OFFICE OF INSPECTOR GENERAL

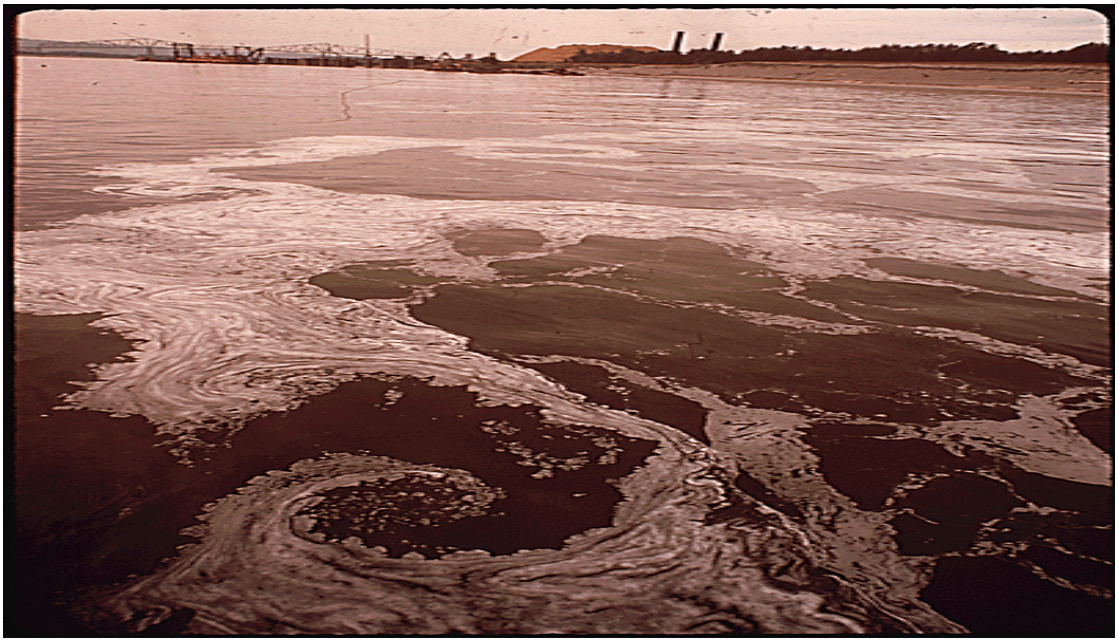
Catalyst for Improving the Environment

Evaluation Report

Effectiveness of Effluent Guidelines Program for Reducing Pollutant Discharges Uncertain

Report No. 2004-P-00025

August 24, 2004



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Abbreviations

AOX	Adsorbable Organic Halides
COD	Chemical Oxygen Demand
EPA	Environmental Protection Agency
NPDES	National Pollutant Discharge Elimination System
NRDC	Natural Resources Defense Council
OIG	Office of Inspector General
PCS	Permit Compliance System
SIC	Standard Industrial Classification

Photo Caption: Effluent from pulp mills being discharged into the Columbia River in Longview, Washington (EPA Photo)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
INSPECTOR GENERAL

August 24, 2004

MEMORANDUM

SUBJECT: Effectiveness of Effluent Guidelines Program for Reducing Pollutant Discharges Uncertain
Report No. 2004-P-00025

FROM: Dan Engelberg /s/
Director for Program Evaluation, Water Issues
Office of Program Evaluation

TO: Benjamin Grumbles
Acting Assistant Administrator
Office of Water

This is our final report on the subject evaluation conducted by the Office of Inspector General (OIG) of the U.S. Environmental Protection Agency (EPA). This report contains findings that describe the problems the OIG has identified and corrective actions the OIG recommends. This report represents the opinion of the OIG, and the findings contained in this report do not necessarily represent the final EPA position. Final determinations on matters in this report will be made by EPA managers in accordance with established audit resolution procedures.

On June 4, 2004, the OIG issued a draft report to EPA for review and comments. A response was submitted on July 7, 2004, and an exit conference was held on August 19, 2004.

Action Required

In accordance with EPA Manual 2750, you are required to provide a written response to this report within 90 calendar days of the date of this report. You should include a corrective action plan for agreed upon actions, including milestone dates. We have no objections to the further release of this report to the public. For your convenience, this report will be available at http://www.epa.gov/oig. In addition to providing a written response, please e-mail an electronic response to engelberg.dan@epa.gov.

If you or your staff have any questions regarding this report, please contact me at (202) 566-0830 or Renee McGhee-Lenart, Assignment Manager, at (913) 551-7534.

Executive Summary

Purpose

Effluent guidelines are national technology regulations that limit the discharge of pollutants to surface waters and publicly owned treatment works. By creating minimum levels of treatment for different industrial sectors based on the environmental performance of specific technologies, effluent guidelines are intended to establish consistent limits across the country. Guidelines produce an environmental outcome by having their requirements factored into individual facilities' discharge permits as they are renewed. The Environmental Protection Agency (EPA) has developed effluent guidelines for 55 industrial point source categories affecting between 35,000 to 45,000 facilities that directly discharge to the nation's waters. According to EPA, effluent guidelines are responsible for preventing the discharge of almost 700 billion pounds of pollutants each year. For this evaluation, we sought to answer the following questions:

- How has EPA's effluent guidelines development process changed over time?
- How effectively are effluent guidelines used to reduce pollutant loadings?
- To what extent does EPA measure the effectiveness of the effluent guidelines program?

Results in Brief

The effluent guidelines program underwent a number of changes in the 1990s. EPA began covering a broader range of pollutants, over a broader array of industries, and generally promulgated more effluent guidelines. Some changes were under the impetus of a Federal Advisory Committee Act committee, formed as the result of a 1992 Consent Decree. EPA issued a draft strategy in November 2002 on how it will select and revise effluent guidelines in the future, and the program is currently undergoing review for resource allocation.

Regarding effectiveness, the impact of effluent guidelines remains uncertain. Although effluent guidelines were used in the National Pollutant Discharge Elimination System (NPDES) permits we analyzed, pollutant discharge data were not readily available to determine whether effluent guidelines reduced pollutant discharges. We found a lag in issuing NPDES permits that utilized the revised effluent guidelines. Once reissued, permit limits were derived from the revised guidelines to a very large extent. We also found that adequate information was widely absent, although revised guideline-derived permit limits had an impact on the limited number of facilities with adequate information. Due to a lack of

pollutant discharge data, we could not determine the extent of environmental benefits brought about by EPA's investment in the effluent guidelines program.

Further, EPA does not measure the effectiveness of either the effluent guidelines program or individual effluent guidelines. Consequently, EPA does not have sufficient evidence to show that this program has actually produced reductions. Although our work showed significant reductions in a few facilities, EPA has not systematically collected data to evaluate this program as a whole. Therefore, EPA cannot support a statement made in its recent Annual Report that industrial discharges of pollutants have been reduced by billions of pounds as a result of effluent guidelines. The effluent guidelines program has a marked insufficiency of information to make managerial decisions because EPA has not developed a systematic way of collecting such information.

Recommendations

We recommend that the Acting Assistant Administrator, Office of Water, systematically collect and monitor data for a select number of facilities to measure the effectiveness of specific effluent guidelines. We also recommend that the Assistant Administrator develop performance measures based on the systematic collection of data and take the necessary steps to ensure that appropriate data is collected.

Agency Comment and OIG Evaluation

In a July 7, 2004, response to our draft report (see Appendix D), the Office of Water generally agreed with our findings and recommendations. The Office of Water agreed to perform retrospective analyses to determine the effectiveness of several effluent guidelines. The Office of Water also agreed that actual pollutant discharge data should be used to develop performance measures and stated that the work evaluating the effectiveness of several effluent guidelines will help address this recommendation. Finally, the Office of Water agreed that adding a data field to the Permit Compliance System would be a useful way to link reporting facilities with the appropriate effluent guidelines.

We agree with the Office of Water's proposed actions. However, we would like to obtain additional information about the retrospective studies EPA plans on undertaking and how these individual studies will be used to develop an assessment of the overall program. For example, we would like to know which effluent guidelines will be selected for analysis, the methodology to be used, and timeframes for completing the studies.

We also made technical changes to the draft in response to the Agency's comments.

