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Center for Environmental Research  
Information  
Cincinnati, Ohio 45268

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Revised October 1989

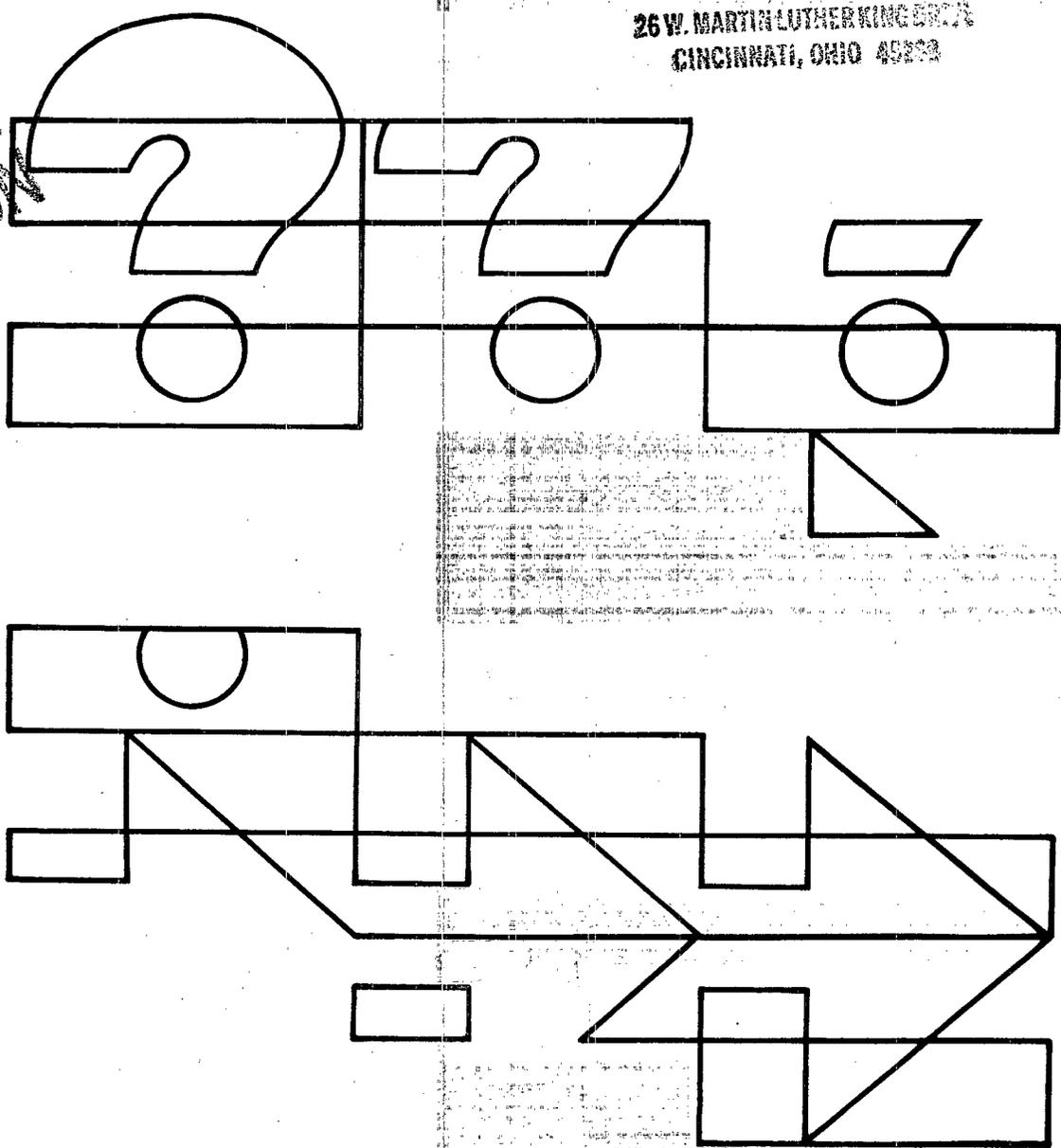


# Handbook for Preparing Office of Research and Development Reports

Revised  
October 1989

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*This document supersedes all previous scientific and technical report preparation specifications that have been issued by the U.S. Environmental Protection Agency's (EPA) Office of Research and Development (ORD) or its predecessor organizations. Technical and scientific reports prepared by or for ORD are expected to conform with the specifications contained herein if the work is initiated after the issuance of this document.*

*These specifications constitute a revision of the "Handbook for Preparing Office of Research and Development Reports," EPA/600/9-83/006 dated March 1986.*

*These specifications are consistent with the ORD publication policy, which has been issued by the Assistant Administrator for Research and Development. This handbook is primarily intended for use by authors, principal investigators, project officers, and those individuals who provide staff support in preparing draft and camera-ready copy of ORD reports.*

*A companion document outlining procedures to be followed when publishing ORD work is available to assist ORD personnel in activities that involve internal processing, review, clearance, printing, distribution, and storage of ORD reports. Copies of these procedures are available from the Technical Information Manager for each ORD laboratory and headquarters office.*

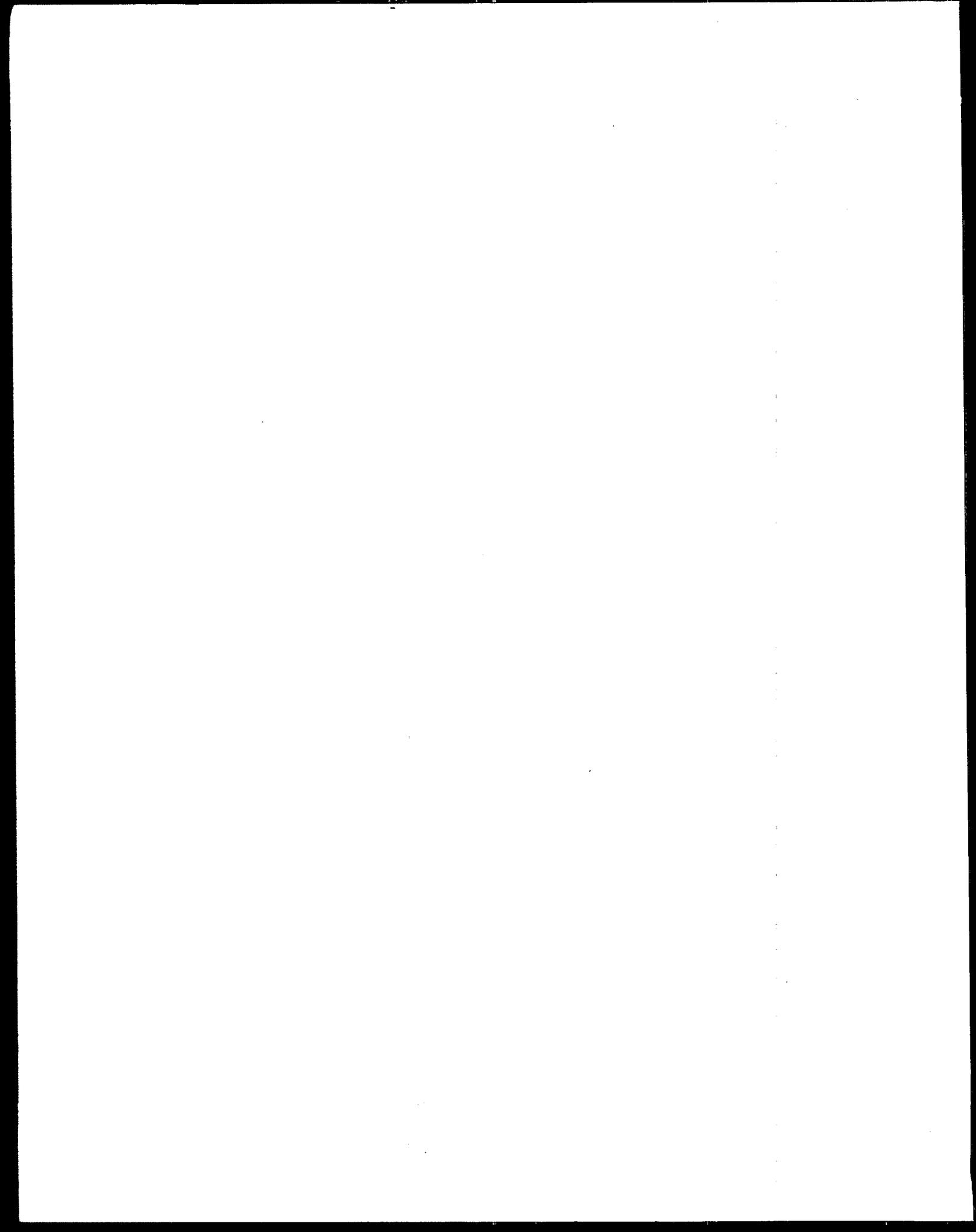
EPA/600/9-83/006  
Revised October 1989

# **Handbook for Preparing Office of Research and Development Reports**

Revised  
October 1989

Compiled by  
Center for Environmental Research Information

Office of Research and Development  
U.S. Environmental Protection Agency  
Cincinnati, OH 45268



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## **Acknowledgment**

We wish to acknowledge the considerable help and constructive suggestions provided by ORD's Technical Information Managers and other key personnel who contributed to this document. Although it was impossible to incorporate all the useful guidance and suggestions provided, we believe that the final specifications contained herein will meet the need of all performing organizations engaged in preparing ORD scientific and technical reports and that these efforts will result in more uniform and higher quality publications of which we can all be proud.

## **Section I INTRODUCTION**

- Purpose** This handbook contains the essential specifications set forth by the Office of Research and Development (ORD) to ensure that the results and conclusions of its research, development, and demonstration programs are documented in a consistent, high-quality and cost-effective manner. It is intended to assist those individuals responsible for preparing ORD scientific and technical documents and their associated computerized disks by providing format specifications and guidelines for actual preparation.
- Applicability** These specifications and guidelines apply to the final documents and associated computerized disks prepared as a result of ORD-sponsored or conducted research. They are to be followed by all EPA/ORD research components: the performing organization, the Project Officer, and all key personnel. These documents include reports resulting from in-house, interagency, grant, cooperative agreement, and contract research activities performed by or for ORD; project reports and summaries that document the findings of research required to produce a specific output, or reports that are tailored to meet the needs of defined user groups. Examples of special reports include but are not limited to: project summaries, research reports, conference proceedings, Environmental Research Briefs, criteria documents, design manuals for pollution control or decision-making models, test protocols or any other type of report providing operational or decision-making guidelines.
- Exclusions** These specifications and guidelines are not totally applicable for non-technical reports and studies, catalogs, administrative or fiscal reports, or manuscripts to be published by other than ORD (e.g., journals). Individuals responsible for preparing such reports should contact the Center for Environmental Research Information (CERI), Cincinnati, OH, for additional guidance and assistance.
- Waivers** Any deviation from these specifications must be initiated by or through the Project Officer. Project Officers should forward any request for approval of a major deviation through their assigned Technical Information Manager (TIM) to CERI, Cincinnati, OH.
- Extramural Considerations** Conformance with the specifications contained in this document and the form of submission must be cited in the final extramural agreement (interagency, cooperative agreement, grant, or contract). When the final report is complete and approved, the performing organization shall submit the reproducible manuscript and associated computerized disks duplicating the manuscript to the assigned Project Officer.

## Section II GENERAL REQUIREMENTS

This section provides information that is generally applicable to all ORD scientific and technical documents. It identifies important reference documents, applicable legal considerations, and criteria for units of measure.

### Sources of Information

The following references are cited as supplemental sources for necessary and helpful information that can be used to prepare ORD scientific and technical reports. Other guides from engineering and scientific societies and journals may be used to the extent that they do not conflict with EPA or ORD specifications.

