



**AKT** PEERLESS

# LANDFILL LEACHATE *a PFAS Problem*

*Presented by*  
Tony R. Anthony, CPG, CHMM  
Robert Lambdin

# THE PROBLEM

# NEWS PAPER HEADLINES

PFAS found in drinking water for 1.5M in Michigan

“Astronomical” PFAS level sets new Michigan contamination milestone

Michigan must act to protect drinking water from PFAS

Congress urged to act swiftly on national PFAS laws

Michigan next environmental crisis is PFAS







# DO NOT EAT THE FISH

This area is part of the Do Not Eat Fish Advisory issued by the State of Michigan due to high amounts of PFAS found in fish.



Enjoy swimming, boating, and catch and release fishing. Touching the water is not a health concern.

For more information, call MDHHS at 1-800-648-6942 or visit [www.michigan.gov/pfasresponse](http://www.michigan.gov/pfasresponse)







# IT'S PERVASIVE

Fire-fighting Foaming Agent

Waterproofing and Stain Resistance

Teflon<sup>®</sup> Gortex<sup>®</sup>

Scotchgard<sup>®</sup> Stainmaster<sup>®</sup>

Non-stick Pans

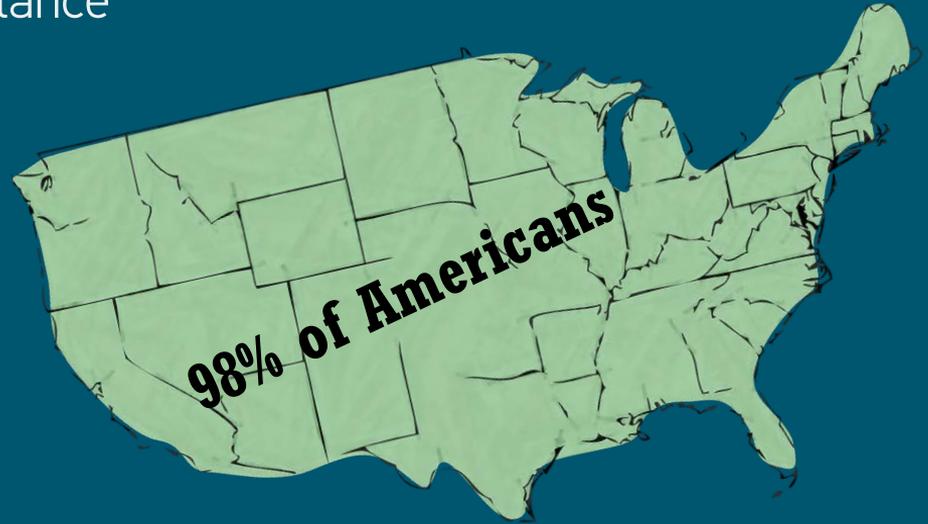
Fast-food Wrappers

Pizza Boxes

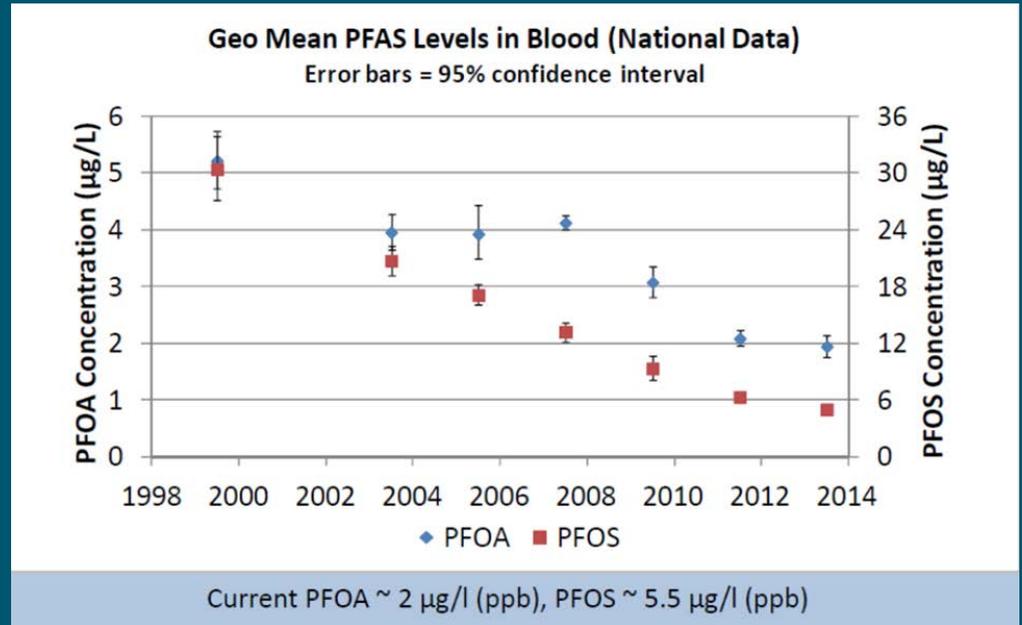
Microwave Popcorn

Carpet

Metal Plating



# PFAS Contamination in Blood



# MDEQ RESPONSE

# MUNICIPAL WWTP

Screen WWTP for High Risk Users

Monitor

Reduce

Evaluate Impacts



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF ENVIRONMENTAL QUALITY  
LANSING DISTRICT OFFICE



C. HEIDI GREYHER  
DIRECTOR

February 20, 2018

IPP Community Representative  
IPP Community address  
IPP Community City, State ZIP

Dear IPP Representative:

SUBJECT: PFAS Source Evaluation and Reduction Requirements

You may have heard news recently about perfluoroalkyl and polyfluoroalkyl substances (PFAS, also referred to as PFCs), especially the specific chemicals PFOS (perfluorooctane sulfonate) and PFOA (perfluorooctanoic acid). The Department of Environmental Quality (DEQ), Water Resources Division (WRD), is requiring Wastewater Treatment Plants (WWTP) with Industrial Pretreatment Programs (IPPs) to evaluate potential sources of PFAS, investigate probable sources, reduce/eliminate the sources found, and take other actions to protect surface water quality as needed.