Table of Contents

Chapter 1
Introduction

Purpose

Effluent guidelines are national technology regulations that limit the discharge of pollutants to surface waters and publicly owned treatment works. By creating minimum levels of treatment for different industrial sectors based on the environmental performance of specific technologies, effluent guidelines are intended to establish a minimum floor of control across the country. Guidelines produce an environmental outcome by having their requirements factored into individual facilities' discharge permits as they are renewed. The Environmental Protection Agency (EPA) has developed effluent guidelines for 55 industrial point source categories affecting between 35,000 to 45,000 facilities that directly discharge to the nation's waters. Guidelines cover industries as diverse as iron and steel to centralized waste. According to EPA, effluent guidelines are responsible for preventing the discharge of almost 700 billion pounds of pollutants each year through their utilization in National Pollutant Discharge Elimination System (NPDES) permits. EPA has budgeted about $22 million a year for the last 3 fiscal years (2001 to 2003) to develop effluent guidelines. For this evaluation, we sought to answer the following questions:

- How has EPA's effluent guidelines development process changed over time?
- How effectively are effluent guidelines used to reduce pollutant loadings?
- To what extent does EPA measure the effectiveness of the effluent guidelines program?

Background

In 1972, Congress established the effluent guidelines program by adopting the Federal Water Pollution Control Act of 1972, which was amended by the 1977 Clean Water Act Amendments and the Water Quality Act of 1987. Congress adopted these Acts to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." EPA's Office of Water is responsible for implementing these Acts, which provide EPA and the States with a variety of programs to protect and restore the nation's waters.

The effluent guidelines program, along with the water quality standards and criteria program, form the basis of all water quality programs used by EPA to reduce point source loadings. National effluent guidelines regulations typically specify the maximum allowable levels of pollutants that may be discharged by

facilities within an industrial category. While pollutant limits are based on the performance of specific technologies, they do not generally require each facility to use these technologies; rather, they allow it to use any effective alternatives to meet the numerical pollutant limits.

Each facility within an industrial category must generally comply with the applicable discharge limits, regardless of its location within the country or on a particular water body. In this way, the limits are consistent for all facilities within an industrial category or subcategory. National regulations apply to three types of facilities within an industrial category:

- Existing facilities that discharge directly to surface waters.
- Existing facilities that discharge to publicly owned treatment works.
- Newly constructed facilities that discharge directly to surface water.
- Newly constructed facilities that discharge to publicly owned treatment works.

According to EPA, effluent guidelines, through their use in NPDES permits, are responsible for preventing the discharge each year into public waters of over 1 billion pounds of toxic pollutants, such as heavy metals; over 470 billion pounds of non-conventional pollutants, such as nutrients and salts; and almost 220 billion pounds of conventional pollutants, such as suspended solids. All facilities that discharge pollutants from any point source into waters of the United States are required to obtain a NPDES permit. Table 1.1 provides definitions for each pollutant type and additional examples.

Table 1.1: Definitions and Examples of Pollutant Types

Pollutant Type	Definition	Examples
Conventional	Pollutants typical of municipal sewage and for which municipal secondary treatment plans are typically designed. These pollutants are defined by regulation.	Biological oxygen demand, total suspended solids
Toxic	Pollutants or combination of pollutants that cause death, disease, or other injuries to humans or animals upon exposure, inhalation, or ingestion. The pollutants are defined by regulation.	Dioxin, chloroform
Non-conventional	All pollutants not listed by regulation.	Acetone, ammonia

Initially, the 1972 Clean Water Act directed EPA to develop effluent guidelines for existing industrial dischargers by certain statutory deadlines. EPA was unable to do this by the statutory deadlines and was sued by the Natural Resources

Defense Council (NRDC). In 1976, EPA entered into a consent decree with NRDC and agreed to speed the completion of effluent guidelines and address more toxic pollutants when developing and revising effluent guidelines.

The Clean Water Act was amended by the Water Quality Act of 1987, which required EPA to establish schedules for reviewing and revising existing effluent guidelines and promulgating new ones. In 1990, EPA published its first Effluent Guidelines Plan, with schedules developing new and revised effluent guidelines for several industrial categories. Following another suit from the NRDC and Public Citizen, Inc., EPA, in 1992, agreed to abide by a consent decree that established a schedule for EPA to promulgate effluent guidelines for 19 industrial categories. The consent decree required EPA to develop effluent guidelines for certain industries, and allowed EPA the discretion of selecting other industries for effluent guidelines development.

The consent decree also required that EPA establish an Effluent Guidelines Task Force (Task Force) to develop recommendations on how to improve the effluent guidelines program. The Task Force sought to determine ways in which the effluent guidelines process could be streamlined.

State and EPA permits writers are responsible for writing NPDES permits. When developing a permit, the permit writers must calculate technology-based effluent limits from effluent guidelines and compare them to water quality-based effluent limits for each pollutant in a permit. The Clean Water Act and EPA regulations require the permit writer to apply the most stringent limit. A permit writer can use an effluent guideline in developing a facility's permit after the effluent guideline is effective (typically about 60 days after the effluent guideline is promulgated).

Scope and Methodology

We conducted our evaluation in accordance with *Government Auditing Standards,* issued by the Comptroller General of the United States. We conducted our field work from August 2002 to November 2003. We evaluated the effluent guidelines program by developing and applying a four-phase model that describes the four key processes involved in the program (Table 1.2).

Table 1.2: The Four Phases of the Effluent Guidelines Program

Phase	Definition
Selection	EPA examines many different industries and then selects certain industries for effluent guidelines development.
Development	EPA develops effluent guidelines for each selected industrial category. Guidelines are prepared according to formal rulemaking procedures. To develop an effluent guideline, EPA must conduct technology, economic, and environmental assessments.
Utilization	To be utilized, an effluent guideline must be implemented in an NPDES permit and used as the basis of pollutant limits.
Evaluation	To determine whether effluent guidelines result in environmental improvements, EPA must collect and analyze data to measure results and improve the prior three phases.

To evaluate these four phases, we interviewed EPA officials, State permit writers, publicly owned treatment works' representatives, environmental groups, and industry officials. We also reviewed the development documents for several effluent guidelines, recommendations made by the Task Force, EPA's disposition on the Task Force recommendations, and EPA's Annual Performance Plans. We evaluated the effectiveness of the effluent guidelines program by analyzing the NPDES permits of three industries: pesticide manufacturing; pharmaceutical manufacturing; and pulp, paper, and paperboard.

We evaluated the effluent guidelines program because it is a key water program and the Office of Inspector General (OIG) and General Accounting Office had not evaluated the program in recent years.

Appendix A provides further details on our scope and methodology.

Chapter 2
Effluent Guidelines Program Has Undergone Changes

The effluent guidelines program underwent a number of changes in the 1990s and is still in the midst of change. EPA began covering a broader range of pollutants, over a broader array of industries, and promulgated effluent guidelines at a faster pace. Some changes were under the impetus of a Federal Advisory Committee Act committee, also known as the Effluent Guidelines Task Force (Task Force), formed as a result of a 1992 Consent Decree. The Task Force issued five reports from 1995 to 2000 and made recommendations to EPA on how to improve the effluent guidelines program. However, EPA has only incorporated about half of the Task Force's recommendations. Additionally, EPA is reevaluating the future of the effluent guidelines program.

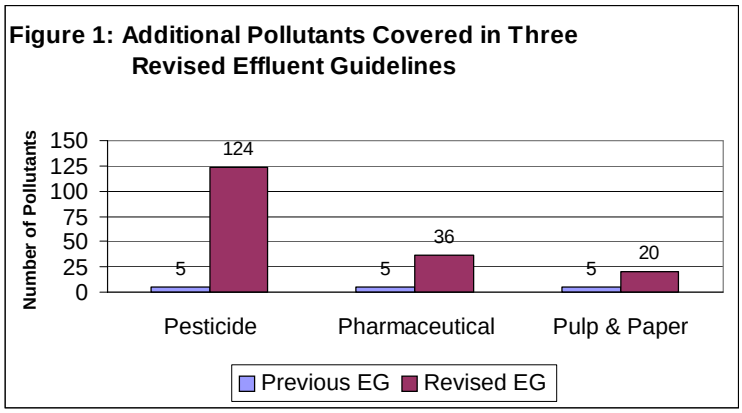
Coverage Increased

Broader Range of Pollutants Covered

Over time, EPA has developed effluent guidelines covering a broader range of pollutants. Expanding pollutant coverage is important because of guidelines' important role in providing coverage on a national basis since water quality standards' coverage of toxic pollutants is relatively limited.

The first round of effluent guidelines that EPA developed during the 1970s typically covered conventional pollutants. As a result of the 1977 Clean Water Act amendments and pressure from law suits, EPA focused on covering a broader range of toxic and non-conventional pollutants, such as dioxin and furan, in its effluent guidelines. The growth increased during the 1990s. For the three industries whose revised effluent guidelines we reviewed, the guidelines in each industry had dramatically greater pollutant coverage in the 1990s than they had under their original guidelines, adopted in the late 1970s and early 1980s (see Figure 1). The revised guidelines for these industries covered an additional 165 pollutants unregulated by the previous technology standards. All of the additional pollutants covered by the three new effluent guidelines were toxic (25 percent) or non-conventional (75 percent) pollutants. By controlling a wider range of

Figure 1: Additional Pollutants Covered in Three Revised Effluent Guidelines



pollutants, especially toxic and non-conventional pollutants, EPA expects to improve human health, water quality, and aquatic life. Many of these pollutants have been associated with serious environmental and human health impacts.

