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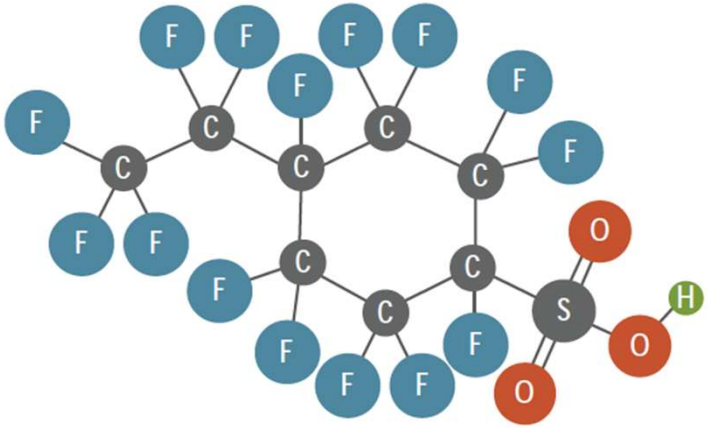
A Practical Approach to PFAS in Due Diligence - From Phase I ESAs through Remediation

Presented by Kathryn Peacock

PFAS – A Practical Guide for Environmental Due Diligence



- The EPA's PFAS Ruling
- What is PFAS and Why is a Concern?
- How is PFAS Identified in a Phase I ESA?
- PFAS Information Sources
- How is PFAS Determined to be a Risk in a Phase I ESA?
- How is PFAS Risk Categorized in a Phase I ESA?
- When are Phase II ESAs recommended in a Phase I ESA?
- Conducting Phase II ESAs
- What if I Choose to Remediate PFAS?

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Final CERCLA Hazardous Substances Designations for PFOA and PFOS

As of July 8th, 2024, the EPA issued a final rule to designate the two PFAS chemicals PFOA and PFOS as hazardous substances under CERCLA. As a result, PFAS risk is now evaluated in Phase I Environmental Site Assessments (ESAs) in the same manner as other hazardous substances.

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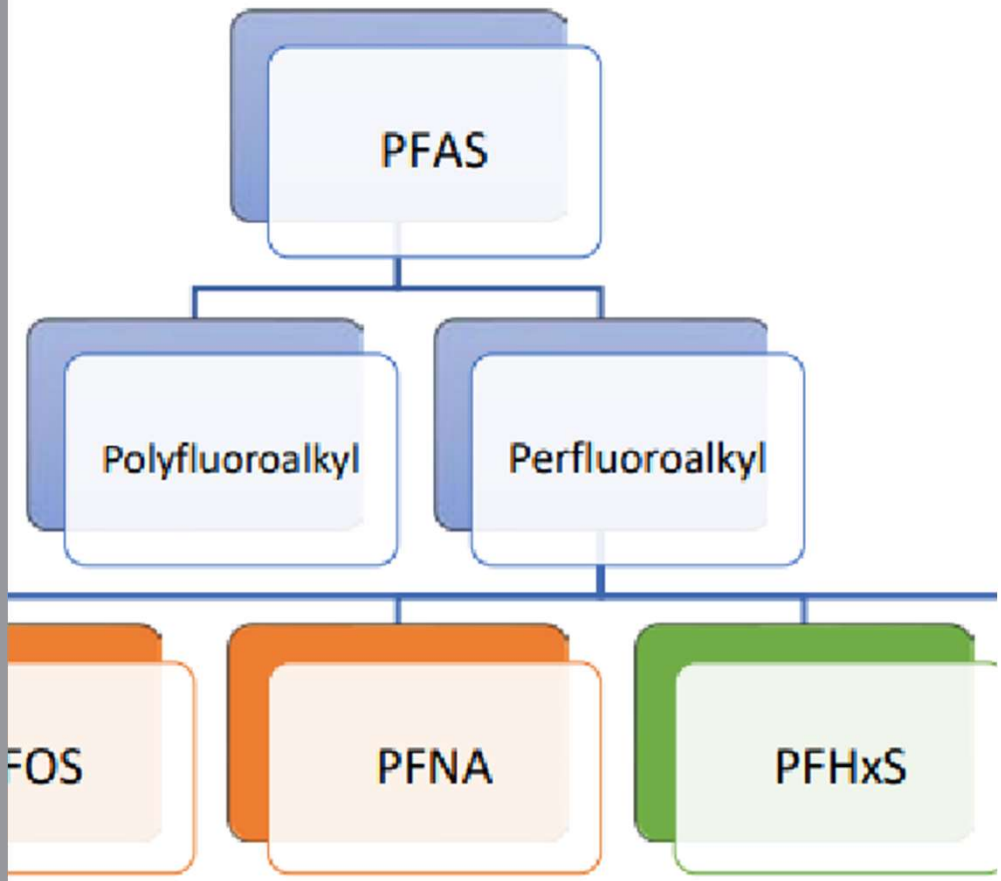

What is PFAS?

- A class of organofluorine chemicals that have been manufactured and used for decades.
- The basic structure of PFAS, includes a carbon-fluorine chain, known as the tail, and a functional group at the end of the chain, known as the head
- Tails are hydrophobic and lipophobic (water and fat repellant)
- Functional group head is polar and hydrophilic (affinity for water)
  which affects the fate and transport of PFAS
- PFAS have resistance to oil and water and withstand high temperatures, and are used in applications, including firefighting foams, food packaging and contact materials, textiles, and various industrial uses.

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What is PFAS?

- PFAS have become widely used in many manufacturing processes since the 1940s
  Present in aqueous firefighting foam (AFFF), waxes, cosmetics, food packaging, paint and coatings, petroleum, plastics, polish, soaps, waxes, fabrics, and other textiles and biosolids used in agriculture

  PFAS present serious human health risks, have a long-term persistence in the environment, and are also very mobile (i.e. they can travel long distances in the environment in air, surface water, and groundwater

  These factors contributed to the EPA's hazardous substance classification with the intention of protecting human health and the environment.

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Why Are PFAS A Concern?

- **Exposure media includes**:
  - Indoor air, ambient air, dust, and soil, as well as occupational exposure (e.g., during firefighting duties),
  - Manufacture, processing, distribution, and use of PFAS or PFAS-containing products.
  - PFAS may be present in/released from, building materials, textiles, and consumer products in residential environments.

- **Health Impacts may include:**
  - Reproductive effects such as decreased fertility or increased high blood pressure in pregnant women.
  - Developmental effects / delays in children, including low birth weight, accelerated puberty, bone variations, or behavioral changes.
  - Increased risk of some cancers, including prostate, kidney, and testicular cancers.
  - Reduced ability of the body's immune system to fight infections, including reduced vaccine response.
  - Interference with the body's natural hormones.
  - Increased cholesterol levels and/or risk of obesity.

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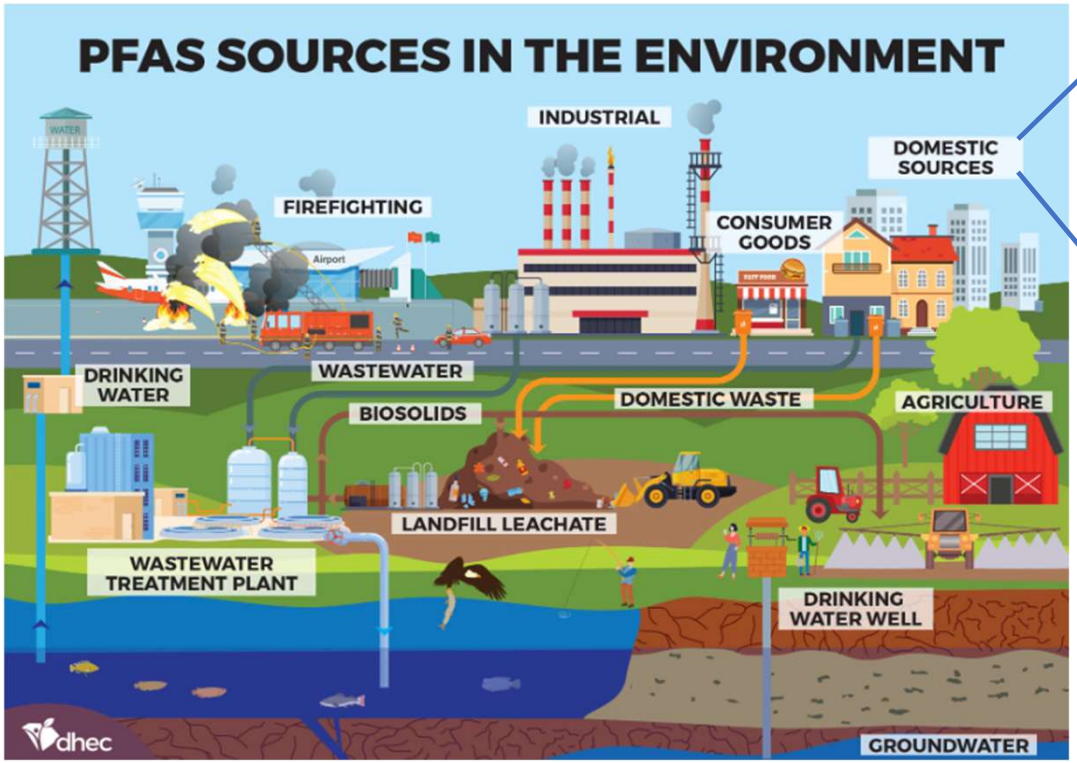
Sources of PFAS



