QUALITY-ASSURANCE PLAN FOR WATER-RESOURCES ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN MISSISSIPPI -- 1991

U.S. GEOLOGICAL SURVEY
Open-File Report 91-526

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By Larry J. Slack

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Jackson, Mississippi
December 1991

U.S. DEPARTMENT OF THE INTERIOR
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U.S. GEOLOGICAL SURVEY
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QUALITY-ASSURANCE PLAN FOR WATER-RESOURCES ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN MISSISSIPPI -- 1991

by Larry J. Slack

ABSTRACT

The U.S. Geological Survey, the Nation's leading earth-science information agency, has developed an international reputation for collecting accurate data and producing factual and impartial interpretive reports based on those data. The mission of the Water Resources Division of the U.S. Geological Survey is to develop and disseminate information on the Nation's water resources. To ensure continued confidence in its products, the Water Resources Division has implemented a policy whereby all scientific work by or for the Division will be performed in accordance with a centrally managed quality-assurance program. This report establishes and documents formal quality-assurance policies for the Mississippi District by describing District organization and operational responsibilities, quality-assurance policies, and functions and quality-assurance responsibilities associated with performing those functions.

The Mississippi District conducts its work through its office in Jackson. Data-collection programs and interpretive studies are conducted by two operating sections, one supporting section, and two supporting units. Discipline specialists provide technical advice and assistance to the District and project chiefs. Management advisors provide guidance on various personnel issues and supporting functions.

The Mississippi District's quality-assurance plan consists of an overall policy that provides a framework for defining the accuracy (correctness), precision (reproducibility), and bias (deviation from the expected value) of collected data. That plan is supported by a series of quality-assurance policy statements (policies) that describe responsibilities for specific functional elements of the District's program. The functional elements described are program planning, project planning, project implementation and review, training, equipment calibration and maintenance, data collection, data processing and storage, data analysis and synthesis, and reports preparation and processing. District activities are systematically conducted under a hierarchy of supervision and management that is designed to ensure

conformance with Division goals on quality assurance, as designed by the U.S. Geological Survey's Total Quality Management Plan. At the highest level of the hierarchy of supervision and management within the District is the District Chief, who is the chief executive officer for the District.

The District quality-assurance plan focuses on policies, functions, and responsibilities that are implemented at the management level. Contents of the plan will be reviewed at least annually and updated as personnel and programs change.

INTRODUCTION

The U.S. Geological Survey (USGS) has collected and disseminated information about the quantity and quality of water in Mississippi's streams, lakes, and aquifers for several decades. Through cooperative and collaborative programs with local, State, and other Federal agencies, the Mississippi District of the USGS has monitored streamflow at nearly one thousand sites throughout the State and has investigated the occurrence, availability, and quality of water both statewide and in numerous study areas. The USGS has collected streamflow data in Mississippi since 1931, ground-water-level data since 1939, water-quality data since 1964, and atmospheric precipitation-quality data since 1982. Information obtained from data-collection programs, investigative studies, and research efforts has been made available to water-resource managers, regulators, and developers through reports published in the formal book series (such as Water-Supply Papers, Professional Papers, Bulletins, and Circulars), informal report series (such as annual data reports, Water-Resources Investigations Reports, and Open-File Reports), and outside publications (such as reports published by cooperators, and papers published in scientific and trade journals or in conference proceedings).

Mission and Programs

U.S. Geological Survey

The U.S. Geological Survey was established by an act of Congress on March 3, 1879, as a permanent Federal agency to conduct the systematic and scientific "classification of the public lands, and examination of the geological structure, mineral resources, and products of National domain." For a detailed summary of the goals and authorizing legislation of the USGS, see U.S. Geological Survey (1986a). An integral part of that original mission includes publishing and disseminating the earth-science information needed to understand and manage the Nation's energy, land, mineral, and water resources.

Through the last two centuries, the research and fact-finding role of the USGS has grown and has been modified to meet the Nation's ever-changing needs. The USGS has become the Nation's largest earth-science research agency, largest employer of professional earth scientists, largest civilian mapmaking agency, and as such, the Nation's primary source of data on surface- and ground-water resources (U.S. Geological Survey 1986b). Consequently, the USGS has developed an international reputation for collecting accurate data and producing factual and impartial interpretive reports based on those data. Current programs of the USGS are designed to serve a diversity of needs and users, as indicated by the following partial list:

- Collecting data on a routine basis to determine the quantity, quality, and use of surface and ground water.
- Conducting water-resource appraisals to describe the consequences of alternative plans for developing land and water resources.
- Conducting research in hydraulics and hydrology, and coordinating all Federal water-data acquisition.
- Conducting detailed assessments of the energy and mineral potential of land and offshore areas.
- Investigating and issuing warnings of earthquakes, volcanic eruptions, landslides, and other geologic and hydrologic hazards.
- Conducting research on the geologic structure of land and offshore areas.
- Studying the geologic features, structures, processes, and history of the planets of our solar system.
- Conducting topographic surveys and preparing topographic and thematic maps and related cartographic products.
- Developing and producing digital cartographic data bases and products.
- Using remotely sensed data to develop new cartographic, geologic, and hydrologic research techniques for natural-resources planning and management.
- Providing earth-science information through an extensive publications program and a network of public access points.

Along with its continuing commitment to meet the expanding and increasingly complex earth-science needs of the Nation, the USGS remains dedicated to its original mission of collecting, analyzing, interpreting, publishing, and disseminating information about the natural resources of each State.

Water Resources Division

The mission of the Water Resources Division is to provide the hydrologic information and understanding needed for the optimum utilization and management of the Nation's water resources for the benefit of the citizens of the United States. This mission is accomplished largely through cooperation with local, State, and other Federal agencies by:

- Collecting, on a systematic basis, data needed for the continuing determination and evaluation of the quantity, quality, and use of the Nation's water resources.

- Conducting analytical and interpretive water-resource appraisals that describe the occurrence, availability, and physical, chemical, and biological characteristics and properties of surface and ground water.

- Conducting supportive basic and problem-oriented research in hydraulics, hydrology, and related fields of science to improve the scientific basis for investigations and measurement techniques and to understand hydrologic systems sufficiently to quantitatively predict their response to natural or anthropogenic stress.

- Disseminating water data and the results of investigations and research through reports, maps, computerized information services, participation in scientific and technical conferences and meetings, and responses to public inquiries.

- Coordinating the activities of Federal agencies in the acquisition of water data for streams, lakes, reservoirs, estuaries, and ground water.

- Providing scientific and technical assistance in hydrology to local, State, and other Federal agencies, to licensees of the Federal Energy Regulatory Commission, and to international agencies on behalf of the U.S. Department of State.

- Acquiring and disseminating information on natural hazards such as droughts, earthquakes, floods, landslides, land subsidence, mudflows, and volcanoes.

- Administering the provisions of the Water Resources Research Act of 1984, which includes the State Water Resources Research Institutes and the Research Grants and Contracts programs.

- Supporting the provisions of the National Environmental Policy Act of 1969 and managing USGS natural-resource surveys in response to the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund Act) of 1980 and its amendments.

Need for Quality Assurance

The U.S. Geological Survey is the Nation's leading earth-science information agency and, as such, has developed an international reputation for collecting accurate data and producing factual and impartial interpretive reports based on those data. Methods for data collection and analysis developed by the USGS have become standard techniques for numerous local, State, and other Federal agencies, as well as private companies and foreign agencies. The stringent standards of professional conduct, meticulous examination of the data, and thorough and deliberately redundant review that characterizes the routine activities of the USGS have given users of USGS products a sense of confidence and trust in the accuracy and scientific validity of the agency's work. As competition for the Nation's finite water supply intensifies, programs to manage, protect, develop, and regulate the resource have come under increasing scrutiny. Consequently, the agency is steadfastly determined that each of its programs continue to be conducted in a manner that provides a measure of the accuracy (correctness), precision (reproducibility), and bias (deviation from the expected value) of collected data and the results of their interpretation.