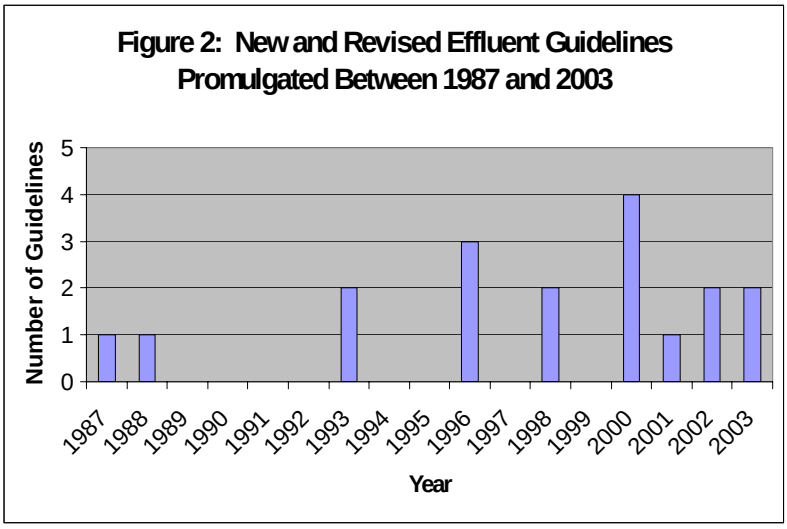
Broader Range of Industries Covered

EPA has promulgated effluent guidelines for 55 point source categories, which have, over the last 10 years, covered a broader range of industries. In 1974, EPA had promulgated effluent guidelines for 15 industries, such as sugar processing, coal mining, and cement manufacturing. In recent years, EPA has increasingly focused on non-industrial point source categories, such as centralized waste treatment and landfills. By broadening the types of industries included in the effluent guidelines program, EPA expects to be able to control waste streams that were not envisioned in the past.

More Effluent Guidelines Promulgated

EPA has dramatically increased its rate of issuance of effluent guidelines in recent years. Whereas it issued 4 effluent guidelines in the 9 years from 1987 to 1995, it issued 14 in the subsequent 8 years from 1996 to 2003 (see Figure 2). Some are new guidelines for industries not previously covered, and others are revisions of guidelines for previously covered industries. EPA was required to promulgate effluent guidelines at a faster pace by the 1992 Consent Decree. The consent decree had established a schedule by which EPA was to propose and take final action on both the revision of existing effluent guidelines and the promulgation of new effluent guidelines. It is important that effluent guidelines are promulgated timely since, without effluent guidelines, the potential reductions of many pollutant discharges would not occur.

Figure 2: New and Revised Effluent Guidelines Promulgated Between 1987 and 2003



Some Changes Resulted from Task Force Recommendations

The effluent guidelines program changed as a result of the Task Force recommendations. The 1992 Consent Decree established the Task Force to provide recommendations on how to improve the effluent guidelines program. The Task Force consisted of representatives from EPA, States, local governments,

environmental groups, industry, and academia. It issued 5 reports (see box) that made 80 recommendations to EPA on how to improve the effluent guidelines program. The Task Force recommendations fell into three main categories. Table 2.1 notes those three categories and the number of recommendations for each, and provides examples.

Five Task Force Reports

- Selection Criteria for Preliminary Industry Studies (1995)
- Fostering Pollution Prevention and Incorporating Multi-Media Considerations into Effluent Guidelines Development (1996)
- Issue Paper Design of Preliminary Studies (1996)
- Removing the Bottlenecks from the Effluent Guideline Development Process (1996)
- Recommendations on Streamlining the Effluent Guideline Development Process (2000)

Table 2.1: Examples of Effluent Guidelines Task Force Recommendations

Recommendations Category	Quantity	Examples of Recommendations
Improving the Pace of Guideline Development	41	Developing surveys quicker by working cooperatively with industry and keeping the number of individual questions to ones absolutely needed.
Improving the Selection of Industries for Guideline Development	24	Seek out and contact trade associations in order to provide such groups the opportunity to contribute available data.
Incorporating Pollution Prevention and a Multi-Media Consideration into Guidelines	15	Promote pollution prevention by allowing an extension of time for a facility to come into compliance.

EPA stated that it has fully implemented 36 of the 80 recommendations, partially implemented 39, and has not implemented 5 as of 2003.

EPA Reevaluating Future of Effluent Guidelines Program

EPA anticipates that it will fulfill its commitments under the provisions of the 1992 Consent Decree by the end of 2004 and is preparing to manage the effluent guidelines program outside of the requirements of the decree. Additionally, in late 2003, the program was reviewed by the Office of Water to determine resource allocation. However, it remains to be seen whether the changes resulting from the 1992 Consent Decree, such as the increase in the number of effluent guidelines promulgated, will continue in the future.

EPA is charting a new course for the future of the effluent guidelines program. First, in November 2002, EPA developed a draft strategy, *A STRATEGY FOR NATIONAL CLEAN WATER INDUSTRIAL REGULATIONS: Effluent Limitations*

Guidelines, Pretreatment Standards, and New Source Performance Standards.[1] The strategy was developed to provide interested stakeholders the chance to comment on how national industrial technology-based regulations could best meet the needs of the broader national clean water program. It also outlined the criteria EPA expects to use to assess the need to develop and/or revise effluent guidelines for specific industrial categories. Since EPA will be responsible for selecting industries for effluent guidelines development after the consent decree is fulfilled, this draft strategy was an important step in establishing how the program will proceed in the future.

In the future, EPA will be developing effluent guidelines with fewer staff. In the Fall of 2003, the Office of Water reviewed the staff allocation for the Engineering and Analysis Division that develops effluent guidelines. Office of Water management chose to reduce the number of staff in the division from 55 to 35 and move these staff to other divisions. For example, 11 staff will be moved to the Standards and Health Protection Division. This reflects the enhanced emphasis on developing water quality standards and enhancing EPA and States' capabilities to monitor water quality. It remains to be seen how this reallocation of resources will affect the effectiveness of the effluent guidelines program in the future.

EPA may have to reevaluate the program again in the near future. In a memo submitted to EPA on March 18, 2004, concerning EPA's Preliminary Effluent Guidelines Program Plan for 2004/2005, NRDC urged EPA "to reevaluate both its legal obligations under the CWA (Clean Water Act) and the overarching purpose of the requirements under section 304(m) of the Act and to make a commitment to updating technology standards and reducing water pollution in our nation's waters." NRDC is alleging that EPA's plan for new guidelines violates section 304(m) of the Clean Water Act because it does not establish a schedule for annual review and revision for all effluent sections, as well as fails to identify categories of sources discharging toxic or non-conventional pollutants for which guidelines have not previously been published. Specifically, NRDC's comments say the guidelines "suffer from many of the same deficiencies" as the previous plans over which NRDC filed suit.

[1]See http://www.epa.gov/guide/strategy/

Chapter 3
Effectiveness of Effluent Guidelines Remains Uncertain

The impact of EPA's effluent guidelines in helping EPA reduce pollutant discharges and meet Clean Water Act goals remains uncertain. Although effluent guidelines were used in the NPDES permits we analyzed, pollutant discharge data were not readily available to determine whether effluent guidelines reduced pollutant discharges. To determine the effectiveness of an effluent guideline, we had to determine how quickly permits for facilities affected by guidelines were reissued; how widely guidelines were used in these permits; and the magnitude, if any, of resultant pollutant discharge reductions. We found:

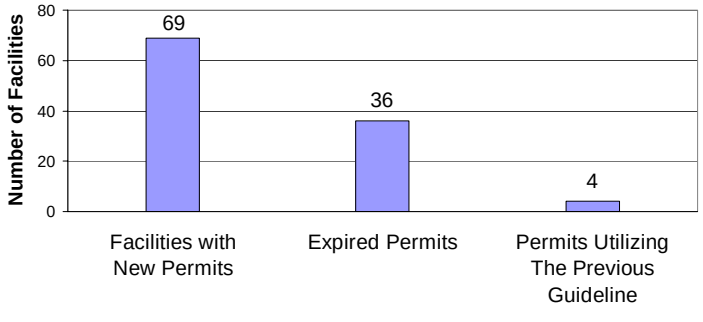
- A lag in issuing permits that utilized the revised effluent guidelines.
- Once reissued, permit limits were derived from the revised guidelines to a very large extent.
- Adequate information was generally absent, although revised guideline-derived permit limits had an impact on the limited number of facilities we examined that had the necessary information for our assessment.