*EPA Graphics Standards System, 1978*, This booklet establishes and delineates the graphic identity system and standards which EPA will adhere to in all its visual communications.

*Government Printing and Binding Regulations*, Joint Committee on Printing, Congress of the United States. This pamphlet provides background information on Government Printing Office requirements concerning the use of color printing, self-mailers, printing requirements resulting from grants or contracts, etc. Copies are available from U.S. Environmental Protection Agency Printing Management and Distribution Section, Washington, DC 20460.

*Metric Practice Guide*, ASTM E (current ed.). This Guide deals with conversion of quantities in various measurement systems to the International System of Units (officially abbreviated SI in all languages). It is available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

*Style Manual*, U.S. Government Printing Office, Washington, DC. This manual contains general editorial advice and the Federal government's recommended style for capitalization, punctuation, use of numerals, hyphenation, etc. It may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

*Units of Weight and Measure: International (Metric) and U.S. Customary*, L. J. Chisholm, U.S. Department of Commerce, National Bureau of Standards, NBS Misc. Pub. 286, revised October 1972. This document provides definitions and conversion factors from various systems of measurements to the international system. It may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

**Legal Considerations**

The Government may be subject to liability for misuse of the literary or intellectual property (patents, trademarks, proprietary information) of others. Report writers and editors should observe the following guidelines:

*Copyrighted, Contributed, or Unpublished Material*

Copyrighted material may not be incorporated in a report unless written permission of the copyright owner has been obtained. Prior use of copyrighted material in another government publication does not necessarily constitute permission to use it in an EPA/ORD publication. When permission has been obtained and the material is used in a report, it shall be identified by a statement substantially as follows:

Reprinted from (title of publication, year of first publication) by (name of author) with permission of (names of copyright owner, if different from that of author).

The National Technical Information Service (NTIS) requires that all copyright release letters accompany publications submitted to it for distribution. When a report containing copyright is sent to CERL for distribution through NTIS, the original and one copy of all copyright release letters should be submitted along with it.

Unpublished work may be protected under common law or equity, even though there is no copyright notice. Refer problems relating to the protection given to unpublished work to EPA's Office of General Counsel, Washington, DC 20460.

Courtesy requires that uncopyrighted materials from, or assistance rendered by, other persons be acknowledged through the use of a footnote, bibliographic reference, or statement in the text. Credit lines need not be given for designers, typographers, layout artists, or art directors. In addition, material purchased by the government need not be credited.

*Privately Owned Information*

To avoid restricting the availability of a report, make every effort not to use information accepted by the government for limited purposes. Such information will be used only when it is essential to the understanding of a report and only after approval for its use is authorized by the Office of General Counsel. Reports containing such information will bear a statement restricting availability and handling, as required.

*Trade Names and Manufacturers' Names*

The use of trade and manufacturers' names should be explicitly brought to the attention of the Project Officer and the cognizant approving official before the report is cleared for publication. Trade and manufacturers' names should always be capitalized when referred to in a report.

*Disclaimer Notice*

Final documents which contain any information unique to a company, laboratory, or individual, including the use of trade names, should carry a statement in the Notice similar to the following, which disclaims any endorsement or recommendation of a commercial product by the Agency:

Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

*Government  
Information*

Information developed, compiled, or written by a government employee as part of that person's official duties exists in the public domain and, as such, is not protected by copyright provisions. Although an EPA employee is permitted to offer a paper, an article, or a portion of a book produced under the auspices of the government for publication in the private sector, he or she may not execute an assignment of copyright to a publisher. Any forms requesting the assignment of copyright privileges should be returned to the publisher unsigned with the following statement affixed:

The assignment cannot be executed, since the referenced work was authored by a United States Government employee as part of that person's official duties, and, in view of Section 105 of Public Law 94-553, it is not subject to copyright protection.

Any non-government author developing information under a government grant, cooperative agreement, or contract may arrange for copyright of that material without the approval of the Agency. However, in these instances, the Government is vested with a royalty-free, non-exclusive, and irrevocable license to publish, translate, reproduce, and deliver that information and to authorize others to do so.

*Draft Documents*

As a result of provisions contained in the Freedom of Information Act and for other programmatic reasons, draft copies of ORD reports are sometimes distributed outside the Agency. To prevent misunderstanding, the following notice must appear in the top half of the first page of the general text of all draft scientific and technical reports:

Notice

This document is a preliminary draft. It has not been formally released by the U.S. Environmental Protection Agency and should not at this stage be construed to represent Agency policy. It is being circulated for comments on its technical merit and policy implications.

Because of their preliminary nature, EPA documents at the draft stage are not to be cited as references in reports prepared by or for ORD.

## Section III FORMAT SPECIFICATIONS

### Overview

This section identifies the guidelines to be followed when preparing ORD scientific and technical reports and information products for publication. It is not intended to supersede methods for handling abbreviations, units of measure, references, and other text annotations that are recommended practice within the many scientific and technical disciplines in the research community. A common sense, consistent approach will usually produce a visually acceptable document.

### Computerized Report Production

All documents submitted as final reports to the Office of Research and Development should be accompanied by back-up computerized disks duplicating the submission. Files from almost any IBM PC-based or Apple Macintosh word processing program on either a 5¼" or a 3½" floppy disk are acceptable. If unsure, submit an ASCII file *in addition*.

If electronic transfer is arranged, a modem capable of transmitting at 1200 baud and using Crosstalk XVI or compatible software must be used. Whether disks or electronic transmission is elected a paper copy of the data on the disk must either accompany or precede the electronic material, and the original of all charts, tables and pictures or computer printouts must be received. The draft should be typed using continuous typing with no carriage returns at the end of the line (except at the end of a paragraph, for tabular material, and for headings). If you have any questions or wish to arrange for electronic transmission of data, call the EPA project officer and he or she will provide the appropriate contacts.

### General Format Requirements

This subsection provides general specifications for print size, image area, spacing, headings, page numbering, equations, footnotes, abbreviations, illustrations, tables, fold-outs, dividers, and paper-saving considerations.

### Typing

When final camera-ready copy is typed, considerable attention should be given to the selection of equipment to maintain consistency of type styles, spacing, point sizes, etc., throughout the publication.

Type size for tabular material, callouts, illustrations, charts, graphs, tables, etc., must be no smaller than 6-point or approximately 1/16 inch, and no larger than 10-point, or approximately 1/9 inch when used for the final camera-ready copy.

This is an example of 6-point type.

This is an example of 8-point type.

This is an example of 10-point type.

- Paste-Up** RUBBER CEMENT should be used for mounting all copy, tables, charts, illustrations, photos, etc. DO NOT USE SCOTCH TAPE, GLUE, OR STAPLES TO MOUNT CAMERA-READY ART OR COPY! Tape, glue, or staples create a distortion on the camera-ready material that will show up on the printer's negatives and plates.
- Image Area** Final camera-ready copy of ORD reports to be printed on 8-1/2 by 11 inch paper should be prepared within an image area of 6-1/2 by 8-3/4 inches (16.51 by 23.18 cm or 39-1/2 x 52-1/2 picas). Page numbers should be centered 3/8 of an inch (2 picas) below the last line of the image area.
- Color Printing** The use of color must be approved by the EPA Headquarters Printing Management Office. The Project Officer will submit the request through the TIM to the Director of CERL, Cincinnati, OH 45268.
- Spacing and Headings** The DRAFT of a final report (prepared for approval of the Project Officer) shall be typed double space or space-and-a-half. After the draft is approved by the Project Officer, the camera-ready copy of the FINAL report must be typed single space or space-and-a-half, if the text contains voluminous quantities of super- and subscript material.
- Headings should stand out from the text, and the relative importance of each heading should be readily apparent.
- Page Numbering** Front Matter (Preliminary Pages): Except for the title page (which is counted as page i, but not indicated), number the front matter consecutively with lower case Roman numerals (ii, iii, iv, etc.).
- Body of the Report and Back Matter: Only the first page of the body of the report (normally the Introduction) begins on the new right-hand page (page 1); thereafter, each new section begins on the next available page. The body of the report must be numbered consecutively with Arabic numerals. Allow no blank pages.
- Equations, Footnotes, and Abbreviations** Equations: short, simple and unnumbered equations should be treated as part of the text. When possible, type simple fractions on one line using a diagonal line and parentheses to avoid ambiguity, e.g.,  $1/(a + b)$  not  $1/a + b$  or  $\frac{1}{a + b}$ . Treat equations (and formulas) that require special symbols, positioning, or brackets as figures, and display the equation on a line by itself, centered on the width of the page with spacing (e.g., 1-1/2 lines) above and below.
- Instructions concerning mathematical and chemical equations—that is, the numbering, defining of symbols, breaking (dividing), building up, enclosing in parentheses, etc.—can be found in the Government Printing Office *Style Manual* and in other style manuals such as those issued by the American Chemical Society (1155 Sixteenth St., NW, Washington, DC 20036) or the American Society of Civil Engineers (345 East 47th St., New York, NY 10017).
- Footnotes: In the text, footnotes should be kept to a minimum. All brief and relevant explanatory comments should be incorporated in the copy.
- Abbreviations: Acceptable modes for general abbreviations are found in standard dictionaries and in the Government Printing Office *Style Manual*. Technical abbreviations may be found in the appropriate reference documents for the particular subject area involved.

*Metric Units of Measure*

The modernized metric system utilizing the International System of Units (Système International d'Unités, SI) shall be used unless otherwise justified by the Project Officer. Equivalent units may be expressed parenthetically, if desired. If other than metric measures are used, the reason for such use should be footnoted at the first nonmetric measure, and reference should be made to a conversion table included in the report.

*Fold-outs and Divider Pages*

Do not use divider pages—those that merely serve to separate the report into parts. The use of fold-outs is also not acceptable. The paper, printing, binding efforts, and costs normally incurred when using fold-outs can usually be saved with preliminary planning: reduce wide tables, have tables fall on successive pages, separate maps into several parts, etc.

*Errata and Addenda*

All changes to reports already printed and listed with the National Technical Information Service (NTIS) must bear the same EPA number and issuance date which appear on the original printed report. For additional information and procedures for processing and distributing modifications to existing reports, contact CERL, Cincinnati, OH 45268.

*Paper Saving*

Because of the rising cost and scarcity of paper and increased shipping and mailing costs, reproduction costs, etc., each individual responsible for preparing ORD reports is strongly encouraged to consider appropriate techniques for saving paper. Suggestions for this purpose include: reducing and cropping tables, figures, and photographs to their smallest usable size; combining tables and figures with text on one page; and where practical, placing lists of items in double columns. In addition, all ORD reports should be reproduced on recycled paper.

**General Organization of Standard Reports**

In the following subsection, the major elements of most full reports documenting a research project and prepared by or for ORD are described.

*Title Page*

The title page should contain the following: title (10 words or less), author(s), organizational name and location, project officer (or technical project manager, where appropriate), and laboratory/office name and address. When a public or private organization originates a report in cooperation with EPA, the information should be noted below the project officer's name and address, along with the contract or grant number. Also, when an in-house study was performed for another government agency, that information should be given in the same location. The publisher's full name and address appears at the bottom of the page.

*Notice of Application of EPA Order 2200.4A*

EPA Order 2200.4A (August 7, 1984) establishes an Agency peer and administrative review process for scientific, informational, and educational documents attributable to EPA. The intent of the order is to ensure the high quality, completeness and accuracy of documents published by the Agency.

*Disclaimer and Peer Review Notices*

The Joint Committee on Printing of the United States Congress requires that Federal Agencies have initial publication rights. Only after peer and administrative review can EPA decide whether to publish a report or waive its initial publication rights.