In response to the increasing needs of the users of USGS products for citable current quality-assurance documents, the Water Resources Division has implemented a program designed to ensure that all scientific work performed by or for the Division will be conducted in accordance with a centrally managed quality-assurance program. The responsibility for the program has been assigned to the Office of the Assistant Chief Hydrologist for Program Coordination and Technical Support (fig. 1). That office has established the Branch of Quality Assurance to develop, coordinate, and implement the quality-assurance program. As a part of that program, each

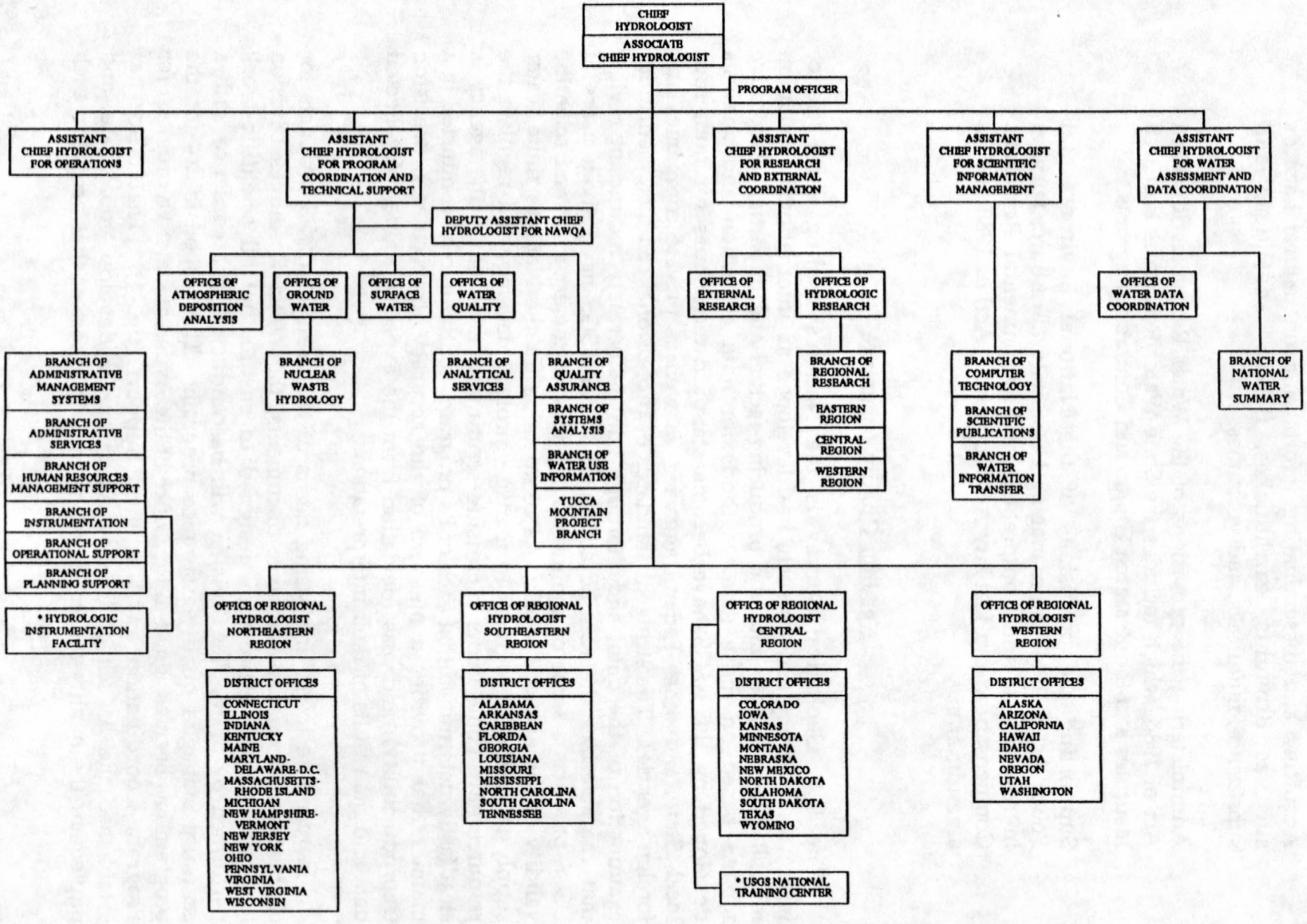

Figure 1.--Organizational chart of the Water Resources Division.

District office in the Water Resources Division is required to prepare a written District Quality-Assurance Plan that includes all elements of scientific work conducted by or for the office.

Purpose and Scope of Report

This report establishes and documents formal policies for the conduct of quality assurance within the Mississippi District. Quality assurance is formalized by:

- Describing the District organization and operational responsibilities.
- Describing the District quality-assurance policies.
- Describing the District functions and quality-assurance responsibilities associated with performing those functions.

Descriptions of the quality-assurance policies and responsibilities relating to the scientific activities of the District are included in this report. Policies and responsibilities are presented by functional elements of the District's hydrologic programs and include all work performed by District or contract personnel. Detailed technical activities that are commonly termed "quality-control procedures" are not described in this report; such activities are described in referenced literature, work plans, District and Division memorandums, and field manuals. Instead, this report focuses on policies, functions, and responsibilities that are implemented at the management level.

Contents of this quality-assurance plan for the Mississippi District will be reviewed and revised at least annually. Revisions will reflect changes in personnel and organizational structure and advances in the state-of-the-science of hydrologic investigations.

DISTRICT ORGANIZATION AND OPERATIONAL RESPONSIBILITIES

The Mississippi District conducts its work through its office in Jackson (fig. 2). The District employs about 50 people to work on about 15 funded projects. The principal mission of the District is to investigate the occurrence, quantity, quality, distribution, and movement of surface and ground water in Mississippi.

