TREATABILITY MANUAL

VOLUME V. Summary

U.S. ENVIRONMENTAL PROTECTION AGENCY
Washington, D.C.

February 1980

PREFACE

In January, 1979, EPA's Office of Enforcement and Office of Water and Waste Management requested help from the Office of Research and Development in compiling wastwater treatment performance data into a "Treatability Manual". This Manual was to be used in developing NPDES permit limitations for facilities which, at the time of permit issuance, were not fully covered by promulgated, industry-specific effluent guidelines authorized under Sections 301, 304, 306, 307, and 501 of the CWA.

A planning group was set up to manage the treatability program under the chairmanship of William Cawley, Deputy Director, Industrial Environmental Research Laboratory - Cincinnati. The group includes participants from: 1) the Industrial Environmental Research Laboratory - Cincinnati, 2) Effluent Guidelines Division, Office of Water and Waste Management; 3) Permits Division, Office of Enforcement; 4) Municipal Environmental Research Laboratory - Cincinnati; 5) R. S. Kerr, Environmental Research Laboratory - Ada; 6) Industrial Environmental Research Laboratory - Research Triangle Park; 7) Monsanto Research Corporation; and 8) Aerospace Corporation.

The objectives of the treatability program are:

- To provide readily accessible data and information on treatability of industrial and municipal waste streams for use by NPDES permit writers, enforcement personnel, and by industrial or municipal permit holders;
- To provide a basis for research planning by identifying gaps in knowledge of the treatability of certain pollutants and wastestreams;
- To set up a system allowing rapid response to program office requirements for generation of treatability data.

The primary output from this program is a five-volume Treatability Manual. The individual volumes are named as follows:

Volume I - Treatability Data
Volume II - Industrial Descriptions
Volume III - Technologies
Volume IV - Cost Estimating
Volume V - Summary

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ACKNOWLEDGMENT

The sheer size and comprehensiveness of this document should make it obvious that this had to be the effort of a large number of people. It is the collection of contributions from throughout the Environmental Protection Agency, particularly from the Office of Enforcement, Office of Water and Hazardous Materials and the Office of Research and Development. Equally important to its success were the efforts of the employees of the Aerospace Corporation and the Monsanto Research Corporation who participated in this operation.

No list of the names of everyone who took part in the effort would in any way adequately acknowledge the effort which those involved in preparing this Manual made toward its development. Equally difficult would be an attempt to name the people who have made the most significant contributions both because there have been too many and because it would be impossible to adequately define the term "significant." This document exists because of major contributions by the contractor's staff and by members of the following:

Effluent Guidelines Division
Office of Water and Waste Management

Permits Division
Office of Water Enforcement

National Enforcement Investigation Center
Office of Enforcement

Center for Environmental Research Information

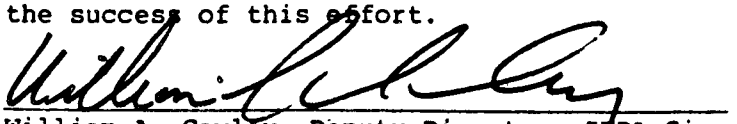
Municipal Environmental Research Laboratory

Robert S. Kerr Environmental Research Laboratory

Industrial Environmental Research Laboratory
Research Triangle Park, NC

Industrial Environmental Research Laboratory
Cincinnati, OH
Office of Research and Development

The purpose of this acknowledgement is to express my thanks as Committee Chairman and the thanks of the Agency to the Committee Members and others who contributed to the success of this effort.



William A. Cawley, Deputy Director, IERL-Ci
Chairman, Treatability Coordination Committee

SECTION V.1

INTRODUCTION

The Treatability Manual presents in five volumes an extensive survey of the effectiveness of various water pollution treatment processes when applied to particular industrial effluents. This volume summarizes volumes one through four and outlines their potential utility to National Pollutant Discharge Elimination System (NPDES) permit writers.

V.1.1 OBJECTIVES

The Treatability Manual is intended for use by NPDES permit writers, along with other information, to:

- Evaluate the potential effectiveness and costs of proposed effluent treatment systems,
- Determine the potential cost and feasibility of compliance with discharge limitations under consideration, and
- Develop the wastewater pollution control and monitoring requirements to be employed at specific sites.

This Manual is <u>not</u> intended to:

- Specify the final effluent concentrations to be required for industrial processes,
- Address "in process" controls,
- Describe wastewater recycling or reuse systems (although their existence is mentioned in Volume II, when such information was provided in the literature),
- Contain an exhaustive study of pollution removal efficiencies or the reliability and applicability of control equipment,
- Define methods or costs for the disposal of by-products of water pollution control, such as solid waste or air pollution, or
- Characterize the suitability of wastewater pollution control equipment and auxiliary processes for meeting air pollution regulations and RCRA regulations.

Nevertheless, this Manual does provide background information on some of these issues for consideration by a permit writer. This, along with other data, may be useful when calculating "best engineering judgment" limits for second-round permits which reflect Best Available Technology for toxic pollutants.

V.1.2 DATA SOURCES

Part A of the bibliography in this volume includes all references used in Volumes I through IV of the Manual. All of these references are available in a central file located at:

U.S. Environmental Protection Agency
Municipal Environmental Research Laboratory
First Floor Library
26 West St. Clair Street
Cincinnati, Ohio 45268

To avoid potentially repetitious literature searches, all other sources examined during this study not containing information considered relevant to this effort are listed in Part B of the bibliography.

V.1.3 GUIDE TO VOLUME V

Subsequent sections of this document are organized as follows:

- Section 2 (Executive Summaries of Volumes I through IV). Summarizes the contents of Volumes I through IV.
- Section 3 (Guidance for Use) provides advice on how the information provided may be used during the NPDES permit writing process.
- Section 4 (Indicators) covers the concept of indicator pollutants and contains a table showing some of the common substances that are efficiently removed by various treatment techniques when operated properly.
- The Bibliography shows all references studied during preparation of Volumes I through IV. Part A covers all references used, and Part B covers references examined but not used.
- Appendix A (Number of Source/Treatment Technology Data Sets) shows the number of effluent test data sets available for various combinations of industrial processes and control technologies.
- Appendix B (Median Observed Effluent Concentrations) shows the median observed effluent concentration for various pollutants, segregated by control technology.
- Appendix C (Median Removal Efficiencies) shows the median observed removal efficiency of different control technologies for various pollutants.

- Appendix D (Pollutant Treatability Index) covers the lowest observed effluent concentration and the highest observed removal efficiency for various pollutants and control technologies, with references to sources of more detailed information in Volume III.
- Appendix E (Regression Analysis) shows the results of a regression analysis of the relationship between toxic pollutant and conventional pollutant concentrations.
- The Glossary defines those abbreviations and terms used in all five volumes of the Manual that might not be readily known.

SECTION V.2

EXECUTIVE SUMMARIES OF VOLUMES I THROUGH IV

V.2.1 VOLUME I - TREATABILITY DATA

Volume I is a compendium of treatability data for specific pollutants. Information is provided on the compounds listed in the Draft Consolidated Permit Application Form 2C (NPDES) Section V, Part B (44 FR 34361, 6/14/79) [3] and the compounds listed in Table 1, 44 FR 50781, August 29, 1979. The pollutants covered were organized into the following chemical categories:

- Metals and inorganics
- Ethers
- Phthalates
- Nitrogen compounds
- Phenols
- Aromatics
- Polynuclear aromatic hydrocarbons
- PCB's and related compounds
- Halogenated hydrocarbons
- Pesticides
- Oxygenated compounds
- Miscellaneous

The following information is provided for each pollutant:

- Alternate names of the chemical;
- Chemical Abstracts Number;
- Physical, chemical, and biological properties, including molecular weight, melting point, boiling point, vapor pressure, solubility in water at 20°C, log octanol/water partition coefficient (relevant to bioaccumulation), Henry's Law constant (reflecting ease of "stripping"), and biodegradability data;
- Probable fate of the compound in the aqueous environment. Removal processes considered include photolysis, oxidation, hydrolysis, volatilization, sorption and biological processes;
- Data on the effectiveness of activated carbon to control the material;

- Industrial occurrence of the material. Minimum, maximum, and mean concentrations are reported for both untreated and treated wastewater for each industry in which the substance has been detected; and
- Average and maximum removal efficiencies and average effluent concentrations for specific control technologies.

V.2.2 VOLUME II - INDUSTRIAL DESCRIPTIONS

Volume II contains a general description of each of the "primary industries" named in the "NRDC Consent Agreement" (NRDC vs Russell E. Train, 8ERC 2120 [D.D.C. 1976] amended on March 1979) and their major subcategories. It also includes:

- Subcategory-wide or industry-wide tables covering,
  - the number of dischargers,
  - the types of pollution control systems in use,
  - the range of effluent flow rates and pollutant concentrations in controlled and uncontrolled waste streams, and
  - the efficiency of control systems, when available;
- Summary tables on BPT effluent guidelines and the status of BAT guidelines, New Source Performance Standards, and Pretreatment standards; and
- Tabulated information on individual plants specifying industrial subcategory, control systems (including operating characteristics when available), effluent concentrations, and influent concentrations when available.

If recycling, reuse, or subsurface injection of wastewater is practiced at a plant, this is noted in the plant-specific table; but no details are included.

V.2.3 VOLUME III - TECHNOLOGIES FOR CONTROL/REMOVAL OF POLLUTANTS

Volume III summarizes information on the nature and effectiveness of various pollution control technologies. It describes the nature of the generic type of control equipment, the major variations of design, and information on the following:

- Design criteria for the process;
- Typical performance of the process;
- Applications and limitations of the process;
- Reliability of the process;
- Chemicals required to operate the process; and
- Environmental impacts of the process.

A summary table for each technology is also provided showing the concentrations of the various pollutants in the effluents; the minimum, maximum, median, and mean removal efficiencies; and the number of data points used to generate this information. Data sheets summarizing the results of tests at specific installations are also included.

Pollution control systems have been classified as:

- Primary - designed to remove suspended solids and colloidal materials;
- Secondary - designed to remove dissolved organics; and
- Tertiary - designed to remove residual organics and dissolved inorganics.

Although exceptions exist, tertiary treatment systems usually operate more reliably and economically on wastewater effluent streams that have received secondary treatment. Secondary treatment systems usually work best on wastewater effluent streams that have received primary treatment.

Figure V.1 summarizes the wastewater treatment options available for pollution control. Treatment options for sludges and liquid by-products of water pollution control are shown at the bottom.

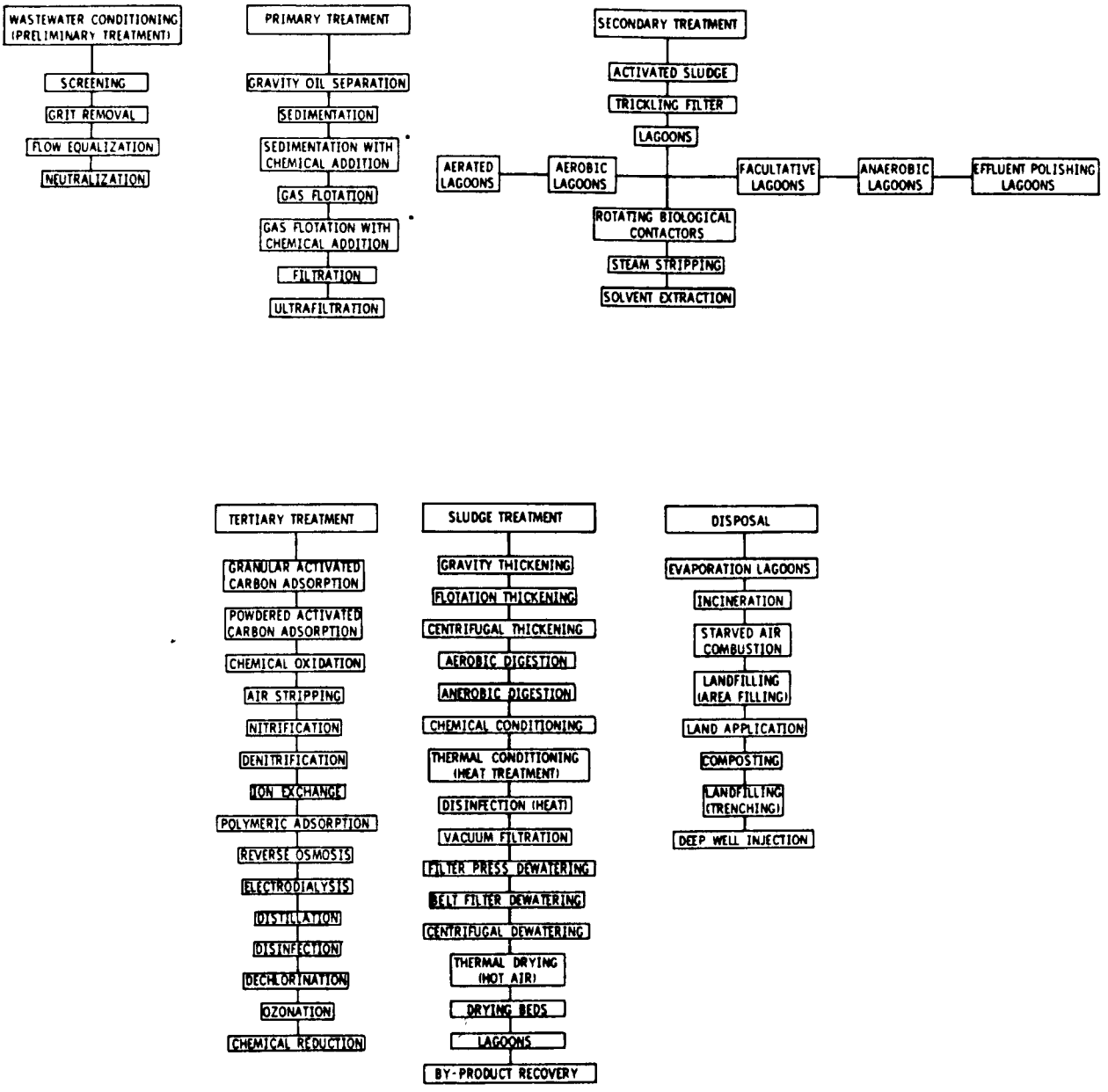
V.2.4 VOLUME IV - COST ESTIMATING

Volume IV provides information on typical costs of pollution control systems. Purchase cost, capital investment, and annual operating costs are provided separately for each technology, as a function of the plant size.

Costs, presented in dollars, generally do not include the cost of the land needed for the plant or the costs of special materials for corrosive service. Such additional expenses must be considered on a case-by-case basis. Costs for the disposal of by-products from water pollution control (air pollution emissions, solid sludge disposal, etc.) also are not included.

Costs are included for the following;

- Equipment purchase and installation;
- Total capital cost;
- Total direct operating cost, including materials, chemicals, power, fuel and labor; and
- Total annual operating cost, including total direct operating cost and total indirect operating cost (plant overhead, taxes, insurance, administrative expenses, depreciation, and interest on working capital).



• SUBCLASSIFICATIONS FOR PERFORMANCE DATA SUMMARY PURPOSES ARE BASED ON THE TYPES OF COAGULANTS OR SETTLING AIDS USED.

Figure V.1. Treatment technology overview.

SECTION V.3

GUIDANCE FOR USE

V.3.1 GENERAL INFORMATION

This Manual is intended to provide background information for consideration during the permit-writing process, but it is not intended to be the sole source of data. When making decisions, permit writers should use all of the information at their disposal, including historical information on the individual facility, their detailed knowledge of many such facilities, and their engineering judgment. This section indicates some of the ways that this Manual may be used in combination with such other information.

If the initial review of a permit application suggests that only a few problem pollutants are present, the permit writer may consult Volume I and Volume V to help identify candidate control technologies.

A general review of the processes used at the facility and the effluent levels observed at similar facilities may also be useful during the initial permit application review. Volume II describes selected industrial processes, the major types of pollution control systems in use within the United States for these processes, and the results of effluent testing. Other sources of information include:

- The first-round permit for the source (if any) and associated files;
- Applicable Development Documents;
- Attainable limitations for similar sources;
- EPA guidance for best available technology economically achievable (BATEA), best conventional pollutant control technology (BCT), best practical control technology currently available (BPTCA), and best management practices (BMP);
- Visits to the site or to similar installations;
- Results of ambient and effluent water monitoring; and
- Additional information supplied by the permit applicant.

In the absence of applicable BATEA guidelines or new source performance standards covering the industrial subcategory, the permit writer may issue a "short-term" permit for a previously permitted facility which is effective for only 18 months past the date of promulgation of BATEA guidelines. (The "Second-Round Permits Policy" guidance dated July 20, 1978 [3] should be consulted for details.)

Where a "short-term" permit is about to expire and BATEA guidelines, Standards of Performance for New Sources (NSPS), or Pretreatment Standards for Existing Sources (PSES) are still not promulgated, the permit writer may be called upon to determine appropriate limits for toxic pollutants or nonconventional pollutants on a case-by-case basis. This Manual is intended to be a systematized source of all data presently available so that the permit writer will not have to do a complete literature search himself while considering each case-by-case or best engineering judgment (BEJ) permit. The permit writer still may have to review literature published after the time interval covered by this Manual, but this should be a much smaller task.

Hundreds of combinations of control technologies may be possible for discharges from a complex facility that cannot be recycled or reused. Although the treatment processes already installed at a plant may reduce the number of plausible combinations, a "process of elimination" to reduce the number of systems given detailed consideration may be desirable. Volume II can be consulted to determine which of the pollution control systems on similar or related processes have been demonstrated to give the desired concentrations or control efficiencies, and which systems have shown inadequate performance.

For each industrial process studied, Volume II contains tables showing the control technologies in use on full-scale installations within the United States, whether or not quantitative effluent data are available. To supplement those tables, Appendix A in this volume shows those combinations of industrial processes and control technologies for which quantitative effluent data <u>are</u> available. There are four columns per combination:

- The first column shows the number of data sets containing influent and effluent data for full-scale commercial plants.
- The second column shows the number of data sets containing influent and effluent data for pilot plants.
- The third column shows the number of data sets containing influent and effluent data for bench-scale plants.

- The fourth column shows the number of data sets for plants of any kind for which only effluent concentrations data were available. Control efficiency data are not included because no data were available on influents into the control system.

For example, there are four data sets containing both influent and effluent data for full-scale activated sludge pollution control systems in the timber products processing industry.

The information in Volume III on the applicability and reliability of different control technologies may also be useful for narrowing the range of potentially applicable pollution control systems. Appendix B summarizes the median observed effluent concentrations for primary, secondary, and tertiary control technologies, respectively. Median removal efficiencies for each control technology are shown in Appendix C. The pollutants are listed in same order as they appear in Form 2c-NPDES from the Draft Consolidated Permit Application Form (44 FR 34346, June 14, 1979) [3].

Users should be cautious about applying these values to specific installations without supplementary information because the quality of treated effluents may vary for different industrial processes. It is also important to note that data were not reported for all pollutants in all effluent tests. Therefore, the set of individual plant test results processed to determine median performance for one pollutant is usually not the same as that for a different pollutants. The number of data points used to generate the medians for an individual pollutant may be determined from the summary tables in Volume III or Appendix D of this volume. A pollution control system with the tabulated median performance for one pollutant may or may not deliver the tabulated median performance for another pollutant. The individual data sheets in Volume III should be consulted to determine how well a system has been demonstrated to perform for several pollutants at once.

Appendix D, the Pollutant Treatability Index, provides a summary of the highest observed removal efficiency and the lowest observed effluent concentration for various pollutants (when a measurable influent concentration exists) as a function of the technology used to control the discharge. Cross references to Volume III are also provided. Details given in the references should indicate whether the tests summarized were performed on effluents similar to the effluent being studied.

The possibility of a novel combination of control equipment constituting the most effective pollution control technology for an industrial process cannot be eliminated *a priori*. If a novel combination of control technologies appears necessary for adequate control of an effluent, pilot-scale tests of effluent

treatability should be considered, even though some insights might be gained from consulting Volume III for the individual treatment processes.

Volume IV provides information on the capital costs, purchase and installation costs, and annual operating cost of various control technologies. The accuracy of these cost figures is not expected to be better than ±30%. If the effluent characteristics or treatment technology design or operating parameters deviate widely from those stated, costs may be quite different. The cost of land, special equipment for corrosive service, and control of air pollution and pollution from solid waste disposal are not included.

V.3.2 STEPWISE APPROACH FOR USING THIS MANUAL

The steps listed below may be followed in using the Manual and the information in revised permit applications to write §402(a)(1) second-round permits. This sequence is intended only as an example because many circumstances may arise during the preparation of a given permit which justify the deletion of certain steps or the addition of others.

Step 1. Complete preapplication communications or hold conferences with permittee.

Step 2. Review first-round permit to determine the parameters limited and BPT levels.

Step 3. Review the permittee's compliance with first-round permit to detect obvious deficiencies.

Step 4. Conduct a preliminary review of the application for completeness and obvious inconsistencies. Notify the prospective permittee immediately if further information or clarification is needed.

Step 5. Consult Volume II of this Manual and the applicable Development Document for a description of the industry, its wastes, and treatment technology.

Step 6. Identify any applicable promulgated effluent guidelines, pretreatment standards, or water quality standards as of the current date.

Step 7. Review wastewater pollutants reported in the application to determine:

a. which toxic pollutants are present and whether there are groups of toxic pollutants (chemical classes or treatability classes); and

b. traditional parameters present.

Step 8. Consider BMP approaches to toxic pollutant reduction on particular processes, if appropriate.

Step 9. Consider requests for exclusion of specific hazardous substances from Section 311 coverage and review Volumes I and III for applicable treatment.

Step 10. Refer to this volume (Section V.4 and Appendix E) to determine the potential "indicator" pollutant parameters for the toxic pollutants found, and the approximate correlation with concentrations. Where possible, determine the optimum overlap in coverage of a number of toxic pollutants by as few indicators as possible.

Step 11. Refer to Volume III to determine the treatment technology options capable of reducing indicator parameters to levels that reasonably assure adequate toxic pollutant reduction. Review of Volume II should provide indications of "significant" parameters from the Effluent Guidelines Division (EGD) perspective in planning BAT. If resource or time constraints require a choice among controlled parameters, the permit writer may choose to focus on coverage of those.

Step 12. If the production volume has changed or the facility been modified, recalculate BPT (including BCT, Water Quality Standards (WQS), and 402(a)(1) considerations).

Step 13. Summarizing, choose the most suitable treatment processes, taking into consideration:

a. Attainment of desired toxic pollutant level;
b. Ability to monitor the operation of the system using indicator substances or other operating parameters;
c. Process reliability and operator skill requirements;
d. Recovery of products;
e. Reuse and recycling of water;
f. Overall process simplicity;
g. Process options consistent with or in addition to those already in place;
h. Prospect of meeting future limits based on BAT guidelines;
i. Cost (in a general way) including:

(1) a comparison of processes capable of achieving acceptable controls; and
(2) cost/benefit on levels of reduction below minimum acceptable reduction.

Step 14. Refer to Volume III and this volume for levels of "indicator" parameters that are attainable by the installation of the specific combination of treatment processes chosen, if they are properly designed, sized, operated, and maintained.

Step 15. Calculate the interim and final permit limits.

Step 16. Determine any special requirements, e.g., pilot-plant treatability studies or additional monitoring.

Step 17. Determine a compliance schedule leading to BAT by 7/1/84, where appropriate.

Step 18. Complete a "fact sheet" summarizing the considerations that served as a basis for writing the permit, including a listing of "indicator" pollutants limited and toxic pollutants "covered" by each (as noted in column 3, p. 34398 of 44 Federal Register, June 14, 1979) [2].

Step 19. Complete the draft permit and issue a public notice.

SECTION V.4

INDICATORS

On June 14, 1979, the EPA proposed a "new permitting strategy" (44 Federal Register, June 14, 1979, pp. 34346 to 34396) which involved, among other new concepts, the use of limits on "indicator" pollutants to control toxic pollutants [2]. Comments were solicited from the general public on the proposed rule-making package. Comments received on or before September 12, 1979 will be considered by the EPA when preparing the final regulations. In the interval between the close of the public comment period and promulgation of the final rule, EPA personnel are prohibited from discussing developments that may have occurred since the close of the public comment period (Home Box Office v. FCC, 567 F2d 9 [D.D. Cir. 1977]).

As a consequence of the judgment cited, and because the June 14, 1979 proposal [2] stated the concept of indicators very clearly, excerpts from the proposed regulations are quoted below.

> (Excerpt from 44 Federal Register 34397-99, June 14, 1979) [2]
>
> C. The Use of Limits on Indicators to Control Toxic Pollutants
>
> As in the past, permit writers may set limits on each pollutant which is discharged at significant levels. However, a new permitting strategy is required to reduce discharges of many of the organic toxic pollutants to BAT levels. The problem of setting specific permit limits upon specific organic pollutants is twofold:
>
> 1. Permit writers and industrial dischargers have not focused upon organic pollutants to any great extent in the past. The Agency has begun to develop treatability studies for all the organic toxic pollutants. These treatability studies will demonstrate which control equipment is effective in removing organic toxic pollutants. The Agency anticipates that the permit writer and the discharger will usually agree based upon these studies and other available information, that a certain piece or combination of treatment equipment will achieve BAT control for the toxic pollutants in the discharge. However,

the lack of a historical data base will often preclude agreements upon precise numbers representing the levels of the toxic pollutants in effluents leaving the treatment equipment. This may result in protracted disputes over numerical limitations despite a general agreement upon appropriate technologies, and could cause serious delay in implementing the CWA's requirements.

2. Sampling and analysis for organic pollutants is much more expensive than it has been for pollutants traditionally regulated by the NPDES program. If organic pollutants are limited in the permit, the cost of periodic compliance monitoring can be very high and possibly unaffordable in some cases (see the detailed discussions of analytical methods and associated costs below in sections V-C and VII-A).

The Agency encourages the direct limitation of specific toxic pollutants wherever feasible, such as where only a few toxics are present in the waste stream and where sufficient data exists to allow agreement between the permit writer and applicant on achievable levels. In addition, direct limitation of a toxic pollutant will be necessary where the discharge of the pollutant is significant.

