Oregon State Board of Geologist Examiners

Geologic Report Guideline

Second Edition
May 30, 2014

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BACKGROUND ON THE BOARD AND PURPOSE FOR GUIDELINE

A. Board Mission and Authority

The Oregon State Board of Geologist Examiners (Board) is charged with regulating the practice of geology within the State of Oregon. Geology is defined in Oregon Revised Statute (ORS) 672.505(6) as "that science which treats of the earth in general; investigation of the earth's crust and the rocks and other materials which compose it; and the applied science of utilizing knowledge of the earth and its constituent rocks, minerals, liquids, gases, and other materials for the benefit of humanity." Public practice of geology is defined in ORS 672.505(7) as "the performance for another of geological service or work, such as consultation, investigation, surveys, evaluation, planning, mapping and inspection of geological work, that is related to public welfare or safeguarding of life, health, property and the environment…", and this guideline elaborates on just what that means.

Based on its statutory direction, the mission of the Board is to help assure the health, safety, and welfare of Oregonians with regard to the public practice of geology through:

- Licensing of those engaged in the public practice of geology;
- Response to complaints from the public and members of the profession;
- Public education directed at appropriate regulatory communities;
- Cooperation with closely related Boards and Commissions;
- Attention to ethics; and
- Systematic outreach to counties, cities, and registrants.

The Board works to achieve this mission through focused efforts in all these areas. The public is best protected if the Board ensures that: (1) only individuals fully qualified by education, experience, and examination are granted the privilege by registration to publicly practice geology in Oregon, (2) relevant laws and rules are regularly reviewed, with needed revisions promulgated expeditiously; (3) enforcement of regulatory laws and rules is pursued vigorously and impartially; and (4) information regarding the Board's goals and activities are effectively available to registrants and the public.

B. Purpose for Guidance Document

The Geologic Report Guideline is intended to encourage best practices in the public practice of geology in Oregon. Such best practices optimize and support protection of Oregonians and their interests. To this end, the guideline is intended as a tool for the preparation, use and review of geologic reports. The guideline proposes recommended contents and suggested formats for reports and attempts to incorporate the major topics normally encountered in such studies. This guidance does not include a detailed theoretical or technical background to each area of geology addressed. Possession of the technical proficiencies required to prepare such reports is the responsibility of the geologist author. The actual scope of services documented in a geologic report also will vary depending on the level of detail, accuracy, and complexity needed for the intended application.

The practice of geology encompasses multiple sub-disciplines and the resulting geological report may vary from these guidelines. See also the Board's Guideline for Preparing Engineering Geologic Reports and Hydrogeologic Report Guideline.

C. Acknowledgements

The first edition of this guidance document was prepared by a dedicated group of Oregon Registered Geologists (RGs) who volunteered their time under the auspices of the Board in 2006 and 2007. This second edition was prepared by the Board, with Board Vice Chair Kenneth Thiessen (E1177) serving as editor. The second edition is strongly based on the first edition but has been revised based on input from Board members, Board registrants, Board staff, and other public participants.

GEOLOGIC REPORT CONTENT AND PREPARATION

Table of Contents

1.0 INTRODUCTION TO PARTS OF A GEOLOGIC REPORT

Regardless of intent, reports containing geologic interpretation as part of the public practice of geology must be signed and sealed by an Oregon Registered Geologist (RG, here after called geologist) (ORS 672.505-705 and OAR Chapter 809 Division 50). The following items are generally expected in any geologic report prepared as part of the public practice of geology:

- Identification of data sources with proper citations
- Explicit delineation of assumptions, interpretations, and professional judgments used in the study and report
- Conclusions and recommendations based on defensible scientific practices and supported by information and data
- Discussion of applicable regulatory matters

The content of a geologic report will vary in accordance with the needs of a specific project. However, topic sections that are commonly utilized and discussed in this guideline include:

- Geologist Signature and Seal
- Title Page
- Abstract or Executive Summary
- Introduction
- Regulatory Framework
- Procedures and Methods
- Background and History
- Physiographic Setting
- Geologic Setting
- Data Presentation
- Data Discussion
- Data Sources and Limitations
- Data Discussion
- Conclusions and Recommendations
- References and Data Sources
- Appendices

While it is common practice to include figures and tables as appendix items, it is helpful to place them in the body of the text as near the point of reference as possible. This is especially important in large documents with multiple volumes. The Data Discussion section presented in this Guideline can be used as a reference for preparation and use of figures and tables wherever in the document they are presented.