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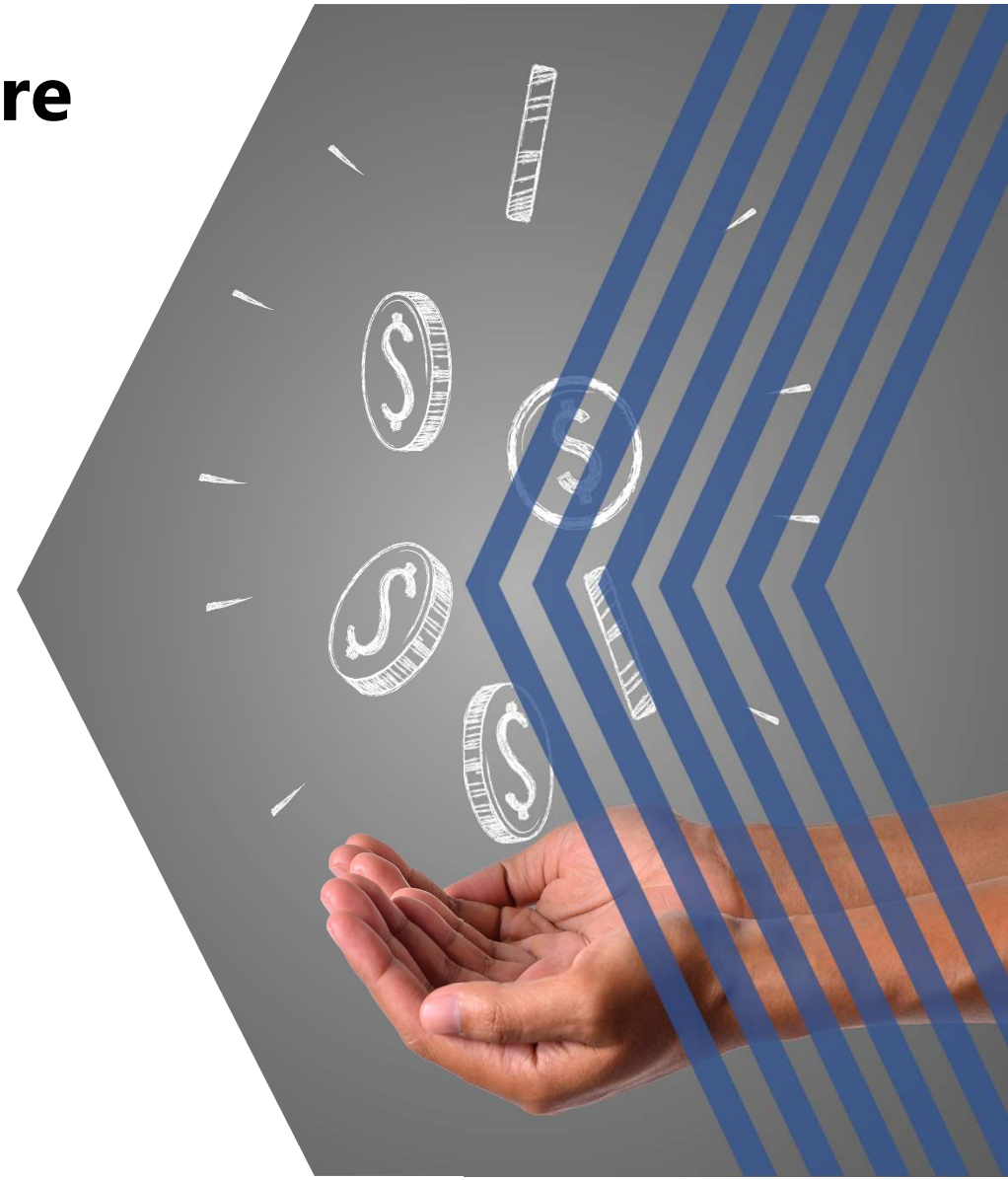
Integrating PFAS in Big Picture Goal of Environmental Due Diligence

How can environmental Due Diligence support the commercial real estate industry?

Determine risk that can impact:

- **Purchaser** - cashflow for environmental investigation (Phase II), remediation, and known or potential liabilities
- **Lender/Investor** - borrower repayment of loan, marketability of real property in the event of foreclosure, direct liabilities for lender



Phase I Environmental Site Assessment

- **Gold standard** to identify known or potential environmental conditions that may impact the subject property
- The purpose is to identify:
  - Recognized Environmental Conditions (RECs)
  - Controlled RECs (CRECs)
  - Historical RECs (HRECs)
  - **Business Environmental Risks (BERs)**
- AAI/ASTM E1527-21:
  - Provides Innocent Landowner Protection/CERCLA Liability for prospective owner / operator
  - ASTM International reviews every 5 years and approved within 8 years

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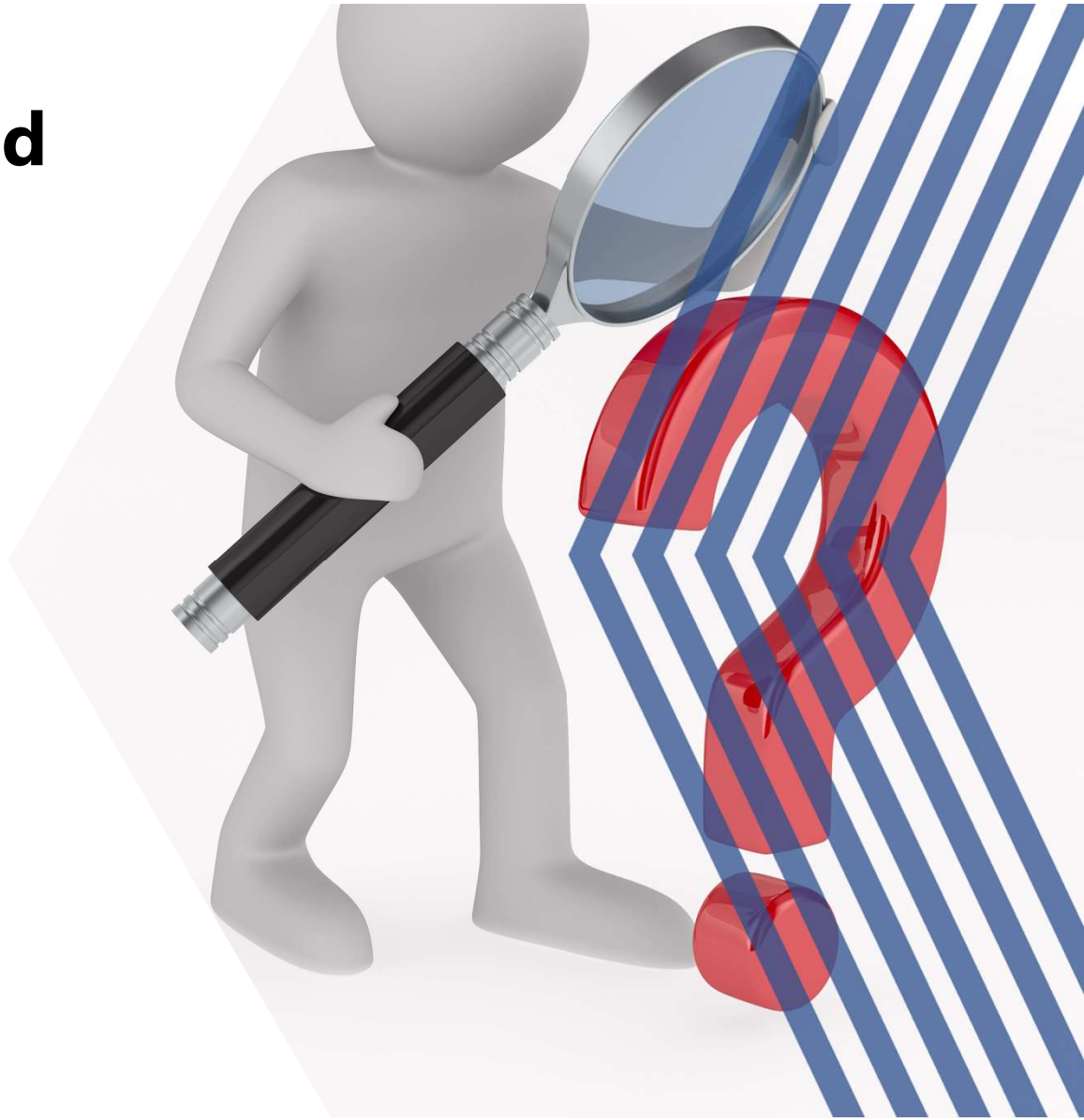
How is PFAS Identified in a Phase I ESA?

