WATER-RESOURCES ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN NEW MEXICO -- FISCAL YEAR 1986

Compiled by R. L. Knutilla

U.S. GEOLOGICAL SURVEY

Open-File Report 86-141

Albuquerque, New Mexico

1986

UNITED STATES DEPARTMENT OF THE INTERIOR

DONALD PAUL MODEL, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information
write to:

District Chief
U.S. Geological Survey
Water Resources Division
505 Marquette NW, Room 720
Albuquerque, New Mexico 87102

Copies of this report can
be purchased from:

Open-File Services Section
Branch of Distribution
U.S. Geological Survey, MS 306
Box 25425, Federal Center
Denver, Colorado 80225
(303) 236-7476

CONTENTS

CONTENTS - Continued

CONTENTS - Concluded

FIGURES

TABLES

WATER-RESOURCES ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY

IN NEW MEXICO, FISCAL YEAR 1986

Compiled by R. L. Knutilla

INTRODUCTION

Origin of the 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 in the Department of the Interior. Its mission is to conduct the systematic and scientific classification of the public lands, and to examine the geological structure, mineral resources, and products of the national domain. An integral part of that original mission includes publishing and disseminating the earth-science information needed to understand, to plan the use of, and to manage the Nation's energy, land, mineral, and water resources.

Since 1879, the USGS has become the Federal Government's largest earth-science research agency, the Nation's largest civilian mapmaking agency, the primary source of data on the Nation's surface- and ground-water resources, and the employer of the largest number of professional earth scientists. Today programs of the USGS serve a diversity of needs and users and include:

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

Along with its continuing commitment to meet the growing and changing earth-science needs of the Nation, the USGS remains dedicated to its original mission to collect, analyze, interpret, publish, and disseminate information about the natural resources of the Nation--providing earth science in the public service.

Basic Mission and Program of the Water Resources Division

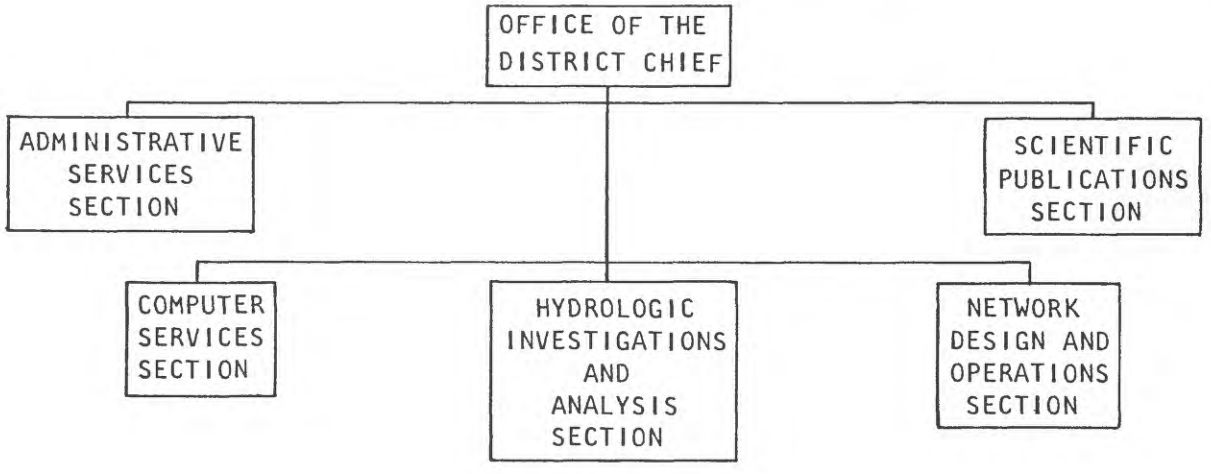
The U.S. Geological Survey, through its Water Resources Division, investigates the occurrence, quantity, distribution, and movement of the surface and underground waters that comprise the Nation's water resources, and coordinates Federal water-data acquisition activities.

The mission of the Division is accomplished through programs supported by the U.S. Geological Survey independent of, or in cooperation with, other Federal and non-Federal agencies. These programs involve:

1. 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.
2. Conducting analytical and interpretive water-resource appraisals that describe the occurrence, availability, and the physical, chemical, and biological characteristics of surface and ground water.
3. Conducting basic problem-oriented research in hydrology to improve the scientific basis for investigations and measurement techniques, and to predict quantitatively the response of hydrologic systems to stress.
4. Disseminating water data and the results of investigations and research through reports, maps, computerized information services, and other forms of public releases.
5. Coordinating the activities of Federal agencies in the acquisition of water data for streams, lakes, reservoirs, estuaries, and ground waters.
6. Providing scientific and technical assistance in hydrologic fields to other Federal, State, and local agencies, to licensees of the Federal Power Commission, and to international agencies on behalf of the Department of State.
7. Administering the provisions of the Water Resources Research Act of 1984, which includes the State Water Resources Research Institute Program (Section 104) and the National Water Resources Research Grant Program (Section 105).
8. Acquiring information useful in predicting and delineating water-related natural hazards from flooding, volcanoes, mudflows, and land subsidence.

NEW MEXICO DISTRICT OFFICE ORGANIZATION

The New Mexico District of the Water Resources Division is organized into five operating units under the District Chief. Water-resources projects are pursued by either the Hydrologic Investigations and Analysis Section or the Network Design and Operations Section, and project responsibility is assigned to a project chief. The New Mexico District consists of the District Office and laboratory in Albuquerque, Subdistrict Offices in Santa Fe and Albuquerque, and Field Headquarters in Las Cruces, Carlsbad, San Antonio, and Roswell (fig. 1).



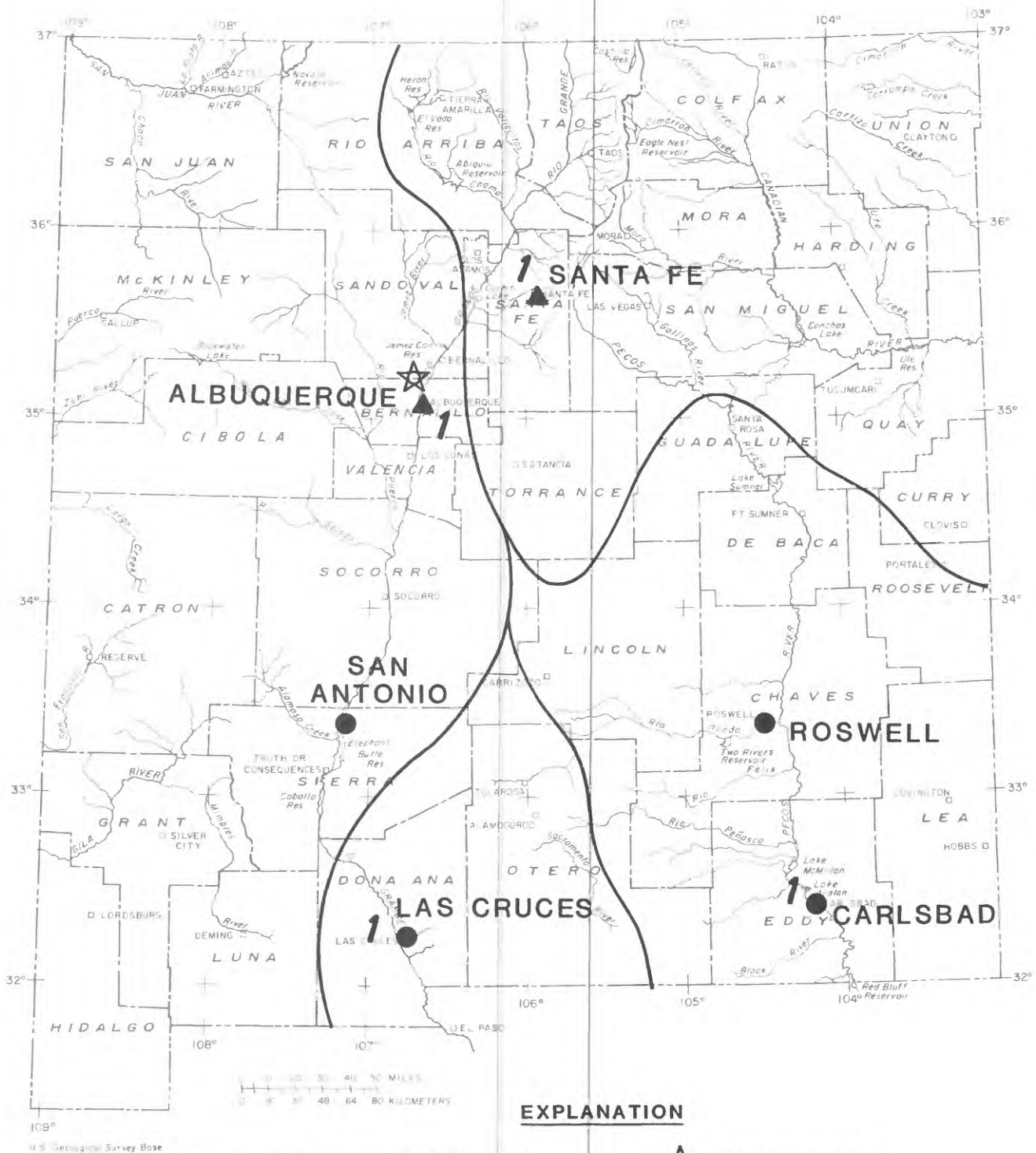


Figure 1.--Location of U.S. Geological Survey offices in New Mexico and general areas of responsibility.

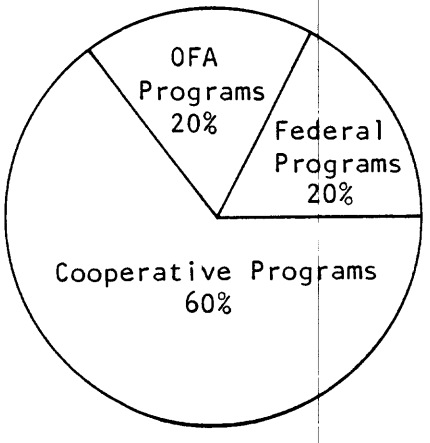
New Mexico Office Addresses

Inquiries regarding projects described in this report may be directed to the District Office, Subdistrict Offices, or Field Headquarters in which the work originated or is being carried out.

DISTRICT OFFICE (505) 766-2246 Chief: Robert L. Knutilla	U.S. Geological Survey Water Resources Division Western Bank Building 505 Marquette NW, Room 720 Albuquerque, New Mexico 87102
ALBUQUERQUE SUBDISTRICT OFFICE (505) 766-6506 Hydrologist-in-Charge: John P. Borland	3540B Pan American Freeway NE Albuquerque, New Mexico 87107
SANTA FE SUBDISTRICT OFFICE (505) 988-6307 Hydrologist-in-Charge: Herbert Garn	Room 115, Federal Building Cathedral Place Santa Fe, New Mexico 87501
LAS CRUCES FIELD HEADQUARTERS (505) 646-4885 Hydrologist-in-Charge: Brennon Orr	P.O. Box 3167 Water Resources Research Inst. NM State University Campus Las Cruces, New Mexico 88003
CARLSBAD FIELD HEADQUARTERS (505) 885-5939 Technician-in-Charge: Ronny L. McCracken	Room 101, Federal Building Carlsbad, New Mexico 88220
ROSWELL FIELD HEADQUARTERS (505) 622-8980 Technician-in-Charge: Ronald L. Rogers	Room 127, Federal Building Roswell, New Mexico 88201
SAN ANTONIO FIELD HEADQUARTERS (505) 835-0116 Technician-in-Charge: Emilio Pargas	P.O. Box 217 San Antonio, New Mexico 87832

TYPES OF FUNDING

Water-resources activities are supported by services and funds from three sources. Cooperative-Program funds are provided from State, Tribal, and local governmental agencies and are generally matched by Federal funds on a 50-50 basis. Funds transferred from other Federal agencies (OFA) are part of the OFA Program, and funds appropriated directly to the Geological Survey by the Congress are part of the Federal Program. In fiscal year 1985 the total financial support from these programs for the New Mexico District was about $5,000,000. The distribution of funds among the three sources was as follows:



In fiscal year 1985 the New Mexico District pursued two broad categories of studies: (1) collection of hydrologic data, and (2) areal appraisals and interpretive studies. Approximately 36 percent of the program was for collection of hydrologic data and 64 percent for appraisals and interpretive studies. These studies provide managers and planners with information about the availability and quality of New Mexico's water resources.

LIST OF COOPERATORS

The following is a list of State, local, and Federal agencies that support water-resources investigation in cooperation with the U.S. Geological Survey during fiscal year 1986.