2.0 GEOLOGIST SIGNATURE AND SEAL

The geologist's seal (stamp) and signature must be placed at a location such that they represent the geologic report. This can be either on the title page, a separate signature page, or another location, which indicates that the registrant is responsible for the entire contents of the report. If multiple volumes are required for a single report, only the main or initial volume needs to be stamped and signed by the registrant. Similarly, technical letter reports and memos involving the public practice of geology in Oregon must be properly stamped and signed. Use of a geologist seal and signature requirements are described in ORS 672.607 and OAR Chapter 809 Division 50.

3.0 TITLE PAGE

A Title Page typically includes the following:

- Document Title
- Date
- Author(s)
- Seal/Signature
- Document number (if applicable)
- A regulatory agency file number (if applicable)

Other project-specific information may be included on the Title Page. If not displayed on the Title Page, the geologist signature and seal must be easily located and prominently displayed.

4.0 ABSTRACT OR EXECUTIVE SUMMARY

Geologic reports may include an Abstract or Executive Summary section, depending on project objectives. An abstract's main purpose is to present highlights of a report or article. Abstracts are more commonly used in scientific journals but may also be applied to unpublished reports. An abstract is usually brief, limited to a few sentences or a few short paragraphs and gives the reader a synopsis of the purpose, methodology, results, and conclusions.

An Executive Summary is a one or two page condensed version of the report. Sufficient information is presented in the Executive Summary to give the reader an overview of the report contents and conclusions. Usually it states the purpose, presents essential background data, and closes with a brief statement of conclusions and recommendations.

5.0 REPORT INTRODUCTION

The Introduction section sets the stage for a geological report's organization and scope and indicates the purpose of the document. The Introduction is the "what" and "why" section of the report.

The Introduction needs to present sufficient background information such that the reader understands the nature and scope of the project, the purpose and approach of the geologic assessment, methods used, and the dates of the study. The Introduction may also discuss previously collected data and present a site location map. This is also a good section to identify funding sources for the completed work.

Several subheadings may be necessary in the Introduction depending on the length or complexity of the report. One such subheading may be a purpose statement to help the reader concentrate on the main points of the document and to provide a starting point and end goal.

The purpose of most geologic reports is to disclose and evaluate geologic conditions, and to provide a framework for evaluating the effects of recommendations or proposed actions.

6.0 REGULATORY FRAMEWORK

Many geologic projects involve oversight and guidance by regulatory agencies, planning departments, water supply departments, or other municipal organizations. It is therefore important for the geologist to identify the regulatory framework of the project, governmental or jurisdictional authority, and stakeholders of the project. Some geologic reports are required to follow specific formats or requirements of an agency or municipality. The geologist needs to be cognizant of any such requirements.

7.0 PROCEDURES AND METHODS

Geologic reports are generally prepared using data collection techniques, methods, and procedures that follow best practices of the profession. Innovative and project-specific procedures and methods should be described. The report should list the dates when the work was performed, the dates of data collection, review dates, the seasons of the work, and a chronology of project events. Within the Procedures and Methods section, the geologist needs to describe these parameters in sufficient detail so that a reader can easily understand them.

The Procedures and Methods section may provide a synopsis of data collection, data sources, and data limitations detailed elsewhere in the report.

8.0 BACKGROUND AND HISTORY

The Background section presents the geologic history and geographic location of the study area. The geologist should give particular attention to relevant geological aspects of the current work. Sufficient detail should be included such that a person could re-occupy the study sites. If site access is restricted, this should be stated in the report along with contact information necessary to obtain permission for additional site visits. Citations and ideas from previous work are credited and references are provided.

9.0 PHYSIOGRAPHIC SETTING

The geologist should provide a summary of the physiographic and geologic features of the study area. These physical characteristics may include topography, climatic conditions, vegetative characteristics, latitude and longitude, township-range-section, landmarks, political boundaries, geomorphic features, faults and seismicity, natural resources, water bodies, drainage patterns, and other physical features of the site and surrounding area. This section could also present anthropomorphic data, such as land use(s), community development, agriculture, and effects of human activity.

