



AFFF: Status of Use and Transition Path Forward to Fluorine-free Foams

NEWMOA: The Science of PFAS Conference
April 2022

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Global Emerging Contaminants Program Manager



Agenda

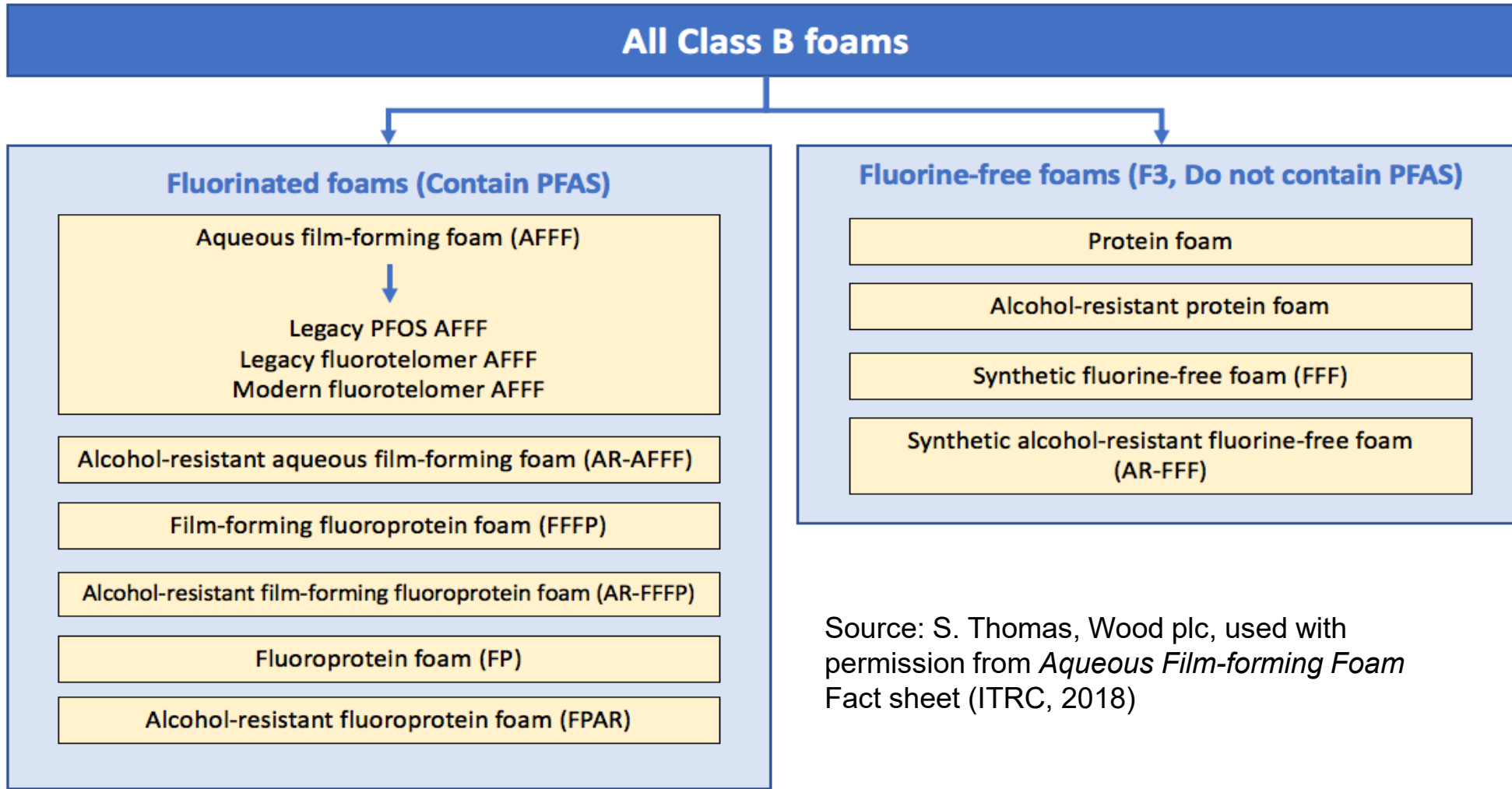
- ✓ Overview of the issue
- ✓ AFFF Status and Update
- ✓ Fluorine-Free Alternatives
- ✓ Conclusion and Considerations



"I'm gonna foam my runway!"