State and Local Agencies

Alamogordo, City of
Albuquerque, City of
Albuquerque Metropolitan Arroyo Flood Control Authority
Bernalillo, County of
Costilla Creek Compact Commission
El Paso, City of
Jemez River Indian Water Authority
Las Cruces, City of
Navajo Indian Nation
New Mexico State Bureau of Mines and Mineral Resources
New Mexico State Environmental Improvement Division
New Mexico State Highway Department
New Mexico State Engineer Office/Interstate Stream Commission
New Mexico Oil Conservation Division, Energy and Minerals Department
Pecos River Commission
Pueblo of Acoma
Pueblo of Laguna
Pueblo of Zuni
Raton, City of
Rio Grande Compact Commission
San Juan, County of
Santa Fe Metropolitan Water Board
Vermejo Conservancy District

Federal Agencies

Federal Emergency Management Agency
International Boundary and Water Commission, United States and Mexico
U.S. Department of the Air Force
    Holloman Air Force Base
U.S. Department of the Army
    Corps of Engineers
    Fort Bliss
    White Sands Missile Range
U.S. Department of Energy
U.S. Department of the Interior
    Bureau of Indian Affairs
    Bureau of Land Management
    Bureau of Reclamation
    National Park Service

WATER SITUATION IN NEW MEXICO

Surface and ground water of New Mexico, a semiarid state, range widely in availability, quantity, and quality. Three principal drainage systems in the United States have portions of their headwaters in New Mexico: the Colorado River, Mississippi River, and western Gulf of Mexico tributaries. The majority of New Mexico surface waters exists in six major rivers. The largest, in terms of total discharge, is the San Juan River (tributary to the Colorado River) in the northwestern corner of the State. The second largest is the Rio Grande which transects the center of the State from Colorado on the north to Texas on the south. Other major rivers include the Canadian River in the northeast, the Pecos River in the east and southeast, the Gila River in the southwest, and the Rio Chama in the north.

All of New Mexico's major streams are subject to one or more of eight interstate water compacts to which the State is a party. For administrative purposes, the State Engineer has declared 31 underground water basins, encompassing approximately 84,400 square miles (69 percent of the State's total area). The State Engineer has jurisdiction over appropriation and use of water resources of declared basins and intrastate administration of surface-water rights. The surface water of the State is fully appropriated; the State Engineer estimates that when the State has fully developed its surface-water resources within the allowances of the eight interstate compacts, river inflow to New Mexico will approximate river outflow from the State. In many areas where development has occurred and water use is significant, draft on the ground-water supply exceeds recharge, and ground-water levels are declining. In eastern New Mexico large withdrawals for irrigation are contributing to the lowering of water level in the Ogallala aquifer by as much as 100 feet. Increases in municipal, domestic, industrial, and agricultural water use in the west-central part of the State, in the vicinity of Gallup, Grants, and the Pueblos of Acoma and Laguna, have caused concern about sufficiency of ground-water supplies to meet future requirements. Other areas of decline in ground-water levels include the Mimbres Basin in the southwest, the San Juan Basin in the northwest, the Estancia Basin in the central part, and the Albuquerque-Belen and Santa Fe Basins in the north-central part of New Mexico.

Proper allocation and optimum utilization of New Mexico's water resources can only be accomplished by comprehensive planning and management, which require reliable hydrologic information. The current activities of the New Mexico District address many of the State's current and anticipated problems and water-information needs. These activities, as described in this report, are designed to provide that hydrologic data and related information needed for the best utilization and management of the water resources of New Mexico and the Nation.

WATER CONDITIONS DURING THE 1985 WATER YEAR

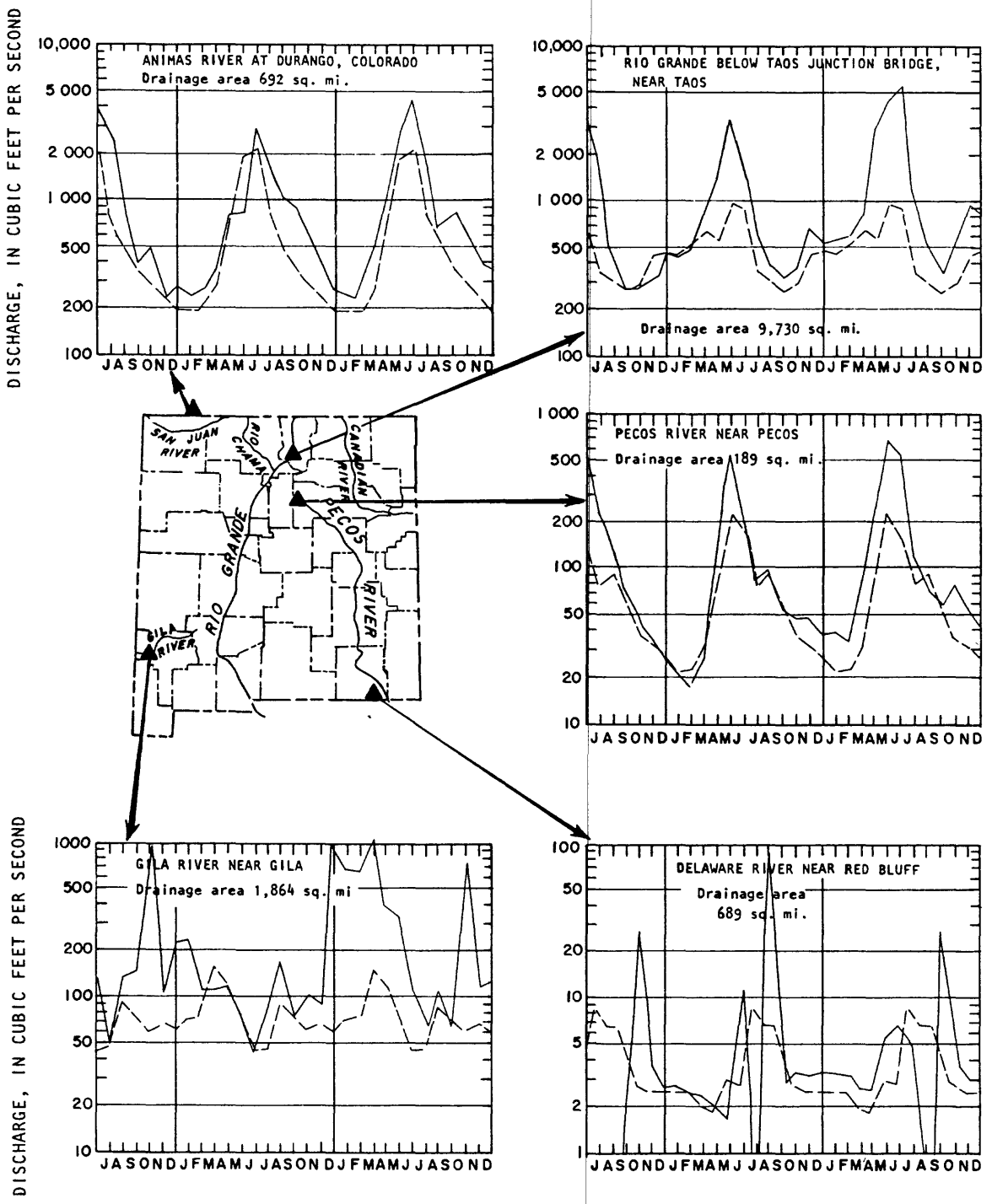
Surface water

Streamflow varied considerably during the 1985 water year (October 1984 through September 1985). Samples of reports released monthly by the New Mexico District are shown in figures 2 and 3. Streamflow conditions are shown in figure 2 and reservoir storage is shown in figure 3. Discharge of streams in New Mexico throughout the water year generally was higher than the 1951-80 median discharges. With the exception of the southeastern quadrant of the State the discharge was within the highest 25 percent of annual discharges recorded during the past 60 years.

Discharge for the 1985 water year at four index stations is shown in the table below and is compared to the median discharge for the reference period 1951-80:

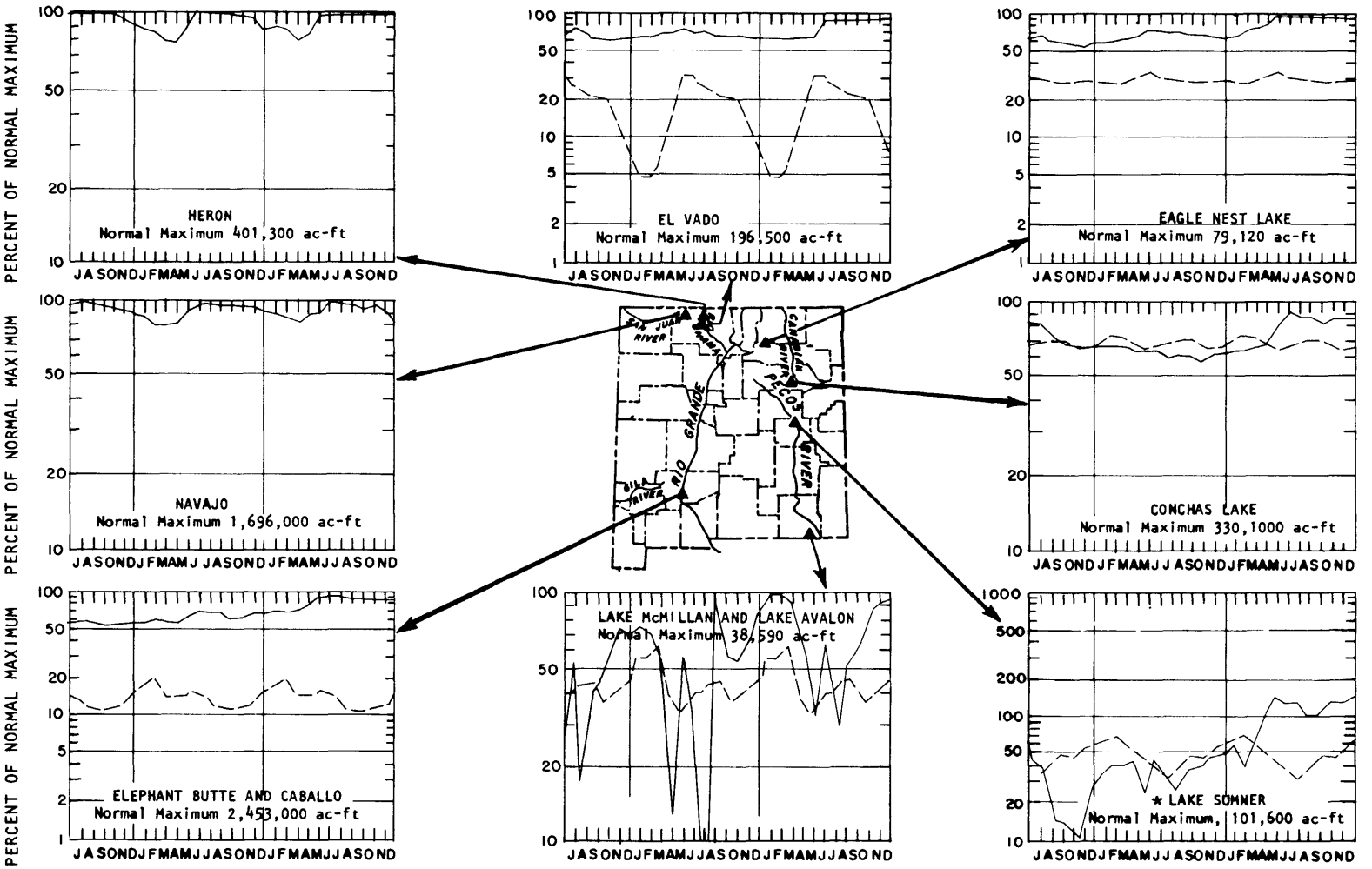
Station	Median discharge for 1951-80 water years, in acre-feet	*Discharge for 1985 water year, in acre-feet	Percent of median
Rio Grande below Taos Junction Bridge	388,700	1,153,000	297
Gila River near Gila	79,950	305,900	383
Pecos River near Pecos	56,090	120,200	214
Delaware River near Red Bluff	7,570	3,790	50

*Discharge data for 1985 water year are provisional.



NOTE: Period of median is 1951-1980 (shown by dashed line)

Figure 2.--Streamflow conditions in New Mexico, July 1983 - December 1985.



NOTE: Period of average is 1961-75 (shown by dashed line)

* Includes storage in Santa Rosa Lake

Figure 3.--Reservoir storage in selected reservoirs in New Mexico, July 1983 - December 1985.

Irrigation Reservoir Storage

Combined storage of 12 major reservoirs in New Mexico increased by 1,106,000 acre-feet during the 1985 water year. Total contents of the reservoirs were 5,223,000 acre-feet on September 30, 1985. The irrigation reservoir storage for six reservoirs in New Mexico from July 1983 to September 1985 is shown in figure 3. In general, reservoir storage was near maximum capacity throughout the 1985 water year. In July, storage in Lake Sumner was as much as 133 percent of the lake's maximum normal storage. Storage in the Elephant Butte Reservoir was the greatest since 1942.

Water Quality

Dissolved-solids concentrations in surface waters continued to be minimal throughout the State during the 1985 water year. Dissolved-solids concentrations were much smaller than normal for the period of record at the NASQAN stations 08358300, Rio Grande Conveyance Channel at San Marcial, and 08358400, Rio Grande Floodway at San Marcial. Dissolved-solids concentrations were larger than normal at 08383000, Pecos River at Santa Rosa, and 08405000, Pecos River at Carlsbad.