10.0 GEOLOGIC SETTING

The geologic setting includes a discussion of features and processes that are relevant to the scale and focus of the geologic study. This section is the core of the geological report and will typically provide data from field observations of rock units, landforms, and structural observations. Include a general statement on the system used for the area such as lithostratigraphic, biostratigraphic, or time-stratigraphic rock sequence organization. Geologic history of study area based on observed structures, rock types, alteration, unconformities, and stratigraphy. Enough information is provided to support current analyses and conclusions. As with all sections of this Guideline, provide citations of relevant previous work.

10.1 Description and Lithology of Rock Units

Lithologic descriptions are typically limited to the macroscopic nature of the mineral content, weathering state and alteration, grain size, texture, and color of in-situ sediment or rock. This classification is based on field observations and physical properties that are confirmed by field and laboratory testing, and published geologic maps and reports. The observation of in-situ samples in the field is usually described from outcrops, hand samples, or cores collected during drilling. Physical properties are generally reported as measured data.

Field descriptions of the rock types in a study area typically include color, degree of weathering, grain size, texture, mineralogy (to the extent possible), structural discontinuities (i.e., veins, joints, fractures), and other pertinent features.

The geologist identifies rock types in the study area and may use this information to address project data requirements and rock sequence classification. Classification of rock types from the study area, and their organizational sequence will likely to be obtained from previously published geologic maps and reports. If detailed chemical or petrographic analyses are performed, a summary of these results, including laboratory data and/or photographs, would be included. Consider inclusion of other data useful for understanding the study area rock units such as geometry of lithostratigraphic units, fossils and their biostratigraphic significance, facies changes, paleomagnetic data, or radiometric data.

The geologist should consult available reference materials such as reports and maps published by the U.S. Geological Survey, the Oregon Department of Geology and Mineral Industries, field trip guides, or symposia proceedings. Soil classification systems are applied where technical concerns include soil classification. The geologist also may include references that support the report being presented. This may include a glossary of terms or a symbols legend, or more detailed descriptions of methods such as rock core evaluation or petrography.

10.2 Stratigraphy

The regional stratigraphy needs to be described in sufficient detail to support the project objectives including names (with citations) of formal or common stratigraphic units. The geologist should adhere to standards for stratigraphic terminology and codes, which may include: Ashley and others (1933); American Commission on Stratigraphic Nomenclature (1961, 1970); and the North American Commission on Stratigraphic Nomenclature (2005). The stratigraphic codes provide a basis for classifying rock units and correlating their spatial and temporal occurrence. The term “stratigraphy”, as used in this document, may be applied to lithologic descriptions of both rock and unconsolidated material.

Stratigraphic units may be described in columnar sections or descriptive logs. The most common stratigraphic logs are those from observations made during subsurface drilling. The written description and correlation of stratigraphic units within reports can be supported with cross-sections or fence diagrams. The author may include copies of boring logs and mapped stratigraphic columns in a report Appendix to provide evidence for lithologic descriptions and stratigraphic correlation.

If geologic formation names are used in the stratigraphic description, the geologist must include evidence supporting such designations.

10.3 Structure

Structural geology relates to large-scale deformation patterns such as folding, regional jointing and faulting, but may also include more subtle indicators of strain such as slickensides, foliation, bedding attitudes and sediment deformation. This subsection describes the overall spatial relationship of rock; however it is also important to describe deformational features of unconsolidated sediment. The degree of precision and method of measurement of original structural data collection should be stated.

If applicable, the report identifies regional structural trends and the interrelationships of principal structural features. Pertinent information for each fault, such as age of activity, strike, sense of displacement, distance from the project site and other available information should be presented.

Folding of rock and sediments can often result in unfavorable bedding orientations that contribute to slope failures. Bedding attitudes are commonly relevant and are plotted on the project base map. This may include field measurements, descriptions, and/or numeric calculations.

10.4 Geomorphology

Provide data on observations of erosion surfaces in study area, relic landforms attributable to erosion, effects of climatic changes on landforms, and other effects of weathering.

10.5 Geologic History

This section could include a chronological interpretation of geological processes in the study area, including structures and geologic evolution of the landscape.

