

Muskegon County Airport PFAS Public Meeting



Image from Google Earth



Michigan Department of Environmental Quality
Remediation & Redevelopment Division

Abigail Hendershott

Grand Rapids District Supervisor

hendershotta@michigan.gov

Peter Van Heest

Project Manager

vanheestp@michigan.gov



What are PFAS?

Per and Poly-fluoroalkyl substances

- Generic family of chemicals: over 3,000
- Man-made and do not occur naturally
- Developed in 1940s
- Used to make products that resist heat, oils, grease, stains and water
- Most prevalent and researched: PFOS & PFOA

PFAS Uses



Aerospace



Apparel



**Building and
Construction**



**Chemicals and
Pharmaceuticals**



Electronics



Oil & Gas



Energy



**Healthcare and
Hospitals**



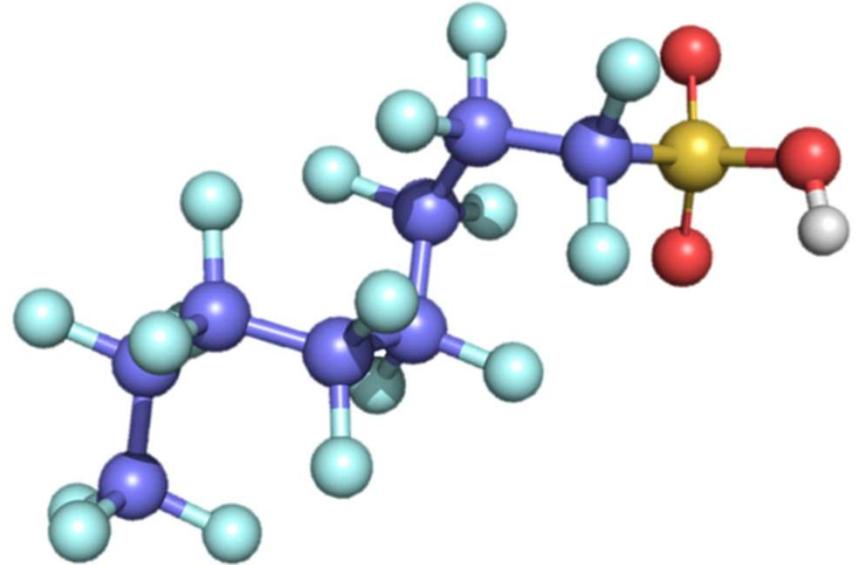
**Aqueous Film
Forming Foam**



Semiconductors

Why the Concern?

- Pervasive
- Persistent
- Bioaccumulative
- Associated with adverse health effects
- Scarcity of information in scientific literature
- Lack of sufficient standards



Aqueous Film Forming Foam (AFFF)



Photo Credit: U.S. Airforce

AFFF meets Military Specification

MPART

Michigan PFAS Action Response Team

- Governor Snyder signed ED 2017-4 on November 13, 2017
- Statewide cooperation and collaboration to strategically and proactively address this emerging contaminant



Michigan.gov

FAQS NEWS AND EDUCATION CONTACT MPART SEARCH

PFAS RESPONSE

TAKING ACTION, PROTECTING MICHIGAN

HEALTH TESTING AND TREATMENT MICHIGAN PFAS SITES FISH AND WILDLIFE FIREFIGHTING FOAM ABOUT MPART

TAKING ACTION TO PROTECT THE PUBLIC'S WATER

Perfluoroalkyl and polyfluoroalkyl substances (PFAS), such as perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), are part of a group of chemicals used globally during the past century in manufacturing, firefighting and thousands of common household and other consumer products.

In recent years, experts have become increasingly concerned by the potential effects of high concentrations of PFAS on human health.

Although there is more to learn about PFAS and human health, the State of Michigan takes this issue seriously and is one of the first states in the nation to establish a clean-up standard for PFAS in groundwater used for drinking water.

Launched in 2017, the Michigan PFAS Action Response Team (MPART) is the first multi-agency action team of its kind in the nation. Agencies representing health, environment and other branches of state government have joined together to investigate sources and locations of PFAS contamination in the state, take action to protect people's drinking water, and keep the public informed as we learn more about this nationally emerging contaminant.