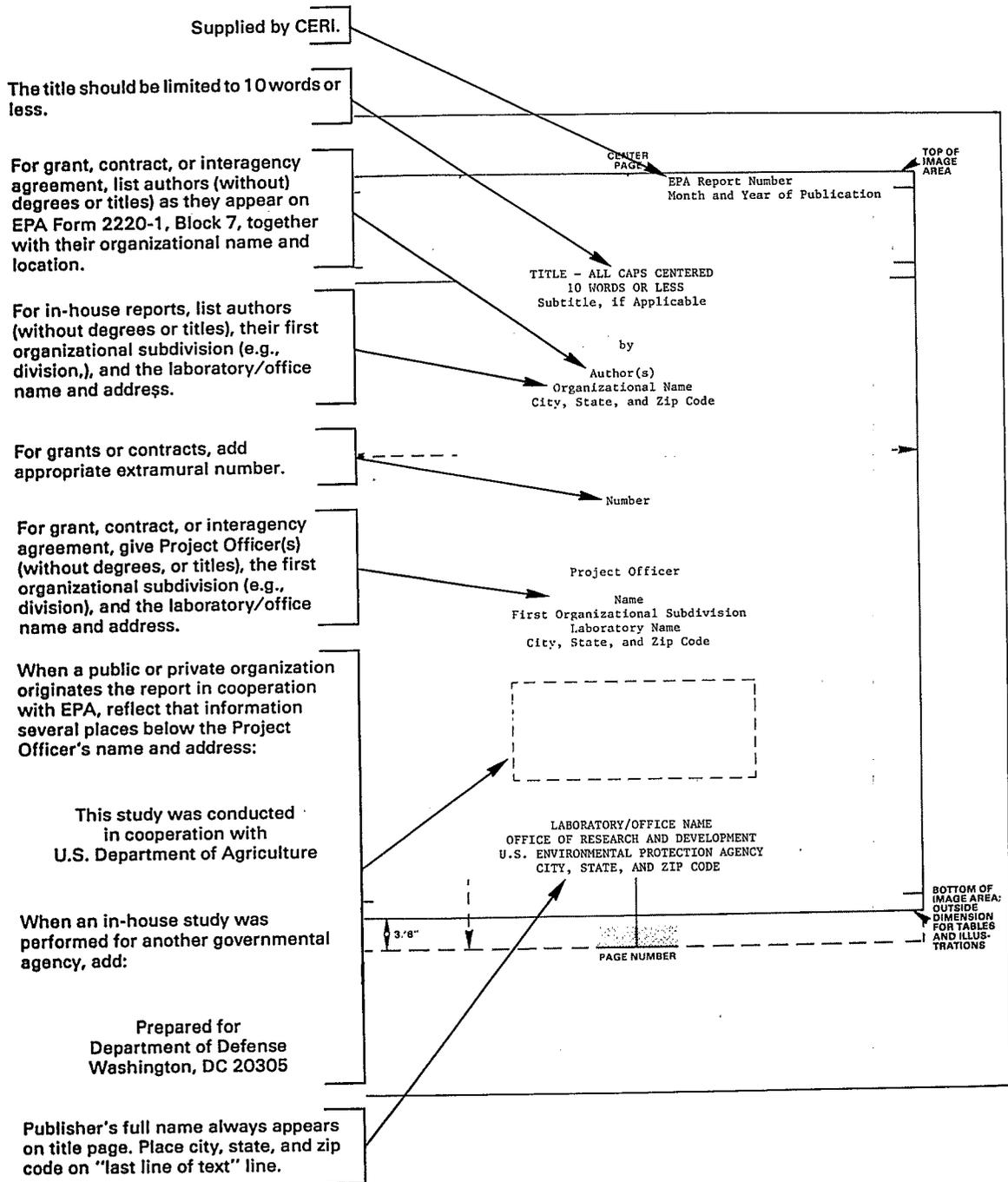


Figure 1. Title Page.

In order to comply with the implementation of the Agency's peer and administrative review requirements, the recipient of a grant or contract:

- (1) must submit three copies of the documents to the Project Officer for EPA's review. EPA will evaluate the documents and will provide the recipient with written suggested changes, if any; and
- (2) should make every effort to accommodate suggestions arising from the EPA review process while preparing a revised draft. The recipient should also alert EPA reviewers to changes initiated in the revised draft.

If agreement is reached that the revised draft is appropriate for release as an EPA publication, the following statement must be used:

The information in this document has been funded wholly or in part by the United States Environmental Protection Agency under (contract or assistance agreement and number) to (name). It has been subjected to the Agency's peer and administrative review, and it has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

If agreement cannot be reached that the revised draft is appropriate for release as an EPA publication, a recipient may independently publish and distribute the document at his own expense provided that he:

- (1) requests approval through EPA from the Joint Committee on Printing to publish independently; and
- (2) includes the following statement in the document:

Although the information in this document has been funded wholly or in part by the United States Environmental Protection Agency under (contract or assistance agreement and number) to (name), it does not necessarily reflect the views of the Agency and no official endorsement should be inferred.

Disclaimer and Peer review notices should appear on p. ii of a full report.

EPA also encourages independent publication of research results in refereed journals at any time. A copy of the article must be submitted to the Project Officer when it is sent for publication. Following publication, three reprints of the article should be submitted to the Project Officer. The article must include the following statement:

Although the research described in this article has been funded wholly or in part by the United States Environmental Protection Agency through (contract or assistance agreement and number) to (name), it has not been subjected to Agency review and therefore does not necessarily reflect the views of the Agency and no official endorsement should be inferred.

*Foreword or  
Preface  
(Optional)*

A report may include a foreword or a preface. Here, such information as the reasons for undertaking the work, the research method, if it might bear on the reader's understanding of the text, or the limitations within which the subject was studied may be described.

*Abstract*

The indicative (descriptive) abstract is limited to between 200 and 250 words; it tells the reader what the report is about—narrative facts about what will be read in the actual report.

As such it is the only type of abstract to be used to introduce a project summary. An informative abstract gives details, in the most concise manner, of what was reported and presents conclusions and results.

The EPA Form 2220-1 limits the abstract to 200 words and thus generally permits the use of the indicative abstract. The abstract, as it appears in the front matter of a complete report, may contain up to 450 words, which permits the use of an informative abstract.

In the "work-done under" statement, which is always placed as the last paragraph of the abstract in extramural reports, the relationship of the prime and the subgrantee or subcontractor can be described in addition to the necessary information contained in the following statement:

This report was submitted in fulfillment of (grant or contract number) by (contractor or grantee) under the (partial) sponsorship of the U.S. Environmental Protection Agency. This report covers a period from (date) to (date), and work was completed as of (date).

On in-house project reports, the following statement is always the last paragraph of the abstract:

This report covers a period from (date) to (date) and work was completed as of (date).

*Contents*

The contents page should begin on a right-hand, odd-numbered page, usually "v." Although preliminary pages (front matter) are not part of the subject matter, they are part of the document and are included in the contents.

The contents include the main headings of the document and the pages on which they appear; dotted leaders may be used to aid readability. Meaningful subheads (indented and subordinated) may be included, if necessary. Avoid double spacing between major sections when it would cause contents to have a short overrun on the following page.

*Lists*

A list of illustrations (figures, maps, charts, plates) and a list of tables need to be included only if considered helpful or essential. For each illustration or table, give the figure or table number, the figure legend or the table heading as it appears in the report (in shortened form, if lengthy), and the page number. Avoid double spacing when it would cause a list to have a short overrun on the following page.

If lists of illustrations and tables are short, combine on one page or combine with contents page.

CENTER PAGE

CONTENTS

BEGIN FIRST LINE OF TEXT HERE

DROPPED HEAD: BEGIN SECTIONS HERE

TOP OF IMAGE AREA

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**Figure 2. Contents.**

When is a list of abbreviations and symbols necessary? For each report, define the possible readership, the number of abbreviations and symbols used, and the uniqueness of or difficulty in defining or understanding these terms; if assembling and defining them will aid the reader, do so. Abbreviations or symbols for the less common or specialized terms should also be given in parentheses following their first use in the text. Thereafter, the abbreviation or symbol may be used. Consider using two columns when the list exceeds one page.

**Acknowledgments**

Limit acknowledgments to peer reviewers and organizations that aided in a major way.

**Introduction**

The introduction, as Section 1, sets the stage for the conclusions and recommendations and for the text proper. With this orientation, the reader

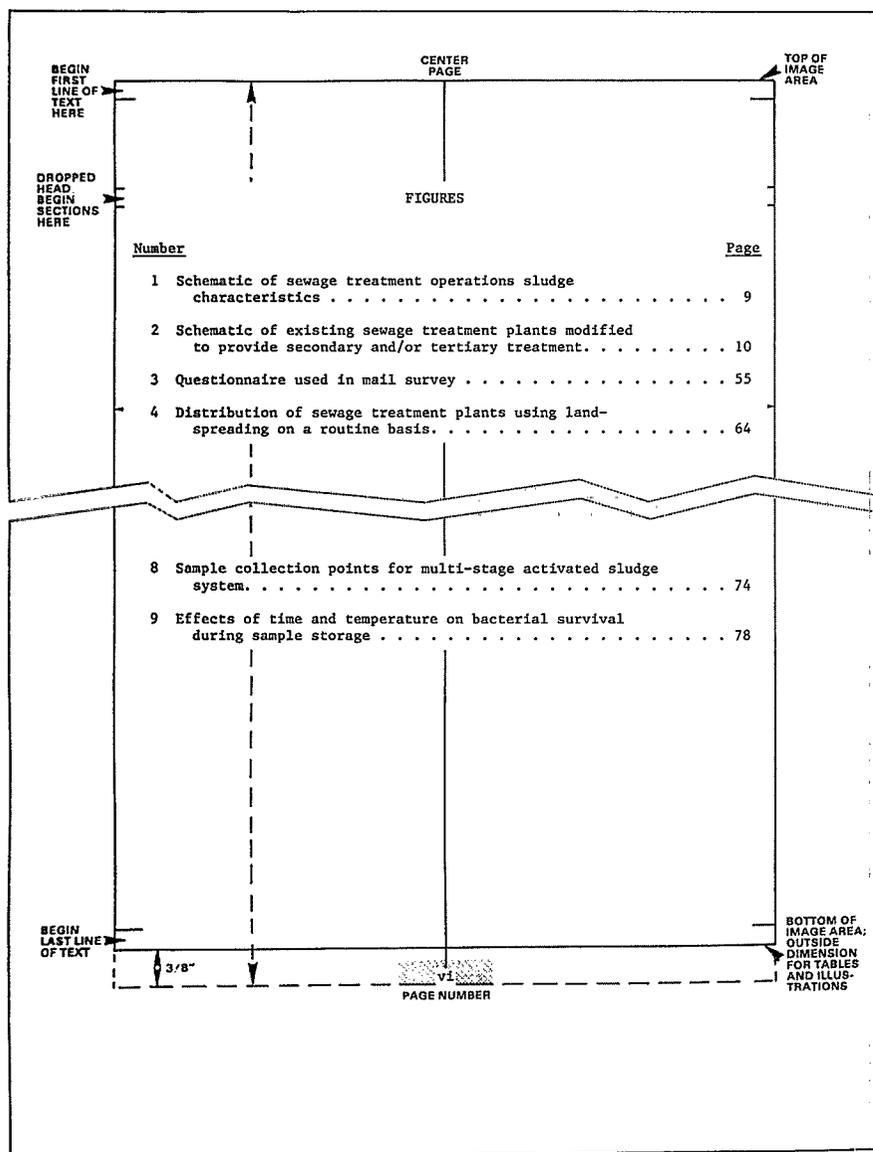


Figure 3. Lists.

learns what he should know before he reads the other sections of the report. In one (or two) pages, the problem is stated and the present work is related to earlier work.

A formal introduction, as such, may not be needed in all reports; in simple, short reports, this information could be combined with conclusions or conclusions and recommendations.