11.0 HYDROGEOLOGY

Hydrogeology is a specialty of geology focusing on the occurrence, availability, productivity, movement, and chemical quality of groundwater. The geologist may need to include a treatment of the hydrogeologic setting with identification of aquifer systems, their water quality, importance, and use. For projects where hydrogeologic information is pertinent, the summary of hydrogeologic setting of the study area would generally include a description of the aquifer system, depth and gradient of groundwater, known groundwater quality, depths of aquifer(s), aquitards(s) and less-permeable zones, production yields, and/or other characteristics applicable to the geologic study.

The Oregon Water Resources Department retains well drilling logs and water well construction details that may enhance understanding of the hydrogeologic setting, with additional information pertaining to groundwater depths and lithologic units.

If the primary focus of the geologic report is hydrogeology, the Board's “Hydrogeologic Report Guideline” is a useful resource for report preparation.

11.1 Surface Water Hydrology

The location and hydrologic characteristics of surface water features are important components of the regional geomorphic framework. Hydrologic setting includes a description of the site relative to streams and the nature of geologic hazards from flooding and stream bank erosion. The geologist should describe the history of site flooding, flood frequency, potential flooding risks, and damages associated with flood stage and duration. In this discussion, the geologist would reference any stream gage assigned an official U.S. Geological Survey hydrologic unit designation.

12.0 DATA COLLECTION METHODS

This section describes the methods used for collecting and processing data presented in the report.

12.1 Site Reconnaissance

The geologist should summarize observations and conclusions made during geologic reconnaissance of the site. The summary typically includes the date(s) of the site visit(s) and a description of observations. However, the geologist should also include information pertaining to access, surrounding land use, and other features that are important.

12.2 Field Mapping

Field maps are a common component of project reports, with some derived from direct field investigations and others synthesized from existing literature. Remote sensing techniques and tools useful for interpretation of landscape features include lidar and GIS mapping tools. The geologist needs to describe the methods and means used to produce the maps presented as figures or other analyses of the report. Additional recommendations are to: (a) Identify base map references and metadata if relevant, (b) Include the basis for field identification of individual features and stratigraphic units and include reference citations for published unit or formation descriptions as needed, (c) Provide a detailed description of the parameters used to differentiate individual stratigraphic units, and (d) Where possible, correlate observed field geologic characteristics to those presented in published literature, while distinguishing between observed and inferred features and relationships.

The geologist should also include a list of tools (i.e. GPS, Brunton compass, inclinometer, altimeter, survey equipment) that were used in the field and any problems that may have been encountered in their use.

12.3 Well and Borehole Logs

The drillers’ rig observations, lithologic logging, groundwater observations sand field oversight by a qualified geologist are fundamental to document well and borehole drilling activities. Well logs and borehole logs are typically submitted to the Oregon Water Resource Department (WRD) and become part of the state geologic database. Additional subsurface data can be provided to address project-specific questions on a separate log prepared by a geologist. If a well or borehole log is used for interpretation during the present study but was completed as part of another project, a copy of the log is included in the appendix with appropriate citation.

For geophysical logs, the geologist should summarize the purpose of the activity, the geophysical methods used, the depth intervals over which the logging was performed, the results, and data analyses. The geologist should also provide the names of the registered geologist providing oversight and individuals performing the geophysical data collection and interpretation work.

The description and identification of soil and rock materials documented by a registered geologist is generally presented in accordance with accepted standards such as the American Society for Testing and Materials, United Soil Classification System (ASTM D2487) or Standard Practice for Description and Identification of Soils (ASTM D2488). Drilling and sampling methods also are based on industry and state-accepted standards. The geologist would include a map of appropriate scale showing the locations of completed boreholes and wells and identifying those wells and boreholes completed before the current project. An appendix is recommended for inclusion of drilling data, lithologic, and geophysical logs.

13.0 DATA PRESENTATION

Data for a report are summarized in the text, tables, figures, appendices or some combination thereof. Before deciding how data are presented, the geologist needs to give careful consideration to the intended audience, the data being presented, and the message to be conveyed by the results of the investigation.

13.1 Text

The text of a report summarizes data collected during the project. Where justified, tables and figures are used to summarize the data. Tables and figures should not be included without reference and explanation in the body of the text. Data are presented in text format if they can be described succinctly in a few sentences or paragraphs. Such a text description might address data quality and quantity and how it is used in the project. The geologist should list more complex or detailed data in tables rather than in text narratives. Longer lists of data typically are presented in appendices.