However, as described above, the Agency believes that it may not always be feasible to directly limit each toxic which is present in a waste stream. As a result, the Agency has developed an alternative approach to directly limiting toxic pollutants. This alternative approach centers upon setting limitations on certain more commonly regulated parameters which can be relatively easily agreed upon and which will not result in greatly increased compliance monitoring costs. This approach has been applied to a certain degree in the past (e.g., certain BPT guidelines which limit certain metals insure the installation of technology which also removes other metals). In developing new toxics-oriented BAT guidelines, this approach will be used even more than in the past. Similarly, permit writers may use this approach in setting case-by-case permit limits under section 402(a) (1).

The Agency uses the term "indicator" to denote a parameter which is limited in a permit based on treatment for removal of toxic pollutants, in lieu of specific limits on each toxic pollutant. Thus, once the appropriate BAT technology for reducing toxic pollutants has been identified, limits on properly selected indicators can be used to require permittees to attain the same degree of control over toxic pollutants as specific limits on toxic pollutants would require.

Indicators will generally be parameters or specific pollutants which are generally familiar. Some of the pollutant parameters which may be used as indicators are: Total suspended solids (TSS), 5-day biochemical oxygen demand (BOD_5), chemical oxygen demand (COD), total organic carbon (TOC), total Kjeldahl nitrogen (TKN), total phosphorus, cyanide, certain metals, and ammonia. Most of these have been frequently limited in permits in the past. Further, most of them may be analyzed by methods which cost substantially less than the methods used to measure many specific pollutants (especially organic toxic pollutants).

However, the Agency recognizes that the use of indicators is not appropriate in all cases. In some situations, EPA may not be able to identify an indicator. For example, current information indicates that chloroform is best treated by steam or air stripping. If a waste stream contains no pollutants in significant quantities except for chloroform and several metals, it may not be possible to require chloroform control by the use of any indicator. In that case, it will be necessary to specify a limitation for chloroform.

Another situation where specific limitations on toxics are required is where any combination of indicator limits could also be met by installation of an alternate treatment technology which would not sufficiently treat the toxic pollutants. If appropriate limits on indicator pollutants would allow the installation of controls which will not remove toxic pollutants, then the toxic pollutant must be controlled directly, or other indicator pollutants must be selected.

One potential problem associated with the indicator approach is that a plant may change its process in a manner which reduces or eliminates the indicator without affecting the indicated toxics. This would allow toxic discharges to take place without being detected by monitoring the indicator.

Another deficiency of indicators is their relative lack of sensitivity to short-term fluctuations of specific toxic pollutants. This means that if many organic constituents of a waste stream are discharged at unusually low levels, a particular organic toxic pollutant could be discharged at an unusually high level without causing a violation of an indicator limit. However, the Agency believes that the risk of an unacceptably high discharge of a particular toxic pollutant is not great so long as proper treatment equipment is installed and is operated and maintained properly. In addition, application-based limits under proposed §122.68(a) (2) remain as a basis of liability for

significantly increased discharges of any individual pollutant. This provision may be supported by permit requirements of occasional monitoring for all or some organic toxics or of additional monitoring when indicator limits are violated. Furthermore, permits may require biomonitoring tests to provide additional safeguards against toxicity (see discussion below on monitoring in section VI).

As noted above, however, the use of indicators is not a required part of EPA's strategy for regulating toxic pollutants, but rather an additional mechanism to allow more rapid agreement on BAT controls and appropriate permit limits. This mechanism has the added benefit of minimizing compliance monitoring costs. Permit writers may still apply direct limits on toxic pollutants as the circumstances warrant, and are encouraged to do so whenever technically and economically feasible.

D. Proposed §125.3(g):Requirement That Indicators Used to Control Toxics Be Limited to BAT Levels

The indicator strategy relies on the principle that limits on indicator parameters will insure the installation and operation of BAT-level equipment to achieve BAT-level reduction of organic toxic pollutants. For the strategy to work BAT limits must be set for indicators which are used to indirectly control toxic pollutants. This principle has also been expressed in prior Agency documents, including the Federal Register notice listing conventional pollutants [43 FR 32858 (July 28, 1978) and EPA's Policy and Guidance for Issuing the Second Round of NPDES Permits to Industrial Discharges (July, 1978)]. Proposed §125.3(g) establishes this principle in regulatory form.

Therefore, proposed §125.3(g) provides that conventional pollutants (such as BOD and TSS) which are used as indicators for toxics are subject to BAT and are not subject to BCT cost tests. Similarly, nonconventional pollutants (such as COD and TOC) which are used as indicators for toxics are also subject to BAT and are not eligible for modifications under sections 301(c) and 301(g) of the CWA.

A potential problem with the concept of indicators is that if it is abused, it could subvert Congressional intent to set BCT limits for conventional pollutants and to allow variances for nonconventional pollutants. To minimize any such abuse, the regulations set a number of tests linking indicators to toxics which must be satisfied before a conventional or nonconventional pollutant can be regulated as an indicator pollutant.

To use conventionals or nonconventionals as indicators to control toxics to BAT levels, permit writers must identify (in the permit and in the accompanying statement of basis or fact sheet required by §§124.8 and 124.9) which toxics are intended to be controlled by each indicator, unless the indicator is established by an applicable effluent guideline. In addition, permit writers must be able to justify indicator limits by demonstrating that the indicator limits will result in installation of treatment equipment which constitutes BAT for toxic pollutant discharges. This will ensure that conventional and nonconventional pollutants are not limited to levels which are more stringent than is required to achieve BAT-level reduction of toxic pollutants. It should be noted that in many instances, conventional and nonconventional pollutants will be limited to BAT levels because of other requirements of the CWA, even if they are not used as indicators. This will occur where BCT for a conventional is the same as BAT or where a source fails to meet the section 301(c) or (g) criteria for modifications from BAT for a nonconventional pollutant.

Nonmodifiable BAT limits for conventionals and nonconventionals where they are used as toxic indicators will not result in the imposition of stricter controls than are authorized by the CWA. For example, where an indicator is a conventional pollutant, the treatment installed to meet the indicator's BAT limit is the same treatment as would be installed to meet the BCT limit for the conventional plus the BAT limits for specific toxics covered by the indicator. While the conventional pollutant may be reduced to levels more stringent than required by BCT, this would occur in any event as the result of the required installation of BAT technology to control the toxics if they were being regulated directly. The method used to require the installation of BAT technology (direct limitation of toxics or the use of indicators) will not affect ultimate level of pollution control.

Comments on all aspects of the indicator approach and suggestions on other alternatives are welcome.

The preceeding Federal Register quotation notes a number of potential problems with the use of indicators. In addition, the relationship between indicators and toxic pollutants probably varies between different control technologies and industrial categories. However, the EPA has never required that the treatment technology at a plant be specified in its NPDES permit. Faced with this situation, we must recognize that permits containing indicator limits will be contested unless the permit writer and permittee have reached an understanding on the control technology to be installed.

As noted in the quotation, permit writers need not use indicators as part of their permit-writing strategy. Direct limits on toxic pollutants are encouraged when technically and economically feasible. Nevertheless, the concept of indicators can be useful to minimize compliance monitoring costs or to minimize controversy over exact limitations for toxic pollutants when appropriate BAT technology for the toxic pollutant is installed and the indicator shows that the equipment is being operated properly.

The suitability of an indicator substance to provide evidence of proper control of another substance must be considered on a case-by-case basis. Some of the variables may be very dependent on details of the specific application. Some of the factors for consideration are:

- The observed or expected variability of the relative amounts of indicators and toxics in the raw and treated effluents,
- The cost of monitoring the indicator versus the cost of monitoring the toxic pollutants of direct interest, and
- The amount of hazard to the environment posed by potential discharges of the toxic pollutant.

Table V.1 lists some of the common pollutant parameters capable of indicating the proper operation of the specified control equipment or process. A very crude indication of the efficiency with which toxic pollutants might be removed when various indicators are efficiently removed is shown in Appendix C. The user should be cautious when comparing efficiencies in this table because it only covers median performance, and the set of individual test results from which the median performance was derived for one pollutant is usually not the same as that for the median performance for other pollutants. The summary tables in Volume III illustrate the range of performance observed for various pollution control technologies. The data sheets for individual plants, found in Volume III, should be consulted for information on specific industrial processes.

Plant-specific determinations of indicator/toxic pollutant relationships are obviously superior to any extrapolation, however sophisticated. These could involve testing indicator and toxic pollutant concentrations under various process conditions with the control system in various states of operation and maintenance. Such a procedure would be very expensive and the resulting accuracy of analysis may not be necessary, assuming (as indicated earlier) that a general agreement on the type of control technology needed has been reached by the permit writer and permittee.

TABLE V.1 TYPICAL CANDIDATE INDICATORS

Pollution control system	Indicator
Gravity oil separation	Oil and grease
Sedimentation	TSS
- with polymer	TSS
- with lime	TSS
- with Fe^{+2}, lime	TSS
- with lime, polymer	TSS
- with barium chloride	TSS
- with alum and coagulant	TSS
- with alum	TSS
Gas flotation	TSS
Filtration	TSS
Ultrafiltration	TSS, oil and grease
Activated sludge	BOD
Trickling filter	BOD, phenol (if present)
Lagoons	BOD
Rotating biological contactor	BOD
Steam stripping	TOC (if for organics)
Solvent extraction	Total chlorine (if present)
Activated carbon	Total phenols, TOC, BOD, COD
Chemical oxidation	
Air stripping	
Nitrification	
Denitrification	
Ion exchange	
Polymeric absorption	TOC
Reverse osmosis	COD, BOD, TOC
Electrodialysis	TDS
Distillation	TDS, TOC (depending on application)
Disinfection	
Dechlorination	Chlorine
Ozonation	COD, total phenol

The current data base may or may not be sufficient to detect statistically significant correlations between indicator pollutants and certain toxic pollutants when subjected to a specific treatment technology. Some statistical analysis of the data may be necessary to help determine what further effort is justified. To that end, individual plant effluent data submitted to the Liquid Effluent Data System (LEDS) prior to January 1, 1980 have been analyzed using the 1972 version of the Statistical Analysis System (SAS) computer program [4].

The results of this analysis are summarized in Appendix E. It was aimed at determining the relationship between toxic pollutant and conventional pollutant concentrations.

SECTION V.5

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APPENDIX A

NUMBER OF SOURCE/TREATMENT TECHNOLOGY DATA SETS

TABLE A-1. NUMBER OF SOURCE/TREATMENT TECHNOLOGY DATA SETS

Industry/control technology	Number of data sets: Data sets with both influent and effluent data — Full scale	Pilot scale	Bench scale	Effluent data only (any scale)
Adhesives and Sealants				
Ozonation			1	
Reverse osmosis		1		
Sedimentation	1			
Ultrafiltration		6		
Auto and Other Laundries				
Filtration	3			
Gas flotation with chemical addition	10			
Granular activated carbon adsorption	1	2		
Sedimentation with chemical addition	1			
Ultrafiltration		8		
Canned and Preserved Fish and Seafood Processing				
Gas flotation with chemical addition	1	5		
Canned and Preserved Fruits and Vegetables				
Activated sludge	12	1		
Gas flotation		2		
Lagoon, aerated	6			
Lagoon, aerobic	4			
Lagoon, anaerobic	3			
Sedimentation with chemical addition	1			
Coal Gas Washing Process				
Activated sludge		1		
Coal Mining				
Rotating biological containers		3		
Sedimentation	3			

(continued)

TABLE A-1 (continued)

Industry/control technology	Number of data sets: Data sets with both influent and effluent data — Full scale	Pilot scale	Bench scale	Effluent data only (any scale)
Coal Tar Distillation Plant				
Activated sludge			1	
Coil Coating				
Sedimentation	4			
Sedimentation with chemical addition	1			
Coke Gasification Plant				
Activated sludge			1	
Combined Waste - Petrochemical and Paper Mills				
Activated sludge	1			
Dairy Products				
Activated sludge	1			
Trickling filters	1			
Electroplating				
Air stripping	1			
Filtration	1			
Ozonation	10			
Reverse osmosis		2		
Sedimentation	1			
Foundry Industry				
Filtration	1			
Sedimentation	9			
Sedimentation with chemical addition	1			
Gum and Wood Chemicals				
Granular activated carbon adsorption	1			
Hospitals				
Activated sludge	2			
Trickling filters	8			

(continued)

TABLE A-1 (continued)

Industry/control technology	Number of data sets: Data sets with both influent and effluent data — Full scale	Pilot scale	Bench scale	Effluent data only (any scale)
Ink Manufacturing				
Sedimentation	1			
Inorganic Chemicals				
Air stripping	1			
Chemical oxidation	2			
Chemical reduction	1			
Filtration	3			
Sedimentation	2			
Sedimentation with chemical addition	3			
Iron and Steel				
Activated sludge	1			
Filtration	3			
Gravity oil separation	1			
Sedimentation	18			
Sedimentation with chemical addition	8			
Leather Tanning and Finishing				
Activated sludge	7			
Lagoon, aerated	1	1		
Lagoon, facultative	2			
Sedimentation	3			
Sedimentation with chemical addition	1	1	4	
Trickling filter	4			
Mineral Mining and Processing				
Sedimentation	14			
Sedimentation with chemical addition	1			
Nonferrous Metals				
Filtration	2			
Sedimentation with chemical addition	2			

(continued)

TABLE A-1 (continued)

Industry/control technology	Number of data sets: Data sets with both influent and effluent data — Full scale	Pilot scale	Bench scale	Effluent data only (any scale)
Ore Mining and Dressing				
Chemical oxidation	1	1		
Filtration	2	22		
Granular activated carbon adsorption		1		
Ion exchange	1	1		
Ozonation		4		
Sedimentation	45	7		
Sedimentation with chemical addition	9	8		
Organic Chemicals				
Activated sludge	12			
Granulated activated carbon adsorption	2	21		
Ozonation		4		
Solvent extraction	1	6		
Steam stripping		4		
Lagoon, aerated	5			
Lagoon, anaerobic	7	1		
Paint Manufacturing				
Filtration	2			
Lagoon, aerated	1			
Sedimentation	3			
Sedimentation with chemical addition	11			
Pesticide Chemicals				
Granular activated carbon adsorption	7			
Petroleum Refining				
Filtration		6		
Gas flotation	1			6
Granular activated charcoal adsorption	3	7		
Gravity oil separation				27
Powdered activated charcoal adsorption	1	3		
Solvent extraction		8		

(continued)

TABLE A-1 (continued)

Industry/control technology	Number of data sets: Data sets with both influent and effluent data — Full scale	Pilot scale	Bench scale	Effluent data only (any scale)
Pharmaceutical Manufacturing				
Activated sludge	7			
Lagoon, aerated	2			
Powdered activated carbon adsorption		1		
Porcelain Enameling				
Gal flotation	4			
Gas flotation with chemical addition	4			
Ion exchange	1			
Sedimentation	2			
Ultrafiltration	1			
Pulp, Paper, and Paperboard				
Activated sludge	2			
Filtration	2	1		
Gas flotation	1			
Granular activated carbon adsorption		6		
Powdered activated carbon adsorption	1		10	
Reverse osmosis		1		
Sedimentation	1			
Sedimentation with chemical addition	2			
Trickling filter	1			
Rubber Processing				
Activated sludge	1			
Steam Electric Power Generation				
Reverse osmosis	2	6		
Sedimentation	6			
Sedimentation with chemical addition	3	11		
Synthetic Resins				
Activated sludge	2			

(continued)

TABLE A-1 (continued)

Industry/control technology	Number of data sets: Data sets with both influent and effluent data — Full scale	Pilot scale	Bench scale	Effluent data only (any scale)
Textile Mills				
Activated sludge	46			
Filtration	1	15		
Gas flotation with chemical addition	1			
Granular activated carbon adsorption		12		
Lagoon, aerated	7			
Lagoon, effluent polishing	2			
Lagoon, facultative				11
Ozonation		4		
Reverse osmosis		34		
Sedimentation		1		
Sedimentation with chemical addition	1	5	2	
Timber Products Processing				
Activated sludge	4			
Gravity oil separation				1
Lagoon, aerated	4			
Lagoon, facultative	1			
Reverse osmosis		1		
Sedimentation with chemical addition	1			
Trickling filter		1		
Ultrafiltration		1		
Tire and Synthetic Rubber				
Reverse osmosis			3	
Trickling filter		1		
Ultrafiltration		10		
Unknown				
Activated sludge	3		1	
Chemical oxidation			1	
Filtration		1		
Granular activated carbon adsorption		5		
Powdered activated carbon adsorption	1			

(continued)

TABLE A-1 (continued)

Industry/control technology	Number of data sets: Data sets with both influent and effluent data — Full scale	Pilot scale	Bench scale	Effluent data only (any scale)
Unknown (continued)				
Reverse osmosis		3	2	1
Rotating biological contactors		5		
Sedimentation with chemical addition	1			
Solvent extraction		5		
Steam stripping			8	
Trickling filter	1	1	1	
Unspecified Industrial and Domestic Wastewater (70:30)				
Activated sludge	1	1		
Wine Making				
Sedimentation with chemical addition	1			

APPENDIX B

MEDIAN OBSERVED EFFLUENT CONCENTRATIONS

TABLE B-1. MEDIAN OBSERVED EFFLUENT CONCENTRATIONS

Pollutant[a]	Treatment technique: Gravity oil separation	Sedimentation	Sedimentation with chemical addition: Polymer	Lime	Fe^{2+}, lime	Lime, polymer	Barium chloride	Alum, coagulant aid	Alum	FeCl	Sulfide	Alum, lime
Classical pollutants, mg/L:												
BOD_5	190	1,200	2,370	619				75	33	325		1,970
COD	420	19	8,000	45		2	10.5	9,800	416			4,090
TSS	52.5	31	15.2	23		11	13.5	66	51	46		254
TKN												
TOC	81	11	1,600	12		7	6.5	2,500	89			1,190
Toxic pollutants, mg/L:												
Cyanide, total												
Phenols, total	57.5	0.027	0.19	0.17			0.010	0.10	0.06			0.67
Toxic pollutants, µg/L:												
Acenaphthene	300											
Acrolein												
Acrylonitrile	30											
Benzene	100	12	0.4			5		160				46
Benzidine												
Carbon tetrachloride	1							1,800				<10[b]
Chlorobenzene												
1,2,4-Trichlorobenzene		53							150			150
Hexachlorobenzene												
1,2-Dichloroethane		<10						<50	17			
1,1,1-Trichloroethane	50	<10b				51		69				
Hexachloroethane												
1,1-Dichloroethane	1	<10[b]										
1,1,2-Trichloroethane								11				
1,1,2,2-Tetrachloroethane		10										35
Chloroethane												
Bis(chloromethyl) ether												
Bis(2-chloroethyl) ether												
2-Chloroethyl vinyl ether												
2-Chloronaphthalene						5						
2,4,6-Trichlorophenol		25										
p-Chloro-*m*-cresol	120					62						
Chloroform	~15	<38	11			10[b]		36	22			74
2-Chlorophenol	33	<10				<5[b]						

(continued)

TABLE B-1 (continued)

Pollutant[a]	Treatment technique: Gravity oil separation	Sedimentation	Sedimentation with chemical addition: Polymer	Lime	Fe^{2+}, lime	Lime, polymer	Barium chloride	Alum, coagulant aid	Alum	FeCl	Sulfide	Alum, lime
Toxic pollutants (cont'd), µg/L:												
1,2-Dichlorobenzene									12			<0.05
1,3-Dichlorobenzene	3											
1,4-Dichlorobenzene												
3,3'-Dichlorobenzidine												
1,1-Dichloroethylene		<12						<10[b]				
1,2-*Trans*-dichloroethylene	~20	10	21					190				
2,4-Dichlorophenol	10	27										
1,2-Dichloropropane												400
1,3-Dichloropropylene												
2,4-Dimethylphenol	>100	<10[b]				<10[b]						
2,4-Dinitrotoluene		10										
2,6-Dinitrotoluene		10		<10[b]								
1,2-Diphenylhydrazine												
Ethylbenzene	>50	880	130					390	2,300			11
Fluoranthene	8	<10[b]			<10[b]							
4-Chlorophenyl phenyl ether												
4-Bromophenyl phenyl ether												
Bis(2-chloroisopropyl) ether												
Bis(2-chloroethoxy)methane												
Methylene chloride	>39	150	66			26		3,100	<40			2,000
Methyl chloride												
Methyl bromide												
Bromoform												
Dichlorobromomethane												
Dichlorodifluoromethane												
Trichlorofluoromethane												
Dichlorofluoromethane												
Chlorodibromomethane		<10[b]							<0.3			
Hexachlorobutadiene												
Hexachlorocyclopentadiene												
Isophorone	6	<23										
Naphthalene	280					6.5						16
Nitrobenzene		<10[b]							35			

(continued)

TABLE B-1 (continued)

Pollutant[a]	Treatment technique: Gravity oil separation	Sedimentation	Sedimentation with chemical addition: Polymer	Lime	Fe^{2+}, lime	Lime, polymer	Barium chloride	Alum, coagulant aid	Alum	FeCl	Sulfide	Alum, lime
Toxic pollutants (cont'd), µg/L:												
2-Nitrophenol	150											
4-Nitrophenol		<10[b]				<10						
2,4-Dinitrophenol		<10[b]										
4,6-Dinitro-o-cresol		460				20						
N-nitrosodimethylamine												
N-nitrosodiphenylamine		<10[b]										
N-nitroso-di-n-propylamine												
Pentachlorophenol	120	24						<0.4				
Phenol	160	10	37			<10		2.0	<5			25
Bis(2-ethylhexyl) phthalate	290	11	<10			22	9	67	39			44
Butyl benzyl phthalate		<10[b]				<10[b]		36				
Di-n-butyl phthalate	1.3	30	<6.4			1.0		<8.5	<5			<10[b]
Di-n-octyl phthalate		<35						5.0				
Diethyl phthalate	12	22	<0.03			<10[b]						
Dimethyl phthalate		<33										
Benz(a)anthracene	55			<10[b]		<10[b]						
Benzo(a)pyrene	15.5	6		67		5						
Benzo(b)fluoranthene		6										
Benzo(k)fluoranthene	150	<5										
Chrysene	11	<10		<10		10						
Acenaphthylene	35	<10[b]				10						
Anthracene/phenanthrene	3	<13	0.9			<10[b]			0.1			
Benzo(ghi)perylene	550	<10[b]										
Fluorene	80	<10[b]			<7.5							
Phenanthrene/anthracene	3											
Dibenz(ah)anthracene												
Indeno(1,2,3-cd)pyrene	40											
Pyrene	4	<16[b]		67		<10[b]						
Tetrachloroethylene	40	<10		51		<10[b]		100	45			13
Toluene	>100	10	950	10		5		540	14			43
Trichloroethylene	<71	34	7.4					12	190			
Vinyl chloride												
Aldrin	3											

(continued)

TABLE B-1 (continued)

Pollutant[a]	Treatment technique: Gravity oil separation	Sedimentation	Sedimentation with chemical addition: Polymer	Lime	Fe^{2+}, lime	Lime, polymer	Barium chloride	Alum, coagulant aid	Alum	FeCl	Sulfide	Alum, lime
Toxic pollutants (cont'd), µg/L:												
Dieldrin	3											
Chlordane	3											
4,4'-DDT												<1
4,4'-DDE												
4,4'-DDD												
α-Endosulfan												
β-Endosulfan												
Endosulfan sulfate												
Endrin												
Endrin aldehyde												<1
Heptachlor												
Heptachlor epoxide												
α-BHC												
β-BHC												
γ-BHC												
δ-BHC												
Aroclor 1242	5.0											
Aroclor 1254												
Aroclor 1221	0.1											
Aroclor 1232	0.5											
Aroclor 1248												
Aroclor 1260												
Aroclor 1016	1.8											
Toxaphene	3											
Antimony	290	22	43	4	9		<50	29	72			
Arsenic	6	5.5		3.0	<2.0	10	<8.5	12	<32		5	62
Beryllium	2	<10		0.9	<0.5				2.2			
Cadmium	6	<9	80	3	1.0	18		33	<9		<9	
Chromium	420	20	<14	21	2.5	40	28	60	41		40	31
Copper	44	50	15	54	20	40	<25	290	14		<260	36
Lead	36	60	70	37	<3	160	40	<200	30		100	<200
Mercury	1.3	0.5	70	0.7	<0.2	0.1	0.5	1,500	<76		20	2
Nickel	26	40	43	10	3.0	280		50	<40		800	<1
Selenium	12	6		8.0	20	10	10					
Silver	125	<10		2.6	1.0	90	20	11	120		<25	
Thallium	2.0	<5		1.1	<4.0							
Zinc	360	140	1,000	60	4.0	250	30	700	2,950		140	3,400

(continued)

TABLE B-1 (continued)

Pollutant[a]	Treatment technique: Gravity oil separation	Sedimentation	Sedimentation with chemical addition: Polymer	Lime	Fe^{2+}, lime	Lime, polymer	Barium chloride	Alum, coagulant aid	Alum	FeCl	Sulfide	Alum, lime
Other pollutants:												
Ammonia-nitrogen, mg/L												
Asbestos, fibers/L		4.0×10^7		6.1×10^6		8.2×10^6	1.4×10^9					
Chlorine, total residual, µg/L												
Fluoride, µg/L		6,200		6,100		130,000						
Oil and grease, mg/L	54.5	12.3	22	2.5		2.2		81	11		<16	
Phosphorus, total, mg/L		13.9							1.6	23		<0.070
Aluminum, µg/L				35								
Iron, µg/L				120								
Molybdenum, µg/L												
Manganese, µg/L				20								
Acetaldehyde, µg/L												
Acetic acid, µg/L												
Acetone, µg/L												
Ammonia, mg/L												
Butyric acid, µg/L												
Calcium, µg/L					230,000							
Chloride, µg/L					1.9×10^7							
Chlorine, total, mg/L												
Chromium (+3), µg/L												
Chromium (+6), µg/L		5			8.5							
Chromium (dissolved), µg/L												
Cyanide, µg/L	40.0	4,500		45	23		74					17
Dichlorobenzenes, µg/L												
Methyl ethyl ketone, µg/L												
Nickel (dissolved), µg/L				20		2,500						
m-p-Cresol, µg/L												
o-Cresol, µg/L												
Propionic acid, µg/L												
Radium (dissolved), PicoCi/L							1.6					
Radium, total, PicoCi/L							3.0					
Styrene, µg/L												
TDS, mg/L												
Xylenes, µg/L												

Note: Blanks indicate data not available in literature.