Due to a lack of pollutant discharge data, we could not determine the overall extent of environmental benefits brought about by EPA's investment in the effluent guidelines program.

Lag In Reissuing Permits Delayed Realizing Benefits

A delay in issuing permits slowed the implementation and, thus, the benefits (and costs) of effluent guidelines. For our review, we focused on effluent guidelines for three industries: pesticide manufacturing (issued in 1993); pharmaceutical manufacturing (issued in 1998); and pulp, paper, and paperboard (issued in 1998). As shown in Figure 3, of the 109 major facilities that we identified as being covered by these three guidelines, 69 had been issued a new permit utilizing the revised guidelines. Of the remaining 40 facilities, 36 were operating with expired permits as of December 31, 2002, our

Figure 3: Many Facilities Are Operating With Expired Permits



established cut-off date, and 4 had been reissued permits erroneously using the previous guideline for the industry.

A high proportion of the expired permits had been expired for a long time. Over 60 percent (22 of 36) of the permits had been delayed 4 or more years. Even among those facilities whose permits had been reissued by the end of 2002, reissuance was often delayed. More than three-quarters (77 percent) of the 69 facilities whose permits had been reissued by the end of 2002 had not been issued on time (see Table 3.1). As a result, much of the potential benefit of EPA's investment in new effluent guidelines was delayed.

Table 3.1 The Time Elapsed Before the Permits Implementing the Three Effluent Guidelines Were Reissued

Time Elapsed	Number of Permits	Percentage of Permits
Permits Reissued on Time	16	23%
Permits Reissued 0 to 1 Year Late	17	25%
Permits Reissued 1 to 2 Years Late	16	23%
Permits Reissued 2 to 3 Years Late	11	16%
Permits Reissued 3 to 4 Years Late	6	9%
Permits Reissued 4 to 5 Years Late	2	3%
Permits Reissued 5 to 6 Years Late	1	1%

This lag is a direct result of the overall backlog of permits in the NPDES program. Issuing water discharge permits in a timely manner has been a challenge for EPA. Until recently the permit backlog was a significant or “material” weakness under the Federal Managers’ Financial Integrity Act.

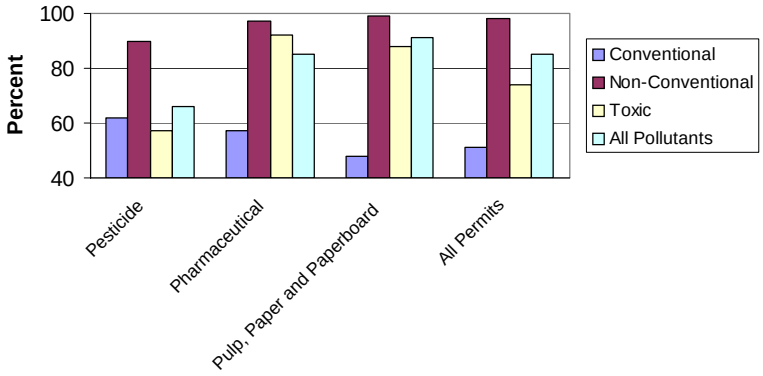
EPA and its State partners have taken a number of steps to reduce the permit backlog, and the Agency believes that it has turned the corner on addressing the number of expired permits. In 2002, EPA downgraded the classification of the NPDES permit backlog to an “Agency” weakness. We are studying this issue in a separate evaluation, focusing on root causes of the backlog and the progress and environmental impact of steps being taken to reduce it.

Reissued Permits Employ Guidelines to Large Extent

Although variation occurred, permit writers used effluent guidelines to derive 85 percent of the pollutant discharge limits for the 69 facilities whose permits we reviewed. Our analysis only focused on the pollutants that had effluent guidelines pollutant limits. This extremely high reliance on effluent guidelines to derive permit limits indicates that these guidelines may have filled a void in the coverage of pollutants discharged into the nation's waters. Since permit writers are required to use the most stringent limit for a pollutant (most stringent of water quality standards or effluent guidelines), our results suggest that (1) deriving discharge limitations from effluent guidelines provided more stringent controls than water quality standards, or (2) water quality standards did not exist for some of the applicable pollutants.

Although the guidelines were used at a high level overall, the three industries differed in their use of the guidelines. Of the 1,828 pollutant limits reviewed for these 69 facilities, effluent guidelines were used to derive 91 percent of the pulp, paper, and paperboard pollutant limits; 84 percent of the pharmaceutical manufacturing pollutant limits; and 66 percent of the pesticide manufacturing pollutant limits (see Figure 4 and Appendix B). The use of the pesticide manufacturing effluent guideline was lower because about 20 percent of the pollutant limits were limited by another effluent guideline – the organic chemicals, plastics, and synthetic fibers effluent guideline.

Figure 4: Effluent Guidelines Usage by Industry and Pollutant Type



Data Largely Unavailable, Although Discharge Reductions Noted in Most Cases Reviewed

A lack of information about discharges prior to the imposition of new limits prevented us from answering whether effluent guidelines effectively reduced pollutant discharges. We found adequate data to analyze changes in discharges for only seven facilities (four covered by the pulp, paper, and paperboard rule and three by the pharmaceutical rule). Our approach and findings may be useful to EPA should it decide to conduct its own evaluation of this program. Details follow.

Data Largely Lacking

EPA lacked the data needed to determine the degree to which these effluent guidelines reduced pollutant loadings. Although EPA collects some facility data to develop effluent guidelines limits, it does not systematically and continuously collect data to examine guidelines' effectiveness.

Additionally, data were not generally available in the Permit Compliance System (PCS), a national information system that tracks NPDES implementation. Data characterizing the industry prior to effluent guidelines promulgation did not exist in the PCS due to a lack of monitoring requirements in earlier NPDES permits. When data were available, they were often reported differently (i.e., daily maximum versus monthly average) before and after the promulgation of the effluent guideline, making comparison difficult. Additionally, the analytical methods used to measure certain pollutants, such as dioxin and furan, are only reliable to a certain level, and pollutant loadings measured below this level are considered "non-detect," making analysis difficult.

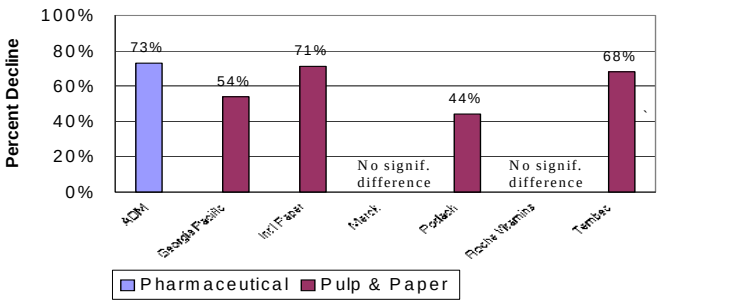
Additionally, pollutant discharge data did not exist prior to the effluent guidelines being implemented for us to examine pollutant discharge changes, or the pollutants were limited by water quality standards and not effluent guidelines.

For these reasons, we were unable to conduct the broad analysis we had intended because of the lack of available, reliable, and valid data. As a result, we were only able to analyze the discharges of two pollutants:

- Adsorbable organic halides (AOX), for pulp, paper, and paperboard facilities.
- Chemical oxygen demand (COD), for pharmaceutical manufacturing facilities.

Facilities Implementing Effluent Guidelines Demonstrated Pollutant Discharge Reductions

Figure 5

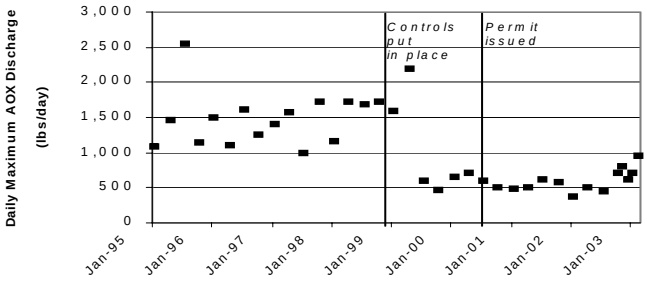


Pollutant discharge reductions occurred at five of the seven pharmaceutical manufacturing and pulp, paper, and paperboard facilities we analyzed (see Figure 5). Further, at the remaining two facilities (both pharmaceutical firms), they had already been meeting the new, more stringent limits under their previous permit and thus were already discharging below effluent guidelines limits. Facility

managers at five of the facilities showing reductions told us that the revised guidelines were the principal reason they implemented new technology to reduce their pollutant discharges. Our results for this small number of facilities document the potential gains resulting from effluent guidelines regulations, and we believe additional evaluation of this program by EPA is warranted. Details regarding each facility type follow.