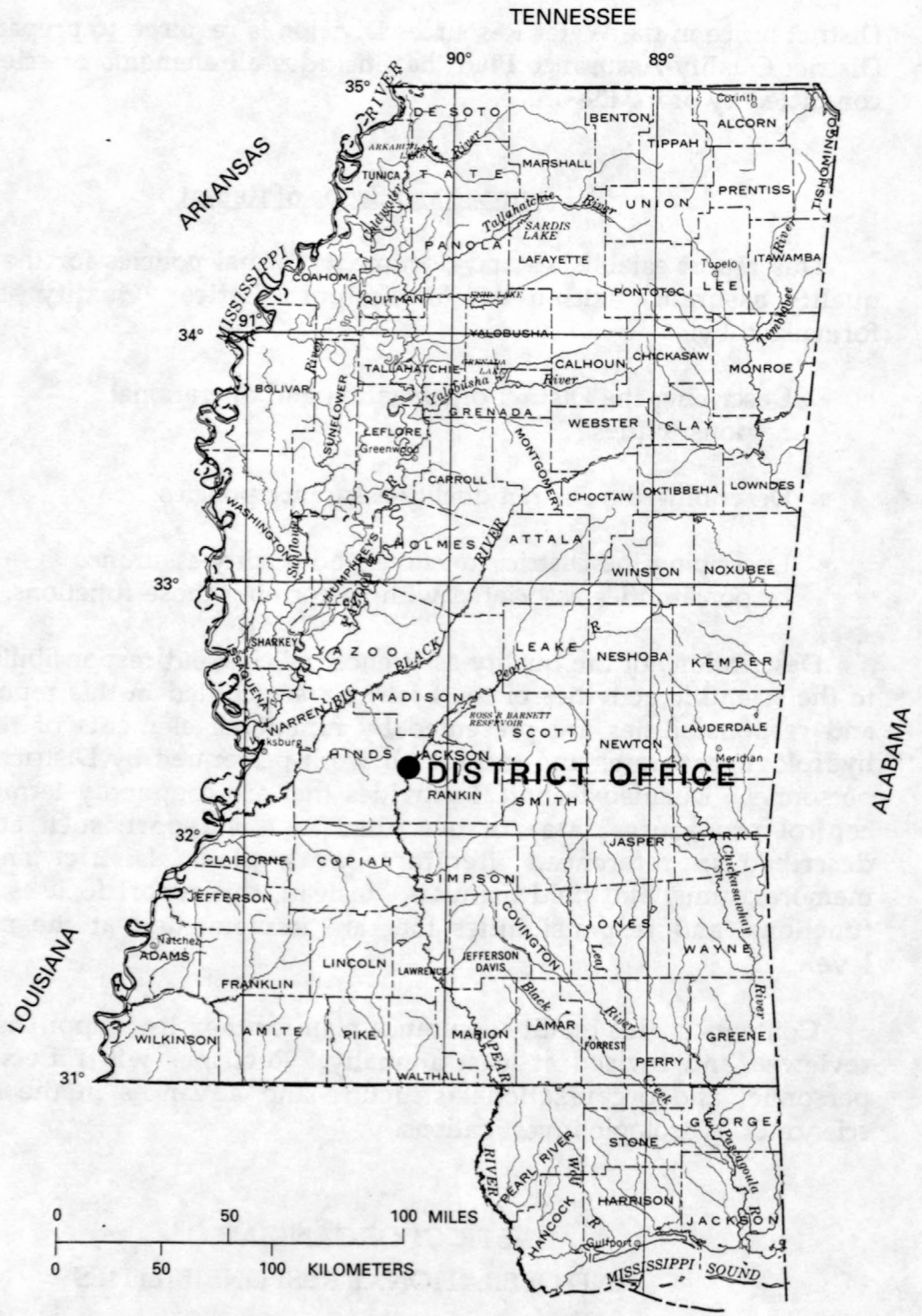

Figure 2.--Location of District Office.

Hydrologic data-collection programs and interpretive studies are conducted by two operating sections, one supporting section, and two supporting units (fig. 3). Discipline specialists provide technical advice and assistance directly to the District and project chiefs, and directly or indirectly to project members. Selected management advisors provide guidance on various personnel issues and supporting functions. The operating sections are responsible for implementation and execution of District projects. The support section and units and the advisory groups provide services and advice to the District Chief and the operating sections.

Operating Sections

Hydrologic Data Section

The Hydrologic Data Section constructs, operates, and maintains networks of hydrologic-data collections stations in Mississippi. These stations are maintained at selected locations throughout the State to obtain data on stream discharge and stage, reservoir and lake stage, ground-water levels, well yields, and the quality of surface water, ground water, and atmospheric precipitation. The Hydrologic Data Section also analyzes the hydrologic data from the State networks, reviews and processes the data, prepares water-resources data for the annual water-data report (Water Resources Data for Mississippi, Water Year 19__), and provides quality assurance in the collection and processing of those data. The Section Chief ultimately is responsible for quality assurance of data collected, processed, published, and stored by the Section. However, initial responsibility for quality assurance of data-collection activities in the Section is delegated to the project chiefs.

Generally, work by the Hydrologic Data Section is performed as part of one of the "basic records" projects. These projects and project chiefs are:

MS-001 Surface-Water Stations	Michael L. Plunkett
MS-002 Ground-Water Stations	William T. Oakley
MS-003 Water-Quality Stations	Larry J. Slack
MS-004 Sediment Stations	Fred H. George
MS-005 Precipitation Stations	Paul E. Grantham

Hydrologic Investigations Section

The Hydrologic Investigations Section plans, conducts, and reports on multidiscipline water-resources projects. These investigations involve determination of magnitude and frequency of floods and droughts, assessment of surface water and ground water availability and use,

OFFICE OF THE DISTRICT CHIEF

District Chief	G.L. Ryan
Hydrologist	L.J. Slack

ADMINISTRATIVE SERVICES SECTION

Administrative Officer	G.C. Brock
Administrative Operations Assistant	D.F. Gale
Accounting Technician	H.D. Golden
Clerk-Typist	J.R. Connor
Clerk-Typist	V.D. Anderson
Clerk-Typist	B.M. Grayson

HYDROLOGIC INVESTIGATIONS SECTION

Supervisory Hydrologist	Vacant
Hydrologist	M.J. Mallory
Hydrologist	J.K. Arthur
Hydrologist	N.L. Barber
Hydrologist	K.V. Wilson, Jr.
Hydrologic Technician	J.W. Hudson
Hydrologist	D. Darden
Hydrologist	G.D. Goldsmith
Hydrologist	R.A. Rebich
Hydrologist	D.P. Turnipseed
Civil Engineer	W.T. Baldwin
Civil Engineer	P.C. Floyd
Hydrologist	P.J. Hom
Hydrologist	R.S. Moreland
Secretary	L.A. Lowery
Hydrologic Technician	C.T. Dobbs
Hydrologic Trainee	R.C. Wallace

HYDROLOGIC DATA SECTION

Supervisory Hydrologist	M.L. Plunkett
Hydrologic Technician	F.H. George
Hydrologic Technician	W.T. Oakley
Hydrologic Technician	P.E. Grantham
Hydrologic Technician	F. Morris III
Hydrologic Technician	S.H. Bishop
Hydrologic Technician	K.E. Burks
Hydrologic Technician	R.P. Durr
Hydrologic Technician	C.D. Leach
Hydrologic Technician	J.A. Powell
Hydrologic Technician	G.E. Peters
Hydrologic Technician	D.E. Burt
Hydrologic Technician	M.A. Manning
Hydrologic Technician	D.T. Wilson
Hydrologic Technician	B.R. Richards
Hydrologic Technician	W.D. Phillips
Hydrologic Technician	T.C. Williams
Hydrologic Aid	R.V. Simmons
Clerk-Typist	L.J. Gabourie
Hydrologic Aid	J.D. Gayle
Hydrologic Aid	G.L. Tillman

REPORTS PREPARATION UNIT

Writer-Editor	B.P. Moss
Cartographic Technician	C.M. Hill

COMPUTER APPLICATIONS UNIT

Computer Programmer Analyst	W.A. Winstead
Computer Assistant	J.R. Guillot

COLLATERAL DUTIES

DIS/Prime Systems Manager	W.A. Winstead
EEO Counselor	P.E. Grantham
FWP Coordinator	D.F. Gale
Safety Officer	F. Morris III
Training Officer	J.K. Arthur

DISCIPLINE SPECIALISTS

Ground Water	M.J. Mallory
Surface Water	M.L. Plunkett
Water Quality	L.J. Slack
Digital Modeling	M.J. Mallory
Reports	L.J. Slack

Figure 3.--Organizational chart of the Mississippi District, December 1991.

application of principles of ground-water hydraulics, mathematical modeling of aquifer systems, and assessment or prediction of natural or anthropogenic effects on the quantity and quality of water in hydrologic systems.

The Hydrologic Investigations Section Chief is responsible for quality assurance of work performed by the section. As such, the Section Chief monitors all phases of project activities to ensure compliance with specific policies. Quality-assurance activities are controlled by several District policies relating to project planning, project implementation and review, training, equipment calibration and maintenance, data collection, data processing and storage, data analysis and synthesis, and reports preparation and processing. Each project chief conducts investigations in accordance with District quality-assurance policies.

Supporting Section and Units

Administrative Services Section

The Administrative Services Section provides administrative support to the District Office and project chiefs. Support services include administrative activities related to personnel, purchasing, contracting, space, vehicles, and fiscal accounting. Although the Section does not have direct quality-assurance responsibilities for technical aspects of the District program, the role of the Section in managing project budgets, purchasing equipment and supplies; contracting for services; securing office, shop, and storage space; acquiring vehicles; and other administrative duties is essential to the successful completion of the projects. The District Administrative Officer is responsible for monitoring project and District budgets weekly and, on a monthly basis, advising project chiefs and District managers of the fiscal status of projects.

Computer Applications Unit

The Computer Applications Unit provides computer support to the District and to project chiefs. The Unit operates and maintains the District computers and peripheral hardware. The Unit provides technical support for the District's library of computer software, trains staff on use and application of various software packages, writes programs for various applications, and documents software developed for District use. Although the Unit does not have direct quality-assurance responsibilities for technical aspects of the District's programs, the Unit's role in providing computer services is essential to the successful implementation and completion of District programs. The Unit is responsible for periodic duplication (backup) of District computer files and records to ensure minimal loss of information in the

event of equipment failure or malfunction. The District Computer Specialist is responsible for efficient operation and effective use of the District's computer hardware and software.

Full backups of all data on the District computer system are performed monthly. Incremental backups are performed daily. Periodic off-site storage of data is scheduled to begin in January 1992. The January backups are retained for 2 years. Full monthly backups are retained for approximately 6 to 8 months. Weekly incremental backups are maintained for approximately 1 to 2 months.