Median specific conductances at selected daily stations are shown in the table below and are compared to the median specific conductances for the reference period, water years 1975-84:

Station	Median specific conductance, in microsiemens per centimeter at 25° Celsius for 1975-84 water years	Median specific conductance, in microsiemens per centimeter at 25° Celsius for 1985 water year	Percent of 1975-84 median
Rio Grande at Otowi	335	310	93
Rio Grande at Albuquerque	426	375	88
Rio Grande CC at San Marcial	1,140	733	64
Rio Grande FW at San Marcial	722	383	53
Pecos River at Carlsbad	3,490	3,670	105
San Juan River at Shiprock	542	419	77

Suspended-sediment loads increased in some rivers and decreased in others in the 1984 water year (the latest year for which data are available) as compared to their median loads for 1974-83. The following table shows the suspended-sediment comparisons. Sediment data for the 1985 water year were not available at the time of publication.

Station	Median for water years 1974-83, in tons	Suspended-sediment load for 1984 water year, in tons[1]	Percent of median
Rio Grande at Otowi	1,497,000	1,468,574	98
Rio Grande at Albuquerque	949,500	1,197,098	126
Pecos River near Artesia	333,100	338,550	102
San Juan at Shiprock	4,821,000	4,228,746	88

[1]U.S. Geological Survey, 1985, Water resources data - New Mexico, water year 1984: U.S. Geological Survey Water-Data Report NM-84-1, 485 p.

Ground Water

Almost one-half of the water used in New Mexico is supplied by ground water. Wells provide 47 percent of the water used in the State and supply water to 89 percent of the New Mexico population (1.36 million people). Almost all of the municipal and domestic water for rural areas in New Mexico is supplied by ground water, but the largest ground-water use is for irrigation of the State's 861,000 acres of farmland. Ground water is an abundant natural resource in places but is unevenly distributed throughout the State. Large ground-water withdrawals are causing water-level declines and depleting supplies in places.[2]

[2]Hart, D. L., 1985, New Mexico--ground-water resources, in National Water Summary 1984--hydrologic events, selected water-quality trends, and ground-water resources: U.S. Geological Survey Water-Supply Paper 2275, p. 317-322.

Ground-water levels are measured periodically in a network of about 5,000 observation wells to record changes in ground-water storage. About 1,000 wells are measured annually, and the remaining 4,000 wells are measured at 5-year intervals, staggered so that some wells in each area are measured each year. The areas of water-level observation are within seven of the nine major drainage basins; most are in areas where ground water is used in large quantities for irrigation, municipal, or industrial purposes. Seventeen selected wells are equipped with continuous water-level recording gages.

Hydrographs of water levels in wells (fig. 4) in the four quadrants of the State illustrate the water-level trends for the last 20 years (or for the period of record available in the case of the Union County well). The wells in Chaves, Luna, and Union Counties are in areas of intensive irrigation. The well in Cibola County is in an area where the mining industry has acquired most of the water rights. A decrease in ground-water withdrawals for agriculture and mining operations may be responsible for the general water-level rise in the Cibola County well.

The water level in the Luna County recorder well (Mimbres Valley) declined during the 1985 water year, but continued to be higher than the average for the past 20 years. The water level in the Union County well continued to decline, a situation that is typical of wells on the High Plains of northeastern New Mexico. The Chaves County recorder well shows the yearly fluctuations that are typical of the Roswell artesian basin.

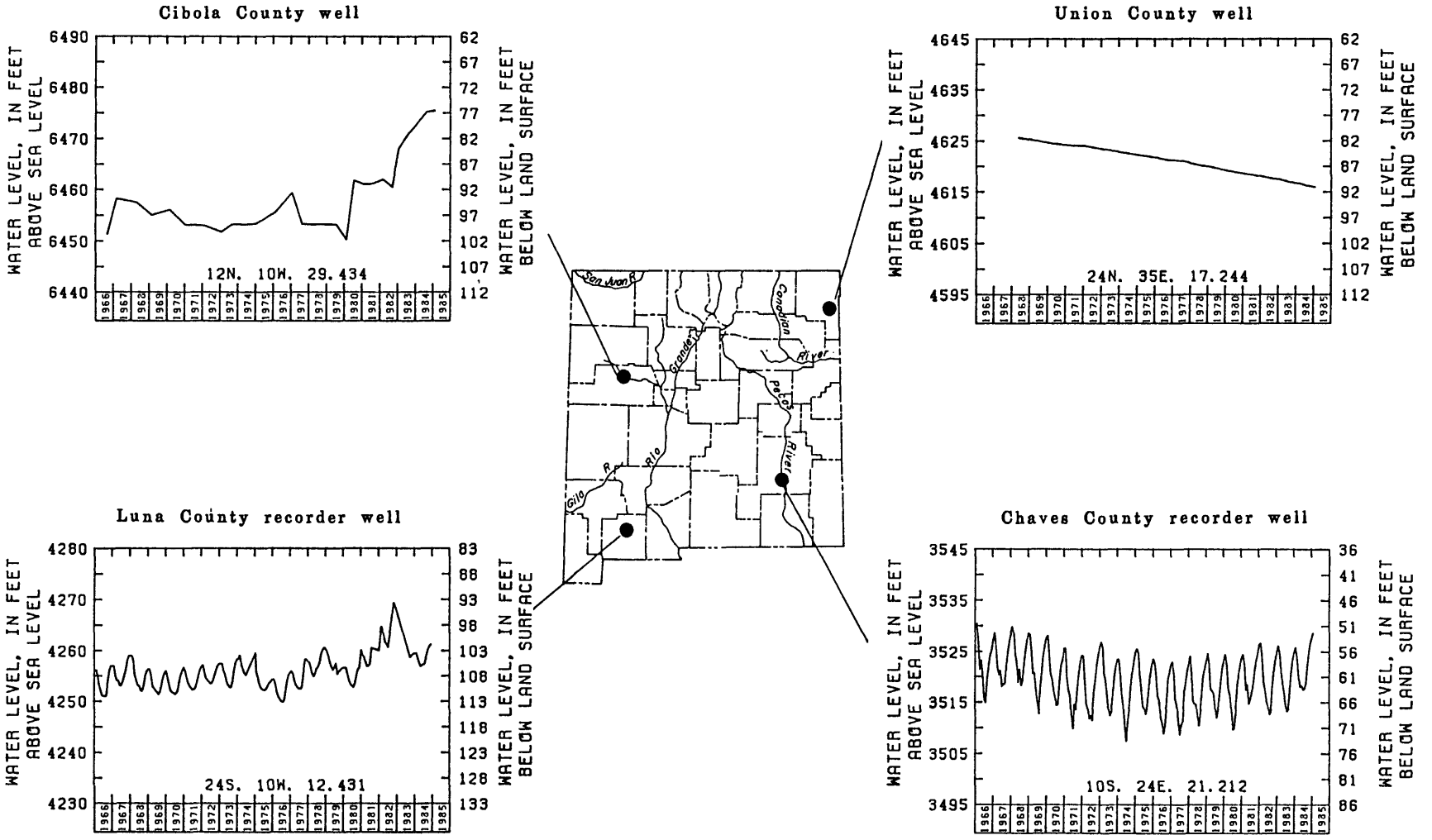


Figure 4.--Ground-water levels for the last 20 years or period of record.

REPORTS RELEASED DURING 1985

Abeyta, C. G., and Delaney, B. M., in press, Annotated bibliography of the hydrology, geology, and geothermal research of the Jemez Mountains and vicinity, north-central New Mexico: U.S. Geological Survey Open-File Report 85-83.

Anderholm, S. K., 1985, Clay-sized fraction and powdered whole-rock x-ray analysis from alluvial basin deposits in central and southern New Mexico: U.S. Geological Survey Open-File Report 85-173, 18 p.

Cruz, R. R., 1985, Annual water-resources review, White Sands Missile Range, New Mexico, 1984: U.S. Geological Survey Open-File Report 85-645, 25 p.

Goetz, C. L., and Abeyta, C. G., in press, Adequacy of NASQAN data to describe areal and temporal variability of water quality of the San Juan River drainage basin upstream from Shiprock, New Mexico: U.S. Geological Survey Water-Resources Investigations Report 85-4043.

Gold, R. L., and Denis, L. P., 1985, Use and availability of continuous streamflow records in New Mexico: U.S. Geological Survey Open-File Report 85-572, 44 p.

Kaehler, Charles, 1985, Geologic characterization of alluvial basins in the Rio Grande Rift region, Colorado, New Mexico, and Texas [abs.]: American Society of Civil Engineers Ground-Water Symposium, April 29-May 2, 1985, Denver, Colorado.

Kernodle, J. M., 1985, Generalized flow modeling of basins along the Rio Grande Rift [abs.]: American Society of Civil Engineers Ground-Water Symposium, April 29-May 2, 1985, Denver, Colorado.

Kues, G. E., in press, Ground-water levels and direction of ground-water flow in central Bernalillo County, New Mexico, summer 1983: U.S. Geological Survey Water-Resources Investigations Report 85-4325.

Myers, R. G., and Villanueva, E. D., in press, Geohydrology of the aquifers that may be affected by the surface mining of coal in the Fruitland Formation in the San Juan Basin, northwestern New Mexico: U.S. Geological Survey Water-Resources Investigations Report 85-4251.

Orr, B. R., and Myers, R. G., in press, Water in basin-fill deposits in the Tularosa Basin, New Mexico: U.S. Geological Survey Water-Resources Investigations Report 85-4219.

Orr, B. R., and White, R. R., 1985, Hydrologic data from the northern part of the Hueco Bolson, New Mexico and Texas: U.S. Geological Survey Open-File Report 85-696, 88 p.

Richey, S. F., 1985, Hydrographs from selected observation wells and total annual pumpage from municipal supply wells, 1950-83, Santa Fe, New Mexico: U.S. Geological Survey Open-File Report 85-152, 1 sheet.

Risser, D. W., 1985, Effect of Santa Rosa Lake on ground-water flow in the Pecos River, in Keyes, C. G., Jr., and Wood, T. J., eds., Development and management aspects of irrigation and drainage systems: New York, American Society of Civil Engineers, p. 469-476.

_____ in press, Possible changes in ground-water flow to the Pecos River caused by Santa Rosa Lake, Guadalupe County, New Mexico: U.S. Geological Survey Water-Resources Investigations Report 85-4291.

Stevens, Ken, and Beyeler, Walt, 1985, Determination of diffusivities in the Rustler Formation from exploratory shaft construction at the Waste Isolation Pilot Plant in southeast New Mexico: U.S. Geological Survey Water-Resources Investigations Report 85-4020, 32 p.

Umari, M. J., and Gorelick, S. M., 1985, An algorithm for the semianalytic advancement of time in solute transport simulations: Dealing with a complex eigensystem [abs.]: American Geophysical Union Transactions, v. 66, no. 18, p. 274.

U.S. Geological Survey, 1985, Annual report to the Pecos River Commission on investigations being made in New Mexico and Texas, calendar year 1984: New Mexico District Report, 17 p.

_____ 1985, Water-resources data--New Mexico, water year 1984: U.S. Geological Survey Water-Data Report NM-84-1, 485 p.

Welder, G. E., in press, Plan of study for the regional aquifer-system analysis of the San Juan structural basin, New Mexico, Colorado, and Arizona: U.S. Geological Survey Water-Resources Investigations Report 85-4294.

Zehner, H. H., 1985, Hydrology and water-quality monitoring considerations, Jackpile uranium mine, northwestern New Mexico: U.S. Geological Survey Water-Resources Investigations Report 85-4226, 61 p.

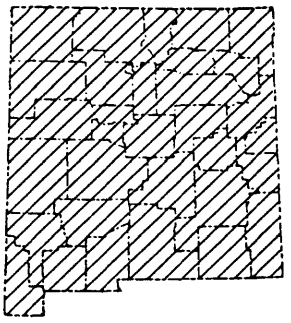
PROJECTS IN PROGRESS IN FISCAL YEAR 1986

Hydrologic-data stations are maintained by the Geological Survey at many locations in New Mexico. They constitute a network for obtaining records of stream stage and discharge, reservoir and lake elevation and storage, ground-water levels, well and spring discharge, sediment yields, and the quality of surface and ground water. The Water Resources Division has a current and a historical file of hydrologic data. Data collected are stored in the Geological Survey's National Water Data Storage and Retrieval System (WATSTORE) and are available on request. This information can be retrieved in machine-readable form, as computer-printed tables or graphs, or as digital plots. Computer programs are available for statistical analyses of the data and the results of these analyses are available. Local assistance in acquisition of services or products from WATSTORE can be obtained from the District Chief, Water Resources Division, Albuquerque.

A summary of each data-collection program is included in this report. The summary consists of maps that show the location of the hydrologic-data stations, time period covered by the project, principal investigator, a list of cooperating agencies, a brief description of the need for the program, its objective, the approach taken, progress and significant results, plans for FY 86, and project reports released and in progress.

In addition to the hydrologic-data program, a number of interpretive projects, areal appraisals, and continuing cooperative projects are undertaken in New Mexico. The interpretive projects and areal appraisals are initiated for investigation of a particular hydrologic problem or specified area. These projects may be active for several years and usually are conducted in cooperation with one or more Federal, State, Tribal, or local agencies. Some projects are continued for many years because of the need for long-term data collection and analysis.