Pulp, Paper, and Paperboard Facilities: The 1998 Pulp, Paper, and Paperboard Effluent Guideline was developed primarily to reduce the discharge of dioxin. Studies have shown that exposure to dioxin at high enough doses may cause a number of adverse health effects, such as cancer and reproductive or developmental effects, and dioxin has also caused some fish consumption advisories. However, dioxin is often discharged at extremely low concentrations, even below detection limits, making it difficult to analyze trends in dioxin discharges. AOX, on the other hand, is discharged at much higher levels, making detection and trend analysis possible. EPA determined that when AOX is decreased, a decrease in dioxin occurred. Our statistical analysis on changes in AOX levels found that all four pulp, paper, and paperboard facilities significantly reduced AOX discharges after implementing new technology to comply with effluent guideline-based pollutant limits. Decreases ranged from 44 percent to 71 percent. Figure 6 illustrates change in loadings at one of the facilities; Appendix C provides a detailed case study.

Figure 6: AOX Loadings From One Pulp, Paper, and Paperboard Facility



Pharmaceutical Facilities: Three facilities in our review had pollutant discharge data for COD. COD is the measure of oxygen-consuming capacity present in the wastewater; adequate oxygen levels in water are a necessity for fish and other aquatic life. One facility decreased its pollutant discharges due to the effluent guideline, while the other two facilities had been discharging below mandated effluent guideline limits prior to the imposition of the guideline. The facility reducing COD discharges did not yet have an approved NPDES permit with the revised effluent guideline based COD limits, but the facility manager expected the permit to be approved soon.

Conclusion

Our evaluation has shown that the effluent guidelines program is having some impact, because the guidelines were being used in permits and were reducing loadings in the few cases we could examine. Some of the impact may be lessened

because effluent guidelines are not implemented timely into permits. However, in general, EPA does not have the data needed to measure the results of the effluent guidelines program. Therefore, due to the lack of pollutant discharge data, we cannot determine whether this program is achieving environmental improvements.

Recommendation

We recommend that the Acting Assistant Administrator, Office of Water:

3.1 Evaluate the effectiveness of effluent guidelines by systematically collecting pollutant discharge data before and after an effluent guideline is promulgated for a select number of facilities for each guideline.

Agency Comment and OIG Evaluation

The Office of Water agreed to perform retrospective analyses to determine the effectiveness of several effluent guidelines. We agreed with the Office of Water's proposed actions. However, we would like to obtain additional information about the retrospective studies EPA plans on undertaking and how these individual studies will be used to develop an assessment of the overall program. For example, we would like to know which effluent guidelines will be selected for analysis, the methodology to be used, and timeframes for completing the studies.

Chapter 4
EPA Does Not Adequately Measure Program Performance

EPA's assessments of the performance of the effluent guidelines program are flawed. Although our work showed significant reductions in a few facilities, EPA has not systematically collected data to evaluate this program as a whole. EPA has developed some performance measures, but the data used to determine whether the measures have been met are imprecise. Therefore, EPA cannot support the following statement it made in its recent Annual Report:

> **FY 2002 Result: Industrial discharges of pollutants to the Nation's waters were significantly reduced through implementation of effluent guidelines. A total of approximately 2 billion pounds of industrial discharges was eliminated.**

The effluent guidelines program, like other water programs that we have recently examined, suffers from a marked insufficiency of information to make managerial decisions, because EPA has not developed a systematic way of collecting such information. In late 2003, Office of Water management decided to reprogram Agency resources, moving staff from the effluent guidelines program to other programs. These decisions are being made without sufficient understanding of how they will effect the environment. EPA has acknowledged these limitations, but has not put into place recommendations that we made in the past that would help to correct this problem.

Congress and the President Require EPA to Report on Program Effectiveness

The Government Performance and Results Act of 1993 and the President's Management Agenda require EPA to measure the effectiveness of its programs:

- The **Government Performance and Results Act** requires agencies to establish performance indicators to measure the outputs, service levels, and outcomes of each program activity and to compare actual program results with the established performance goals. An output measure is the tabulation, calculation, or recording of activity, while an outcome measure indicates the results of a program activity compared to its intended purpose.

- The **President's Management Agenda** notes that "many agencies and programs lack rigorous data or evaluations to show that they work. Such evidence should be a prerequisite to continued funding." It further notes that all Federal agencies will be expected to use the Office of Management and

Budget Program Assessment Rating Tool results and performance measures to support and explain budget requests.

EPA Has Identified Useful Goals and Performance Measures

The goals and performance measures shown in Table 4.1, referred to as "reducing industrial discharges," are designed to provide useful outcome-oriented information to assess program results.

Table 4.1: EPA's 2003 Annual Performance Goals and Measures for Reducing Industrial Pollutant Discharges (in millions of pounds)

Performance Measures	Fiscal Year 2002 Enacted	Fiscal Year 2002 Actual
Reduction in loadings for **toxic** pollutants for facilities subject to effluent guidelines promulgated between 1992 and 2000, as compared to 1992 levels as predicted by model projections (cumulative)	10.5	13.5
Reduction in loadings for **conventional** pollutants for facilities subject to effluent guidelines promulgated between 1992 and 2000, as compared to 1992 levels as predicted by model projections (cumulative)	572.0	715.7
Reduction in loadings for **non-conventional** pollutants for facilities subject to effluent guidelines promulgated between 1992 and 2000, as compared to 1992 levels as predicted by model projections (cumulative)	1,007	1,199.8

In Fiscal Year 2003, EPA's annual performance goal was to develop effluent guidelines that, when implemented, reduce pollutant loadings into surface waters. The quantity of pollutant loadings being prevented from being discharged is a valuable measure of outcomes and an indicator of program success. However, it is not a true measure of *environmental* outcomes; measures such as the number of impaired waters that were restored to designated uses or the number of fish advisories reduced would be closer to a true environmental outcome measure. As EPA gains experience designing measures, and improves the quality of its environmental data bases, it should be able to construct such measures.

EPA's Performance Reports Are Imprecise

Although performance measures for the effluent guidelines program provide a useful target against which to measure progress, the process EPA uses to measure its progress is highly uncertain. EPA performance measures are based on two estimates: an average reduction per facility and the number of facilities implementing the guideline. As a result, EPA cannot truly assess benefits, since each of these factors is highly uncertain. Details follow.

Accuracy of Reduction Projections Untested

Because EPA has chosen to assess performance by estimating rather than measuring results, it cannot verify the degree to which these projections are accurate. Pollutant discharge reduction estimates are typically based on data that EPA gathers at facilities when it develops the effluent guidelines. Because the Clean Water Act does not authorize EPA to mandate which technologies facilities will employ to meet effluent guidelines-based permit limits, variations occur in the pollutant discharges at facilities. Although EPA conducts detailed analysis as part of its rulemaking process, it does not verify the accuracy of the predictions once the rule has been issued and, therefore, is not in a position to tell whether its projections of facility-level discharge reductions are, in fact, accurate.

EPA officials stated that, due to limited resources, they had not assessed the results of effluent guidelines after promulgation because they were focused on developing and promulgating effluent guidelines required by the consent decree. However, one EPA official said work has begun to assess results for one industry.

Estimates of Number of Facilities Using Guidelines Untested

Determining the number of facilities whose permits were issued and who utilized the effluent guidelines is the second component of developing an estimate of reduced pollutant discharges. However, EPA used a process to determine the number of permits that could likely be in error and could result in an overestimate of the loading reductions.

EPA's Water Permits Division obtains the Standard Industrial Classification (SIC) codes for the applicable industrial categories with effluent guidelines. Staff from five of the nine regions we interviewed explained that the numbers that they supply to EPA headquarters are based on simply identifying those permits that match the SIC codes supplied to them, typically through the PCS. Two regions' officials said they send the list to the States to complete.

We found that identifying facilities that implemented effluent guidelines by using SIC codes can result in overestimating the number of facilities. For example, the revised pulp, paper, and paperboard effluent guidelines applied only to facilities that produced bleached papergrade kraft or papergrade sulfite. The only way to determine which facilities applied those subparts was to examine the permit file. If only a SIC code search was done, EPA would identify all pulp, paper, and paperboard facilities and not just those that produce papergrade kraft or papergrade sulfite. EPA regional officials said they rarely examine the NPDES permits to determine whether the facility was subject to the effluent guideline before providing the number of facilities to EPA's Water Permits Division. It is also possible that some industrial facilities implementing the effluent guideline might not fall into the set of SIC codes provided to EPA regions, which could result in undercounting the number of facilities.