MPART Response

- Protect Public Health
- Standardize sampling and analysis
- Study occurrence
- Identify sources and source pathways
- Study environmental transport and fate
- Study ecological effects
- Develop standards



Muskegon County Airport PFAS Investigation

Muskegon County Airport PFAS Sample Area Map



= Drinking Well Water Sample Area



= Known Area of Fire Training or AFFF Use
(Locations are approximate)

1/2 Mile



Base-Map from Google Earth

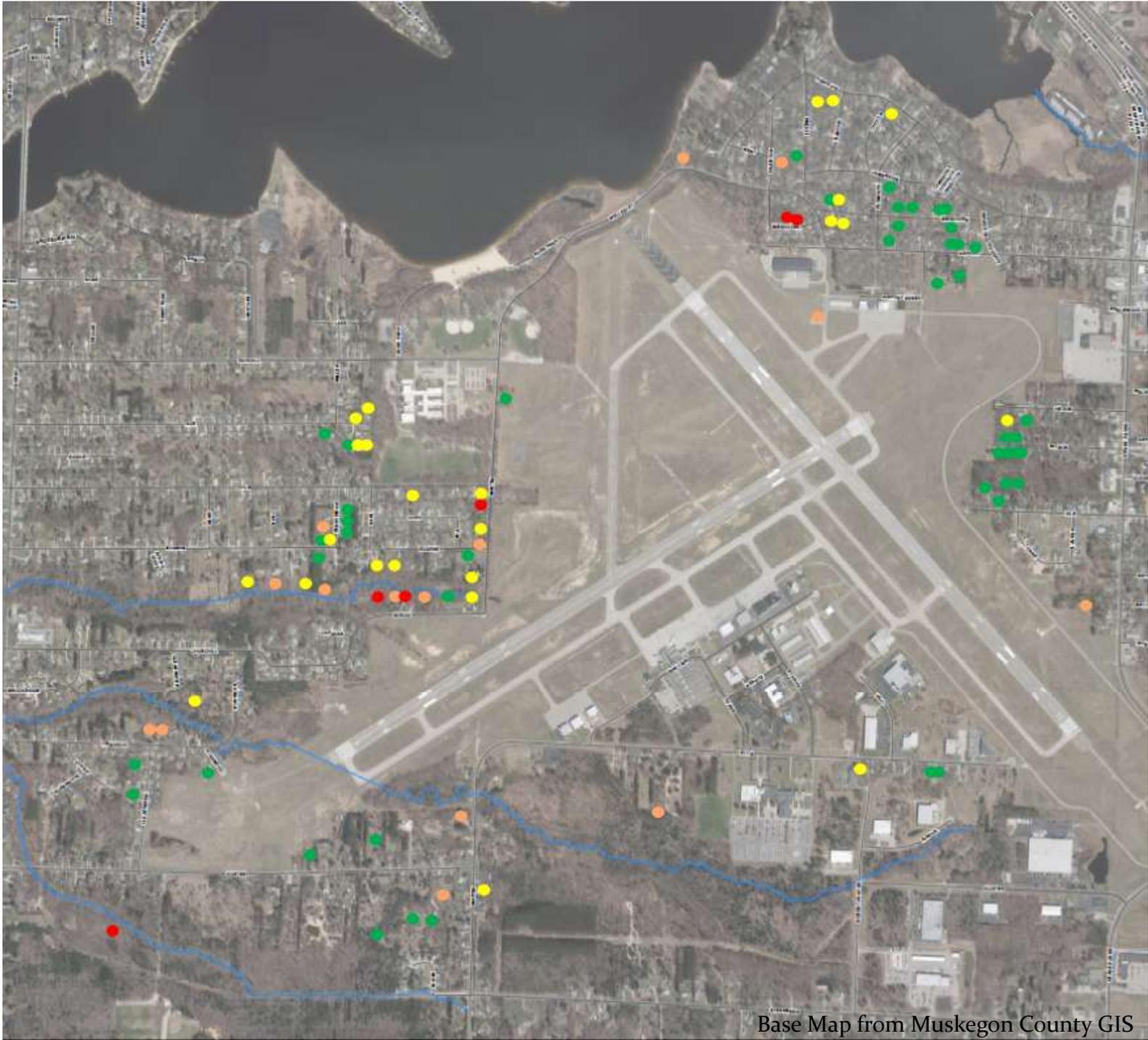
- Airport required by federal regulations to use AFFF
- DEQ asked airport to identify areas of AFFF use
- AFFF used in multiple areas
- DEQ requested that Muskegon County sample residential drinking water wells near historic firefighting training areas
- Some homes in area are serviced by municipal water and others are serviced by wells

Investigation

- The County has sampled over 90 drinking wells
- PHMC quickly provided clean drinking water to homes where exceedances were detected
- Sample area expanded based upon initial results