#### Background

PFAS are a group of manmade chemicals that have been widely used in industry and consumer products since the 1950s. They are most often associated with nonstick coatings; plating operations; firefighting foams; and stain- and water-resistant treatments for clothing, furniture, and carpeting.

Unfortunately, PFAS have been found to have adverse effects in laboratory animals and humans when ingested. PFAS are also very persistent in the environment and can bioaccumulate in animal and human tissue. The chemical PFOS in particular, due to its persistence and toxicity, has led to fish consumption advisories for some Michigan rivers. The applicable Water Quality Standard (WQS) (Michigan Rule 57 value) for PFOS is 12 ng/l (nanograms per liter or parts per trillion) for streams that are not used for drinking water and 11 ng/l for those that are used as a drinking water source. The applicable WQS for PFOA is 12,000 ng/l for lakes and streams that are not used for drinking water and 420 ng/l for those used as a drinking water source.

With some exceptions for limited industrial uses, chemical manufacturers in the United States voluntarily stopped making PFOA and PFOS, but they are still manufactured in other locations around the globe and may be imported through such consumer goods as carpets, paper and

# HIGH RISK USERS

Metal Platers

Landfills

Fabric/Leather

Stain and Water Repellants

FFFA

# INDUSTRIAL PRETREATMENT PROGRAMS

Landfill Leachate is an Industrial Waste

Allowable Discharge for WWTP

PF0A – 12 nanograms per liter (part per trillion)

PFOS – 11 nanograms per liter (ppt) is drinking water source

**MUNICIPALITY**

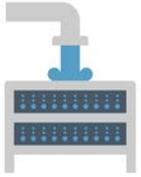
# MUNICIPAL LANDFILL



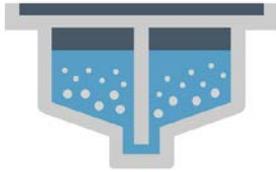
# MUNICIPAL WWTP



# MUNICIPAL WWTP



Screen



Primary  
Settling



Biological/  
Aeration

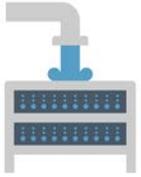


Secondary  
Settling

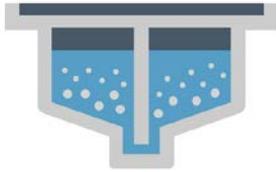
Sludge



# MUNICIPAL WWTP



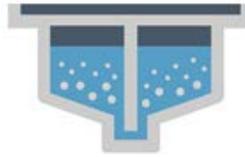
Screen



Primary  
Settling



Biological/  
Aeration



Secondary  
Settling



Carbon



Sludge



# MUNICIPAL CONCERNS

How to treat for PFAS?