NM-001 SURFACE-WATER STATIONS, NEW MEXICO



Period of Project: Continuous since 1930

Principal Investigator: Louis P. Denis

Cooperating Agencies: Most of the agencies shown in the list of cooperators

Problem: Surface-water information is needed for purposes of surveillance, planning, design, hazard warning, operation, and management in water-related fields such as water supply, hydroelectric power, flood control, irrigation, bridge and culvert design, wildlife management, pollution abatement, flood-plain management, and water-resources development. An appropriate data base is necessary to provide this information.

Objective: To obtain and document surface-water discharge (streamflow) and stage (water level) for general hydrologic purposes such as assessment of water resources, areal analysis, determination of long-term trends, research and special studies, or for management and operational purposes on streams and reservoirs of New Mexico.

Approach: Standard methods of data collection are used as described in the series, "Techniques of Water-Resources Investigations of the U.S. Geological Survey." Daily and partial (annual peak discharge) records are collected, computed, and prepared for publication each year in the annual report, "Water resources data--New Mexico." The following table summarizes the types of stations in operation during FY 86.

Station classification	Number of stations
Stream stations	379
Continuous stage and discharge record:	
Water year	174
Irrigation season only	4
Cumulative discharge record:	
Irrigation season total only	30
Partial stage and discharge record	141
Lake and reservoir stations	24
Continuous stage and contents	23
Intermittent stage and contents	1
Total stations	403

All stations, including those operated in support of other projects, are summarized in table 1. Location of the stations is shown in figure 5 except partial-record stations that record peak flow only (141), and selected stations only operated during the irrigation season (64). As part of interpretive hydrologic investigations, streamflow measurements are sometimes made at temporary gaging stations and at locations other than gaging stations.

Progress and Significant Results: Streamflow and stage data were collected at 403 network sites and prepared for publication.

Plans for FY 86: Continuation of network operated in fiscal year 1985 with minor revisions made in response to program changes.

Reports in Progress:
Water resources data--New Mexico, water year 1985.

Reports Released:
U.S. Geological Survey, 1985, Water resources data--New Mexico, water year 1984: U.S. Geological Survey Water-Data Report NM-84-1, 485 p. Reports on water-resources data for New Mexico are published annually.

Table 1.--Surface-water gaging stations in operation during the 1986 water year

STATION	STATION NAME	COUNTY	DRAINAGE AREA (SQ. MI.)	HYDROLOGIC UNIT CODE	PERIOD OF RECORD
07199000	CANADIAN RIVER NR HEBRON, NM	007	229	11080001	1946-
07199450	LAKE MALOYA NR RATON, NM	007	20.8	11080001	1975-
07199550	LAKE ALICE NR RATON, NM	007	29.4	11080001	1975-
07199600	CHICORICA CREEK NR YANKEE, NM	007	32.5	11080001	*1984-
07199650	EAST FORK CHICORICA CREEK NR YANKEE, NM	007	--	11080001	1984-
07200500	CHICORICA CREEK NR RATON, NM	007	--	11080001	1983-
07202000	CHICORICA CREEK NR HEBRON, NM	007	381	11080001	1984-
07202400	VERMEJO RIVER AT VERMEJO PARK, NM	007	--	11080001	1985-
07202500	EAGLE TAIL DITCH NR MAXWELL, NM	007	--	11080001	*1975-
07203000	VERMEJO RIVER NR DAWSON, NM	007	301	11080001	*1927-
07203505	VERMEJO DITCH NR COLFAX, NM	007	--	11080001	1980-
07203525	VERMEJO RIVER NR MAXWELL, NM	007	--	11080001	1983-
07204000	MORENO CREEK AT EAGLE NEST, NM	007	73.8	11080002	*1964-
07204500	CIENEGUILLA CREEK NR EAGLE NEST, NM	007	56.0	11080002	*1964-
07205000	SIXMILE CREEK NR EAGLE NEST, NM	007	10.5	11080002	*1958-
07205500	EAGLE NEST LAKE NR EAGLE NEST, NM	007	167	11080002	*1950-
07206000	CIMARRON RIVER BL EAGLE NEST DAM, NM	007	167	11080002	1950-
07207000	CIMARRON RIVER NR CIMARRON, NM	007	294	11080002	1950-
07207500	PONIL CREEK NR CIMARRON, NM	007	171	11080002	1950-
07208500	RAYADO CREEK AT SAUBLE RANCH NR CIMARRON, NM	007	65.0	11080002	*1927-
07211000	CIMARRON RIVER AT SPRINGER, NM	007	1030	11080002	*1926-
07211500	CANADIAN RIVER NR TAYLOR SPRINGS, NM	007	2850	11080003	*1964-
07215100	LA CUEVA CANAL BL LA CUEVA, NM	033	--	11080004	1956-
07215500	MORA RIVER AT LA CUEVA, NM	033	173	11080004	*1931-
07216500	MORA RIVER NR GOLONDRINAS, NM	033	267	11080003	*1924-
07218000	COYOTE CREEK NR GOLONDRINAS, NM	033	215	11080004	*1930-
07221000	MORA RIVER NR SHOEMAKER, NM	033	1100	11080004	*1927-
07221500	CANADIAN RIVER NR SANCHEZ, NM	047	6010	11080003	*1935-
07222500	CONCHAS RIVER AT VARIADERO, NM	047	523	11080005	1936-
07223300	CONCHAS CANAL BL CONCHAS DAM, NM	047	--	11080006	*1984-
07223500	CONCHAS LAKE AT CONCHAS DAM, NM	047	7400	11080006	1938-
07226500	UTE CREEK NR LOGAN, NM	021	2060	11080007	*1942-
07226800	UTE RESERVOIR NR LOGAN, NM	037	11100	11080006	1963-
07227000	CANADIAN RIVER AT LOGAN, NM	037	11100	11080006	1959-
07227100	REVUELTO CREEK NR LOGAN, NM	037	786	11080008	1959-
08252500	COSTILLA CREEK AB COSTILLA DAM, NM	055	25.1	13020101	1937-
08253000	CASIAS CREEK NR COSTILLA, NM	055	16.6	13020101	1937-
08253500	SANTISTEVAN CREEK NR COSTILLA, NM	055	2.15	13020101	1937-
08254000	COSTILLA CREEK BL COSTILLA DAM, NM	055	54.6	13020101	1937-
08255500	COSTILLA CREEK NR COSTILLA, NM	055	195	13020101	1936-
08256000	ACEQUIA MADRE AT COSTILLA, NM	055	--	13020101	1944-
08258000	CERRO CANAL AT COSTILLA, NM	055	--	13020101	1944-
08258600	CERRO CANAL BL ASSOCIATION DITCH AT COSTILLA, NM	055	--	13020101	1972-
08259600	CERRO CANAL AT STATE LINE NR JAROSO, CO	055	--	13020101	1973-
08260500	COSTILLA CREEK BL DIVERSION AT COSTILLA, NM	055	197	13020101	1952-

Table 1.--Surface-water gaging stations in operation during the 1986 water year - Continued

STATION	STATION NAME	COUNTY	DRAINAGE AREA (SQ. MI.)	HYDROLOGIC UNIT CODE	PERIOD OF RECORD
08261000	COSTILLA CREEK NR GARCIA, CO	055	200	13020101	1944-
08262000	EASTDALE NO. 1 INTAKE CANAL NR JAROSO, CO	023	--	13020101	1944-
08263500	RIO GRANDE NR CERRO, NM	055	8440	13020101	1948-
08265000	RED RIVER NR QUESTA, NM	055	113	13020101	*1926-
08265500	LLANO DITCH NR QUESTA, NM	055	--	13020101	1961-
08266000	CABRESTO CREEK NR QUESTA, NM	055	36.7	13020101	1943-
08266820	RED RIVER BL FISH HATCHERY NR QUESTA, NM	055	186	13020101	*1978-
08267500	RIO HONDO NR VALDEZ, NM	055	36.2	13020101	1934-
08268700	RIO GRANDE NR ARROYO HONDO, NM	055	8760	13020101	1963-
08269000	RIO PUEBLO DE TAOS NR TAOS, NM	055	66.6	13020101	*1962-
08271000	RIO LUCERO NR ARROYO SECO, NM	055	16.6	13020101	*1962-
08275500	RIO GRANDE DEL RANCHO NR TALPA, NM	055	83	13020101	*1985-
08276300	RIO PUEBLO DE TAOS BL LOS CORDOVAS, NM	055	380	13020101	1957-
08276500	RIO GRANDE BL TAOS JUNCTION BRIDGE NR TAOS, NM	055	9730	13020101	1925-
08279000	EMBUDO CREEK AT DIXON, NM	039	305	13020101	*1962-
08279500	RIO GRANDE AT EMBUDO, NM	039	10400	13020101	1889-
08281100	RIO GRANDE AB SAN JUAN PUEBLO, NM	039	10500	13020101	1963-
08284100	RIO CHAMA NR LA PUENTE, NM	039	480	13020102	1955-
08284160	AZOTEA TUNNEL AT OUTLET NR CHAMA, NM	039	--	13020102	1970-
08284200	WILLOW CREEK AB HERON RESERVOIR NR LOS OJOS, NM	039	112	13020102	1962-
08284300	HORSE LAKE CREEK AB HERON RESERVOIR NR LOS OJOS, NM	039	45.0	13020102	1962-
08284510	HERON RESERVOIR NR LOS OJOS, NM	039	193	13020102	1970-
08284520	WILLOW CREEK BL HERON DAM, NM	039	193	13020102	1971-
08285000	EL VADO RESERVOIR NR TIERRA AMARILLA, NM	039	873	13020102	1935-
08285500	RIO CHAMA BL EL VADO DAM, NM	039	877	13020102	*1935-
08286500	RIO CHAMA AB ABIQUIU RESERVOIR, NM	039	1600	13020102	1961-
08286900	ABIQUIU RESERVOIR NR ABIQUIU, NM	039	2140	13020102	1963-
08287000	RIO CHAMA BL ABIQUIU DAM, NM	039	2140	13020102	1961-
08289000	RIO OJO CALIENTE AT LA MADERA, NM	039	419	13020102	1932-
08290000	RIO CHAMA NR CHAMITA, NM	039	3140	13020102	1912-
08291000	SANTA CRUZ RIVER NR CUNDIYO, NM	049	86.0	13020101	1930-
08291950	SANTA CLARA CREEK BL TURKEY CREEK NR ESPANOLA, NM	039	--	13020101	1984-
08292000	SANTA CLARA CREEK NR ESPANOLA, NM	039	34.5	13020101	*1985-
08294200	NAMBE FALLS RESERVOIR NR NAMBE, NM	049	25.0	13020101	1976-
08294210	RIO NAMBE BL NAMBE FALLS DAM NR NAMBE, NM	049	34.1	13020101	1979-
08313000	RIO GRANDE AT OTOWI BRIDGE, NM	049	14300	13020101	1895-
08313500	COCHITI EAST SIDE MAIN CANAL AT COCHITI, NM	043	--	13020201	*1970-
08314000	SILI MAIN CANAL (AT HEAD) AT COCHITI, NM	043	--	13020201	*1970-
08315500	MCCLURE RESERVOIR NR SANTA FE, NM	049	17.4	13020201	*1947-
08316000	SANTA FE RIVER NR SANTA FE, NM	049	18.2	13020201	1913-
08316500	NICHOLS RESERVOIR NR SANTA FE, NM	049	22.8	13020201	1943-
08317200	SANTA FE RIVER AB COCHITI LAKE, NM	049	231	13020201	1970-
08317300	COCHITI LAKE NR COCHITI PUEBLO, NM	043	14900	13020201	1973-
08317400	RIO GRANDE BL COCHITI DAM, NM	043	14900	13020201	1970-
08317900	GALISTEO RESERVOIR NR CERRILLOS, NM	049	596	13020201	1970-

Table 1.--Surface-water gaging stations in operation during the 1986 water year - Continued

