Ad-Hoc INDUSTRY

NATURAL RESOURCE MANAGEMENT GROUP

FOR DISCUSSION

FRAMEWORK

PFAS/NRD BEST PRACTICE APPROACH FRAMEWORK WORKSHOP

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New York, New York

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Ad-Hoc INDUSTRY
NATURAL RESOURCE
MANAGEMENT GROUP

A BEST PRACTICE FRAMEWORK:

PFAS and Natural Resource Damages

Updated November 15, 2023

Note to Reader: This document is one of four Best Practice Approach Frameworks presented and discussed at (and subsequent to) the Natural Resources Symposium held in September 2022 at The George Washington University Law School in Washington, DC. See www.NaturalResourcesSymposium.com. Symposium participants were unanimous that the Draft for Discussion Best Practice Frameworks should be made available broadly within multistakeholder law, policy and practice communities. Ongoing Working Groups on this and other topics, coordinated by the Ad-Hoc Industry Natural Resource Management Group, continue to address possible refinements and expansions to the Frameworks and identify additional documents or activities as appropriate. In fact, a multistakeholder Workshop on this Framework and related issues is planned for 2024.

Feedback on this Framework is welcomed. Contact us at info@NRDonline.org with your comments and suggestions, requests to be added to distribution for updates or join our ongoing activities on this important issue.

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Introduction

This document presents a Best Practice Framework for how per- and polyfluoroakyl substances (PFAS) are considered in the context of Natural Resource Damage Assessments. (NRDAs). It assumes advance knowledge of the natural resource damage assessment (NRDA) process as defined in various federal and state statutes and regulations\1. The process outlined here consists of six main steps, each of which is detailed below.

The Framework is intended for multistakeholder use and is aimed at building consistency in practice as to how these issues can be considered. While there are rapidly changing legislative, regulatory and policy requirements related to this practice arena, the fundamental underpinnings and principles of the Best Practice Approach presented here remains constant until and unless there are specific changes in the state-of-the art that require an update.

We first outline the legal and regulatory context of considering PFAS in the context of NRDA below, followed by presentation of the Framework and some cost-benefit considerations. Appendix A contains a case example application of the Framework and Appendix B includes additional resources.

Legal and Regulatory Context

Overview. PFAS are a group of man-made chemicals, which include perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), GenX and many others, that have been manufactured and used by a variety of industries starting in the 1940s. PFOA and PFOS have been the most extensively studied of these chemicals. It has been shown that these chemicals do not break down easily and can accumulate over time. There is some preliminary evidence that exposure to certain PFAS may lead to adverse human health effects, which may in turn impact human use of natural resources (USEPA).\2 **What does this mean for future natural resource damage cases involving PFAS?**

The use of PFAS in product manufacturing has become widespread across numerous industrial sectors. To date, there are thousands of different PFAS, and that number continues to grow as industry creates new forms of these chemicals.\3 PFAS are everywhere: food packaging (including pizza boxes, candy wrappers, and microwave popcorn); nonstick cookware; carpets, upholstery, and other fabrics; water resistant clothing; shampoo, dental floss, nail polish, and eye makeup; and paints, varnishes, and sealants, etc.\4 Among the sectors that manufacture or use PFAS in some fashion are airports, military installations, petroleum refineries, bulk chemical transporters or storage facilities, landfills and wastewater treatment plants, as well as textile, leather, paper, plastic, and wire manufacturers. Whether through manufacturing releases into water or air

\1 For further background on natural resource damage (NRD) liability and related issues, see www.NRDonline.org, https://darrp.noaa.gov/ and https://www.doi.gov/restoration.

2 https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas

3 *Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)*, NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES (Apr. 27, 2021), https://www.niehs.nih.gov/health/topics/agents/pfc/index.cfm#footnote2

4 *Per- and Polyfluoroalkyl Substances (PFAS) and Your Health*, AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (June 24, 2020), https://www.atsdr.cdc.gov/pfas/health-effects/exposure.html

or through use in certain products such as fire-fighting foams, human exposure to PFAS has become a significant concern for many stakeholders.

Given the complex nature of PFAS, there are issues and challenges unique to PFAS when determining potential liability for natural resource damages. For example, the term PFAS includes precursor compounds, which tend to breakdown in the environment to certain terminal compounds, as well as the terminal compounds themselves. Furthermore, there are differences in what constitutes a PFAS compound across different states and regulatory agencies, leading to confusion over how to define them. In addition, only selected PFAS compounds have regulatory thresholds or are of interest to regulators and/or Trustees\[5] at this time. Therefore, several key issues should be addressed upfront when conducting a natural resource damage assessment (NRDA) in order to provide clarity for the entire assessment.