Reports Preparation Unit

The Reports Preparation Unit, directed by the District Writer/Editor, provides report preparation and processing services for the District. The Unit prepares text and illustrations from authors' rough drafts, performs editorial reviews, compiles manuscript packages for Regional and Director approval, prepares reports for publication, and distributes published reports. The Unit assists project chiefs in planning final report products and acquiring base maps for final products. Timely completion of well-written, technically sound reports is a direct measure of the District's success in meeting quality-assurance guidelines.

The District Reports Specialist and the Hydrologic Investigations and Hydrologic Data Section Chiefs conduct and arrange technical colleague reviews and are responsible for ensuring that reports receive adequate editorial, verification, and technical reviews. The Section Chiefs must read the review comments and author responses and ensure that authors adequately respond to all review comments before the report is submitted for Director or Regional approval. Although the Reports Preparation Unit does not have direct quality-assurance responsibilities for technical aspects of the District's programs, the Unit's role is essential to the successful implementation and completion of District programs.

Technical Discipline Specialists

A team of discipline specialists serves as technical advisors to the Office of the District Chief. Although each member of the team generally has other primary duties, each contributes substantially to quality-assurance activities by virtue of individual special competencies in particular fields. Both collectively and individually, the team assists in program planning, project planning, design and implementation of data-collection programs, technical oversight of interpretive projects, and review of reports. The specialists are responsible for technical adequacy of programs in their particular field of

expertise and serve as advisors to other members of the District staff. Project proposals, work plans, and draft reports are reviewed by the specialists to ensure technical adequacy of methodology, appropriate application of methodologies, adequacy of funding, likelihood of successful completion of the project, and validity of results and conclusions. The District discipline specialists and their areas of expertise are:

Michael J. Mallory	Ground-Water and Digital-Modeling Specialist: Geology; aquifer tests; ground-water hydraulics and numerical models
Michael L. Plunkett	Surface-Water Specialist: Surface-water hydraulics and hydrology
Larry J. Slack	Water-Quality and Reports Specialist: Water quality; quality assurance; reports

The District Ground-Water and Digital-Modeling Specialist is consulted on all projects involving ground-water data collection, analysis, and report preparation. He advises project chiefs regarding methods required to meet the technical objectives of ground-water related projects and advises and aids in training District personnel in proper ground-water data-collection and data-analysis techniques. He is knowledgeable in the modeling of complex hydrologic systems, particularly clastic aquifer systems. Examples of the incumbent's areas of expertise are (1) application of fundamental principles of ground-water hydrology and hydraulics in primary permeability terranes; (2) simulation of the response of regional aquifer systems to imposed stresses; and (3) application of analytical and numerical methods of ground-water hydrology.

The District Surface-Water Specialist is consulted on all projects involving surface-water data collection, analysis, and report preparation. He advises project chiefs regarding methods required to meet the technical objectives of surface-water related projects. Also, he or his designee advises and aids in training District personnel in proper surface-water data-collection and data-analysis techniques. He personally conducts the most difficult phases of surface-water investigations, including providing expert opinion and analyzing data. The Surface-Water Specialist is also the Hydrologic Data Section Chief in the Mississippi District; this allows the quality-assurance and management duties for the two positions to be blended into a single coherent policy.

The District Water-Quality and Reports Specialist oversees projects involving water-quality data collection, analysis, and report preparation. He advises project chiefs regarding methods required to meet the technical

objectives of water-quality related projects. Also, he advises and aids in training District personnel in proper water-quality data-collection and data-analysis techniques. He performs complex computations and analysis of water-quality data to prepare them for scientific interpretation and public release, evaluates any unusual analysis flagged by the water-quality data base manager, and provides technical guidance to district project personnel and to management regarding the feasibility and techniques to ensure that projects are technically sound and conducted efficiently.

Management Advisors

A team of management advisors provides guidance on various personnel issues and support functions. When serving as management advisors, these individuals do not always have specific quality-assurance responsibilities but provide advice and assistance that are essential to District management. The team includes the discipline specialists and the following:

J. Kerry Arthur	Training Officer
Nancy L. Barber	Geographic Information Systems Officer
Gayl C. Brock	Contracting Officer
Deloris F. Gale	Personnel Officer
G.L. Ryan	Equal Employment Opportunity Representative
Fred H. George	Sediment Officer
Hilma D. Golden	Travel Officer; Imprest Fund Cashier
Deloris F. Gale	Federal Women's Program Coordinator
Paul E. Grantham	Equal Employment Opportunity Counselor
Penny J. Hom	Water Use Officer
James W. Hudson	Bridge-Site Reports and Flood Frequency Coordinator
Fred Morris III	Safety Officer
Michael L. Plunkett	Flood Coordinator
K. Van Wilson, Jr.	Scour and Geomorphology Coordinator
William A. Winstead	DIS/Prime System Coordinator; Computer Programming Officer

QUALITY ASSURANCE

District Quality-Assurance Policies

The Mississippi District quality-assurance policies for maintaining the credibility and scientific excellence of USGS products can be summarized with the following overall policy statement:

> **The Mississippi District will conduct all of its investigations in a manner that will produce data of known quality following the policies and technical directives of the USGS, Water Resources Division.**

The quality of the data is considered to be "known" when a USGS approved and documented procedure is used to collect, process, or analyze the data; hence, the bias and precision of the data can be stated. However, when the District performs work for which no USGS approved or documented procedure is applicable or available, the District will prepare the necessary quality-assurance documentation and determine the precision and bias for the procedure used.

Because the highest possible quality data are not always needed or may not be practical, this quality-assurance policy does not always require use of the most accurate or precise methodology available. The methodology selected for a particular activity will be commensurate with the purpose and scope of the investigation and the needs of the District and cooperator, with consideration given to constraints in funding, resources, and time available. The essential requirement is that the precision and bias of the final product be known and defined.

District Functions and Quality-Assurance Responsibilities

District activities are systematically conducted under a hierarchy of supervision and management that is designed to ensure conformance with Water Resources Division goals and policy on quality assurance, as designed by the USGS's Quality Improvement Concept. At the highest level of the hierarchy of supervision and management within the District is the District Chief, who is the chief executive officer for the District. The Mississippi District's systematic approach guides the direction of work from general to specific--from program planning to ultimate completion of individual assignments. All activities undertaken by the District will meet the quality-assurance requirements outlined in this report. The functional elements described are program planning, project planning, project implementation and review, training, equipment calibration and maintenance, data collection, data processing and storage, data analysis and synthesis, and reports

preparation and processing. Although an individual activity may not include every element, each activity will conform to the quality-assurance policies that are appropriate to successful completion of the activity.

Program Planning

The Mississippi District quality-assurance policies for program planning can be summarized with the following policy statement:

> **Program plans for the Mississippi District will be developed in accordance with the annual statement of program priorities issued by Headquarters. All program plans will recognize the National interests served. Local and State interests will be addressed to the extent that National perspectives and responsibilities are served.**

The District Chief has primary responsibility for all aspects of short- and long-range program planning--from satisfying the mission goals of the Bureau and Division and maintaining District viability to utilizing personnel and other resources effectively. Although the District Chief has the primary responsibility for managing the District's program-planning activities, he is aided and advised by the other members of the senior staff and the team of discipline specialists. The senior staff includes the District Chief, the Chief of the Hydrologic Investigations Section, the Chief of the Hydrologic Data Section, and the Administrative Officer. The Hydrologic Investigations Section Chief has first-line responsibility for determining what hydrologic information and analyses are needed to address the identified local, State, and National needs. The Chief of the Hydrologic Data Section will ensure that data-collection sites operated by the District satisfy local, State, and National needs.

Discipline specialists are responsible for program planning by advising the District Chief on matters related to their particular field of expertise. The discipline specialists will provide substantive recommendations on state-of-the-science methodologies, resources required to implement various technologies or study approaches, technical adequacy of study plans, likelihood of successful completion of the project, and validity of results and conclusions. The discipline specialists are responsible for alerting the District and Section Chiefs of the quality-assurance and quality control activities needed for a program to meet quality-assurance policy.