[a]Pollutants are listed in the same order as that in the Draft Consolidated Permit Form [3].

[b]The concentration was reported as "not detected."

[c]The concentration was reported as "below detection limit."

TABLE B-2. MEDIAN OBSERVED EFFLUENT CONCENTRATIONS

Pollutant[a]	Treatment technique: Gas flotation	Gas flotation with chemical addition: Alum	Alum, polymer	CaCl, polymer	Polymer	Filtration	Ultra-filtration
Classical pollutants, mg/L:							
BOD_5	250		303	540	<171	19	457
COD	509		1,670	1,300	592	184	813
TSS	200		141	81	102	13	<27
TKN							
TOC	280		544	381	87	42	224
Toxic pollutants, mg/L:							
Cyanide, total							
Phenols, total	23		0.094	0.44	0.205	0.048	79
Toxic pollutants, µg/L:							
Acenaphthene							
Acrolein			720			<100	
Acrylonitrile							
Benzene				100	12	<8.4	
Benzidine							
Carbon tetrachloride			410	1		30	
Chlorobenzene							
1,2,4-Trichlorobenzene							
Hexachlorobenzene							
1,2-Dichloroethane						170	
1,1,1-Trichloroethane			860	14	<6	310	
Hexachloroethane							
1,1-Dichloroethane							
1,1,2-Trichloroethane						2,100	
1,1,2,2-Tetrachloroethane						0.8	
Chloroethane							
Bis(chloromethyl) ether							
Bis(2-chloroethyl) ether							
2-Chloroethyl vinyl ether							
2-Chloronaphthalene			16			17	
2,4,6-Trichlorophenol				3		69	
p-Chloro-*m*-cresol						0.45	
Chloroform	<10[b]		19	8	24	22	
2-Chlorophenol					2	2	
1,2-Dichlorobenzene						5.4	
1,3-Dichlorobenzene							
1,4-Dichlorobenzene							

(continued)

TABLE B-2 (continued)

Pollutant[a]	Treatment technique: Gas flotation	Gas flotation with chemical addition: Alum	Alum, polymer	CaCl, polymer	Polymer	Filtration	Ultra-filtration
Toxic pollutants, µg/L (cont'd):							
3,3'-Dichlorobenzidine							
1,1-Dichloroethylene						<2.0	
1,2-*Trans*-dichloroethylene						<10[b]	
2,4-Dichlorophenol					6	1.1	
1,2-Dichloropropane						1.0	
1,3-Dichloropropylene							
2,4-Dimethylphenol				<0.1	28	0.9	
2,4-Dinitrotoluene							
2,6-Dinitrotoluene							
1,2-Diphenylhydrazine							
Ethylbenzene	<10[b]		3	77	160	0.20	
Fluoranthene					0.5	0.14	
4-Chlorophenyl phenyl ether							
4-Bromophenyl phenyl ether							
Bis(2-chloroisopropyl) ether							
Bis(2-chloroethoxy)methane							
Methylene chloride			8	500	22	16	
Methyl chloride					30		
Methyl bromide							
Bromoform							
Dichlorobromomethane			<0.9				
Dichlorodifluoromethane							
Trichlorofluoromethane			<2			8.5	
Dichlorofluoromethane							
Chlorodibromomethane							
Hexachlorobutadiene							
Hexachlorocyclopentadiene							
Isophorone				<10[b]		1.5	
Naphthalene	380		11	790	<5		
Nitrobenzene							
2-Nitrophenol							
4-Nitrophenol							
2,4-Dinitrophenol					28		
4,6-Dinitro-*o*-phenol							
N-nitrosodimethylamine							
N-nitrosodiphenylamine				620		0.4	

(continued)

TABLE B-2 (continued)

Pollutant[a]	Treatment technique: Gas flotation	Gas flotation with chemical addition: Alum	Alum, polymer	CaCl, polymer	Polymer	Filtration	Ultra-filtration
Toxic pollutants, µg/L (cont'd):							
N-nitroso-di-n-propylamine							
Pentachlorophenol				27	19	10.0	
Phenol	1,200		28	100	18	2.2	
Bis(2-ethylhexyl) phthalate	560		90	610	60	19	
Butyl benzyl phthalate	<10[b]		81	<0.03	<0.03	3.2	
Di-n-butyl phthalate			300	150	<5	3	
Di-n-octyl phthalate			21	33	11	2	
Diethyl phthalate	<10[b]					0.8	
Dimethyl phthalate						<0.03	
Benz(a)anthracene							
Benzo(a)pyrene						0.5	
Benzo(b)fluoranthene							
Benzo(k)fluoranthene						0.1	
Chrysene							
Acenaphthylene							
Anthracene/phenanthrene	600		10	66	2	0.5	
Benzo(ghi)perylene							
Fluorene						10,000	
Phenanthrene/anthracene	600		10	66	2	0.5	
Dibenz(ah)anthracene							
Indeno(1,2,3-cd)pyrene							
Pyrene					0.3	0.3	
Tetrachloroethylene			<0.9	666	2	17	
Toluene	<10[b]		4.5	840	130	2.0	
Trichloroethylene				18		3.0	
Vinyl chloride							
Aldrin							
Dieldrin							
Chlordane						24	
4,4'-DDT							
4,4'-DDE							
4,4'-DDD							
α-Endosulfan							
β-Endosulfan							
Endosulfan sulfate							
Endrin							

(continued)

TABLE B-2 (continued)

Pollutant[a]	Treatment technique: Gas flotation	Gas flotation with chemical addition: Alum	Alum, polymer	CaCl, polymer	Polymer	Filtration	Ultra-filtration
Toxic pollutants, µg/L (cont'd):							
Endrin aldehyde							
Heptachlor							
Heptachlor epoxide							
α-BHC						4.0	
β-BHC						55	
γ-BHC							
δ-BHC							
Aroclor 1242	0.5					480	
Aroclor 1254						650	
Aroclor 1221							
Aroclor 1232						480	
Aroclor 1248						480	
Aroclor 1260						480	
Aroclor 1016	7.9						
Toxaphene							
Antimony			2,200	<20	64	53	
Arsenic			3.5	<10[b]		7	
Beryllium						1.6	
Cadmium			40	<2.5	5	5	<10
Chromium	300		360	280	28	34	67
Copper	5		660	330	66	30	<500
Lead	110		1,000	120	<40	62	5,000
Mercury	0.6		1	<0.2		0.5	0.6
Nickel	52		270	<50	48	50	<500
Selenium	8.5		<1	2		41	
Silver			66	<17	29	<9	
Thallium				50	14	<10	
Zinc	27,000		2,300	≤130	120	150	<10,000
Other pollutants:							
Ammonia-nitrogen, mg/L							
Asbestos, fibers/L						$3x10^6$	
Chlorine, total residual, µg/L							

(continued)

TABLE B-2 (continued)

Pollutant[a]	Treatment technique: Gas flotation	Gas flotation with chemical addition: Alum	Alum, polymer	CaCl, polymer	Polymer	Filtration	Ultra-filtration
Other pollutants (cont'd):							
Fluoride, µg/L							
Oil and grease, mg/L	170	12.5	100	156	27	11	55
Phosphorus, total, mg/L			12.2	12.3	1.0	2	
Aluminum, µg/L							
Iron, µg/L							
Molybdenum, µg/L							
Manganese, µg/L							
Acetaldehyde, µg/L							
Acetic acid, µg/L							
Acetone, µg/L							
Ammonia, mg/L							
Butyric acid, µg/L							
Calcium, µg/L							
Chloride, µg/L							
Chlorine, total, mg/L							
Chromium (+3), µg/L						610	
Chromium (+6), µg/L						20	
Chromium (dissolved), µg/L							
Cyanide, µg/L				290	25	23	5,000
Dichlorobenzenes, µg/L			≤10	260			
Methyl ethyl ketone, µg/L							
Nickel (dissolved), µg/L							
m-p-Cresol, µg/L							
o-Cresol, µg/L							
Propionic acid, µg/L							
Radium (dissolved), PicoCi/L							
Radium, total, PicoCi/L							
Styrene, µg/L							
TDS, mg/L							
Xylenes, µg/L							

Note: Blanks indicate data not available in literature.

[a]Pollutants are listed in the same order as that in the Draft Consolidated Permit Form [3].

[b]The concentration was reported as "not detected."

[c]The concentration was reported as "below detection limit."

TABLE B-3. MEDIAN OBSERVED EFFLUENT CONCENTRATIONS

Pollutant[a]	Treatment technique: Activated sludge	Trickling filters	Lagoons: Aerated	Lagoons: Anaerobic	Lagoons: Facultative	Lagoons: Aerobic	Tertiary polishing	Rotating biological contactors	Steam stripping	Solvent extraction
Classical pollutants, mg/L:										
BOD_5	32	29	78	548	138	38†		18		
COD	440	623	60		1,410		202	750	173	1,140
TSS	62	45	80	2,300	105		25	62		
TKN			64		67.5			15		
TOC	280		126						110	43.5
Toxic pollutants, mg/L:										
Cyanide, total										
Phenols, total	0.032	<2.8	0.011				0.04			34.5
Toxic pollutants, µg/L:										
Acenaphthene	<0.04		4							
Acrolein										
Acrylonitrile										
Benzene	<10[b]		<10	5,000						8,100
Benzidine	4		7.0							
Carbon tetrachloride	<5									
Chlorobenzene	<0.2									
1,2,4-Trichlorobenzene	<5									
Hexachlorobenzene	<0.3		<4[b]							
1,2-Dichloroethane								33,000	7,000	31,500
1,1,1-Trichloroethane	<2.0		22						42,000	
Hexachloroethane										
1,1-Dichloroethane	<3.5									
1,1,2-Trichloroethane	-[b]								<10[b]	16,000
1,1,2,2-Tetrachloroethane	<9							33,000		2,000
Chloroethane										
Bis(chloromethyl) ether	<10[b]									
Bis(2-chloroethyl) ether	<10[c]									
2-Chloroethyl vinyl ether										
2-Chloronaphthalene	1.0		<10[b]							
2,4,6-Trichlorophenol	11	2	<10[b]							
p-Chloro-*m*-cresol	2.8									
Chloroform	<8	19	<10[b]						<10[b]	
2-Chlorophenol	5.5									

†Estimated from the ranges of values reported in original data base.

(continued)

TABLE B-3 (continued)

Pollutant[a]	Treatment technique: Activated sludge	Trickling filters	Lagoons: Aerated	Lagoons: Anaerobic	Lagoons: Facultative	Lagoons: Aerobic	Tertiary polishing	Rotating biological contactors	Steam stripping	Solvent extraction
Toxic pollutants (cont'd), µg/L:										
1,2-Dichlorobenzene	0.3		<10[b]							
1,3-Dichlorobenzene										
1,4-Dichlorobenzene	0.9		<10[b]							
3,3'-Dichlorobenzidine										
1,1-Dichloroethylene										
1,2-*Trans*-dichloroethylene									16,000	
2,4-Dichlorophenol	<7									
1,2-Dichloropropane	<5.4									
1,3-Dichloropropylene										
2,4-Dimethylphenol	9									
2,4-Dinitrotoluene			3							
2,6-Dinitrotoluene	390		2							
1,2-Diphenylhydrazine	340		14							
Ethylbenzene	<0.2		<10[b]							4,000
Fluoranthene	2.0		<2							
4-Chlorophenyl phenyl ether										
4-Bromophenyl phenyl ether	18									
Bis(2-chloroisopropyl) ether			<2[b]							
Bis(2-chloroethoxy)methane			<10[b]						130,000	
Methylene chloride	9.0	1.0	130							
Methyl chloride										
Methyl bromide										
Bromoform	3.0									
Dichlorobromomethane	<5.3									
Dichlorodifluoromethane										
Trichlorofluoromethane	35						<10[b]			
Dichlorofluoromethane										
Chlorodibromomethane										
Hexachlorobutadiene										
Hexachlorocyclopentadiene										
Isophorone	<4.6		2							
Naphthalene	<0.15	55	5.5				<10[b]			
Nitrobenzene			<3							

(continued)

TABLE B-3 (continued)

Pollutant[a]	Treatment technique: Activated sludge	Trickling filters	Lagoons: Aerated	Lagoons: Anaerobic	Lagoons: Facultative	Lagoons: Aerobic	Tertiary polishing	Rotating biological contactors	Steam stripping	Solvent extraction
Toxic pollutants (cont'd), µg/L:										
2-Nitrophenol	<0.4									
4-Nitrophenol	<0.9		<10							
2,4-Dinitrophenol										
4,6-Dinitro-o-phenol										
N-nitrosodimethylamine										
N-nitrosodiphenylamine	<0.8		1							
N-nitroso-di-n-propylamine	<10.5									
Pentachlorophenol	<0.4	3	<10[b]							
Phenol	<0.07	37	<10[b]							190,000
Bis(2-ethylhexyl) phthalate	12	6	<10[b]							
Butyl benzyl phthalate	11		6							
Di-n-butyl phthalate	<2	6	1							
Di-n-octyl phthalate	5,000									
Diethyl phthalate	<0.03	140	4							
Dimethyl phthalate	<0.03		6							
Benz(a)anthracene										
Benzo(a)pyrene			2							
Benzo(b)fluoranthene			<0.4							
Benzo(k)fluoranthene										
Chrysene										
Acenaphthylene	1.0		5							
Anthracene/phenanthrene	1.2									
Benzo(ghi)perylene										
Fluorene	<0.02		0.2							
Phenanthrene/anthracene	1.2		3							
Dibenz(ah)anthracene										
Indeno(1,2,3-cd)pyrene	<0.02									
Pyrene	0.2		1.0[b]							
Tetrachloroethylene	<0.9		-[b]							
Toluene	8		<10[b]						<10[b]	1,950
Trichloroethylene	<0.5	1							23,000	
Vinyl chloride										
Aldrin										
Dieldrin										
Chlordane										
4,4'-DDT										

(continued)

TABLE B-3 (continued)

Pollutant[a]	Treatment technique: Activated sludge	Trickling filters	Lagoons: Aerated	Lagoons: Anaerobic	Lagoons: Facultative	Lagoons: Aerobic	Tertiary polishing	Rotating biological contactors	Steam stripping	Solvent extraction
Toxic pollutants (cont'd), µg/L:										
4,4'-DDE										
4,4'-DDD										
α-Endosulfan										
β-Endosulfan										
Endosulfan sulfate										
Endrin										
Endrin aldehyde										
Heptachlor	1.5									
Heptachlor epoxide										
α-BHC										
β-BHC										
γ-BHC										
δ-BHC										
Aroclor 1242										
Aroclor 1254										
Aroclor 1221										
Aroclor 1232										
Aroclor 1248										
Aroclor 1260										
Aroclor 1016										
Toxaphene										
Antimony	3.5		30							
Arsenic	<8.0									
Beryllium			<1							
Cadmium	4.0		<2							
Chromium	28	17	16				<10[b]			
Copper	30	42	26				18			
Lead	30	49	<50							
Mercury	0.7		0.1							
Nickel	38		32							
Selenium	41		<200				18			
Silver	33									
Thallium	29		<16							
Zinc	18		<80				110			

(continued)

TABLE B-3 (continued)

Pollutant[a]	Treatment technique: Activated sludge	Trickling filters	Lagoons: Aerated	Lagoons: Anaerobic	Lagoons: Facultative	Lagoons: Aerobic	Tertiary polishing	Rotating biological contactors	Steam stripping	Solvent extraction
Other pollutants:										
Ammonia-nitrogen, mg/L										
Asbestos, fibers/L										
Chlorine, total residual, µg/L										81
Fluoride, µg/L										
Oil and grease, mg/L	25		17					29		
Phosphorus, total, mg/L	3.6							3.4		
Aluminum, µg/L										
Iron, µg/L										
Molybdenum, µg/L										
Manganese, µg/L										
Acetaldehyde, µg/L				35						
Acetic acid, µg/L				2,300						
Acetone, µg/L										16,000
Ammonia, mg/L										
Butyric acid, µg/L				320						
Calcium, µg/L										
Chloride, µg/L										
Chlorine, total, mg/L										
Chromium (+3), µg/L										
Chromium (+6), µg/L										
Chromium (dissolved), µg/L										
Cyanide, µg/L	24	16	100							
Dichlorobenzenes, µg/L										
Methyl ethyl ketone, µg/L										1,900,000
Nickel (dissolved), µg/L										
m-p-Cresol, µg/L										25,000
o-Cresol, µg/L										31,000
Propionic acid, µg/L				480						
Radium (dissolved), PicoCi/L										
Radium, total, PicoCi/L										
Styrene, µg/L										<1,000
TDS, mg/L										
Xylenes, µg/L	<2.0	2.0								<1,000

Note: Blanks indicate data not available in literature.

[a]Pollutants are listed in the same order as that in the Draft Consolidated Permit Form [3].

[b]The concentration was reported as "not detected."

[c]The concentration was reported as "below detection limit."

TABLE B-4. MEDIAN OBSERVED EFFLUENT CONCENTRATIONS

Pollutant[a]	Treatment technique: Activated carbon absorption: Granular	Activated carbon absorption: Powdered with sludge	Activated carbon absorption: Powdered without sludge	Chemical oxidation (chlorination)	Air stripping	Ion exchange	Reverse osmosis	Dechlorination	Ozonation	Chemical reduction
Classical pollutants, mg/L:										
BOD_5	13		13						330	
COD	176		98	565					212	
TSS	12.5		54	96	162				14	
TKN			28							
TOC	86		38						544	
Toxic pollutants, mg/L:										
Cyanide, total			0.013	30	51,000					
Phenols, total	0.017								0.021	
Toxic pollutants, µg/L:										
Acenaphthene	<0.04						0.8			
Acrolein		700,000								
Acrylonitrile							1.0			
Benzene	9.8	20,000								
Benzidine										
Carbon tetrachloride										
Chlorobenzene	<0.2	20,000								
1,2,4-Trichlorobenzene	<0.09	20,000								
Hexachlorobenzene		20,000								
1,2-Dichloroethane	31,000	190,000								
1,1,1-Trichloroethane	<10[b]									
Hexachloroethane										
1,1-Dichloroethane	<10[b]									
1,1,2-Trichloroethane	<10[b]									
1,1,2,2-Tetrachloroethane										
Chloroethane	63									
Bis(chloromethyl) ether										
Bis(2-chloroethyl) ether		44								
2-Chloroethyl vinyl ether										
2-Chloronaphthalene										
2,4,6-Trichlorophenol										
p-Chloro-*m*-cresol	<0.1[b]									
Chloroform	<10[b]						14			
2-Chlorophenol		190,000								

(continued)

TABLE B-4 (continued)

Pollutant[a]	Treatment technique: Activated carbon absorption: Granular	Activated carbon absorption: Powdered with sludge	Activated carbon absorption: Powdered without sludge	Chemical oxidation) (chlorination)	Air stripping	Ion exchange	Reverse osmosis	Dechlorination	Ozonation	Chemical reduction
Toxic pollutants (cont'd):										
1,2-Dichlorobenzene	<0.05	20,000								
1,3-Dichlorobenzene		20,000								
1,4-Dichlorobenzene		20,000								
3,3'-Dichlorobenzidine										
1,1-Dichloroethylene										
1,2-*Trans*-dichloroethylene									2.1	
2,4-Dichlorophenol										
1,2-Dichloropropane	<5.4	70,000								
1,3-Dichloropropylene										
2,4-Dimethylphenol	<0.1									
2,4-Dinitrotoluene		20,000								
2,6-Dinitrotoluene		20,000								
1,2-Diphenylhydrazine										
Ethylbenzene	<0.2	18,000								
Fluoranthene	<0.02								0.1	
4-Chlorophenyl phenyl ether										
4-Bromophenyl phenyl ether										
Bis(2-chloroisopropyl) ether										
Bis(2-chloroethoxy)methane										
Methylene chloride	18						5		38	
Methyl chloride							45			
Methyl bromide										
Bromoform										
Dichlorobromomethane										
Dichlorodifluoromethane										
Trichlorofluoromethane	69									
Dichlorofluoromethane										
Chlorodibromomethane										
Hexachlorobutadiene										
Hexachlorocyclopentadiene										
Isophorone		30,000								
Naphthalene		<10[b]								
Nitrobenzene		20,000								

(continued)

TABLE B-4 (continued)

Pollutant[a]	Treatment technique: Activated carbon absorption: Granular	Activated carbon absorption: Powdered with sludge	Activated carbon absorption: Powdered without sludge	Chemical oxidation (chlorination)	Air stripping	Ion exchange	Reverse osmosis	Dechlorination	Ozonation	Chemical reduction
Toxic pollutants (cont'd):										
2-Nitrophenol										
4-Nitrophenol										
2,4-Dinitrophenol										
4,6-Dinitro-*o*-cresol										
N-nitrosodimethylamine										
N-nitrosodiphenylamine	<0.07									
N-nitroso-di-n-propylamine										
Pentachlorophenol	<1.7									
Phenol	0.9		<10[b]				0.7			
Bis(2-ethylhexyl) phthalate	17		<10[b]				3.0		100	
Butyl benzyl phthalate	<0.03								<0.03	
Di-n-butyl phthalate	0.4						1.0		2.7	
Di-n-octyl phthalate	55									
Diethyl phthalate	1.4									
Dimethyl phthalate							110			
Benz(a)anthracene										
Benzo(a)pyrene	<0.02								<0.02	
Benzo(b)fluoranthene										
Benzo(k)fluoranthene	<0.02								<0.02	
Chrysene										
Acenaphthylene										
Anthracene/phenanthrene	0.1						0.7		0.2	
Benzo(ghi)perylene										
Fluorene										
Phenanthrene/anthracene	0.1						0.7		0.2	
Dibenz(ah)anthracene										
Indeno(1,2,3-cd)pyrene										
Pyrene	<0.01						18		0.1	
Tetrachloroethylene	32									
Toluene	1.3	67,000					20		1.0	
Trichloroethylene	2.8						0.4		0.9	
Vinyl chloride	6,700									
Aldrin										

(continued)

TABLE B-4 (continued)

Pollutant[a]	Treatment technique: Activated carbon absorption — Granular	Activated carbon absorption — Powdered with sludge	Activated carbon absorption — Powdered without sludge	Chemical oxidation (chlorination)	Air stripping	Ion exchange	Reverse osmosis	Dechlorination	Ozonation	Chemical reduction
Toxic pollutants (cont'd):										
Dieldrin										
Chlordane										
4,4'-DDT										
4,4'-DDE										
4,4'-DDD										
α-Endosulfan										
β-Endosulfan										
Endosulfan sulfate										
Endrin										
Endrin aldehyde										
Heptachlor										
Heptachlor epoxide										
α-BHC	<1									
β-BHC										
γ-BHC										
δ-BHC										
Aroclor 1242										
Aroclor 1254										
Aroclor 1221										
Aroclor 1232										
Aroclor 1248										
Aroclor 1260										
Aroclor 1016										
Toxaphene										
Antimony	42	150	47				90		610	
Arsenic	5						1		23	
Beryllium	2.7						<2.8			
Cadmium	9.8		10			<10[c]	14.0		250	
Chromium	32		53			10	520		6.3	130,000
Copper	42		14	320		95	50		340	
Lead	35		38	2,500		10	250		<22	120,000
Mercury	0.4		0.6				0.53			
Nickel	81		<10			<10	<10		2,500	
Selenium	13		<30				4			
Silver	22						9		650	
Thallium							2			
Zinc	76	80	110			400	70		240	1,500

(continued)

TABLE B-4 (continued)

Pollutant[a]	Treatment technique: Activated carbon absorption: Granular	Activated carbon absorption: Powdered with sludge	Activated carbon absorption: Powdered without sludge	Chemical oxidation (chlorination)	Air stripping	Ion exchange	Reverse osmosis	Dechlorination	Ozonation	Chemical reduction
Other pollutants:										
Ammonia-nitrogen				120	41					
Asbestos										
Chlorine, total residual								0.02		
Fluoride										
Oil and grease	8	13					<60		4	
Phosphorus, total	1.9								1.1	
Aluminum										
Iron										
Molybdenum						1,300				
Manganese										
Acetaldehyde										
Acetic acid										
Acetone										
Ammonia										
Butyric acid										
Calcium										
Chloride										
Chlorine, total										
Chromium (+3)							15			
Chromium (+6)	<20	<20				10	10			
Chromium (dissolved)										
Cyanide	<18	20		30	51,000	65	22		190	
Dichlorobenzenes										
Methyl ethyl ketone										
Nickel (dissolved)										
m-p-Cresol										
o-Cresol										
Propionic acid										
Radium (dissolved)						<1.0				
Radium, total						7.2				
Styrene										
TDS							140			
Xylenes										

Note: Blanks indicate data not available in literature.

[a] Pollutants are listed in the same order as that in the Draft Consolidated Permit Form [3].

[b] Values were reported as zero.

[c] Actual data show higher concentration in stream leaving control equipment than in stream entering control equipment.