*Conclusions*

After all the measurements are made—the surveys conducted—the experiments performed—and the significance of these results analyzed and interpreted—what problems did this research solve? These are the conclusions. If the problem was not solved or major mistakes or hazards occurred, they can be included here.

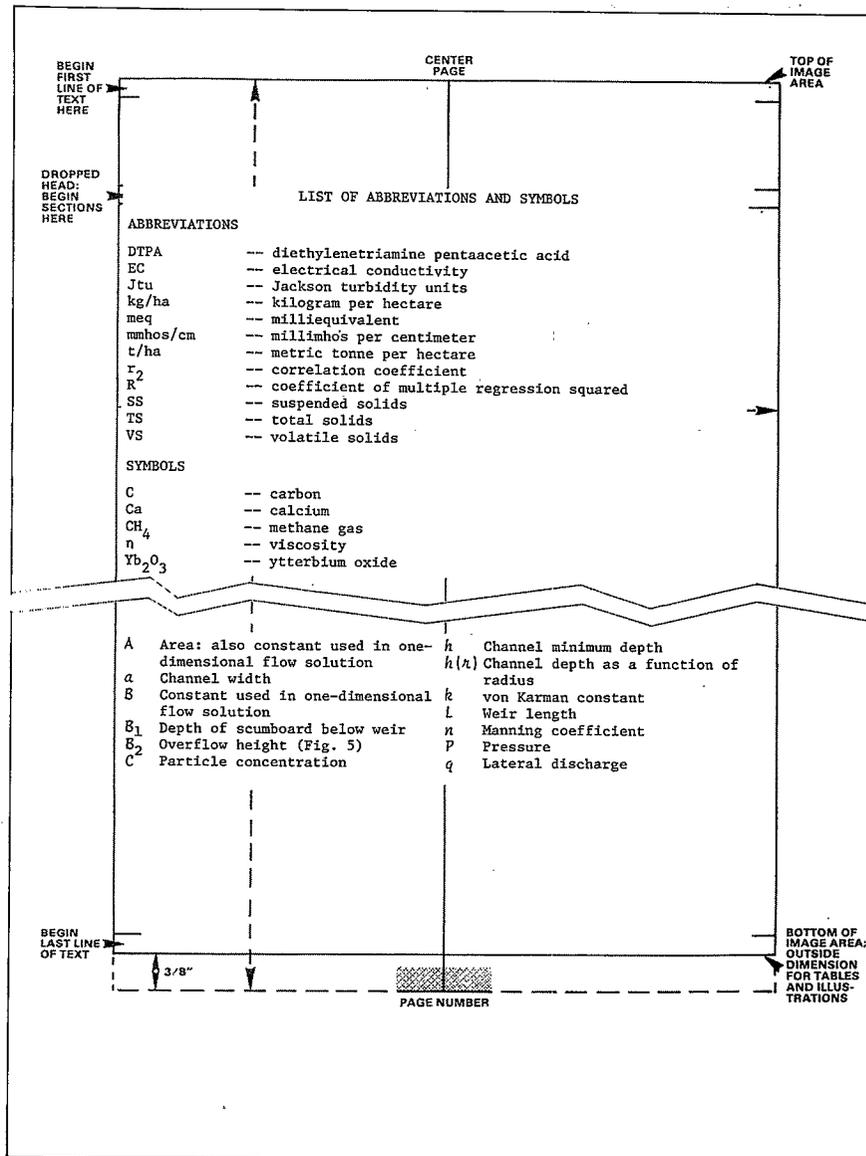


Figure 4. List of abbreviations and symbols.

Usually, the conclusions can be stated on one page; when both conclusions and recommendations are short and straightforward, combine them.

*Recommendations*

When the research has been completed and the conclusions have been drawn, is further study or additional information needed to solve the problem? Is a pilot-scale feasibility study needed to reinforce the laboratory findings? Can the conclusions be applied now? Such suggestions for future investigations or activity can be included in a recommendations section. These need occupy but one page, or they can be combined into a conclusions and recommendations section.

*Illustrations*

Illustrations should be treated consistently throughout the document and used only if they: relate entirely to the transaction of public business and

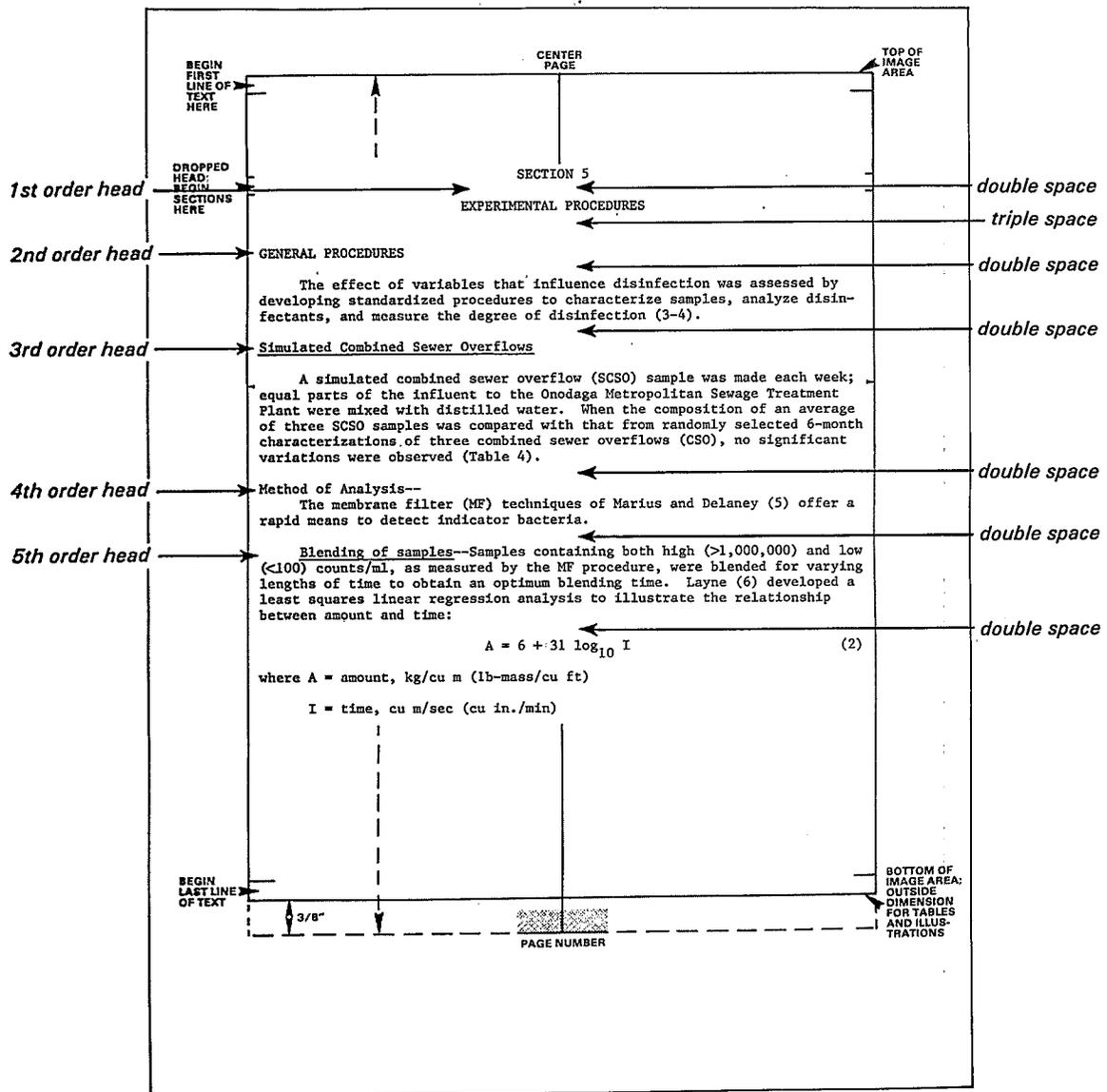


Figure 5. Page of text.

are in the public interest; relate directly to the subject matter and are necessary to explain the text; do not aggrandize any individual; are in good taste; or illustrate employees engaged in work- or service-related duties.

When preparing illustrations for ORD reports, make sure that line weights, tone values or any shading used is consistent throughout the report.

Take care in preparing line illustrations, making sure that only BLACK ink is used! Any lines to be used for illustrations, tables, charts, and graphs should be ruled with ink, preferably with technical drafting pens.

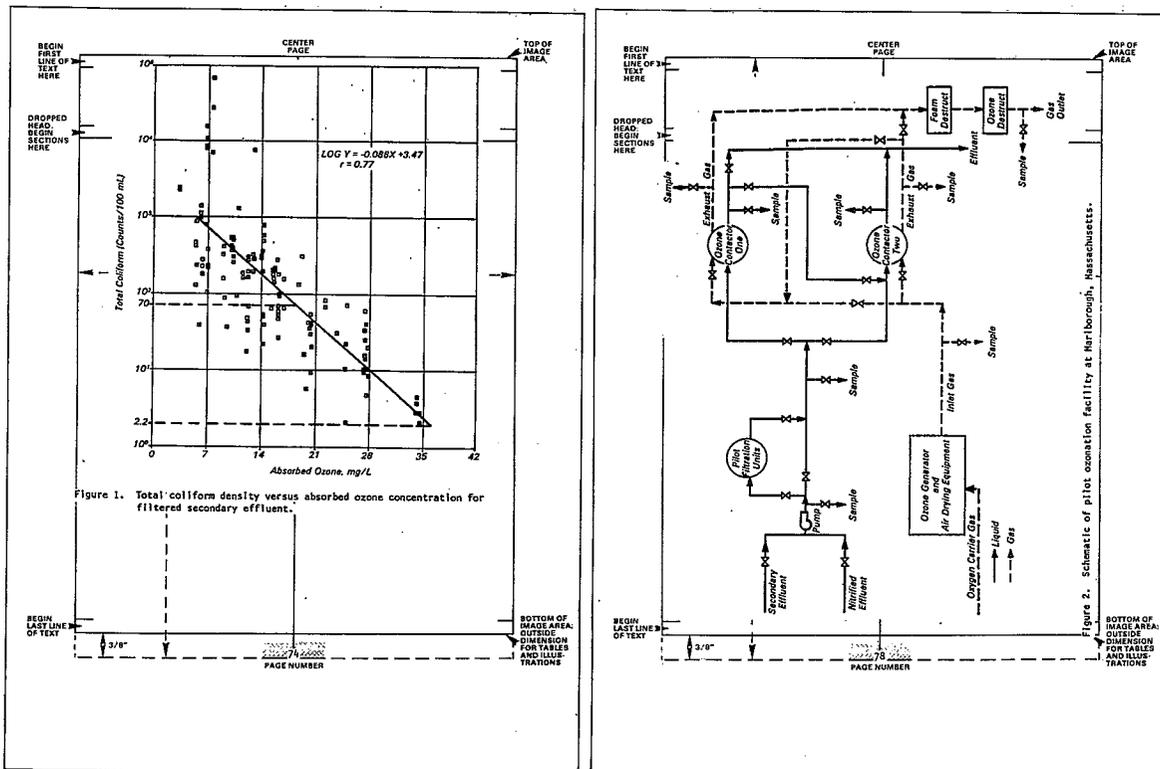


Figure 6. Illustrations.

The use of weak office copies, blueprints, and diazo prints is NOT ACCEPTABLE for camera-ready art or copy. These DO NOT reproduce well when photographed for printing.

Oversized illustrations should be reduced to fit within the image area of 6-1/2 x 8-3/4 inches (including the figure number and caption).

When charts and graphs are used in a report and a visible grid is desired, MAKE SURE that the grid background is RED! BLUE and GREEN grids do not photograph well.