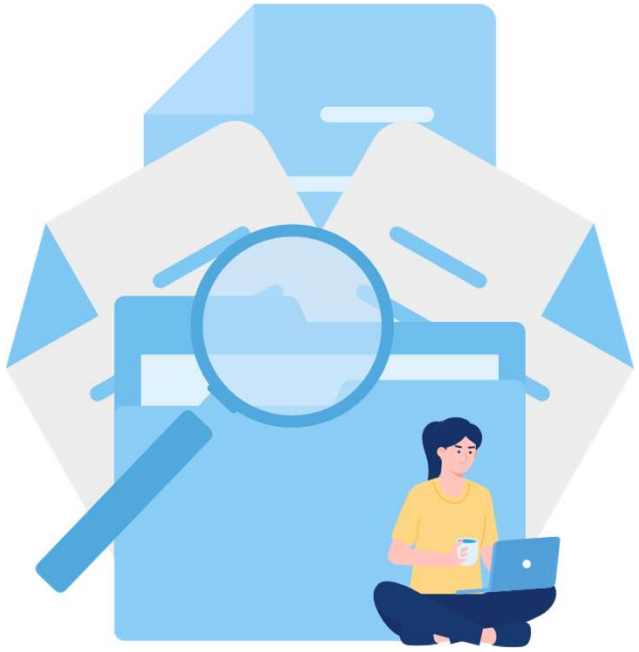
- The research requirements for assessing PFAS in a Phase I ESA are no different than how other hazardous substances are researched per ASTM E1527-21.
- Because of the unique nature of PFAS, the process may differ slightly, and additional sources may need to be researched, which may translate to additional time.



Phase I ESA / PFAS Information Sources

Pre-Site Reconnaissance

- ✓ **PFAS Red Flag Industries**
- ✓ **NAICS Codes** for Manufacturers and Industry Users
- ✓ **Records Review** *(Includes adjoining properties)*
  - Environmental Database Radius Map Report
  - Review Government Records (local, State, Federal)
- ✓ **Historical Sources**
- ✓ **Supplemental PFAS Source Information**



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PFAS Red Flag Industries

Common Red Flag Industries for PFAS	
Commercial Printing	PFAS are used in inks to create rubbing resistance.
Electronics	PFAS can be present in cable and wire coatings, process aids, circuit flame retardants, hard drive lubricants, tape coatings, and as mineral oil impurities.
Plating	PFAS are used in the electroplating process as wetting agents, mist suppression, and surfactants.
Fabric and Textiles	PFAS are applied to outdoor gear, carpets, clothing, and furniture for waterproofing and coating.
Cosmetics Manufacturers	PFAS have been found in dental floss, micro powders, shampoos, nail polish, eye makeup and denture cleaners.
Fire Protection (AFFF)	AFFF foam contains PFAS and is used for fire suppression.
Food Packaging	PFAS are used in linings for trays, ovens, grills, coatings, and on commercial and retail food packaging.
Mining	PFAS are found in surfactants used in ore flotation during mining.
Airports	AFFF foam, containing PFAS, is stored and used in large quantities for fire suppression at airports.
Carwashes	PFAS are present in water repellents, retail car waxes, and detailing chemicals used in carwashes.
Dry Cleaners	PFAS have been found in waste streams from the dry cleaning process due to PFAS containing clothing.

Identifying Likely Sources of PFAS

Industries producing and uses of PFAS

Firefighting Foams

- Introduced in the 1970s , most formulations of so-called “legacy” AFFF were PFAS-based.

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Identifying Likely Sources of PFAS

Industries producing and uses of PFAS

Machinery and equipment manufacturing

- Used as a “functional fluid” in manufacturing.

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Identifying Likely Sources of PFAS

Industries producing and uses of PFAS

Chemical Industry

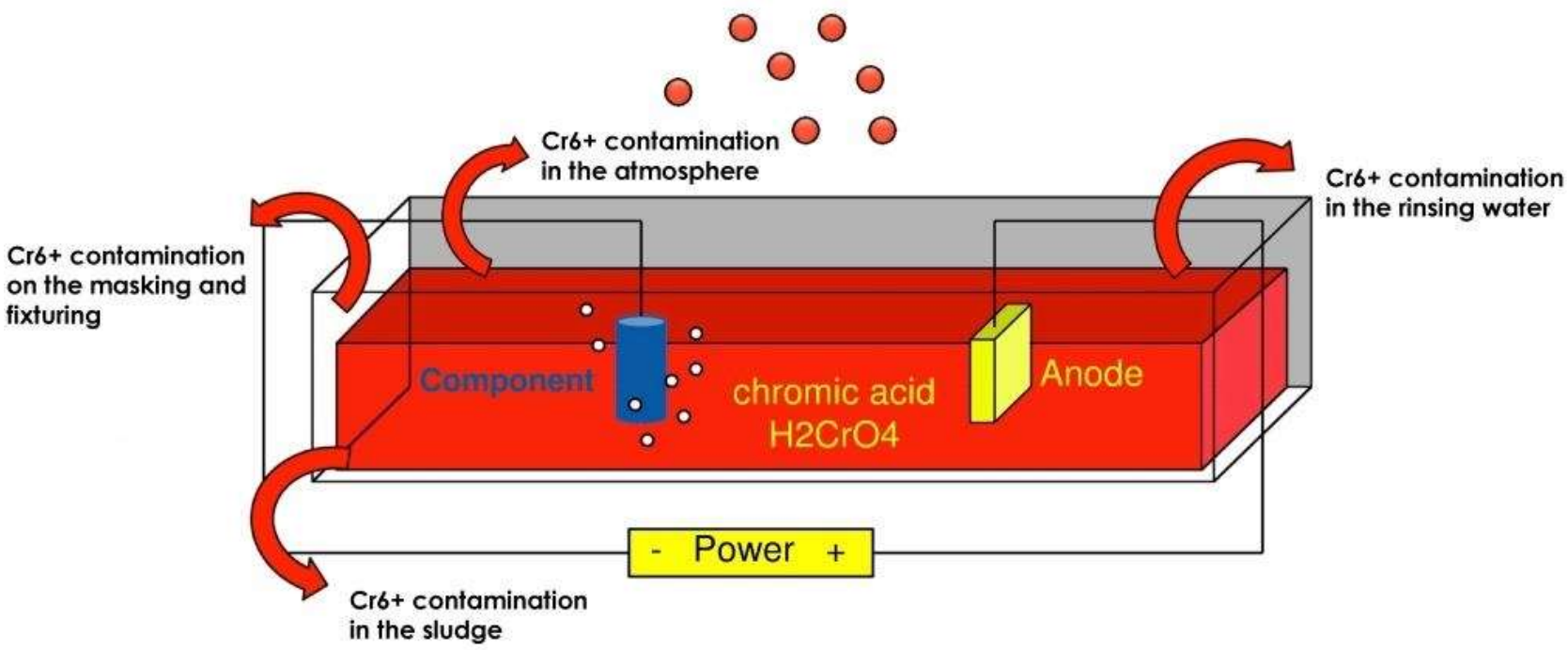
- Fluorinated surfactants aid in industrial applications as a cleaning agent, leveling agent, and antistatic agent

Identifying Likely Sources of PFAS

Industries producing and uses of PFAS

Electroplating

- PFAS surfactants to reduce inhalation exposure to hexavalent chromium [Cr(VI)], a carcinogen.