Members of the District senior staff contribute their specialized knowledge to the formulation of policies and plans for short- and long-term programs and the establishment and application of criteria for determining

the type and scope of future projects. They are concerned with the following types of program development functions:

1. Identify present and potential water problems in Mississippi.

2. Determine the needs for hydrologic information required for planning, design, and operation of water projects in Mississippi.

3. Develop goals toward which the District program and projects are directed.

4. Develop techniques and aids for effectively proposing programs and projects to State and other cooperating officials.

5. Establish District policies and criteria to ensure that the overall program and project proposals conform to Region and District policies.

6. Generate new ideas on National program thrusts of the Division.

National program thrusts or activities of high priority are determined each year by the Bureau (the Geological Survey) and the Water Resources Division. These topics are reviewed by the senior staff and discipline specialists to guide program development with local, State, and other Federal cooperating agencies. The senior staff and discipline specialists will meet regularly with representatives of cooperating agencies to maintain an awareness of priority issues of current concern to those agencies. The District senior staff will establish program priorities on a District level and, together with the Region, will merge those priorities with National priorities to establish guidelines for project selection.

Members of the District senior staff will review ongoing cooperative programs annually with the concerned agencies to determine the feasibility of releasing personnel and funds for activities of higher National priority. The staff will review and evaluate all project proposals and maintain records of proposals unapproved because of priority considerations or shortages of personnel or Federal matching funds.

Project chiefs, unit supervisors, and other members of the District staff -- not just the senior staff and discipline specialists--are encouraged to discuss hydrologic programs with accredited cooperating agencies. However, no formal proposals are presented to potential cooperating agencies before review by the appropriate discipline specialists for technical adequacy and by the District Chief for conformance with USGS mission goals and policy.

Although the District does not prepare a formal long-range plan, it documents its intentions in an informal report, which is presented to the staff of the Office of the Regional Hydrologist at the annual program review meeting near the end of the third quarter of each fiscal year. After review and approval by Region staff, program plans are converted to specific project proposals for consideration by cooperating agencies. After proposals receive approval from cooperating agencies and Region, written agreements are prepared to formalize the plans.

Project Planning

The Mississippi District quality-assurance policies for project planning can be summarized with the following policy statement:

> **Plans for new projects will be developed in sufficient detail to allow adequate technical evaluation and review. Documentation of plans in project proposals will be submitted to Region staff for review and acceptance before standard project description forms are prepared for formal approval by Region. Plans for new projects will include a determination of the quality-assurance data that will be obtained or are needed.**

Project planning involves formulation, review, and approval of a formal project proposal that will be used to guide the conduct of the project. Because the project proposal is a documentation of the project plans, the project proposal cover sheet serves as formal documentation of review and approval of the plan by appropriate authorities.

A proposal for an investigation may originate as an idea from District, Region, or National personnel or in response to a request from a local or State cooperator or other Federal agency. The proposals are developed by the responsible persons and are forwarded to the District senior staff and discipline specialists for review. Final approval of all project proposals is provided by the Regional Hydrologist.

Contents of the project proposals may vary considerably depending on complexity and scope of the planned activity. However, all project proposals will contain the following elements:

1. Title: will relate to objective, scope, and location of proposed study.

2. Problem: will indicate specific needs and background for study.

3. Hydrologic Conditions: will provide a brief description of hydrologic system as it pertains to proposed study.

4. Objectives: will define nature of goals; point out solutions to problems or needs.

5. Scope of Project: will define technical and areal context of study. Specific technical limits of study and parameters to be studied will be defined.

6. Approach: will divide the project plan into major work elements, describe how they will be accomplished, and include a time schedule of work elements.

7. Relation to long-range plan: will describe how project goals lead toward attaining objectives of District's Long-Range Plan.

8. Relation to State and Water Resources Division programs: will briefly explain the appropriateness of project for undertaking and relation to District and National priorities.

9. Reports: will identify types of reports and give preliminary titles and completion dates.

10. Time frame: will give completion dates for all scheduled work elements.

11. Personnel: will identify required disciplines of project personnel, approximate grades, full or part-time, and need for consultants.

12. Cost: will list proposed expenditures by object class and by fiscal year. Review checks are made to assure that budget is adequate to achieve work elements stated in approach.

13. Quality assurance: will list by broad category the quality-assurance and quality-control data that will be obtained and specify who is responsible for overall quality-assurance activities.

A project chief usually will have been selected at the project-proposal stage of planning; therefore, preliminary plans for the project and report will be formulated by the project chief with assistance from the Section Chief, District Reports Specialist and other District discipline specialists. If a project chief has not been selected, the discipline specialists, Section Chiefs, or other staff members will independently or collaboratively prepare the proposal.

Review of project proposals will be given high priority. Local reviews will be performed by the appropriate specialist(s) and the Section Chief before submission to the District Chief. Additional review and final approval are to be determined by the District Chief.

Project Implementation and Review

The Mississippi District quality-assurance policies for project implementation and review can be summarized with the following policy statement:

> **Projects will be implemented and reviewed in accordance with a work plan that will be developed and approved for each project. The time allotted for developing the work plan will depend upon the length and complexity of the project, but the plan will be approved before any substantive work is undertaken. Any significant deviations from the work plan will require that the original plan be modified and approved by the Section Chief.**

After a proposed interpretive project has been approved by the Region staff and funding has been arranged with any cooperating agencies, the project chief will prepare the project description for submittal to the Regional Hydrologist for final approval. Project description forms will be submitted within 30 days of project proposal approval or before the beginning date of the project. Following formal approval of the project description, the project chief will prepare a detailed project work plan.

The project work plan serves as the day-to-day operational plan for completing the project; as such, it is an expansion of the approved project proposal and project description. The work plan generally will include a literature search of applicable reports and may include some limited field reconnaissance. The plan itself will summarize data needs and proposed technical approaches, identify work elements, identify quality-assurance and quality-control activities, itemize costs, define total personnel needs, and provide deadlines for each work element. Requirements for work by the District, by the cooperator, or by contractors will be clearly identified and scheduled.

In developing various aspects of the work plan, the project chief will collaborate with discipline specialists and other colleagues as necessary. The project chief will meet with the Chief of the Hydrologic Investigations Section and the Reports Specialist to discuss report plans, arrange for any base maps, schedule report production services, and develop a conceptual plan for the

final report. The work plan will be approved by the Chief of the Hydrologic Investigations Section before any substantive work is undertaken.

The Mississippi District quality-assurance policies for project review can be summarized with the following policy statement:

> **Formal project reviews are scheduled and performed on a quarterly basis for all projects. For multi-year investigations, the District discipline specialist will participate in these reviews at least semi-annually. For complex or technically innovative projects (as determined by the District Chief), more frequent review will be scheduled. Topics will include, but are not limited to: (1) accomplishments since last review, such as data collection and processing, reports, and contacts with the cooperator; (2) plans for next 3 months; (3) plans for next year; (4) conformance to project goals, objectives, funding, and deadlines; (5) quality-assurance activities; and (6) unresolved problems.**

Primary objectives of these reviews are to verify the progress of the project, assure that appropriate analytical techniques are being used, and verify that conclusions drawn from the study are sound and well documented. When problems are identified, the supervisor and the project leader will agree on appropriate remedial actions. When substantial changes in the work plan are necessary or desirable (for instance, adding a modeling specialist to the project or eliminating a project objective), a justification must be prepared, and approval obtained from the District Chief.

Prior to each formal quarterly project review, the project chief completes a brief project review form and submits it to the reviewer. During the quarterly review session, comments based on discussions between the project chief and the reviewer are noted on the project review form. This copy is signed by the project chief and the reviewing officials and forwarded to the District Chief. When the District Chief and/or discipline specialist attends the project review, the additional attendees are provided with copies of the review form and their comments also are noted on the final copy. During each review, previous review comments are discussed and the reviewer documents that previously agreed upon action has been taken. Design of the data-collection program will be reviewed annually (and coincide with the formal quarterly reviews) to ensure that the program is neither over-designed nor under-designed and that the information is collected on schedule. Appropriate members of the senior staff or discipline-specialists team will review the work plan and data-collection activities to ensure that the objectives of the

project are fulfilled. A list of key review dates will be developed for each major work element for use in communicating the plan to co-workers and supervisors.

