# PFAS Research & Development Federal-Wide Perspective

NATIONAL SCIENCE AND TECHNOLOGY COUNCIL,
PFAS STRATEGY TEAM CO-CHAIRS
APRIL KLUEVER, NATALIA VINAS, PAUL SOUTH

# Joint Subcommittee on Environment, Innovation, and Public Health (the "JEEP")

**Purpose:** promote Federal cross-disciplinary R&D activities

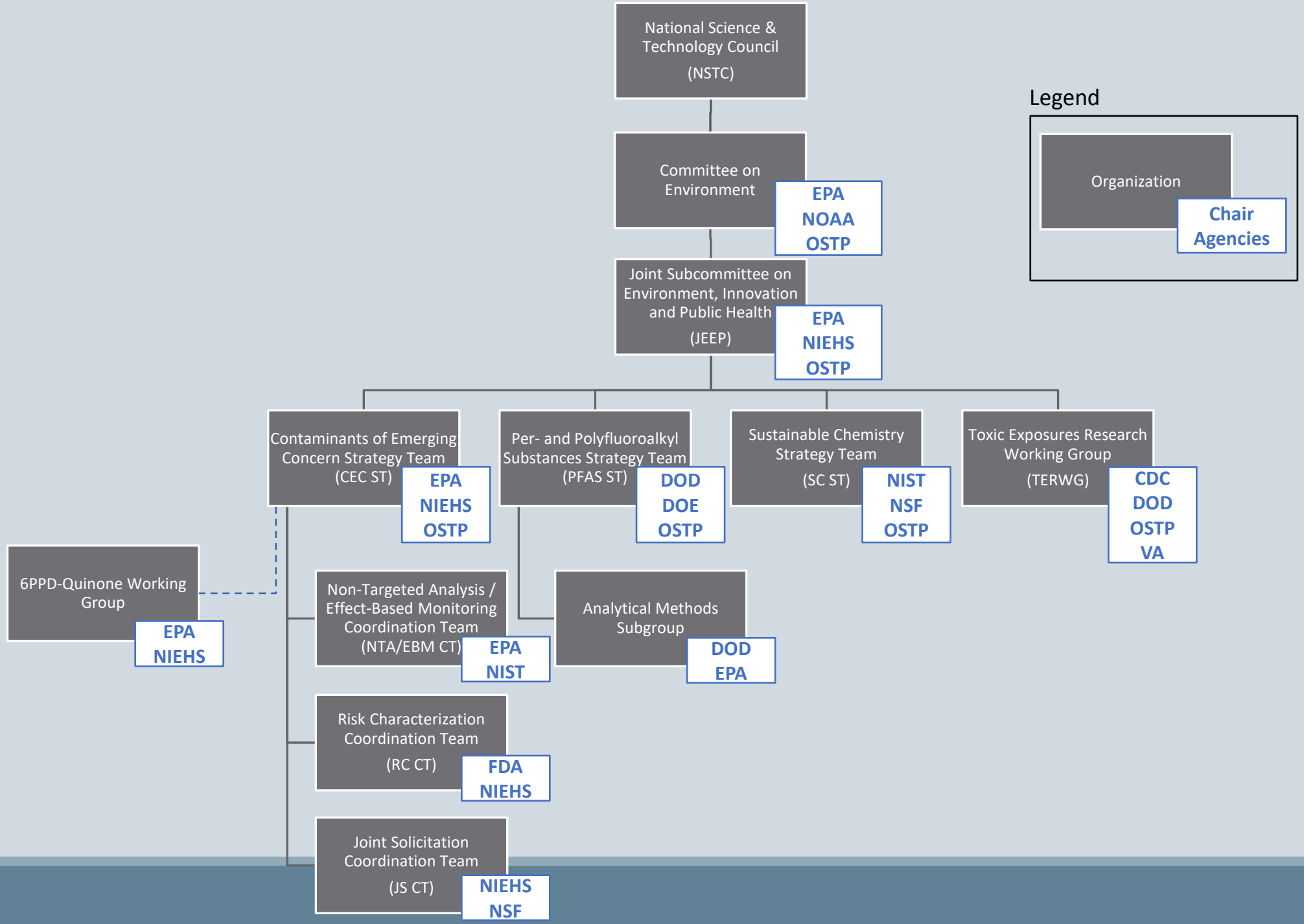
- Contaminants of Emerging Concern
- Per- and Polyfluoroalkyl Substances (PFAS)
- Sustainable Chemistry
- Military toxic exposures