Identifying Likely Sources of PFAS

Industries producing and uses of PFAS

Electronics

- Flat panel displays, cooling fluids, cleaning solutions, lubricants, and etching solutions.
- Hydrofluorocarbon pentafluoroethane is the most widely used PFAS in the electronics industry

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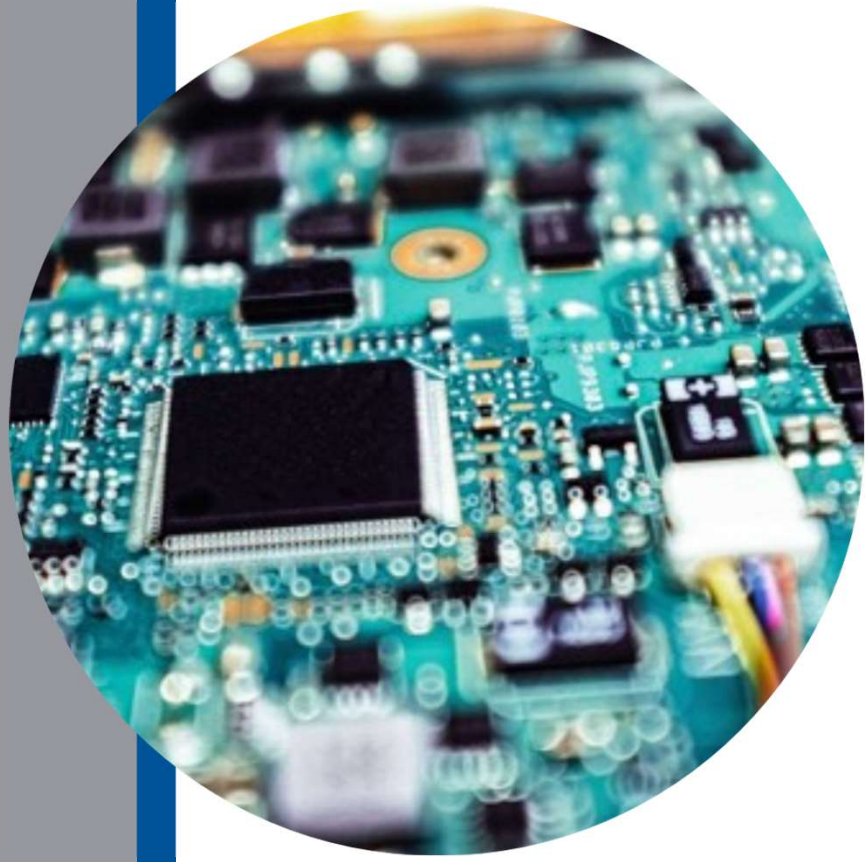
Identifying Likely Sources of PFAS

Industries producing and uses of PFAS



Semiconductor industry

- Used in lithographic patterning for producing semiconductors.

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Identifying Likely Sources of PFAS

Industries producing and uses of PFAS

Production of plastic and rubber.

- Used as mold release agents, polymer processing aids, anti-blocking agents for rubber, and as curatives in the production of plastic and rubber.

Identifying Likely Sources of PFAS

Industries producing and uses of PFAS

Cleaning products

- PFAS are used as surfactants in industrial and household cleaning products.

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Identifying Likely Sources of PFAS

Industries producing and uses of PFAS

Coatings, paints, and varnishes (CPVs)

- Coatings on wires, cables, solar panels, paint leveling and stain blocking .
- Provides durability and resistance to weathering, corrosion, flames, heat, chemicals, abrasion, and UV light.

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Identifying Likely Sources of PFAS

Food Packaging and Contact Materials

- Used for coatings in non-stick cookware, and grease-proofing agents used on food contact paper and paperboard as a water/oil barrier in food packaging/containers (food wrappers, molded fiber bowls).

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Identifying Likely Sources of PFAS

Pesticides

- Anti-foaming agents, insecticidal agents, dispersing agents, and inert additives in pesticides.

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Identifying Likely Sources of PFAS

Textile Industry

- Applied to converted fabrics and textiles such as carpets, rugs, clothing and protective apparel, shoes, and upholstery to create materials that eliminate or repel stains, dirt, oil, or water and increase durability and performance.

Identifying Likely Sources of PFAS

Recreation Products

- Use of PFAS in recreation include ski wax and bike chain lubricants.

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Identifying Likely Sources of PFAS

Cosmetics and Personal Care Products

- Moisturizers, body lotions, nail polish/enamel, cleansers, hair products, and make-up (lipsticks, mascaras, eyeshadows).
- Anticaking agents, binders, skin and hair conditioning agents.

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Identifying Likely Sources of PFAS

Pharmaceuticals and Medical Devices

- Drugs and medical devices or formulations
- Medical care: dental floss and in non-prescription drug products, such as sunscreen

How is PFAS Determined to be a Risk in a Phase I ESA?

- **Pathways:** Presence of drains, sumps, pits, or other surface and subsurface pathways through which PFAS can enter the environment.
- **Topography:** Transport of PFAS throughout the site or offsite via surface drainage.
- **Waste Discharges:** Discharges that could contain PFAS, impacting surface waters and wastewater treatment systems.
- **Air:** Emissions that could disperse PFAS.
- **Wells:** Groundwater sources used for potable water, industrial uses, and irrigation potentially impacted by PFAS.

In addition to traditional factors used to determine risk in a Phase I ESA, such as groundwater depth, groundwater gradient, and other physical setting features, the existing and future use of the property needs to be considered when assessing PFAS risk.

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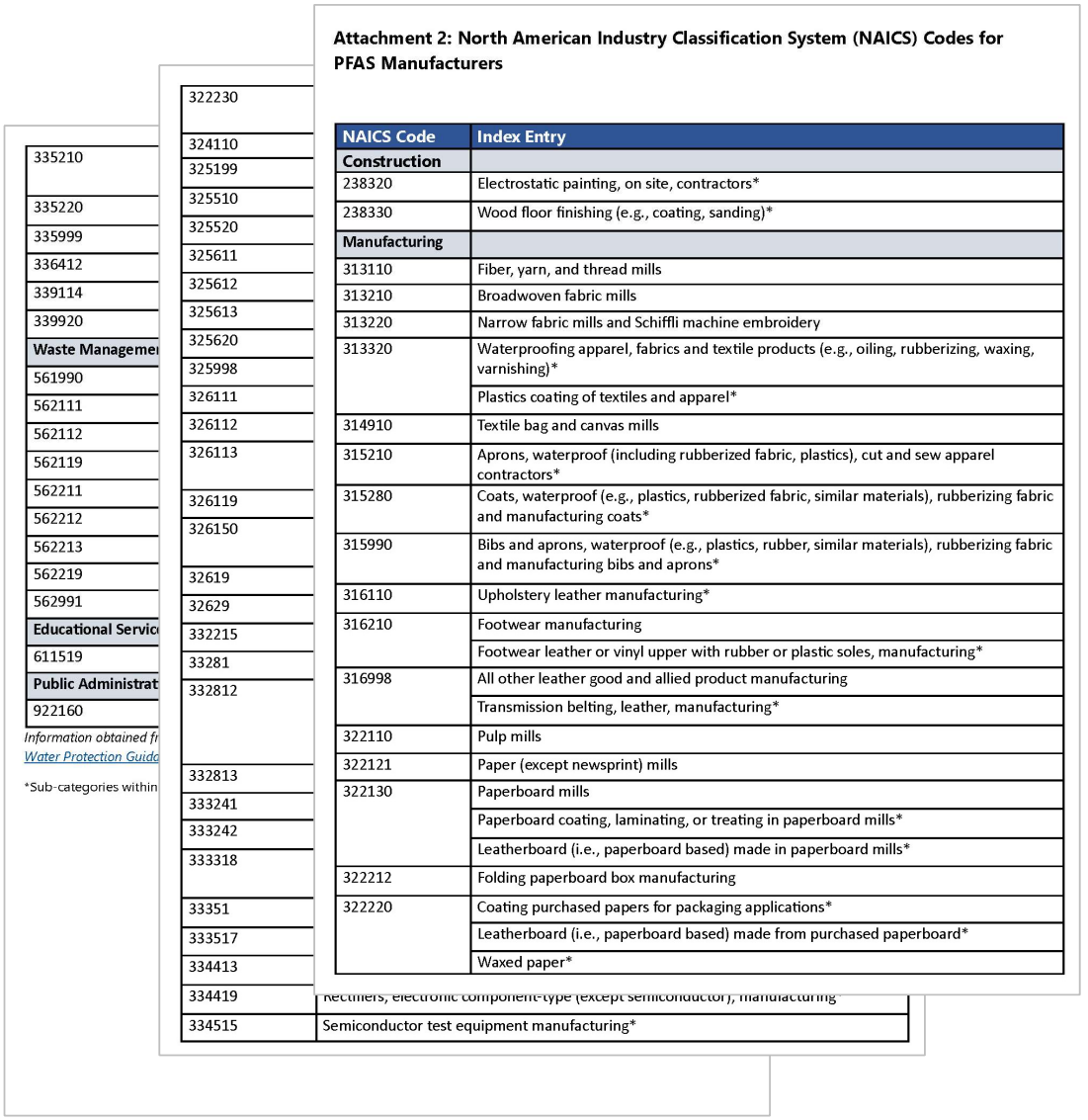
NAICS Codes for Manufacturers and Industry Users



Attachment 2: North American Industry Classification System (NAICS) Codes for PFAS Manufacturers

