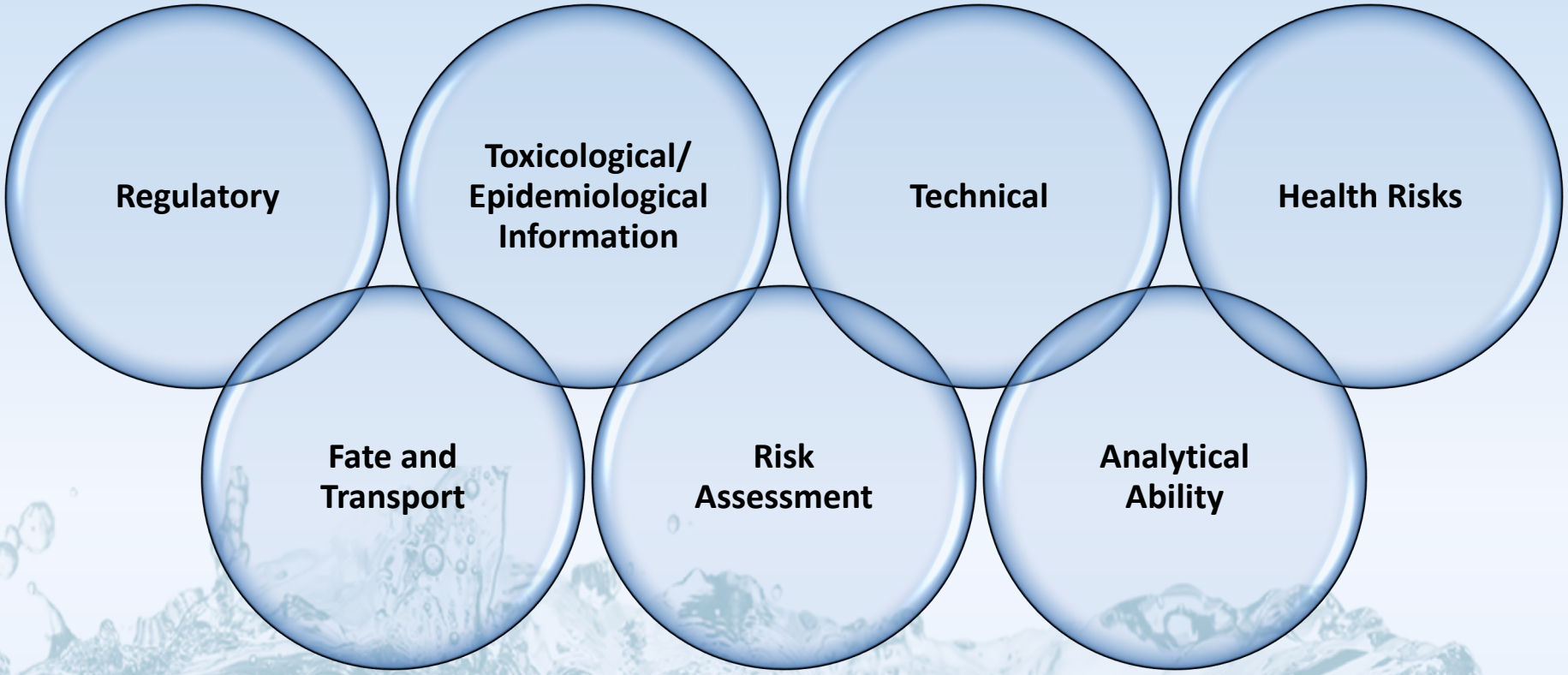
5. Explaining Risk and Management Strategies

- Learn stakeholder concerns
- Learn how they receive information
- Understand stakeholder knowledge of the subject
- Use down to earth language
- Make sure graphics are understandable
- Acknowledge uncertainty
- Use risk comparisons carefully
- Provide background materials