APPENDIX C

MEDIAN REMOVAL EFFICIENCIES

TABLE C-1. MEDIAN REMOVAL EFFICIENCIES

Pollutant[a]	Treatment technique: Gravity oil separation	Sedimentation	Sedimentation with chemical addition: Polymer	Lime	Fe^{2+}, lime	Lime, polymer	Barium chloride	Alum, coagulant aid	Alum	FeCl	Sulfide	Alum, lime
Classical pollutants:												
BOD_5		25	50	52				37	61			41
COD		93	71	32		>99	60	59	10	60		86
TSS		97	>99	71		>99	>89	66	84	>89		93
TKN												
TOC		32	82	18		22	49	47	63	49		80
Toxic pollutants:												
Cyanide, total												
Phenols, total		20	29	22			<1[b]	26	19	0		11
Acenaphthene												
Acrolein												
Acrylonitrile												
Benzene		>9	-[c]			-[c]		49				50
Benzidine												
Carbon tetrachloride												
Chlorobenzene												
1,2,4-Trichlorobenzene		-[c]							90			91
Hexachlorobenzene												
1,2-Dichloroethane		>70						30	-[c]			
1,1,1-Trichloroethane		33				-[c]		46				
Hexachloroethane												
1,1-Dichloroethane		>0[d]										
1,1,2-Trichloroethane								-[c]				
1,1,2,2-Tetrachloroethane		-[c]										30
Chloroethane												
Bis(chloromethyl) ether												
Bis(2-chloroethyl) ether												
2-Chloroethyl vinyl ether												
2-Chloronaphthalene						-[c]						
2,4,6-Trichlorophenol		-[c]										
p-Chloro-*m*-cresol						44						
Chloroform		-[c]	-[c]			<1[b]		-[c]	-[c]			-[c]
2-Chlorophenol		44				>0						
1,2-Dichlorobenzene									25			>99
1,3-Dichlorobenzene												
1,4-Dichlorobenzene												
3,3'-Dichlorobenzidine												

(continued)

TABLE C-1 (continued)

Pollutant[a]	Treatment technique: Gravity oil separation	Sedimentation	Sedimentation with chemical addition: Polymer	Lime	Fe^{2+}, lime	Lime, polymer	Barium chloride	Alum, coagulant aid	Alum	FeCl	Sulfide	Alum, lime
Toxic pollutants (cont'd):												
1,1-Dichloroethylene		<1[d]						>98				
1,2-*Trans*-dichloroethylene		-[c]	-[c]					28				
2,4-Dichlorophenol												
1,2-Dichloropropane												59
1,3-Dichloropropylene												
2,4-Dimethylphenol		>0				>76						
2,4-Dinitrotoluene		80										
2,6-Dinitrotoluene		80		>79								
1,2-Diphenylhydrazine												
Ethylbenzene		55[b]	81					75	-[c]			99
Fluoranthene		<1[b]				>97						
4-Chlorophenyl phenyl ether												
4-Bromophenyl phenyl ether												
Bis(2-chloroisopropyl) ether												
Bis(2-chloroethoxy)methane												
Methylene chloride		31	-[c]			<1[b]		90	>78			13
Methyl chloride		77										
Methyl bromide												
Bromoform												
Dichlorobromomethane												
Dichlorodifluoromethane												
Trichlorofluoromethane												
Dichlorofluoromethane												
Chlorodibromomethane		>77							>50			
Hexachlorobutadiene												
Hexachlorocyclopentadiene												
Isophorone		>49										
Naphthalene		>41				49						70
Nitrobenzene		>52							68			
2-Nitrophenol		>47										
4-Nitrophenol		>0				>9						
2,4-Dinitrophenol		>0										
4,6-Dinitro-o-cresol		48				-[c]						
N-nitrosodimethylamine												
N-nitrosodiphenylamine		>77										

(continued)

TABLE C-1 (continued)

Pollutant[a]	Treatment technique: Gravity oil separation	Sedimentation	Sedimentation with chemical addition: Polymer	Lime	Fe^{2+}, lime	Lime, polymer	Barium chloride	Alum, coagulant aid	Alum	FeCl	Sulfide	Alum, lime
Toxic pollutants (cont'd):												
N-nitroso-di-n-propylamine												
Pentachlorophenol		55						>96				
Phenol		>0[d]	14			18		>1[b]	>86			
Bis(2-ethylhexyl) phthalate		16	>48			49	48	78	-[c]	48		-[c]
Butyl benzyl phthalate		>48				>99		54				>99
Di-n-butyl phthalate		>0[d]	50			99		>78	-[c]			
Di-n-octyl phthalate		>49						92				
Diethyl phthalate		-[c]	>98			>99						
Dimethyl phthalate		>49										
Benz(a)anthracene				>92		>81						
Benzo(a)pyrene		80		-[c]		-[c]						
Benzo(b)fluoranthene		83										
Benzo(k)fluoranthene		>57										
Chrysene		>0[d]		>92		99						
Acenaphthylene		>17				-[c]						
Anthracene/phenanthrene		>64	-[c]			>0			-[c]			
Benzo(ghi)perylene		>17										48
Fluorene		>79				50						
Phenanthrene/anthracene			-[c]						-[c]			
Dibenz(ah)anthracene												
Indeno(1,2,3-cd)pyrene												
Pyrene		>69		-[c]		>70						
Tetrachloroethylene		>28		-[c]		>0		-[c]	-[c]			95
Toluene		>0	20	-[c]		-[c]		<1[b]	55			76
Trichloroethylene		35	-[c]					<1[b]	10			
Vinyl chloride												
Aldrin												
Dieldrin												
Chlordane												
4,4'-DDT												>52
4,4'-DDE												
4,4'-DDD												
α-Endosulfan												
β-Endosulfan												
Endosulfan sulfate												

(continued)

TABLE C-1 (continued)

Pollutant[a]	Treatment technique: Gravity oil separation	Sedimentation	Sedimentation with chemical addition: Polymer	Lime	Fe^{2+}, lime	Lime, polymer	Barium chloride	Alum, coagulant aid	Alum	FeCl	Sulfide	Alum, lime
Toxic pollutants (cont'd):												
Endrin												
Endrin aldehyde												
Heptachlor												>29
Heptachlor epoxide												
α-BHC												
β-BHC												
γ-BHC												
δ-BHC												
Aroclor 1242												
Aroclor 1254												
Aroclor 1221												
Aroclor 1232												
Aroclor 1248												
Aroclor 1260												
Aroclor 1016												
Toxaphene												
Antimony		50	44	40	-[c]		>0	-[c]	-[c]	>0		
Arsenic		>93		>70	>77	37	17	29	19	17	>99	
Beryllium		>84			>82				-[c]			
Cadmium		77	25	>38	24	8		42	44		>50	
Chromium		>94	>96	62	45	89	72	90	45	72	>97	
Copper		86	52	87	83	95	>62	58	>73[b]	>62	>98	
Lead		89	46	73	>25	>73	42	56	<1[b]	42	>93	
Mercury		≥50	>62	-[c]	>30	-[c]	87	74	>34	87	>99	
Nickel		>77	35	43	20	86		9	25		>11	
Selenium		80		-[c]	18	-[c]	-[c]			-[c]		
Silver		>90		10	4	-[c]	-[c]	21	5	-[c]	>90	
Thallium		<66		58	>55							
Zinc		86	89	85	92	99	65	70	70	65	>98	
Other pollutants:												
Ammonia-nitrogen												
Asbestos		>99		95		>99	38					
Chlorine, total residual												

(continued)

TABLE C-1 (continued)

Pollutant[a]	Treatment technique: Gravity oil separation	Sedimentation	Sedimentation with chemical addition: Polymer	Lime	Fe^{2+}, lime	Lime, polymer	Barium chloride	Alum, coagulant aid	Alum	FeCl	Sulfide	Alum, lime
Other pollutants (cont'd):												
Fluoride		72		72		92						
Oil and grease		99	98	74		84		80	99			>98
Phosphorus, total		3						77	14			>75
Aluminum				90								
Iron				>98								
Molybdenum												
Manganese				99								
Acetaldehyde												
Acetic acid												
Acetone												
Ammonia												
Butyric acid												
Calcium				57								
Chloride				26								
Chlorine, total												
Chromium (+3)												
Chromium (+6)		<1[b]				41						
Chromium (dissolved)				>99		99						
Cyanide				-[c]		65		-[c]				>70
Dichlorobenzenes												
Methyl ethyl ketone												
Nickel (dissolved)				>99		99						
m-p-Cresol												
o-Cresol												
Propionic acid												
Radium (dissolved)							82					
Radium, total							91					
Styrene												
TDS												
Xylenes												

Note: Blanks indicate data not available in literature.

[a]Pollutants are listed in the same order as that in the Draft Consolidated Permit Form [3].

[b]Values were reported as zero.

[c]Actual data show higher concentration in stream leaving control equipment than in stream entering control equipment.

TABLE C-2. MEDIAN REMOVAL EFFICIENCIES (Percent)

Pollutant[a]	Treatment technique: Gas flotation	Gas flotation with chemical addition: Alum	Alum, polymer	CaCl, polymer	Polymer	Filtration	Ultra-filtration
Classical pollutants:							
BOD_5	4		60	64	47	24	64
COD	48		51	66	20	24	53
TSS	77		68	88	33	67	99
TKN							
TOC	-[c]		25	50	36	13	76
Toxic pollutants:							
Cyanide, total							
Phenols, total	4		13	1	42	8	32
Acenaphthene						73	
Acrolein			-[c]			>86	
Acrylonitrile							
Benzene				-[c]	33	14	
Benzidine							
Carbon tetrachloride			76	50		89	
Chlorobenzene						-[c]	
1,2,4-Trichlorobenzene						37	
Hexachlorobenzene							
1,2-Dichloroethane						-[c]	
1,1,1-Trichloroethane			74	22	>4	>88	
Hexachloroethane						-	
1,1-Dichloroethane						-[c]	
1,1,2-Trichloroethane						-[c]	
1,1,2,2-Tetrachloroethane						-[c]	
Chloroethane							
Bis(chloromethyl) ether							
Bis(2-chloroethyl) ether							
2-Chloroethyl vinyl ether							
2-Chloronaphthalene			3			-[c]	
2,4,6-Trichlorophenol				-[c]		80	
p-Chloro-*m*-cresol						-[c]	
Chloroform	>0		-[c]	20	41	-[c]	
2-Chlorophenol					-[c]		
1,2-Dichlorobenzene						55	
1,3-Dichlorobenzene							
1,4-Dichlorobenzene							
3,3'-Dichlorobenzidine							

(continued)

TABLE C-2 (continued)

Pollutant[a]	Treatment technique: Gas flotation	Gas flotation with chemical addition: Alum	Alum, polymer	CaCl, polymer	Polymer	Filtration	Ultrafiltration
Toxic pollutants (cont'd):							
1,1-Dichloroethylene						>52	
1,2-*Trans*-dichloroethylene						-[c]	
2,4-Dichlorophenol					-[c]	33.5	
1,2-Dichloropropane						-[c]	
1,3-Dichloropropylene							
2,4-Dimethylphenol				>99	-[c]	-[c]	
2,4-Dinitrotoluene							
2,6-Dinitrotoluene							
1,2-Diphenylhydrazine							
Ethylbenzene	>99		-[c]	30	59	>82	
Fluoranthene					-[c]	29	
4-Chlorophenyl phenyl ether							
4-Bromophenyl phenyl ether							
Bis(2-chloroisopropyl) ether							
Bis(2-chloroethoxy)methane							
Methylene chloride			84	<1[b]	61	-[c]	
Methyl chloride					-[c]		
Methyl bromide							
Bromoform							
Dichlorobromomethane			>85				
Dichlorodifluoromethane							
Trichlorofluoromethane			>50			-[c]	
Dichlorofluoromethane							
Chlorodibromomethane							
Hexachlorobutadiene							
Hexachlorocyclopentadiene							
Isophorone				>95			
Naphthalene	~36		52	80	>65	70	
Nitrobenzene							
2-Nitrophenol							
4-Nitrophenol							
2,4-Dinitrophenol							
4,6-Dinitro-o-cresol							
N-nitrosodimethylamine							
N-nitrosodiphenylamine				66		-[c]	

(continued)

TABLE C-2 (continued)

Pollutant[a]	Treatment technique: Gas flotation	Gas flotation with chemical addition: Alum	Alum, polymer	CaCl, polymer	Polymer	Filtration	Ultrafiltration
Toxic pollutants (cont'd):							
N-nitroso-di-n-propylamine							
Pentachlorophenol				-[c]	9	-[c]	
Phenol	51		-[c]	57	36	17	
Bis(2-ethylhexyl) phthalate	-[c]		25	72	51	36	
Butyl benzyl phthalate	>99		-[c]	>99	>99	64	
Di-n-butyl phthalate			<1[b]	39	>61	<1[b]	
Di-n-octyl phthalate			-[c]	78	61	64	
Diethyl phthalate	>17					38	
Dimethyl phthalate						>98	
Benz(a)anthracene						-[c]	
Benzo(a)pyrene							
Benzo(b)fluoranthene						-[c]	
Benzo(k)fluoranthene							
Chrysene							
Acenaphthylene							
Anthracene/phenanthrene	45		-[c]	83	-[c]	44	
Benzo(ghi)perylene							
Fluorene						-[c]	
Phenanthrene/anthracene	45		-[c]	83	-[c]	44	
Dibenz(ah)anthracene							
Indeno(1,2,3-cd)pyrene							
Pyrene					<1[b]	<1[b]	
Tetrachloroethylene			>10	-[c]	<1[b]	<1[b]	
Toluene			10	6	59	21	
Trichloroethylene				43		40	
Vinyl chloride							
Aldrin							
Dieldrin							
Chlordane						37	
4,4'-DDT							
4,4'-DDE							
4,4'-DDD							
α-Endosulfan							
β-Endosulfan							
Endosulfan sulfate							

(continued)

TABLE C-2 (continued)

Pollutant[a]	Treatment technique: Gas flotation	Gas flotation with chemical addition: Alum	Alum, polymer	CaCl, polymer	Polymer	Filtration	Ultra-filtration
Toxic pollutants (cont'd):							
Endrin							
Endrin aldehyde							
Heptachlor							
Heptachlor epoxide							
α-BHC						38	
β-BHC						21	
γ-BHC							
δ-BHC	<1[b]						
Aroclor 1242						16	
Aroclor 1254						20	
Aroclor 1221							
Aroclor 1232						16	
Aroclor 1248						16	
Aroclor 1260						16	
Aroclor 1016	-[c]						
Toxaphene							
Antimony			6	>51	-[c]	21	
Arsenic			56	>13		<1[b]	
Beryllium						22	
Cadmium			<1[b]	>96	-[c]	57	>90
Chromium	40		19	>50	-[c]	21	67
Copper	69		19[b]	79	42	34	>71
Lead	49[c]		<1[b]	98	15	36	>74
Mercury	-[c]		33	>80		>37	15
Nickel	-[c]		41[b]	>67[c]	-[c]	7[c]	>32
Selenium	-[c]		<1[b]	-[c]		-[c]	
Silver			44	24	-[c]	-[c]	
Thallium				-[c]	-[c]	>55	
Zinc	11		10	96	>38	36	94
Other pollutants:							
Ammonia-nitrogen							
Asbestos						>99	
Chlorine, total residual							

(continued)

TABLE C-2 (continued)

Pollutant[a]	Treatment technique: Gas flotation	Gas flotation with chemical addition: Alum	Alum, polymer	CaCl, polymer	Polymer	Filtration	Ultra-filtration
Other pollutants (cont'd):							
Fluoride							
Oil and grease	74	92	74	79	59[c]	20	85
Phosphorus, total			49	48	-[c]	30	
Aluminum							
Iron							
Molybdenum							
Manganese							
Acetaldehyde							
Acetic acid							
Acetone							
Ammonia							
Butyric acid							
Calcium							
Chloride							
Chlorine, total							
Chromium (+3)							
Chromium (+6)							
Chromium (dissolved)							
Cyanide	-[c]		≥61	-[c]	14	-[c]	-[c]
Dichlorobenzenes							
Methyl ethyl ketone							
Nickel (dissolved)							
m-p-Cresol							
o-Cresol							
Propionic acid							
Radium (dissolved)							
Radium, total							
Styrene							
TDS							
Xylenes							

Note: Blanks indicate data not available in literature.

[a]Pollutants are listed in the same order as that in the Draft Consolidated Permit Form [3].

[b]Values were reported as zero.

[c]Actual data show higher concentration in stream leaving control equipment than in stream entering control equipment.

TABLE C-3. MEDIAN REMOVAL EFFICIENCIES

Pollutant[a]	Treatment technique: Activated sludge	Trickling filters	Lagoons: Aerated	Lagoons: Anaerobic	Lagoons: Facultative	Lagoons: Aerobic	Tertiary polishing	Rotating biological contactors	Steam stripping	Solvent extraction
Classical pollutants:										
BOD_5	93	93	86	78	90	91		72		
COD	67	23	62	39	62		26	40[c]	62	50
TSS	44	59	45		74		50	-		
TKN			77		50			33		
TOC	69		45						72	35
Toxic pollutants:										
Cyanide, total		79								
Phenols, total	65	>96	65[b]				23			99
Acenaphthene	>99		<1							
Acrolein										
Acrylonitrile										
Benzene	>81		>65	50					80	96
Benzidine	<1[b]		41							
Carbon tetrachloride	>98									
Chlorobenzene	84									
1,2,4-Trichlorobenzene	95									
Hexachlorobenzene	>45		>0							
1,2-Dichloroethane									>99	89
1,1,1-Trichloroethane	>85		96						9	
Hexachloroethane										
1,1-Dichloroethane	>9									
1,1,2-Trichloroethane	>9								>99[c]	92
1,1,2,2-Tetrachloroethane	>22								-	98
Chloroethane										
Bis(chloromethyl) ether	>83									
Bis(2-chloroethyl) ether	>47									
2-Chloroethyl vinyl ether										
2-Chloronaphthalene	50		>47							
2,4,6-Trichlorophenol	>18	-[c]	>99							
p-Chloro-*m*-cresol	80									
Chloroform	>78	-[c]	>50						>99	
2-Chlorophenol	46									
1,2-Dichlorobenzene	>86		>96							
1,3-Dichlorobenzene										
1,4-Dichlorobenzene	>93		>81							
3,3'-Dichlorobenzidine										

(continued)

TABLE C-3 (continued)

Pollutant[a]	Treatment technique: Activated sludge	Trickling filters	Lagoons: Aerated	Lagoons: Anaerobic	Lagoons: Facultative	Lagoons: Aerobic	Tertiary polishing	Rotating biological contactors	Steam stripping	Solvent extraction
Toxic pollutants (cont'd):										
1,1-Dichloroethylene										
1,2-*Trans*-dichloroethylene									99	
2,4-Dichlorophenol	>25									
1,2-Dichloropropane	>67									
1,3-Dichloropropylene										
2,4-Dimethylphenol	-[c]									
2,4-Dinitrotoluene			-[c]							
2,6-Dinitrotoluene	-[c]		83							
1,2-Diphenylhydrazine	-[c]		-[c]							
Ethylbenzene	>98		>89							97
Fluoranthene	<1[b]		>0							
4-Chlorophenyl phenyl ether										
4-Bromophenyl phenyl ether	95		>0							
Bis(2-chloroisopropyl) ether										
Bis(2-chloroethoxy)methane			>60							
Methylene chloride	-[c]	-[c]	97						81	
Methyl chloride			>91							
Methyl bromide										
Bromoform	-[c]									
Dichlorobromomethane	<1[b]									
Dichlorodifluoromethane										
Trichlorofluoromethane	-[c]						>79			
Dichlorofluoromethane										
Chlorodibromomethane										
Hexachlorobutadiene										
Hexachlorocyclopentadiene										
Isophorone	>0		33							
Naphthalene	>95	-[c]	>28				>82			
Nitrobenzene			>0							
2-Nitrophenol	>99									
4-Nitrophenol	>99									
2,4-Dinitrophenol			>23							
4,6-Dinitro-o-cresol										
N-nitrosodimethylamine										
N-nitrosodiphenylamine	>84[c]		67							
N-nitroso-di-n-propylamine	-[c]									

(continued)

TABLE C-3 (continued)

Pollutant[a]	Treatment technique: Activated sludge	Trickling filters	Lagoons: Aerated	Lagoons: Anaerobic	Lagoons: Facultative	Lagoons: Aerobic	Lagoons: Tertiary polishing	Rotating biological contactors	Steam stripping	Solvent extraction
Toxic pollutants (cont'd):										
Pentachlorophenol	89	-[c]	>71							
Phenol	98	-[c]	>61							80
Bis(2-ethylhexyl) phthalate	24	83	>78							
Butyl benzyl phthalate	-[c]	-[c]	<1[b]							
Di-n-butyl phthalate	84	25	<1[b]							
Di-n-octyl phthalate	-[c]									
Diethyl phthalate	>85	-[c]	-[c]							
Dimethyl phthalate	>99		25							
Benz(a)anthracene										
Benzo(a)pyrene			33							
Benzo(b)fluoranthene			97							
Benzo(k)fluoranthene										
Chrysene										
Acenaphthylene	-[c]		-[c]							
Anthracene/phenanthrene	68									
Benzo(ghi)perylene										
Fluorene	>99		99							
Phenanthrene/anthracene	68		-[c]							
Dibenz(ah)anthracene										
Indeno(1,2,3-cd)pyrene	>99									
Pyrene	-[c]		67							
Tetrachloroethylene	>93		>60						>99	
Toluene	62		>90							95
Trichloroethylene	>96	-[c]							54	
Vinyl chloride										
Aldrin										
Dieldrin										
Chlordane										
4,4'-DDT										
4,4'-DDE										
4,4'-DDD										
α-Endosulfan										
β-Endosulfan										

(continued)

TABLE C-3 (continued)

Pollutant[a]	Treatment technique: Activated sludge	Trickling filters	Lagoons: Aerated	Lagoons: Anaerobic	Lagoons: Facultative	Lagoons: Aerobic	Tertiary polishing	Rotating biological contactors	Steam stripping	Solvent extraction
Toxic pollutants (cont'd):										
Endosulfan sulfate										
Endrin										
Endrin aldehyde										
Heptachlor	76									
Heptachlor epoxide										
α-BHC										
β-BHC										
γ-BHC										
δ-BHC										
Aroclor 1242										
Aroclor 1254										
Aroclor 1221										
Aroclor 1232										
Aroclor 1248										
Aroclor 1260										
Aroclor 1016										
Toxaphene										
Antimony	>14		82							
Arsenic	>39									
Beryllium			>50							
Cadmium	<1[b]		>97							
Chromium	48	-[c]	91				>71[c]			
Copper	57	-[c]	36				-			
Lead	44	-[c]	87				>72			
Mercury	>29		>99							
Nickel	>14[c]		<1[b]							
Selenium	-		>50				44			
Silver	20									
Thallium	38		>44							
Zinc	30		61				43			
Other pollutants:										
Ammonia-nitrogen										
Asbestos										
Chlorine, total residual										94

(continued)

TABLE C-3 (continued)

Pollutant[a]	Treatment technique: Activated sludge	Trickling filters	Lagoons: Aerated	Lagoons: Anaerobic	Lagoons: Facultative	Lagoons: Aerobic	Tertiary polishing	Rotating biological contactors	Steam stripping	Solvent extraction
Other pollutants (cont'd):										
Fluoride										
Oil and grease	86		98					6		
Phosphorus, total	31							11		
Aluminum										
Iron										
Molybdenum										
Manganese										
Acetaldehyde				56						
Acetic acid				-[c]						
Acetone										52
Ammonia										
Butyric acid				-[c]						
Calcium										
Chloride										
Chlorine, total										
Chromium (+3)										
Chromium (+6)										
Chromium (dissolved)										
Cyanide	-[c]	79	45							
Dichlorobenzenes										
Methyl ethyl ketone										51
Nickel (dissolved)										
m-p-Cresol										91
o-Cresol										90
Propionic acid				-[c]						
Radium (dissolved)										
Radium, total										
Styrene										93
TDS										
Xylenes	>0	-[c]								97

Note: Blanks indicate data not available in literature.

[a]Pollutants are listed in the same order as that in the Draft Consolidated Permit Form [3].

[b]Values were reported as zero.

[c]Actual data show higher concentration in stream leaving control equipment than in stream entering control equipment.