Place illustrations closely following their first reference in the text; combine with text when possible. When a report contains only a few pages of text and many illustrations, however, place the illustrations in numerical sequence after the text.

When necessary, place illustrations broadwise and center within the image area on a page so that the head of the illustration is to the reader's left, and the bottom of the illustration is to the reader's right, i.e., will be readable when the page is turned clockwise 90° for normal viewing.

In preparing illustrations, care must be exercised to ensure that details and lettering within the illustration are 6 points (about 1/12 inch) or larger and clearly legible after final reproduction. Photographs should be cropped or masked to eliminate insignificant details. Unnecessary border frames should be eliminated.

As far as practical, place lettering (callout; label) on an illustration horizontally, unboxed, and near the item identified. There should be high contrast and easy readability. Use a UNIVERS or HELVETICA typeface for all illustrations.

Number illustrations within the text with consecutive Arabic numerals preceded by the word "Figure" (Figure 1, Figure 2). Within appendices, include appendix letter (Figure A-1, Figure B-9).

Each illustration must have a descriptive caption. Center the caption beneath the illustration following the figure number. The caption is usually styled as a sentence; capitalize the first letter of the first word and any proper nouns or chemical or mathematical symbols, and close with a period.

If photographs are required, submit GLOSSY black and white photo prints. Satin finish photo prints are NOT ACCEPTABLE! The finish on these conflicts with the screens used by the printer when preparing the finished plates and causes shadowing and variations in the texture.

### Tables

Organize tables as simply as possible for easy reading. Make sure that the format of the tables is consistent throughout the publication. Use a UNIVERS or HELVETICA typeface for all typeset tables. Computer printout sheets for electrically tabulated data must show clear, black/white contrast and must not contain any gray or broken type or horizontal print bars. The use of a new ribbon is strongly recommended for the preparation of all camera-ready computer printouts.

Number tables within the text with consecutive Arabic numerals, preceded by the word "Table" (Table 1, Table 2). Within appendices, include the appendix letter (Table A-1, Table C-3). Center a descriptive caption above each table after the table number. Type the caption in all caps, without a closing period.

When necessary, place a table broadwise and center within the image area on a page so that the head of the table is to the reader's left, and the bottom of the page is to the reader's right, i.e., will be readable when the page is turned clockwise 90° for normal viewing.

Use symbols for the table footnotes (e.g., \*, †, as available); double their use, if needed. Assign the symbols consecutively, in normal reading order (left to right across the table and from top to bottom). Superscript lower-case letters, preferably italicized, may be substituted for symbols if their use will not confuse the reader.

When a long table is continued on two or more pages, note this continuation at the bottom of all but the last page, e.g., (continued). Repeat the table number and "continued," but not the table caption, on all the following pages, e.g., Table 4. (continued). Repeat the column headings, with rules, on each page.

The Government Printing Office *Style Manual* may be helpful for preparing tables. When a report contains only a few pages of text and many tables, place tables in numerical sequence following the text.

### References

References concern source material cited in the document. Present this information in an accurate, uniform manner; use a style consistent with that of any reputable scientific or technical journal or society. Take care

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After analyzing a number of quench water samples in duplicate (three final DO determinations were performed to ensure reasonable duplicate results), the precision of the observations was evaluated by calculating (with the Olivetti Programma 101) the pooled standard deviation of all observations except those obtained on samples collected from dump truck drainage (Table 7).

TABLE 7. PRECISION OF THE DO ANALYSIS

Type of sample	No. of determinations*	Pooled standard deviation (s)†	Confidence interval $\pm(1.96\sqrt{2})$ (s)
Standards (normality)	44	0.13	$\pm 0.36\ddagger$
Dilution water (Blank)	32	0.19	$\pm 0.53\ddagger$
Quench water	76	0.49	$\pm 1.35\ddagger$
Both dilution and quench water	108	0.43	$\pm 1.19\ddagger$

\* Includes initial and final determinations.

† A pooled standard deviation was computed for all determinations. It was assumed that there was no statistically significant difference between initial and final variances, that is, homogeneity of the variances was assumed.

‡ The absolute value of the difference between duplicate readings should not exceed  $1.96\sqrt{2}(s)$ , or 0.36 ppm, more than 5 percent of the time. The covariance between the duplicate readings was ignored.

Figure 7. Tables.

to include all essential elements of a reference: author(s), title, source, identifying number, pages, and date. References may be cited using either the "number" system (using superscript numerals for citations in the text) or the "author-year" system.

Personal communications are not legitimate references, since they cannot be verified in a secondary, published source of information; include them, if necessary, in parentheses, within the text (e.g., C. D. Doe, State University, personal communication, 1963.). In citing personal communications, the author should obtain permission from the person to be quoted.

### Bibliography

Bibliographic entries provide supplementary sources for information on the subject of the document. Present this literature, which has not been cited in the text, in an accurate, uniform manner. There are many modes of presenting reference and bibliographic data.

List bibliographic entries alphabetically by senior author; take care to include all the essential elements of a reference: author(s), title, source, identifying numbers, pages, date. Be sure to use a style consistent with that of any reputable scientific or technical journal or society. Within any one report, have the punctuation, capitalization, abbreviations, etc., of the bibliography agree with that used for the reference section.

### Appendices

Appendices contain supplementary illustrative material, original data, and quoted matter too lengthy for incorporation in the body of the report or generally relevant but not immediately essential to an understanding of the subject.

The appendices (or, if there is only one, Appendix) must not be separated from the preceding material by either a titled cover sheet or a divider

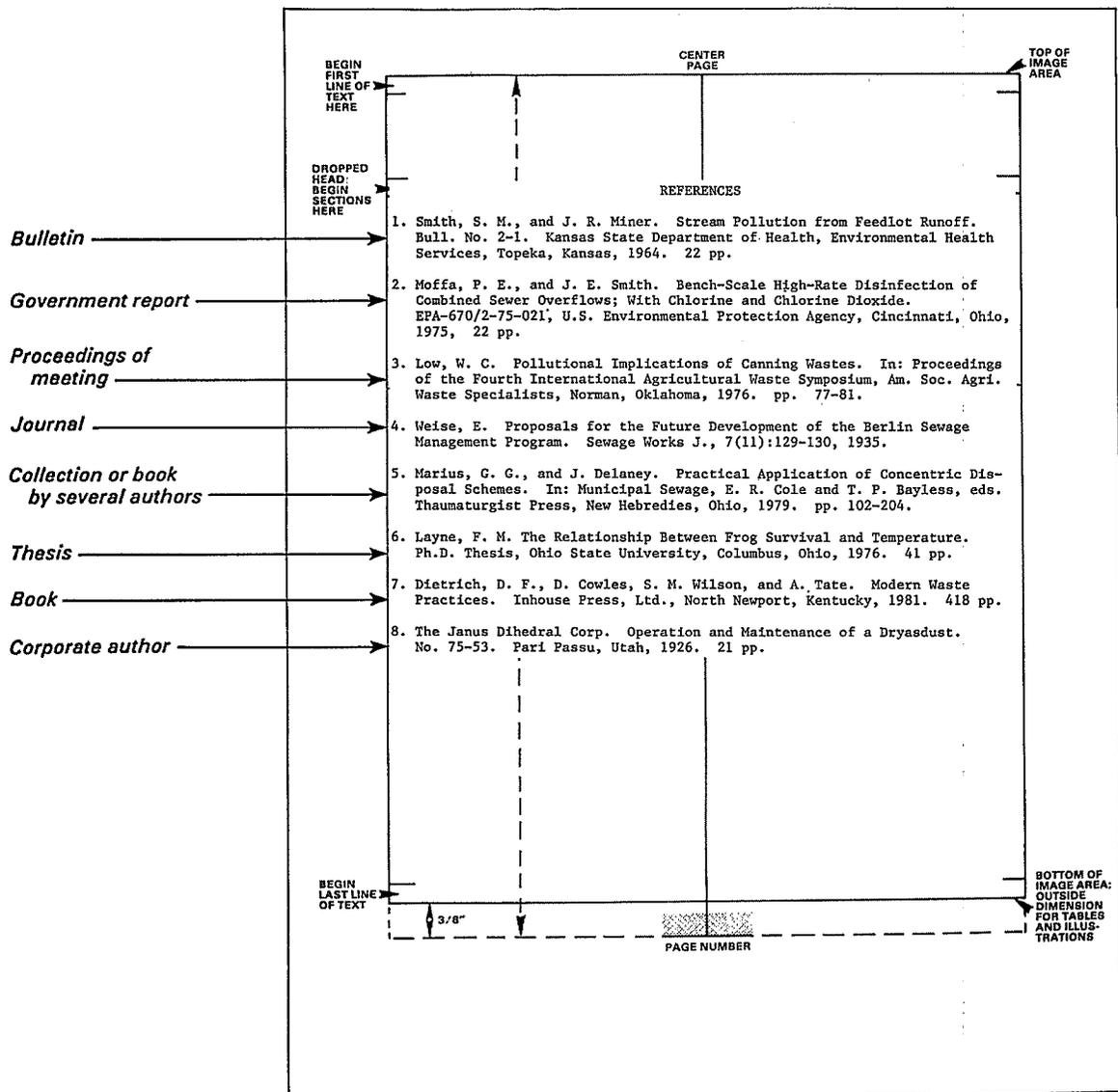


Figure 8. References.

page. The title and subtitle (if applicable) are to be treated as dropped section heads.

The Appendices may be divided into Appendix A, Appendix B, etc., depending on the kinds and amounts of material used. These divisions should not be arbitrary. There must be a close relationship among materials compiled within any given appendix.

List all Appendices in "Contents" and number all pages consecutively from the body of the report. The page number should not show the alphabetical appendix designation.

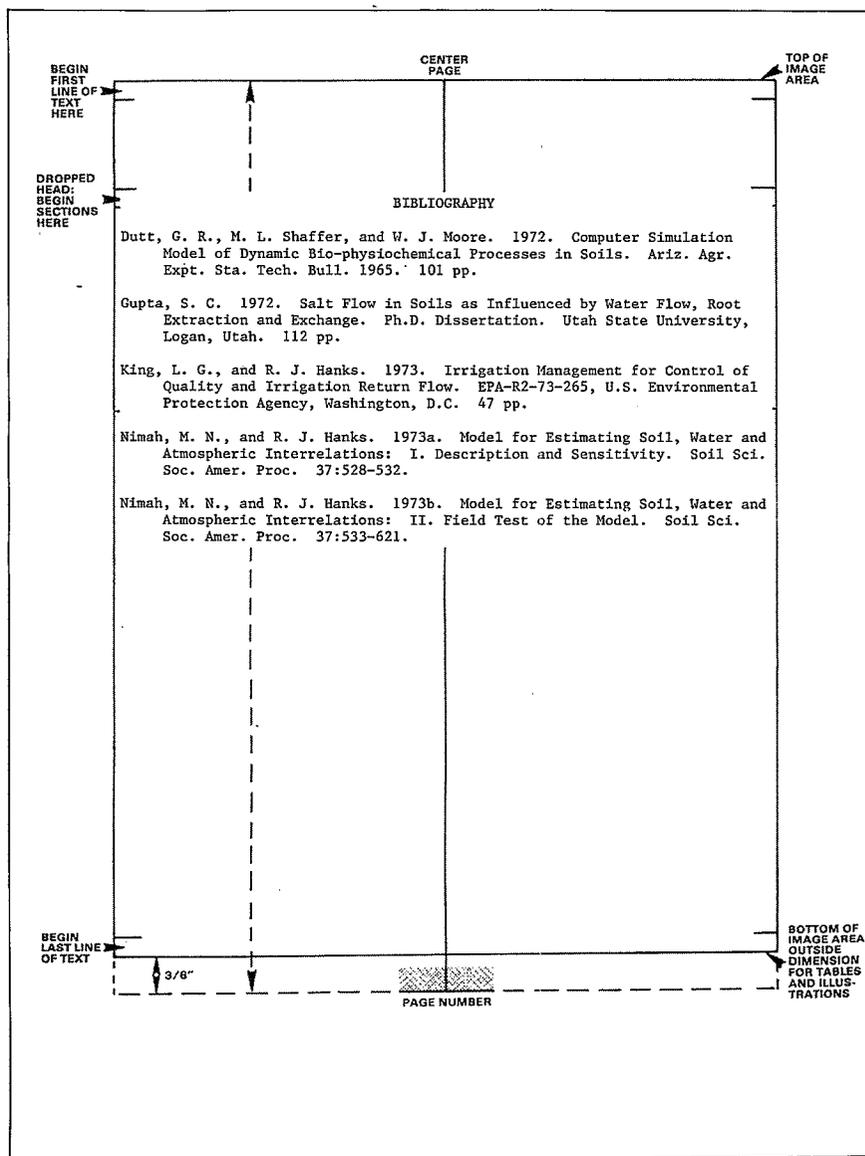


Figure 9. Bibliography.