Current Results Summary for PFOS+PFOA

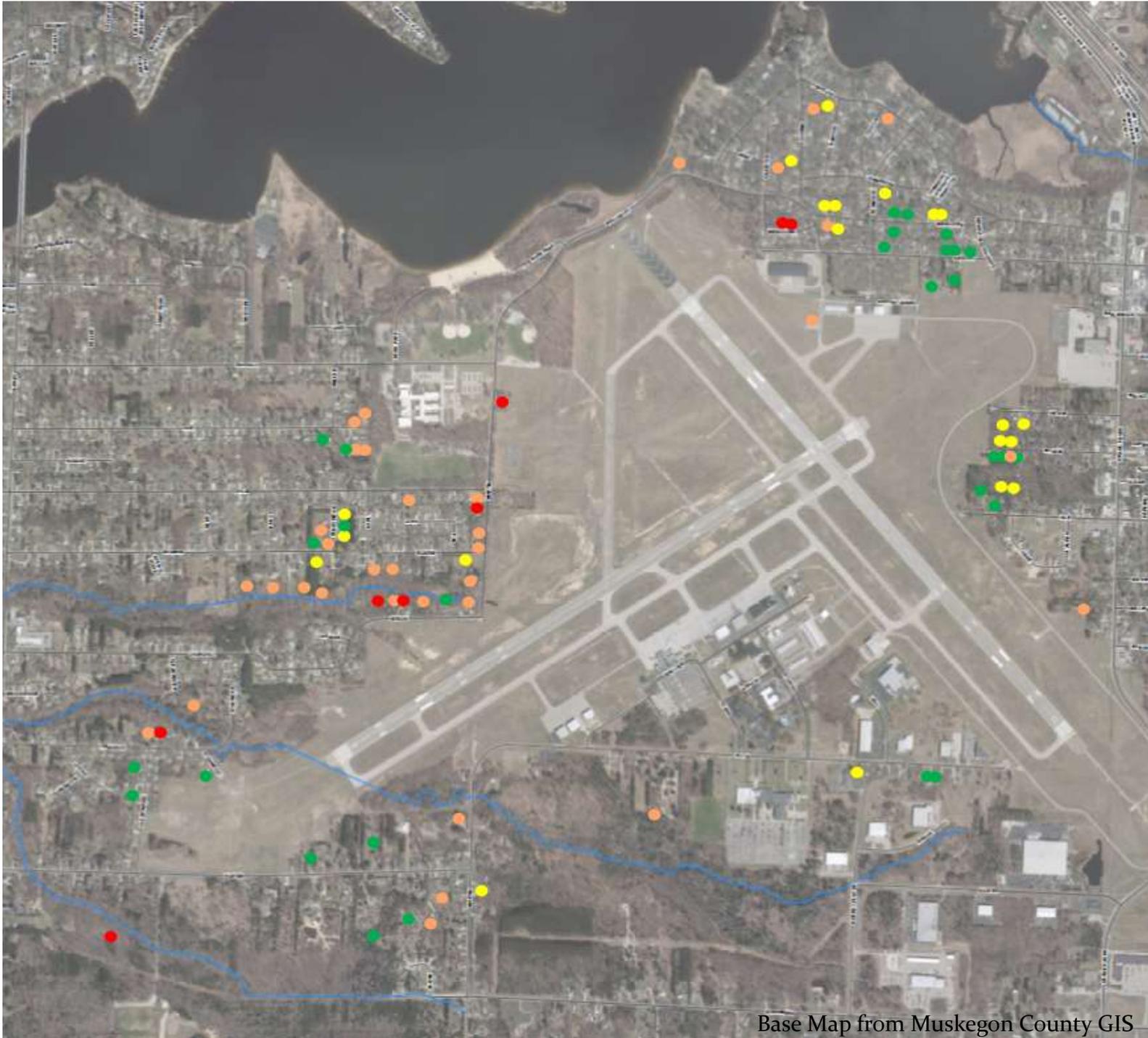
Number of Residential Drinking Wells Sampled	Number of Results Received	Number Non-Detect	Number Non-Detect to 70 ppt	Number Greater than 70 ppt	Highest Detection (ppt)
90	90	46	38	6	563.7