Overview of the Issue

Aqueous Film-Forming Foam (AFFF)



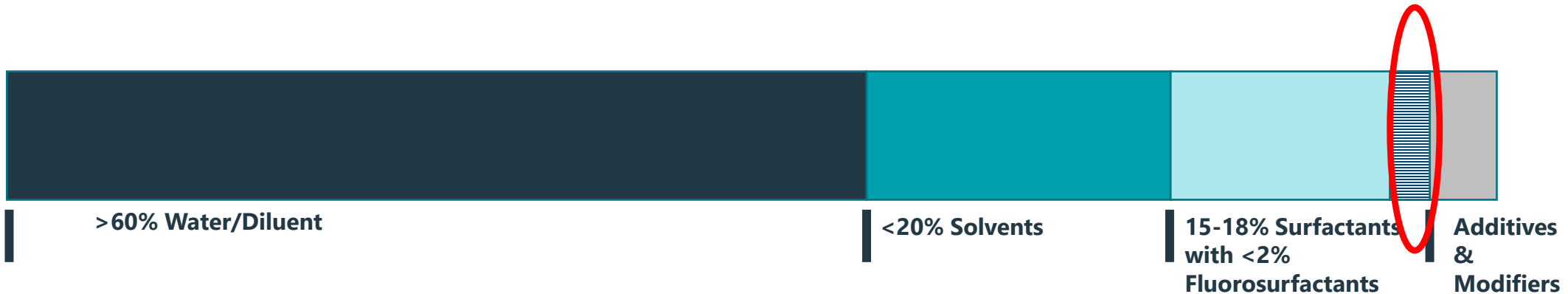
CLASS B Foams

- ✓ Used to fight fires involving flammable and combustible liquids and gases; petroleum greases, tars, oils and gasoline; and solvents and alcohols

Source: S. Thomas, Wood plc, used with permission from *Aqueous Film-forming Foam* Fact sheet (ITRC, 2018)

