Alaska Department of Environmental Conservation
Contaminated Sites Program

Introduction to PFAS

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DEC Contaminated Sites Program

PFAS: Emerging Contaminants

Per-and Polyfluoroalkyl Substances (PFAS)

➢**A class of man-made chemicals**

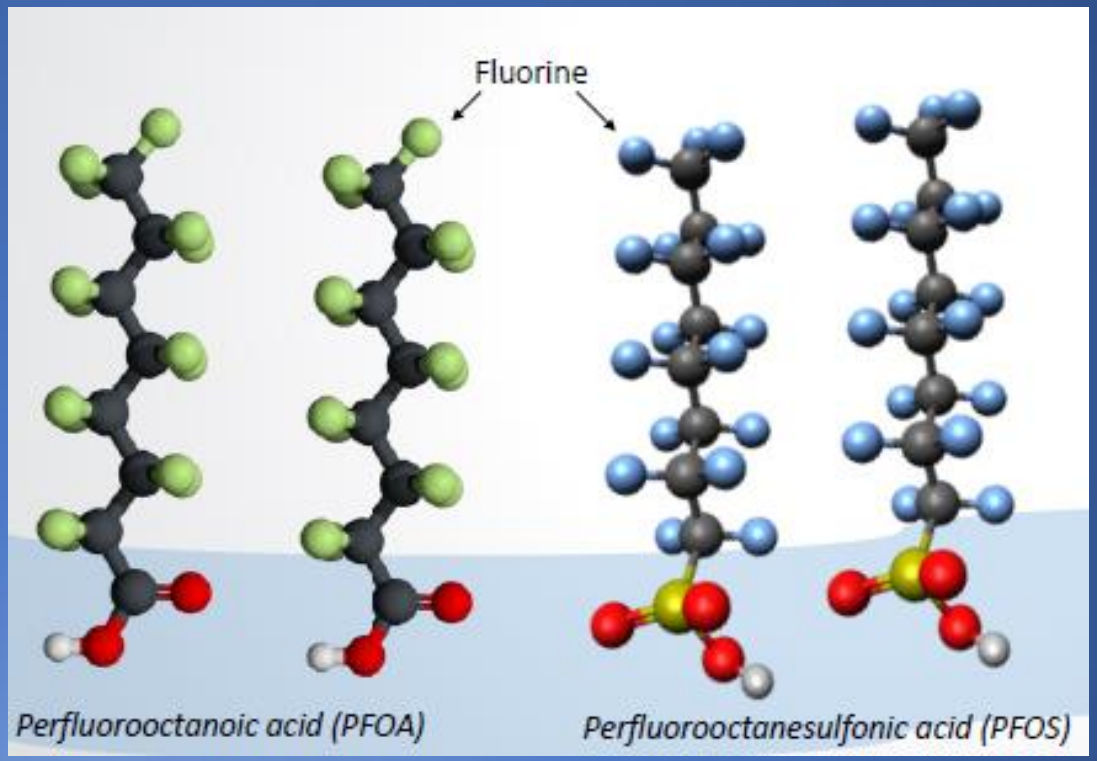
•Chains of carbon (C) atoms surrounded by fluorine (F) atoms

−Water-repellent

−Stable C-F bond

•Some PFAS include oxygen, hydrogen, sulfur and/or nitrogen atoms, creating a polar end

PFAS are generally highly soluble, resistant to degradation, and persist in the environment



PFAS
Per- and Polyfluoroalkyl Substances

Non-polymer

Polymer (includes potential precursors)

PFCs*
Perfluorinated Compounds

Polyfluoro-alkyls

*PFC is a historical term; the current national trend is to move away from this acronym as it does not describe the whole class of compounds, however it is sometimes used synonymously with PFAS