A report plan will be developed either as an integral part of the work plan or as an attached document. The report plan will identify the type, scope, intended audience, and length of all reports, and will provide a preliminary outline of each report, including a description of major illustrations, maps, and tables. For single-year projects, the work/report plan may be limited to that described in the project proposal. For multi-year studies, preparation of the report plan is to be accomplished in the first 10 percent of the project duration (for example, on a 2-year project, this task will be completed in the first 10 weeks).

The work plan and report plan will meet the financial and temporal limits already placed on the study and will provide for: (1) preparation of a preliminary annotated outline midway through the study, (2) preparation of a final annotated outline (containing the topic sentences of all paragraphs that will be in the report as well as all table and figure headings) when the project is three-fourths completed, and (3) submission of a final report for supervisory approval at least 5 months prior to conclusion of funding for a multi-year project.

The work plan will be reviewed by the appropriate discipline specialists, the Section Chief, and the District Chief. Review may also be sought from Region or Headquarters personnel, or from the cooperating agency. The project leader will develop a final work plan and report plan in response to the review comments.

If, during development of the work plan, it becomes clear that the technology, funding, personnel, or time indicated in the original project description are inadequate to meet project objectives, two versions of the work plan will be completed. In one of these the objectives will be reduced to fit the originally estimated resources; in the other, the resources will be increased to meet the original objectives. These two plans, after appropriate internal review, will form the basis for further negotiations with the cooperating agency and the District staff on modifications to the original proposal. A final plan will be developed from the results of these negotiations.

The general personnel requirements of the project are determined in the early stages of project planning and modified as the work plan is developed. As the need for each position on the project staff is established, selection procedures are initiated and the staff is assembled. This process will normally overlap the process of developing the work plan.

The qualifications of project personnel relative to the technical demands of the work will be determined by the project leader and discipline specialist, and training to remedy deficiencies will be recommended. The discipline specialists will develop and document a specific plan to provide the required training and will have the responsibility of verifying that the required training actions were taken.

The entire program preparation process will be reviewed thoroughly in the initial project review and at least annually thereafter for the duration of the project.

Training

The Mississippi District quality-assurance policies for training of District personnel can be summarized with the following policy statement:

> **All employees of the Mississippi District will receive sufficient training to perform their assigned tasks.**

Training is a critical element in the Mississippi District's quality-assurance program. Employees will not be assigned tasks for which they are not adequately trained. The responsibility for ensuring that employees are adequately trained will be shared jointly by the employee and the employee's supervisor.

A formal training plan will be prepared for each employee as part of the employee's Career Documentation Profile. The employee will participate in development of the training plan by identifying training needs and topics of personal interest. The employee's supervisor will discuss training needs with the employee informally throughout the year and formally during the annual performance appraisal process and will document training needs. The District Training Officer will compile a list of employee training needs and will request consideration by the District Chief. The District Chief and the senior staff will make selections for training by weighing program plans, employee skills, and project requirements against funds available to support training activities, but in no case will an employee be denied the minimum training required to perform his or her assigned duties. Also, because of the increasing complexity of many projects, personnel must continue to receive systematic training to maintain technical expertise. The importance of adequate training is illustrated by the fact that all employees annually must initial their performance appraisal forms to indicate that they have discussed their training needs with their supervisor.

The District considers all workshops, District specialists' conferences, Regional and National training courses, and Water Resources Division-sponsored university courses to be formal training. Records of these training activities are maintained by the Administrative Section and entered as they are completed on the employee's Career Documentation Profile. The supervisor is responsible for interviewing the employee upon completion of the training and evaluating the effectiveness of the training.

On-the-job training is considered by the District to be informal training; however, this training is often as important as formal training. Frequently, one person--for example, a project or Section Chief--may attend formal training and then instruct others in the District. On-the-job training always is performed by experienced personnel whose proficiency has been documented.

The project chief or person responsible for the records at a particular site generally trains observers and contractors. However, if specialized or highly technical training is required, this may be accomplished from other sources: the discipline specialist or a senior technician, for example.

Equipment Calibration and Maintenance

The Mississippi District quality-assurance policies for equipment calibration and maintenance can be summarized with the following policy statement:

> **Equipment and instruments used in hydrologic programs will be maintained in serviceable condition and calibrated in accordance with guidelines documented in Division or District procedural guides or manufacturer instruction manuals.**

Collection of hydrologic information in the field or laboratory involves the use of mechanical and electrical instruments that must be calibrated and maintained to ensure proper operation. Instructions, procedures, and quality-control practices are outlined in numerous field manuals, instructional guides, manufacturer's operating manuals, and memorandums from Headquarters, Region, Hydrologic Instrumentation Facility, National Water Quality Laboratory, Water-Quality Service Unit, or the District.

All District employees who collect hydrologic measurements in the field or laboratory are responsible for proper maintenance of equipment in their care. Employees are required to read and practice guidelines for adjusting, calibrating, and testing instruments to ensure collection of reliable and accurate data. Whenever malfunctioning equipment is discovered, the user is required to document the nature of the malfunction, to repair the

equipment, or to inform a supervisor who will arrange for the repair or replacement of the equipment. Supervisors are responsible for reviewing field and laboratory techniques of subordinates to ensure adherence to applicable guidelines. Supervisors will prepare written statements documenting findings of reviews and submit these statements to the Chief, Hydrologic Investigations Section, and the Chief, Hydrologic Data Section, who will ensure that identified deficiencies are corrected.

All employees who measure specific conductance or pH in water samples are required to participate in both the National and District Field Quality Assurance Programs by measuring and reporting these parameters for standard solutions provided by the appropriate laboratory. Employees who fail to meet an acceptable level of accuracy in reported measurements will receive additional training and be required to repeat the test to demonstrate an acceptable level of performance.

In addition to the responsibilities outlined above for employees and supervisors, the following individuals have specific responsibilities related to quality control of instruments and equipment:

Fred Morris III	Testing and certifying acceptability of water-quality equipment and instruments before distribution to field personnel
William T. Oakley	Ensuring periodic calibration of gages used to measure pressures in artesian wells

Data Collection

The Mississippi District quality-assurance policies for data collection can be summarized with the following policy statement:

> **Data will be collected using approved and documented procedures outlined in published Division or District technical manuals or reports. Any exceptions to the use of these procedures will be documented in writing and approved by the District Chief.**

Proper collection of data is vital to all that the USGS is and does. As the Nation's leading earth-science information agency, the USGS is first and foremost a data-collection agency. To ensure that data collected by the USGS are unbiased, accurate, and reliable, all data-collection activities of the Mississippi District are performed in strict accordance with approved methods. Adequate program planning, project planning, project implementation and review, training, and equipment calibration and

maintenance will, with the professional discharge of quality-assurance responsibilities, result in proper data collection.

As discussed in the "Training," and "Equipment Calibration and Maintenance" sections of this report, instructions, procedures, and quality-control practices are outlined in numerous field manuals, instructional guides, manufacturer's operating manuals, and memorandums from Headquarters, Region, Hydrologic Instrumentation Facility, National Water Quality Laboratory, Water-Quality Service Unit, or the District. Most of the field methods and procedures used in routine work are described in the various Techniques of Water-Resources Investigations series reports listed in the "Selected References." Procedures for specialized or non-standard procedures generally are documented in other USGS report series or in professional journals.

The U.S. Geological Survey supports and encourages development or new methodologies. The USGS's National Research Program, which began in the late 1950's, has grown to include studies in biology, chemistry, ecology, engineering, hydrology, mathematics, and physics. As new or modified procedures are developed, they are documented and submitted to appropriate discipline specialists and Section Chiefs for review and comment prior to implementation.

Supervisors, together with the discipline specialists, are responsible for reviewing field and laboratory techniques of subordinates to ensure adherence to applicable guidelines. Supervisors will prepare written statements documenting findings of reviews and submit these statements to the Chief, Hydrologic Investigations Section, and the Chief, Hydrologic Data Section, who will ensure that identified deficiencies are corrected.