STATION	STATION NAME	COUNTY	DRAINAGE AREA (SQ. MI.)	HYDROLOGIC UNIT CODE	PERIOD OF RECORD
08317950	GALISTEO CREEK BL GALISTEO DAM, NM	049	597	13020201	1970-
08319000	RIO GRANDE AT SAN FELIPE, NM	043	16100	13020201	1925-
08321500	JEMEZ RIVER BL EAST FORK NR JEMEZ SPRINGS, NM	043	173	13020202	*1981-
08323000	RIO GUADALUPE AT BOX CANYON NR JEMEZ, NM	043	235	13020202	*1981-
08324000	JEMEZ RIVER NR JEMEZ, NM	043	470	13020202	*1953-
08328500	JEMEZ CANYON RESERVOIR NR BERNALILLO, NM	043	1030	13020202	1953-
08329000	JEMEZ RIVER BL JEMEZ CANYON DAM, NM	043	1030	13020202	*1943-
08329700	CAMPUS WASH AT ALBUQUERQUE, NM	001	--	13020203	1982-
08329835	NORTH FLOODWAY CHANNEL AT ALBUQUERQUE, NM	001	--	13020203	1982-
08329900	NORTH FLOODWAY CHANNEL NR ALAMEDA, NM	001	--	13020203	1968-
08330000	RIO GRANDE AT ALBUQUERQUE, NM	001	17400	13020203	1941-
08330600	TIJERAS ARROYO NR ALBUQUERQUE, NM	001	133	13020203	*1974-
08330800	TIJERAS ARROYO BL S DIV INLET NR ALBUQUERQUE, NM	001	--	13020203	1974-
08332010	RIO GRANDE FLOODWAY NR BERNARDO, NM	053	19200	13020203	*1941-
08332050	BERNARDO INTERIOR DRAIN NR BERNARDO, NM	053	--	13020203	*1943-
08334000	RIO PUERCO AB ARROYO CHICO NR GUADALUPE, NM	043	420	13020204	1951-
08340500	ARROYO CHICO NR GUADALUPE, NM	043	1390	13020204	1943-
08341400	BLUEWATER LAKE NR BLUEWATER, NM	006	201	13020207	*1958-
08343000	RIO SAN JOSE AT GRANTS, NM	006	1020	13020207	*1968-
08343100	GRANTS CANYON AT GRANTS, NM	006	13.0	13020207	1961-
08343500	RIO SAN JOSE NR GRANTS, NM	006	2300	13020207	1936-
08349800	RIO PAGUATE BL JACKPLIE MINE NR LAGUNA, NM	006	107	13020207	1976-
08351500	RIO SAN JOSE AT CORREO, NM	006	3660	13020207	1943-
08353000	RIO PUERCO NR BERNARDO, NM	053	7350	13020204	1939-
08354500	SOCORRO MAIN CANAL NORTH AT SAN ACACIA, NM	053	--	13020203	1936-
08354800	RIO GRANDE CONVEYANCE CHANNEL AT SAN ACACIA, NM	053	--	13020203	1960-
08354900	RIO GRANDE FLOODWAY AT SAN ACACIA, NM	053	26700	13020203	1936-
08358300	RIO GRANDE CONVEYANCE CHANNEL AT SAN MARCIAL, NM	053	--	13020203	1969-
08358400	RIO GRANDE FLOODWAY AT SAN MARCIAL, NM	053	27700	13020203	1964-
08360500	ELEPHANT BUTTE RESERVOIR AT ELEPHANT BUTTE, NM	051	29400	13020211	1915-
08361000	RIO GRANDE BL ELEPHANT BUTTE DAM, NM	051	29400	13030101	1915-
08362000	CABALLO RESERVOIR NR ARREY, NM	051	30700	13030102	1938-
08362500	RIO GRANDE BL CABALLO DAM, NM	051	30700	13030102	1938-
08377900	RIO MORA NR TERRERO, NM	047	53.2	13060001	1963-
08378500	PECOS RIVER NR PECOS, NM	047	189	13060001	1919-
08379500	PECOS RIVER NR ANTON CHICO, NM	019	1050	13060001	*1927-
08380500	GALLINAS CREEK NR MONTEZUMA, NM	047	84.0	13060001	1916-
08382500	GALLINAS RIVER NR COLONIAS, NM	019	610	13060001	1951-
08382600	PECOS RIVER AB CANON DEL UTA NR COLONIAS, NM	019	2330	11080005	1976-
08382650	PECOS RIVER AB SANTA ROSA LAKE, NM	019	2340	13060001	1976-
08382730	LOS ESTEROS CREEK AB SANTA ROSA LAKE, NM	019	65.6	13060001	1973-
08382760	LOS ESTEROS CREEK TR AB SANTA ROSA LAKE, NM	019	13.7	13060001	1973-
08382810	SANTA ROSA LAKE NR SANTA ROSA, NM	019	--	13060001	1980-
08382830	PECOS RIVER BL SANTA ROSA LAKE, NM	019	2430	13060001	1980-
08383000	PECOS RIVER AT SANTA ROSA, NM	019	2650	13060001	*1928-

Table 1.--Surface-water gaging stations in operation during the 1986 water year - Continued

STATION	STATION NAME	COUNTY	DRAINAGE AREA (SQ. MI.)	HYDROLOGIC UNIT CODE	PERIOD OF RECORD
08383500	PECOS RIVER NR PUERTO DE LUNA, NM	019	3970	13060001	1938-
08384000	LAKE SUMNER NR FORT SUMNER, NM	011	4390	13060001	1938-
08384500	PECOS RIVER BL SUMNER DAM, NM	011	4390	13060003	*1938-
08385000	FORT SUMNER MAIN CANAL NR FORT SUMNER, NM	011	--	13060003	*1954-
08386000	PECOS RIVER NR ACME, NM	005	11300	13060007	*1937-
08387000	RIO RUIDOSO AT HOLLYWOOD, NM	027	120	13060008	1953-
08390500	RIO HONDO AT DIAMOND A RANCH NR ROSWELL, NM	005	947	13060008	*1939-
08390600	TWO RIVERS RESERVOIR NR ROSWELL, NM	005	1020	13060008	1963-
08390610	RIO HONDO RESERVOIR NR ROSWELL, NM	005	963	13060008	1963-
08390620	ROCKY ARROYO RESERVOIR NR ROSWELL, NM	005	64.0	13060008	1963-
08390800	RIO HONDO BL DIAMOND A DAM NR ROSWELL, NM	005	963	13060008	1963-
08393500	RIO HONDO AT ROSWELL, NM	005	--	13060008	1981-
08394100	PECOS RIVER NR HAGERMAN, NM	005	13600	13060007	1968-
08394500	RIO FELIX AT OLD HWY BR NR HAGERMAN, NM	005	932	13060009	1939-
08395500	PECOS RIVER NR LAKE ARTHUR, NM	005	14700	13060007	1938-
08396500	PECOS RIVER NR ARTESIA, NM	015	15300	13060007	*1909-
08398500	RIO PENASCO AT DAYTON, NM	015	1060	13060010	1951-
08399500	PECOS RIVER (KAISER CHANNEL) NR LAKEWOOD, NM	015	--	13060011	1950-
08400000	FOURMILE DRAW NR LAKEWOOD, NM	015	265	13060011	1951-
08400500	LAKE MCMILLAN NR LAKEWOOD, NM	015	16900	13060011	1939-
08401000	PECOS RIVER BL MCMILLAN DAM, NM	015	16900	13060011	*1946-
08401100	PECOS RIVER AB SEVEN RIVERS NR LAKEWOOD, NM	015	17000	13060011	1974-
08401200	SOUTH SEVEN RIVERS NR LAKEWOOD, NM	015	220	13060011	1963-
08401500	PECOS RIVER BL MAJOR JOHNSON SP NR CARLSBAD, NM	015	17600	13060011	*1971-
08401900	ROCKY ARROYO AT HWY BR NR CARLSBAD, NM	015	285	13060011	1963-
08402000	PECOS RIVER AT DAMSITE 3 NR CARLSBAD, NM	015	17900	13060011	*1944-
08403500	CARLSBAD MAIN CANAL AT HEAD NR CARLSBAD, NM	015	--	13060011	1939-
08403800	LAKE AVALON NR CARLSBAD, NM	015	18000	13060011	1939-
08404000	PECOS RIVER BL AVALON DAM, NM	015	18000	13060011	*1951-
08405150	DARK CANYON DRAW AT CARLSBAD, NM	015	451	13060011	1973-
08405200	PECOS RIVER BL DARK CANYON DRAW AT CARLSBAD, NM	015	18500	13060011	1970-
08405500	BLACK RIVER AB MALAGA, NM	015	343	13060011	*1946-
08406500	PECOS RIVER NR MALAGA, NM	015	19100	13060011	1920-
08407000	PECOS RIVER AT PIERCE CANYON CROSSING, NM	015	19200	13060011	*1951-
08407500	PECOS RIVER AT RED BLUFF, NM	015	19500	13060011	1937-
08408500	DELAWARE RIVER NR RED BLUFF, NM	015	689	13070002	*1937-
08477110	MIMBRES RIVER AT MIMBRES, NM	017	184	13030202	1978-
08481500	TULAROSA CREEK NR BENT, NM	035	120	13050003	1947-
08484500	LA LUZ CREEK AT LA LUZ, NM	035	62.7	13050003	1983-
08492900	SACRAMENTO RIVER NR SUNSPOT, NM	035	12.7	13050004	1984-
09355100	NAVAJO RESERVOIR NR ARCHULETA, NM	045	3230	14080101	1962-
09355500	SAN JUAN RIVER NR ARCHULETA, NM	045	3260	14080101	1954-
09363500	ANIMAS RIVER NR CEDAR HILL, NM	067	1090	14080104	1933-
09364500	ANIMAS RIVER AT FARMINGTON, NM	045	1360	14080104	*1912-
09365000	SAN JUAN RIVER AT FARMINGTON, NM	045	7240	14080105	*1912-

Table 1.--Surface-water gaging stations in operation during the 1986 water year - Concluded

STATION	STATION NAME	COUNTY	DRAINAGE AREA (SQ. MI.)	HYDROLOGIC UNIT CODE	PERIOD OF RECORD
09367500	LA PLATA RIVER NR FARMINGTON, NM	045	583	14080105	1938-
09367561	SHUMWAY ARROYO NR WATERFLOW, NM	045	73.8	14080105	1974-
09367680	CHACO WASH AT CHACO CANYON NATIONAL MONUMENT, NM	045	578	14080106	1976-
09367950	CHACO RIVER NR WATERFLOW, NM	045	4350	14080106	*1975-
09368000	SAN JUAN RIVER AT SHIPROCK, NM	045	12900	14080105	*1927-
09371010	SAN JUAN RIVER AT FOUR CORNERS, CO	083	14600	14080201	1977-
09386185	SMITH ARROYO NR QUEMADO, NM	003	--	15020003	1985-
09386187	CINDER CONE LAKE NR QUEMADO, NM	003	--	15020003	1985-
09386189	ZUNI SALT LAKE NR QUEMADO, NM	003	--	15020003	1985
09386900	RIO NUTRIA NR RAMAH, NM	031	71.4	15020004	1969-
09386950	ZUNI RIVER AB BLACK ROCK RESERVOIR, NM	031	810	15020004	1969-
09430500	GILA RIVER NR GILA, NM	017	1860	15040001	*1927-
09430600	MOGOLLON CREEK NR CLIFF, NM	017	69.0	15040001	1967-
09431500	GILA RIVER NR REDROCK, NM	017	2820	15040002	*1962-
09442680	SAN FRANCISCO RIVER NR RESERVE, NM	003	350	15040004	1959-
09442692	TULAROSA RIVER AB ARAGON, NM	003	94.0	15040004	1966-
09443000	SAN FRANCISCO RIVER NR ALMA, NM	003	1540	15040004	*1964-
09444000	SAN FRANCISCO RIVER NR GLENWOOD, NM	003	1650	1504004	1927-

* Some records have been collected previously.

Code	County Name	Code	County Name	Code	County Name
001	Bernalillo	019	Guadalupe	037	Quay
003	Catron	021	Harding	039	Rio Arriba
005	Chaves	023	Hidalgo	041	Roosevelt
006	Cibola	025	Lea	043	Sandoval
007	Colfax	027	Lincoln	045	San Juan
009	Curry	028	Los Alamos	047	San Miguel
011	De Baca	029	Luna	049	Santa Fe
013	Dona Ana	031	McKinley	051	Sierra
015	Eddy	033	Mora	053	Socorro
017	Grant	035	Otero	055	Taos

Code	County Name
057	Torrance
061	Union
083	Montezuma (Colorado)