What is the cost of treatment?

What about filter cake?

Should the WWTP continue to accept leachate?

# NEW TREATMENTS EVERY DAY

UV

Hemp Seed Protein

Flocculants

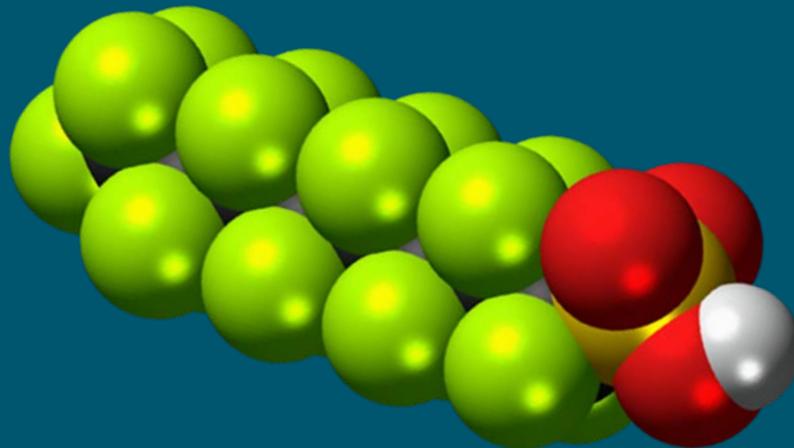
Binding Agents

# WHY ARE PFAS DIFFICULT TO TREAT?

# PFAS – Unusual Chemistry

## Fluorocarbon Tail

Strong Bonds  
Hydrophobic  
Oleophobic



## Functional Group

Strong to weak acids  
Hydrophilic

# USEPA to EXPAND LIST

- PFOS- perfluorooctane sulfonic acid
- PFOA- perfluorooctanoic acid
- PFBS- perfluorobutane sulfonic acid
- PFNA- perfluorononanoic acid
- PFHxS- perfluorohexane sulfonic acid
- PFHpA- perfluoroheptanoic acid

# INJECTION WELLS

# Michigan Wells

- 15,500 oil & gas
- 3,000 gas storage
- 1,300 injection and secondary recovery
- 200 mineral wells



# Well Classification



- Class I – hazardous waste
- Class I – non-hazardous waste
- Class II – oil & gas byproducts
- Class III – salt recovery
- Class IV – banned in 1984
- Class V – septic tank fluids
- Class VI – carbon sequestration

# Class I - Requirements

- Double cased well.
- Cemented to surface (engineered cement).
- Injection must incorporate tubing and packer to isolate and seal the receiving formation.
- Specifications vary between wells for injection rate, temperature, pressure, and cement requirements.
- Testing to insure no vertical migration of fluids.

# Class I - Requirements

- Receiving formation must have enough permeability, porosity, and thickness to handle volume and rate of injection.
- A confining zone to prevent vertical migration.
- Injected materials are compatible with well material.
- Geologically stable.
- Injection zone has no economic value.
- Area of Review  $\frac{1}{4}$  mile for non-hazardous wells.

# Class I - Hazardous Requirements

- Injection and confining formations must be free of vertical transmissivity through fissures and faults.
- Low seismic probability.
- Injection will not induce earthquakes.
- Area of Review is 2 miles.
- Modeling to demonstrate all injected waste will remain in formation for 10,000 years.

# Class I - Type of Waste

- Petroleum Refining
- Metal Production
- Chemical Manufacturing
- Pharmaceutical
- Commercial
- Food Production
- Municipal wastewater treatment

# Class II - Oil & Gas By-products

- Construction
  - Confining zone must separate the receiving formation from a drinking water source.
  - Confining zone must be free of faults or fractures.
  - Cased and cemented to prevent vertical migration.
- Operating
- Monitoring
- Reporting

# Class II - Oil & Gas By-products

- Oil & Gas by-products
- Federal regulations restrictions

**DIFFICULTIES**

# Romulus – Class I Permitting



- Public Opposition – “not in my backyard”
- Cost of Construction

**WHAT'S AHEAD**

- Increased regulation
- Law suits
- Public pressure



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