TABLE C-4. MEDIAN REMOVAL EFFICIENCIES

Pollutant[a]	Treatment technique: Activated carbon absorption: Granular	Activated carbon absorption: Powdered with sludge	Activated carbon absorption: Powdered without sludge	Chemical oxidation, (chlorination)	Air stripping	Ion exchange	Reverse osmosis	Dechlorination	Ozonation	Chemical reduction
Classical pollutants:										
BOD_5	52		96				87		-[c]	
COD	50		91	28			92		50	
TSS	38		-[c]	48	-[c]		>87		15	
TKN			96							
TOC	55		90				92		9	
Toxic pollutants:										
Cyanide, total					60					
Phenols, total	69		>99				2		24	
Acenaphthene	>93						73			
Acrolein		30								
Acrylonitrile										
Benzene	64	95					50			
Benzidine										
Carbon tetrachloride										
Chlorobenzene	>96									
1,2,4-Trichlorobenzene	>99									
Hexachlorobenzene										
1,2-Dichloroethane	98	81								
1,1,1-Trichloroethane	>99									
Hexachloroethane										
1,1-Dichloroethane	>99									
1,1,2-Trichloroethane	>99									
1,1,2,2-Tetrachloroethane										
Chloroethane	>99									
Bis(chloromethyl) ether										
Bis(2-chloroethyl) ether		53								
2-Chloroethyl vinyl ether										
2-Chloronaphthalene										
2,4,6-Trichlorophenol										
p-Chloro-*m*-cresol	>83									
Chloroform	74						-[c]			
2-Chlorophenol		81								
1,2-Dichlorobenzene	>99									
1,3-Dichlorobenzene										
1,4-Dichlorobenzene										
3,3'-Dichlorobenzidine										

(continued)

TABLE C-4 (continued)

Pollutant[a]	Treatment technique: Activated carbon absorption: Granular	Activated carbon absorption: Powdered with sludge	Activated carbon absorption: Powdered without sludge	Chemical oxidation, (chlorination)	Air stripping	Ion exchange	Reverse osmosis	Dechlorination	Ozonation	Chemical reduction
Toxic pollutants (cont'd):										
1,1-Dichloroethylene										
1,2-*Trans*-dichloroethylene									[c]	
2,4-Dichlorophenol										
1,2-Dichloropropane	>64	93								
1,3-Dichloropropylene										
2,4-Dimethylphenol	>89									
2,4-Dinitrotoluene										
2,6-Dinitrotoluene										
1,2-Diphenylhydrazine										
Ethylbenzene	<1[b]	84								
Fluoranthene	>82								50	
4-Chlorophenyl phenyl ether										
4-Bromophenyl phenyl ether										
Bis(2-chloroisopropyl) ether										
Bis(2-chloroethoxy)methane										
Methylene chloride	22						10[c]		[c]	
Methyl chloride										
Methyl bromide										
Bromoform										
Dichlorobromomethane										
Dichlorodifluoromethane										
Trichlorofluoromethane	[c]									
Dichlorofluoromethane										
Chlorodibromomethane										
Hexachlorobutadiene										
Hexachlorocyclopentadiene										
Isophorone		97								
Naphthalene		>96								
Nitrobenzene										
2-Nitrophenol										
4-Nitrophenol										
2,4-Dinitrophenol										
4,6-Dinitro-o-cresol										
N-nitrosodimethylamine										
N-nitrosodiphenylamine	>82									

(continued)

TABLE C-4 (continued)

Pollutant[a]	Treatment technique: Activated carbon absorption: Granular	Activated carbon absorption: Powdered with sludge	Activated carbon absorption: Powdered without sludge	Chemical oxidation, (chlorination)	Air stripping	Ion exchange	Reverse osmosis	Dechlorination	Ozonation	Chemical reduction
Toxic pollutants (cont'd):										
N-nitroso-di-n-propylamine										
Pentachlorophenol	>76									
Phenol	50	>83					25			
Bis(2-ethylhexyl) phthalate	-[c]	>97					67		-[c]	
Butyl benzyl phthalate	>97								>97	
Di-n-butyl phthalate	76						75		77	
Di-n-octyl phthalate	91[c]									
Diethyl phthalate	-[c]									
Dimethyl phthalate							30			
Benz(a)anthracene										
Benzo(a)pyrene	>93								>90	
Benzo(b)fluoranthene									>80	
Benzo(k)fluoranthene	>80									
Chrysene										
Acenaphthylene										
Anthracene/phenanthrene	67						77		48	
Benzo(ghi)perylene										
Fluorene										
Phenanthrene/anthracene	67						77		48	
Dibenz(ah)anthracene										
Indeno(1,2,3-cd)pyrene										
Pyrene	>93						<1[b]		67	
Tetrachloroethylene	68									
Toluene	24	79					-[c]		15[c]	
Trichloroethylene	29[c]						60		-[c]	
Vinyl chloride	-[c]									
Aldrin										
Dieldrin										
Chlordane										
4,4'-DDT										
4,4'-DDE										
4,4'-DDD										
α-Endosulfan										
β-Endosulfan										
Endosulfan sulfate										

(continued)

TABLE C-4 (continued)

Pollutant[a]	Treatment technique: Activated carbon absorption, Granular	Activated carbon absorption, Powdered with sludge	Activated carbon absorption, Powdered without sludge	Chemical oxidation, (chlorination)	Air stripping	Ion exchange	Reverse osmosis	Dechlorination	Ozonation	Chemical reduction
Toxic pollutants (cont'd):										
Endrin										
Endrin aldehyde										
Heptachlor										
Heptachlor epoxide										
α-BHC	>47									
β-BHC										
γ-BHC										
δ-BHC										
Aroclor 1242										
Aroclor 1254										
Aroclor 1221										
Aroclor 1232										
Aroclor 1248										
Aroclor 1260										
Aroclor 1016										
Toxaphene										
Antimony	10[b]	-[c]	5				30		-[c]	
Arsenic	<1[b]						>92		24	
Beryllium	-[c]						>42[b]			
Cadmium	-[c]		-[c]			>99	<1[b]		-[c]	
Chromium	34		88			>99	>60		-[c]	58
Copper	>53		61	14[c]		>98	80		-[c]	
Lead	2		39	-[c]		99	>25		>29	25
Mercury	<1[b]		-[c]				4			
Nickel	10		>0			>99	47		-[c]	
Selenium	9		6				77			
Silver	<1[b]					>99	17		-[c]	
Thallium							50			
Zinc	52	-[c]	50			97	97		-[c]	97
Other pollutants:										
Ammonia-nitrogen										
Asbestos										
Chlorine, total residual								82		

(continued)

TABLE C-4 (continued)

Pollutant[a]	Treatment technique: Activated carbon absorption — Granular	Activated carbon absorption — Powdered with sludge	Activated carbon absorption — Powdered without sludge	Chemical oxidation, (chlorination)	Air stripping	Ion exchange	Reverse osmosis	Dechlorination	Ozonation	Chemical reduction
Other pollutants (cont'd):										
Fluoride										
Oil and grease	24	54					>43		97	
Phosphorus, total	<1[b]								<1[b]	
Aluminum										
Iron										
Molybdenum						94				
Manganese										
Acetaldehyde										
Acetic acid										
Acetone										
Ammonia				36	90					
Butyric acid										
Calcium										
Chloride										
Chlorine, total										
Chromium (+3)							>99			
Chromium (+6)	>33	>60					-[c]			
Chromium (dissolved)										
Cyanide	>63	>67		84		98	>41		93	
Dichlorobenzenes										
Methyl ethyl ketone										
Nickel (dissolved)										
m-p-Cresol										
o-Cresol										
Propionic acid										
Radium (dissolved)						>99				
Radium, total						99				
Styrene										
TDS							95			
Xylenes										

Note: Blanks indicate data not available in literature.

[a]Pollutants are listed in the same order as that in the Draft Consolidated Permit Form [3].

[b]Values were reported as zero.

[c]Actual data show higher concentration in stream leaving control equipment than in stream entering control equipment.

APPENDIX D

POLLUTANT TREATABILITY INDEX

TABLE D-1. POLLUTANT TREATABILITY INDEX

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
BOD_5	Sedimentation	7	980,000	4.2-18	69	4.2-17
	Sedimentation with Chemical Addition (Alum)	5	3,600	4.3-64	82	4.3-13
	Sedimentation with Chemical Addition (Alum, Polymer)	10	4,400	4.3-15	79	4.3-48
	Sedimentation with Chemical Addition (Lime)	3	476,000	4.3-36	57	4.3-35
	Sedimentation with Chemical Addition ($FeCl_3$)	1	325,000	4.3-49	85	4.3-49
	Sedimentation with Chemical Addition (Polymer)	2	39,600	4.3-43	98	4.3-43
	Sedimentation with Chemical Addition (Alum, Lime)	2	32,000	4.3-47	82	4.3-47
	Gas Flotation with Chemical Addition (Alum, Polymer)	2	180,000[a] 428,000	4.5-6 4.5-13	70	4.5-13
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	3	318,000	4.5-12	68	4.5-9
	Gas Flotation with Chemical Addition (Polymer)	4	112,000	4.5-17	>50	4.5-3
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	209,000	4.5-10	84	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	486,000	4.5-11	66	4.5-11
	Gas Flotation with Chemical Addition (Lime, Polymer)	1	1,240,000	4.5-16	65	4.5-16
	Filtration	16	2,400	4.6-15	51	4.6-12

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
BOD_5 (continued)	Ultrafiltration	12	12,000	4.7-14	88	4.7-14, 4.7-30
	Activated Sludge	87	<5,000[a] <5,000[a] <5,000 <5,000 <5,000 <5,000 <5,000	5.1-60 5.1-106 5.1-57 5.1-60 5.1-66 5.1-68 5.1-100	>99	5.1-57, 5.1-66, 5.1-68, 5.1-78, 5.1-100
	Trickling Filters	14	4,000	5.2-19	98	5.2-19, 5.2-24
	Lagoon (Aerated)	24	6,000	5.3-60	>99	5.3-18
	Lagoon (Aerobic)	5	7,800	5.3-34	>99	5.3-67
	Lagoon (Facultative)	4	53,000	5.3-47	92	5.3-47
	Lagoon (Anaerobic)	8	80,000	5.3-19	>90	5.3-57
	Rotating Biological Contactors	4	18,000	5.4-7, 5.4-8, 5.4-9	82	5.4-7
	Granular Activated Carbon Adsorption	20	1,200	6.1-40	95	6.1-61
	Powdered Activated Carbon Adsorption (With Activated Sludge)	24	4,000 4,000	6.2-13 6.2-20	>99	6.2-23
	Reverse Osmosis	22	3,000	6.9-40	99	6.9-40
	Ozonation	4	4,900[b] 5,190,000	6.14-16 6.14-14	10	6.14-14

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
COD	Sedimentation	26	<2,000[a] 4,000	4.2-36 4.2-46	>99	4.2-13, 4.2-15, 4.2-34, 4.2-51, 4.2-54, 4.2-84
	Sedimentation with Chemical Addition (Alum)	5	212,000	4.3-13	78	4.3-13
	Sedimentation with Chemical Addition (Alum, Polymer)	6	125,000[a] 9,500,000	4.3-54 4.3-20	80	4.3-17
	Sedimentation with Chemical Addition (Lime)	11	8,000	4.3-74	84	4.3-75
	Sedimentation with Chemical Addition (Lime, Polymer)	1	2,000	4.3-61	>99	4.3-61
	Sedimentation with Chemical Addition ($BaCl_2$)	2	4,000	4.3-60	67	4.3-60
	Sedimentation with Chemical Addition (Polymer)	1	8,000,000	4.3-25	71	4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	2	212,000[a] 7,970,000	4.3-47 4.3-21	95	4.3-21
	Gas Flotation with Chemical Addition (Alum, Polymer)	3	1,220,000	4.5-13	64	4.5-13
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	5	1,100,000	4.5-9	78	4.5-9
	Gas Flotation with Chemical Addition (Polymer)	2	459,000[a] 725,000	4.5-7 4.5-3	31	4.5-3
	Gas Flotation with Chemical Addition (Sodium aluminate, Polymer)	1	1,800,000	4.5-8	37	4.5-8

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
COD (continued)	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	600,000	4.5-10	87	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	410,000	4.5-11	89	4.5-11
	Filtration	25	29,000[a] 258,000 206,000	4.6-18 4.6-11 4.6-12	75	4.6-38
	Ultrafiltration	12	148,000	4.7-32	99	4.7-22
	Activated Sludge	64	45,000	5.1-64	97	5.1-106
	Trickling Filters	3	290,000	5.2-25	77	5.2-13
	Lagoon (Aerated)	11	92,000	5.3-60	>99	5.3-18
	Lagoon (Facultative)	2	717,000	5.3-45	68	5.3-45
	Lagoon (Anaerobic)	4	348,000	5.3-16	47	5.3-16
	Lagoon (Tertiary)	2	142,000[a] 263,000	5.3-32 5.3-33	52	5.3-33
	Rotating Biological Contactors	4	340,000	5.4-8	54	5.4-7
	Steam Stripping	6	118,000	5.5-19	72	5.5-19
	Solvent Extraction	4	699,000	5.6-13	74	5.6-15
	Granular Activated Carbon Adsorption	41	11,000	6.1-50	99	6.1-61

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
COD (continued)	Powdered Activated Carbon Adsorption (With Activated Sludge)	26	33,000	6.2-15	98	6.2-23
	Chemical Oxidation	7	441,000	6.3-13	39	6.3-13
	Reverse Osmosis	30	6,000	6.9-9	99	6.9-9
	Ozonation	4	17,000	6.14-16	92	6.14-16
TSS	Sedimentation	93	<1,000	4.2-46, 4.2-50	>99	4.2-13, 4.2-15, 4.2-27, 4.2-34, 4.2-37, 4.2-44, 4.2-45, 4.2-46, 4.2-47, 4.2-49, 4.2-50, 4.2-51, 4.2-52, 4.2-53, 4.2-54, 4.2-74, 4.2-76, 4.2-77, 4.2-87, 4.2-88, 4.2-89, 4.2-90, 4.2-91, 4.2-83, 4.2-84, 4.2-101, 4.2-100, 4.2-99, 4.2-98, 4.2-97, 4.2-104, 4.2-102, 4.2-117, 4.2-122, 4.2-115
	Sedimentation with Chemical Addition (Alum)	6	28,000	4.3-13, 4.3-55	99	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	9	11,200	4.3-27	99	4.3-20
	Sedimentation with Chemical Addition (Lime)	12	4,000	4.3-45	99	4.3-74

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
TSS (continued)	Sedimentation with Chemical Addition (Lime, Polymer)	9	4,000	4.3-72	>99	4.3-61
	Sedimentation with Chemical Addition ($FeCl_3$, Sodium bicarbonate)	2	34,000	4.3-56	99	4.3-56
	Sedimentation with Chemical Addition ($BaCl_2$)	2	<1,000	4.3-65	90	4.3-60
	Sedimentation with Chemical Addition (Polymer)	3	6,000[a] 15,200	4.3-32 4.3-43	>99	4.3-43, 4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	2	28,000[a] 480,000	4.3-47 4.3-21	97	4.3-21
	Gas Flotation with Chemical Addition (Alum, Polymer)	3	95,000	4.5-13	83	4.5-13
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	6	18,000	4.5-9	98	4.5-9
	Gas Flotation with Chemical Addition (Polymer)	4	32,000	4.5-3, 4.5-7	84	4.5-3
	Gas Flotation with Chemical Addition (Sodium aluminate, Polymer)	1	515,000	4.5-8	56	4.5-8
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	86,000	4.5-10	88	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	61,000	4.5-11	89	4.5-11
	Gas Flotation with Chemical Addition (Lime, Polymer)	1	369,000	4.5-16	66	4.5-16

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
TSS (continued)	Filtration	44	<1,000	4.6-40, 4.6-62, 4.6-64, 4.6-65	>99	4.6-34, 4.6-40, 4.6-60
	Ultrafiltration	13	2,400	4.7-29	>99	4.7-7, 4.7-28, 4.7-29, 4.7-30
	Activated Sludge	77	5,000	5.1-95	99	5.1-85
	Trickling Filters	1	45,000	5.2-11	59	5.2-11
	Lagoon (Aerated)	20	3,000	5.3-60	99	5.3-60
	Lagoon (Facultative)	3	48,000	5.3-47	86	5.3-47
	Lagoon (Tertiary)	2	22,000	5.3-33	76	5.3-33
	Rotating Bilogical Contactors	8	23,000	5.4-10	35	5.4-8
	Granular Activated Carbon Adsorption	28	<1,300	6.1-50	99	6.1-61
	Powdered Activated Carbon Adsorption (With Activated Sludge)	4	17,000	6.2-6	96	6.2-6
	Chemical Oxidation	2	33,300	6.3-16	97	6.3-16
	Air Stripping	1	162,000[b]	6.4-6	0[c]	6.4-6
	Reverse Osmosis	2	<4,000[a] <5,000	6.9-9 6.9-8	>90	6.9-8
	Ozonation	4	3,000	6.14-16	33	6.14-16

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
TKN	Activated Sludge	8	27,000	5.1-35	69	5.1-52
	Lagoon (Aerated)	2	22,000	5.3-43	79	5.3-15
	Lagoon (Facultative)	2	35,000	5.3-46	67	5.3-46
	Rotating Biological Contactors	5	6,000	5.4-8	57	5.4-6
	Powdered Activated Carbon Adsorption (With Activated Sludge)	1	28,000	6.2-23	96	6.2-23
TOC	Sedimentation	23	1,000	4.2-48	>99	4.2-34, 4.2-15
	Sedimentation with Chemical Addition (Alum)	4	72,000	4.3-13, 4.3-64	80	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	5	21,500[a] 3,200,000	4.3-15 4.3-17	71	4.3-20
	Sedimentation with Chemical Addition (Lime)	3	9,000	4.3-52	37	4.3-45
	Sedimentation with Chemical Addition (Lime, Polymer)	1	7,000	4.3-61	22	4.3-61
	Sedimentation with Chemical Addition ($BaCl_2$)	2	7,000	4.3-65	98	4.3-65
	Sedimentation with Chemical Addition (Polymer)	1	1,600,000	4.3-25	82	4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	2	72,000[a] 2,300,000	4.3-47 4.3-21	82	4.3-21

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III Page(s)	Highest observed removal efficiency, %	Volume III Page(s)
TOC (continued)	Gas Flotation with Chemical Addition (Alum, Polymer)	1	544,000	4.5-6	25	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	4	155,000[a] 270,000 690,000	4.5-12 4.5-9 4.5-21	72	4.5-18
	Gas Flotation with Chemical Addition (Polymer)	1	87,000	4.5-7	36	4.5-7
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime Polymer)	1	177,000	4.5-10	77	4 5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	160,000	4.5-11	73	4.5-11
	Filtration	20	10,000	4.6-15	49	4.6-19
	Ultrafiltration	18	66,000	4.7-12	97	4.7-25, 4.7-26
	Activated Sludge	13	35,000	5.1-80	97	5.1-78
	Lagoon (Aerated)	4	47,000	5.3-61	99	5.3-18
	Steam Stripping	40	14,000	5.5-8	94	5.5-8
	Solvent Extraction	6	37,000	5.6-11	49	5.6-11
	Granular Activated Carbon Adsorption	47	2,900	6.1-45	99	6.1-61
	Powdered Activated Carbon Adsorption (With Activated Sludge)	25	9,000	6.2-20	97	6.2-15

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
TOC (continued)	Reverse Osmosis	30	3,000	6.9-24	97	6.9-8
	Ozonation	33	15,000	6.14-16	50	6.14-20
Total cyanide	Sedimentation	15	2	4.2-80	>90	4.2-44, 4.2-84
	Sedimentation with Chemical Addition (Alum, Polymer)	1	74	4.3-22	0[c]	4.3-22
	Sedimentation with Chemical Addition (Lime)	1	45	4.3-52	0[c]	4.3-52
	Sedimentation with Chemical Addition (Lime, Polymer)	3	2	4.3-73	89	4.3-73
	Sedimentation with Chemical Addition (Alum, Lime)	2	<4[a] 30	4.3-47 4.3-21	80	4.3-21
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	≤10	4.5-6	≥61	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	3	54	4.5-21	5	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	1	25	4.5-7	14	4.5-7
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	≤32	4.5-10	≥30	4.5-10
	Filtration	12	10 11	4.6-9, 4.6-23 4.6-25	>99	4.6-34
	Ultrafiltration	1	5,000[b]	4.7-9	0[c]	4.7-9

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III Page(s)	Highest observed removal efficiency, %	Volume III page(s)
Total cyanide (continued)	Activated Sludge	24	<4	5.1-47, 5.1-63 5.1-100	>90	5.1-47
	Trickling Filters	1	16	5.2-27	79	5.2-27
	Lagoon (Aerated)	2	52	5.3-64	91	5.3-64
	Granular Activated Carbon Adsorption	7	<2[a] <2	6.1-39 6.1-41	>90	6.1-41
	Powdered Activated Carbon Adsorption (With Activated Sludge)	3	<20	6.2-7	69	6.2-4
	Chemical Oxidation	17	<2	6.3-16	>99	6.3-15, 6.3-16
	Air Stripping	1	51,000	6.4-6	91	6.4-6
	Ion Exchange	2	40	6.7-13	99	6.7-13
	Reverse Osmosis	10	1	6.9-48	97	6.9-23
	Ozonation	18	<2[a] <4	6.14-13 6.14-12	99	6.14-26, 6.14-29, 6.14-31, 6.14-32
Total phenols	Sedimentation	23	6[b] 6[b] 10	4.2-46 4.2-47 4.2-49	96	4.2-76, 4.2-77
	Sedimentation with Chemical Addition (Alum)	4	16	4.3-64	31	4.3-55
	Sedimentation with Chemical Addition (Alum, Polymer)	5	28	4.3-54	60	4.3-20

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Total phenols (continued)	Sedimentation with Chemical Addition (Lime)	2	12	4.3-45	33	4.3-45
	Sedimentation with Chemical Addition ($BaCl_2$)	1	10	4.3-60	0	4.3-60
	Sedimentation with Chemical Addition (Polymer)	2	82[b] 300	4.3-62 4.3-25	58	4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	2	47	4.3-47	22	4.3-47
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	94	4.5-6	13	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	4	<1	4.5-19	>94	4.5-19
	Gas Flotation with Chemical Addition (Polymer)	2	26	4.5-3	72	4.5-3
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	1,090[b]	4.5-10	0[c]	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	34	4.5-11	48	4.5-11
	Filtration	21	1.1	4.6-72	65	4.6-16
	Ultrafiltration	4	44,600	4.7-16	82	4.7-16
	Activated Sludge	31	7	5.1-61	>99	5.1-123, 5.1-118, 5.1-42

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Total phenols (continued)	Trickling Filters	4	<1,000	5.2-13	>99	5.2-23
	Lagoon (Aerated)	2	3	5.3-18	>99	5.3-18
	Lagoon (Tertiary)	2	28	5.3-33	46	5.3-33
	Solvent Extraction	6	200	5.6-9	>99	5.6-9
	Granular Activated Carbon Adsorption	19	<2	6.1-40	99	6.1-17
	Powdered Activated Carbon Adsorption (With Activated Sludge)	4	<10	6.2-7	>99	6.2-4, 6.2-5, 6.2-7
	Reverse Osmosis	6	<1	6.9-54	81	6.9-58
	Ozonation	3	13	6.14-12	>99	6.14-14
Acenaphthene	Filtration	1	0.6	4.6-15	73	4.6-15
	Activated Sludge	10	<0.04	5.1-58, 5.1-60, 5.1-67, 5.1-101, 5.1-104, 5.1-105	>99	5.1-58, 5.1-60, 5.1-67, 5.1-101, 5.1-104, 5.1-105
	Lagoon (Aerated)	1	4	5.3-66	0	5.3-66
	Granular Activated Carbon Adsorption	1	<0.04	6.1-45	>93	6.1-45
	Reverse Osmosis	3	0.8	6.9-56, 6.9-60	99	6.9-56
Acrolein	Gas Flotation with Chemical Addition (Alum, Polymer)	1	720[b]	4.5-6	0[c]	4.5-6
	Filtration	1	<100	4.6-24	>86	4.6-24

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Benzene	Sedimentation	7	<10[d]	4.2-108, 4.2-13	63	4.2-19
	Sedimentation with Chemical Addition (Alum, Polymer)	2	<10[d]	4.3-17	>97	4.3-17
	Sedimentation with Chemical Addition (Lime, Polymer)	1	5	4.3-73	0[c]	4.3-73
	Sedimentation with Chemical Addition (Polymer)	1	0.4	4.3-62	0[c]	4.3-62
	Sedimentation with Chemical Addition (Alum, Lime)	1	46	4.3-21	50	4.3-21
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	2	5[b]	4.5-21	0[c]	4.5-18, 4.5-21
	Gas Flotation with Chemical Addition (Polymer)	1	12	4.5-3	33	4.5-3
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	120[b]	4.5-10	0[c]	4.5-10
	Filtration	6	0.5[a,b] 50 200	4.6-41 4.6-23 4.6-72	>99	4.6-71
	Activated Sludge	9	<0.2	5.1-59, 5.1-106	>99	5.1-59
	Lagoon (Aerated)	4	<5	5.3-44	>95	5.3-18
	Lagoon (Anaerobic)	1	5,000	5.3-36	50	5.3-36
	Solvent Extraction	6	2,400	5.6-13	97	5.6-13

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Benzene (continued)	Granular Activated Carbon Adsorption	3	<0.2	6.1-44	>80	6.1-44
	Powdered Activated Carbon Adsorption (With Activated Sludge)	1	20,000	6.2-9	95	6.2-9
	Reverse Osmosis	3	0.4	6.9-60	80	6.9-60
Benzidine	Activated Sludge	1	4	5.1-117	0[c]	5.1-117
	Lagoon (Aerated)	1	7	5.3-66	41	5.3-66
Carbon tetrachloride	Sedimentation with Chemical Addition (Alum, Polymer)	1	1,800	4.3-22	94	4.3-22
	Sedimentation with Chemical Addition (Alum, Lime)	1	<10[d]	4.3-21	>17	4.3-21
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	410	4.5-6	76	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	1	4.5-21	50	4.5-21
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	36[b]	4.5-10	0[c]	4.5-10
	Filtration	3	<10[a,d] 55	4.6-71 4.6-23	93	4.6-24
	Activated Sludge	2	0.1	5.1-40	>99	5.1-38

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Chlorobenzene	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	57[b]	4.5-10	0[c]	4.5-10
	Filtration	2	4.8[b]	4.6-38	0[c]	4.6-38, 4.6-23
	Activated Sludge	6	<0.2	5.1-63, 5.1-64, 5.1-104, 5.1-106	>99	5.1-63, 5.1-64
	Granular Activated Carbon Adsorption	1	<0.2	6.1-41	>96	6.1-41
1,2,4-Trichlorobenzene	Sedimentation	1	53	4.2-82	0[c]	4.2-82
	Sedimentation with Chemical Addition (Alum)	1	150	4.3-13	90	4.3-13
	Sedimentation with Chemical Addition (Alum, Lime)	1	150	4.3-47	91	4.3-47
	Filtration	1	94	4.6-9	37	4.6-9
	Activated Sludge	11	<0.09	5.1-46, 5.1-57, 5.1-60	>99	5.1-46, 5.1-48, 5.1-57, 5.1-60
	Granular Activated Carbon Adsorption	1	<0.09	6.1-46	>99	6.1-46
Hexachlorobenzene	Activated Sludge	4	<0.05	5.1-59, 5.1-60	>97	5.1-60
	Lagoon (Aerated)	1	<10[e]	5.3-66	>0	5.3-66

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
1,2-Dichloroethane	Sedimentation	1	<10	4.2-19	>70	4.2-19
	Sedimentation with Chemical Addition (Alum)	1	17	4.3-16	0[c]	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	2	<10[d]	4.3-17	>60	4.3-17
	Filtration	1	170[b]	4.6-71	0[c]	4.6-71
	Steam Stripping	45	300	5.5-19	>99	5.5-19
	Solvent Extraction	6	<20,000	5.6-18	>99	5.6-18
	Granular Activated Carbon Adsorption	15	<10[d]	6.1-30, 6.1-31, 6.1-34, 6.1-37	>99	6.1-30, 6.1-31, 6.1-34, 6.1-36, 6.1-37
	Powdered Activated Carbon Adsorption	1	190,000	6.2-9	81	6.2-9
1,1,1-Trichloroethane	Sedimentation	3	2	4.2-93	>57	4.2-15
	Sedimentation with Chemical Addition (Alum, Polymer)	2	17	4.3-17	93	4.3-17
	Sedimentation with Chemical Addition (Lime, Polymer)	1	51	4.3-53	0[c]	4.3-53