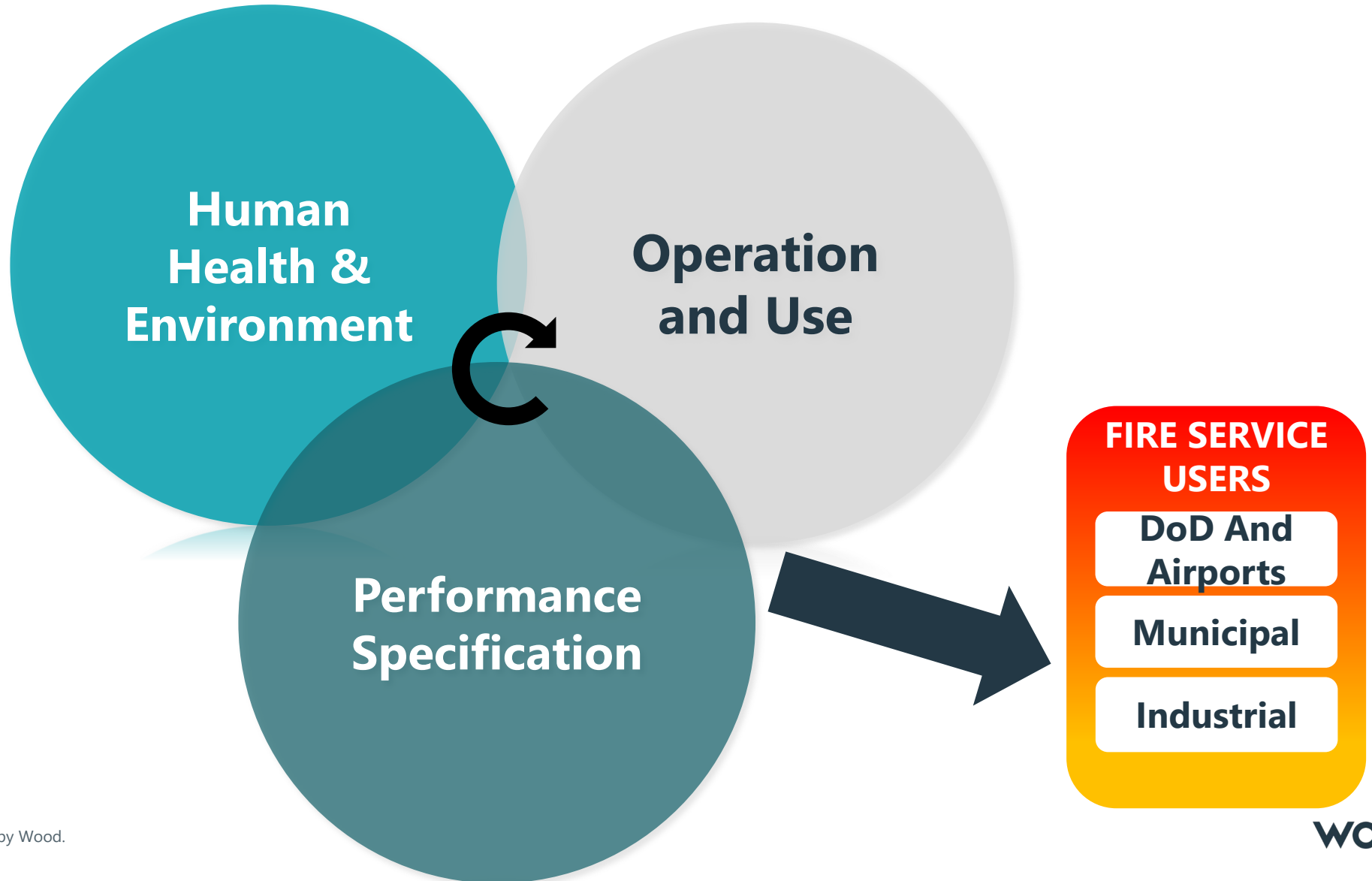
Typical Composition of AFFF

- AFFF products contain other surfactants, solvents, additives
- ✓ 3% AFFF concentrate contains:
 - More than 60% water/diluent
 - Up to 20% is solvents
 - As much as 18% is surfactants ***of which less than 2% is fluorosurfactants.***



Source: S. Thomas, Wood, PLC. Adapted from Chapter 1 by Stephen H. Korzeniowski, Robert C. Buck et al., Book by Kempisty, Xing, and Racz 2018

The issue is complex

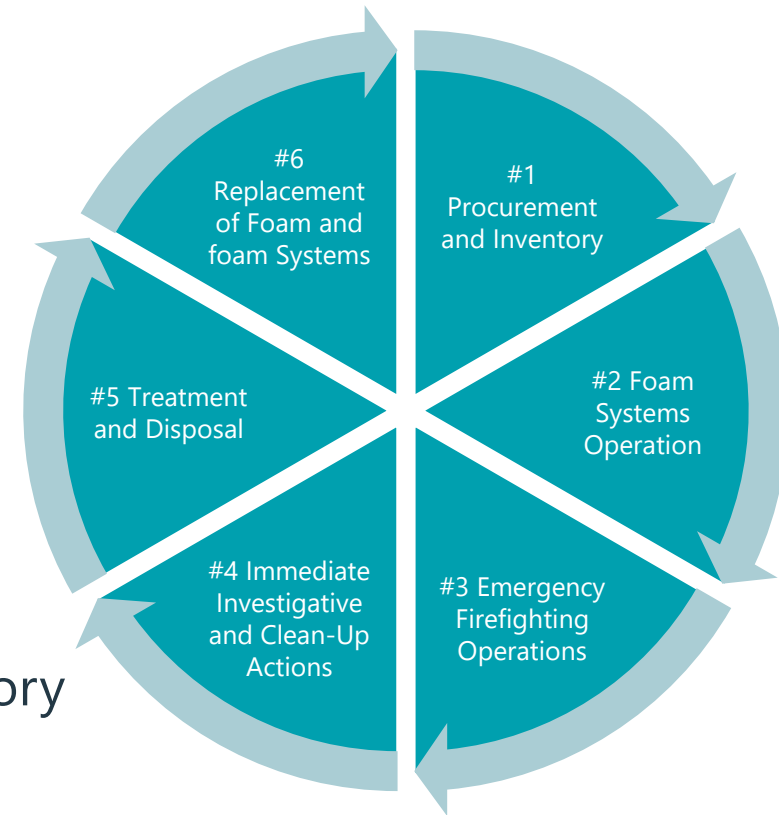


AFFF Status and Update

AFFF –Status and Update



Life cycle of Foam Use



Source: S. Thomas, Wood plc, used with permission from ITRC PFAS Technical and Regulatory Guidance Document (ITRC, 2020 April)