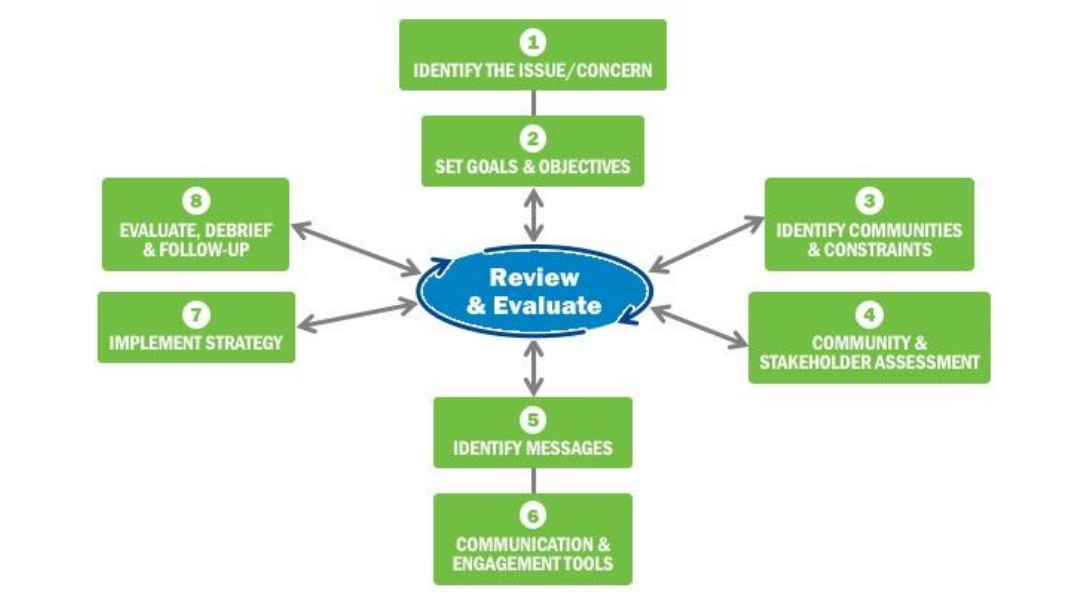


NJDEP 1991

PFAS Risk Communication Challenges

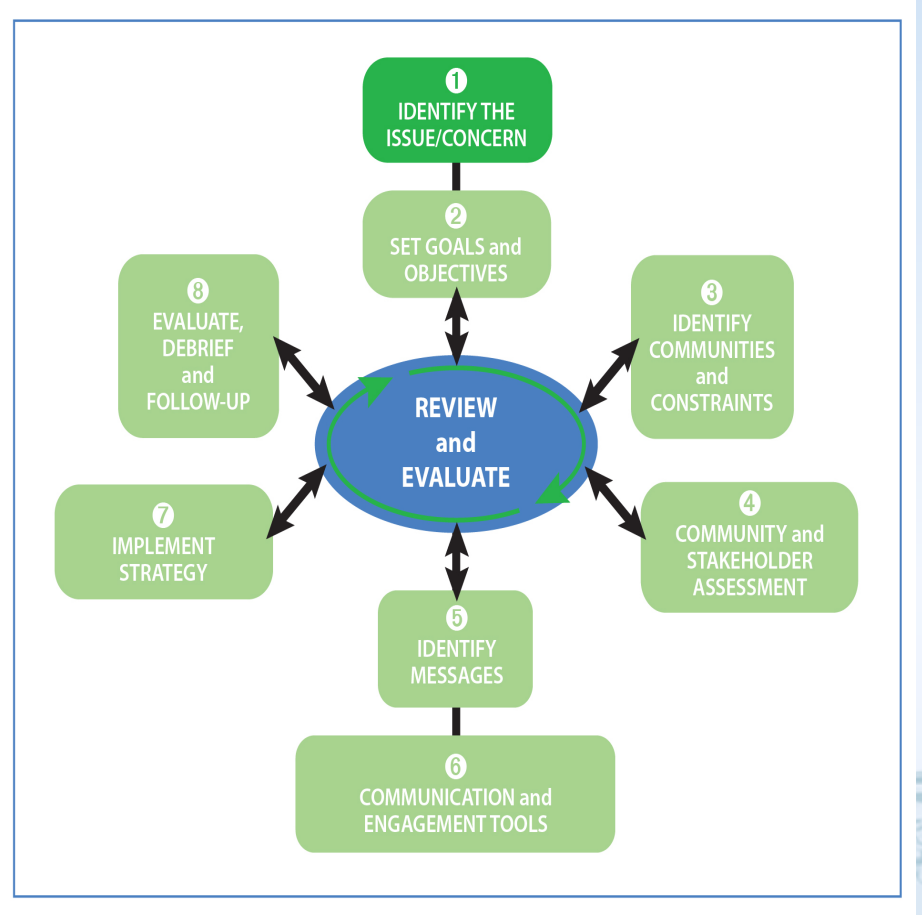


Risk Communication Plan Process Diagram



1. Identify the Issue

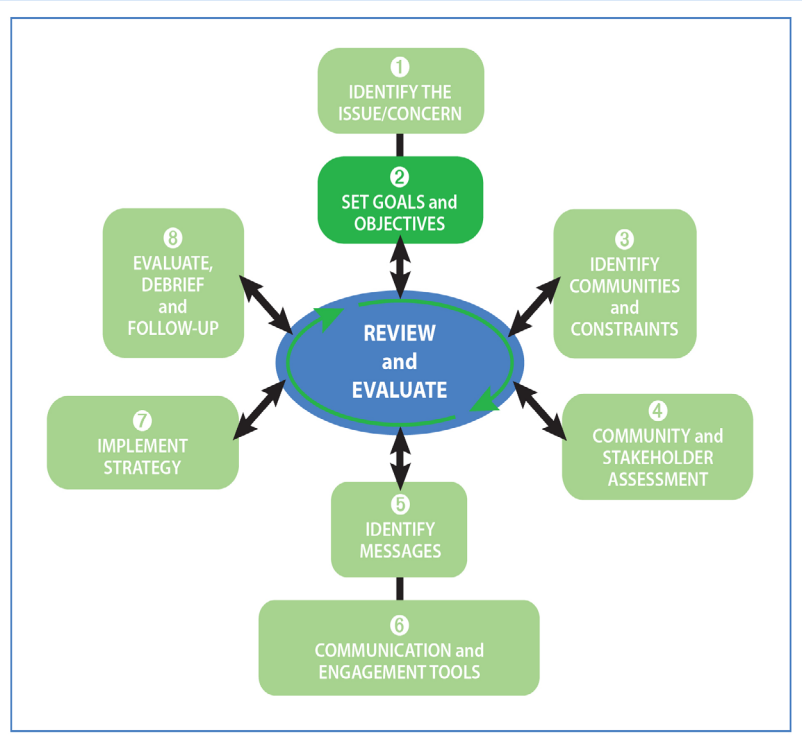
- Establish a case record and clearly state issue
- Identify key internal and external stakeholders
- Determine available resources – time, staff, money, knowledge base
- Compile data on the case
- Profile the affected community
- Review history
- Establish core communication team



NJDEP 2014

2. Set Goals

A "big picture" or ultimate impact desired for a project, issue or situation



SMART Goals are…

- Specific
- Measurable
- Achievable
- Realistic
- Timely

Source: ITRC. 2011b. Integrated DNAPL Site Strategy.