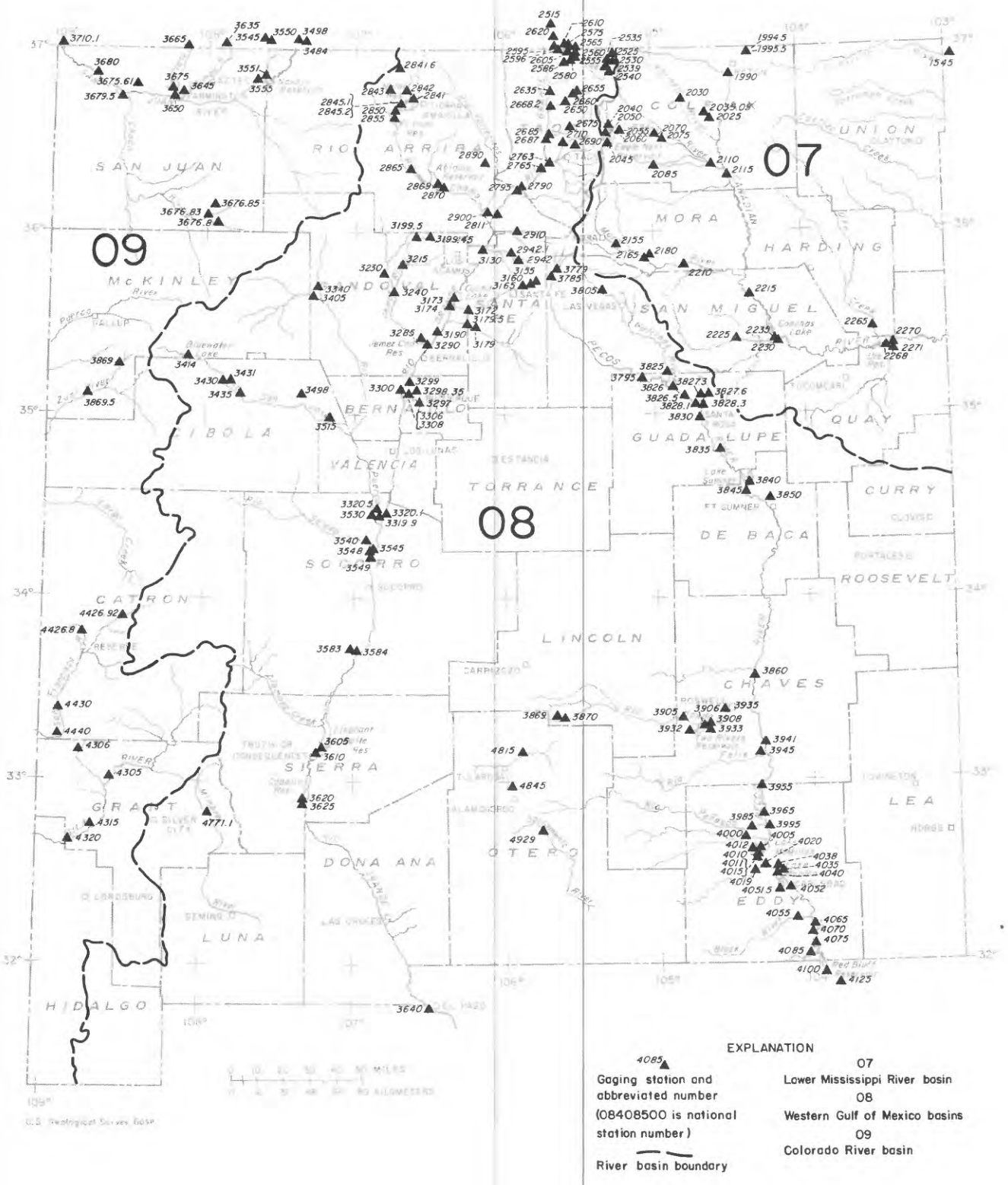
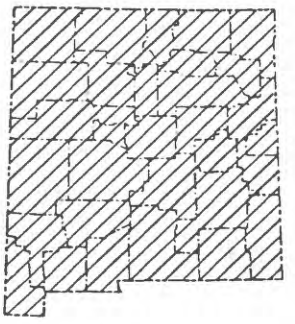


Figure 5.--Location of surface-water gaging stations.

NM-002 GROUND-WATER STATIONS, NEW MEXICO



Period of Project: Continuous since 1925

Principal Investigator: Jim D. Hudson

Cooperating Agency: New Mexico State Engineer

Problem: Ground-water data are collected to determine short-term changes and long-term trends in ground-water levels, to relate these data to changes in ground-water storage, and to provide the data base necessary for management of this resource. Water levels in wells, discharge of springs and wells, and water-quality data are critical for monitoring ground-water trends; however, these data must be integrated with other observations and studies of ground-water systems to have the fullest meaning and usefulness.

Objective: A network of ground-water observation wells is maintained in New Mexico to provide a long-term data base encompassing areas of ground-water development or potential development. This data base is designed to allow evaluation of the general response of the hydrologic system to natural and induced stresses.

Approach: Most areas of ground-water development in the State are scheduled for intensive ground-water-level measurements at 5-year intervals (fig. 6). Initial work in an area selected for 5th-year water-level measurements includes inventory of wells and well data, such as depth-to-water, well drilling and completion records, well yield, and water-quality analyses that are readily available. Observation wells are selected from the initial inventory data. Water levels for the selected wells are evaluated to assure that the wells' water levels are representative of the primary ground-water aquifer. Each 5th-year measurement effort includes inventory of new wells, update of the existing data base, and selection of additional observation wells to fill gaps created by the evaluation process. A number of wells in each major ground-water basin are selected as "key wells" (fig. 7). A special effort is made to determine the well construction and aquifer characteristics for each key well. These wells are scheduled for annual water-level measurement.

Progress and Significant Results: Water-level data were collected and prepared for publication as planned.

Plans for FY 86: "Key well" network will be continued. The areas, numbers 1-7, in figure 6 are scheduled for intensive ground-water measurements. Summary and publication of data will be continued.

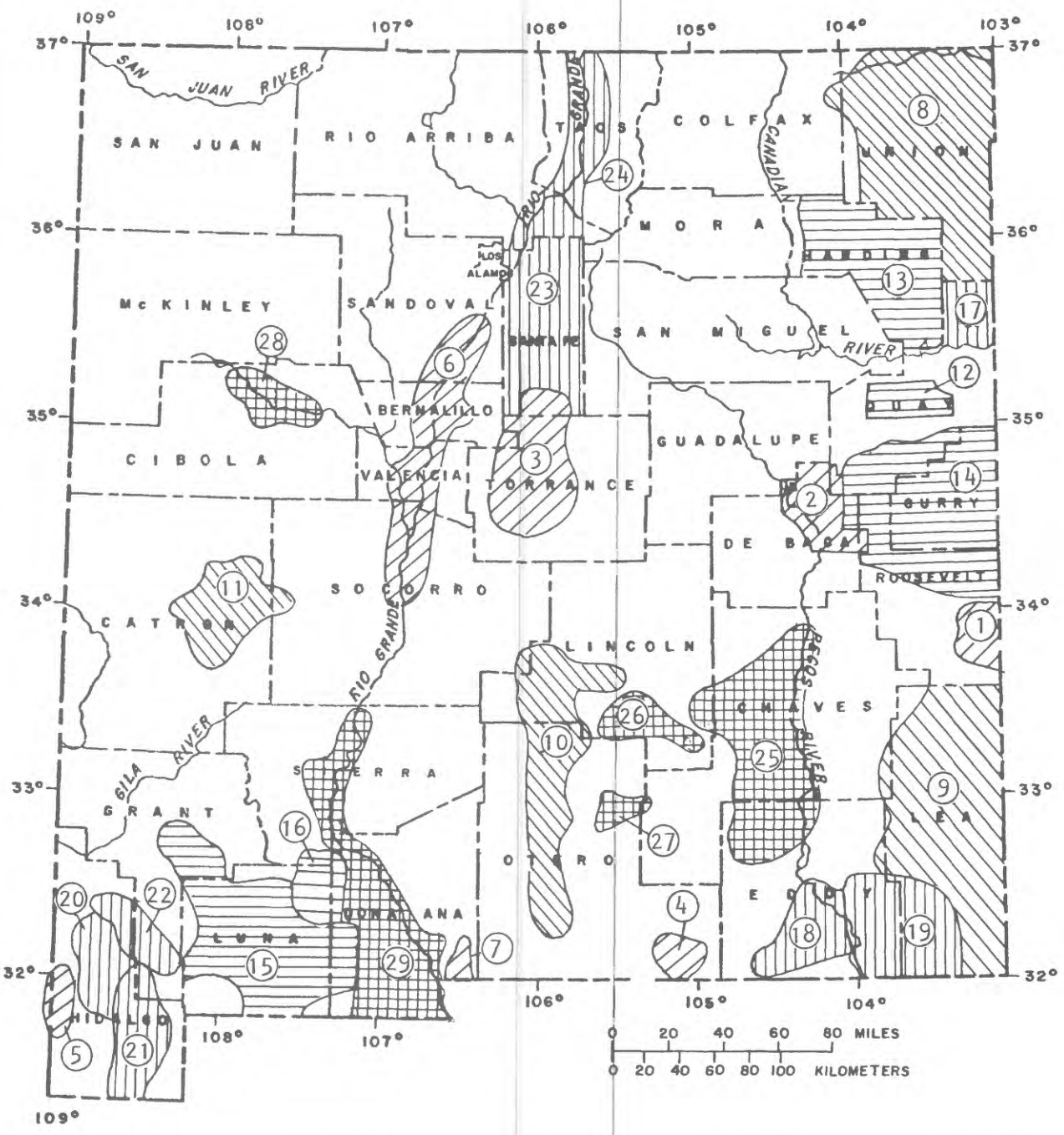


Figure 6.--Location of areas of 5-year ground-water-level monitoring.

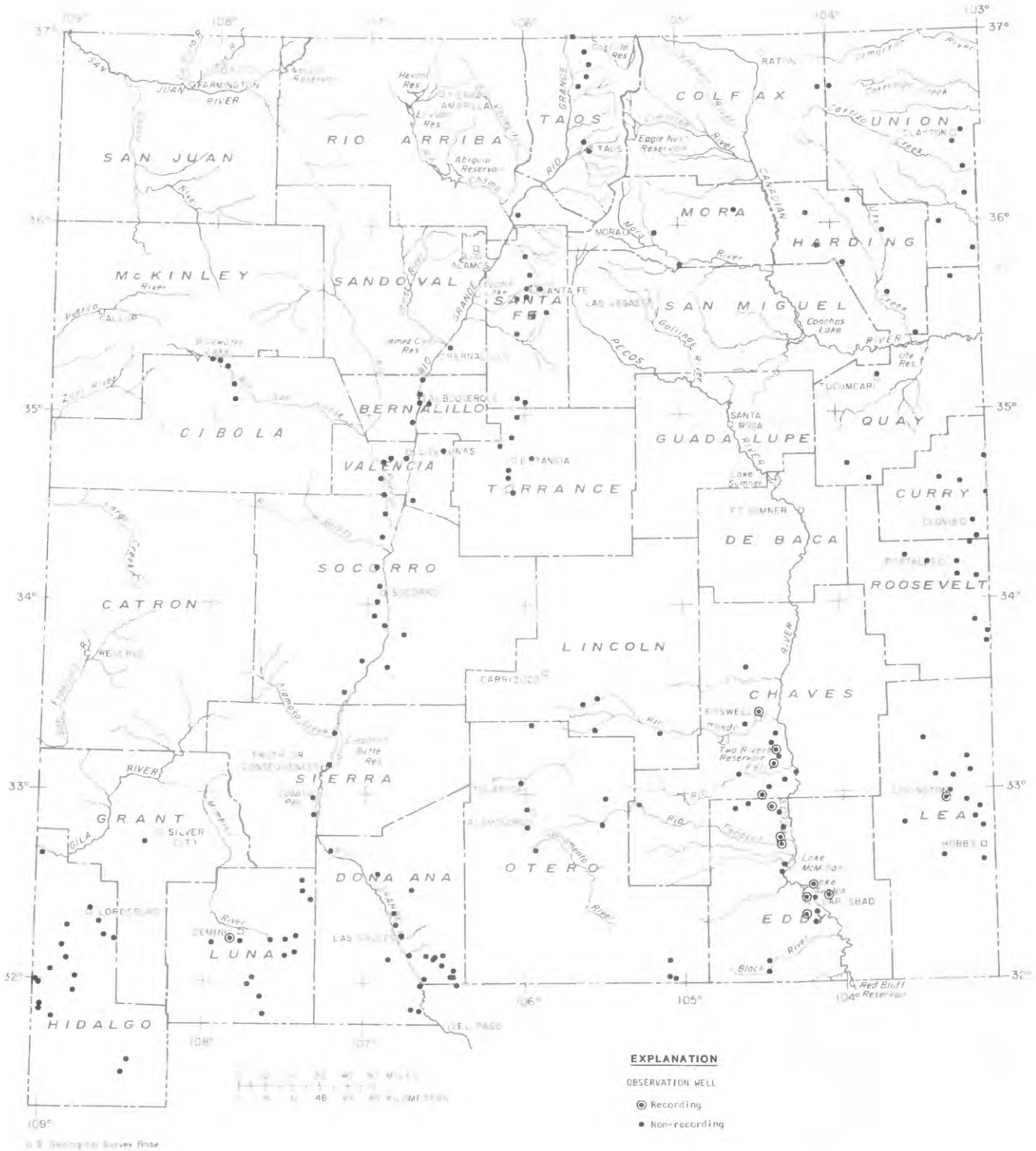


Figure 7.--Location of key observation wells.

Reports in Progress:

Hudson, J. D., Ground-water levels in New Mexico, 1982: New Mexico State Engineer Basic Data Report [in press].

Hudson, J. D., Ground-water levels in New Mexico, 1983: New Mexico State Engineer Basic Data Report [draft completed].

Hudson, J. D., Ground-water levels in New Mexico, 1984: New Mexico State Engineer Basic Data Report [draft completed].

Reports Released Since 1982:

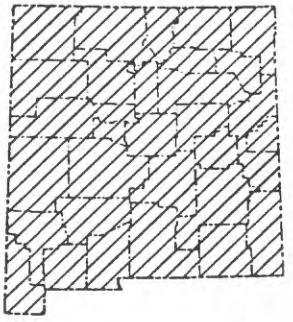
Hudson, J. D., 1982-84, Ground-water depletion, in feet, allowed in Portales Valley, Roosevelt County, New Mexico, 1981-83: New Mexico State Engineer Maps RO-25 - RO-27, 3 sheets.