13.2 Figures

Figures are used to represent conceptual geologic information such as maps, aerial photographs, cross-sections, layouts, diagrams, relationships, spatial understanding, and other geologic concepts. At a minimum, at least one figure is prepared with a map that shows the site or work location(s).

Project maps are typically prepared using a suitable base map, such as a topographic map or aerial photograph, and are presented at a functional scale. Maps included in a geologic report should provide enough information to be informative but not be too cluttered. Maps typically include:

- A figure number or reference to where the figure or map is introduced in the text.
- A scale or special note if the drawing is not prepared to scale.

- An indication of geographic orientation and position of the site (i.e., north arrow, latitude and longitude, Universal Transverse Mercator coordinate system indicators, etc.)
- Legend or key
- Representative geographic features, including proposed project improvements.
- Subsurface borehole or drilling locations
- The author or base map source
- The date

Any figures included in a geologic report need to be of sufficient scale to effectively identify the work location and other features of interest. A ratio scale is useful, but bar or graphical scales are more flexible, especially if figures are reduced or enlarged through photocopying.

Each figure needs to be orientated to the sample or site location correctly by the use of a north arrow or some other directional graphic. Figures need to present only relevant data and avoid extraneous information. Figures also need to be drawn at an appropriate scale to be easily readable and effectively present data, and be suitable for reproduction. As necessary, notes should be added to the figures to further explain data and analyses. Careful consideration is given to the intended methods of document reproduction and how the use of colors or black and white tones will be transferred. All symbols used in a figure are defined in a key, legend, or figure caption. If a Figure may be used as a stand-alone document separate from the report, the Figure must be signed and sealed by a geologist (ORS 672.605 and OAR Chapter 809 Division 50). The geologist should consider including full resolution figures in digital format such as a CD.

13.3 Graphs

Graphs are recommended when data are used to communicate a message represented by time-series trends or interdependent relationships between variables. Graphs also serve to show meaningful patterns and exceptions projected by the shape of the data.

The geologist should select the most applicable graph type to best communicate the message for its intended purpose. Graph types could include:

- Ratio or interval scales, which have units of measurement
- Bar/column graphs to present categorical and numeric information grouped in intervals
- Pie graphs to summarize categorical data
- Scatter or line graphs to show trends between two or more variables
- Time series graphs
- Statistical displays

13.4 Photographs

Photographs record site conditions, characterize the setting, or document procedures. Photos should be of sufficient resolution so as to effectively display features of interest. Large numbers of photos are commonly included in an appendix or are copied onto a CD included in the report. Supporting photographs are numbered, captioned, and referenced in the text.

13.5 Tables

Tables are used for long lists of data that are not easily summarized in the report text. Tables work best when the data presentation:

- Is used to emphasize individual values,
- Is used to compare individual values and identify potential trends or variations,
- Requires precise values, and
- Involves values with multiple units of measure.

Tables are scaled to fit the specified page size with a legible font size. Each Table includes a title that identifies what types of data are presented in the Table, the date prepared, the data collection methods, and row and/or column headings. Data are presented using proper scientific notation and significant digits, as per standard academic protocol. The geologist needs to provide footnotes as needed to explain abbreviations, units, references, data flags, Oregon rules and regulations, or other necessary information included in a Table. The geologist also should identify in a Table whether a selected portion of the data set or all of the observed values are reported.

14.0 DATA SOURCES AND LIMITATIONS

The reliability, accuracy, precision, and the validity of data are important to establish before undertaking analysis. Part of this process includes creation of metadata that specifies quality, source, collection methods and quality control measures. If this information is uncertain or does not meet the standards of the study, then a performance audit is recommended.

The geologist should discuss any concerns or discrepancies posed by the data used. This step may be helpful in avoiding problems with the use of poor or incomplete data sets. Geologic reports describe analytical methodologies and limitations therein. This section includes a discussion of data acquisition methods, reliability, quality, completeness, and analytical methods.

As needed, the geologist should use guidance documents available from federal agencies (U.S. Environmental Protection Agency, U.S. Geological Survey) and state agencies (Oregon Water Resources Department, Oregon Department of Environmental Quality, Oregon Department of Geology and Mineral Industries, etc.). In certain instances, data may be collected under guidance of a quality assurance/quality control (QA/QC) plan.