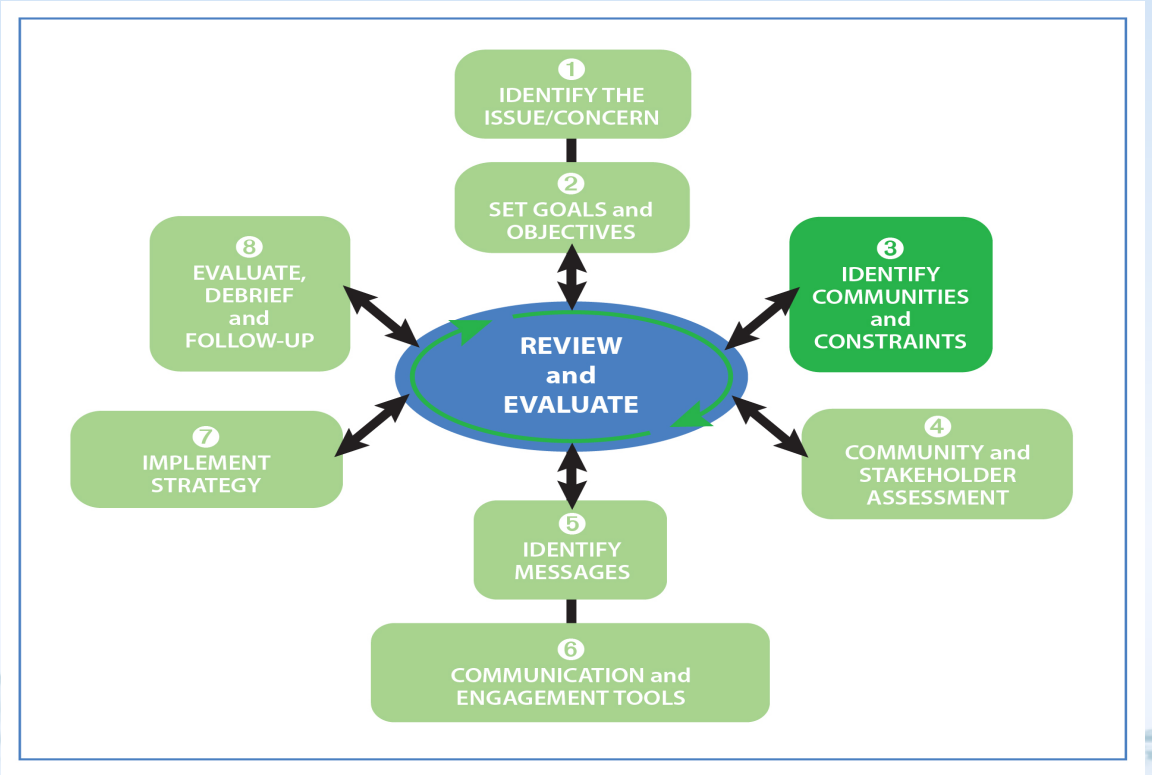
Examples of a SMART PFAS Goal

- By (date), the community is informed via the municipal website, flyers, and canvassing that bottled water is available as an alternate water source and used by 85% of the affected population.
- After (months), the extent of the impacted water supply is known via well testing, possible remediation options are identified and communicated to the community via a public meeting, municipal website, and newsletter.