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
1,1,1-Trichloroethane (continued)	Gas Flotation With Chemical Addition (Alum, Polymer)	1	860	4.5-6	74	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	14	4.5-21	22	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	2	<2[a] <10	4.5-7 4.5-3	>9	4.5-3
	Filtration	4	<10[d]	4.6-71	94	4.6-24
	Activated Sludge	6	<2.0	5.1-58, 5.1-61 5.1-105, 5.1-106	>99	5.1-61
	Lagoon (Aerated)	1	22	5.3-18	96	5.3-18
	Steam Stripping	1	42,000	5.5-15	9	5.5-15
	Granular Activated Carbon Adsorption	1	<10[d]	6.1-28	>99	6.1-28
1,1,-Dichloroethane	Sedimentation	1	<10[d]	4.2-115	>0	4.2-115
	Filtration	1	180[b]	4.6-71	0[c]	4.6-71
	Activated Sludge	2	<3.0	5.1-61	>18	5.1-61
	Granular Activated Carbon Adsorption	7	<10[d]	6.1-30, 6.1-31, 6.1-34, 6.1-37	>99	6.1-30, 6.1-31, 6.1-34, 6.1-37

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
1,1,2-Trichloroethane	Sedimentation with Chemical Addition (Alum, Polymer)	1	11	4.3-18	0[b]	4.3-18
	Activated Sludge	1	<10[e]	5.1-38	>9	5.1-38
	Steam Stripping	5	<10[d]	5.5-13, 5.5-15, 5.5-16, 5.5-17	>99	5.5-13, 5.5-15, 5.5-16, 5.5-17
	Solvent Extraction	5	5,400	5.6-10	95	5.6-10
	Granular Activated Carbon Adsorption	1	<10[d]	6.1-28	>99	6.1-28
1,1,2,2-Tetrachloroethane	Sedimentation	1	10	4.2-115	0[c]	4.2-115
	Sedimentation with Chemical Addition (Alum, Lime)	1	35	4.3-21	30	4.3-21
	Filtration	2	0.7[b]	4.6-35	0[c]	4.6-35
	Activated Sludge	2	<8[e]	5.1-38	>44	5.1-35
	Steam Stripping	5	<10[d]	5.5-16	>99	5.5-16
	Solvent Extraction	5	1,000	5.6-10	99	5.6-10
Chloroethane	Granular Activated Carbon Adsorption	9	<10[d]	6.1-30, 6.1-31, 6.1-34, 6.1-37	>99	6.1-30, 6.1-31, 6.1-34, 6.1-36, 6.1-37
Bis(chloromethyl) ether	Activated Sludge	1	<10[d]	5.1-49	>83	5.1-49

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Bis(2-chloroethyl) ether	Activated Sludge	1	<10[e]	5.1-117	>47	5.1-117
	Powdered Activated Carbon Adsorption	1	44	6.2-9	53	6.2-9
2-Chloronaphthalene	Sedimentation with Chemical Addition (Lime, Polymer)	1	5	4.3-73	0[c]	4.3-73
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	16	4.5-6	3	4.5-6
	Filtration	1	17[b]	4.6-24	0[c]	4.6-24
	Activated Sludge	1	1	5.1-117	50	5.1-117
	Lagoon (Aerated)	1	<10[e]	5.3-66	>47	5.3-66
2,4,6-Trichlorophenol	Sedimentation	2	11	4.2-122	0[c]	4.2-122
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	3[b]	4.5-21	0[c]	4.5-21
	Filtration	1	69	4.6-23	80	4.6-23
	Activated Sludge	10	<0.2	5.1-68	98	5.1-124, 5.1-37
	Trickling Filters	1	2	5.2-27	0[c]	5.2-27
	Lagoon (Aerated)	1	<10[d]	5.3-15	>99	5.3-15
p-Chloro-*m*-cresol	Sedimentation with Chemical Addition (Lime, Polymer)	1	62	4.3-53	44	4.3-53

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
p-Chloro-*m*-cresol (continued)	Filtration	2	0.3[b]	4.6-15	0[c]	4.6-15, 4.6-38
	Activated Sludge	4	<0.1	5.1-101	>98	5.1-101
	Granular Activated Carbon Adsorption	1	<0.1	6.1-41	>83	6.1-41
Chloroform	Sedimentation	5	10[b] <38	4.2-114 4.2-19	>81	4.2-19
	Sedimentation with Chemical Addition (Alum)	1	22	4.3-16	0[c]	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	5	<10[d]	4.3-17	>94	4.3-17
	Sedimentation with Chemical Addition (Lime, Polymer)	3	7[b] <10	4.3-53 4.3-68	>78	4.3-68
	Sedimentation with Chemical Addition (Polymer)	1	11	4.3-25	0[c]	4.3-2[illegible]
	Sedimentation with Chemical Addition (Alum, Lime)	1	74	4.3-21	0[c]	4.3-21
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	19[b]	4.5-6	0[c]	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	3	0.8[a,b] 8	4.5-21 4.5-19	74	4.5-20
	Gas Flotation with Chemical Addition (Polymer)	1	24	4.5-7	41	4.5-7
	Filtration	6	7[b] 12	4.6-14 4.6-25	50	4.6-25

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Chloroform (continued)	Activated Sludge	16	<1	5.1-41	>99	5.1-38, 5.1-46
	Trickling Filters	1	19	5.2-27	0[c]	5.2-27
	Lagoon (Aerated)	3	<10[d]	5.3-18, 5.3-42	>57	5.3-18
	Steam Stripping	5	<10[d]	5.5-13, 5.5-14, 5.5-16, 5.5-17	>99	5.5-13, 5.5-14, 5.5-16, 5.5-17
	Granular Activated Carbon Adsorption	3	<5[a] <10[d]	6.1-45 6.1-28	>99	6.1-28
	Reverse Osmosis	4	4	6.9-59	79	6.9-59
2-Chlorophenol	Sedimentation	2	9	4.2-93	>88	4.2-15
	Sedimentation with Chemical Addition (Lime, Polymer)	1	<10[d]	4.3-73	>0	4.3-73
	Gas Flotation with Chemical Addition (Polymer)	1	2[b]	4.5-7	0[c]	4.5-7
	Filtration	1	2	4.6-25	0	4.6-25
	Activated Sludge	2	0.9[b] 10	5.1-117 5.1-45	92	5.1-45
	Powdered Activated Carbon Adsorption	1	190,000	6.2-9	81	6.2-9

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
1,2-Dichlorobenzene	Sedimentation with Chemical Addition (Alum)	2	<10[d]	4.3-13	>50	4.3-13
	Sedimentation with Chemical Addition (Alum, Lime)	1	<0.05	4.3-47	>99	4.3-47
	Filtration	3	<0.05	4.6-40	>94	4.6-40
	Activated Sludge	12	<0.05	5.1-46, 5.1-56 5.1-61, 5.1-101 5.1-105	>99	5.1-56, 5.1-105
	Lagoon (Aerated)	1	<10[d]	5.3-15	>96	5.3-15
	Granular Activated Carbon Adsorption	2	<0.05	6.1-40, 6.1-46	>99	6.1-40, 6.1-46
1,4-Dichlorobenzene	Activated Sludge	8	<0.04	5.1-67, 5.1-105	>99	5.1-97, 5.1-105
	Lagoon (Aerated)	1	<10[d]	5.3-15	>81	5.3-15
1,1-Dichloroethylene	Sedimentation	2	<10	4.2-115	>0	4.2-115
	Sedimentation with Chemical Addition (Alum, Polymer)	1	<10[d]	4.3-22	>98	4.3-22
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	1,000[b]	4.5-10	0[c]	4.5-10
	Filtration	1	<2	4.6-38	>52	4.6-38

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
1,2-*Trans*-dichloroethylene	Sedminetation	3	<10[d]	4.2-114	>0	4.2-114
	Sedimentation with Chemical Addition (Alum, Polymer)	1	190	4.3-22	28	4.3-22
	Sedimentation with Chemical Addition (Polymer)	1	21	4.3-25	0[c]	4.3-25
	Steam Stripping	5	<10[d]	5.5-15	>99	5.5-15
	Ozonation	1	2.1	6.14-13	0[c]	6.14-13
2,4-Dichlorophenol	Sedimentation	3	11[a] 48	4.2-122 4.2-73	98	4.2-73
	Gas Flotation with Chemical Addition (Polymer)	1	6[b]	4.5-7	0[c]	4.5-7
	Filtration	2	0.2[a,b] 2	4.6-15 4.6-25	67	4.6-25
	Activated Sludge	2	<4[e] <10[d]	5.1-117 5.1-49	>50	5.1-49
1,2-Dichloropropane	Sedimentation with Chemical Addition (Alum, Lime)	1	400	4.3-21	59	4.3-21
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	930[b]	4.5-10	0[c]	4.5-10
	Filtration	1	1[b]	4.6-40	0[c]	4.6-40
	Activated Sludge	2	<0.7	5.1-105	>82	5.1-49
	Granular Activated Carbon Adsorption	2	<0.7[a,b] <10[d]	6.1-43 6.1-28	>99	6.1-28

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
1,2-Dichloropropane (continued)	Powdered Activated Carbon Adsorption	1	70,000	6.2-9	93	6.2-9
1,3-Dichloropropane	Activated Sludge	1	0.89[b]	5.1-61	0[c]	5.1-61
2,4-Dimethylphenol	Sedimentation	3	<10[d]	4.2-15, 4.2-6	>55	4.2-15
	Sedimentation with Chemical Addition (Lime, Polymer)	1	<10[e]	4.3-52	>76	4.3-53
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	<0.1	4.5-21	>99	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	1	28	4.5-7	0[c]	4.5-7
	Filtration	3	0.4 29	4.6-15 4.6-25	0[c]	4.6-15, 4.6-9, 4.6-25
	Activated Sludge	3	8[b] <10[d]	5.1-65 5.1-49	>95	5.1-49
	Granular Activated Carbon Adsorption	1	<0.1	6.1-46	>89	6.1-46
2,4-Dinitrotoluene	Sedimentation	1	10	4.2-82	80	4.2-82
	Lagoon (Aerated)	1	3	5.3-66	0[c]	5.3-66
2,6-Dinitrotoluene	Sedimentation	1	10	4.2-82	80	4.2-82
	Sedimentation with Chemical Addition (Lime)	1	<10[d]	4.3-66	>79	4.3-66
	Activated Sludge	1	390[b]	5.1-117	0[c]	5.1-117
	Lagoon (Aerated)	1	2	5.3-66	83	5.3-66

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
1,2-Diphenylhydrazine	Activated Sludge	1	340	5.1-117	0[c]	5.1-117
	Lagoon (Aerated)	1	14	5.3-66	0[c]	5.3-66
Ethylbenzene	Sedimentation	3	3[a] 1,700	4.2-12 4.2-19	78	4.2-19
	Sedimentation with Chemical Addition (Alum)	2	1.3	4.3-64	0[c]	4.3-16, 4.3-64
	Sedimentation with Chemical Addition (Alum, Polymer)	3	<10[d]	4.3-20	>94	4.3-20
	Sedimentation with Chemical Addition (Polymer)	1	130	4.3-25	81	4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	2	<0.2	4.3-47	>96	4.3-47
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	3[b]	4.5-6	0[c]	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	4	<10[d]	4.5-18	>99	4.5-18
	Gas Flotation with Chemical Addition (Polymer)	1	160	4.5-3	65	4.5-3
	Filtration	6	<0.2 <0.2 0.2[a]	4.6-13 4.6-16 4.6-38	>99	4.6-72

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Ethylbenzene (continued)	Activated Sludge	24	<0.2 <0.2[a]	5.1-45, 5.1-46, 5.1-56, 5.1-58, 5.1-59, 5.1-60, 5.1-62, 5.1-67, 5.1-99, 5.1-101 5.1-104, 5.1-106	>99	5.1-124, 5.1-39, 5.1-45, 5.1-46, 5.1-56, 5.1-58, 5.1-62, 5.1-99, 5.1-106
	Lagoon (Aerated)	3	<10[d]	5.3-44, 5.3-15, 5.3-41	>94	5.3-44
	Solvent Extraction	1	4,000	5.6-12	97	5.6-12
	Granular Activated Carbon Adsorption	1	<0.2	6.1-41	>0	6.1-41
	Powdered Activated Carbon Adsorption	1	18,000	6.2-9	84	6.2-9
Fluoranthene	Sedimentation	6	0.4	4.2-12	64	4.2-12
	Sedimentation with Chemical Addition (Lime, Polymer)	1	<10[e]	4.3-53	>97	4.3-53
	Gas Flotation with Chemical Addition (Polymer)	1	0.5[b]	4.5-7	0[c]	4.5-7
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	≤10[b]	4.5-10	0[c]	4.5-10
	Filtration	4	0.05	4.6-26	50	4.6-16
	Activated Sludge	1	2	5.1-117	0	5.1-117
	Lagoon (Aerated)	1	<10[d]	5.3-66	>0	5.3-66
	Granular Activated Carbon Adsorption	2	<0.02 <0.02[a]	6.1-42 6.1-43	>90	6.1-42

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Fluoranthene (continued)	Ozonation	1	0.1	6.14-12	50	6.14-12
4-Bromophenyl phenyl ether	Activated Sludge	1	18	5.1-117	95	5.1-117
Bis(2-chloroisopropyl) ether	Lagoon (Aerated)	1	<10[e]	5.3-66	>0	5.3-66
Bis(2-chloroethoxy)methane	Lagoon (Aerated)	1	<10[e]	5.3-66	>60	5.3-66
Methylene chloride	Sedimentation	8	1.5	4.2-44	>99	4.2-44
	Sedimentation with Chemical Addition (Alum)	2	<10[d]	4.3-16	>99	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	5	38[b] 110	4.3-54 4.3-17	98	4.3-17
	Sedimentation with Chemical Addition (Lime, Polymer)	2	13	4.3-73	0	4.3-73
	Sedimentation with Chemical Addition (Polymer)	2	2.5[b] 130	4.3-62 4.3-25	0[c]	4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	1	2,000	4.3-21	13	4.3-21
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	8	4.5-6	84	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	3	2	4.5-21	7	4.5-19
	Gas Flotation with Chemical Addition (Polymer)	1	22	4.5-7	61	4.5-7

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TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Methylene chloride (continued)	Filtration	16	<0.4	4.6-35	>87	4.6-35
	Activated Sludge	5	0.9[a] 5	5.1-40 5.1-122	99	5.1-122
	Trickling Filters	1	1	5.2-27	0[c]	5.2-27
	Lagoon (Aerated)	3	32	5.3-64	97	5.3-18, 5.3-64
	Steam Stripping	5	90,000	5.5-13	87	5.5-13
	Granular Activated Carbon Adsorption	8	1.8	6.1-42	92	6.1-69
	Reverse Osmosis	4	4[a] 5	6.9-59 6.9-54, 6.9-57, 6.9-58	64	6.9-58
	Ozonation	2	15	6.14-13	0[c]	6.14-12, 6.14-13
Methly chloride	Sedimentation	1	3	4.2-54	84	4.2-54
	Gas Flotation with Chemical Addition (Polymer)	1	30	4.5-3	0[c]	4.5-3
	Lagoon (Aerated)	1	<5	5.3-44	>91	5.3-44
	Reverse Osmosis	1	45[b]	6.9-60	0[c]	6.9-60
Bromoform	Activated Sludge	1	3[c]	5.1-121	0[c]	5.1-121

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III Page(s)	Highest observed removal efficiency, %	Volume III page(s)
Dichlorobromomethane	Gas Flotation with Chemical Addition (Alum, Polymer)	1	<0.9	4.5-6	>85	4.5-6
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	290[b]	4.5-10	0[c]	4.5-10
	Activated Sludge	2	1.5[a] <9[d]	5.1-61 5.1-122	>0	5.1-122, 5.1-61
Trichlorofluoromethane	Gas Flotation with Chemical Addition (Alum, Polymer)	1	<2	4.5-6	>50	4.5-6
	Filtration	2	5[b]	4.6-25	0[c]	4.6-25, 4.6-24
	Activated Sludge	5	1.7	5.1-105	96	5.1-105
	Lagoon (Tertiary)	1	<10[d]	5.3-32	>79	5.3-32
	Granular Activated Carbon Adsorption	1	69[b]	6.1-45	0[c]	6.1-45
Chlorodibromomethane	Sedimentation	1	<10[d]	4.2-20	>77	4.2-20
	Sedimentation with Chemical Addition (Alum)	1	<0.3	4.3-64	>50	4.3-64
Isophorone	Sedimentation	2	<10[d]	4.2-15	>97	4.2-15
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	<10[d]	4.5-19	>95	4.5-19
	Activated Sludge	2	<0.2[e]	5.1-117	>0	5.1-117, 5.1-38

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Isophorone (continued)	Lagoon (Aerated)	1	2	5.3-66	33	5.3-66
	Powdered Activated Carbon Adsorption	1	30,000	6.2-9	97	6.2-9
Naphthalene	Sedimentation	3	<10[d]	4.2-15	>98	4.2-15
	Sedimentation with Chemical Addition (Lime, Polymer)	2	3	4.3-53	98	4.3-53
	Sedimentation with Chemical Addition (Alum, Lime)	1	16	4.3-21	70	4.3-21
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	11	4.5-6	52	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	3	790	4.5-19	82	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	2	0.6[a] <10[d]	4.5-7 4.5-3	>96	4.5-3
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	96	4.5-10	77	4.5-10
	Filtration	3	0.9[b] 1.5	4.6-25 4.6-24	86	4.6-24
	Activated Sludge	26	<0.007	5.1-46, 5.1-57, 5.1-58, 5.1-64, 5.1-65, 5.1-66, 5.1-69, 5.1-97, 5.1-99, 5.1-100, 5.1-101, 5.1-102, 5.1-106	>99	5.1-24, 5.1-46, 5.1-57, 5.1-58, 5.1-64, 5.1-65, 5.1-66, 5.1-69, 5.1-100, 5.1-101, 5.1-102, 5.1-106

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Naphthalene (continued)	Trickling Filters	1	55	5.2-27	0[c]	5.2-27
	Lagoon (Aerated)	2	<10[d] <10[e]	5.3-15 5.3-66	>58	5.3-15
	Lagoon (Tertiary)	1	<10[d]	5.3-33	>82	5.3-33
	Powdered Activated Carbon Adsorption	1	<10[e]	6.2-12	>96	6.2-12
Nitrobenzene	Sedimentation	1	<10[d]	4.2-15	>52	4.2-15
	Sedimentation with Chemical Addition (Alum)	1	35	4.3-16	68	4.3-16
	Lagoon (Aerated)	1	<10[e]	5.3-66	>0	5.3-66
2-Nitrophenol	Sedimentation	1	<10[d]	4.2-15	>47	4.2-15
	Activated Sludge	1	<0.4	5.1-101	>99	5.1-101
4-Nitrophenol	Sedimentation	1	<10[d]	4.2-114	>0	4.2-114
	Sedimentation with Chemical Addition (Lime, Polymer)	1	<10	4.3-68	>9	4.3-68
	Activated Sludge	1	<0.9	5.1-101	>99	5.1-101
	Lagoon (Aerated)	1	<10	5.3-44	>23	5.3-44
2,4-Dinitrophenol	Sedimentation	1	<10[d]	4.2-108	>0	4.2-108

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
4,6-Dinitro-*o*-cresol	Sedimentation	2	<10[d]	4.2-15	>95	4.2-15
	Sedimentation with Chemical Addition (Lime, Polymer)	1	20	4.3-73	0[c]	4.3-73
N-nitrosodiphenylamine	Sedimentation	1	<10[d]	4.2-15	>77	4.2-15
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	620	4.5-19	66	4.5-19
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	84[b]	4.5-10	0[c]	4.5-10
	Filtration	1	0.4[b]	4.6-9	0[c]	4.6-9
	Activated Sludge	2	<0.07	5.1-62	>99	5.1-62
	Lagoon (Aerated)	1	1	5.3-66	67	5.3-66
	Granular Activated Carbon Adsorption	1	<0.07	6.1-46	>82	6.1-46
N-nitroso-di-n-propylamine	Activated Sludge	2	2[b]	5.1-100	0[e]	5.1-64, 5.1-100
Pentachlorophenol	Sedimentation	1	24	4.2-73	55	4.2-73
	Sedimentation with Chemical Addition (Alum, Polymer)	1	<0.4	4.3-54	>96	4.3-54
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	27[b]	4.5-21	0[c]	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	2	8[a,b] 30	4.5-7 4.5-3	19	4.5-3

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Pentachlorophenol (continued)	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	13[b]	4.5-10	0[c]	4.5-10
	Filtration	4	<0.4	4.6-35	>87	4.6-35
	Activated Sludge	15	<0.4	5.1-45, 5.1-61, 5.1-66, 5.1-68, 5.1-97, 5.1-99, 5.1-105, 5.1-106	>99	5.1-97, 5.1-106
	Trickling Filters	1	3	5.2-27	0[c]	5.2-27
	Lagoon (Aerated)	1	<10[d]	5.3-44	>71	5.3-44
	Granular Activated Carbon Adsorption	4	<0.4	6.1-40, 6.1-46	>97	6.1-40
Phenol	Sedimentation	5	<10[d]	4.2-114, 4.2-115	>99	4.2-114, 4.2-115
	Sedimentation with Chemical Addition (Alum)	2	<0.07	4.3-64	>90	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	1	2	4.3-54	0	4.3-54
	Sedimentation with Chemical Addition (Lime, Polymer)	2	<10[e]	4.3-53	>37	4.3-53
	Sedimentation with Chemical Addition (Polymer)	2	0.5	4.3-62	29	4.3-62
	Sedimentation with Chemical Addition (Alum, Lime)	2	3[b]	4.3-47 4.3-21	96	4.3-21

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Phenol (continued)	Gas Flotation with Chemical Addition (Alum, Polymer)	1	28[b]	4.5-6	0[c]	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	3	42	4.5-21	80	4.5-19
	Gas Flotation with Chemical Addition (Polymer)	2	9[a,b] 26	4.5-7 4.5-3	72	4.5-3
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	190[b]	4.5-10	0[c]	4.5-10
	Filtration	11	<0.07	4.6-35	>93	4.6-35
	Activated Sludge	30	<0.07	5.1-46, 5.1-47, 5.1-56, 5.1-57, 5.1-58,, 5.1-59, 5.1-61, 5.1-64, 5.1-65, 5.1-66, 5.1-97, 5.1-98, 5.1-101, 5.1-103, 5.1-105, 5.1-106	>99	5.1-24, 5.1-37, 5.1-46, 5.1-47, 5.1-56, 5.1-57, 5.1-59, 5.1-64, 5.1-65, 5.1-66, 5.1-101, 5.1-103, 5.1-105, 5.1-106
	Trickling Filters	1	37	5.2-27	0[c]	5.2-27
	Lagoon (Aerated)	4	<10[b]	5.3-15	>99	5.3-15
	Solvent Extraction	15	<1,000	5.6-16, 5.6-17	>99	5.6-16, 5.6-17
	Granular Activated Carbon Adsorption	5	<0.07	6.1-44, 6.1-45	>96	6.1-44

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Phenol (continued)	Powdered Activated Carbon Adsorption (With Activated Sludge)	2	<10[e]	6.2-12	>85	6.2-12
	Reverse Osmosis	4	0.2	6.9-58	80	6.9-58
Bis(2-ethylhexyl) phthalate	Sedimentation	14	0.02	4.2-48	>99	4.2-108, 4.2-115
	Sedimentation with Chemical Addition (Alum)	2	33	4.3-64	0[c]	4.3-13, 4.3-64
	Sedimentation with Chemical Addition (Alum, Polymer)	1	67	4.3-54	78	4.3-54
	Sedimentation with Chemical Addition (Lime, Polymer)	2	12	4.3-61	99	4.3-53
	Sedimentation with Chemical Addition ($BaCl_2$)	2	2.4	4.3-65	95	4.3-65
	Sedimentation with Chemical Addition (Polymer)	2	<10	4.3-25	>97	4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	1	44	4.3-47	0[c]	4.3-47
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	90	4.5-6	25	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	2	220	4.5-21	82	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	2	45	4.5-3	92	4.5-3
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	110	4.5-10	98	4.5-10
	Filtration	15	3.3	4.6-41	98	4.6-23

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Bis(2-ethylhexyl) phthalate (continued)	Activated Sludge	38	<0.04	5.1-66	>99	5.1-66
	Trickling Filters	1	6	5.2-27	83	5.2-27
	Lagoon (Aerated)	5	1	5.3-66	96	5.3-15
	Lagoon (Tertiary)	2	<10[a,d]	5.3-33, 5.3-32	72	5.3-32
	Granular Activated Carbon Adsorption	9	3.9	6.1-44	66	6.1-46, 6.1-69
	Powdered Activated Carbon Adsorption	1	<10[e]	6.2-12	>97	6.2-12
	Reverse Osmosis	5	2	6.9-58	96	6.9-58
	Ozonation	2	90[b]	6.14-13	0[c]	6.14-12, 6.14-13
Butyl benzyl phthalate	Sedimentation	4	4	4.2-73	>99	4.2-115
	Sedimentation with Chemical Addition (Alum, Polymer)	1	36	4.3-54	54	4.3-54
	Sedimentation with Chemical Addition (Lime, Polymer)	1	<10[e]	4.3-53	>99	4.3-53
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	81[b]	4.5-6	0[c]	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	<0.03	4.5-21	>99	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	1	<0.03	4.5-7	>99	4.5-7
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	42	4.5-10	97	4.5-10
	Filtration	4	<0.03	4.6-24	>99	4.6-24

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Butyl benzyl phthalate (continued)	Activated Sludge	1	11[b]	5.1-121	0[c]	5.1-121
	Lagoon (Aerated)	1	6	5.3-66	0	5.3-66
	Granular Activated Carbon Adsorption	3	<0.03	6.1-39, 6.1-41	>99	6.1-41
	Ozonation	1	<0.03	6.14-13	>97	6.14-13
Di-n-butyl phthalate	Sedimentation	7	<10[e]	4.2-106	99	4.2-115
	Sedimentation with Chemical Addition (Alum)	2	0.6	4.3-64	>94	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	2	7	4.3-54	>99	4.3-22
	Sedimentation with Chemical Addition (Lime, Polymer)	1	1	4.3-53	99	4.3-53
	Sedimentation with Chemical Addition (Polymer)	2	2.8[b] <10	4.3-62 4.3-25	>99	4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	1	<10[d]	4.3-21	>99	4.3-21
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	300	4.5-6	0	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	2	19	4.5-21	79	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	2	<0.02	4.5-7	>99	4.5-7
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	21	4.5-10	97	4.5-10