PFOS+PFOA

- Non-Detect
- >ND to 10 ppt
- >10 to 70 ppt
- > 70 ppt

Base Map from Muskegon County GIS



Total PFAS

● Non-Detect

● >ND to 10 ppt

● >10 to 70 ppt

● > 70 ppt

Base Map from Muskegon County GIS

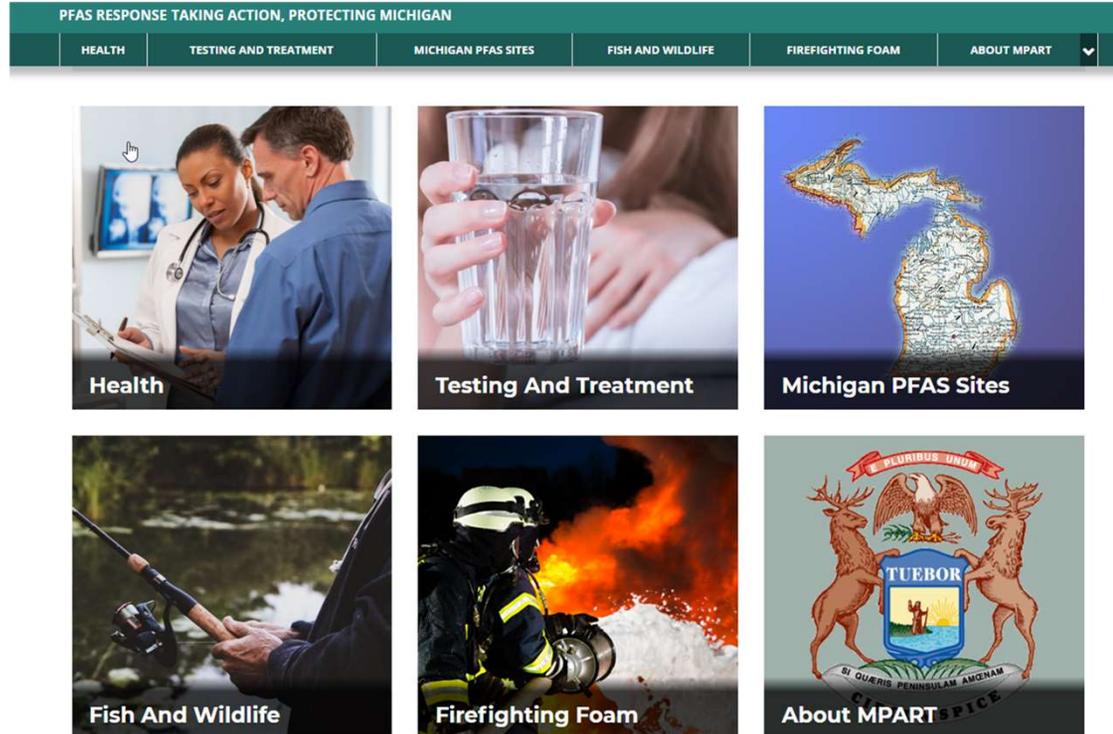


Investigation Continued

- DEQ does not have a criteria for total PFAS but total PFAS data is used to help determine location of contamination
- Investigation is ongoing with more residential well sampling soon
- Muskegon County will be conducting an environmental investigation to refine understanding of contaminant distribution

Stay Informed

- Info on approved filters and ways to test your well
- Info on health and other concerns
- FAQs



www.Michigan.gov/PFASresponse

Airport Rescue & Firefighting (ARFF) Aqueous Film Forming Foam (AFFF)

- The FAA requires commercial service airports to provide ARFF services which include the use of AFFF to ensure proper response during an emergency.
- **Currently, all commercial service airports are required to use foams meeting military specifications (MIL-PRF-24385), which contain PFAS.**

Airport Rescue & Firefighting Aqueous Film Forming Foam

ARFF Training Requirements

FAA-required ARFF training curriculum includes:

- 1) Application of the types of extinguishing agents required for FAA compliance; and
- 2) All ARFF personnel must participate in at least one **live-fire drill every 12 consecutive calendar months.**



Airport Rescue & Firefighting Aqueous Film Forming Foam



ARFF “Live Burn” Training

Muskegon Airport has used a propane-fed mobile training unit since the early 2000s to provide the annual “live burn” training required for ARFF personnel (Norton Shores Fire Department).

The propane trainer does not require AFFF to be applied unlike earlier “open pit” burn pits traditionally used at most airports.

The ARFF units are able to spray water without engaging the foam system. Use of AFFF is now limited solely to actual emergencies.