**Scope:**

- Landscape and gap analysis
- Strategic planning
- Coordination of Federal research and development efforts
- Recommending policy options

**Agency Involvement:**

- DHS, DOC/NIST, DoD, DOE, DOT, EPA, OMB, OSTP, HHS (CDC/ATSDR, FDA, NIH/NIEHS), NASA, NSF, SBA, USDA, USGS, VA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(NSTC)
Committee on Environment
EPA
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Joint Subcommittee on Environment, Innovation and Public Health
(JEEP)
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Contaminants of Emerging Concern Strategy Team
(CEC ST)
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Per- and Polyfluoroalkyl Substances Strategy Team
(PFAS ST)
DOD
DOE
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Sustainable Chemistry Strategy Team
(SC ST)
NIST
NSF
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Toxic Exposures Research Working Group
(TERWG)
CDC
DOD
OSTP
VA
6PPD-Quinone Working Group
EPA
NIEHS
Non-Targeted Analysis / Effect-Based Monitoring Coordination Team
(NTA/EBM CT)
EPA
NIST
Analytical Methods Subgroup
DOD
EPA
Risk Characterization Coordination Team
(RC CT)
FDA
NIEHS
Joint Solicitation Coordination Team
(JS CT)
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# PFAS 2021 NDAA

The 2021 NDAA directs OSTP to:

- Establish an interagency working group

Develop a strategic plan for Federal support for PFAS research and development

- Identifies all federally funded PFAS research and development
- Identifies scientific and technological challenges
- Identify cost-effective alternatives to PFAS, methods for removal of PFAS from the environment
- Establishes goals, priorities, and metrics for federally funded PFAS research and development
- Develop an implementation plan for Federal agencies

Consult with States, tribes, territories, local governments, appropriate industries, academic institutions and nongovernmental organizations with expertise in PFAS research and development, treatment, management, and alternative development

# Strategy Team: PFAS

**Co-Chairs:** OSTP, DOE, DoD

**ST Charge**

*Coordinate Federal activities related to PFAS research and development*

**Agency Involvement**

*CPSC, DHS, DOC/NIST, DoD, DOE, DOT (FAA, Volpe), OMB, EPA, HHS (CDC/ATSDR, CDC/NIOSH, FDA, NIH/NIEHS), NASA, NOAA, NSF, SBA, USDA, USGS, VA*

# Request for Information (RFI)

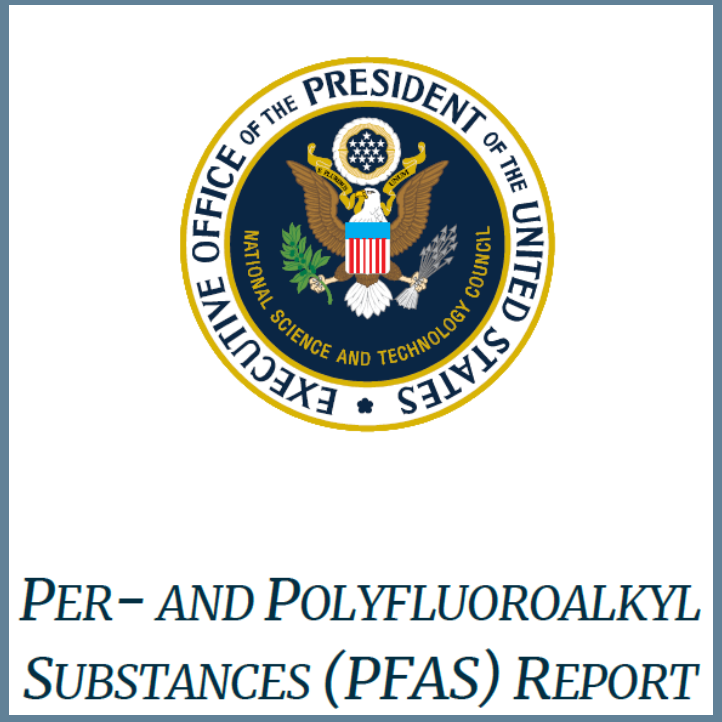
- Published July 13, 2022
- Submissions due August 29, 2022
- Requested information on the following:
  - Should the USG consider identifying priority PFAS
  - Criteria for evaluating progress toward research goals, general vs. specific
  - Scientific, technological, and human challenges
  - Specific chemistries and/or intended uses of PFAS with no known alternatives
  - Alternative definitions of PFAS and implications of those definitions
  - Research & Development priority areas
  - Challenges around Mixtures and Formulations
  - Goals, priorities, and performance metrics to measure success of R&D initiatives