In this report section, the geologist describes the methods used to analyze the data. The following is an overview of relevant techniques commonly employed.

14.1 Data Set Reliability, Quality and Completeness

A description of the data reliability and quality is included in this section. Consideration should be given to the following:

- Source of the data (i.e., field collection, published source, unpublished source)
- Date of data acquisition
- Collection method

- Study location
- Data storage methods
- Reproducibility of the data set

The sources of all data used are listed in the report. The geologist should clearly describe the completeness of the data set in the report. The description includes perceived data gaps, and the representativeness of measurements for the area being studied.

14.2 Chemical and Physical Data Analysis

Laboratory analyses use standard methods, conducted by certified laboratories as required by state rules and regulations. As necessary, laboratory data include sufficient duplicate and quality control samples (i.e., trip blanks and equipment blanks). Laboratory methods conform to ASTM, U.S. EPA, state, and/or other standard test methods, as required. The report documents sample collection and preservation procedures, explanations of data flags, and provide copies of laboratory data sheets in the appendix.

14.3 Other Data Analysis

Methods used to analyze other data are described. Analytical methods could include data correlation, statistical analysis, comparisons of similar data sets collected for other studies, and spatial analysis. The method description is sufficiently described so as to make the results repeatable by an independent review team. The analysis section also includes a discussion of the assumptions, limitations, equations, variables, and parameters used in the analyses. Computer derived results are manually reviewed and validated.

14.4 Models

A brief description of the model function and objective is useful. There are many commercially available geologic modeling programs available, and other software that can help illustrate important features, such as contours, flow paths, chemical concentrations and material depths. It is important for the geologist to identify the model and software used, and explain how it is applied in the geologic work and report.

Any models employed must be of sufficient scale to include the entire site and surrounding area so that the output is representative of the site setting and not driven by boundary conditions. A sensitivity analysis identifies and evaluates modeled parameters and determines if input values are justified. Assumptions made to facilitate development of the project model must be noted, especially with the presentation of predictive modeling results.

15.0 DATA DISCUSSION

The Data Discussion section focuses on the important points drawn from the analyses, such as patterns, trends, or themes and any important correlations revealed in relation to the project objectives. In addition, the discussion can explain how data from different sources are compared and contrasted. While a client or employer may desire a specific, stated outcome, and the registered geologist may be directed to review the data with that endpoint in mind, the geologist must not weight or manipulate the information to reach that desired outcome.

The Data Discussion section demonstrates the logic used to draw conclusions and interpretations from the data. It is important for the geologist to show how the data were evaluated and how this lead to the conclusions derived. The discussion reflects the main points reflected by the data and represent how the geologist rendered the interpretations.

16.0 CONCLUSIONS AND RECOMMENDATIONS

Conclusions and Recommendations must be based on, and supported by information and data provided in the report. Further, they must follow defensible scientific practices. Concepts presented in this section need to be based on the presented data and analyses.

While recommendations may assist in evaluating a subsequent phase of a project, some clients may prefer that recommendations be prepared and submitted separately. If this is the case, the geologist generally should indicate that recommendations are included under separate cover. The geologist needs to ensure that a separate recommendations document is appropriately sealed (stamped) and signed.

17.0 REFERENCES AND DATA SOURCES

References used in preparation of the report are generally cited in both the references section and in the main body of text. The geologist needs to include personal communications and other unpublished data sources such that the body of the work is traceable. Proprietary or in-house reports are generally avoided as citations, as they often are not available to the public for inspection or peer review.

While reference styles may vary widely depending on agency or firm protocol, a reference guide is found in "Suggestions to Authors of the Reports of the U.S. Geological Survey", published in 1991.

18.0 APPENDICES

Appendices present data supportive of the main text. They are numbered or ordered as they are cited in the text. While it is not necessary to be exhaustive in content, appendices may include information such as:

- Boring and well logs
- Laboratory reports
- Calibration information for downhole instruments (i.e., vibrating-wire transducers, etc.)
- Raw data and field sheets
- Unpublished references
- Photographs
- Other material that supports the text, tables, or figures, for example model output and calibration parameters.

As the organization of the main body of the report is flexible, so is the content of technical appendices. The methods, results, and analyses of field investigations often are placed in technical appendices, along with data listings, and copies of required technical documents.

Place voluminous material, such as laboratory reports, on a CD, rather than including them in print.

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