NAICS Code	Index Entry
Construction	
238320	Electrostatic painting, on site, contractors*
238330	Wood floor finishing (e.g., coating, sanding)*
Manufacturing	
313110	Fiber, yarn, and thread mills
313210	Broadwoven fabric mills
313220	Narrow fabric mills and Schiffli machine embroidery
313320	Waterproofing apparel, fabrics and textile products (e.g., oiling, rubberizing, waxing, varnishing)*
	Plastics coating of textiles and apparel*
314910	Textile bag and canvas mills
315210	Aprons, waterproof (including rubberized fabric, plastics), cut and sew apparel contractors*
315280	Coats, waterproof (e.g., plastics, rubberized fabric, similar materials), rubberizing fabric and manufacturing coats*
315990	Bibs and aprons, waterproof (e.g., plastics, rubber, similar materials), rubberizing fabric and manufacturing bibs and aprons*
316110	Upholstery leather manufacturing*
316210	Footwear manufacturing
	Footwear leather or vinyl upper with rubber or plastic soles, manufacturing*
316998	All other leather good and allied product manufacturing
	Transmission belting, leather, manufacturing*
322110	Pulp mills
322121	Paper (except newsprint) mills
322130	Paperboard mills
	Paperboard coating, laminating, or treating in paperboard mills*
	Leatherboard (i.e., paperboard based) made in paperboard mills*
322212	Folding paperboard box manufacturing
322220	Coating purchased papers for packaging applications*
	Leatherboard (i.e., paperboard based) made from purchased paperboard*
	Waxed paper*
334515	Semiconductor test equipment manufacturing*

Records Review: Regulatory Database

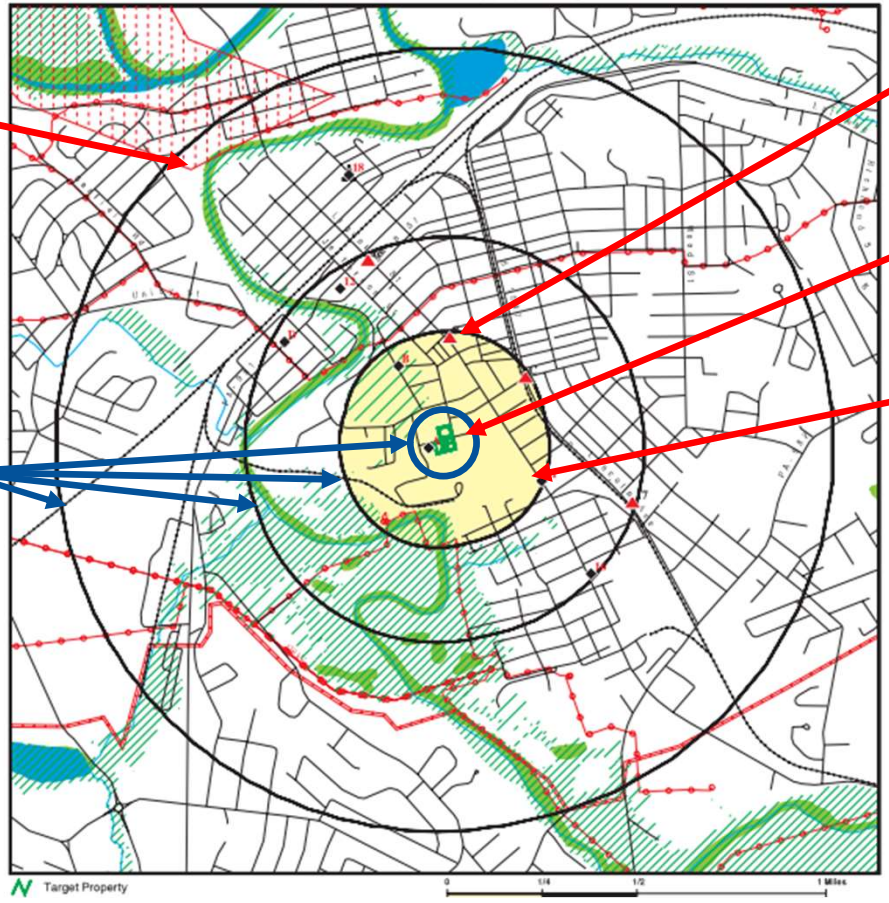
Department of Defense (DOD) Site

Fire Fighting Training Site

Subject Property

Dry Cleaner Site

Approximate Minimum Search Distance (AMSD) 0.125, 0.25, 0.50, 1 Mile



Standard Environmental Records

Federal

NPL	Y	1
PROPOSED NPL	Y	1
DELETED NPL	Y	0.5
SEMS	Y	0.5
ODI	Y	0.5
SEMS ARCHIVE	Y	0.5
CERCLIS	Y	0.5

Records Review: Regulatory Database

Database	Searched	Search Radius	Project Property	Within 0.12mi	0.125mi to 0.25mi	0.25mi to 0.50mi	0.50mi to 1.00mi	Total
TRIS	Y	PO	0	-	-	-	-	0
PFAS NPL	Y	0.5	0	0	0	0	-	0
PFAS FED SITES	Y	0.5	0	0	0	0	-	0
PFAS SSEHRI	Y	0.5	0	0	0	0	-	0
ERNS PFAS	Y	0.5	0	0	0	0	-	0
PFAS NPDES	Y	0.5	0	0	0	0	-	0
PFAS TRI	Y	0.5	0	0	0	0	-	0
PFAS WATER	Y	0.5	0	0	0	0	-	0
PFAS TSCA	Y	0.5	0	0	0	0	-	0
PFAS E-MANIFEST	Y	0.5	0	0	0	0	-	0
PFAS IND	Y	0.5	0	1	0	0	-	1

15	PFAS IND	FORMER MANSFIELD FIRE STATION	MANSFIELD MA	NE	0.09 / 462.23	3	80

Records Review: Regulatory Database

162.36 / 3	**FORMER MANSFIELD FIRE STATION**
	MANSFIELD MA
Fac Fips Code:	25005
Compliance Status:	No Violation Identified
EPA Programs:	RCRA
Federal Facility:	No
Federal Agency:	-
Fac Snc Flg:	N
AIR Flag:	N
NPDES Flag:	N
SDWIS Flag:	N
RCRAFlag:	Y
TRI Flag:	N
GHG Flag:	N
TRI IDs:	-
TRI Releases Trnsfrs:	-
TRI on Site Releases:	-
TRI off Site Trnsfrs:	-
TRI Reporter:	-
Fac Imp Water Flg:	-

This dataset is made available via the EPA PFAS Analytic Tools. The EPA dataset is based on sources that show industries that may be handling PFAS including:

- EPA's Enforcement and Compliance History Online (ECHO) records restricted to potential PFAS-handling industry sectors;
- ECHO records for Fire Training Sites identified where fire-fighting foam may have been used in training exercises;
- Airports compiled from FAA Airport Data records and Information Portal. Since July 2006, certificated Airports are required to have fire-fighting foam which are fluorinated (AFFF)

This dataset does not indicate that PFAS are manufactured, processed / used / released by the facility.

Facilities are listed based on their industrial profile (unconfirmed by the EPA). Keyword searches in ECHO for Fire Training sites may misidentify some facilities and is not be considered an exhaustive list of fire training facilities in the U.S.

State Regulatory Status Table

NOTES:

***** = Includes regulations that are proposed, considered draft, or recommended, but not yet finalized and confirmed to be in use by the applicable state.

GW = Groundwater

DW = Drinking Water

SW = Surface Water

Table contains information derived from current online sources as of 1-20-2023, including ITRC, various state websites, and the US EPA. The information may not constitute definitive PFAS regulatory conditions.