The reason EPA requests this type of information from the regional offices was because permit writers were not required to input data on which effluent guidelines were applicable to a facility. In our report, *EPA Should Require Program Results Data Fields For the Effluent Guidelines Program in the Modernized Permit Compliance System* (2002-M-000052), dated September 30, 2002, we recommended that EPA develop a required data field in the modernized PCS to capture the effluent guideline or guidelines that apply to each permitted facility. EPA's Office of Enforcement and Compliance Assurance stated in its response that such a field will be included in the modernized PCS. It is important that this be done as soon as possible to ensure that an accurate number of permits that utilized effluent guidelines is used in EPA's effluent guidelines performance measures.

Conclusion

EPA does not have the data to measure the results of the effluent guidelines program. EPA's current method of measuring performance is too imprecise since it relies on estimates. Because EPA does not measure the effectiveness of the program, the Office of Water cannot ensure that (1) resources are allocated appropriately and efficiently, resulting in the largest degree of environmental improvement for the resources it expends; and (2) the program is accomplishing its pollution reduction goals.

Recommendations

We recommend that the Acting Assistant Administrator, Office of Water:

4.1 Develop performance measures that are based on actual pollutant discharge data rather than discharge estimates gathered before the effluent guideline was effective.

4.2 Work with the Office of Enforcement and Compliance Assurance to ensure that it develops a required data field in the modernized PCS to capture the effluent guideline or guidelines that apply to each permitted facility.

Agency Comment and OIG Evaluation

The Office of Water agreed that actual pollutant discharge data should be used to develop performance measures and stated that the work evaluating the effectiveness of several effluent guidelines will help address this recommendation. Also, the Office of Water agreed that adding a data field to the PCS would be a useful way to link reporting facilities with the appropriate effluent guidelines. We agree with the Office of Water's responses to these recommendations.

Appendix A

Details on Scope and Methodology

We evaluated the effluent guidelines program by developing and applying a four-phase model that describes the program: selection, development, utilization, and evaluation.

Selection

The first phase of this process, the selection of industries for effluent guidelines development, is not addressed in this report. Instead, we reported on the effluent guidelines selection process in a briefing to EPA management on their draft strategy; that draft strategy is titled *A STRATEGY FOR NATIONAL CLEAN WATER INDUSTRIAL REGULATIONS: Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards,* dated November 2002.

Development

To evaluate the development process, we interviewed EPA officials, State permit writers, publicly owned treatment works representatives, environmental groups, and industry officials. We also reviewed documents EPA prepared describing the process used to develop several effluent guidelines, recommendations made by the Effluent Guidelines Task Force, EPA's disposition on the Task Force recommendations, and a flowchart of the effluent guidelines development process.

Utilization

To determine the utilization of effluent guidelines, we narrowed our focus to a limited number of industries' effluent guidelines. We developed criteria to assist us in selecting among the different industries with effluent guidelines. We chose industries with effluent guidelines that (1) had been effective for several years so that the likelihood of effluent guidelines being utilized in the permits reviewed was great; (2) limited toxic pollutants; and (3) had a defined number of SICs to define the universe of major dischargers. Pesticide manufacturing; pharmaceutical manufacturing; and the pulp, paper, and paperboard industries were the only industries that fit all of these criteria. As a result, our results cannot be extrapolated to other industries' utilization of effluent guidelines.

We restricted our review to major, direct dischargers with NPDES permits in the three industries listed above. Since the OIG is conducting a separate review on indirect dischargers, we focused only on direct industrial dischargers.

To identify facilities that should have complied with one of the three effluent guidelines, we used the PCS to search for major facilities by SIC code. We used the SIC codes for the pesticide manufacturing; pharmaceutical manufacturing; and pulp, paper, and paperboard effluent guidelines found in their development documents. For the pulp, paper, and paperboard effluent guideline, we sampled all facilities listed by EPA as facilities producing bleached papergrade kraft and soda or papergrade sulfite.

From our research, we found 215 facilities with permits in these three industries. Of the 215 permits we requested, 104 were either (1) not required to implement any of the three effluent guidelines we reviewed because the effluent guidelines were not applicable to those facilities, or (2) information was unavailable. Two permits were issued prior to the revised guidelines promulgation date and thus were not reviewed. We analyzed 109 NPDES permits required to implement 1 of the 3 effluent guidelines to determine how timely the new effluent guidelines were implemented into the permits, if at all. We did this by examining the most current permit to determine whether the new effluent guideline had been implemented.

For those permits that implemented the new effluent guidelines (69 permits), we determined to what extent effluent guidelines were used as the basis of pollutant limits. Our analysis only focused on the pollutants that had effluent guidelines pollutant limits listed in the applicable Code of Federal Regulations.

Finally, we set out to determine the impact that effluent guideline-based limits had on the facilities' pollutant discharge levels. We found that comprehensive discharge data was not available for most facilities. We identified only four pulp and paper facilities and three pharmaceutical manufacturing facilities for which pollutant discharge data was readily available. We interviewed the facility managers for the seven identified facilities and analyzed discharge data from the PCS to determine whether there was a statistically significant difference in pollutant loadings before and after facilities implemented technology changes to comply with the guidelines.

Evaluation

To assess the evaluation process of the effluent guidelines program, we interviewed and obtained data from EPA officials. We also interviewed State permit writers and industry representatives. Further, we reviewed EPA's Annual Performance Plan for the last 5 years, analyzing the performance measures related to the effluent guidelines program.

Appendix B

NPDES Permit Analysis Results

This appendix displays further results of our evaluation of 69 facility permits: 47 pulp, paper, and paperboard; 12 pharmaceutical manufacturing; and 10 pesticide manufacturing permits. We determined whether the pollutant limits in these permits were based on effluent guidelines, water quality standards, or permit writer's best professional judgment. Permit limits were occasionally based on a combination of the above, such as effluent guidelines and best professional judgment. We only evaluated those pollutants subject to the three effluent guidelines. For example, the pollutant fecal coliform was in several pulp, paper, and paperboard permits, but since the pollutant is not covered by the pulp, paper, and paperboard effluent guideline it was not considered in our analyses. The number of pollutant limits in each category is presented in Table B.1.

Table B.1: The Classification of Pollutant-Based Limits in 69 NPDES Permits Reviewed

Basis of Pollutant Limits	Industries		
	Pesticide Manufacturing	Pharmaceutical Manufacturing	Pulp, Paper, and Paperboard
Effluent Guidelines	163 (44%)	132 (80%)	1,156 (90%)
Effluent Guidelines and Water Quality Standards	0 (0%)	0 (0%)	13 (1%)
Effluent Guidelines and Best Professional Judgment	4 (1%)	7 (4.2%)	4 (0%)
Water Quality Standards	3 (1%)	7 (4.2%)	51 (3%)
Best Professional Judgment	9 (2%)	0 (0%)	22 (2%)
Other Combinations	87 *(Note 1)* (23%)	12 (7.4%)	10 (1%)
Cannot Determine	32 (9%)	7 (4.2%)	34 (3%)
Total Pollutant Limits	298 *(Note 2)* (80%)	165 (100%)	1,290 (100%)

Note 1: The other combinations category for pesticide manufacturing included 22 percent of pollutant limits (81 of 373) that had the pesticide manufacturing effluent guideline as a part of combination. The other 1 percent of the combinations (6 of 373) did not have the pesticide effluent guidelines as part of the combination.

Note 2: The total was not 100 percent because 20 percent of the limits (75 of 373) were based on the organic chemicals, plastics, and synthetic fibers effluent guideline.

Appendix C

Case Study of a Pulp and Paper Facility

Tembec USA operates a pulp and paper mill in St. Francisville, Louisiana, a town approximately 30 miles north of Baton Rouge with a population of 1,712. The facility is a bleached kraft pulp and paper mill that produces board, container, and tissue papers, discharging its wastewater to the Mississippi River. In the spring of 1999, Tembec changed its pulp bleaching process to reduce their toxic discharges and comply with the Pulp, Paper, and Paperboard Effluent Guidelines. The average AOX discharge between July 1999 and February 2003 was 68 percent lower than the average AOX discharge between January 1995 and April 1999.

The Pulp, Paper, and Paperboard Effluent Guideline

The Pulp, Paper, and Paperboard Effluent Guidelines were revised in 1998 primarily to reduce the discharges of toxic and non-conventional pollutants from two categories of mills: bleached papergrade kraft and soda mills and papergrade sulfite mills. The National Dioxin Study, initiated in 1983, found that dioxin was present in fish downstream of 57 percent of the pulp and paper mills studied. To further investigate, EPA conducted a Five-Mill Study and the 104-Mill Study. During the late 1980s, EPA found that dioxin was generated when chlorine or chlorine derivatives were used in the bleaching process. Accordingly, EPA developed the 1998 Pulp, Paper, and Paperboard Effluent Guidelines based on the complete substitution of chlorine dioxide for chlorine as the key process technology. The guidelines required facilities to virtually eliminate all dioxin and dioxin-related discharges.