Key Laws/Regulations. Today, 95% of the U.S. population is estimated to have at least some measurable concentration of PFAS in their blood. \[6] The prevalence and occurrence of these chemicals in drinking-water supplies nationwide, as well as recent discoveries of new areas of contamination or their sources, are driving a flurry of legislative and regulatory developments at the federal and state levels. Many have described PFAS contamination as an unfolding public health crisis.\[7] At the same time, companies that use PFAS in product manufacturing or fire suppression and control face a growing risk of liability exposure in the midst of the fast-changing regulatory environment and the fast-emerging litigation boom that could rival the tidal wave of asbestos litigation of previous years. In light of these emerging trends, there is a growing demand for alternative product formulations that avoid the use of various types of PFAS, stepped- up regulatory control over their use in products, and remediation of contaminated drinking-water supplies in communities located near manufacturing facilities emitting PFAS or where PFAS-containing products have been used in fire-fighting foam.

In recent years, state authorities have brought legal actions against PFAS manufacturers and users to require remediation of PFAS and to recover damages for injuries to natural resources due to releases of PFAS. Generally, state PFAS suits arise in three categories, with states usually filing under multiple categories. These categories include: (1) PFAS as "discharges" from facilities alleging injury to surrounding natural resources; (2) product liability and related common aw claims associated with manufacturing of aqueous film-forming foam (AFFF) (a type of firefighting foam); and (3) common law claims related to the release of PFAS into the environment associated with a wide array of products.

A great amount of activity related to regulation of PFAS in the past few years has been seen at both the federal and state level. At the federal level, for example, EPA has issued a final regulatory determination to begin the process to regulate two PFAS—perfluorooctanoic acid ("PFOA") and perfluorooctane sulfonate ("PFOS")—in drinking

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[5] Natural resource trustees include federal, state and tribal officials designated under federal or state laws to hold natural resources (land, water, biota) in the public's trust.

[6] *PFAS Top 10 Facts,* NATIONAL GROUNDWATER ASSOCIATION, https://www.ngwa.org/docs/default-source/default-document- library/pfas/pfastop-10.pdf?sfvrsn=8c8ef98b_2#:~:text=Studies%20have%20estimated%2095%20percent,measurable%20concentrations%20in%   20their%20blood (last visited Mar. 24, 2021).

[7] *See, e.g.* Tom Perkins, *The "Forever Chemicals" Fueling a Public Health Crisis in Drinking Water*, THE GUARDIAN (Feb. 3, 2020), https://www.theguardian.com/society/2020/feb/03/pfas-forever-chemicals-what-are-they.

water.\[8] Several states have led in regulating several PFAS in groundwater, drinking water, soil, in consumer product and in designating certain PFAS as hazardous substances. Further, several states have adopted drinking water and groundwater standards or advisories far below the EPA's .004 ppt health advisory for PFOA and PFOS.\[9] Additional influences and state of the practice concerning the PFAS/NRD interface can be found in the presentations and proceedings of the Group's 2020, 2022 and 2023 Natural Resources Symposia (see www.naturalresourcessymposium.com).

Best Practice Framework

The proposed best practice approach, described here involves a six-step process, establishing a framework for evaluation of potential impacts of PFAS on natural resource damage liability, assessment, and restoration.

This solution is intended to be used by both potentially responsible parties (PRPs) as well as the regulators and Trustees conducting and/or overseeing the NRD assessment. Because of the need to clarify the key issues early on in an NRD, such as identifying the PFAS compounds of interest and key regulatory thresholds, it is important to have a well articulated protocol. Furthermore, this protocol may be helpful for regulatory agencies and Trustees which may have oversight over the establishment of regulatory thresholds.

- The **first step** is to "Frame the Problem," which seeks to define PFAS in the current instance.
- The **second step** is to "Understand PFAS Usage," which determines to what extent PFAS were used at the site.
- The **third step** is the "Establish Discharge Pathways," to identify the potential pathways specific for PFAS to the environment.
- The **fourth step**, "Identify Receptors,", assesses the potential for PFAS to have reached both human and environmental receptors.
- The **fifth step**, "Evaluate Service Loss," evaluates the specific services that may have been lost at the site due to PFAS contamination.
- The **sixth step**, "Determine Restoration Alternatives," identifies possible restoration alternatives exists for natural resource restoration of the lost services.