# Responses to PFAS RFI

- 37 total respondents
- 15 non-profit or non-governmental organizations
- 13 from industry or industry groups
- 3 government affiliated
- 3 joint responses from cross-stakeholder respondents
- 2 from academia
- 1 from an FFRDC

Responses available: https://www.whitehouse.gov/wp-content/uploads/2022/09/09-2022-All-PFAS-RFI.pdf

# PFAS Report to Congress, March 2023




The PFAS ST engaged over 60 Federal experts to identify critical research gaps and needs for PFAS and issued a Request for Information (RFI) to gather public opinions and comments.

The Report identified four strategic areas of research:

- removal, destruction, or degradation of PFAS;
- safer and environmentally-friendlier alternatives;
- sources and pathways of exposure; and
- toxicity.

The ST proceeded to engage with Federal and non-Federal organizations on the topics of PFAS alternative chemistries, removal and destruction of PFAS, and measurement standards for PFAS.

# Agency Involvement

- ST: CPSC, DHS, DOC/NIST, DoD, DOE, DOT (FAA, Volpe), OMB, EPA, HHS (CDC/ATSDR, CDC/NIOSH, FDA, NIH/NIEHS), NASA, NOAA, NSF, SBA, USDA, USGS, VA
- 8 technical writing teams
  - Leads: EPA, NSF, DOT, DoD, HHS/CDC/ATSDR, HHS/NIH/NIEHS, OMB
  - Writing Teams: (in addition to agencies listed above) HHS/FDA, USDA, DHS, NIST, VA, DOE, USGS, NOAA

# Report to Congress

I. Introduction

II. Removal, Safe Destruction, or Degradation of PFAS from the Environment

III. Safer and Environmentally Friendlier PFAS alternatives

IV. Sources of Environmental PFAS Contamination and Pathways to Exposure

V. Understanding of Toxicity of PFAS to Humans and Animals

VI. Environmental Justice Considerations

VII. Shared Challenges

VIII. Areas for Opportunity

IX. Summary and Next Steps

Appendices

A. Overview of Federal R&D Activities

B. Financial resources allocated to PFAS R&D

C. Stakeholder Engagement

D. References

E. Additional Tables

# Shared Challenges & Areas for Opportunity

- Analytical Technology
- Communication
- Alternatives
- Mixtures
- Reporting
  - Shared data systems
- New Approach Methodologies (NAMs)
  - PFAS-specific high throughput assays
- Ambient Levels

# Challenges - Definition of PFAS

**Table 1. Chemical Structure-Based Definitions of the PFAS Class***

Broadest Definition ↓ Narrowest Definition

| Source | Definition |
|---|---|
| NDAA for FY 2021 | A man-made chemical in which all of the carbon atoms are fully fluorinated carbon atoms, and man-made chemicals containing a mix of fully fluorinated carbon atoms, partially fluorinated carbon atoms, and non-fluorinated carbon atoms. |
| Organisations for Economic Co-operation and Development 2021[4] | Fluorinated substances that contain at least one fully fluorinated methyl or methylene carbon atom (without any hydrogen (H)/chlorine/bromine/iodine atom attached to it), i.e., with a few noted exceptions, any chemical with at least a perfluorinated methyl group ($-CF_3$) or a perfluorinated methylene group ($-CF_2-$) is a PFAS. |
| Buck et al. 2011[5] | Highly fluorinated aliphatic substances that contain one or more carbon (C) atoms on which all the H substituents (present in the nonfluorinated analogues from which they are notionally derived) have been replaced by fluorine (F) atoms, in such a manner that they contain the perfluoroalkyl moiety $C_nF_{2n+1}$. |
| EPA's Office of Pollution Prevention and Toxics [6] | A structure that contains the unit $R-CF_2-CF(R')(R'')$, where R, R', and R'' do not equal H and the carbon-carbon bond is saturated (note: branching, heteroatoms, and cyclic structures are included). |

NSTC PFAS Report, March 2023

When talking about alternatives, it is important to acknowledge what constitutes a PFAS.

This includes whether or not a fluoropolymer is considered a PFAS.

The NSTC report provides several different definitions of PFAS, and more have been proposed since March, 2023.

The conversation about PFAS alternatives will continue to be driven by PFAS definitions.