3. Identify Communities and Constraints

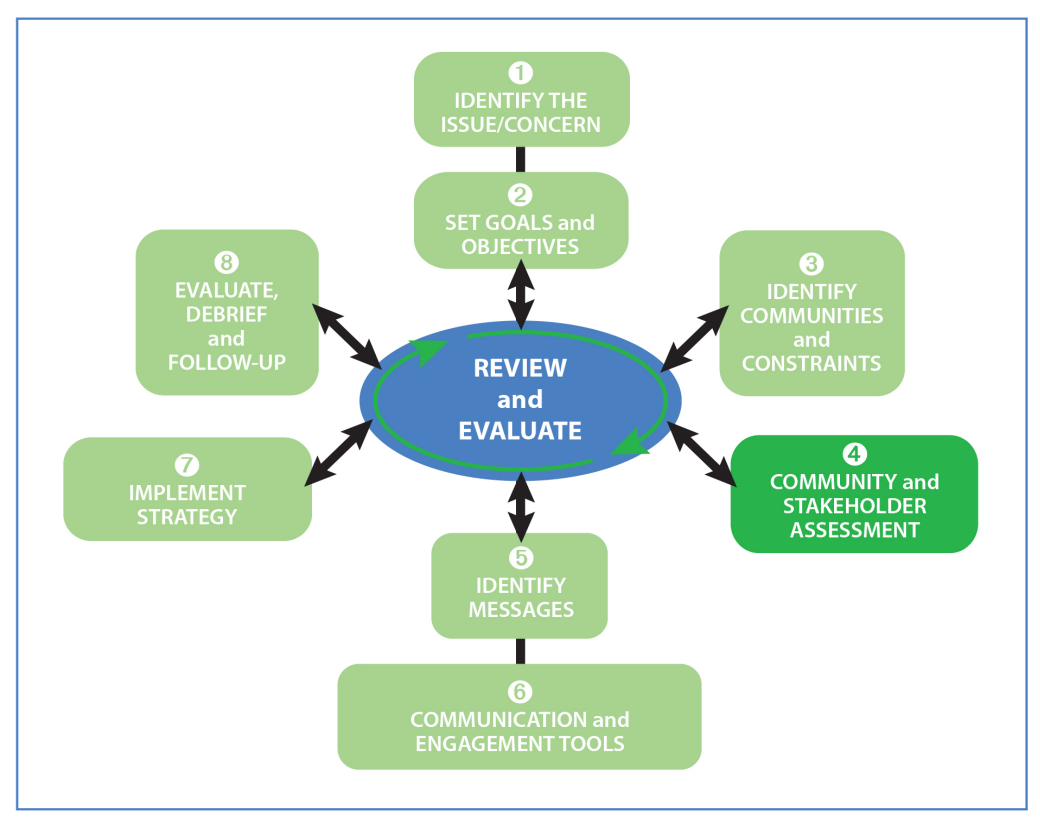
- Key audiences - those people with whom you need to establish a dialogue with and those who wish to talk with you
  - Those who are or must be made aware of the issue and are affected by the problem, those affected by the solution, and the media

- Constraints – barriers to communicating
  - Remote locations, access to the internet, ability to attend engagement activities



4. Community and Stakeholder Assessment

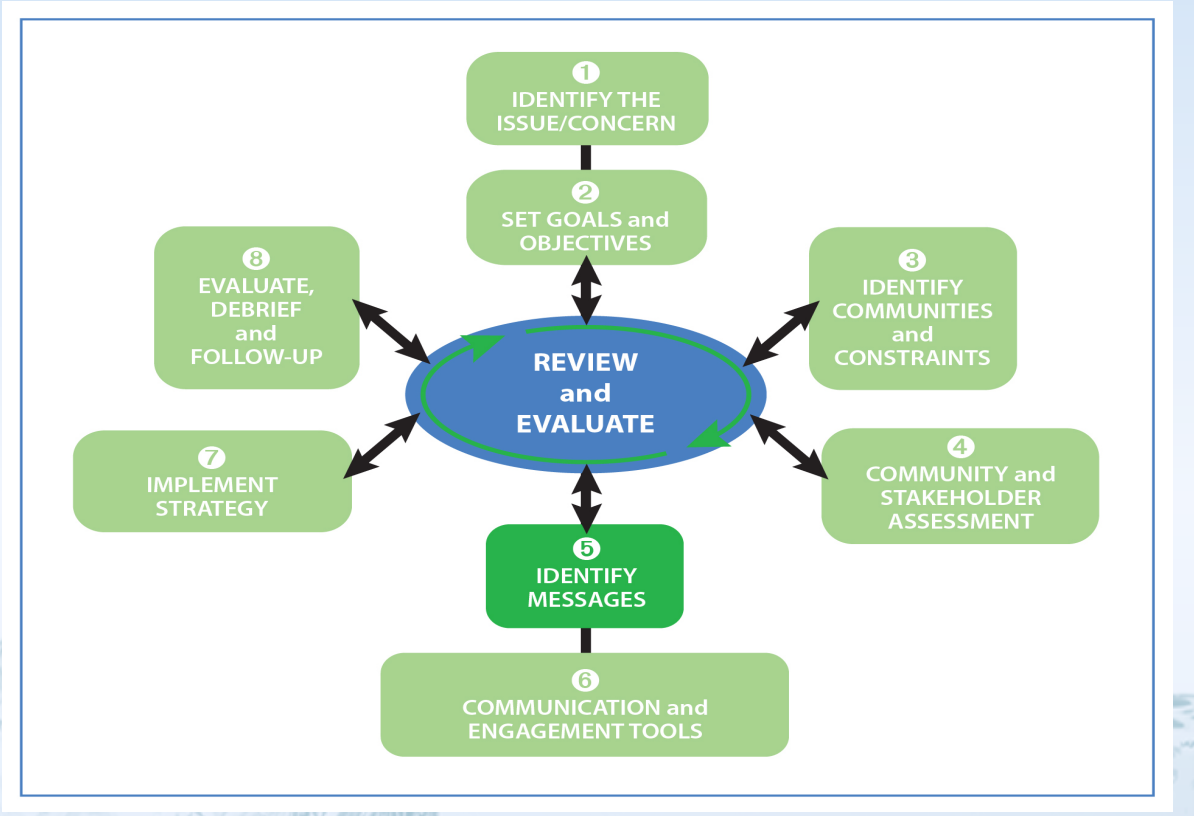
- Review media sources used in community
- Use community partners
- Discuss expected audience concerns with management team
- If appropriate, make a few targeted and/or random contacts to determine audience knowledge, perception and concern about issue



