

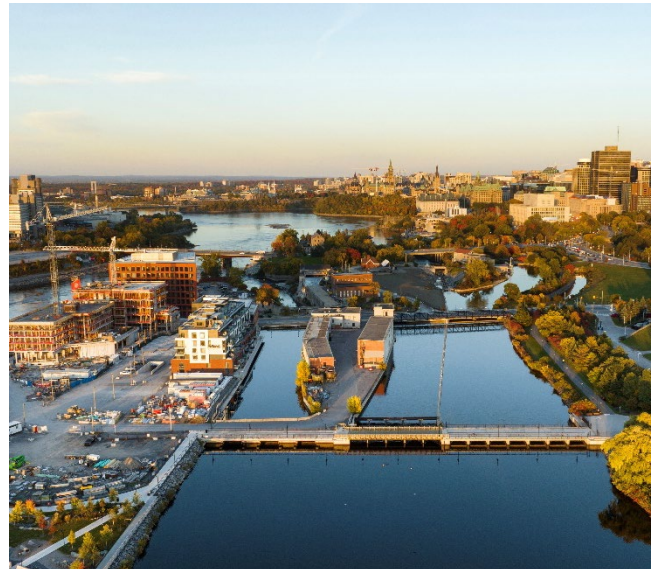
# Implementing Case-by-Case Technology-Based Effluent Limitations in NPDES Permits for Pollutants of Emerging Concern

## A “How-To” for NPDES Permit Writers

### Background

The National Pollutant Discharge Elimination System (NPDES) permit program requires permits to include technology-based effluent limitations and any more stringent limitations necessary to protect the designated uses of waters of the United States and ensure applicable water quality criteria are not exceeded.<sup>1</sup> Technology-based effluent limitations for industrial facilities are developed from national effluent limitations guidelines (ELGs) for specific industrial categories or, where national ELGs are not applicable, on a case-by-case (also described as best professional judgement or BPJ) basis by the permit writer for a specific facility considering the same factors that are used to develop the national standards. 40 CFR 125.3(c).

For pollutants of emerging concern, including persistent pollutants such as per- and polyfluoroalkyl substances (PFAS), pharmaceutical and personal care products, and microplastics, it is often the case that national ELGs have not yet been developed or revised to include relevant effluent limitations. In December 2022, the Office of Water issued a memorandum to NPDES permitting authorities describing actions and permit conditions that could be implemented under existing authorities to address PFAS discharges from point sources while certain ELGs are being revised and water quality criteria developed to ensure comprehensive implementation of technology-based and water quality-based effluent limitations in Regional and state issued permits, including the use of case-by-case technology-based effluent limits.<sup>2</sup> This “how-to” fact sheet provides information on implementing case-by-case technology-based effluent limitations for PFAS, but the methodology can be applied to any pollutant of emerging concern.<sup>3</sup>



### Case-by-Case Framework

Successful efforts to develop case-by-case effluent limitations start with early identification of the facilities within an industrial category known to utilize or generate PFAS.<sup>4</sup> The 2022 memorandum noted that permits cannot be issued unless the permittee submits a complete permit application, including any appropriate PFAS effluent monitoring data for final outfalls (40 CFR 122.21(e), (g)(13)). Permitting authorities should continue to work with permittees in these industrial categories to implement monitoring of facility discharges for PFAS.

While effluent monitoring at the final outfall(s) is important to demonstrate the presence and amounts of PFAS being discharged, EPA recommends that permitting authorities also require monitoring of the influent and effluent of any existing treatment technology to establish a treatment performance metric for use in a case-by-case evaluation.<sup>5</sup> If

<sup>1</sup> CWA sections 301(b)(1) and 301(b)(2).

<sup>2</sup> U.S. EPA, [Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs](#) (Dec. 5, 2022). See EPA’s Effluent Guidelines webpage for more information on PFAS and ELGs <https://www.epa.gov/eg>

<sup>3</sup> For more information, see [Chapter 5 of the NPDES Permit Writers’ Manual](#) (5-44).