Per and Polyfluorinated Alkyl Substances (PFAS)

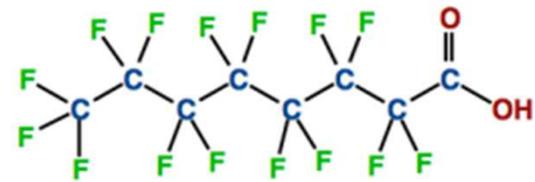
Bill Farrell/ Sesa Kallakuri

Michigan Department of Health and Human Services

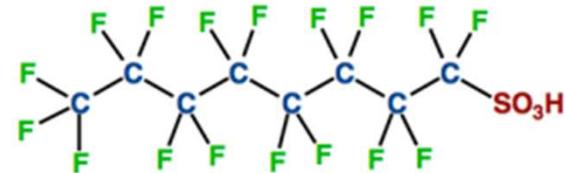
February 19, 2019

PFAS

- Synthetic class of compounds
- About 4600 chemicals
- Well studied – PFOA and PFOS
- PFOA – **P**er**F**luoro**O**ctanoic **A**cid (1947 – 2002)
- PFOS – **P**er**F**luoro**O**ctane **S**ulfonate (1949 – 2002)



PFOA - perfluorooctanoic acid



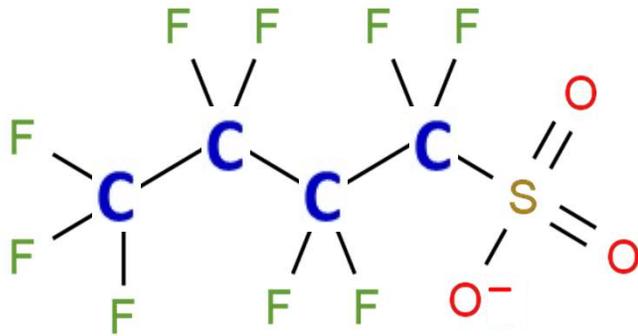
PFOS - perfluorooctanesulfonic acid

Chain Lengths

Short-chain

PFBS $n=4$

PFPeS $n=5$



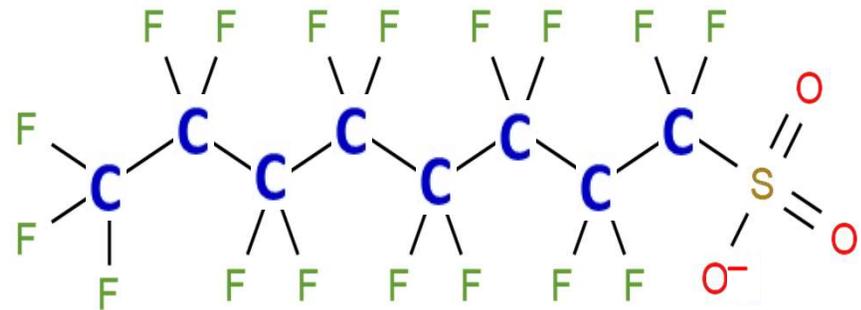
PFBS

Long-chain

PFHxS $n=6$

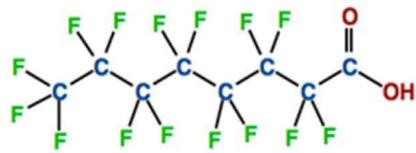
PFHpS $n=7$

PFOS $n=8$

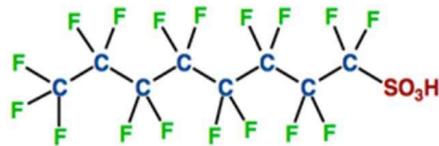


PFOS

Characteristics



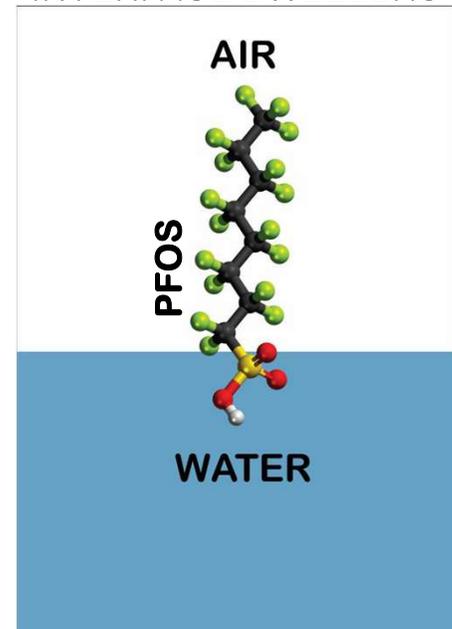
PFOA - perfluorooctanoic acid



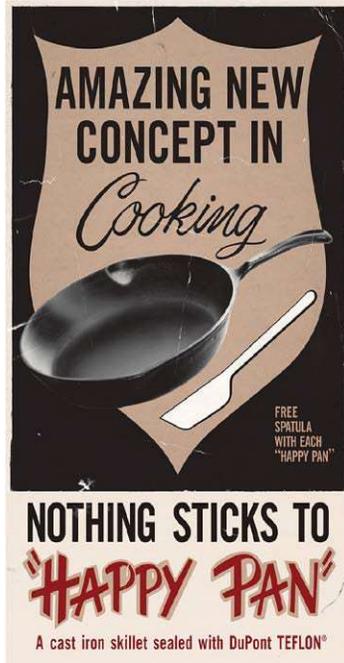
PFOS - perfluorooctanesulfonic acid

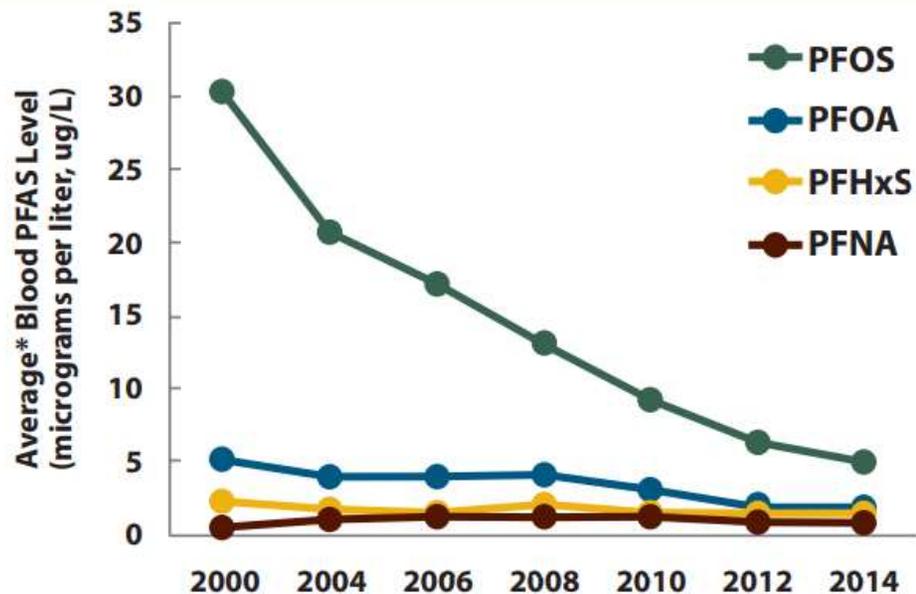
- Incredibly Stable
- Highly soluble and mobile
- Grease, soil and water-repellant properties
- Bioaccumulate in Biota

INTERFACE DWELLERS



Sources





* Average = geometric mean

Data Source: Centers for Disease Control and Prevention. Fourth Report on Human Exposure to Environmental Chemicals, Updated Tables, (January 2017). Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

Blood Levels of
the Most
Common PFAS in
People in the
United States
from 2000-2014

The Role of MDHHS/PHMC

- Provide Public Health information and advice
 - Support PHMC and other agencies