Chess et al. 1989

5. Identify Key Messages

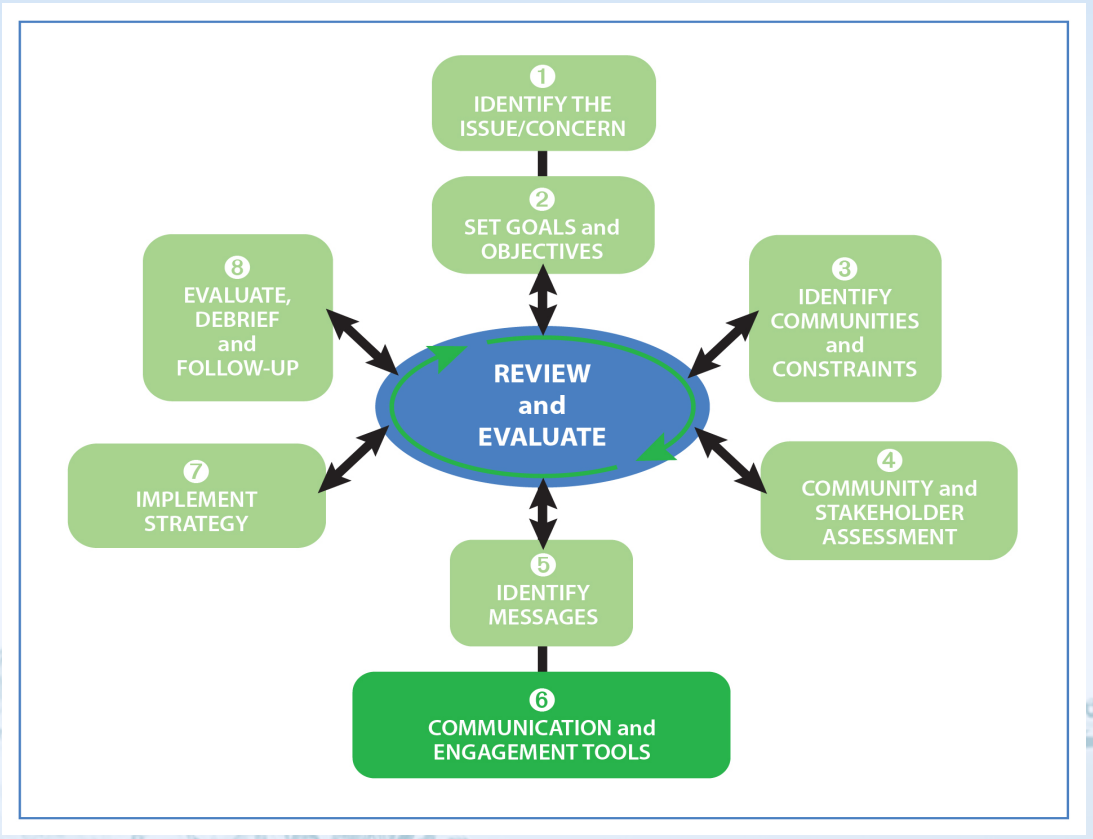
- Accurate, timely information you want or need to share with audiences about the issue or case.
- Linked to the case specific goal.
- Addresses key points about the issue.
- Create consistency in communications.