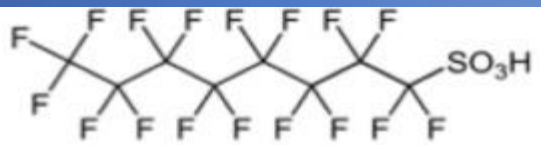
PFOS
Perfluorooctane sulfonate

PFHxS
Perfluorohexane sulfonate

PFOA
Perfluorooctanoic acid

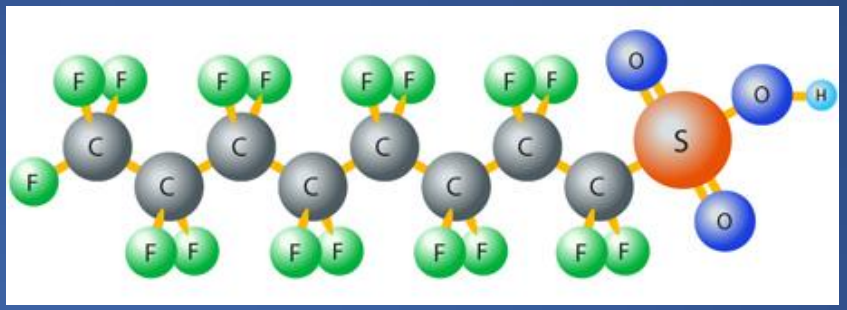
PFNA
Perfluorononanoic acid

PFOS

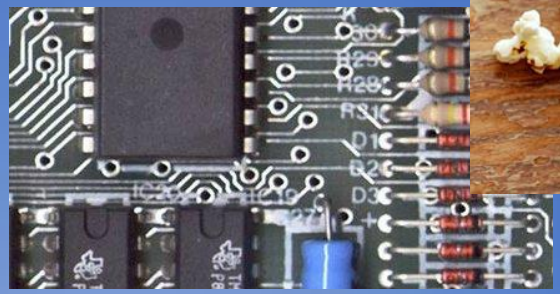


PFOA

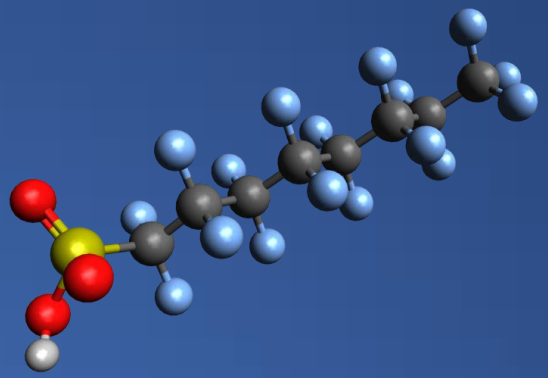
What are PFAS?



- Wide variety of uses
  - Food contact surfaces such as cookware, pizza boxes, fast food wrappers, popcorn bags, etc.
  - Polishes, waxes, and paints
  - Stain repellants for carpets, clothing, upholstered furniture, etc.
  - Cleaning products
  - Dust suppression for chrome plating
  - Electronics manufacturing
  - Oil and mining for enhanced recovery
  - Performance chemicals such as hydraulic fluid, fuel additives, etc.

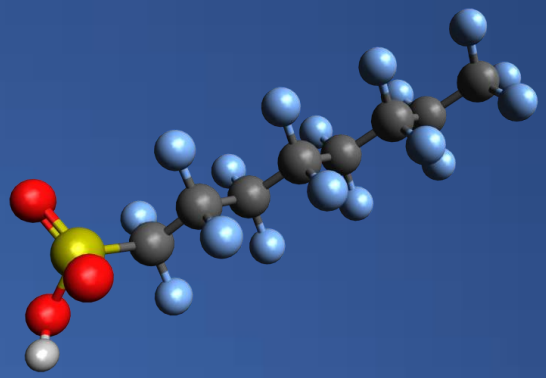


PFAS in the environment



- Occurrence of PFAS is widespread
  - Can be transported atmospherically on airborne particulates
  - Studies have detected PFAS near urban areas in both soil and groundwater at higher levels than in remote locations
  - Almost every US citizen has detectable levels of PFAS (PFOS and PFOA) in their blood serum
  - Have been found in polar bear blood