_____ 1982-84, Ground-water depletion, in feet, allowed in a part of Curry County, New Mexico, 1981-83: New Mexico State Engineer Maps CU-22 - CU-24, 3 sheets.

_____ 1982-84, Ground-water depletion, in feet, allowed in central and northern Lea County, New Mexico, 1981-83: New Mexico State Engineer Maps LC-22, - LC-24, LN-22 - LN-24, 6 sheets.

Hudson, J. D., and Borton, R. L., 1983, Ground-water levels in New Mexico, 1978-80, including water-level measurements for winter 1981 and water-level-change maps for 1974-81 in selected areas: New Mexico State Engineer Basic Data Report, 283 p.

NM-003 CHEMICAL AND BIOLOGICAL WATER-QUALITY NETWORK IN NEW MEXICO



Period of Project: Continuous since 1937

Principal Investigator: Richard Lepp

Cooperating Agencies: New Mexico State Engineer Office, U.S. Bureau of Land Management, Pecos River Commission, U.S. Bureau of Reclamation, and U.S. Bureau of Indian Affairs

Problem: Water-resource planning and water-quality assessment require a reasonable level of standardized information. For informed planning and realistic assessment of the water resource, the chemical, biological, and physical quality of the ground water and surface water must be defined and monitored.

Objectives: To provide water-quality data for Federal, State, and local planning and action programs and to provide data for management of interstate and international waters.

Approach: Operate a network of water-quality stations to provide data describing chemical concentrations, loads, and time trends as required by planning and management agencies. Chemical and biological water-quality data are obtained at 70 continuous-record stations for surface water (table 2 and fig. 8). Information is also collected at numerous partial-record stations and miscellaneous sites. Some of these stations are also part of the Geological Survey nationwide network known as the National Stream Quality Accounting Network (NASQAN). Miscellaneous water-temperature data, recorded at the time streamflow measurements are made, are available from the Subdistrict offices. The types of data determined at the continuous-record stations are given in the following table:

Type of data	Number of sites
Physical data:	
pH, specific conductance, dissolved oxygen, etc.	69
suspended sediment	43
Chemical data:	
major dissolved inorganic constituents	54
chemical analyses of fluvial sediments	17
nutrients	39
organic compounds	23
radiochemicals	14
trace elements	39
Biological data:	
bacteria	28

Chemical water-quality data for ground water were also obtained in conjunction with project activities. In 1984, approximately 70 sites were sampled.

Progress and Significant Results: The water-quality data tables for the 1984 water year report, "Water resources data - New Mexico" were completed.

Plans for FY 86: Hydrologic-data network (fig. 8 and table 2) will be continued with only minor revisions from 1985.

Reports in Progress:
Water resources data - New Mexico, water year 1985.

Reports Released:
U.S. Geological Survey, 1985, Water-resources data -- New Mexico, water year 1984: U.S. Geological Survey Water-Data Report NM-84-1, 485 p. Reports on water-resources data for New Mexico are published annually.

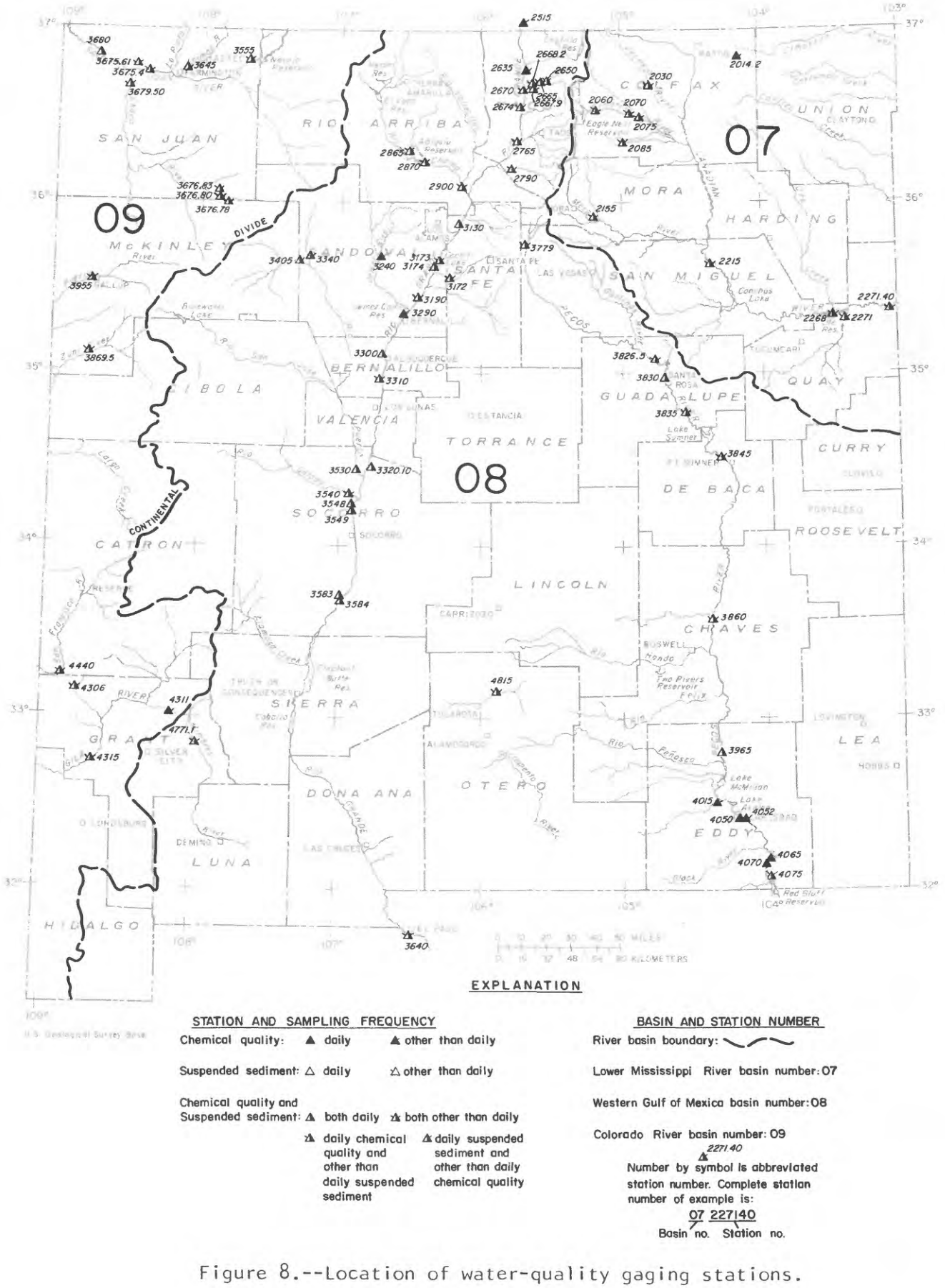


Figure 8.--Location of water-quality gaging stations.

Table 2.--Surface-water-quality stations in operation during 1986 water year

EXPLANATION

Type of data:

- B biological (bacteria, phytoplankton, etc.)
- C major dissolved inorganic constituents (sodium, chloride, sulfate, etc.)
- M chemical analyses of fluvial sediments (streambed materials or lake-bottom materials)
- N nutrient (nitrogen and phosphorus compounds)
- O organic compounds (insecticides, herbicides, organic carbon, etc.)
- P physical measurements (pH, specific conductance, dissolved oxygen, etc.)
- R radiochemicals (uranium, radium, etc.)
- S suspended sediment (concentration and particle size)
- T trace elements (arsenic, lead, iron, etc.)

Cooperators:

- BIA - U.S. Bureau of Indian Affairs
- BLM - U.S. Bureau of Land Management
- BR - U.S. Bureau of Reclamation
- CE - U.S. Army Corps of Engineers
- GS - U.S. Geological Survey
- PRC - Pecos River Commission
- SEO - New Mexico State Engineer/Interstate Stream Commission

Table 2.--Surface-water-quality stations in operation during 1986 water year - Continued

Station number	Station name	Type of data	Cooperator	Drainage area (sq. mi.)	Period of record (water year)
		CANADIAN RIVER BASIN			
07207000	Cimarron River near Cimarron, NM	CNOPST	SEO	294	1979,1981 to current year
07207500	Ponil Creek near Cimarron, NM	CPS	SEO	171	1981 to current year
07208500	Rayado Creek at Sauble Ranch near Cimarron, NM	CPS	SEO	65	1981 to current year
07215500	Mora River at La Cueva, NM	CPS	SEO	173	1981 to current year
07221500	Canadian River near Sanchez, NM	BCMNOPST	SEO	6,015	1975 to current year
07226510	Ute Res. at F, 9.1 mi above Ute Dam, NM	P	SEO	11,140	1963 to current year
07226515	Ute Res. at I, 5.0 mi above Ute Dam, NM	P	SEO	11,140	1963 to current year
07226520	Ute Res. at G, 6.9 mi above Ute Dam, NM	P	SEO	11,140	1963 to current year
07226560	Ute Res. at B, 0.6 mi above Ute Dam, NM	BCMNOPST	SEO	11,140	1963 to current year
07226800	Ute Res. near Logan, NM	BCMNOPST	SEO	11,140	1963 to current year
07227100	Revuelto Creek near Logan, NM	CPS	SEO	786	1959 to current year
07227140	Canadian River above NM-TX State line, NM	BCNPST	GS	12,616	1969-73,1975 to current year
		RIO GRANDE BASIN			
08251500	Rio Grande near Lobatos, CO	BCNPRT	GS	7,700	1969 to current year
08263500	Rio Grande near Cerro, NM	PT	BLM	8,440	1977,1979 to current year
08265000	Red River near Questa, NM	PT	BLM	113	1979 to current year
08266500	Red River below Questa, NM	CNOPST	BLM,SEO	160	1979 to current year
08266790	Red River above State Fish Hatchery near Questa, NM	PT	BLM	175	1979 to current year
08266820	Red River below Fish Hatchery, near Questa, NM	PT	BLM	185	1978 to current year
08267400	Rio Grande above Rio Hondo at Dunn Bridge, NM	PT	BLM	--	1979 to current year
08267500	Rio Hondo near Valdez, NM	CNOPS	SEO	36.2	1985
08276300	Rio Pueblo de Taos below Los Cordovas, NM	CNOPS	SEO	380	1985

Table 2.--Surface-water-quality stations in operation during 1986 water year - Continued

Station Number	Station name	Type of data	Cooperator	Drainage area (sq. mi.)	Period of record (water year)
08276500	Rio Grande below Taos Junction Bridge near Taos, NM	BCMNOPST	BLM,SEO	9,730	1975 to current year
08279000	Embudo Creek at Dixon, NM	CP	SEO	305	1970 to current year
08284100	Rio Chama near La Puente, NM	CNOPS	SEO	480	1985
08313000	Rio Grande at Otowi Bridge, NM	BCMNP*RST	GS,SEO	14,300	1947 to current year
08313408	Cochiti Lake (Site D) near Cochiti Pueblo, NM	P	SEO	14,900	1981 to current year
08313412	Cochiti Lake (Site C) near Cochiti Pueblo, NM	P	SEO	14,900	1981 to current year
08317200	Santa Fe River above Cochiti Dam, NM	CNOPS	SEO	231	1974-75,1979,1981 to current year
08317298	Cochiti Lake (Site B) near Cochiti Pueblo, NM	P	SEO	14,900	1981 to current year
08317300	Cochiti Lake (Site A) near Cochiti Pueblo, NM	BCMNOPST	SEO	14,900	1981 to current year
08319000	Rio Grande at San Felipe, NM	BCMNOPST	SEO	16,100	1975 to current year
08324000	Jemez River near Jemez, NM	CNOPRST	SEO	470	1981 to current year
08330000	Rio Grande at Albuquerque, NM	P*S	SEO	17,440	1969 to current year
08331000	Rio Grande at Isleta, NM	BCMNOPRST	SEO	18,100	1972 to current year
08332010	Rio Grande FW near Bernardo, NM	CNOP*T	SEO	19,230	1957 to current year
08343500	Rio San Jose near Grants, NM	BCMNOPRST	SEO	2,300	1985
08353000	Rio Puerco near Bernardo, NM	CP*R	SEO	7,350	1947 to current year
08354800	Rio Grande CV CH at San Acacia, NM	BCMNOP*ST	SEO	--	1959 to current year
08354900	Rio Grande FW at San Acacia, NM	BCMNOP*ST	SEO	26,770	1937-56,1959 to current year
08358300	Rio Grande CV CH at San Marcial, NM	BCMNP*RST	GS,SEO	--	1954 to current year
08358400	Rio Grande FW at Marcial, NM	BCMNP*RST	GS,SEO	27,700	1905-07,1946 to current year
08364000	Rio Grande at El Paso, TX	BCNPST	GS	32,207	1930 to current year
08370500	Rio Grande at Fort Quitman, TX	BCNPST	GS	31,944	1930 to current year

Table 2.--Surface-water-quality stations in operation during 1986 water year - Continued