Dioxins and Adsorbable Organic Halides

Dioxins refers to a group of chemical compounds that share certain chemical structures and biological characteristics. Several hundred of these compounds exist. Studies have shown that exposure to dioxins at high enough doses may cause an increased risk of cancer and reproductive or developmental effects. Dioxins are also persistent compounds that break down slowly in the environment, often becoming concentrated in food chains. The Pulp, Paper, and Paperboard Effluent Guideline of 1998 addressed discharges of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), one of the most toxic dioxins. This dioxin has been identified as a human carcinogen based on the weight of animal and human evidence.

Dioxins are often discharged at extremely low quantities, even below the detection limits made possible by modern analytical techniques. For example, the current minimum detection level for TCDD is 10 picograms per liter. Dioxin discharges below the minimum detection level cannot be quantified and are reported in the PCS as "0," complicating analyses of dioxin discharge trends. Still, unquantifiable dioxin discharges can bioaccumulate in fish tissue, resulting in possible harm to those eating the fish. In fact, most dioxin exposure occurs through diet, with over 95 percent coming through dietary intake of animal fats.

Adsorbable Organic Halides (AOX) is a gross measure of chlorinated organic matter. EPA concluded that reductions in AOX will reduce the mass of dioxin, and included AOX limitations in the 1998 Pulp, Paper, and Paperboard Effluent Guidelines. AOX is also discharged at significantly higher levels than dioxin, thereby eliminating the issue of discharges below the limit of detection and making analyses of AOX discharge trends less complicated. OIG recognizes that both the American Forest and Paper Association and the Alliance for Environmental Technology did not agree with EPA's scientific conclusions concerning AOX as it relates to dioxin. Still, AOX was included in the final rule-making, so we included it in our evaluation as a surrogate measure for dioxin, based on EPA's statement, "that reducing AOX loadings will have the effect of reducing the mass of dioxin... and other chlorinated organic pollutants discharged by this industry." Further, in the permits we reviewed, AOX was the only pollutant (1) whose basis was effluent guidelines; (2) that was revised in the 1998 Pulp, Paper, and Paperboard Effluent Guidelines; and (3) that had discharge data available in the PCS.

AOX Discharge Trends at Tembec USA

In November 1994, EPA issued an NPDES permit for Tembec USA's St. Francisville Mill that included quarterly monitoring requirements for AOX. The mill began reporting daily maximum discharges of AOX in January 1995, as well as wastewater flows. Later, in 1999, the facility implemented chlorine free bleaching, which was the pollution control technology recommended by the effluent guideline. The facility expected that its NPDES permit was to be renewed in 1999 and would include new pollutant limits based on the 1998 Pulp, Paper, and Paperboard Effluent Guidelines. Although the permit was not renewed until October 2002, the facility implemented the new technology to meet the expected effluent guideline-based limits. The facility significantly reduced its average daily maximum AOX discharges between April 1999 and July 1999. See Figure C.1 and Table C.1.

Figure C.1: Daily Maximum AOX Discharges for Tembec USA

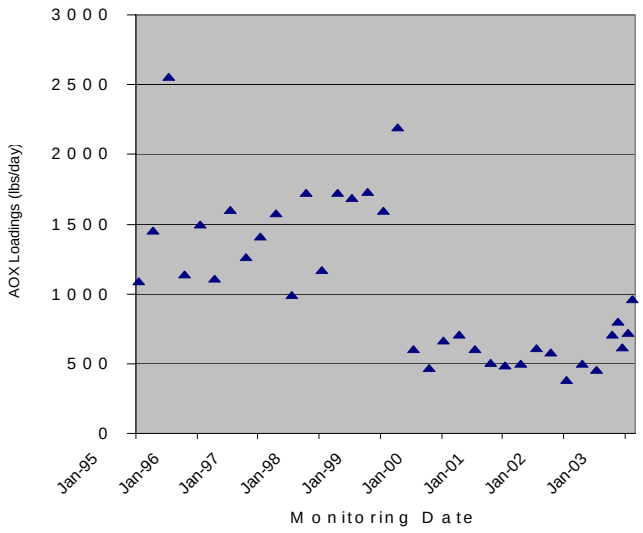


Table C.1: Daily Maximum AOX Discharge t-Test, Assuming Unequal Variances (Tembec USA)

Statistic	Discharges From 1/95 to 4/99	Discharges From 7/99 to 2/03
Mean (lbs/day)	1,529	604
Variance	157,697	19,972
Standard Deviation	397.1	141.3
Observations	18	18
Degrees of Freedom	21	
t Statistic	9.31	
P(T<=t) one-tail	< 0.001	
t Critical one-tail	1.721	
P(T<=t) two-tail	< 0.001	
t Critical two-tail	2.08	

Noting that the AOX discharges on July 1995 and April 1999 appeared to be outliers and might lead to an overestimate of average AOX discharge before the new process was put in place, these values were excluded from the data set and a t-test was re-run. Excluding these values, there was still a significant reduction in AOX discharges between January 1999 and July 1999. See Table C.2.

Table C.2: Daily Maximum AOX Discharge t-Test, Excluding Outliers, Assuming Unequal Variance (Tembec USA)

Statistic	Discharges from 1/95 to 1/99	Discharges from 7/99 to 2/03
Mean (lbs/day)	1,423	604
Variance	66,941	19,972
Standard Deviation	397.1	141.3
Observations	16	18
Degrees of Freedom	23	
t Statistic	11.259	
P(T<=t) one-tail	< 0.001	
t Critical one-tail	1.714	
P(T<=t) two-tail	< 0.001	
t Critical two-tail	2.069	

The AOX discharge data were also normalized by their respective wastewater flows to ensure that the reductions in AOX discharges were not due to decreases in the wastewater flows of the facility. Similar to the non-flow normalized data, there was a significant decrease in AOX discharges between April 1999 and July 1999. See Figure C.2 and Table C.3.

Figure C.2: Flow Normalized Daily Maximum AOX Discharges at Tembec USA

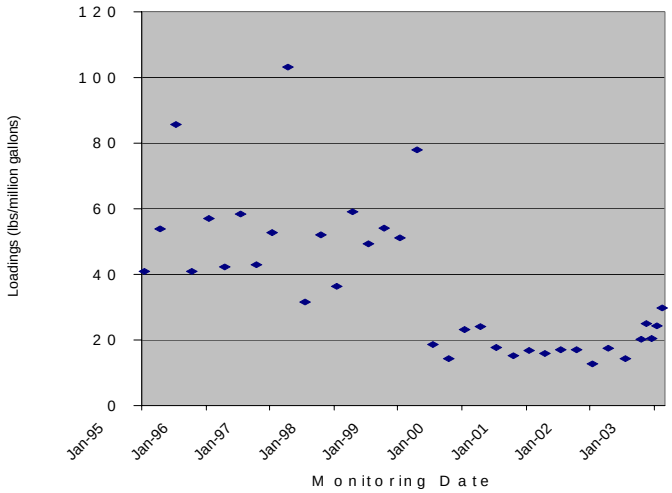


Table C.3: Flow Normalized Daily Maximum AOX Discharge t-Test, Assuming Unequal Variance (Tembec USA)

Statistic	Discharges From 1/95 to 4/99	Discharges From 7/99 to 2/03
Mean (lbs/million gallons)	55	19
Variance	323	20
Standard Deviation	18	4.5
Observations	18	18
Degrees of Freedom	19	
t Statistic	8.206	
P(T<=t) one-tail	< 0.0001	
t Critical one-tail	1.729	
P(T<=t) two-tail	< 0.0001	
t Critical two-tail	2.093	

The AOX daily maximum discharge data were also log-transformed to account for the possibility that AOX discharges are not normal, but lognormal. Data is lognormal when the log of the data series is normally distributed. Figures C.3 and C.4 show that the AOX loadings data *may* be lognormal, as the log of the loadings data appears *slightly* more normal than the untransformed data.