<sup>4</sup> Industrial categories known or suspected to discharge PFAS as identified on page 14 of the [PFAS Strategic Roadmap](#) include: organic chemicals, plastics & synthetic fibers (OCPSE); metal finishing; electroplating; electric and electronic components; landfills; pulp, paper & paperboard; leather tanning & finishing; plastics molding & forming; textile mills; paint formulating, and airports.

<sup>5</sup> The applicant may be required to submit additional information under CWA Section 308 or under a similar provision of state law.

permittees have identified potential treatment technologies for the pollutants, the permitting authority should request information on the anticipated performance of each technology on effluent generated from processes at the facility, including, where appropriate, information on pilot testing of any treatment technology. EPA recommends that permitting authorities reach out to permittees prior to permit reissuance and request that permittees submit with the application requested information to develop case-by-case effluent limitations.

In January 2025, the Office of Water proposed Method 1633A<sup>6</sup> (for 40 PFAS compounds) that has been tested in a wide variety of wastewaters and contains all the required quality control (QC) procedures for the Clean Water Act for inclusion in 40 CFR Part 136. The Office of Water also proposed Method 1621<sup>7</sup> that can broadly screen for thousands of known PFAS compounds at the part per billion level in water samples. The availability of these methods provides a suitable approach for PFAS screening at permitted facilities and obtaining relevant data in case-by-case effluent limitation evaluations. Note: until the 40 CFR Part 136 rulemaking is finalized, the methods are not required to be used for CWA monitoring purposes.

In 2021, EPA issued two reports that are key resources for facilities and permitting authorities in beginning their efforts to identify potential treatment technologies and predicting resulting effluent quality. The first report, *Evaluation of Industrial Wastewater PFAS Treatment Technologies Report*,<sup>8</sup> was an output of the PFAS Multi-Industry Study and provided an overview of the current literature on pollution control processes and treatment technologies capable of removing or eliminating PFAS in industrial wastewater streams. The second report, *Multi-Industry Per- and Polyfluoroalkyl Substances (PFAS) Report – 2021 Preliminary Report*,<sup>9</sup> provided a summary of the readily available information and data the Office of Water collected and reviewed concerning industrial discharges of PFAS from five industrial point source categories: organic chemicals, plastics, and synthetic fibers (OCPSF) manufacturing; metal finishing; pulp, paper, and paperboard manufacturing; textile mills; and commercial airports. In addition, EPA’s Industrial Wastewater Treatment Technology Database includes treatment technology performance data for PFAS.<sup>10</sup> More information can be found on EPA’s Effluent Guidelines webpage.<sup>11</sup>

At least 65 permits with effluent limitations have been issued and provide a model for permitting authorities to evaluate appropriate permit conditions for PFAS in NPDES permits. In the permits where case-by-case TBELs were developed, the effluent data and treatment technologies identified in these permits will be beneficial for discussions with permittees that may or do discharge. State permitting authorities can work with their EPA Regional office to identify permits that may serve as examples of appropriate approaches in specific circumstances.

## Regulatory Requirements

A case-by-case evaluation under 40 CFR 125.3(c)(2) must: (1) apply the factors found in 40 CFR 125.3(d); (2) consider the appropriate technology for the category of point sources of which the facility is a member; and (3) consider any unique factors related to the facility. All of the Clean Water Act technology-based standards for industrial facilities require the permit writer to address the following factors found in 40 CFR 125.3(d):

1. The age of equipment and facilities involved;
2. The process employed;
3. The engineering aspects of the application of various types of control techniques;
4. Process changes;
5. The cost of achieving such effluent reduction; and
6. Non-water quality environmental impact (including energy requirements).

Each of the Clean Water Act technology standards further requires a particular economic evaluation to determine the appropriate technology as specified in 40 CFR 125.3(d). For example, in developing case-by-case effluent limitations that reflect Best Available Technology Economically Achievable, the permit writer must consider “the cost of achieving such effluent reduction.” 40 CFR 125.3(d)(3)(v).