Human
Health &
Environment

✓ ITRC Update and activities

(<https://pfas-1.itrcweb.org/>)

✓ December 2021

- Case Study Table for transition
- Foam inventory and Characteristics
- Source Identification Analysis
- Destruction and Disposal Options

✓ Planned for 2022

- New regulatory tracking table
- Update Case Study and Foam Inventory tables
- Update on Destruction and Disposal (EPA 9/23)

AFFF –Status and Activity

Representative contributors:

- ✓ **Firefighter Cancer Cohort Study- funded by FEMA. Sub-study pertaining to AFFF and PFAS**

(<https://www.ffccs.org/pfas>)


- ✓ PFAS exposures in the fire service, potential sources and health effects
- ✓ Initiated in 2016, plan through 2022
- ✓ First publication- October 2021
 - <https://pubmed.ncbi.nlm.nih.gov/34670402/>



Human
Health &
Environment

AFFF –Status and Activity

- ✓ **NFPA Research Foundation** Fire Fighting Foam Road Map <https://www.nfpa.org/News-and-Research/Resources/Fire-Protection-Research-Foundation/Current-projects/Firefighting-Foams-Fire-Service-Roadmap>
- ✓ Collaboration across fire user communities
- ✓ Develop BMPs
- ✓ Summarize trends in foam applications
- ✓ Identify factors that influence performance
- ✓ Report currently in draft



**Operation
and Use**



RESEARCH FOUNDATION
RESEARCH FOR THE NFPA MISSION

AFFF –Status and Activity

✓ DoD Inventory of Fixed and Mobile Systems

Inventory of all land-based systems using AFFF	Mobile Systems (trucks, etc.)	3,087
	Fixed Systems (hangars, etc.)	1,578
Inventory of foam concentrate	In Service	2,500,000 gallons
	Reserve stock	500,000 gallons

- ✓ Estimates for the inventory of civilian airports under FAA is estimated to be three times larger
- ✓ Other considerations- Estimates in Municipal and Industrial inventory??



Reference: Briefing to Congress on AFFF Replacements, October 2021, Secretary of Defense

AFFF –Status and Activity



Performance
Specification

- ✓ **Key Dates to remember (per 2020 NDAA Section 322)**
- ✓ **January 31, 2023-** Navy expected to publish Milspec for fluorine-free foam agent
- ✓ **October 1, 2023-** Cannot purchase foam with >1ppb PFAS
- ✓ **October 1, 2024-** Cannot use PFAS AFFF (SECDEF may grant two 1-year extensions = 2026)