 - Respond to Public's questions and concerns
- Be proactive/respond immediately to protect health of people
- Understand the chemicals
 - How they move, how they could impact health, what can be done to prevent harm
- Evaluate residential well results and provide recommendations/public health response actions
- Maintain scientific knowledge
 - Science is constantly changing
 - Provide Expert
- Outreach to residents, healthcare providers, others

Exposure to PFAS Chemicals

Health problems are
not immediate



If you drink high levels
of PFAS chemicals
over time you could
be more likely than the
average person to
develop some health
problems in the future

Associated Health Outcomes – PFOA and/or PFOS

Animals

- Liver effects
- Immunological effects
- Developmental effects
- Endocrine effects (thyroid)
- Reproductive effects
- Tumors (liver, testicular*, pancreatic)

Humans

- Liver effects (serum enzymes/bilirubin, cholesterol)
- Immunological effects (decreased vaccination response, asthma)
- Developmental effects (birth weight)
- Endocrine effects (thyroid disease)
- Reproductive effects (decreased fertility)
- Cardiovascular effects (pregnancy induced hypertension)
- Cancer* (testicular, kidney)

* PFOA ONLY

USEPA's "Lifetime Health Advisory"

- Based on Reference Dose (RfD) derived from developmental toxicity study in rats
- Lifetime Health Advisory for Drinking Water
 - PFOA + PFOS = 70 ppt
 - Short-term (during pregnancy) and long-term (lifetime) exposure
- Protective of unborn baby against developmental effects
- Protective of all against non-cancer and cancer effects