<sup>6</sup> [“Analysis of Per- and Polyfluoroalkyl Substances \(PFAS\) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS,”](#) a method to test for 40 PFAS compounds in wastewater, surface water, groundwater, soil, biosolids, sediment, landfill leachate, and fish tissue.

<sup>7</sup> [“Determination of Adsorbable Organic Fluorine \(AOF\) in Aqueous Matrices by Combustion Ion Chromatography \(CIC\),”](#) a method to measure the aggregate concentration of organofluorides (molecules with a carbon-fluorine bond) in wastewater.

<sup>8</sup> See [Evaluation of Industrial Wastewater PFAS Treatment Technologies Report, Revision 1](#), (4-2 to 4-4) (Feb. 2021).

<sup>9</sup> See [Multi-Industry Per- and Polyfluoroalkyl Substances \(PFAS\) Report – 2021 Preliminary Report](#), (10-2 to 10-3) (Sept. 2021).

<sup>10</sup> See <https://www.epa.gov/eg/industrial-wastewater-treatment-technology-database-iwtt>.

<sup>11</sup> See <https://www.epa.gov/eg>.

The 2022 memorandum also discussed when it may be appropriate for permitting authorities to consider Best Management Practices (BMPs). EPA continues to recommend BMPs be included in permits where it is not feasible to calculate numeric PFAS effluent limitations (40 CFR 122.44(k)(3)) or to supplement numeric PFAS effluent limitations where reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intents of the Clean Water Act (40 CFR 122.44(k)(4)).<sup>12</sup> BMP conditions based on pollution prevention/source reduction opportunities may include:

1. Product elimination or substitution when a reasonable alternative to using PFAS is available in the industrial process;
2. Accidental discharge minimization by optimizing operations and good housekeeping practices; and
3. Equipment decontamination or replacement (such as in metal finishing facilities) where PFAS products have historically been used to prevent discharge of legacy PFAS following the implementation of product substitution.

## Case-by-Case Effluent Limitations: An Overview of Resources

### Permit Information

The permit writer can obtain information about the presence or absence of pollutants of emerging concern from the permit application, discharge monitoring reports and special studies. These materials should provide information on pollutant concentrations in effluent from each process at the facility as well as whether the existing treatment effectively removes pollutants, information which can be considered in the case-by-case evaluation.

### Other Facility Information

The permit writer can review permits for similar facilities to inform the potential for a facility to discharge pollutants of concern. These permits may also have case-by-case effluent limitations that, where appropriate, can be considered in developing case-by-case limitations for the subject facility, specifically, the treatment technologies considered, performance metrics and any cost information.

### Effluent Guidelines

Published effluent guidelines provide a template for the evaluation of treatment technologies for specific pollutants and establishment of effluent limitations. As part of effluent guidelines development,<sup>1</sup> EPA prepares many documents, such as the development document, that provide factual information that can be utilized in case-by-case evaluations. The permit writer can use the information from the facility or similar facilities to identify ELGs that may provide insight for developing case-by-case limitations. EPA has published an ELG database<sup>2</sup> that allows permit writers to search existing ELGs based upon several criteria.

### Economic Guidance

Effluent guidelines' economic analyses can provide information about treatment technologies affordability that may be transferable<sup>3</sup> to the facility being evaluated. The permit writer can utilize EPA's BAT Workbook<sup>3</sup> in evaluating the economic achievability of a specific treatment technology. Permits incorporating case-by-case limitations can also be a resource for how to conduct an economic analysis consistent with the Clean Water Act's economic criteria.

1: <https://www.epa.gov/eg/current-effluent-guidelines-program-plan>

2: <https://owapps.epa.gov/elg/>

3: [https://www3.epa.gov/npdes/pubs/protocol\\_npdespermits.pdf](https://www3.epa.gov/npdes/pubs/protocol_npdespermits.pdf) and [https://www3.epa.gov/npdes/pubs/workbook\\_econ\\_permits.pdf](https://www3.epa.gov/npdes/pubs/workbook_econ_permits.pdf)

<sup>12</sup> For more information, see [Guidance Manual for Developing Best Management Practices \(BMPs\)](#).