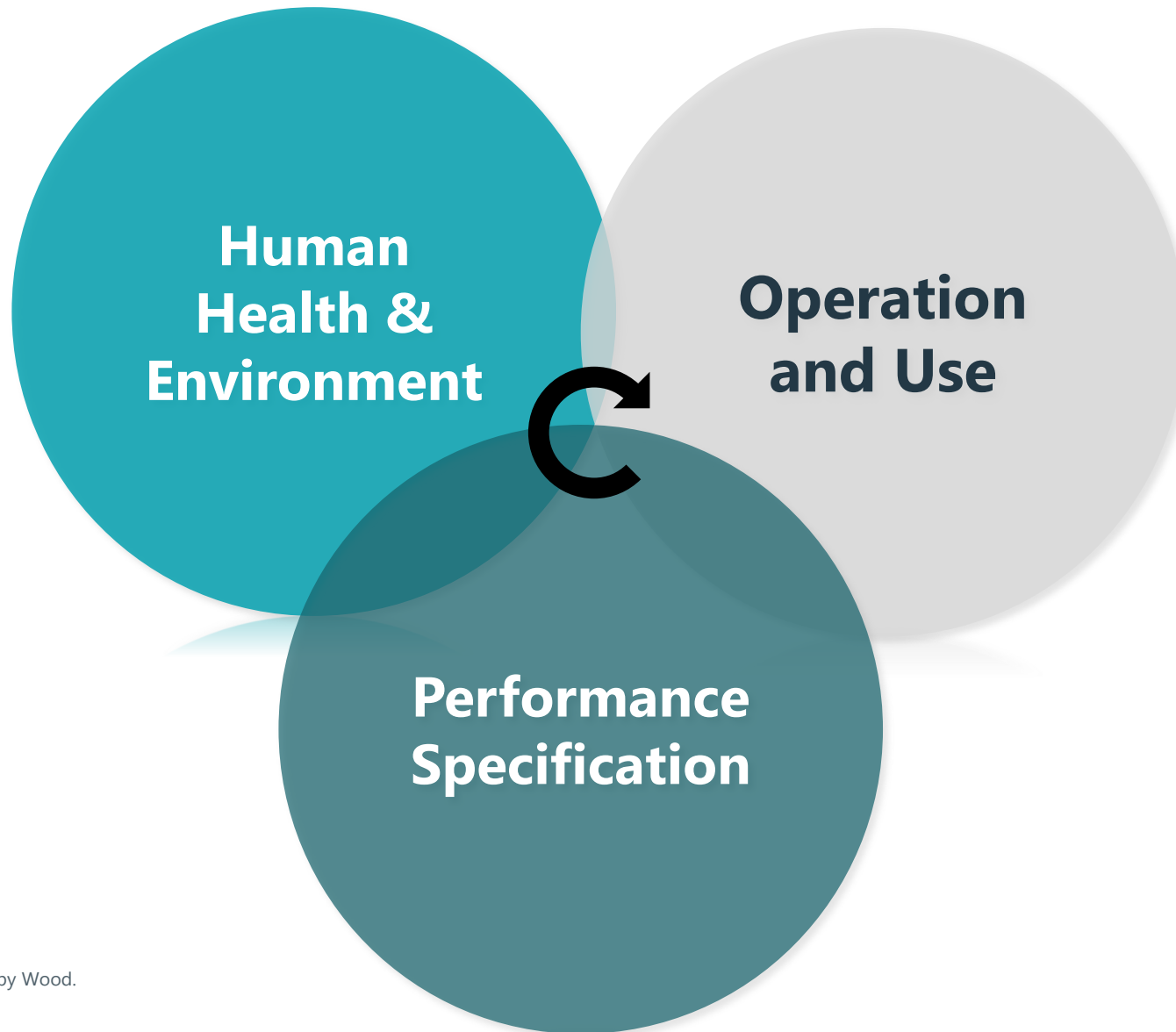
PERFORMANCE

Certification

Engineering/
Design

Testing/
Modifications

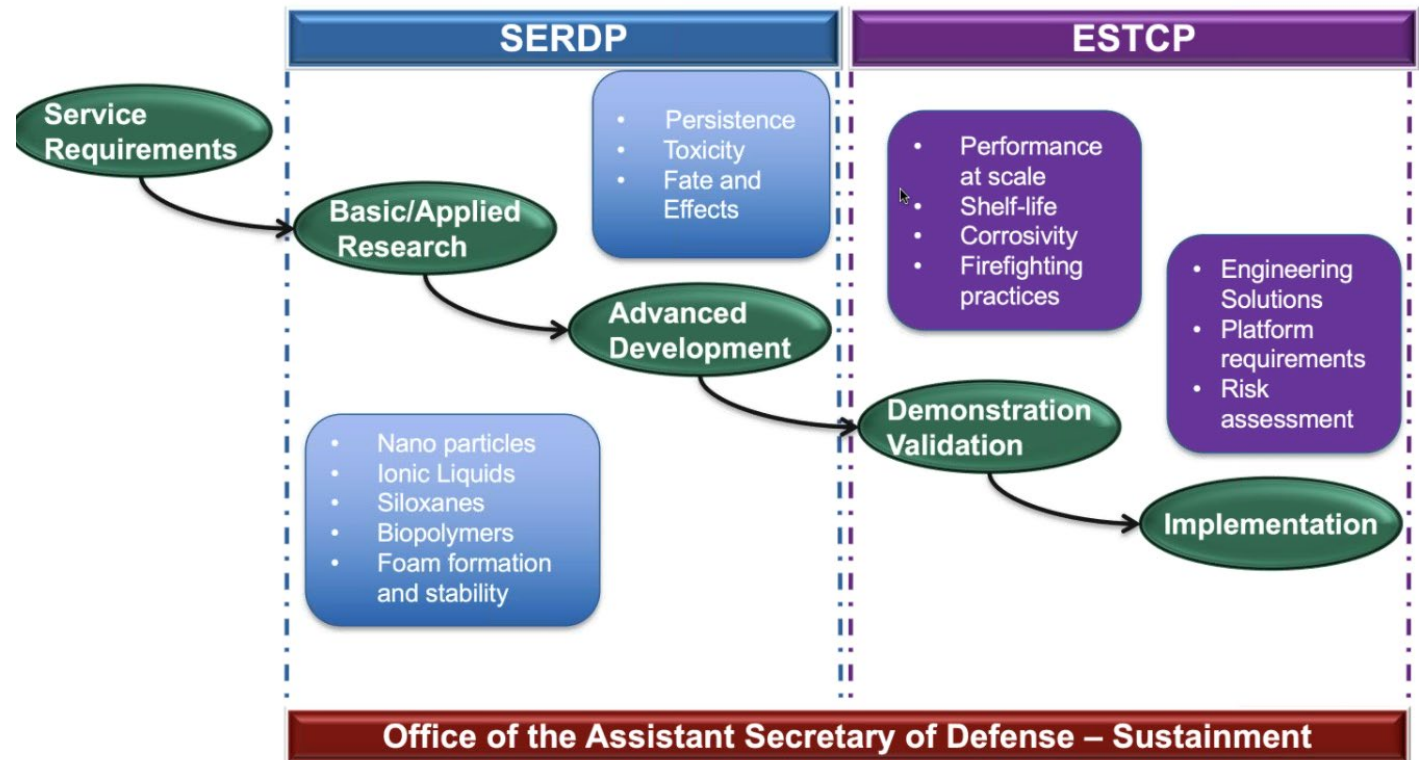
The issue is complex



Fluorine-free Alternatives



AFFF Alternatives Process: All Activities Carried Out in Parallel



Fluorine-free Alternatives