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Di-n-butyl phthalate (continued)	Filtration	13	<0.02	4.6-15	>99	4.6-15
	Activated Sludge	9	<0.02	5.1-64, 5.1-99, 5.1-101, 5.1-103	>99	5.1-64, 5.1-99, 5.1-101, 5.1-103
	Trickling Filters	1	6	5.2-27	25	5.2-27
	Lagoon (Aerated)	1	1	5.3-66	0	5.3-66
	Granular Activated Carbon Adsorption	7	<0.02	6.1-39, 6.1-44, 6.1-45	>99	6.1-39, 6.1-44, 6.1-45
	Reverse Osmosis	3	0.8[a]	6.9-60, 6.9-56, 6.9-58	83	6.9-58
	Ozonation	1	2.7	6.14-13	77	6.14-13
Di-n-octyl phthalate	Sedimentation	2	<10[e]	4.2-106	>99	4.2-115
	Sedimentation with Chemical Addition (Alum, Polymer)	1	5	4.3-54	92	4.3-54
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	21[b]	4.5-6	0[c]	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	33	4.5-21	78	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	1	11	4.5-7	61	4.5-7
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	<10[d]	4.5-10	>98	4.5-10
	Filtration	3	< 0.9	4.6-24	>96	4.6-24

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Di-n-octyl phthalate (continued)	Activated Sludge	1	5,000[b]	5.1-38	0[c]	5.1-38
	Granular Activated Carbon Adsorption	5	4[a] 55	6.1-69 6.1-71	96	6.1-71
Diethyl phthalate	Sedimentation	3	1	4.2-93	>99	4.2-115
	Sedimentation with Chemical Addition (Lime, Polymer)	1	<10[e]	4.3-53	>99	4.3-53
	Sedimentation with Chemical Addition (Polymer)	1	<0.03	4.3-62	>98	4.3-62
	Filtration	5	<0.03	4.6-35	>99	4.6-35
	Activated Sludge	17	<0.03	5.1-45, 5.1-61, 5.1-64, 5.1-68, 5.1-69, 5.1-97, 5.1-98, 5.1-100, 5.1-105	>99	5.1-45, 5.1-61, 5.1-69, 5.1-98, 5.1-100, 5.1-105
	Trickling Filters	1	140	5.2-27	0[c]	5.2-27
	Lagoon (Aerated)	1	4	5.3-66	0[c]	5.3-66
	Granular Activated Carbon Adsorption	3	1.2[b]	6.1-43	0[c]	6.1-43, 6.1-44, 5.1-69
Dimethyl phthalate	Sedimentation	4	<10[d]	4.2-114, 4.2-115	>99	4.2-114, 4.2-115
	Filtration	1	<0.03	4.6-40	>98	4.6-40

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Dimethyl phthalate (continued)	Activated Sludge	9	<0.03	5.1-45, 5.1-60, 5.1-64, 5.1-67, 5.1-97	>99	5.1-45, 5.1-60, 5.1-64, 5.1-67, 5.1-97
	Lagoon (Aerated)	1	6	5.3-66	25	5.3-66
	Reverse Osmosis	2	45	6.9-60	41	6.9-58
Benz(a)anthracene	Sedimentation with Chemical Addition (Lime)	1	<10[d]	4.3-66	>92	4.3-66
	Sedimentation with Chemical Addition (Lime, Polymer)	1	<10	4.3-53	>81	4.3-53
Benzo(a)pyrene	Sedimentation	3	<0.02	4.2-12	>98	4.2-12
	Sedimentation with Chemical Addition (Lime)	1	67	4.3-66	0[c]	4.3-66
	Sedimentation with Chemical Addition (Lime, Polymer)	1	5	4.3-73	0[c]	4.3-73
	Filtration	2	0.2[b]	4.6-16	0[c]	4.6-9, 4.6-16
	Lagoon (Aerated)	1	2	5.3-66	33	5.3-66
	Granular Activated Carbon Adsorption	2	<0.02[a] <0.02	6.1-42 6.1-46	>97	6.1-46
	Ozonation	1	<0.02	6.14-12	>90	6.14-12

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TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Benzo(b)fluoranthene	Sedimentation	2	6	4.2-73	83	4.2-73
	Lagoon (Aerated)	1	0.4	5.3-66	97	5.3-66
Benzo(k)fluoranthene	Sedimentation	2	<0.02	4.2-12	>97	4.2-12
	Filtration	1	0.1[b]	4.6-16	0[c]	4.6-16
	Granular Activated Carbon Adsorption	1	<0.02	6.1-42	>80	6.1-42
	Ozonation	1	<0.02	6.14-12	>80	6.14-12
Chrysene	Sedimentation	1	<10[d]	4.2-114	>0	4.2-114
	Sedimentation with Chemical Addition (Lime)	1	<10	4.3-66	>92	4.3-66
	Sedimentation with Chemical Addition (Lime, Polymer)	1	10	4.3-53	99	4.3-53
Acenaphthaylene	Sedimentation	1	<10[d]	4.2-15	>17	4.2-15
	Sedimentation with Chemical Addition (Lime, Polymer)	1	10	4.3-73	0[c]	4.3-73
	Activated Sludge	1	1[b]	5.1-117	0[c]	5.1-117
	Lagoon (Aerated)	1	5	5.3-66	0[c]	5.3-66
Anthracene	Sedimentation	1	32	4.2-73	92	4.2-73

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Anthracene/phenanthrene	Sedimentation	3	0.4	4.2-12	73	4.2-12
	Sedimentation with Chemical Addition (Alum)	1	0.1	4.3-64	0[c]	4.3-64
	Sedimentation with Chemical Addition (Lime, Polymer)	1	<10[e]	4.3-53	>0	4.3-53
	Sedimentation with Chemical Addition (Polymer)	1	0.9	4.3-62	0[c]	4.3-62
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	10[b]	4.5-6	0[c]	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	66	4.5-21	83	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	1	2[b]	4.5-7	0[c]	4.5-7
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	≤10	4.5-10	≥8	4.5-10
	Filtration	9	0.03	4.6-13	70	4.6-13
	Activated Sludge	9	<0.01	5.1-100	>98	5.1-41
	Granular Activated Carbon Adsorption	5	<0.01	6.1-39	>97	6.1-39
	Reverse Osmosis	1	0.7	6.9-58	77	6.9-58
	Ozonation	2	<0.01	6.14-13	>97	6.14-13

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Benzo(ghi)perylene	Sedimentation	1	<10[d]	4.2-15	>17	4.2-15
Fluorene	Sedimentation	1	<10[d]	4.2-15	>79	4.2-15
	Sedimentation with Chemical Addition (Lime, Polymer)	2	5	4.3-73	>99	4.3-53
	Gas Flotation with CHemical Addition (Ferrous sulfate, Lime, Polymer)	1	14	4.5-10	0[c]	4.5-10
	Filtration	1	10,000[b]	4.6-23	0[c]	4.6-23
	Activated Sludge	2	<0.02	5.1-102, 5.1-105	>99	5.1-102, 5.1-105
	Lagoon (Aerated)	1	0.2	5.3-66	99	5.3-66
Phenanthrene	Sedimentation	4	32	4.2-73	92	4.2-73
	Lagoon (Aerated)	1	3	5.3-66	0[c]	5.3-66
Indeno(1,2,3-cd)pyrene	Activated Sludge	1	<0.02	5.1-104	>99	5.1-104
Pyrene	Sedimentation	4	0.2	4.2-12	79	4.2-73
	Sedimentation with Chemical Addition (Lime)	1	67	4.3-66	0[c]	4.3-66
	Sedimentation with Chemical Addition (Lime, Polymer)	2	<10[e] <10[d]	[e]4.3-53 4.3-73	>87	4.3-53

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III Page(s)
Pyrene (continued)	Gas Flotation with Chemical Addition (Polymer)	1	0.3	4.5-7	0	4.5-7
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	18[b]	4.5-10	0[c]	4.5-10
	Filtration	3	0.1	4.6-40	0[c]	4.6-16, 4.6-25, 4.6-40
	Activated Sludge	5	0.1[b]	5.1-69, 5.1-106	78	5.1-45
	Lagoon (Aerated)	1	1	5.3-66	67	5.3-66
	Granular Activated Carbon Adsorption	2	<0.01 <0.01[a]	6.1-42 6.1-43	>97	6.1-42
	Reverse Osmosis	1	18	6.9-56	0	6.9-56
	Ozonation	1	0.1	6.14-12	67	6.14-12
Tetrachloroethylene	Sedimentation	6	1.1	4.2-54	76	4.2-54
	Sedimentation with Chemical Addition (Alum)	1	45	4.3-16	0[c]	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	3	<10[d]	4.3-17	>44	4.3-17
	Sedimentation with Chemical Addition (Lime)	1	51	4.3-51	0[c]	4.3-51
	Sedimentation with Chemical Addition (Lime, Polymer)	1	<10[d]	4.3-73	>0	4.3-73
	Sedimentation with Chemical Addition (Alum, Lime)	1	13	4.3-21	95	4.3-21

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Tetrachloroethylene (continued)	Sedimentation with Chemical Addition (Alum)	1	45	4.3-16	0[c]	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	3	<10[d]	4.3-17	>44	4.3-17
	Sedimentation with Chemical Addition (Lime)	1	51	4.3-51	0[c]	4.3-51
	Sedimentation with Chemical Addition (Lime, Polymer)	1	<10[d]	4.3-73	>0	4.3-73
	Sedimentation with Chemical Addition (Alum, Lime)	1	13	4.3-21	95	4.3-21
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	<0.9	4.5-6	>10	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	4	5	4.5-20	94	4.5-20
	Gas Flotation with Chemical Addition (Polymer)	1	2	4.5-7	0	4.5-7
	Filtration	7	1[b] 17	4.6-24 4.6-6	>99	4.6-71
	Activated Filters	11	<0.1	5.1-40	>99	5.1-46, 5.1-56
	Lagoon (Aerated)	1	<10[d]	5.3-18	>60	5.3-18
	Steam Stripping	3	<10[d]	5.5-13, 5.5-15	>99	5.5-13, 5.5-15
	Granular Activated Carbon Adsorption	1	32	6.1-69	68	6.1-69

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Toluene	Sedimentation	7	9.5[b] <10	4.2-12 4.2-107	76	4.2-19
	Sedimentation with Chemical Addition (Alum)	3	1	4.3-64	93	4.3-64
	Sedimentation with Chemical Addition (Alum, Polymer)	4	3	4.3-54	73	4.3-17
	Sedimentation with Chemical Addition (Lime)	1	10	4.3-66	0[c]	4.3-66
	Sedimentation with Chemical Addition (Lime, Polymer)	1	5	4.3-73	0[c]	4.3-73
	Sedimentation with Chemical Addition (Polymer)	2	0.4[a] 1,900	4.3-62 4.3-25	39	4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	2	14[a] 72	4.3-47 4.3-21	96	4.3-21
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	4.5	4.5-6	10	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	4	380[a,b] 900	4.5-21 4.5-18	65	4.5-18
	Gas Flotation with Chemical Addition (Polymer)	1	130	4.5-3	59	4.5-3
	Filtration	16	<0.1	4.6-13, 4.6-16	>99	4.6-16, 4.6-71

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Toluene (continued)	Activated Sludge	31	<0.1	5.1-40, 5.1-45, 5.1-67, 5.1-100	>99	5.1-40, 5.1-45, 5.1-39, 5.1-124
	Lagoon (Aerated)	4	<10[d]	5.3-18, 5.3-41, 5.3-44	>95	5.3-18, 5.3-44
	Solvent Extraction	2	1,600	5.6-13	96	5.6-13
	Granular Activated Carbon Adsorption	8	<0.1	6.1-43, 6.1-46	>99	6.1-46
	Powdered Activated Carbon Adsorption	1	67,000	6.2-9	79	6.2-9
	Reverse Osmosis	6	0.7	6.9-54	12	6.9-54
	Ozonation	2	0.9	6.14-13	31	6.14-13
Trichloroethylene	Sedimentation	2	12	4.2-19	71	4.2-19
	Sedimentation with Chemical Addition (Alum)	1	190	4.3-16	10	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	1	12	4.3-54	0	4.3-54
	Sedimentation with Chemical Addition (Polymer)	2	14	4.3-25	0[c]	4.3-25
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	2	6[a,b] 30	4.5-21 4.5-19	86	4.5-19
	Filtration	5	<0.5	4.6-41	>90	4.6-71

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III Page(s)
Trichloroethylene (continued)	Activated Sludge	13	<0.5[a] <0.5	5.1-106 5.1-45, 5.1-46, 5.1-59, 5.1-65, 5.1-98, 5.1-103	>99	5.1-45, 5.1-46, 5.1-48, 5.1-103
	Trickling Filters	1	1	5.2-27	0[c]	5.2-27
	Steam Stripping	5	<10[d]	5.5-13, 5.5-15	>99	5.5-13, 5.5-15
	Granular Activated Carbon Adsorption	2	0.6[b] 5	6.1-39 6.1-69	58	6.1-69
	Reverse Osmosis	1	0.4	6.9-57	60	6.9-57
	Ozonation	1	0.9[b]	6.14-13	0[c]	6.14-13
Vinyl chloride	Granular Activated Carbon Adsorption	1	6,700[b]	6.1-28	0[c]	6.1-28
Chlordane	Filtration	1	24	4.6-23	37	4.6-23
4,4'-DDT	Sedimentation with Chemical Addition (Alum, Lime)	1	<1	4.3-47	>52	4.3-47
Heptachlor	Sedimentation with Chemical Addition (Alum, Lime)	1	<1	4.3-27	>29	4.3-47
	Activated Sludge	1	1.5	5.1-97	76	5.1-97
α-BHC	Filtration	2	1.9[b] 6	4.6-9 4.6-23	77	4.6-23
	Granular Activated Carbon Adsorption	1	<1.0	6.1-46	>47	6.1-46

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
β-BHC	Filtration	1	55	4.6-23	21	4.6-23
Aroclor 1254	Filtration	1	650	4.6-23	20	4.6-23
Total aroclors; 1232, 1242, 1248, 1260	Filtration	1	480	4.6-23	16	4.6-23
Antimony	Sedimentation	18	1	4.2-34	98	4.2-114
	Sedimentation with Chemical Addition (Alum)	2	23	4.3-13	0[c]	4.3-13, 4.3-64
	Sedimentation with Chemical Addition (Alum, Polymer)	1	29	4.3-54	0[c]	4.3-54
	Sedimentation with Chemical Addition (Lime)	7	1.9	4.3-58	83	4.3-24
	Sedimentation with Chemical Addition ($BaCl_2$)	1	<50	4.3-65	>0	4.3-65
	Sedimentation with Chemical Addition (Polymer)	1	43	4.3-62	44	4.3-62
	Sedimentation with Chemical Addition (Ferrous sulfate, Lime)	4	3.5	4.3-81	30	4.3-81
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	2,200	4.5-6	6	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	5	<10	4.5-21	>89	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	1	64[b]	4.5-7	0[c]	4.5-7

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Antimony (continued)	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	18	4.5-10	81	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	3	4.5-11	62	4.5-11
	Filtration	16	<10	4.6-25, 4.6-35	89	4.6-33
	Activated Sludge	18	0.3	5.1-105	90	5.1-106
	Lagoon (Aerated)	1	30	5.3-18	82	5.3-18
	Granular Activated Carbon Adsorption	8	24[a] 36	6.1-39, 6.1-46 6.1-44	33	6.1-41
	Powdered Activated Carbon Adsorption (With Activated Sludge)	1	41	6.2-5	5	6.2-5
	Powdered Activated Carbon Adsorption	1	150	6.2-12	0[c]	6.2-12
	Reverse Osmosis	11	2	6.9-49	60	6.9-49
	Ozonation	2	25[b]	6.14-13	0[c]	6.14-12, 6.14-13
Arsenic	Sedimentation	27	<2	4.2-27, 4.2-45, 4.2-47, 4.2-51, 4.2-54	>99	4.2-27, 4.2-44, 4.2-45, 4.2-47, 4.2-51, 4.2-53, 4.2-54
	Sedimentation with Chemical Addition (Alum)	2	<1	4.3-64	>37	4.3-64

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Arsenic (continued)	Sedimentation with Chemical Addition (Alum, Polymer)	1	12	4.3-54	29	4.3-54
	Sedimentation with Chemical Addition (Lime)	11	<1	4.3-83, 4.3-84	>99	4.3-83
	Sedimentation with Chemical Addition (Lime, Polymer)	2	10	4.3-73	75	4.3-73
	Sedimentation with Chemical Addition ($BaCl_2$)	2	<2	4.3-65	>33	4.3-65
	Sedimentation with Chemical Addition (Sulfide complex)	1	5	4.3-29	>99	4.3-29
	Sedimentation with Chemical Addition (Alum, Lime)	1	62	4.3-47	0[c]	4.3-47
	Sedimentation with Chemical Addition (Ferrous sulfate, Lime)	4	<1	4.3-78, 4.3-81	>99	4.3-81
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	3.5	4.5-6	56	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	4	2	4.5-21	80	4.5-21
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	11	4.5-10	65	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	9[b]	4.5-11	0[c]	4.5-11
	Filtration	8	<1	4.6-39	>99	4.6-33

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Arsenic (continued)	Activated Sludge	8	<5 <5[a]	5.1-45 5.1-63, 5.1-68	>96	5.1-45
	Granular Activated Carbon Adsorption	7	<1	6.1-46	>99	6.1-46
	Reverse Osmosis	10	<1	6.9-50, 6.9-52, 6.9-56, 6.9-59	>99	6.9-50
	Ozonation	2	4[a] 43	6.14-13 6.14-12	48	6.14-12
Asbestos[f]	Sedimentation	26	4.6×10^6	4.2-84	>99	4.2-44, 4.2-46, 4.2-47, 4.2-51, 4.2-54, 4.2-55, 4.2-56, 4.2-57, 4.2-59, 4.2-60, 4.2-61, 4.2-62, 4.2-64, 4.2-84
Beryllium	Sedimentation	8	<1	4.2-13	>98	4.2-13
	Sedimentation with Chemical Addition (Alum)	1	2.2	4.3-64	0[c]	4.3-64
	Sedimentation with Chemical Addition (Lime)	2	0.8	4.3-82	76	4.3-82
	Sedimentation with Chemical Addition (Ferrous sulfate, Lime)	2	<.5	4.3-80	>85	4.3-80
	Filtration	4	1.2[a,b]	4.6-13	71	4.6-72
	Lagoon (Aerated)	1	<1	5.3-18	>50	5.3-18

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Beryllium (continued)	Granular Activated Carbon Adsorption	3	2	6.1-58	0	6.1-58
	Reverse Osmosis	2	<0.5	6.9-53	>85	6.9-53
Cadmium	Sedimentation	18	2[a] <5	4.2-10 4.2-45, 4.2-54, 4.2-47, 4.2-51	>99	4.2-45, 4.2-52, 4.2-54, 4.2-124
	Sedimentation with Chemical Addition (Alum)	2	2.9	4.3-64	>88	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	2	30	4.3-22	61	4.3-22
	Sedimentation with Chemical Addition (Lime)	9	0.2	4.3-74	99	4.3-74
	Sedimentation with Chemical Addition (Lime, Polymer)	4	10[b] 15	4.3-68 4.3-44	93	4.3-44
	Sedimentation with Chemical Addition (Sulfide complex)	2	8	4.3-29	>99	4.3-29
	Sedimentation with Chemical Addition (Polymer)	2	60	4.3-32	50	4.3-32
	Sedimentation with Chemical Addition (Ferrous sulfate, Lime)	4	<0.5	4.3-79	>50	4.3-79
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	40	4.5-6	0	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	6	>2	4.5-9, 4.5-20, 4.5-21	>98	4.5-21

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Cadmium (continued)	Gas Flotation with Chemical Addition (Polymer)	1	5[b]	4.5-7	0[c]	4.5-7
	Gas Flotation with Chemical Addition (Ferrous sulfate, lime, Polymer)	1	≤15	4.5-10	≥84	4.5-10
	Filtration	22	<1	4.6-17, 4.6-18, 4.6-20	>99	4.6-33
	Ultrafiltration	3	<5	4.7-28	>93	4.7-30
	Activated Sludge	17	<0.5	5.1-60, 5.1-65, 5.1-68, 5.1-100	>99	5.1-65
	Lagoon (Aerated)	1	<2	5.3-18	>97	5.3-18
	Granular Activated Carbon Adsorption	5	5.2	6.1-46	95	6.1-46
	Powdered Activated Carbon Adsorption (With Activated Sludge)	1	10	6.2-4	0[c]	6.2-4
	Ion Exchange	1	<10[e]	6.7-13	>99	6.7-13
	Reverse Osmosis	11	<0.5	6.9-53	50	6.9-58
	Ozonation	1	250	6.14-12	0[c]	6.14-12
Chromium	Sedimentation	30	6[a] <10	4.2-10, 4.2-50, 4.2-54, 4.2-45, 4.2-47	>99	4.2-20, 4.2-44, 4.2-49, 4.2-50, 4.2-124

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Chromium	Sedimentation with Chemical Addition (Alum)	4	17[b] 40	4.3-64 4.3-16	98	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	4	30	4.3-20	95	4.3-22
	Sedimentation with Chemical Addition (Lime)	10	<2[a] 5	4.3-84 4.3-75	97	4.3-75
	Sedimentation with Chemical Addition (Lime, Polymer)	5	30	4.3-72	98	4.3-72
	Sedimentation with Chemical Addition ($BaCl_2$)	2	25	4.3-65	93	4.3-60
	Sedimentation with Chemical Addition (Sulfide complex)	2	30	4.3-29	>99	4.3-29
	Sedimentation with Chemical Addition (Polymer)	2	<4	4.3-62	97	4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	1	31	4.3-47	72	4.3-47
	Sedimentation with Chemical Addition (Ferrous sulfate, Lime)	4	<2	4.3-80	>95	4.3-80
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	360	4.5-6	19	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	6	100	4.5-9	67	4.5-9
	Gas Flotation with Chemical Addition (Polymer)	1	28[b]	4.5-7	0[c]	4.5-7

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Chromium (continued)	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	≤27	4.5-10	≥93	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	58	4.5-11	59	4.5-11
	Filtration	22	<4	4.6-37	>99	4.6-34
	Ultrafiltration	1	2,900	4.7-30	67	4.7-30
	Activated Sludge	34	<0.2	5.1-63, 5.1-64, 5.1-101	99	5.1-39
	Trickling Filters	1	17	5.2-27	0[c]	5.2-27
	Lagoon (Aerated)	3	9	5.3-18	99	5.3-15
	Lagoon (Tertiary)	1	<10[d]	5.3-33	>71	5.3-33
	Granular Activated Carbon Adsorption	11	5.2	6.1-43	95	6.1-43
	Powdered Activated Carbon Adsorption (With Activated Sludge)	4	24	6.2-7	97	6.2-6
	Ion Exchange	1	10	6.7-13	>99	6.7-13
	Reverse Osmosis	13	<1	6.9-51	>99	6.9-11
	Ozonation	1	6.3[b]	6.14-13	0[c]	6.14-13
	Chemical Reduction	1	130,000	6.15-8	58	6.15-8

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Copper	Sedimentation	44	<4	4.2-43	>99	4.2-13, 4.2-20, 4.2-44, 4.2-47, 4.2-49, 4.2-51, 4.2-52, 4.2-53, 4.2-54, 4.2-84, 4.2-124
	Sedimentation with Chemical Addition (Alum)	4	<10[d]	4.3-12	>99	4.3-12
	Sedimentation with Chemical Addition (Alum, Polymer)	4	16	4.3-54	80	4.3-17
	Sedimentation with Chemical Addition (Lime)	16	7	4.3-75	>99	4.3-38
	Sedimentation with Chemical Addition (Lime, Polymer)	10	15[a] 30	4.3-71 4.3-70	>99	4.3-31, 4.3-39, 4.3-61
	Sedimentation with Chemical Addition ($BaCl_2$)	2	<20	4.3-65	73	4.3-60
	Sedimentation with Chemical Addition (Sulfide complex)	2	10	4.3-26	>99	4.3-29
	Sedimentation with Chemical Addition (Polymer)	3	<4	4.3-62	>89	4.3-62
	Sedimentation with Chemical Addition (Alum, Lime)	2	13[a] 60	4.3-47 4.3-21	88	4.3-21
	Sedimentation with Chemical Addition (Ferrous sulfate, Lime)	6	4	4.3-76, 4.3-77	92	4.3-80

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Copper (continued)	Gas Flotation with Chemical Addition (Alum, Polymer)	1	660	4.5-6	19	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	5	150	4.5-18	91	4.5-18
	Gas Flotation with Chemical Addition (Polymer)	2	50[a] 81	4.5-7 4.5-3	75	4.5-3
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	73	4.5-10	98	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	400[b]	4.5-11	0[c]	4.5-11
	Filtration	36	2.5[a,b] <4 13	4.6-13 4.6-37 4.6-64	>99	4.6-33
	Ultrafiltration	3	<500 <500[a]	4.7-28 4.7-29	90	4.7-30
	Activated Sludge	37	<0.2	5.1-99, 5.1-101, 5.1-104	>99	5.1-99, 5.1-101, 5.1-104
	Trickling Filters	2	42	5.2-27	0[c]	5.2-27
	Lagoon (Aerated)	4	5	5.3-15	94	5.3-18
	Lagoon (Tertiary)	1	18	5.3-33	0[c]	5.3-33
	Granular Activated Carbon Adsorption	12	<4	6.1-45	>85	6.1-45