States w/ Water / Soil Regulations or Guidelines	Surface Water Regulations	Groundwater Regulations	Drinking Water Regulations	Water Guidelines	Soil Regulations &/or Guidelines
Alaska		X		X - DW/GW/SW	X
California			X	X-DW	
Colorado	X	X			
Connecticut				X - DW/GW	X
Delaware				X - GW	X
Florida	X*	X*			X
Hawaii		X*			X
Illinois		X*	X*		
Indiana		X			X
Iowa		X			X
Maine		X*	X*		X
Maryland				X - DW	
Massachusetts		X	X*		X
Michigan	X	X	X	X - DW	X
Minnesota		X	X	X - DW/GW/SW	X
Montana		X			
Nebraska					X
Nevada				X - DW	X
New Hampshire		X	X		X
New Jersey		X	X	X - GW	X
New Mexico				X - DW	X
New York			X		X
North Carolina		X		X - DW	X
Ohio			X*		
Oregon	X			X -DW	
Pennsylvania				X - GW	X
Rhode Island		X	X		
Texas		X			X
Vermont		X	X		X
Washington		X	X		X
Wisconsin	X*		X*		X

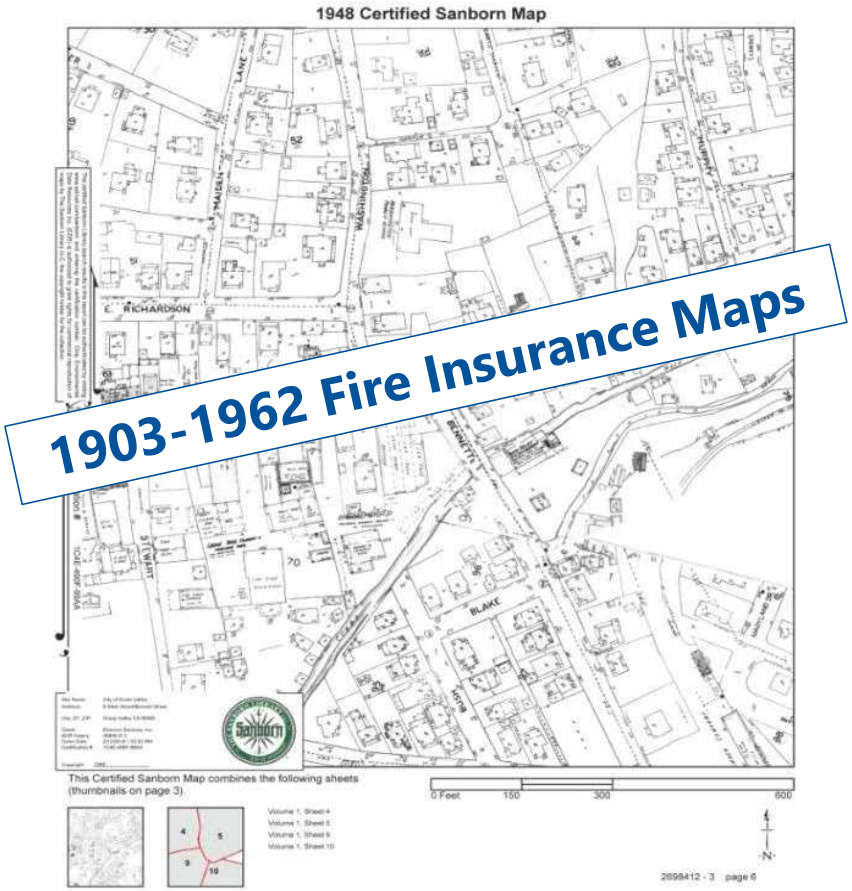
States with <u>No</u> Regulations or Guidelines: Alabama, Arizona, Arkansas, Georgia, Idaho, Kansas, Kentucky, Iowa, Mississippi, Missouri, North Dakota, Oklahoma, South Carolina, South Dakota, Tennessee, Utah, West Virginia, Wyoming

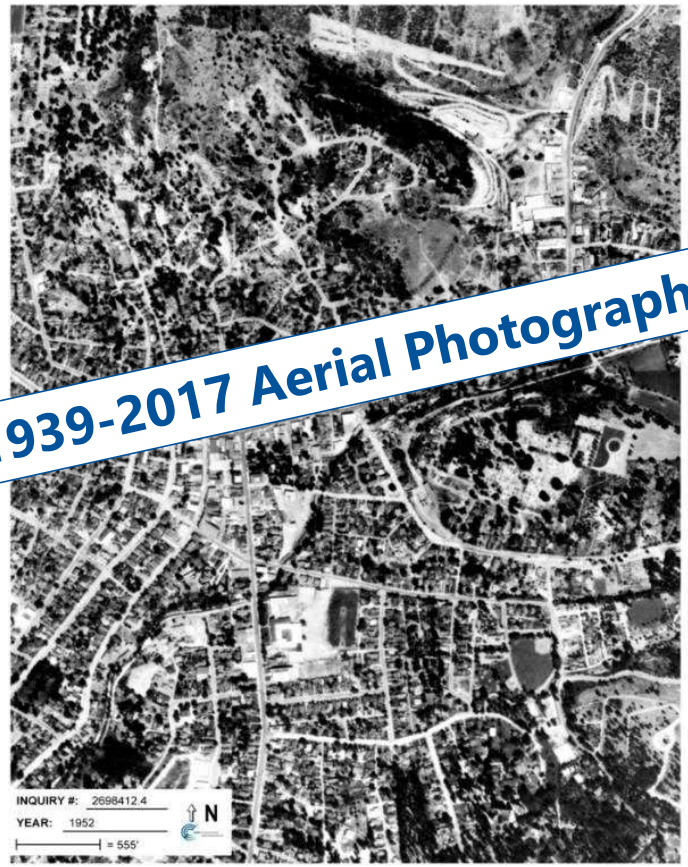
Digesting the Dynamic Challenges

- Is subject property a known or likely Source of PFAS?
- Are there adjoining or surrounding area PFAS sites known or likely to impact the subject property?
- Translating all the information to conclude if likely or known PFAS at the subject property are a:

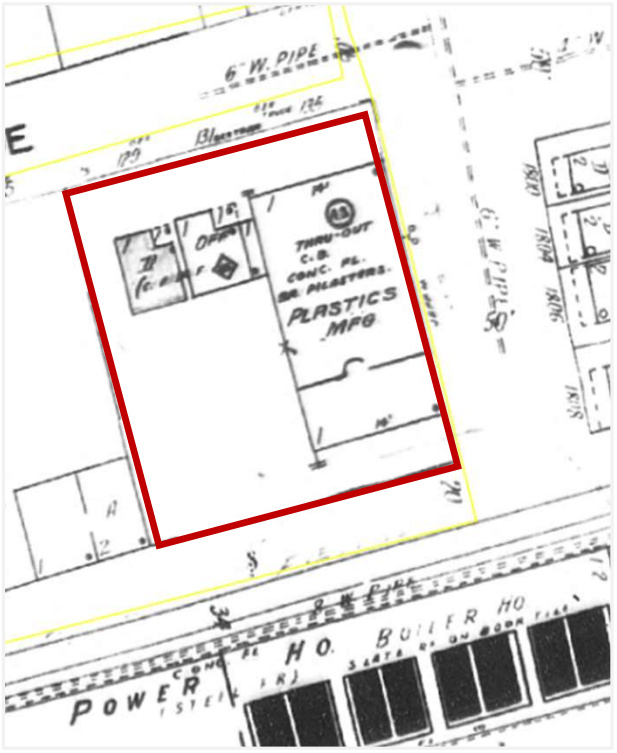
  - **REC**
    - Known or likely presence
    - Extent and nature not identified
    - Not addressed to prevent unacceptable exposure in accordance with regulatory criteria (State and Federal)
  - **CREC**
    - Known presence above cleanup / screening levels
    - Engineered or Use controls implemented in accordance with regulatory criteria
  - **HREC**
    - Has the known presence above unrestricted / residential use criteria (State and Federal) been remediated to unrestricted and residential use criteria
  - **BER:**
    - Other PFAS substances not designated as hazardous (other than PFOA and PFAS)
    - Likelihood for future PFAS designated as hazardous substances

Historical Records: Fire Insurance Maps & Aerials

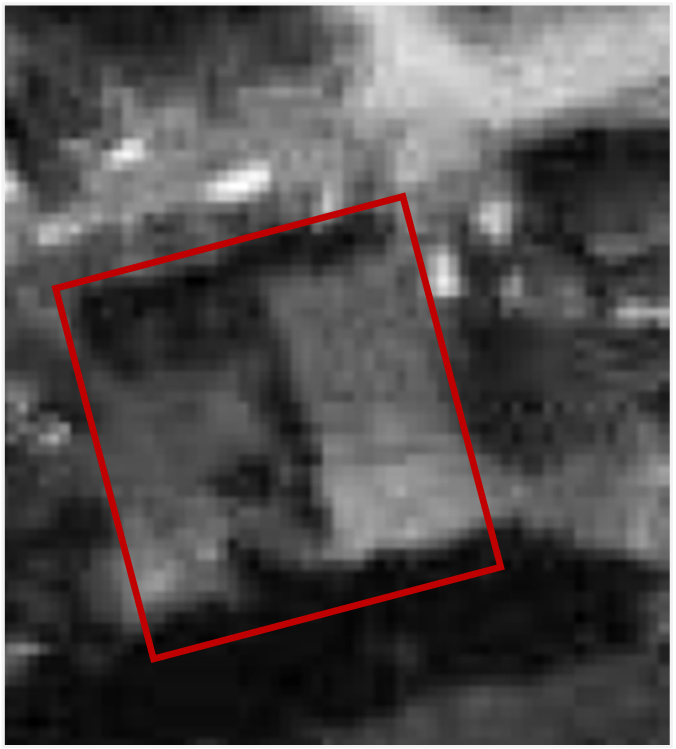




Historical Records: Fire Insurance Maps & Aerials



1962 Fire Insurance Map



1955 Aerial Photograph

City Directory Listings

City Directory listings are reverse phone records/listings which were collected mainly for marketing purposes in the past