6,000,000* ppt
(1,000,000 ng/kg/day)



Rodent to human
conversion



98,000 ppt
(5,300 ng/kg/day)



Human
protections



350 ppt
(20 ng/kg/day)



Accounting for
other exposures
in the
environment



70 ppt
(ng/L)

Lowest dose that causes
an effect in rat pups

Human equivalent
dose

Dose that is safe in the most vulnerable
people (like developing babies)

Lifetime Health Advisory
for PFOA in drinking water

Illustrating the concept behind a Lifetime Health Advisory: Perfluorooctanoic acid (PFOA)

* Exact numbers have been generalized for illustration
ppt = Parts per trillion

MDHHS/PHMC Public Health Response Actions

- Exceedance of PFOA + PFOS over LHA of 70 ppt
 - Advise use of filtered water for –
 - drinking
 - cooking
 - brushing teeth
 - washing vegetables
 - any other consumption
 - Bottled water is provided before POU filters are installed.

MDHHS/PHMC Public Health Response Actions

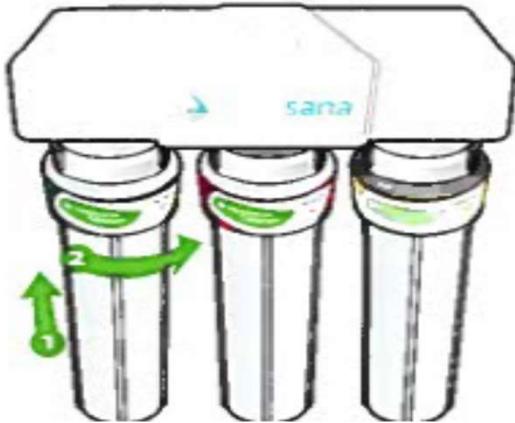
- Detectable Levels of PFAS; but PFOA + PFOS < 70 ppt
 - Interim precaution - PHMC offering filter
- Purpose of filters?
 - Need time to conduct investigation
 - Determine source area extent and strength
 - Determine horizontal and vertical extent of PFAS in groundwater
 - Gather information to determine long-term groundwater quality
 - Therefore – filter provides residents with protection from potential fluctuations in PFAS levels, if any, while investigation is going on



MDHHS/PHMC Public Health Response Actions

- No detectable levels of PFAS
 - No public health actions
 - Water safe for consumption

Point-of-Use Filter



- NSF P473 Certification
- Certified to remove up to 96% of PFOA and PFOS
- Certified only for water containing PFOA + PFOS concentrations less than 1,500 ppt



Full system certified to NSF/ANSI Standards 42, 53, 401 and conforms to NSF protocol P473.

Residential Well Water Testing

- MPART Website – www.michigan.gov/pfasresponse
- Handouts at MDHHS Table
 - *Sampling and Lab Information for Residents Wanting to Test Their Private Residential Well*
 - *For Homeowners – Private Residential Well PFAS Sampling*