Each step and the questions to be addressed is detailed below.

Step 1: Frame the Problem	• ***What PFAS?*** o The term "PFAS" includes thousands of chemicals. Identify how the relevant regulator/Trustee defines "PFAS" and which particular PFAS compounds have regulatory thresholds (e.g., PFOA, PFOS, PFBS).

[8] *Ibid.*

[9] See US EPA Rulemaking Lifetime Drinking Water Health Advisories for Four Perfluoroalkyl Substances: https://www.govinfo.gov/content/pkg/FR-2022-06-21/pdf/2022-13158.pdf

	○ PFAS can be used in many different applications and products. Determine whether specific uses are of concern to the relevant regulator/Trustee.
Step 2: Understand PFAS Usage	• ***To what extent were PFAS used at the site?*** ○ Understand which PFAS compounds were historically used or are currently being used at the facility. ○ Understand how the PFAS were used – duration, application, volumes, and waste streams. ○ Understand whether any precursor PFAS were used at the facility — some PFAS transform into others in the environment. For example, certain fluorotelomer alcohols transform into PFOA.
Step 3: Establish Discharge Pathways	• ***What are the potential pathways for PFAS to the environment?*** ○ Understand the potential release mechanisms for PFAS to reach the environment, including pathways that are receiving more scrutiny by certain regulators/Trustees (e.g., air to groundwater pathway). ○ Understand which specific PFAS may have been released at various stages of the operational process.
Step 4: Identify Receptors	• ***What is the potential for PFAS to have reached receptors?*** ○ Identify receptors, both human and environmental, that may have been affected by any PFAS released from operations. ○ Evaluate which specific PFAS may have reached each receptor — not all PFAS behave the same way in the environment, and the fate and transport of any particular PFAS will depend, to some extent, on the chemistry of that specific PFAS and the environmental conditions at issue (geology, hydrology, etc.). ○ Evaluate whether and to what extent the same specific PFAS already exist in the environment – given the ubiquitous nature of many PFAS, and their relative lack of degradation, it is important to understand whether certain PFAS already may

	have reached the same receptor from another specific source or ambient concentrations (e.g., "background").
<u>Step 5</u>: Evaluate Service Loss	• ***What services have been lost due to any PFAS contamination?*** o Evaluate the potential for the specific PFAS to cause a loss of natural resource services. o Evaluate the extent, if any, to which that potential natural resource service loss may be attributable to "background" PFAS presence.
<u>Step 6</u>: Determine Restoration Alternatives	• ***What alternatives exist for natural resource restoration?*** o Assess what remediation is to be required by the regulator/Trustee. o Evaluate the extent to which remediation can be enhanced to provide further natural resource restoration, or whether there are technical impracticability challenges in doing so (i.e., remediation standard is already as low as analytical methodologies allow detection). [Note: While the restoration alternatives in the step are focused on remediation, restoration beyond remediation can also be considered.]

Cost-Benefit Considerations

Following the above best practice approach for preparing for damage issues related to PFAS will involve some additional costs by various parties, including PRPs, Trustees and others. However, these costs may very well be outweighed by the benefits of understanding potential liability. A better understanding of potential liability by all involved parties ensures the appropriate level of remediation and natural resource restoration is identified. In particular, establishing baseline levels of PFAS as well as natural resource services at a site, allows a better assessment of any future changes in services related to PFAS. **Separation of baseline services from potential impacts of PFAS ensures proper causation links.**

In addition, a clear understanding of pathways of potential contamination as well as natural resource receptors may allow steps to be taken that could reduce or prevent the loss in natural resource services that may occur. In particular, protection of groundwater resources that are used for drinking water or preemptively mitigating potential groundwater impacts through soil-pathway remediation or provision of substitute supplies would prevent future potential damage before it could occur.

Summary

This above Framework sets forth a best practice approach for considering for assessing natural resource damages related to PFAS contamination in site-specific instances. It is intended to be a resource for the different parties at a given site, including Potentially Responsible Parties (PRPs), response agencies, natural resource trustees, and others. **Using this Framework can save time and costs and align NRDA objectives, including desired end points, of the parties involved at specific site.** While the material presented in this Framework focuses on natural resource issues under US laws, the considerations and proposed solutions herein may also be applicable to natural resource regimes in the UK, EU and other countries.