Subject Property Address:

123 Gertrude Street

1992-2005	Dumpy Plastics
2010	Dumpy Plastics
	Spilling Electronics
2014	Dumpy Plastics
2017	Dumpy Plastics
	PFAS Gallery

GERTRUDE ST 1992

112	MURPHY, JOHN F
116	HOWELL, RONALD R
118	ANGELO, THOMAS J
120	MELAGO, WILLIAM J
135	Dumpy Plastics
206	HELMAN, KAYE
209	CONEFF, JOHN

GERTRUDE ST 2010

107	LATROBE RECYCLING INC
	LEHIGH SPECIALTY MELTING INC
112	HISSEM, BRADLEY
116	HOWELL, RONALD R
118	ANGELO, THOMAS
120	MELAGO, MAFALDA T
135	Spilling Electronics
	Dumpy Plastics
204	MORROW, JENNIFER R
206	MMENANNO, MARISSA

Review Government Records: File Reviews

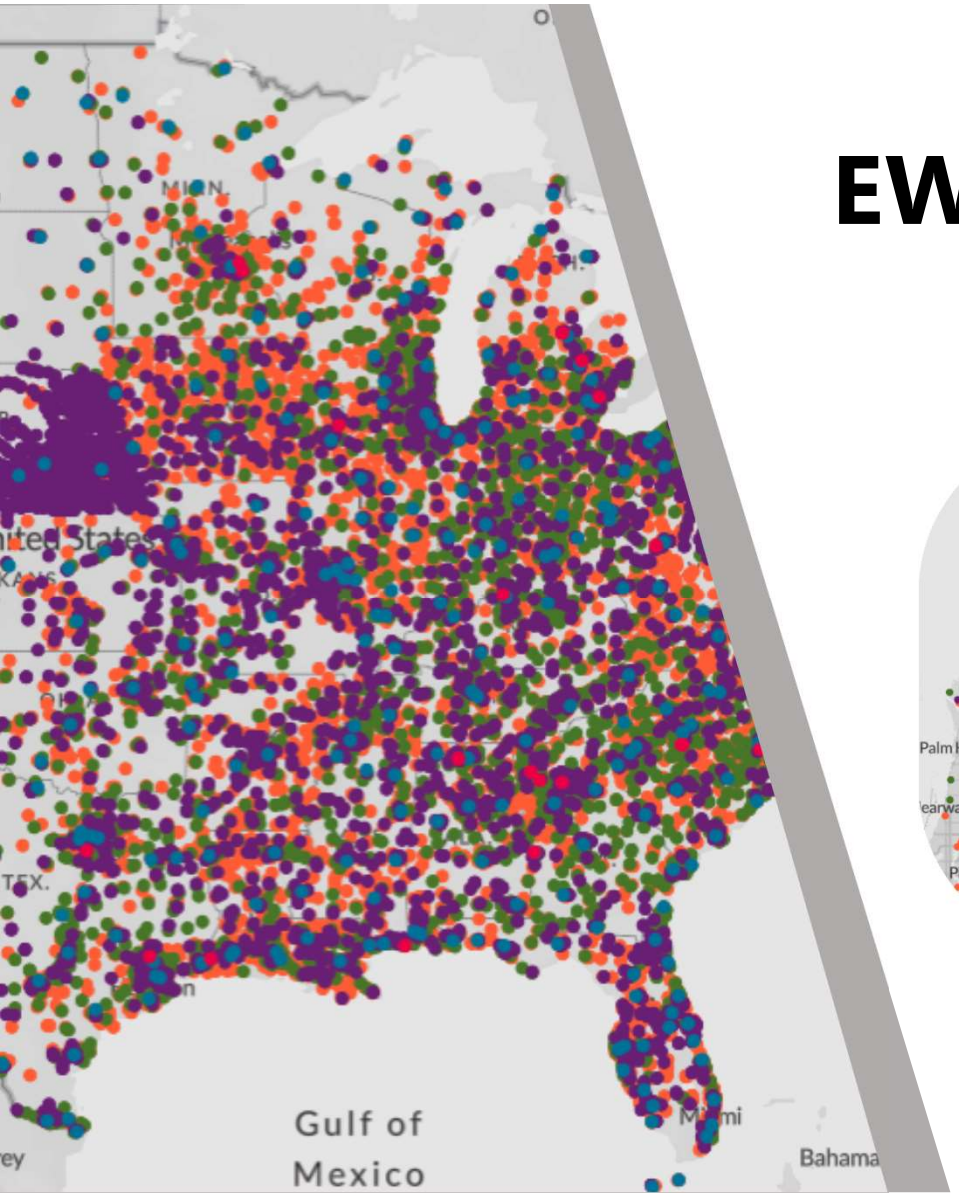
Supplemental Records Review: PFAS Specific

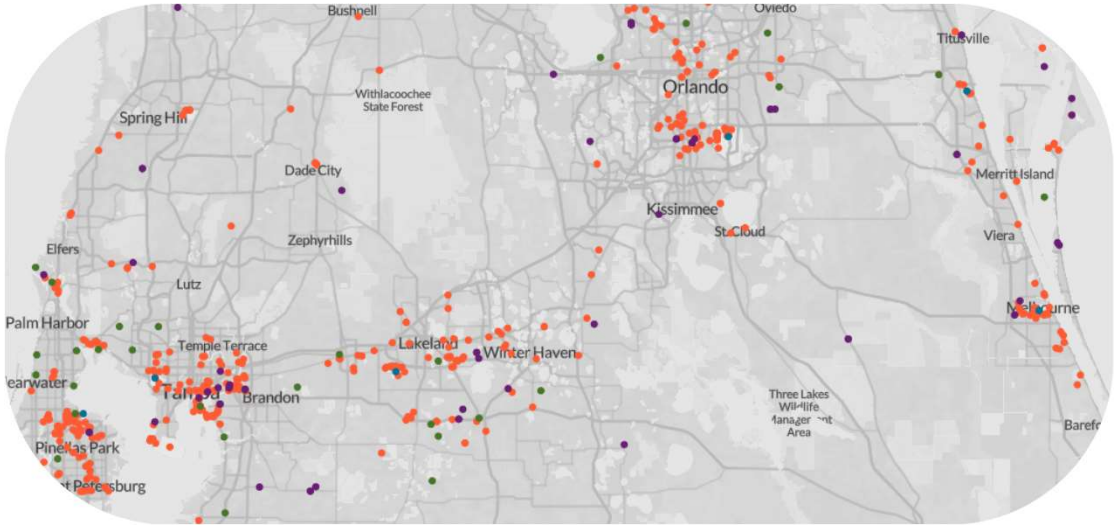
Environmental Working Group (EWG):

- All Sites: https://www.ewg.org/interactive-maps/pfas_contamination/map/
  - PFAS Identified in Drinking Water
  - Suspected Industrial Discharges (41,828 sites)
    - Known Users (60 broad categories)
    - Suspected Users
    - Airports previously required to use AFFF
    - Landfills and waste disposal facilities
    - Sewage and waste treatment plants
  - Military Sites (>700 sites)
  - Confirmed PFAS Contamination (5,021 sites)

- EPA State Resources: https://www.epa.gov/pfas/us-state-resources-about-pfas
  - Action being taken in 21 states
  - Identified state site

EWG Suspected Industrial Discharge Sites





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Sources of PFAS Contamination

During Site Reconnaissance Identify:

- Interview Information
- Pathways to the subsurface include drains, sumps, oil-water separators
- Other evidence of a release… Monitoring wells!
- Illegal Dumping
- Poor housekeeping practices

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ASTM E1527-21 Phase I ESA Terminology:

- Recognized Environmental Condition **(REC)**
- Controlled Recognized Environmental Condition **(CREC)**
- Historical Recognized Environmental Condition **(HREC)**
- Business Environmental Risk **(BER)**

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How is PFAS Risk Categorized in a Phase I ESA?

PFAS can be categorized as a Recognized Environmental Condition (REC):

- At this time, only two PFAS constituents, perfluorooctane sulfonic acid (PFOS), and their salts and isomers, and perfluorooctanoic acid (PFOA), have been classified as hazardous substances.

- The science of and regulatory approach to PFAS is constantly evolving and should be monitored for future updates. It is very likely that additional PFAS constituents will be classified as hazardous substances in the future.

PFAS can be categorized as a Business Environmental Risk (BER):

- When there is a known release of PFAS and results of a Phase II investigation do not identify PFOA and PFAS then the other PFAS forms are considered a BER as "emerging contaminants" that in the future may be classified as hazardous substances. There are may other circumstances where a BER is applicable.