Chess et al. 1989

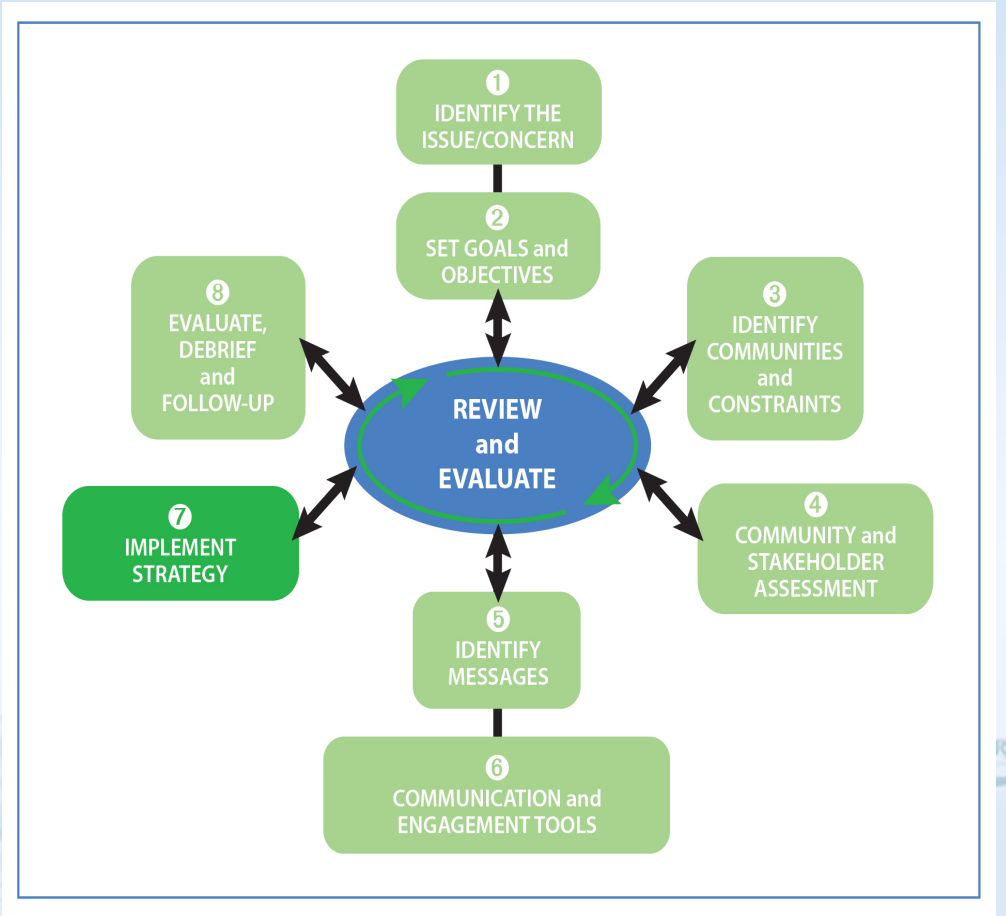
6. Communication and Engagement Tools: Methods

- A communication method is the means by which you communicate with your audiences.
- Selection of a method is based on your goal, how your audience finds or receives information (learned about in the audience assessment), and the nature of the issue.