PFAS in the environment



Releases

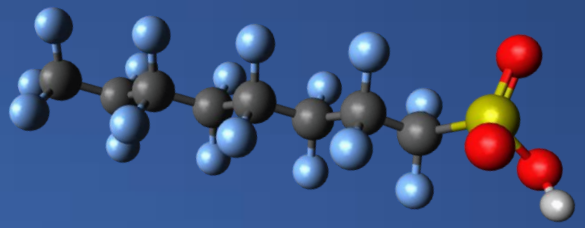
Caused by:

- Fire Fighting Foam use
  - (training and response)
- Landfill leachate
- Biosolid application
- Industrial use & manufacture

Behavior in Environment:

- Highly soluble
  - Easily transported in groundwater
- Persistent
  - Do not degrade easily
- Potential for large, mobile, long-lasting contaminant plumes

PFAS awareness



1990s

- Studies find PFCs in blood of general population

2000s

- Improved lab methods reveal low level concentrations in environmental samples

2009

- EPA publishes Provisional Health Advisory (200 ppt PFOS, 400 ppt PFOA)

2012-present

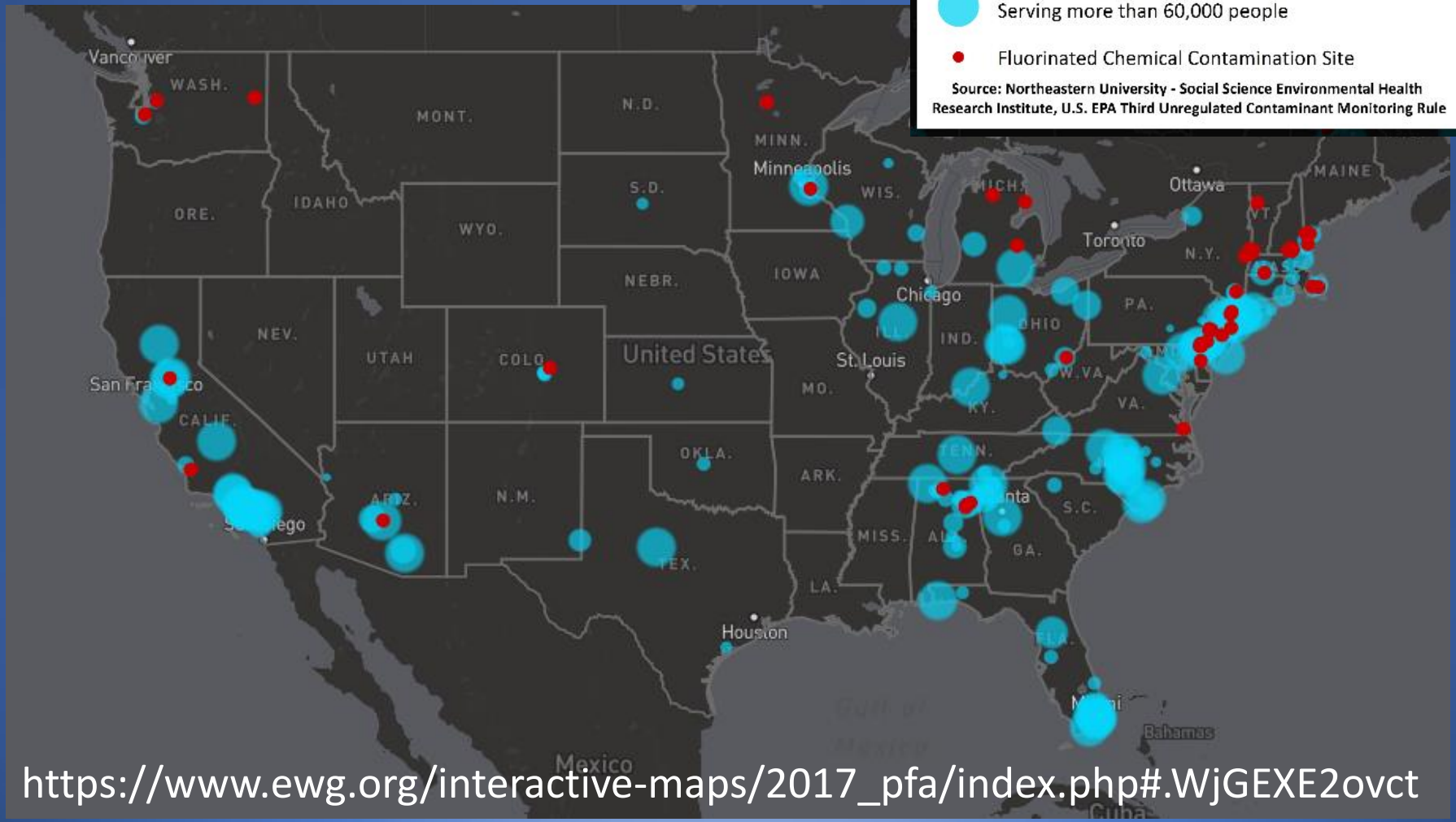
- UCMR3 finds PFAS in public water systems around USA
- Increased regulatory concern from states, tribes, federal gov't