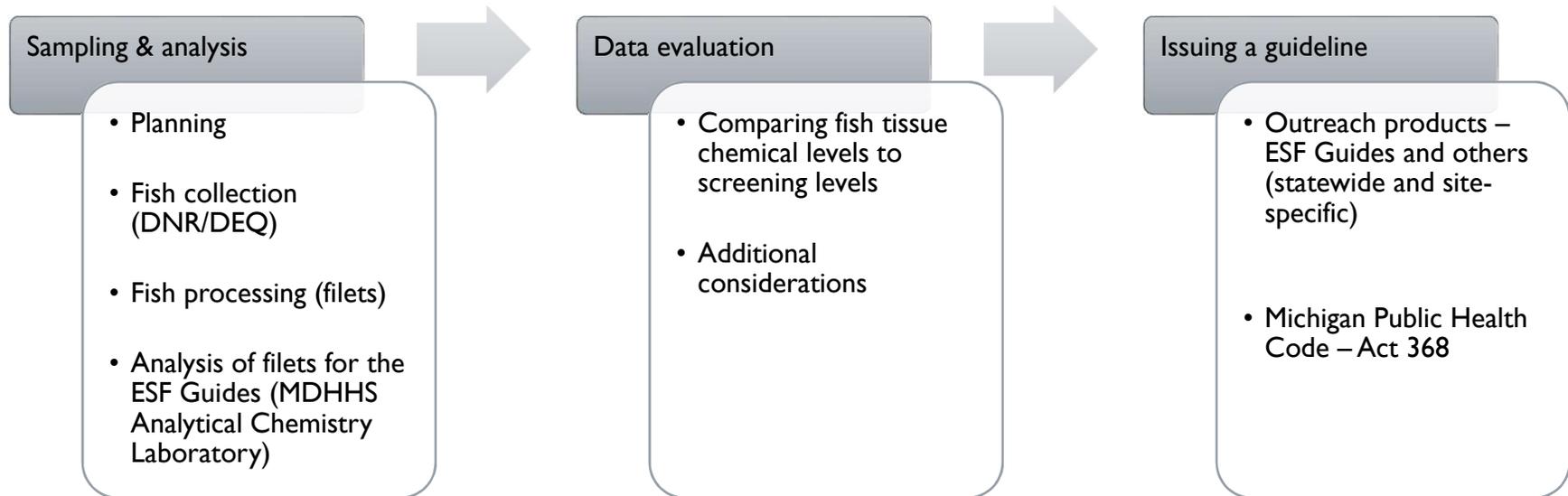


The Michigan Fish Consumption Advisory Program

Michigan Department of Health
and Human Services

www.mi.gov/EatSafeFish.com

General Process For Consumption Guideline Development



2018 Eat Safe Fish Guide – Muskegon County

Black Creek

Type of Fish	Chemicals of Concern	Size of Fish (length in inches)	MI Servings per Month*
Carp	PCBs	Any	Limited [▲]
Suckers	PCBs	Any	6 Per Year ^{2x}

Mona Lake

Type of Fish	Chemicals of Concern	Size of Fish (length in inches)	MI Servings per Month*
Carp	DDT	Under 18"	2 ^{2x}
	PCBs	18" to 28"	6 Per Year ^{2x}
		Over 28"	Limited [▲]
Largemouth Bass	PCBs	Any	6 Per Year ^{2x}
Smallmouth Bass	PCBs	Any	6 Per Year ^{2x}
Walleye	PCBs	Under 20"	1 ^{2x}
		Over 20"	6 Per Year ^{2x}
All Other Species	PCBs	Any	6 Per Year ^{2x}

Type of Fish	Chemical of Concern	Size of Fish (length in inches)	MI Servings per Month*
Black Crappie	Mercury	Any Size	4
Bluegill	Mercury	Any Size	8
Carp	PCBs	Any Size	2
Catfish	PCBs & Mercury	Any Size	4
Largemouth Bass	Mercury	Under 18"	2
		Over 18"	1
Muskellunge (Muskie)	Mercury	Any Size	1
Northern Pike	Mercury	Under 30"	2
		Over 30"	1
Rock Bass	Mercury	Any Size	4
Smallmouth Bass	Mercury	Under 18"	2
		Over 18"	1
Suckers	Mercury	Any Size	8
Sunfish	Mercury	Any Size	8
Walleye	Mercury	Under 20"	2
		Over 20"	1
White Crappie	Mercury	Any Size	4
Yellow Perch	Mercury	Any Size	4

Statewide Safe Fish Guidelines

- These general guidelines are based on the typical amount of chemicals found in fish filets tested from around the state. Some fish may be higher or lower.
- These general guidelines can be used for lakes, rivers, and fish species not included in the Eat Safe Fish Guide.



MDHHS – Toxicology and Response Section

Sesha Kallakuri, Toxicologist

(517) 284-0038

KallakuriS@michigan.gov

Bill Farrell, Toxicologist

(517) 284-0018

FarrellW@michigan.gov

County Site Investigation

- Prior to the 2018 MDEQ requested investigation, there was no known sampling data indicating the presence of PFAS in the groundwater.
- Work plans and procedures were developed and experienced laboratories selected. These steps help result in good data being generated. Good data is needed to make good decisions.
- To be protective of human health, the County decided to identify possible drinking water wells in the airport vicinity and sample them first.
- Sampling residential drinking water wells was a priority over any sampling on airport property.
- 23 homes were sampled initially. Data was used to identify logical expansion areas for sampling.
- To date, over 90 homes have been sampled.

Next Steps

- Residential drinking water well sampling continues. Over 30 additional homes were recently contacted for sampling based upon new data.
- The County is currently reviewing qualifications from hydrogeological firms with previous PFAS site experience.
- The chosen hydrogeological consultant will use existing data and site & area information to determine the extent of PFAS containing plumes and likely source areas. They will recommend “next steps” on sampling efforts to develop a conceptual site model.
- The County will work to identify long-term drinking water solutions for those homes with concentrations above regulatory compliance levels.