# Challenges - PFAS Alternatives

Functional Alternatives: *Technical or Engineering Solutions*

Electroplating –

PFAS is used to reduce potential exposures to CrVI – functional alternatives include engineering controls (closed systems) or adapting to uses CrIII [limited utility]

Alternative fluorination processes that reduce the potential for unintentional manufacture of PFAS.

Chemical Alternatives: *Replacement of fluorinated compounds*

New, fluorine-free formulation of aqueous film forming foam

Replacement of fluoropolymers with non-fluorinated alternatives for specific uses

Steel drums and non-PFAS coated HDPE containers for pesticides

# Challenges - Critical or Essential Uses of PFAS

*A use of PFAS for which use of a replacement substance is impossible or impractical* (H.R. 7900- NDAA 2023)

- Pharmaceutical Products and Medical Devices (ex, cardiovascular stents)
- Infrastructure (ex, electric vehicles)
- Energy (ex, solar panels, batteries)
- Defense and Aeronautics (ex, kinetics [explosives], aviation)
- Technology (ex, semiconductors)

# Challenges to Reducing or Eliminating PFAS use in Products

Increased cost

Increased complexity

Decreased performance or efficiency

Lack of awareness of critical use or essential use scenarios

# PFAS Strategy Team Next Steps – Strategic Plan for PFAS Research and Development

Current focus is on the creation of a coordinated interagency strategic plan for PFAS research and development.

Received input from to member agencies on current research plans to identify the priority objectives of the Federal government.

Engaged stakeholders in listening sessions

Over 600 interagency comments were received from the department/agency representatives on the strategy team.

# PFAS R&D Strategic Plan

## Strategic Goals

**Provide relevant, high-quality scientific data that increases the understanding of PFAS exposure pathways to inform federal decisions to reduce risks to human health and the environment.**

**Effectively and equitably communicate federal work and results regarding PFAS R&D to impacted communities.**

**Identify research and technologies to manage PFAS contamination and mitigate the adverse impacts on communities.**

**Generate information that facilitates informed procurement decisions by federal agencies, manufacturers, and consumers regarding products that contain or use PFAS and PFAS alternatives.**

## R&D Strategies

**Strategy 1:** Understand PFAS exposure pathways to humans and the environment.

**Strategy 2:** Address current PFAS measurement challenges through the development of advanced sampling and analytical methodologies.

**Strategy 3:** Understand the toxicological mechanisms, human and environmental health effects, and risks of PFAS exposure.

**Strategy 4:** Develop, evaluate, and demonstrate technologies for the removal, destruction, and disposal of PFAS.

**Strategy 5:** Identify PFAS alternatives and evaluate their human health and ecological effects.

## Crosscutting Themes

**Federal Data Sharing and Improved Access to Data**

**Community Engagement & Communication**

**Environmental Justice**

# Where DOE May Be Able to Help

| | |
|---|---|
| Evaluate | Objective 1.1: Further evaluate occurrence, identity, and concentrations of PFAS in various media to understand the extent of potential exposure routes and inform quantitative exposure assessments for risk assessment. |
| Characterize | Objective 1.2: Characterize the bioaccumulation, biotic and abiotic transformation, and food web behavior of individual and mixtures of PFAS. [+AI/ML] |
| Improve | Objective 2.1: Further improve targeted and non-targeted analytical methods for identifying, detecting, and quantifying PFAS in a variety of samples types. |
| Advance | Objective 2.2: Advance the science of total fluorine and PFAS summations with method-defined analyses and protocols. |
| Measure | Objective 2.3: Foster the development of new technologies for efficiently measuring and identifying, quantifying, and modeling PFAS occurrence in the environment. [+AI/ML] |
| Removal<br>Destruction<br>Disposal | Objective 4.1: Develop and evaluate technologies for PFAS removal, destruction, and disposal. [+AI/ML] |

# Acknowledgments

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PFAS Strategy Team Members

Report to Congress Technical Writing Teams

**Leads**: Susan Burden (EPA), Mamadou Diallo (NSF), Chris Zevitas (DOT), Jessica Kratchman (OMB), Herb Nelson (DOD), Karen Scruton (HHS/ATSDR), Janice Willey (DOD), Andrea Winquist (HHS/CDC), Sue Fenton (formerly HHS/NIEHS), Natalia Vinas (DOD), Carmine Leggett (OMB)

National Science and Technology Council Report to Congress: https://www.whitehouse.gov/wp-content/uploads/2023/03/OSTP-March-2023-PFAS-Report.pdf