2016

- EPA publishes lifetime health advisory level for PFOA and PFOS
- Alaska publishes groundwater and soil cleanup levels for PFOA and PFOS

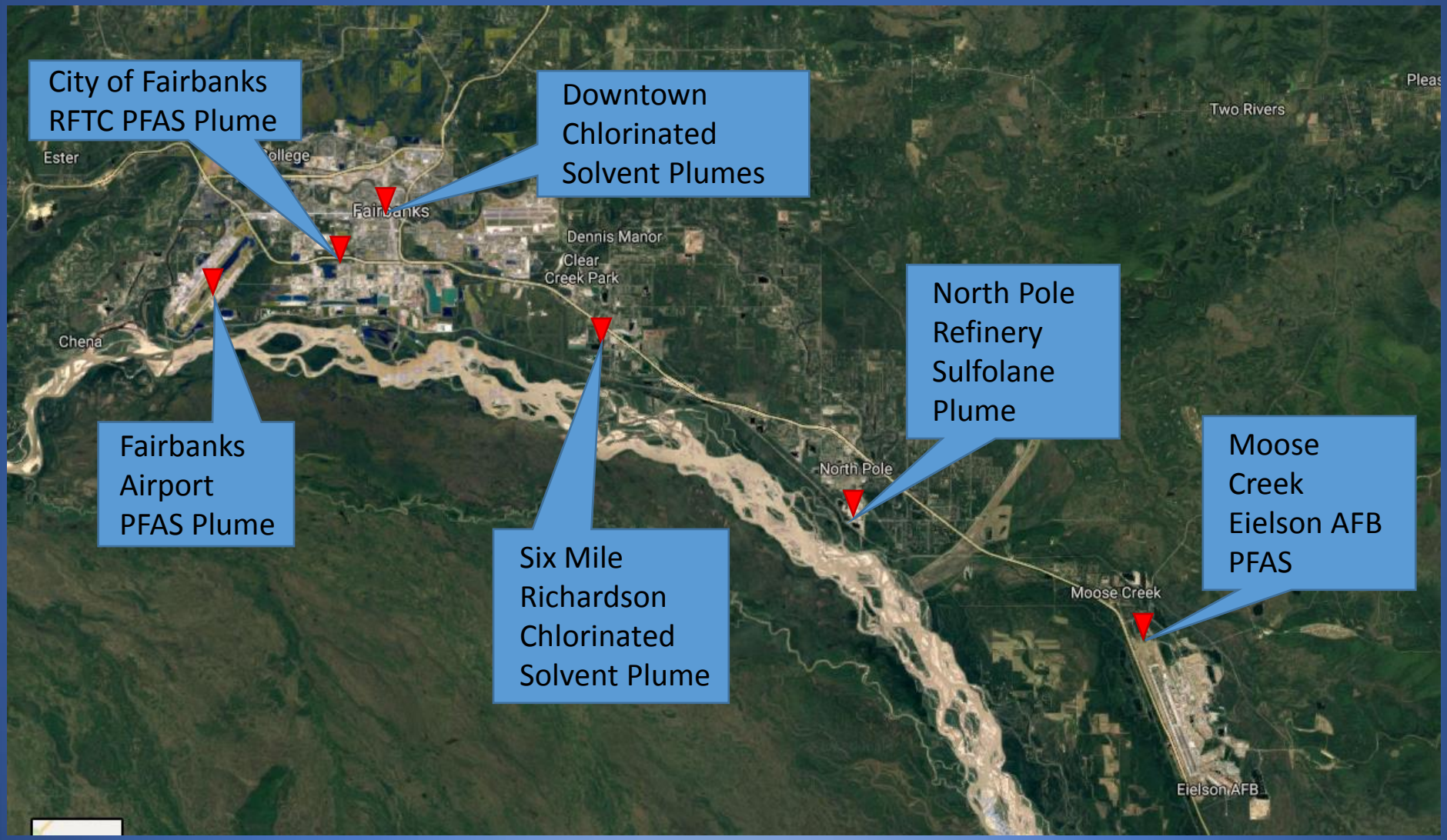
Nation-wide PFAS detections

State and Federal agencies around the country are aware of and working on this problem.



https://www.ewg.org/interactive-maps/2017_pfa/index.php#.WjGEXE2ovct

Large Contaminant Plumes in Tanana Valley



Understanding Regulatory Numbers

Type of published number	CUL Clean up Level (Groundwater)	MCL Maximum Contaminant Level	LHA Lifetime Health Advisory
Enforcement Authority	Enforceable	Enforceable	Advisory (non-regulatory)
Application	Groundwater, including use without treatment.	Public Drinking Water Systems serving 25 or more people per day.	Drinking Water
Governing Authority	State of Alaska	EPA and State	EPA