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Copper (continued)	Powdered Activated Carbon Adsorption (With Activated Sludge)	3	7	6.2-4	96	6.2-6
	Chemical Oxidation	1	320	6.3-17	14	6.3-17
	Ion Exchange	2	90	6.7-13	>99	6.7-12
	Reverse Osmosis	25	9[a] 9	6.9-50 6.9-51	>99	6.9-11
	Ozonation	2	89[b]	6.14-13	0[c]	6.14-12, 6.14-13
Lead	Sedimentation	35	<5	4.2-92	>99	4.2-20, 4.2-45, 4.2-47, 4.2-49, 4.2-51, 4.2-52, 4.2-53, 4.2-54
	Sedimentation with Chemical Addition (Alum)	3	23	4.3-12	18	4.3-12
	Sedimentation with Chemical Addition (Alum, Polymer)	4	73	4.3-54	>96	4.3-17
	Sedimentation with Chemical Addition (Lime)	13	<3	4.3-82, 4.3-85	99	4.3-75
	Sedimentation with Chemical Addition (Lime, Polymer)	8	<20	4.3-44	98	4.3-70, 4.3-73
	Sedimentation with Chemical Addition ($BaCl_2$)	2	30	4.3-60	83	4.3-60
	Sedimentation with Chemical Addition (Sulfide complex)	2	<10[a,b] 200	4.3-26 4.3-29	96	4.3-29

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Lead (continued)	Sedimentation with Chemical Addition (Polymer)	3	<22[a] 70	4.3-62 4.3-32	97	4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	1	<200	4.3-21	50	4.3-21
	Sedimentation with Chemical Addition (Ferrous sulfate, Lime)	3	<3	4.3-77, 4.3-76, 4.3-80	>96	4.3-80
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	1,000	4.5-6	0	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	6	67	4.5-20	98	4.5-9, 4.5-18, 4.5-19, 4.5-20
	Gas Flotation with Chemical Addition (Polymer)	2	<10[d]	4.5-3	>29	4.5-3
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	≤140	4.5-10	≥98	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	≤87	4.5-11	≥74	4.5-11
	Filtration	32	5	4.6-33	>99	4.6-28
	Ultrafiltration	3	<1,000 <1,000[a]	4.7-28 4.7-29	>95	4.7-30
	Activated Sludge	26	0.6	5.1-105	99	5.1-105
	Trickling Filters	1	49	5.2-27	0[c]	5.2-27

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Lead (continued)	Lagoon (Aerated)	2	<20	5.3-18	93	5.3-15
	Lagoon (Tertiary)	1	<10[d]	5.3-32	>72	5.3-32
	Granular Activated Carbon Adsorption	7	<22	6.1-46	>72	6.1-46
	Powdered Activated Carbon Adsorption (With Activated Sludge)	2	<18	6.2-6	>78	6.2-6
	Chemical Oxidation	1	2,500	6.3-17	0[c]	6.3-17
	Ion Exchange	1	10	6.7-12	99	6.7-12
	Reverse Osmosis	11	<3[a] <3	6.9-48 6.9-52, 6.9-53	>99	6.9-11
	Ozonation	1	<22	6.14-13	>29	6.14-13
	Chemical Reduction	1	120,000	6.15-8	25	6.15-8
Mercury	Sedimentation	22	<0.2	4.2-26, 4.2-27, 4.2-28	>99	4.2-26, 4.2-124
	Sedimentation with Chemical Addition (Alum)	2	1.7	4.3-12	>62	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	3	30	4.3-17	88	4.3-20
	Sedimentation with Chemical Addition (Lime)	9	<0.2	4.3-82	>96	4.2-59

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Mercury (continued)	Sedimentation with Chemical Addition (Lime, Polymer)	1	0.1	4.3-71	0[c]	4.3-71
	Sedimentation with Chemical Addition ($BaCl_2$)	1	0.5	4.3-65	87	4.3-65
	Sedimentation with Chemical Addition (Sulfide complex)	1	20	4.3-29	>99	4.3-29
	Sedimentation with Chemical Addition (Polymer)	2	<0.3[a] 140	4.3-62 4.3-25	99	4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	1	2	4.3-21	71	4.3-21
	Sedimentation with Chemical Addition (Ferrous sulfate, Lime)	2	<0.2	4.3-80	>60	4.3-80
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	1	4.5-6	33	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	3	<0.2	4.5-19, 4.5-20	>90	4.5-19
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	≤0.97	4.5-10	≥64	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	1.2	4.5-11	40	4.5-11
	Filtration	9	0.3[a] <0.5	4.6-37 4.6-19, 4.6-20	86	4.6-71, 4.6-72
	Ultrafiltration	2	0.4	4.7-29	20	4.7-29
	Activated Sludge	9	<0.5	5.1-62, 5.1-97	>87	5.1-97

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Mercury (continued)	Lagoon (Aerated)	1	0.1	5.3-18	>99	5.3-18
	Granular Activated Carbon Adsorption	3	0.4[b] 0.4	6.1-44 6.1-45	>99	6.1-7
	Powdered Activated Carbon Adsorption (With Activated Sludge)	1	0.6	6.2-6	0[c]	6.2-6
	Reverse Osmosis	5	<0.2	6.9-53	>60	6.9-53
Nickel	Sedimentation	30	<5	4.2-13	>99	4.2-13, 4.2-44, 4.2-46, 4.2-49, 4.2-124
	Gas Flotation with Chemical Addition (Alum)	3	10[a] <40	4.3-12 4.3-16	>56	4.3-16
	Gas Flotation with Chemical Addition (Alum, Polymer)	3	<50	4.3-17	>97	4.3-17
	Gas Flotation with Chemical Addition (Lime)	13	2.2[a] 2.3	4.3-83 4.3-82	99	4.3-74
	Gas Flotation with Chemical Addition (Lime, Polymer)	4	45	4.3-42	96	4.3-68
	Gas Flotation with Chemical Addition (Sulfide complex)	2	<10[a,d] 1,700	4.3-26 4.3-29	96	4.3-29
	Gas Flotation with Chemical Addition (Polymer)	1	43	4.3-62	35	4.3-62
	Gas Flotation with Chemical Addition (Alum, Lime)	1	<1	4.3-47	>83	4.3-47

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Nickel (continued)	Gas Flotation with Chemical Addition (Alum, Polymer)	1	270	4.5-6	41	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	5	<5	4.5-9	>94	4.5-9
	Gas Flotation with Chemical Addition (Polymer)	2	32[b]	4.5-3	0[c]	4.5-3, 4.5-7
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	<5	4.5-10	>96	4.5-10
	Filtration	17	<5	4.6-72	>99	4.6-33, 4.6-72
	Ultrafiltration	1	<500	4.7-30	>32	4.7-30
	Activated Sludge	32	4	5.1-62	92	5.1-62
	Lagoon (Aerated)	3	30	5.3-15	50	5.3-15
	Granular Activated Carbon Adsorption	7	<36	6.1-69	68	6.1-47
	Powdered Activated Carbon Adsorption (With Activated Sludge)	3	<10	6.2-4, 6.2-6	>58	6.2-6
	Ion Exchange	2	<10[e]	6.7-13	>99	6.7-13
	Reverse Osmosis	13	<1	6.9-49, 6.9-51	>98	6.9-11
	Ozonation	2	66[b]	6.14-13	0[c]	6.14-12, 6.14-13
Nickel (dissolved)	Sedimentation with Chemical Addition (Lime)	1	20	4.3-67	>99	4.3-67
	Sedimentation with Chemical Addition (Lime, Polymer)	1	2,500	4.3-69	99	4.3-69

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Selenium	Sedimentation	19	<2[a] 3	4.2-35 4.2-15	>99	4.2-51
	Sedimentation with Chemical Addition (Lime)	5	2.3[b] 8	4.3-82 4.3-85	0[c]	4.3-82, 4.3-87 4.3-83, 4.3-59
	Sedimentation with Chemical Addition (Lime, Polymer)	3	10	4.3-68, 4.3-73	0[c]	4.3-68, 4.3-73, 4.3-71
	Sedimentation with Chemical Addition ($BaCl_2$)	1	10	4.3-65	0[c]	4.3-65
	Sedimentation with Chemical Addition (Ferrous sulfate, Lime)	2	7[a] 32	4.3-77 4.3-81	24	4.3-81
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	≤1	4.5-6	0	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	2[b]	4.5-21	0[c]	4.5-21
	Filtration	6	<1	4.6-24	10	4.6-17
	Activated Sludge	1	41	5.1-48	0[c]	5.1-48
	Lagoon (Aerated)	1	<200	5.3-18	>50	5.3-18
	Lagoon (Tertiary)	1	18	5.3-33	44	5.3-33
	Granular Activated Carbon Adsorption	4	<1	6.1-41	>50	6.1-41
	Powdered Activated Carbon Adsorption (With Activated Sludge)	2	<20	6.2-4	>13	6.2-4

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Silver	Sedimentation	15	3[a] <10	4.2-10, 4.2-45, 4.2-47, 4.2-51, 4.2-52, 4.2-53	>99	4.2-51, 4.2-124
	Sedimentation with Chemical Addition (Alum)	2	72	4.3-64	10	4.3-64
	Sedimentation with Chemical Addition (Alum, Polymer)	1	11	4.3-54	21	4.3-54
	Sedimentation with Chemical Addition (Lime)	6	0.4	4.3-85	>80	4.3-23
	Sedimentation with Chemical Addition (Lime, Polymer)	1	90	4.3-73	0[c]	4.3-73
	Sedimentation with Chemical Addition ($BaCl_2$)	1	20	4.3-60	0[c]	4.3-60
	Sedimentation with Chemical Addition (Sulfide complex)	2	<10[a,b]	4.3-26	>99	4.3-29
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	66	4.5-6	44	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	2	<15	4.5-20	>48	4.5-20
	Gas Flotation with Chemical Addition (Polymer)	1	29[b]	4.5-7	0[c]	4.5-7
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	<1	4.5-10	>75	4.5-10

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Silver (continued)	Filtration	12	<5	4.6-25, 4.6-40	>83	4.6-25
	Activated Sludge	17	<5	5.1-68, 5.1-69, 5.1-99, 5.1-101, 5.1-102, 5.1-106	>96	5.1-68
	Granular Activated Carbon Adsorption	6	<5	6.1-44	36	6.1-69
	Ion Exchange	2	<10[e]	6.7-13	>99	6.7-13
	Reverse Osmosis	13	<0.2	6.9-52	92	6.9-53
	Ozonation	2	16[b]	6.14-13	0[c]	6.14-12, 6.14-13
Thallium	Sedimentation	3	<5 <5[a]	4.2-15, 4.2-92 4.2-13	>83	4.2-92
	Sedimentation with Chemical Addition (Lime)	3	<1	4.3-82	>88	4.3-82
	Sedimentation with Chemical Addition (Ferrous sulfate, Lime)	2	<1	4.3-80	>88	4.3-80
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	50[b]	4.5-21	0[c]	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	1	14[b]	4.5-3	0[c]	4.5-3
	Filtration	1	<10	4.6-71	>55	4.6-71
	Activated Sludge	1	29	5.1-113	38	5.1-113
	Lagoon (Aerated)	2	13	5.3-44	>80	5.3-18
	Reverse Osmosis	3	1	6.9-50	89	6.9-50

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Zinc	Sedimentation	45	10	4.2-92	>99	4.2-45, 4.2-47, 4.2-49, 4.2-51, 4.2-52, 4.2-54, 4.2-84, 4.2-124, 4.2-129
	Sedimentation with Chemical Addition (Alum)	4	110	4.3-12	85	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	4	220	4.3-54	83	4.3-22
	Sedimentation with Chemical Addition (Lime)	15	<2	4.3-82, 4.3-83	>99	4.3-38, 4.3-46
	Sedimentation with Chemical Addition (Lime, Polymer)	11	25	4.3-42	>99	4.3-39, 4.3-31, 4.3-61, 4.3-70, 4.3-73
	Sedimentation with Chemical Addition ($BaCl_2$)	2	30	4.3-60, 4.3-65	80	4.3-60
	Sedimentation with Chemical Addition (Sulfide complex)	2	90	4.3-26	>99	4.3-29
	Sedimentation with Chemical Addition (Polymer)	3	160	4.3-62	97	4.3-62
	Sedimentation with Chemical Addition (Alum, Lime)	2	1,100	4.3-21	>99	4.3-21
	Sedimentation with Chemical Addition (Ferrous sulfate, Lime)	6	<2	4.3-80, 4.3-81	>97	4.3-80

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Zinc (continued)	Gas Flotation with Chemical Addition (Alum, Polymer)	1	2,300	4.5-6	±0	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	6	10[d]	4.5-18	>99	4.5-18
	Gas Flotation with Chemical Addition (Polymer)	2	<10	4.5-3	>60	4.5-3
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	130	4.5-10	95	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	910[b]	4.5-11	0[c]	4.5-11
	Filtration	42	16	4.6-33	>99	4.6-33
	Ultrafiltration	6	180	4.7-30	98	4.7-16, 4.7-30
	Activated Sludge	36	48[a] 68	5.1-48 5.1-35	92	5.1-39
	Lagoon (Aerated)	3	49	5.3-15	>99	5.3-18
	Lagoon (Tertiary)	2	100[b] 120	5.3-33 5.3-32	86	5.3-32
	Granular Activated Carbon Adsorption	18	<1	6.1-44	>99	6.1-44
	Powdered Activated Carbon Adsorption (With Activated Sludge)	3	78[a] 110	6.2-5 6.2-6	98	6.2-6
	Powdered Activated Carbon Adsorption	1	80	6.2-12	0[c]	6.2-12

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Zinc (continued	Ion Exchange	1	400	6.7-13	>7	6.7-13
	Reverse Osmosis	40	<2[a] <2	6.9-48, 6.9-52, 6.9-53	>99	6.2-24, 6.2-37
	Ozonation	3	90	6.14-14	96	6.14-14
	Chemical Reduction	1	1,500	6.15-7	97	6.15-7
Asbestos[f]	Filtration	8	8×10^{6}	4.6-46	>99	4.6-43, 4.6-46, 4.6-52, 4.6-55, 4.6-56
	Sedimentation with Chemical Addition (Lime)	1	6.1×10^{8}	4.3-52	95	4.3-52
	Sedimentation with Chemical Addition (Lime, Polymer)	1	8.2×10^{8}	4.3-61	>99	4.3-61
	Sedimentation with Chemical Addition ($BaCl_2$)	2	5.7×10^{8}	4.3-65	75	4.3-65
Asbestos (chrysotile)[f]	Sedimentation	16	3.3×10^{5}	4.2-65	>99	4.2-55, 4.2-56, 4.2-57, 4.2-59, 4.2-60, 4.2-61, 4.2-62, 4.2-64, 4.2-65, 4.2-67
	Filtration	3	1×10^{5}	4.6-53	>99	4.6-51, 4.6-53, 4.6-54

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Total chlorine	Solvent Extraction	11	1,800	5.6-11	9[illegible]	5.6-11
Total residual chlorine	Dechlorination	1	20	6.13-4	92	6.13-4
Fluoride	Sedimentation	4	140	4.2-119	72	4.2-119
	Sedimentation with Chemical Addition (Lime)	2	250	4.3-74	98	4.3-67
	Sedimentation with Chemical Addition (Lime, Polymer)	1	130,000	4.3-69	92	4.3-69
Oil and grease	Sedimentation	25	1,100[b] 2,000	4.2-12 4.2-130	99	4.2-120, 4.2-130
	Sedimentation with Chemical Addition (Alum)	1	11,000	4.3-16	99	4.3-16
	Sedimentation with Chemical Addition (Alum, Polymer)	4	4,000	4.3-54	99	4.3-20
	Sedimentation with Chemical Addition (Lime)	2	1,000	4.3-67	82	4.3-66
	Sedimentation with Chemical Addition (Lime, Polymer)	6	300	4.3-69	94	4.3-69, 4.3-70, 4.3-73
	Sedimentation with Chemical Addition (Polymer)	1	22,000	4.3-25	98	4.3-25
	Sedimentation with Chemical Addition (Alum, Lime)	1	<16,000	4.3-21	>98	4.3-21

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Oil and grease (continued)	Gas Flotation with Chemical Addition (Alum)	4	<10,000[d]	4.5-22	>99	4.5-22
	Gas Flotation with Chemical Addition (Alum, Polymer)	2	76,000[a] 128,000	4.5-6 4.5-14	85	4.5-14
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	6	53,000	4.5-12	90	4.5-12
	Gas Flotation with Chemical Addition (Polymer)	3	16,000	4.5-7	68	4.5-15
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	28,000	4.5-10	97	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	101,000	4.5-11	70	4.5-11
	Gas Flotation with Chemical Addition (Lime, Polymer)	1	190,000	4.5-16	66	4.5-16
	Filtration	15	<500	4.6-48	>98	4.6-48
	Ultrafiltration	11	5,000[a] 90,000	4.7-14 4.7-27	>99	4.7-30
	Activated Sludge	7	<5,000	5.1-42	>98	5.1-42
	Lagoon (Aerated)	1	17,000	5.3-15	98	5.3-15
	Rotating Biological Contactors	5	13,000	5.4-8	21	5.4-5

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Oil and grease (continued)	Granular Activated Carbon Adsorption	11	1,800	6.1-17	92	6.1-47
	Powdered Activated Carbon Adsorption (With Activated Sludge)	4	11,000	6.2-6	96	6.2-6
	Reverse Osmosis	4	<4,000[a] <4,000	6.9-8 6.9-9	69	6.9-17
	Ozonation	1	4,000	6.14-14	97	6.14-14
Total phosphorus	Sedimentation	1	13,900	4.2-10	3	4.2-10
	Sedimentation with Chemical Addition (Alum)	2	2,300	4.3-64	15	4.3-64
	Sedimentation with Chemical Addition (Alum, Polymer)	1	1,600	4.3-54	77	4.3-54
	Sedimentation with Chemical Addition (Alum, Lime)	1	<70	4.2-47	>75	4.3-47
	Gas Flotation with Chemical Addition (Alum, Polymer)	1	12,200	4.5-6	49	4.5-6
	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	2	1,700	4.5-21	96	4.5-21
	Gas Flotation with Chemical Addition (Polymer)	1	1,000[b]	4.5-7	0[c]	4.5-7
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	140	4.5-10	99	4.5-10
	Gas Flotation with Chemical Addition (Ferrous sulfate, Polymer)	1	300	4.5-11	98	4.5-11

Date: 2/4/80

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Total phosphorus (continued)	Filtration	7	230	4.6-39	83	4.6-24
	Activated Sludge	28	150	5.1-59	97	5.1-59
	Rotating Biological Contactors	5	3,000	5.4-8	21	5.4-7
	Granular Activated Carbon Adsorption	5	1,000	6.1-43	57	6.1-43
	Ozonation	1	1,100	6.14-13	0	6.14-13
Aluminum	Sedimentation with Chemical Addition (Lime)	2	20	4.3-74	97	4.3-74
Iron	Sedimentation with Chemical Addition (Lime)	1	30	4.3-74	>99	4.3-74
Manganese	Sedimentation with Chemical Addition (Lime)	1	20	4.3-74	99	4.3-74
Molybdennim	Ion Exchange	1	1,290	6.7-10	94	6.7-10
Acetaldehyde	Lagoon (Anaerobic)	3	10	5.3-36	67	5.3-36
Acetic acid	Lagoon (Anaerobic)	3	220	5.3-36	0[c]	5.3-35, 5.3-36, 5.3-37
Acetone	Solvent Extraction	3	12,000	5.6-23	57	5.6-26
Ammonia-Nitrogen	Chemical Oxidation	1	124	6.3-16	36	6.3-16
	Air Stripping	1	41,000	6.4-6	90	6.4-6

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Butyric acid	Lagoon (Anaerobic)	2	300	5.3-35	0[c]	5.3-35, 5.3-37
Calcium	Sedimentation with Chemical Addition (Lime)	1	230,000	4.3-74	57	4.3-74
Chloride	Sedimentation with Chemical Addition (Lime)	1	19 x 10[6]	4.3-75	26	4.3-75
Chromium(+3)	Filtration	1	610	4.6-50	95	4.6-50
	Reverse Osmosis	1	15	6.9-11	>99	6.9-11
Chromium(+6)	Sedimentation	1	5	4.2-10	0	4.2-10
	Sedimentation with Chemical Addition (Lime, Polymer)	2	5	4.3-73	82	4.3-73
	Filtration	2	20	4.6-17, 4.6-18	0 0[c]	4.6-17 4.6-18
	Granular Activated Carbon Adsorption	1	<20	6.1-52	>33	6.1-52
	Powdered Activated Carbon Adsorption (With Activated Sludge)	3	<20	6.2-6, 6.2-7	>64	6.2-7
	Ion Exchange	1	10	6.7-13	>99	6.7-13
	Reverse Osmosis	1	10[b]	6.9-11	0[c]	6.9-11
Chromium (dissolved)	Sedimentation with Chemical Addition (Lime)	1	40	4.3-67	>99	4.3-67
	Sedimentation with Chemical Addition (Lime, Polymer)	1	1,300	4.3-69	99	4.3-69

TABLE D-1 (continued)

Pollutant	Pollution treatment technology	Number of data points	Lowest observed effluent concentration, µg/L	Volume III page(s)	Highest observed removal efficiency, %	Volume III page(s)
Dichlorobenzene	Gas Flotation with Chemical Addition (Calcium chloride, Polymer)	1	260	4.5-21	76	4.5-21
	Gas Flotation with Chemical Addition (Ferrous sulfate, Lime, Polymer)	1	18[b]	4.5-10	0[c]	4.5-10
Methyl ethyl ketone	Solvent Extraction	7	12,000	5.6-26	95	5.6-26
m,p-Cresol	Solvent Extraction	1	25,000	5.6-15	91	5.6-15
o-Cresol	Solvent Extraction	9	2,300	5.6-20	>99	5.6-22
Propionic acid	Lagoon (Anaerobic)	2	470	5.3-35	0[c]	5.3-35, 5.3-37
Radium (dissolved)	Sedimentation with Chemical Addition ($BaCl_2$)	7	<0.75[a] <2	4.3-51 4.3-50	>99	4.3-60
	Ion Exchange	1	<1	6.7-11	>99	6.7-11
$Radium_{226}$ (total)	Sedimentation with Chemical Addition ($BaCl_2$)	10	1.1	4.3-60	>99	4.3-60
Radium (total)	Ion Exchange	1	7.2	6.7-11	99	6.7-11
Styrene	Solvent Extraction	1	<1,000	5.6-12	>93	5.6-12
TDS	Reverse Osmosis	5	24	6.9-13	98	6.9-9
Xylenes	Activated Sludge	1	<2.0[b]	5.1-121	>0	5.1-121
	Trickling Filters	1	2	5.2-27	0[c]	5.2-27
	Solvent Extraction	3	<1,000	5.6-13, 5.6-14	>98	5.6-14

[a] The removal efficiency associated with this sample was less than the median.

[b] The effluent concentration reported was higher than the influent concentration for the pollution control device tested.

[c] Actual data indicate negative removal.

[d] The concentration was reported as "not detected."

[e] The concentration was reported as "below detection limits."

[f] Units given in fibers/L.

[g] Units given in picoCi/L.

APPENDIX E

REGRESSION ANALYSIS

(To be supplied)

GLOSSARY

AAP: Army Ammunitions Plant.

AN: Ammonium Nitrate.

ANFO: Ammonium Nitrate/Fuel Oil.

BATEA: Best Available Technology Economically Achievable.

BAT: Best Applicable Technology.

BEJ: Best Engineering Judgment.

BOD: Biochemical Oxygen Demand.

clarification: Process by which a suspension is clarified to give a "clear" supernatant.

cryolite: A mineral consisting of sodium-aluminum fluoride.

CWA: Clean Water Act.

cyanidation process: Gold and/or silver are extracted from finely crushed ores, concentrates, tailings, and low-grade mine-run rock in dilute, weakly alkaline solutions of potassium or sodium cyanide.

comminutor: Mechanical devices that cut up material normally removed in the screening process.

effluent: A waste product discharged from a process.

EGD: Effluent Guidelines Division.

elutriation: The process of washing and separating suspended particles by decantation.

extraction: The process of separating the active constituents of drugs by suitable methods.

fermentation: A chemical change of organic matter brought about by the action of an enzyme or ferment.

flocculation: The coagulation of coalescence of a finely-divided precipitate.

fumigant: A gaseous or readily volatilizable chemical used as a disinfectant or pesticide.

GAC: Granular Activated Carbon.

gravity concentration: A process which uses the differences in density to separate valuable ore minerals from gangue.

gravity separation/settling: A process which removes suspended solids by natural gravitational forces.

grit removal: Preliminary treatment that removes large objects, in order to prevent damage to subsequent treatment and process equipment.

influent: A process stream entering the treatment system.

intake: Water, such as tap or well water, that is used as makeup water in the process.

lagoon: A shallow artificial pond for the natural oxidation of sewage and ultimate drying of the sludge.

LAP: Loading Assembly and Packing operations.

LEDS: Liquid Effluent Data System.

MHF: Multiple Hearth Furnace.

neutralization: The process of adjusting either an acidic or a basic wastestream to a pH in the range of seven.

NPDES: National Pollutant Discharge Elimination System.

NRDC: Natural Resources Defense Council.

NSPS: New Source Performance Standards.

photolysis: Chemical decomposition or dissociation by the action of radiant energy.

PCB: PolyChlorinated Biphenyl.

POTW: Public Owned Treatment Works.

PSES: Pretreatment Standards for Existing Sources.

purged: Removed by a process of cleaning; take off or out.

screening process: A process used to remove coarse and/or gross solids from untreated wastewater before subsequent treatment.

SIC: Standard Industrial Classification.

SS: Suspended Solids.

SRT: Solids Retention Time.

starved air combustion: Used for the volumetric and organic reduction of sludge solids.

terpene: Any of a class of isomeric hydrocarbons.

thermal drying: Process in which the moisture in sludge is reduced by evaporation using hot air, without the solids being combusted.

TKN: Total Kjeldahl Nitrogen.

TOC: Total Organic Carbon.

trickling filter: Process in which wastes are sprayed through the air to absorb oxygen and allowed to trickle through a bed of rock or synthetic media coated with a slime of microbial growth to remove dissolved and collodial biodegradable organics.

TSS: Total Suspended Solids.

vacuum filtration: Process employed to dewater sludges so that a coke is produced having the physical handling characteristics and contents required for processing.

VSS: Volatile Suspended Solids.

WQC: Water Quality Criterion.