Figure C.3: Distribution of Daily Maximum AOX Discharges, Post Technology Implementation (Tembec USA)

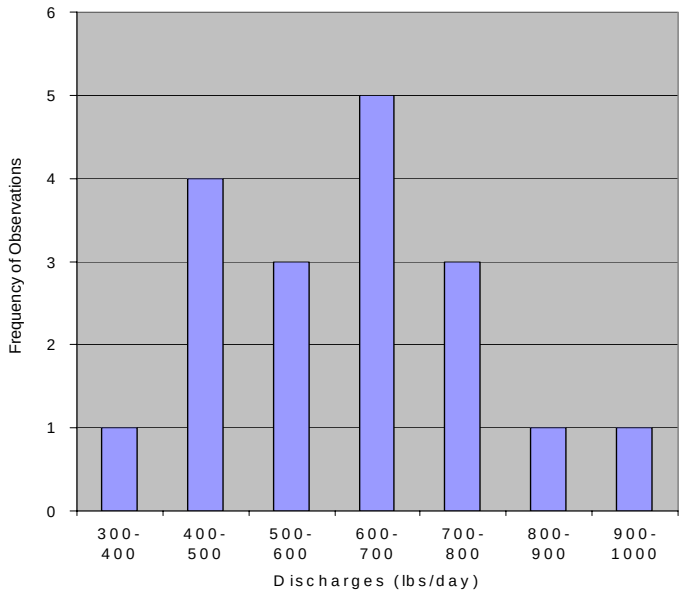
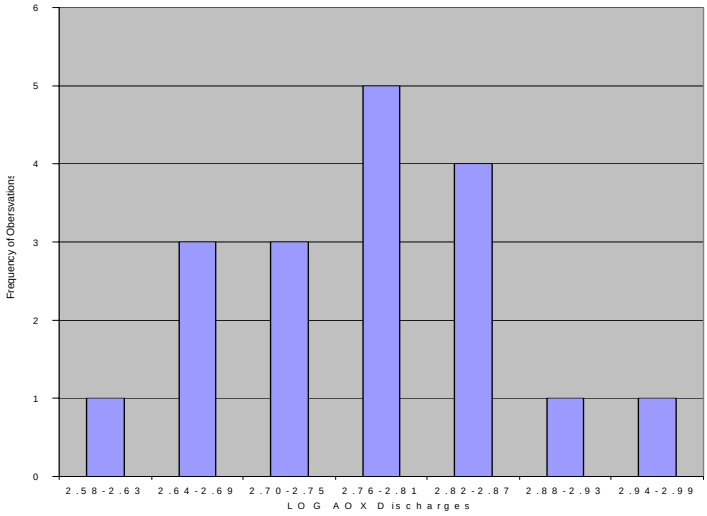


Figure C.4: Distribution of Log Transformed Daily Maximum AOX Discharges, Post Technology Implementation (Tembec USA)



Using the log-transformed data, there was still a significant reduction in AOX discharges between April 1999 and July 1999. See Table C.4.

Table C.4: Log Transformed Daily Maximum AOX Discharge t-Test, Assuming Unequal Variance (Tembec USA)

Statistic	Discharges From 1/95 to 4/99	Discharges From 7/99 to 2/03
Mean of Log Transformed Observations	3.17	2.77
Variance	0.012	0.010
Standard Deviation	0.1	0.1
Observations	18	18
Degrees of Freedom	34	
t Statistic	11.655	
P(T<=t) one-tail	< 0.0001	
t Critical one-tail	1.691	
P(T<=t) two-tail	< 0.0001	
t Critical two-tail	2.032	

The average daily maximum AOX loading prior to the implementation of chlorine free bleaching was 1,529 lbs/day with an average flow of 30 million gallons/day. Normalized for flow, the facility was discharging 50.3 lbs of AOX per million gallons of flow. The average daily maximum AOX loading after the implementation of chlorine free bleaching technology was 604 lbs/day with an average flow of 37 million gallons/day. Normalized for flow, the facility was discharging 16.25 lbs of AOX per million gallons of flow. After the implementation of chlorine free bleaching technology to comply with the pulp and paper effluent guideline, the average daily maximum AOX discharge was reduced by 34.5 lbs per million gallons of flow, a 68 percent reduction.

Appendix D

Agency Response

July 7, 2004

WATER

MEMORANDUM

SUBJECT: Draft Evaluation Report: "Effectiveness of Effluent Guidelines Program for Reducing Pollutant Discharges Uncertain"

FROM: Benjamin H. Grumbles /s/
Acting Assistant Administrator

TO: Dan Engelberg
Director for Program Evaluation Water Issues
Office of Program Evaluation
Office of Inspector General

Thank you for your memo dated June 4, 2002, transmitting the draft report on the subject evaluation, No. 2003-000228. We appreciate your careful and thoughtful study of the effluent guidelines program, and we appreciate the opportunity to provide you with the following comments. The questions you sought to answer are important ones. Your findings highlighted the critical role of effluent guidelines in improving water quality. For example, the draft report indicates that permit writers used effluent guidelines to derive 85 percent of the pollutant discharge limits for the 69 facilities whose permits you reviewed. This evidence of relying on effluent guidelines is an excellent indicator of the program*s success.

In the following paragraphs, I am pleased to respond to the draft report*s specific recommendations. In addition, an attachment to this memo provides some additional clarifications.

Recommendation 1 (Report Recommendation 3.1):
Evaluate the effectiveness of effluent guidelines by systematically collecting pollutant discharge data before and after an effluent guideline is promulgated for a select number of facilities for each guideline.

I appreciate this suggestion, and acknowledge the value of collecting pollutant discharge data before and after promulgation of an effluent guideline. There are advantages to being able to show the benefits generated by effluent guidelines with such a comparison.

We need to find a way to collect this data within reasonable resource constraints. Potential costs are high. For example, the cost to collect and analyze statistically valid data to support the development of an effluent guideline – the "before" part of the equation – for a single point source category is in the range of $1 million to $5 million, based on recent experience. (The sampling, analytical, and reporting costs for a typical wastewater sampling event in developing a guideline range from $50,000 to $250,000 and depend on which analytes are sampled, the number of analytes sampled, the number of sample points, the site of the operation, the diversity of the industry, and the geographical location of the industry.) We estimate that the cost of collecting effluent sampling data after an effluent guideline has been implemented would be an additional $200,000 based on an estimated $20,000 per facility and 10 facilities sampled in a given industry. The number of facilities could change based on several factors, including the quality of data already available in PCS, the size of the industry, and statistical considerations. The post-guideline estimated cost is less than the pre-guideline sampling because there would be fewer analytes to collect and fewer sample points.

In the absence of funds of this magnitude we have identified some alternative approaches that may have similar merit. For example, we could use the data collected during the development of the effluent guideline and compare that data to self-monitoring data, which facilities report to the PCS. I have directed the Engineering and Analysis Division (EAD) to conduct a retrospective analysis of the effectiveness of several effluent guidelines, similar to the approach in your draft report. Their focus will be on three or four point source categories with recently-collected and sufficiently-robust data. I have also directed EAD to determine the usefulness of comparing the sampling data collected during the revision of an effluent guideline with that collected during the original promulgation. EAD will report back to me on their findings by mid-FY05.

Recommendation 2 (Report Recommendation 4.1):
Develop performance measures that are based on actual pollutant discharge data rather than discharge estimates gathered before the effluent guideline was effective.

The Office of Water agrees that using actual data is the ideal approach for developing performance measures. Actual data gathered during effluent guideline development is used as the basis for projections in the performance measures used currently by the Office of Science and Technology. These projected values are based on wastewater samples collected from industrial facilities and carefully extrapolated using statistically-valid methods to determine industry-wide pollutant loadings before and after an effluent guideline is promulgated. I agree that being able to validate these projections would enhance the reliability of our performance measures. I believe that the work EAD is undertaking in response to Recommendation 1 will help address this recommendation.

Recommendation 3 (Report Recommendation 4.2):
Work with the Office of Enforcement and Compliance Assurance to ensure that it develops a required data field in the modernized PCS to capture the effluent guideline or guidelines that apply to each permitted facility.

I agree that adding a data field to PCS would be a useful way to link reporting facilities with the appropriate effluent guidelines. A new effluent data element has been included in the Office of Enforcement and Compliance Assurance**'**s (OECA) Integrated Compliance Information System (ICIS). You may recall the memo J. P. Suarez sent you in November 2002 about this effort. Adding this information presents the potential to make self-monitoring data available for systematically evaluating the effectiveness of effluent guidelines, at least for major facilities that are direct dischargers. The Office of Water is continuing, through the Permitting for Environmental Results Strategy, to fully develop and implement the tools described in that Strategy in consultation with OECA, Regions and States.

Clarifications
The draft report covered a range of subjects related to effluent guidelines development and implementation. We identified some clarifications that we ask you to consider before issuing the report in final form. If your staff would like to review or discuss these clarifications, please ask them to contact Pat Harrigan (202/566-1666) in the Office of Science and Technology and Jan Pickrel (202/564-7904) in the Office of Wastewater Management.

Attachment

Appendix E

Distribution

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