**Glossary**

The glossary should be considered as a partial dictionary where technical or abstruse terms that might not be readily known can be listed and explained. Its need might well depend on the intended audience for the report.

**Index**

Instructions on indexing can be found in the *CBE Style Manual*, Council of Biology Editors, Committee on Form and Style, (available from American Institute of Biological Sciences, 3900 Wisconsin Avenue NW, Washington, DC 20016) or in *A Manual of Style*, University of Chicago Press, Chicago, IL.

**Project Reports**

Project Reports provide the means by which most EPA research is documented and made available to the research community. Project

Reports are required when (1) neither a journal article nor an EPA Research Report is produced, or (2) the journal article or EPA Research Report published is incomplete in terms of fully documenting the project or would require additional background data to survive rigorous scientific challenge.

Project Reports should follow the general format and organizational requirements discussed in this *Handbook*.

However, since the major distributor of project reports is NTIS, their guidelines are used to establish minimum requirements for camera-copy quality. Camera copy of project reports submitted to ORD for distribution through NTIS only must therefore conform to the following minimum provisions:

- The camera copy must be an original, not an office copy.
- It must be typed on 8-1/2 x 11 inch white paper.
- All ink must be black.
- All computer printouts must be highly legible originals.
- All pages must be numbered and accounted for.
- All pages of copy must be set to size (NTIS makes no reductions).
- All photos are to be stripped in place and affixed to the camera copy. Photos must be screened for good reproduction.
- An approximate 7-1/2 x 9 inch outer margin should be used for all copy.

### **Project Summaries**

The Project Summary is a condensed version of the Project Report and serves to announce to the scientific and technical community the availability of the Project Report from NTIS. It is similar to a short journal article and contains enough information for the reader to determine if he or she is sufficiently interested in the project to purchase the complete report from NTIS. Therefore, the Summary should present a concise synopsis of the key findings of the research project. Although ORD requires that a Project Summary be prepared for every Project Report, one Summary may be written for several closely related Project Reports which are produced concurrently. This option is at the discretion of the Project Officer. The approved hard-copy draft and disk of the Project Summary will be formatted on the desktop publisher, printed, and distributed to appropriate audiences by EPA.

CERI will handle production of all Project Summaries. The final draft of the Summary along with the disk copy must be sent to CERI with the Project Report.

The Summary should consist of double-space typed, error-free final draft of no more than 21 pages in length, highlighting principal findings and conclusions and including only the tables and illustrations which serve to summarize significant results. In order of appearance, it should be composed of the following:

- Title, identical to the title of the Project Report it summarizes. In the case of one Project Summary describing several closely related Project Reports, the title should be as closely linked as possible to the Project Report titles.
- Abstract—200-250 words (usually a duplicate of that required for the Technical Report Data sheet, EPA Form 2220-1)
- Introduction
- Procedure

- Results and Discussion—methodology, evidence, and analysis
- Conclusions and recommendations

The limited use of figures and tables is recommended. Figures (schematics and/or photographs) must be clean and reproducible prints, not to exceed 6 x 8-1/2 inch size. Photographs must be glossy black and white. Figures and photographs must be numbered to correspond with the text and must be captioned. If orientation is questionable, indicate top of photograph on back side with soft-tip marker. Tables should be organized for maximum clarity and ease of interpretation. Each table must have a caption and must be referenced in the text.

The use of references is discouraged. The complete list of references is included in the Project Report, but only those that are considered **essential** to the presentation should be included in the Project Summary.

## Research Reports

The Research Report is a book-length presentation of the best of EPA/ORD's research findings. These reports are normally the most authoritative results of a research project on a critical area of interest in which the Agency is involved. Due to the definitive nature of information presented in a research report, these products are expected to have a relatively long shelf life and, as such, their entire presentation is keyed to reflect their permanence and credibility.

## Presentation

The Research Report, therefore, is formatted to the extent possible in classic textbook style—clean and understated. It is produced in either of two page sizes, an approximate 6 x 9 inch page size with a single column format or an 8-1/2 x 11 inch page size with a two column format. CERL should be contacted for advice and specifications for the preparation of research reports.

## Content

A Research Report will fit into one of two broad categories: investigative or expository. In a standard *investigative report*, results and conclusions, the evidence to support them, and the evaluation of that evidence are the most important inclusions. The background of the project and the methodology used should buttress the results and recommendations. The body of an investigative report should be structured as follows:

1. Introduction
2. Conclusions
3. Recommendations
4. Methodology
5. Evidence and analysis

The introduction should focus on the hypothesis or problem which the report "solves." Conclusions and recommendations should be placed before other matter in the body of an investigative report, because this allows the reader ready access to the full scope of the project. Methodology, evidence, and analysis may be interwoven or discussed separately, as logic dictates.

An *expository report* sheds additional light on a topic or an area of high interest about which information is lacking. It is more "literary" or discursive in nature than an investigative report, in the sense that its structure is not bound by the scientific method. Its organization is therefore looser than that of the investigative report; however, where possible, it should contain the same format elements as the investigative report.

The text of a Research Report will be heavily weighted in favor of explanatory copy and will not contain large volumes of back-up and unedited data, repeatedly used illustrations of government or other organizational forms, or verbatim reprints from or transcripts of other printed information sources (e.g., the *Federal Register*). These inclusions would detract from the classic format of the book, run up the cost excessively, and are more appropriately referenced as secondary sources than printed. All background materials should be footnoted or referenced where appropriate to enable the reader to locate them in the library, through NTIS, or through the appropriate information data base.

The following kinds of material *must* be documented or referenced as background:

1. The source of a significant and original statement.
2. The source of information not sufficiently familiar so that most readers would know it or be able to find it readily.
3. The sources of controversial matter and opposing views.
4. Details, data, or statistics that would interrupt the text.

The effective use of appropriate referencing and footnoting techniques is absolutely necessary as a means of increasing the credibility of the document and enhancing the objectivity of the presentation. Careful documentation suggests that a research project has been thoroughly investigated. Referencing systems do, of course, vary from scientific discipline to scientific discipline, but each annotation must be complete and the chosen referencing system must be used consistently.

#### **Front Matter**

The front matter of a Research Report will include a Notice\* required by the Peer Review System and a table of contents. An acknowledgement page and a foreword or preface are recommended but optional. The title page will show the publication date and EPA/600 number, the title, the primary author(s) or editor(s) and their affiliation, the EPA project officer, and the originating laboratory or office within EPA/ORD.

\*The "Notice" should read:

This document has been reviewed in accordance with U.S. Environmental Protection Agency policy and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

#### **Proceedings**

A Proceedings is usually a report derived from prepared paper presentations as well as from the questions, answers, and general discussion at conference sessions.

Camera copy for each manuscript should be prepared in a uniform style and format by each speaker.

All preliminary pages, text, any figures and tables, footnotes, references and bibliographies will conform to general format requirements stipulated in this *Handbook*. Each paper will follow the typing specifications detailed in Figure 10 (a through f).

#### **Applications Guides**

Applications guides are instructional guides which are appropriate and cost-effective information products when there is a strong need for a large number of people to apply a given technology or methodology and when the only available information on the topic is dispersed over many

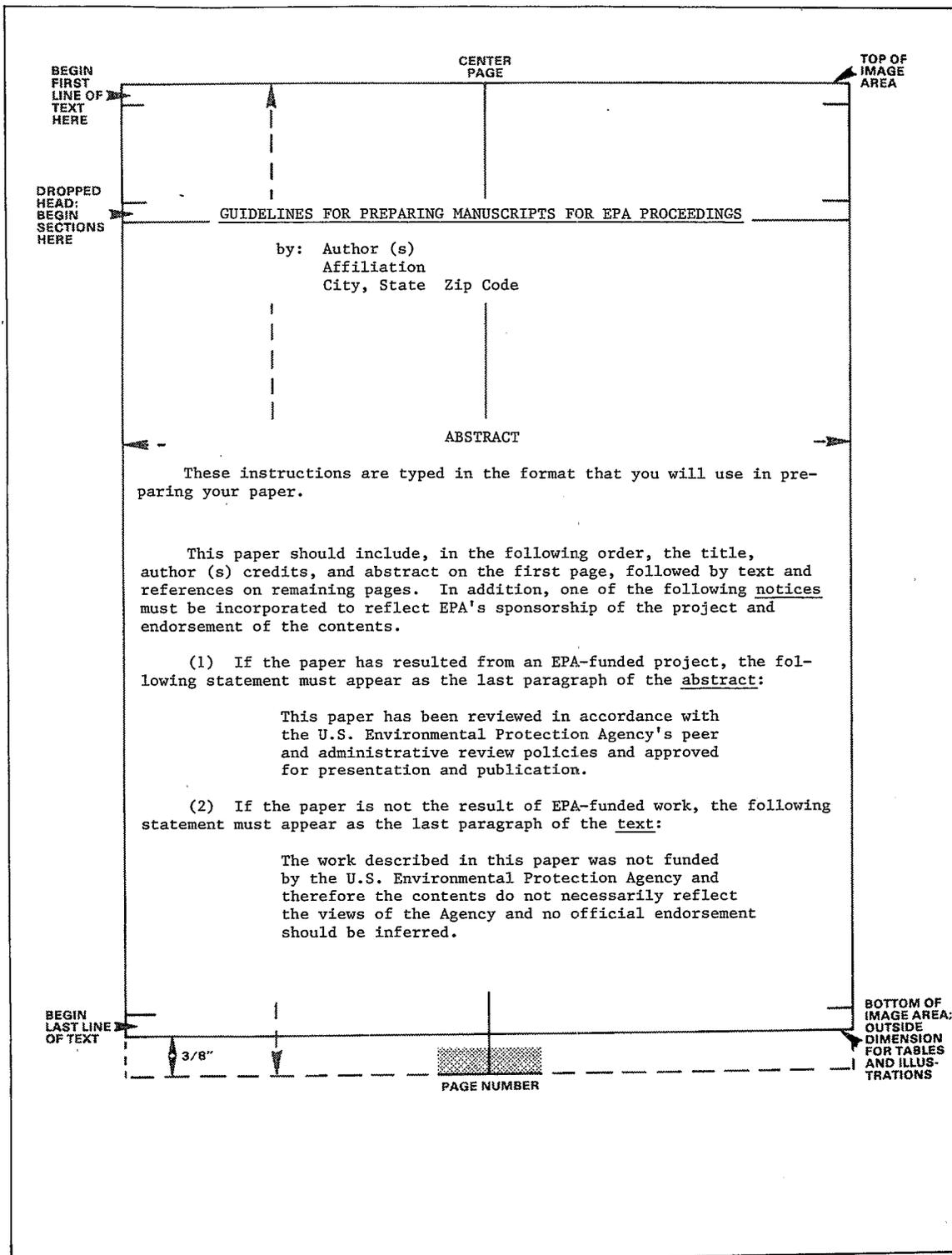


Figure 10a.