APPENDIX A
Case Application of Best Practice Approach Framework

CONFIDENTIAL PFAS SITE

PFAS was discharged from a manufacturing facility into a stream. It migrated to a lake that is linked by connecting channels to a number of other lakes and a river. PFAS was discovered in fish tissue samples and a fish consumption advisory was issued. There were also concerns about drinking water contamination and the ecological effects of elevated levels of PFAS concentrations on the health of fish, birds, and mammals. This case study exposition, focuses on the evaluation of human-use service loss associated with fish consumption advisories.

Step 1: Frame the Problem

a. The term PFAS includes thousands of chemicals
b. Relevant PFAS was Perfluorooctane sulfonate (PFOS) o PFOS was manufactured at the facility where discharges were alleged
    i. PFOS was present in elevated fish tissue samples that led to a fish consumption advisory in downstream waterbodies
    ii. Distinction is important for baseline evaluation due to proliferation of unrelated PFAS's of concern

Step 2: Understand PFAS Production, Usage and Discharge

a. Identify the extent of PFAS production and use at the site o PFOS was manufactured at the facility
    i. Residual amounts of the manufactured PFOS was discharged into the facility's wastewater

Step 3: Identify Discharge Pathways

a. Establish the pathways through which the PFAS of interest was discharged to the affected resources o Wastewater stream emptied into an affected lake
    i. Initial affected lake was tied by a connecting channel to other affected lakes and a river
    ii. Wastewater discharge migrated to the affected streams, lakes, and river and into groundwater

Step 4: Identify Receptors

a. Fish that had elevated levels of PFOS in tissue samples
b. Anglers who may catch, keep, and eat the fish

Step 5: Evaluate Service Loss

a. The elevated levels of PFOS in fish tissue samples led to the issuance of a fish consumption advisory.
b. The fish consumption advisory creates a specific link to injury for anglers who fish or would potentially fish in the affected sites.
c. Baseline advisory characterization was important at affected sites

   i. Some affected sites had advisories that were only for PFOS
   ii. Other affected sites had advisories for PFOS and other chemicals including PCBs, dioxins, and mercury

d. Baseline advisory characterization was important at unaffected sites o Some of the unaffected sites had no advisory
   i. Some had advisories for PFOS only-but not the PFOS from the manufacturing site,
   ii. Some had advisories for PFOS, PCBs, dioxins, and mercury
e. To isolate the effect of the site's release and therefore damages, it was important for the analysis to characterize and account for these differences

Step 6: Determine Restoration Alternatives

a. Restoration projects focused on fishing enhancements at fishing sites that did not have a PFOS advisory
b. The costs of restoration projects necessary to offset the service losses estimated in Step 5 represented the monetary estimate of damages

APPENDIX B
Resources

By way of example, the following are additional resources.

Websites

- **Battelle**: Battelle's PFAS ANNIHILATOR

Government

- **Department of Commerce/NOAA**: Project Begins to Address the Science of PFAS During Oil Spill Response
- **Department of Defense**: DOD PFAS website
- **US Environmental Protection Agency:**
    - US EPA PFAS Website
    - TSCA Section 8(a)(7) Reporting and Recordkeeping Requirements for Perfluoroalkyl and Polyfluoroalkyl Substances (2023)
    - US EPA Proposed Designation of Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) as CERCLA Hazardous Substances**:** Proposed Rule" (2022)
- **US Department of the Interior**: Guidance Memo issued in Jan 2022: Protective Actions regarding Per- and Polyfluoroalkyl Substances (PFAS)

Published Articles

- "PFAS Litigation", Thomas Bloomfield, et al., Natural Resources & Environment; Chicago Vol. 36, Iss. 1, (Summer 2021)
- "How the Safe Drinking Water Act & the Comprehensive Environmental Response, Compensation, and Liability Act Fail Emerging Contaminants: A Per- and Polyfluoroalkyl Substances (PFAS) Cast Study", Carly Johnson, 42 Mitchell Hamline L. J. Pub. Pol'y & Prac. 91 (2021)
- "Commentary: PFAS Experts Symposium: Statements on regulatory policy, chemistry and analytics, toxicology, transport/fate, and remediation for per and polyfluoroalkyl substances (PFAS) contamination issues", John A. Simon, et al., Remediation, Volume 29, Issue 4, Autumn 2019

Note to Reader: We invite your suggested additions and/or corrections to the Resources identified above.