Performance
Specification

- ✓ **DoD is also evaluating non-foam alternatives**
 - Risks and costs of replacement strategies
 - Sundown policy evaluation

Floor Drains



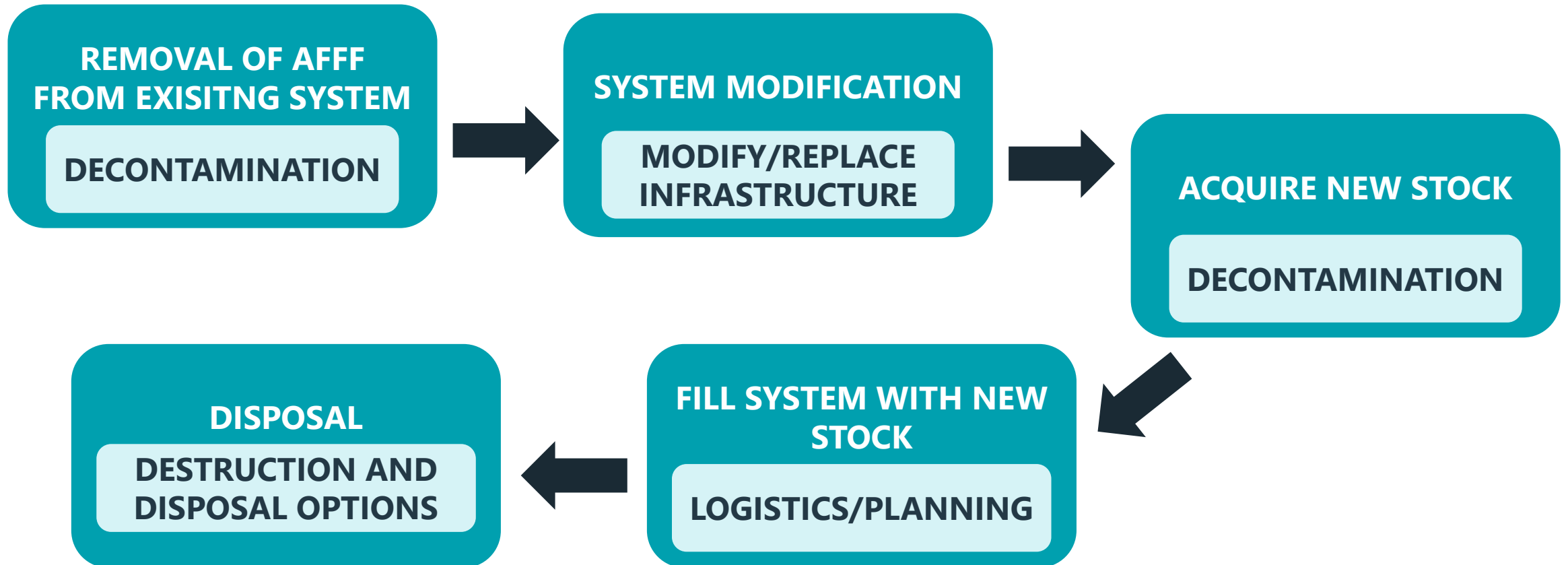
Water Mist Systems



Advanced Additives



Many challenges still exist...