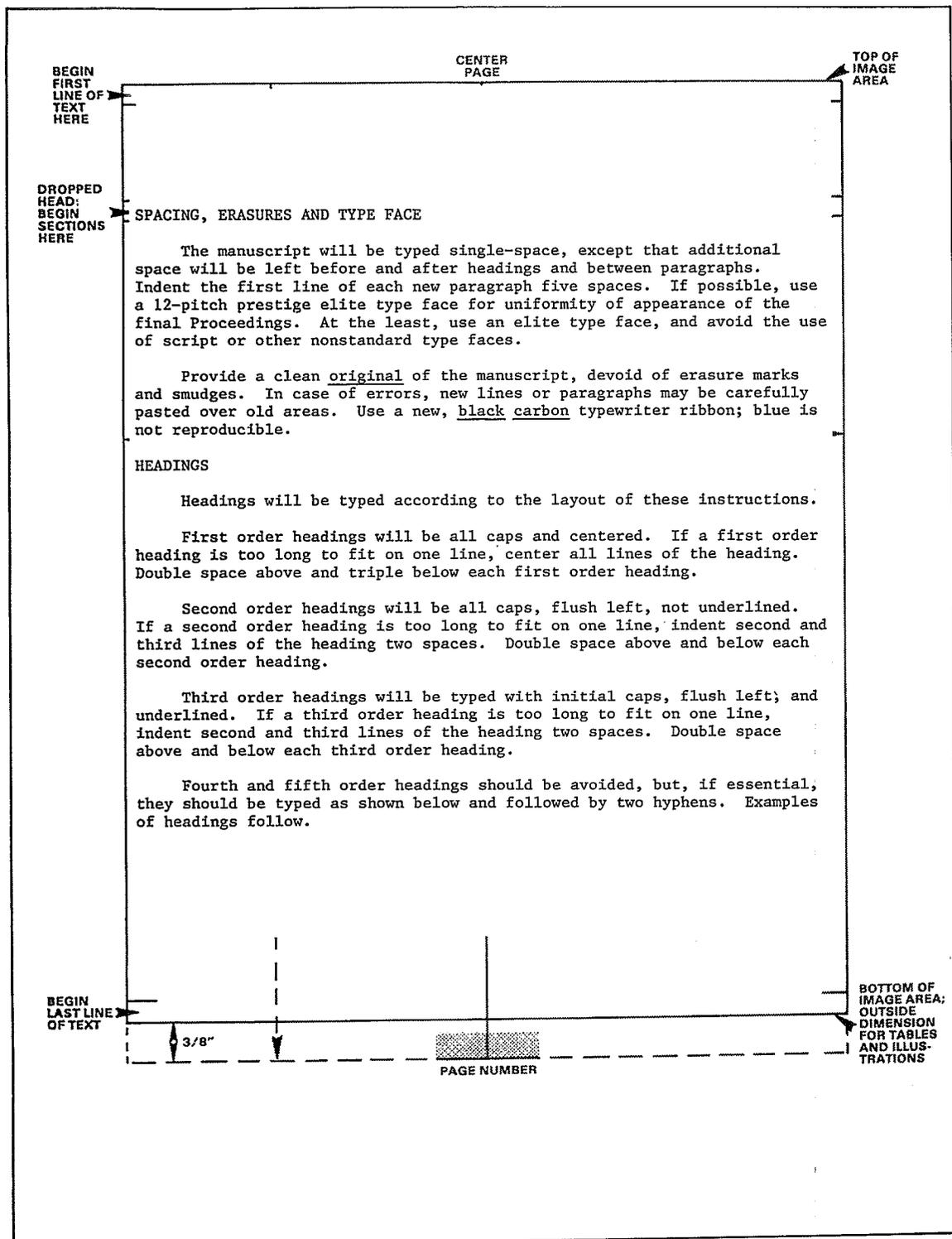


Figure 10b.

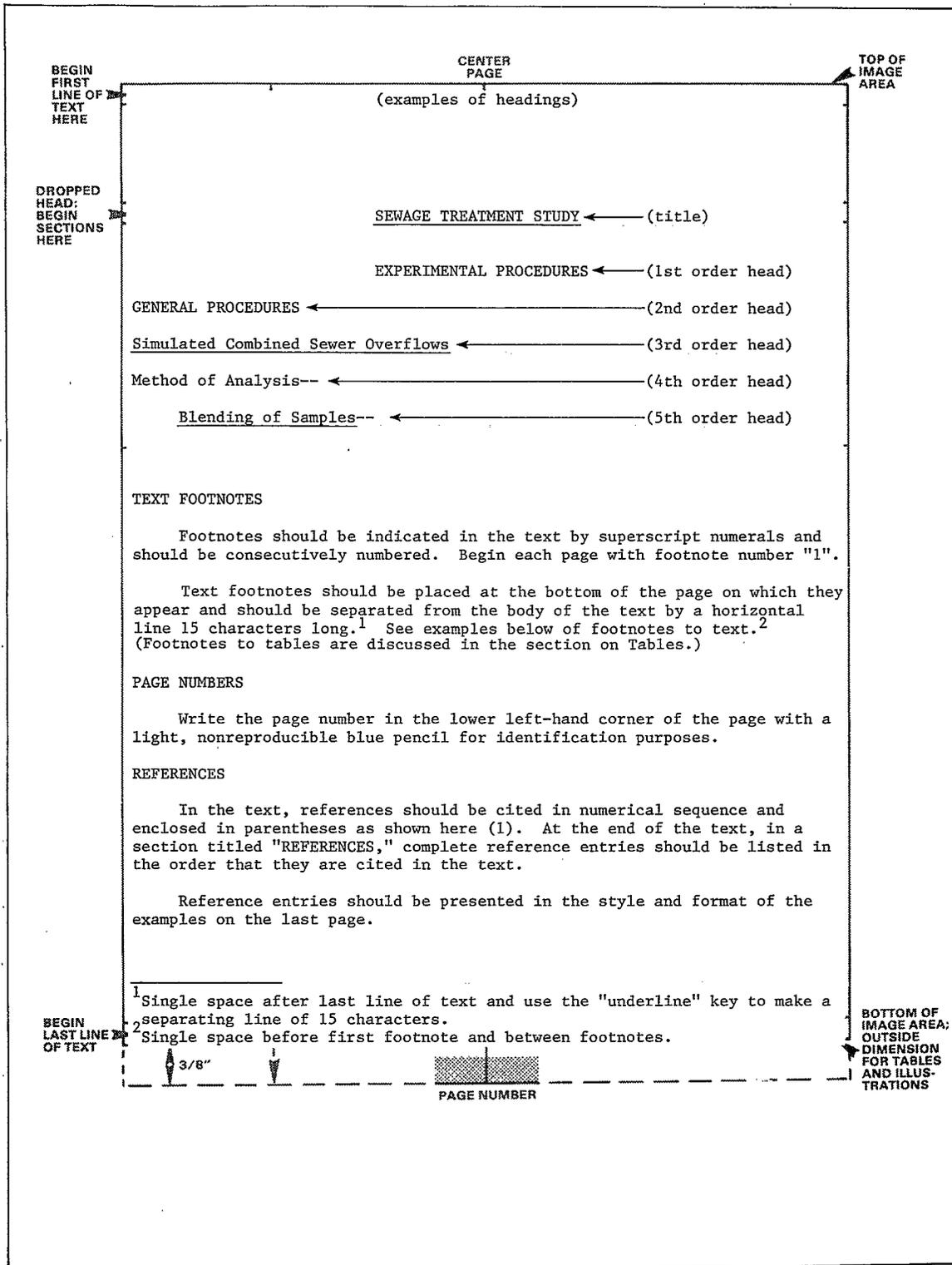


Figure 10c.

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FIGURES

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All figures will be reproduced exactly as submitted and must be placed in the proper position on the page and mounted exactly as you want them. No foldouts are permitted.

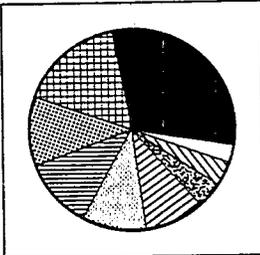
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Figures should be drawn using black ink on white paper. Use heavy lines which remain legible after you reduce them. Do not use small details, like tiny circles, that will fill in or bleed during printing. Keep illustrations simple. Do not submit hand lettered graphics.

Do not use grid paper for graphs. Instead, use "tic" marks along the edges of the graph at the major divisions of the graph.

Each figure must have a descriptive legend, which should be placed directly below the figure (see example). Spell out the word "figure" in the text and legend. Center the legend beneath the illustration following the figure number and indent the second line immediately below the first line. All figures must be referenced in the text. The figure should follow its mention in the text as closely as possible. Do not use footnotes with a figure; make this material part of the legend or text.

For proper reproduction, figures using photographs should be clear, glossy, black and white prints with good contrast. Photographs must be sized and cropped to fit within the image area. Include space for the legend, which should be typed on the paper in the proper position.



■	manufacturing	30.7%
▨	trade	16.2%
▩	government	11.5%
▧	finance, insurance, real estate	10.1%
▦	services and other	10.1%
▥	transportation, communication, utilities	9.2%
▤	farm	4%
▣	construction	4.1%
▢	mining	3%

Figure 1. Sectoral contributions to ORBES gross regional product.

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Figure 10d.

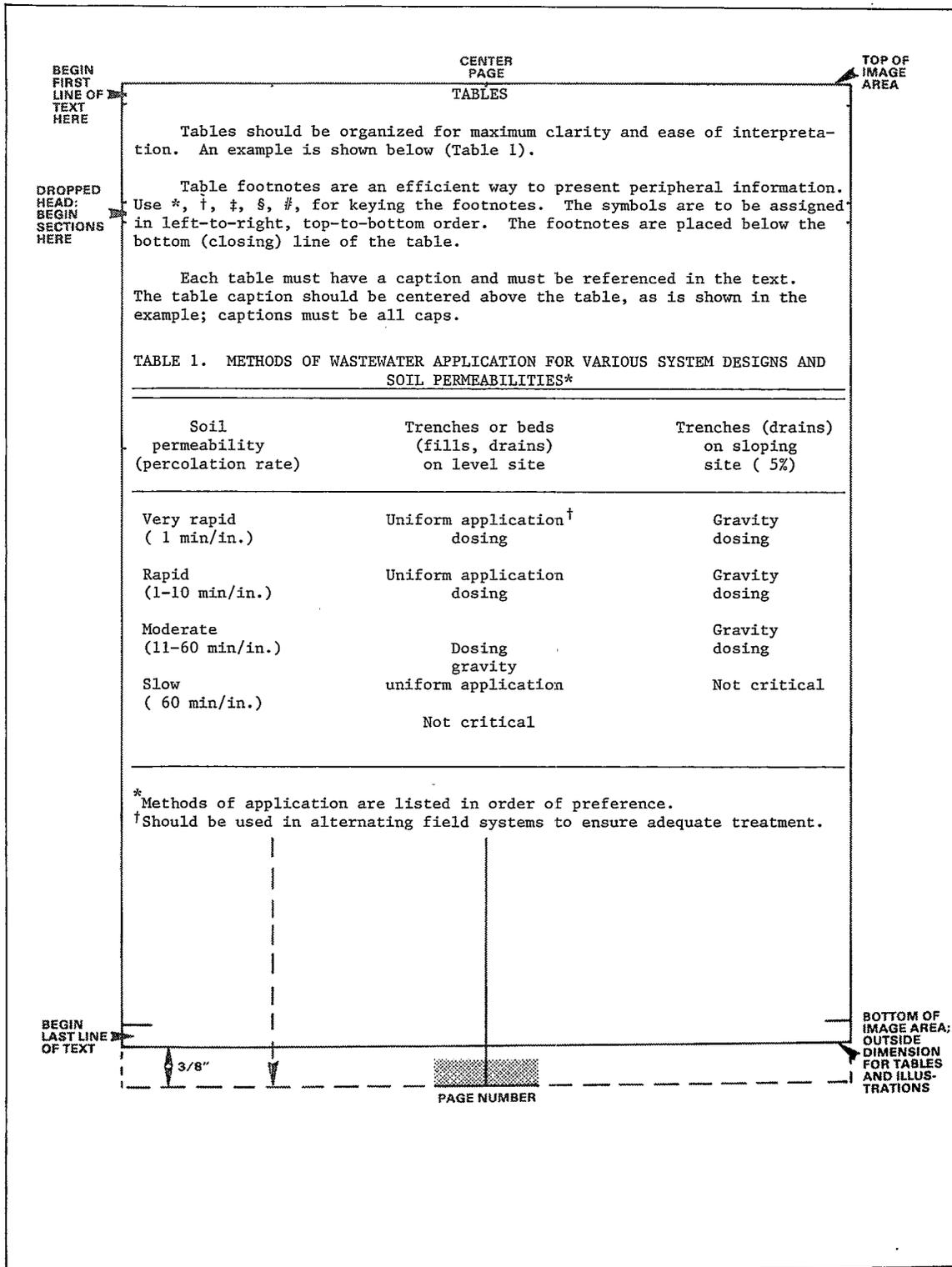


Figure 10e.