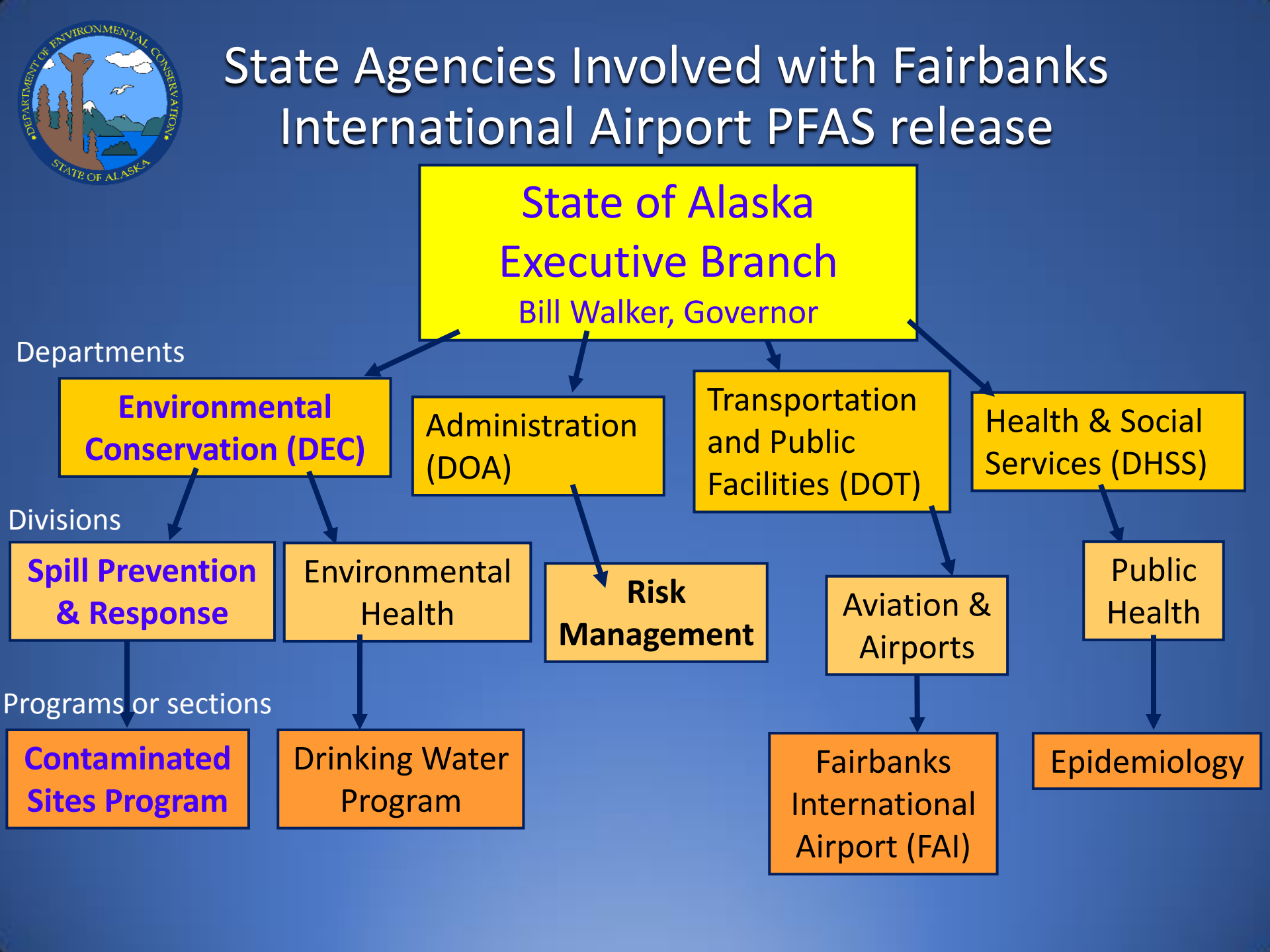
Understanding Regulatory Numbers

- Only 8 states have established regulatory numbers for PFAS compounds. (A few others have pending legislation)
- The EPA does not have an enforceable number
  - EPA has published an advisory level equivalent to 70 parts per trillion (ppt) for PFOS + PFOA (combined)
- Alaska has passed a cleanup level of 400 ppt for PFOS and 400 ppt for PFOA (separate)
- Why are these numbers different?

Understanding Regulatory Numbers

Published PFAS Number	Alaska Groundwater Cleanup Level (Nov. 2016)	EPA Lifetime Health Advisory (May 2016)
Concentration	400 ppt (PFOS) 400 ppt (PFOA)	70 ppt (PFOS +PFOA)
Application	Groundwater, including use without treatment.	Drinking Water
Scientific Basis	EPA Health Effects Study	EPA Health Effects Study
Water Intake Ratio	Based on child (0.0052 L/Kg*day)	Based on pregnant woman (0.0054 L/Kg*day)
Relative Source Contribution	Does not assume exposure through other sources	Assumes 80% of exposure from other sources

State Agencies Involved with Fairbanks International Airport PFAS release



Contaminated Sites Program

The Contaminated Sites Program protects human health and the environment by managing the cleanup of contaminated soil and groundwater in Alaska.

- **Develops regulations and guidance**
- **Provides regulatory oversight**
- **Maintains public database**

Contaminated Site Regulatory Process

A contaminated site is land and/or water contaminated with oil or hazardous chemicals due to:

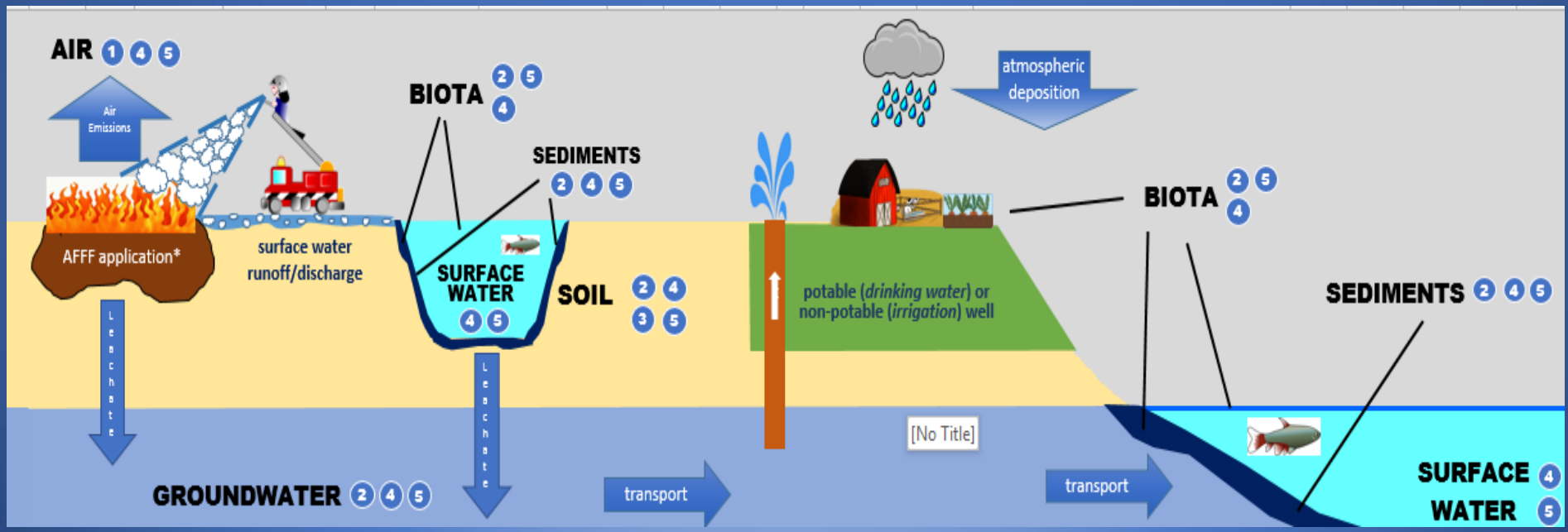
- Spills/releases
  - where initial response is not able to remove or contain 100% of contamination
- Careless handling & storage
- Improper disposal
- Practices once considered acceptable (use or disposal)

Contaminated Site Regulatory Process

Characterization

- What is it
- Where is it
- How did it get there
- Where is it going
- Who and what will it affect

- Conceptual Site Model (CSM)
- Describes source, migration, and receptors
- Revised during characterization and cleanup activities
- Final CSM should show no risk



Contaminated Site Regulatory Process

Site Discovery

- Spill occurs and is reported
- Contamination discovered
- Compounds found to be harmful

Characterization

- What is it
- Where is it
- How did it get there
- Where is it going
- Who and what will it affect

Evaluate Cleanup Options

Cleanup and Mitigation

- Interim actions (e.g., provide water)
- Long-term Solution

Site Closure

Contaminated Sites Program

Finding More Information

- **Regulatory process, site progress, technical information, data repository**
  - DEC Contaminated Sites Program
    - Home page http://dec.alaska.gov/spar/csp/index.htm
      - Links to database, map, and site summary page
    - Project Manager:
      - Robert Burgess (907)451-2153 robert.burgess@alaska.gov
- **Alternative Water source info, ongoing plans, general information**
  - Fairbanks International Airport
    - Angie Spear
    - Ashley Jaramillo
- **PFC health and safety information**
  - Alaska Department of Health and Social Services (HSS)
    - Stacey Cooper (907)269-8016 stacey.cooper@alaska.gov
- **Technical details, site progress, well sampling coordination**
  - Shannon & Wilson, Inc. (environmental consultants)
    - Marcy Nadel (907)451-0600 mdn@shanwil.com

Contaminant Transport in Groundwater

- Soluble contaminants can be transported in groundwater
- As groundwater moves, it will carry dissolved substances with it
- If an ongoing source exists, plume will expand.
- If the source is eliminated, plume will stop expanding and will attenuate over time