Global Activity –Wood’s Support to EU

- **Decision-Making Tool for Foams**

https://echa.europa.eu/documents/10162/28801697/pfas_flourine-free_alternatives_fire_fighting_en.pdf/d5b24e2a-d027-0168-cdd8-f723c675fa98

PFAS Policy

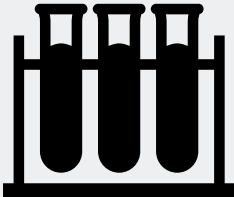
European Chemical Agency/European Commission

Technical and economic feasibility and socioeconomic impacts of alternatives via analysis of volume of use, functionality of foam, and potential hazards and risks

Assessment of AFFF and Foam Alternatives



Env. Agencies,
international
Organisations &
NGOs



Monitoring data



Scientific
publications



Legal requirements
databases



Stakeholder consultation

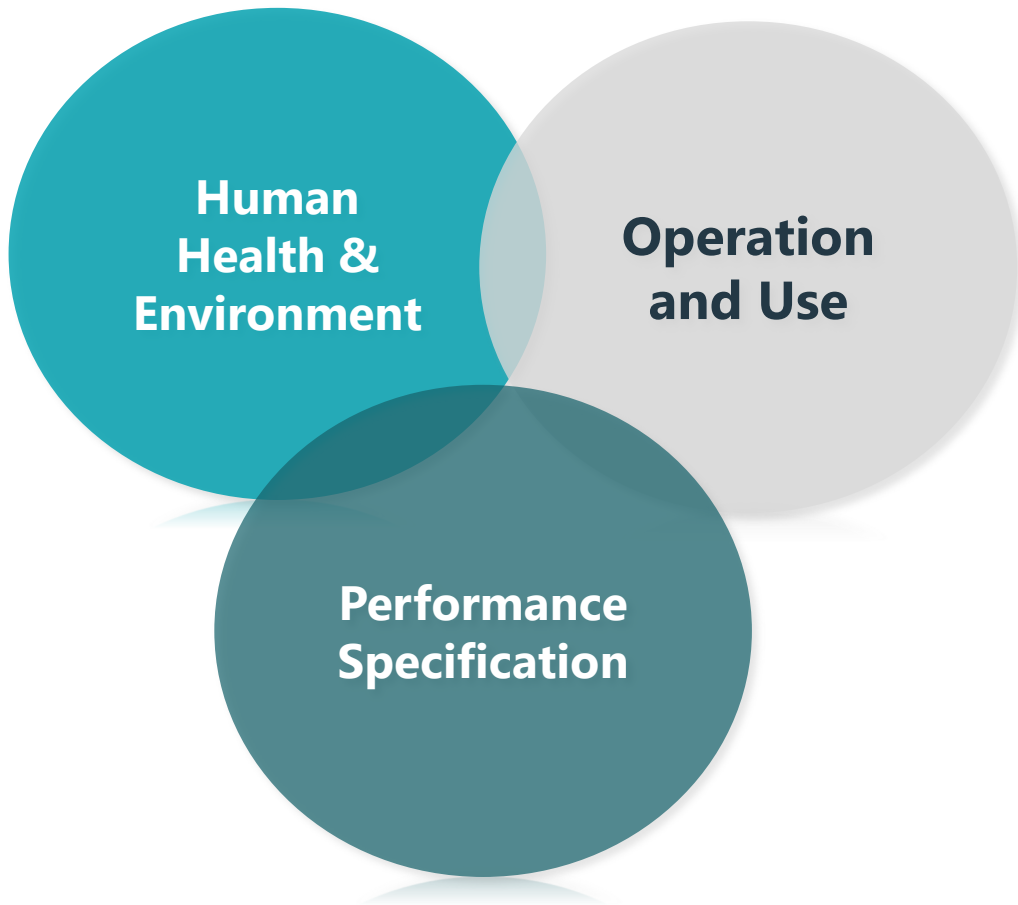


Information by
producers

Socio-economic impact of substitution
Potential hazards and risks of alternatives