7. Implement Strategy: Communication Task Planning

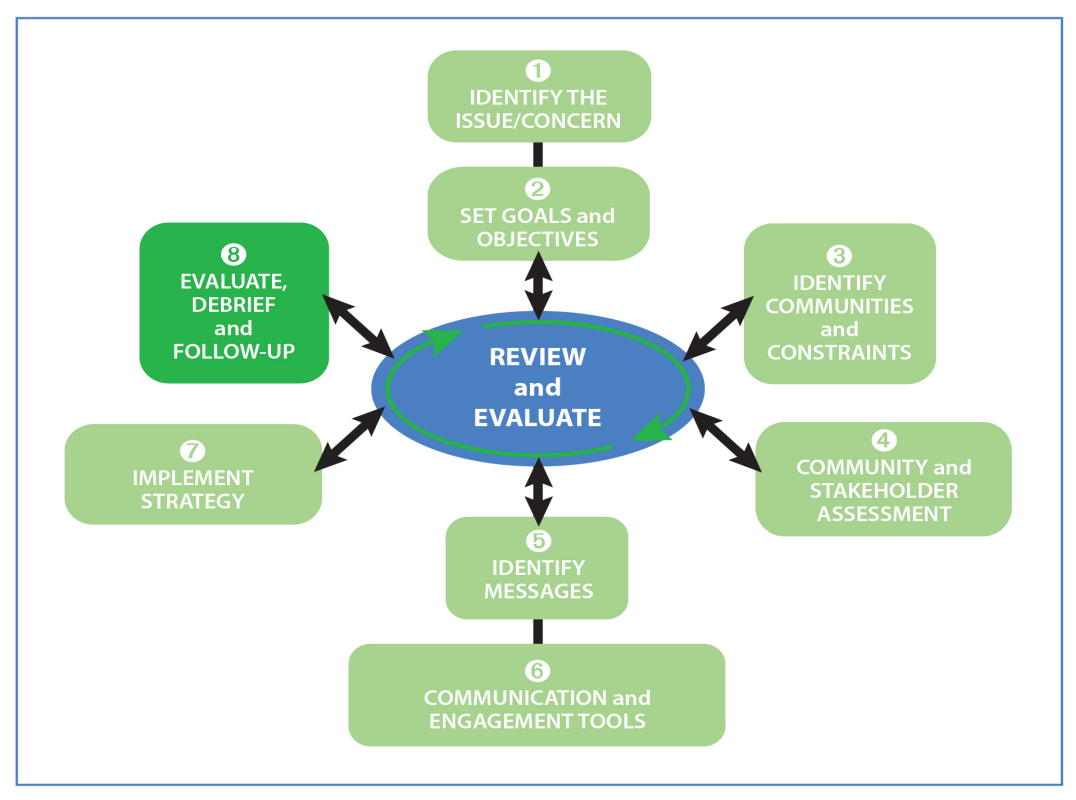
- Develop a material and activity timeline
  - List tasks to develop materials
  - List activities used for communications
- Use the questions below to plan
  - How long will tasks take to complete?
  - What data needs to be shared and in what form?
  - Who is responsible for each task?
  - Who is the appropriate spokesperson?
  - What constraints may emerge in completing tasks?
  - How will the effort be evaluated?



8. Evaluate, Debrief and Follow Up

Systematically collect information about materials, activities, and outcomes of projects.

- To assess what went well
- What did not go well
- How to improve effectiveness
- Inform decisions about future programming
- What were the results of outcome evaluation?
- How did ongoing evaluation inform or impact the goals and results?
- What follow-up is needed with the community?
- What ongoing support is needed if any?



www.coast.noaa.gov/digitalcoast/training/building-risk-communication-skills.html

Thank you!

More information

PFAS.nj.gov

Contact

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