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The Dynamic & Ongoing Challenges

Screening Levels:

- EPA has established **health risk levels for PFOS and PFOA in drinking water** and no other media (some states do have standards for soil and air).
- The presence of PFOS and PFOA in media, other than water, has no established Federal enforceable screening levels; however, the EPA has **established soil regional screening levels** (RSLs) based on EPA toxicity data for the most commonly used PFAS that includes PFOS and PFOA.

Are the RSLs an option to determine if remediation, engineered controls, or use restrictions are an option with appropriate integration of state requirements (if any)?

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The Dynamic and Ongoing Challenges

- While **PFOA** and **PFOS** are the **most widely used PFAS**, other PFAS chemicals have adverse health and environmental impacts. **Additional PFAS are likely to be designated as hazardous substances** based on future studies.

- Because consideration of PFAS in prior due diligence of existing CRE holdings or investments was not required, the new rule will likely result in:
  - ✓ Many **discoveries of properties** that currently or historically were a source of PFAS or impacted from other sites
  - ✓ An **increase of cost to comply** with more stringent sampling and investigations to address associated cleanup/remediation, if applicable.
  - ✓ An **increase in liability** lawsuits and claims.

- Because consideration of PFAS as a hazardous substance in due diligence (after the effective date of the "Rule") is limited to PFOA and PFAS, the new rule will likely result in…

When Regulatory Closure Results in No Further Action Letters

SCAN ME

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- If a contaminated site has achieved regulatory closure, typically the regulating body will issue a **"No Further Action"** (NFA) or a closure letter
  - Be wary of NFAs
    - **No states issue NFA letters that conform to ASTM terminology** (e.g.: REC, CREC, HREC, No REC)

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When are Phase II ESAs Recommended in a Phase I ESA?

The decision to conduct a Phase II ESA for is highly dependent on specific factors such as:

- The presence of a drinking water well that could expose occupants to PFAS
- The specific state regulations, which could be more stringent than the EPA's
- Future use of the site including planned development that act as an exposure pathway through soil or add significant costs related to PFAS impacted soil
- Area-wide PFAS contamination may only require site-specific controls

Each site should be considered individually taking the above factors, and other deal specifics into account. There is not a one size fits all solution when it comes to PFAS Phase II ESAs.

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Federal Requirements

- **National Primary Drinking Water Regulation (NPDWR) for six PFAS including:**
  1. Perfluorooctanoic Acid **(PFOA)**
  2. Perfluorooctane Sulfonic Acid **(PFOS)**
  3. Perfluorononanoic Acid **(PFNA)**
  4. Perfluorohexane Sulfonic Acid **(PFHxS)**
  5. Perfluorobutane Sulfonic Acid **(PFBS)**
  6. Hexafluoropropylene Oxide Dimer Acid **(HFPO-DA**, **GenX Chemicals)**,

- **Establish Maximum Contaminant Levels & Goals (MCLG)**

- **Public water system requirements**:
  - Monitor for these PFAS
  - Notify the public of the levels of these PFAS
  - Reduce the levels of these PFAS in drinking water if they exceed the proposed standards.

- **Hazard Index is the cumulative impact of multiple PFAS**

Compound	Proposed MCLG	Proposed MCL (enforceable levels)
PFOA	Zero	4.0 parts per trillion (also expressed as ng/L)
PFOS	Zero	4.0 ppt
PFNA	1.0 (unitless) Hazard Index	1.0 (unitless) Hazard Index
PFHxS		
PFBS		
HFPO-DA (commonly referred to as GenX Chemicals)		

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Phase II ESA Considerations

Cost and Timing: Phase II ESAs for PFAS are generally more expensive and time-consuming. This is due to the longer analysis time and high cost per sample for PFAS lab tests. Although there are some methods recently approved that take less time, they are not yet widely used.

Vapor Intrusion Considerations: The science and technology around PFAS and vapor intrusion is still evolving. Currently, vapor intrusion assessments are not standard practice. Some research suggests that certain forms of PFAS are volatile; however, lab analysis technology and regulatory screening level standards are still in development. As the regulatory environment and analysis methods continue to evolve, the vapor intrusion pathway may become a consideration in the future.

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Phase II ESA Considerations Continued….

Sampling Techniques: Field sampling techniques for PFAS are unique and require additional measures to prevent cross-contamination, which can occur if the sampler's own PFAS-containing items, such as personal hygiene products, water-resistant clothing, fast food wrappers, and/or cosmetics, come into contact with the samples.

Regulations: In April 2024, the EPA finalized the National Primary Drinking Water Regulation (NPDWR) for six PFAS chemicals, which establishes Maximum Contaminant Levels (MCLs) for safe drinking water. In the absence of state-specific regulations, these MCLs often serve as the default regulatory screening levels for Phase II ESAs, even if groundwater is not used for potable use. Note that some states have more conservative MCLs which would take precedence over the EPA's standards.

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Average Cost of a Phase II ESA with PFAS

Property Type	Phase II Cost
All Sites 2024 (not with PFAS)	$12,785
Airfields	$21,477
Warehouses (with Manufacturing)	$62,779
Car Washes	$17,846
Dry Cleaners	$ 25,145

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What if I Choose to Remediate PFAS?

If a Phase II ESA identifies contamination above the EPAs regulatory action levels, there are some options that can help you move forward with your deal including:

Evolving Remediation Technology: Due to its inherent chemical stability, PFAS is resistant to many traditional remediation technologies, such as chemical oxidation/reduction or bioremediation, that are normally used for other common contaminants. This makes "old school" methods like dig-and-haul for soil and pump-and-treat for groundwater the most obvious cleanup options, though both can be quite expensive. More sophisticated remediation technologies—such as thermal treatment, injection of carbon substrate materials, and supercritical water oxidation—are already on the market and proven to be effective. However, these technologies are often more expensive, time-consuming, and challenging to implement compared to remediation for other contaminants like volatile organic compounds or petroleum hydrocarbons. Of course, remediation technology is evolving right alongside regulations. The good news is that these PFAS remediation technologies will generally also remediate other common co-contaminants.

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What if I Choose to Remediate PFAS?

Monitoring as a Mitigation Measure: Since PFAS remediation can be both expensive and lengthy due to the current state of remediation technologies and uncertainties with regulatory closure criteria, alternative options may be considered when PFAS is present at a property. One such option is longer-term monitoring of sites with PFAS-impacted groundwater. While full remediation can be costly, monitoring a PFAS groundwater plume to ensure it does not migrate toward water bodies or potable supply wells, along with some limited groundwater injection for transport control, can be an option when performed in conjunction with regulatory agency oversight. Although this approach is not true remediation, it can be considered as part of its feasibility analysis.

Wastewater Effluent: Above-ground technologies for managing wastewater streams, treating groundwater as part of a pump-and-treat remediation system, and/or treating private water supplies are well-established. These technologies typically use carbon or other absorptive/adsorptive media to remove PFAS from the waste stream. While effective, they still include disposal costs for the PFAS-impacted waste media, often resulting in significant disposal costs. These methods are typically utilized at sites such as plating facilities, airports, drycleaners and laundries, and sites that use or manufacture PFAS.

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What if I Choose to Remediate PFAS?

Remedial Cost Estimating: Because of PFAS' unique chemical makeup, addressing PFAS as a contaminant cannot be a simple "add-on" to proposed or existing remediation approaches used for other contaminants, such as chlorinated solvents or petroleum hydrocarbons which are commonly found at dry cleaners, gas stations, or historical industrial sites. When PFAS is present as a contaminant, it will drive the overall remediation strategy and associated cleanup costs. Due to the rapidly evolving regulatory environment and uncertainty about reaching regulatory closure for PFAS sites, industry professionals can expect a higher level of uncertainty and wider ranges within remedial cost estimates (RCEs).

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Additional Resources

November 19, 2024

White Papers

A Practical Guide to PFAS

A Practical Guide to PFAS: From Phase I ESAs to Remediation Following the EPA's 2024 ruling designating PFOA and PFOS as hazardous substances under CERCLA, managing PFAS risks in environmental [...]

Due Diligence, Industrial, PFAS, Vapor Intrusion

August 28, 2024

Articles

How the New PFAS Ruling Impacts CRE Transactions

Recent EPA Ruling About PFAS Has Ramifications for Buyers of Commercial Real Estate. Learn How PFAS Risk Is Assessed and Managed During Acquisition. By By Kathryn Peacock, Steven Luzkow, & [...]

PFAS

June 27, 2024

Articles

PFAS and Real Estate FAQs

What are PFAS? PFAS, or per- and polyfluoroalkyl substances, are man-made chemicals widely used in various industrial applications and consumer products. Why are PFAS a concern? PFAS are forever chemicals that may also pose serious health risks.

PFAS

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Questions?

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