Data Processing and Storage

The Mississippi District quality-assurance policies for data processing and storage can be summarized with the following policy statement:

> **Field and laboratory data collected by District personnel for a USGS program, District contractors, or State agencies using USGS approved techniques, including laboratory data from the USGS and local, State, and private contract laboratories under provisions of USGS programs, must be stored in the USGS National Water Data Storage and Retrieval System (WATSTORE) and National Water Information System (NWIS). National data bases will be kept as current as practicable. All updates will be made before March 31 of the following year.**

To ensure integrity of the data and to prevent loss or damage to the data, all data collected by or for the District that have been certified as meeting Division standards will be entered into appropriate data bases and made available for public use. Certified data will be published according to the instructions in the "WRD Data Reports Preparation Guide" (Novak, 1985) and Division or (discipline) Office memorandums. Data that have not or can not be certified as meeting Division standards--for example, data collected for another Federal agency according to procedures requested by that agency--may be released only with an appropriate disclaimer.

Certification of data for entry into National data bases or release to the public is ultimately the responsibility of the District Chief. In the Mississippi District, responsibility for approving ground-water records is delegated to the Hydrologic Investigations Section Chief; responsibility for approving surface-water records is delegated to the Hydrologic Data Section Chief. Responsibility for approving water-quality data (surface-water, ground-water, and sediment data) is delegated to the District Water-Quality Specialist.

It is to be noted that the project chief is responsible for initial verification of field data entered into the system by the data base managers (as discussed below). He is also responsible for reviewing data in his area of responsibility quarterly for completeness. However, many of the guidelines that apply to data collection for the District also apply to data processing and storage. For example, the supervisors, together with the discipline specialists, are responsible for reviewing data processing and storage techniques of subordinates to ensure adherence to applicable guidelines. Supervisors will prepare written statements documenting findings of reviews and submit these statements to the Hydrologic Data Section Chief and the Hydrologic Investigations Section Chief, who will ensure that identified deficiencies are corrected. When supervisors determine that corrective actions are necessary, they have full authority and responsibility to require remedial training, replication of computations, or similar procedures.

The increased importance of the District data bases has changed the process and requirements for data handling in the District. Currently, the principal data bases in the District are ADAPS (Automated Data Processing System), GWSI (Ground-Water Site Inventory), MISSIS (Mississippi Information System), QWDATA (Quality of Water Data Processing System), and SWUDS (State Water-Use Data System). The data base managers are:

ADAPS	George E. Peters
GWSI	JoAnn R. Guillot
MISSIS	George E. Peters
QWDATA	Fred Morris III
SWUDS	Penny J. Hom

Regardless of discipline, primary records are considered to be historic information and are stored permanently in an area secured from the general public and from hazards. Typically, primary records include field notes, recorder charts or tapes, laboratory reports, and initial printouts of data from electronic recording or monitoring devices--either unedited or with handwritten additions or corrections. Hard copy of surface-water records transmitted by satellite or by "chips" also is considered primary record. It is especially important to note that, as valuable and important as the computer files are, computer files are not primary data. The hard copy for most records (surface water, precipitation, and water quality) is maintained by the project chief, the technician responsible for the site, or the data entry clerk. Well schedules are filed by county.

Generally, within 1 or 2 weeks of data collection, the surface-water and ground-water records are entered into the District computer system. All continuous record and crest-stage gage record are stored in ADAPS. Files of miscellaneous records, discharge measurements, low-flow, and peak-flow data are maintained in MISSIS. Ground-water daily-values data are entered into ADAPS; miscellaneous measurements are entered into GWSI. W.T. Oakley, the Senior Ground-Water Technician, performs quality-assurance reviews of ground-water data that are entered or corrected in the computer files. Interpretive ground-water data, such as the measurements, computations, and results of aquifer tests, are submitted to the Office of the Regional Hydrologist for evaluation and approval. All primary records from hydrologic investigations are transferred to appropriate files prior to the conclusion of the project.

The water-quality data base manager is responsible for entering the water-quality field and laboratory data into QWDATA. He retrieves chemical analysis and laboratory accounting data, conducts a review of routine laboratory primaries, and reviews the data for completeness. The District Water-Quality Specialist oversees data processing and storage for all projects involving water-quality data. As such, he performs statistical, graphical, and tabular analysis of water-quality data to prepare the data for public release. Consequently, the Water-Quality Specialist works closely with the water-quality data base manager and evaluates anomalous results.

The site-specific water-use data base, SWUDS, is based largely on water-use reports mailed to the cooperating agency (the Mississippi Office of Land and Water Resources) and forwarded to the District. Water use for public-supply and industrial facilities which do not send in reports may be calculated when a more complete water-use estimate is required. Water use for other categories, such as livestock, irrigation, aquaculture, and self-supplied domestic, are estimated at least every 5 years and are stored in the aggregated water-use data base, AWUDS. Site-specific water-use reports are filed

temporarily in the District. When the data have been coded, input, and checked, the reports are returned to the cooperator for archiving.

District policy for primary water-use data is:

> **All primary water-use data collected by the USGS--that is, data collected by direct observation or instrumentation by USGS personnel, such as direct measurements of discharge, readings from a time-totalizer network or irrigated-land estimates from remotely-sensed data--will be collected according to established USGS procedures.**

Most of the data in SWUDS, however, is secondary data. For secondary water-use data, District policy is:

> **All secondary water-use data collected by the District will be evaluated and rated as practicably as possible prior to entering the data into USGS data bases or releasing the data to the public.**

Naturally, the application of quality-assurance procedures to secondary data is much more difficult that to primary data. However, for water-use data to have any scientific worth, they must be obtained, evaluated, and reported under a clearly defined set of criteria. Although specific instructions do not always exist, general procedures (such as reporting the make, model, and rating of equipment) are still applicable.

The following statement summarizes quality-assurance policy for all water-use data collected and reported by the Mississippi District:

> **Whether containing primary or secondary water-use data, the District water-use data file and subsequent water-use reports will contain evaluations of the precision, accuracy, completeness, representativeness, and comparability of the data.**

Application of this is especially critical to water-use data because water-use data have such a large variation in reliability. The data will be flagged so that the user will know if the numbers are measurements or estimates. When the data are released in a USGS report, a section will describe all manipulations done to the data. Data manipulations may include unit conversion, estimation of a water-use amount from a related parameter (such as utility bills, acres irrigated, types of crop or livestock raised, per capita use for a similar area), estimation of multiple aquifer contributions to a single well or user, estimation of deliveries to various user categories. Furthermore, the report will contain a section specifically addressing the quality-assurance policies and quality-control procedures used in accepting, modifying, or rejecting the data.

Frequency of District data-base transfers (uploads) to the National data bases depends on the status of review and certification. As soon as final review of the data is completed, the daily discharge, peak-flow, ground-water, and water-quality records are submitted to the National data bases.

Selected field and laboratory data collected by another agency but used in a USGS program may be stored in WATSTORE and NWIS provided they are carefully reviewed, meet the standards set by the USGS, and their use is approved by the District Chief. The responsibility for ensuring that these data meet USGS standards rests with the project leader who will, as necessary, consult with the District discipline specialists and, as appropriate, the Chief of the Branch of Quality Assurance.

Data Analysis and Synthesis

Data collection and data analysis are parallel and mutually supportive activities; weakness in data can sometimes be revealed by concurrent analysis (for example, plotting and contouring water-level or water-quality data frequently will show data anomalies), and the absence of needed data can be recognized during the analysis of the system under study.

The area of data analysis and synthesis covers a very broad range of activities, including the entire field of simulation. Standards against which these activities can be measured are accordingly distributed across a very wide segment of the hydrologic literature. To the extent practical, without placing undue restraint on the freedom of the project staff to employ or develop innovative technology, the methods of data analysis and synthesis will be detailed in the project work plan, and standards will be set by reference to specific descriptions of those methods in the literature. It is to be noted, though, that any data synthesized (that is, not actually measured) are to be clearly identified as such and carefully separated from measured data. All synthesized data must be approved by the appropriate discipline specialist.

The project leader is responsible for the daily conduct of project activities and the supervision, guidance, and instruction of other project personnel. Quality assurance is provided by the discipline specialists through continuous informal consultation and review of progress. The Section Chief will assure that the elements of the work plan are properly addressed and completed on time. In those instances where it becomes evident that the work plan will be modified, the Section Chief will approve and document the changes.