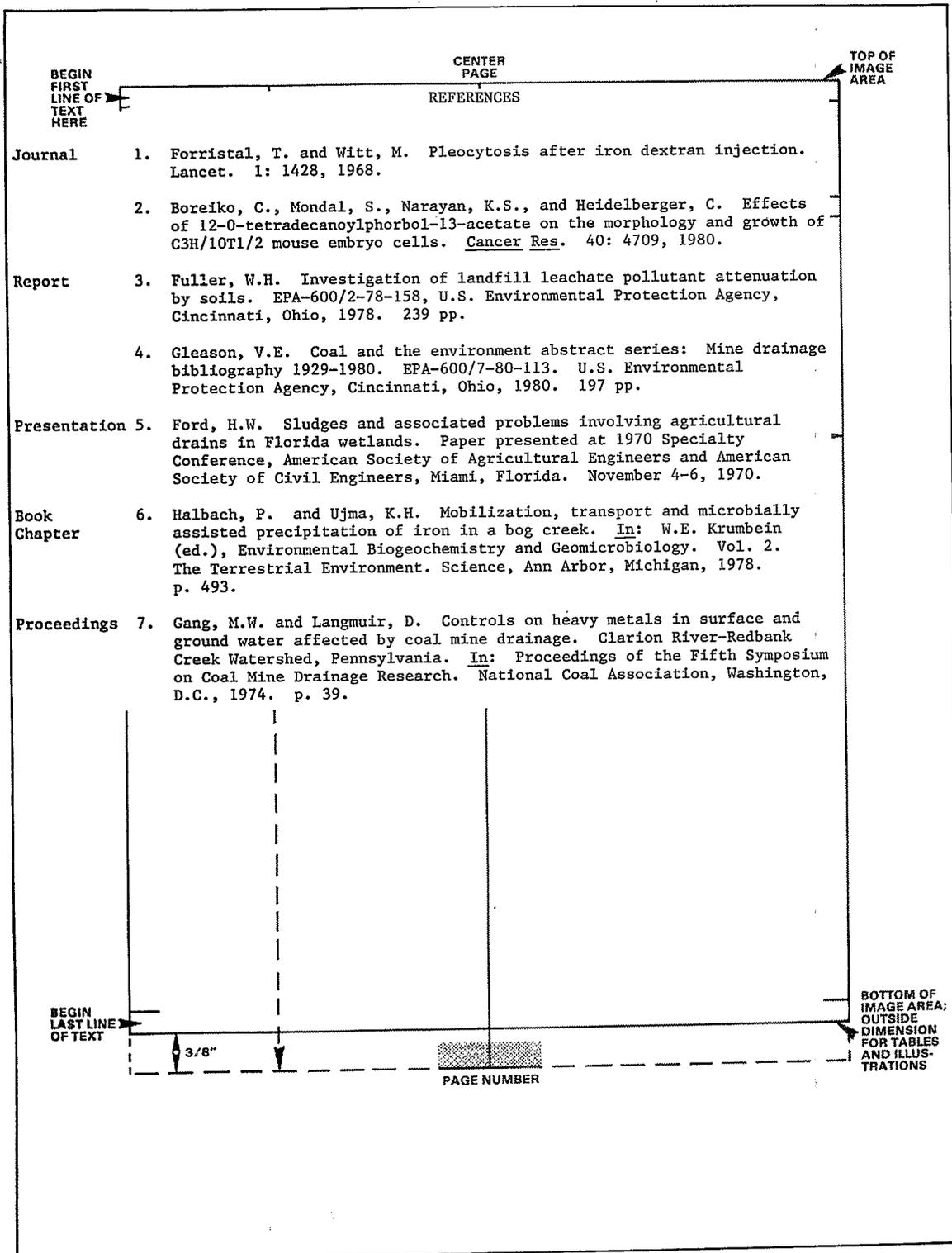


Figure 10f.

sources. They are intended to be used to direct a course of action or to solve a particular environmental problem. The information and data contained in these reports are presented in a well-constructed format, and the language is straightforward and precise. Extensive use is made of tabular material and graphic illustration to ensure that concepts or procedures are clear.

Each specific type of applications guide is described as follows:

- A *design manual* is a comprehensive, specific description of a new technology or methodology applicable to a particular environmental problem. It is intended to guide the user through major steps of the process of creating, constructing, and maintaining a particular technology or technique.
- A *handbook* is a broad collection of information, statistics, data, and techniques which are proven both accurate and highly relevant to a particular subject area.
- A *user's guide* explains and describes, step by step, how to employ an ORD-developed procedure, piece of equipment, model or program.

*Report  
Organization*

The major elements that should appear in these reports are the same as those required for all ORD reports. The manual, handbook, or user's guide should fulfill the general format requirements described in this *Handbook*. CERL should be contacted for advice and specifications for the preparation of applications guides.

The contents and organization of the body of a report shall be determined by the nature of the work. However, limit the contents to that information required to inform the reader. Eliminate unnecessary details, appendices, and pages to reduce primary and secondary reproduction costs and to expedite review, approval, printing, and distribution.

*Headings*

All headings will be numbered; e.g., first-order headings, 1; second-order headings, 1.1, 1.2, etc.; third-order headings, 1.2.1, 1.2.2, etc.; on through fourth-order headings.

*Tables*

Tables can help clarify the text for the reader as well as present data that cannot easily be given in the running text. Many tables, however, appear to be assortments of data. It is the responsibility of the writer to ensure that tables are pertinent and that they can be deciphered by the intended audience. If the tables require the stacking of more than two "layers" of headings, vertically, and several layers, horizontally, the table is too complicated for the reader and should be split into two or more tables, or reorganized, or simplified by the elimination of some of the data.

Tables should be placed on the page in regular orientation wherever possible. Tables typed broadwise on the page should be kept to a minimum. Instead, split tables into parts and put them on facing pages; split into two or more tables; or reorganize them so that they can be oriented differently. **Do not use fold-out tables.**

Do not reduce tables beyond legibility; type should be at least 6-point size in the body and footnotes.

1. Titles are in caps centered above the table. The word "TABLE," in caps and the number (assigned according to chapter and order in which it occurs in the chapter) are to be centered above the title.

2. Footnotes are cited by means of superscript lower case letters; separated by double space; begun with an initial cap and closed with a period.
3. Center columns under headings; align on decimal.
4. Double space between horizontal entries.
5. Combine tables with text when possible.
6. Vertical lines should not be used.

### Figures

Because good illustrations enhance the value of technical reports, use them to emphasize, demonstrate, and summarize. Treat illustrations consistently throughout the document.

1. Place illustrations closely following their first reference in the text; combine with text when possible.
2. All figures are to be self-explanatory. The text must carry a reference to each figure used. When one or more sources are cited for figures, the text should carry reference numbers and the figure title should also carry those reference numbers.
3. Figure captions should be limited to one sentence where possible; also, the use of notes should be restricted. If notes are necessary, include the note in the title within parentheses or within the frame of figures.
4. When photographs (half tones) are used, only high-contrast black and white glossy prints will be accepted; they should be pasted in place, or if oversized, should be mounted, cropped, and marked for reduction.

### References and Footnotes

The following kinds of material *must* be documented or referenced as background:

1. The source of a significant and original statement.
2. The source of information not sufficiently familiar so that most readers would know it or be able to find it readily.
3. The sources of controversial matter and opposing views.

Present references in an accurate, uniform manner, at the end of each chapter; cite references in text in parentheses. Number them consecutively as they appear in the text. Use a style consistent with that of any reputable scientific or technical journal or society. Include all essential elements of a reference: author(s), title, source, identifying numbers, pages, dates. Cite footnotes by \*, \*\*, †, ‡, etc.

### Pagination

Number the front matter of the report consecutively with lower case Roman numerals. The preface and the contents must begin on an odd-numbered (right-hand) page.

Each chapter in the body of the report and each appendix may be numbered non-consecutively. That is, each chapter may begin with a new page 1, and the chapter number may be used as the prefix designator (e.g., 2-1 would indicate page 1 of Chapter 2).

### Mathematical Style

Define mathematical symbols at their first use. When mathematical formulas and equations are numerous, furnish a separate listing of symbols used.

Equations—short, simple equations, chemical or mathematical, should be treated as part of the text. When possible, type simple fractions on one line, using a diagonal fraction bar (solidus) and parentheses and/or brackets to avoid ambiguity; e.g.,  $1/(a + b)$  not  $1/a + b$ .

Equations and formulas that require special symbols, positioning, or brackets should be typed on lines by themselves, centered on the width of the column of type with one line above and below the equation or formula. Break equations before an equal, plus, or multiplication sign. Align a group of separate but related equations by their equal signs and indent or center the group as a whole. Such equations should be numbered with the equation number within that chapter; e.g., 1-1, 2-4, 3-5, etc. Numbers are enclosed within parentheses and typed flush right.

### **Technology Transfer Reports**

Technology Transfer Reports have long been one of ORD's most popular forms of communication with the technical applications community. Generally, these reports are summaries of significant regulatory or control technology developments, for example, Environmental Regulation and Technology Reports and Capsule Reports. These reports are especially suited for providing an audience with a succinct, accurate overview of a complex subject.

Technology Transfer Reports are initiated by individuals within a laboratory or an office director's office, who are responsible for notifying the CERL staff when there is a technology development that merits reporting in the technology transfer series.

CERL is responsible for the preparation of these reports and will work closely with personnel in the laboratories and offices as the text is drafted and the appropriate format, artwork and photography are developed.

### **Environmental Research Briefs**

The Environmental Research Brief is another published product designed to keep the research and technical community abreast of current research status based on information resulting from EPA activities.

Any laboratory/office may produce an Environmental Research Brief. CERL will coordinate editing, graphics, layout, production, and distribution of the product.

Briefs should be kept as short as possible and will range from four (nine draft pages) to eight typeset (21 draft pages) 8-1/2 x 11 inch. Tables and illustrations should be included only if essential to the clarification of the text. References are permitted but should focus on the topic of the Brief.

### **Internal Reports**

The Internal Report is a mechanism for providing research information in response to a request from an EPA office.

Format may vary greatly—from a memo, to a set of aerial photographs and interpretive keys, to a typical Project Report—depending on the request and urgency of the need.