Conclusion and Considerations

The issue is complex



Qualitative Risk Analysis with Probability of Occurrence

Probability of Occurrence	Consequence of Occurrence				
	Very Low	Low	Moderate	High	Very High
Very Low	Low Risk	Low Risk	Low Risk	Medium Risk	Medium Risk
Low	Low Risk	Low Risk	Medium Risk	Medium Risk	High Risk
Moderate	Low Risk	Medium Risk	Medium Risk	Medium Risk	High Risk
High	Medium Risk	Medium Risk	High Risk	High Risk	High Risk
Very High	Medium Risk	High Risk	High Risk	High Risk	High Risk

■ Low Risk ■ Medium Risk ■ High Risk

This slide is 100% editable. Adapt it to your needs and capture your audience's attention.

GO BACK TO THE BASICS AND MAKE INFORMED RISK MANAGEMENT DECISIONS

Thank you

wood.

For more information:

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Examples of our Publications

- Poly- and perfluoroalkyl substances experts Symposium 2: Key advances in poly- and perfluoroalkyl characterization, fate, and transport. <https://doi.org/10.1002/rem.21703> (Dora Chiang/Dave Woodward), Evolution from past to present, current efforts, and potential futures. <https://doi.org/10.1002/rem.21705> (Nathan Hagelin), PFAS Toxicology and Risk Assessment in 2021 and risk assessment in 2021—Contemporary issues in human and ecological risk assessment of PFAS. <https://doi.org/10.1002/rem.21706> (Usha Vedagiri). PFAS An update on advances in chemical analysis of PFAS. <https://doi.org/10.1002/rem.21707> (Maureen Leahy)
- Ambient (Background) Levels of PFOS and PFOA in Multiple Environmental Media. <https://doi.org/10.1002/rem.21548> (Usha Vedagiri)
- PFAS Fate and Transport 2021. https://my.ngwa.org/NC_Product?id=a182J00000EMRmHQAX (Omneya El-Sharnouby)
- PFAS Risk Communication for Contractors. https://www.ngwa.org/docs/default-source/default-document-library/pfas/pfas-risk-communication-for-contractors.pdf?sfvrsn=b125f191_4 (Shalene Thomas)
- PFAS Technical and Regulatory Guidance. <https://pfas-1.itrcweb.org/> (Shalene Thomas-AFFF Lead, Dora Chiang- Training Lead, Usha Vedagiri- Water and Soil Values Table)
- Firefighting Foams: Fire Service Roadmap. <https://www.nfpa.org/News-and-Research/Resources/Fire-Protection-Research-Foundation/Current-projects/Firefighting-Foams-Fire-Service-Roadmap> (Shalene Thomas- Project Technical Panel)



Overview- Examples of our PFAS work

AFFF Study- Informing Policy

https://echa.europa.eu/documents/10162/28801697/pfas_flourine-free_alternatives_fire_fighting_en.pdf/d5b24e2a-d027-0168-cdd8-f723c675fa98

Remediation and Treatment-Former Pease Air Force Base

<https://www.woodplc.com/news/2020/wood-pfas-remediation-project-at-former-us-military-base-receives-national-recognition>

Drinking Water- State of MN vs 3M- \$850M settlement

<https://3msettlement.state.mn.us/DrinkingWaterSupply>

PFAS Risk Screening and Assessment

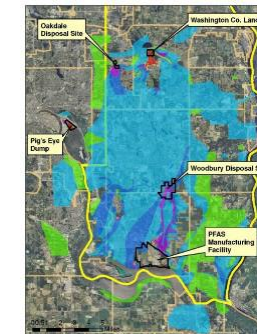
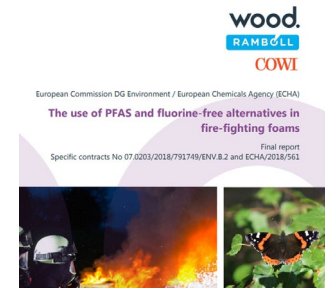
<https://www.defence.gov.au/Environment/PFAS/Lavarack/publications.asp>

R&D- Environmental Security Technology Certification Program(ESTCP)

[https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/ER18-5015/\(language\)/eng-US](https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/ER18-5015/(language)/eng-US)

R&D- Strategic Environmental Research and Development

Program(SERDP) <https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Groundwater/Emerging-Issues/ER18-1306>



wood.