It is the policy of the District that:

> **When ground-water flow or transport models are to be used in a project, only those models documented and supported by the U.S. Geological Survey's Office of Ground Water will be used. Exceptions to this policy will be approved only by the Chief, Office of Ground Water, and only when clear evidence exists that the model is theoretically sound and operationally efficient, that adequate model support can be obtained, and that a documentation of the model will be published prior to the completion of the project.**

For multi-year investigations, formal project review by the District discipline specialist will be conducted semi-annually over the term of the project. For complex or technically innovative projects, more frequent review will be scheduled. The intent of these reviews is to verify the progress of the project, to assure that appropriate analytical techniques are being used, and to verify that conclusions drawn from the study are sound and well documented. When problems are identified, the discipline specialist and the project leader will agree on appropriate remedial actions, and, if necessary, modify the work plan accordingly. All remedial actions will be evaluated by the Section Chief 3 months after their initiation. When substantial changes in the work plan are necessary or desirable (for instance, adding a modeling specialist to the project or eliminating a project objective), a justification must be prepared, and approval obtained from the District Chief. All significant findings of the project reviews will be documented for the project file, and, most importantly, all changes in the project work plan will be dated and made part of the work plan.

Reports Preparation and Processing

The Mississippi District quality-assurance policies for reports preparation and processing can be summarized with the following policy statement:

> **Reports will have the content, quality, and timeliness necessary to establish and maintain the U.S. Geological Survey's reputation for integrity and impartiality in the fields of water quality, quantity, availability, and use.**

Sound project planning, adherence to the work plan, and constructive supervision to achieve project objectives will assure the quality of report products. Widespread respect for the USGS is the result of its integrity and impartiality and its ability to release results of its investigations in a manner that serves the whole public rather than the interest of any special group or

individual. For this purpose, the USGS has devoted itself to the publication of reports that achieve and disseminate its findings.

The following is a list of principal references that have affected the policy of USGS reports. The following policy statement applies to all District authors:

All USGS authors will be thoroughly familiar with the contents of the following references and prepare their reports accordingly.

A. References listed at back of this report

- **Water Resources Division Publications Guide, vol. 1, 1986**
- **Suggestions to Authors of Reports of the U.S. Geological Survey (7th ed.) 1991**
- **U.S. Government Printing Office, 1984**

B. Important references not readily accessible to the general public because they are: parts of other much larger references, for example, public laws; from internal correspondence or administrative reports; or out of print

- **Appropriations Act of 1879, commonly referred to as the "Act of Congress (Organic Act) that created the U.S. Geological Survey," March 3, 1879.**
- **Geological Survey Manual, No. 500.14, January 28, 1980, "Safeguard and Release of Geological Survey Information."**
- **Geological Survey Manual, No. 500.9 July 15, 1976, "Outside Publication and Oral Presentation - Clearance from the Director."**
- **Internal memorandums maintained in the District Office by the Administrative Services Section.**

Report writing will not be deferred until the end of the project. For multi-year projects, writing will start within the first 10 percent of the project duration with the preparation of a report outline, and then at the 50 percent interval a topic sentence outline will be prepared. From this point, sections of the report will be written, when practical, for the duration of the project.

Interim reports, or reports on particular aspects of the technical program, will be written soon after the particular work element is completed. During preparation of these sections, there will be an informal review by the District Reports Specialist upon completion of the segments to assure that style and editorial requirements are met. Review of these reports by colleagues within the District will give an early indication of potential problems or technical deficiencies.

District policy is:

Report progress will be an element of the formal project reviews, and the writing of the final report or reports that describe the entire scope and present the results and interpretations of the study will be well underway at the 50 percent review time.

Also at that time, the District colleague reviewers will be selected, and candidates for outside reviewers will be identified. It is the responsibility of the District discipline specialist to arrange for qualified outside review after he is satisfied with the adequacy of the report.

After the author has replied to review comments, the project leader and discipline specialist will jointly go over the report to assure that the criticism has been adequately addressed or that the reasons for rejecting criticism are sound. District policy is:

All reports transmitted to the Region for processing will be technically correct and editorially sound.

In order that the processing and completion of reports may be expedited, the following guidelines will be adhered to:

1. **It is USGS policy that its investigators bear primary responsibility for their findings and be credited publicly for their work. This policy stems from recognition that the success of the USGS in carrying out its mission is entirely dependent upon the skill and dedication of its employees. Implementation of this policy requires that USGS investigators document their work and findings, and that authorship of reports be displayed clearly. Consequently, authors are responsible for the accuracy of the data reported or interpreted in their reports.**

2. **Authors are responsible for performing a verification review of their report to ensure that the report is internally consistent.**

3. **The USGS has a proprietary interest in, and is accountable for, the work performed by its employees. Accordingly, supervisors at all levels share the responsibility for assuring that reports prepared under their supervision are accurate, well-written, impartial, and in conformance with USGS policies.**

4. **The District Chief has final authority and responsibility for deciding what reports are worthy of being processed for Director's approval and publication. It is the District Chief who makes final judgement of the overall adequacy of a report--in technical and editorial matters, but most of all in policy matters.**

5. **There will be two official editorial reviews. One editorial review (by both the District Writer/Editor and the District Reports Specialist) will be performed before colleague review; the second will be performed after the author has responded to colleague review and before transmittal to Region.**

6. **There will generally be two colleague reviews, both preferably from outside the District. The colleague reviewers will be chosen with a view to their experience in the major technologies (for example, simulation) used in the study.**

7. **The author is responsible for substantiating or resolving all review comments; all review comments will be responded to professionally.**

8. **The Section Chief will ensure that the report is prepared and reviewed in a timely manner, and that the response to review is prompt and thorough. The Section Chief will document the performance of each in-house colleague reviewer, and the adequacy of the author's response.**

9. **The performance of authors in terms of meeting report deadlines and producing technically sound, comprehensible reports will be considered, in writing, on every formal performance evaluation.**

10. **The performance of District colleague reviewers of internal or external reports in terms of the quality and thoroughness of their review will be considered, in writing, on every formal performance evaluation.**

These guidelines are designed to place responsibilities in their proper place (that is, on the author, the colleague reviewer, the discipline specialists, the Reports Specialist, the Section Chief, and--ultimately--the District Chief).

Authors must be aware that their report responsibilities do not end with the submittal of their first rough draft, and that these performance evaluations will be based on the quality and timeliness of the final products.

SUMMARY

The U.S. Geological Survey, the Nation's leading earth-science information agency, has developed an international reputation for collecting accurate data and producing factual and impartial interpretive reports based on those data. The mission of the USGS's Water Resources Division is to develop and disseminate information on the Nation's water resources. To ensure continued confidence in its products, the Division has implemented a policy that all scientific work by or for the Division will be performed in accordance with a centrally managed quality-assurance program.

This report establishes and documents formal quality-assurance policies for the Mississippi District by describing District organization and operational responsibilities, quality-assurance policies, and functions and quality-assurance responsibilities associated with performing those functions.

The Mississippi District conducts its work through its office in Jackson. Data-collection programs and interpretive studies are conducted by two operating sections, one supporting section, and two supporting units. Discipline specialists provide technical advice and assistance to the District and project chiefs. Management advisors provide guidance on various personnel issues and supporting functions.

The Mississippi District's quality-assurance plan consists of an overall policy that provides a framework for defining the accuracy, precision, and bias of collected data. That plan is supported by a series of quality-assurance policy statements that describe responsibilities for specific functional elements of the District's program. The functional elements described are program planning, project planning, project implementation and review, equipment calibration and maintenance, data collection, data processing and storage, data analysis and interpretation, synthesis, reports preparation and processing, and training. District activities are systematically conducted under a hierarchy of supervision and management that is designed to ensure conformance with Division goals on quality assurance, as designed by the USGS's Total Quality Management Plan. At the highest level of the hierarchy of supervision and management within the District is the District Chief, who is the chief executive officer for the District.

The District quality-assurance plan focuses on policies, functions, and responsibilities that are implemented at the management level. Contents of the plan will be reviewed at least annually and updated as personnel and programs change.

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