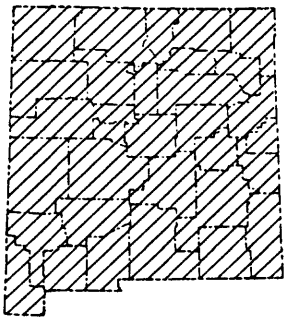
Station number	Station name	Type of data	Cooperator	Drainage area (sq. mi.)	Period of record (water year)
		PECOS RIVER BASIN			
08377900	Rio Mora near Terrero, NM	BCNPRST	GS	53.2	1963 to current year
08382650	Pecos River above Santa Rosa Reservoir, NM	CNOPST	SEO	2,340	1976,1981 to current year
08383000	Pecos River at Santa Rosa, NM	CPS	SEO	2,650	1905-07,1959 to current year
08383500	Pecos River near Puerto de Luna, NM	BCMNOPST	SEO	3,970	1937-66,1972 to current year
08384500	Pecos River below Sumner Dam, NM	BCNP*ST	GS	4,390	1937-66,1972 to current year
08386000	Pecos River near Acme, NM	CMNOPST	SEO	11,380	1937 to current year
08396500	Pecos River near Artesia, NM	BCMNOP*ST	SEO	15,300	1937 to current year
08401500	Pecos River below Major Johnson Springs near Carlsbad, NM	CP	SEO	17,650	1960,1962,1978-79, 1981 to current year
08405000	Pecos River at Carlsbad, NM	CP*	PRC	18,100	1905-07,1937-46, 1951 to current year
08405200	Pecos River below Dark Canyon at Carlsbad, NM	P	PRC	18,550	1972 to current year
08406500	Pecos River near Malaga, NM	CNP*	PRC	19,190	1937 to current year
08407000	Pecos River at Pierce Canyon Crossing, NM	CP*	PRC	19,260	1938-41,1952 to current year
08407500	Pecos River at Red Bluff, NM	BCNPST	GS	19,540	1937 to current year
08412500	Pecos River near Orla, TX	CP*	GS	21,210	1937 to current year
		MIMBRES RIVER AND TULAROSA RIVER BASIN			
08477110	Mimbres River at Mimbres, NM	BCNPST	GS	184	1978 to current year
08481500	Tularosa Creek near Bent, NM	BCNPST	GS,SEO	120	1963 to current year

Table 2.--Surface-water-quality stations in operation during 1986 water year - Concluded

Station Number	Station name	Type of data	Cooperator	Drainage area (sq. mi.)	Period of record (water year)
		SAN JUAN RIVER BASIN			
09355500	San Juan River near Archuleta, NM	CP	BR	3,260	1955 to current year
09364500	Animas River at Farmington, NM	BCNP*ST	GS	1,360	1940 to current year
09367540	San Juan River near Fruitland, NM	CP	BR	8,010	1978 to current year
09367561	Shumway Arroyo near Waterflow, NM	CPR	GS	73.8	1974 to current year
09367950	Chaco River near Waterflow, NM	CPR	GS	4,350	1976 to current year
09368000	San Juan River at Shiprock, NM	BCMNOP*RST	GS,SEO	12,900	1941-45,1951 to current year
09371010	San Juan River at Four Corners, CO	CP	BR	14,600	1978-81,1985
09386950	Zuni River above Black Rock Reservoir, NM	CS	BIA	810	1978 to current year
		GILA RIVER BASIN			
09430600	Mogollon Creek near Cliff, NM	BCNPRST	GS	69	1967 to current year
09431100	Mangas Creek below Mangas Springs, NM	CP	SEO	177	1970 to current year
09431500	Gila River near Redrock, NM	BCNPRST	GS	2,829	1967 to current year

* Daily or continuous recorder

NM-004 SEDIMENT STATIONS, NEW MEXICO



Period of Project: Continuous since 1937

Principal Investigator: David E. Funderburg

Cooperating Agencies: New Mexico State Engineer Office, U.S. Bureau of Land Management, U.S. Army Corps of Engineers, U.S. Bureau of Indian Affairs, and Federal Program

Problem: Water-resource planning and water-quality assessment require a data base of relatively standardized information. Sediment concentrations, particle size, and loads of sediment carried in New Mexico rivers and streams must be defined and monitored to define impacts of sediment loads and changes over time.

Objective: To provide sediment data for use in Federal, State, and local planning and action programs. Information is collected for the evaluation of sources of sediment, effects of changing land use, effects of water management on channel stability, and regional baseline conditions.

Approach: Establish and operate a network of sediment stations to provide spatial and temporal averages and trends of sediment concentration, sediment load, and particle size of sediment being transported by rivers and streams.

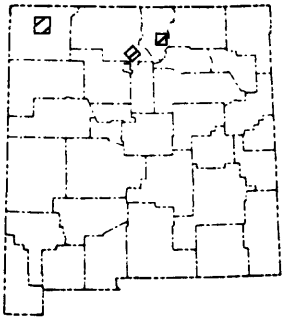
Progress and Significant Results: Sediment data at 54 streamflow stations in New Mexico were collected and will be published in the annual report, "Water resources data - New Mexico, water year 1985." The location of sediment sampling stations is shown in figure 8.

Plans for FY 86: Continue collection and analyses of sediment data in New Mexico.

Reports in Progress:
Water resources data - New Mexico, water year 1985.

Reports Released:
U.S. Geological Survey, 1985, Water resources data -- New Mexico, water year 1984: U.S. Geological Survey Water-Data Report NM-84-1, 485 p. Reports on water-resources data for New Mexico are published annually.

NM-006 FLOOD-INSURANCE STUDIES



Period of Project: Continuous since 1983.

Principal Investigator: Robert L. Gold

Cooperating Agency: Federal Emergency Management Agency

Problem: The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 provide for the operation of a flood-insurance program. The Federal Emergency Management Agency (FEMA) needs flood studies in selected areas to determine the extent of flooding for given recurrence intervals to define applicable flood-insurance-premium rates.

Objective: To conduct hydraulic analysis of selected stream reaches to determine the 100-year flood profile for those reaches. The analysis will be performed as a Limited Detail Study.

Approach: The study is conducted in three phases. The first is identification of unincorporated urban areas and areas within counties where the need for flood studies exist. The second phase involves community meetings in order to identify areas of significant growth that may be subject to flooding. Lastly, the selected stream reaches are studied to determine the 100-year flood profile. The analysis includes field determination of roughness coefficients, surveying of stream cross sections, and use of U.S. Geological Survey computer program HY7 to compute the flood elevations.

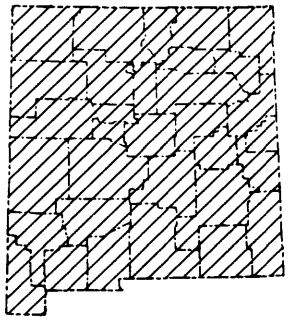
Progress and Significant Results: Three areas have been selected for study: (1) San Juan County - City of Aztec, (2) Rio Arriba County, and (3) Taos County. Community meetings have been conducted for each area. Surveying of cross sections and determination of roughness coefficients have begun.

Plan for FY 86: Collection of field data will be completed. The hydraulic analysis will begin, and a report for each area will be submitted to FEMA. Work will begin on additional studies as directed by FEMA.

Reports in Progress: None

Reports Released: None

NM-007 NEW MEXICO WATER-USE DATA ACQUISITION AND DISSEMINATION PROGRAM, NEW MEXICO



Period of Project: Continuous since 1978

Principal Investigator: Herbert S. Garn

Cooperating Agency: New Mexico State Engineer Office

Problem: Information on water use is required for management of the Nation's water resources. In the past, there was no single source for accurate, consistent, timely, and accessible water-use information. In 1977, the U.S. Congress recognized the need for information on water use and directed the Survey to establish a National Water-Use Data Program. The New Mexico State Engineer Office had collected information on water use at 5-year intervals since 1965. The State and Federal efforts were combined as part of a State-Federal Cooperative Program in 1978 in order to standardize a water-use information system.

Objectives: The goals of the program are: (1) To collect and compile water-use data; (2) to develop and refine computerized data storage and retrieval systems at the State and national levels; (3) to devise new methods and techniques to improve and standardize collection and analysis of water-use information; and (4) to disseminate this information to water users and water-resource managers.

Approach: Three types of water-use data (withdrawal, return flow, and type of use) will be collected. These data are collected and compiled for 12 major categories of use by State, county, and hydrologic unit. The Survey in cooperation with the State Engineer Office will implement a program for computer storage and retrieval of water-use information. The Survey computer data bases, SWUDS (State Water-Use Data System) and NWUDS (National Water-Use Data System), will be used to store site-specific and aggregated information.

Progress and Significant Results: Installed the State Water-Use Data System software on the computer and coordinated with the State on system needs. A report on the relationships between water use and water-level declines in Curry and Roosevelt Counties is almost complete. About 1,200 wells were measured in the 5-year intensive program for measuring water levels. A leaflet showing pie diagrams of water use by county was distributed.

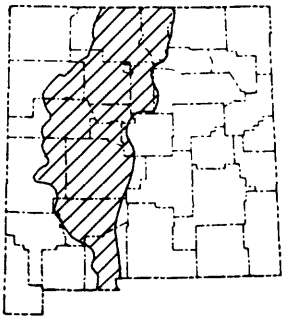
Plan for FY 86: Prepare for a test of the SWUDS software in a pilot area of the San Juan Basin. Continue planning with the cooperator for collection and compilation of 1985 water-use information for the National Water-Use Program. Complete Curry-Roosevelt report and submit for review. Continue program development in cooperation with the New Mexico State Engineer Office.

Reports in Progress:

Villanueva, E. D., Relationships between water use and water-level decline in Curry and Roosevelt Counties, New Mexico [draft completed].

Reports Released: None

NM-100 DUTIES FOR THE RIO GRANDE COMPACT COMMISSION, NEW MEXICO



Period of Project: Continuous since 1948

Principal Investigator: Herbert S. Garn

Cooperating Agency: Rio Grande Compact Commission

Problem: The Rio Grande Compact Commission is composed of representatives of the States of Colorado, New Mexico, and Texas. Administration of the compact requires that certain water data be collected, compiled, correlated, and presented to the commission. The U.S. Geological Survey acts as secretary to the commission under rules and regulations for administration of the Rio Grande Compact.

Objectives: The principal duties as secretary to the commission are to compile monthly streamflow and storage data as prescribed by the commission, to prepare a report on activities and a summary of data needed for determination of debits and credits of water, to prepare and publish annual reports of the commission, and to aid in other matters pertaining to the administration of the compact.

Approach: Basic report input consists of data on streamflow and storage at index stations and storage facilities. Monthly reports on streamflow of index stations and release of water from project storage are sent to the commissioners. Data are summarized annually, presented to the commissioners' engineer advisers, and prepared for publication in the annual report.

Progress and Significant Results: Attended the 1985 annual compact meeting and prepared the minutes. Provided monthly reporting of current data for administration of the compact. Prepared, published, and distributed the 1984 report of the Rio Grande Compact Commission. A special meeting of the Compact Commission was held on July 2, 1985, to celebrate the spill from Elephant Butte Reservoir.

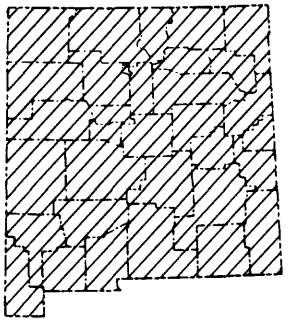
Plans for FY 86: Continue secretarial duties as in previous years, including monthly data reporting, preparation of minutes from meetings, and publication of the annual report.

Reports in Progress: None

Reports Released:

Rio Grande Compact Commission, 1985, Report of the Rio Grande Compact Commission for 1984. Reports of the Rio Grande Compact Commission are published annually.

NM-101 INFORMATION-DISTRIBUTION PROGRAM DEVELOPMENT, NEW MEXICO



Period of Project: Continuous since 1960

Principal Investigator: Kathy D. Peter

Cooperating Agency: New Mexico State Engineer Office

Problem: The project provides support required for answering requests for water-resources data from the public, for special data computation required by the State Engineer Office, and for computer hardware and data-base management.

Objectives: Respond to requests for data on the water resources of New Mexico. Support limited, special studies requested by the State Engineer Office.

Approach: Project coordinators in the offices of the New Mexico State Engineer and the U.S. Geological Survey handle requests made to individuals and other agencies. They provide data requested or direct questions to other qualified staff members for response.

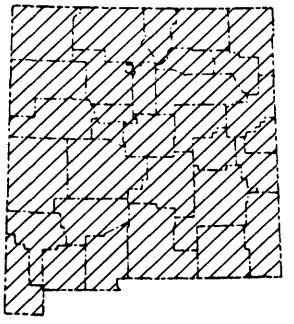
Progress and Significant Results: In FY 85, 315 requests for information were answered by Geological Survey personnel. In addition, numerous informal requests were answered.

Plans for FY 86: Continue to respond to public information requests.

Reports in Progress: None

Reports Released: None

NM-105 NEW MEXICO DISTRICT DATA BANK



Period of Project: Continuous since 1970

Principal Investigator: R. G. Roybal

Cooperating Agency: New Mexico State Engineer Office

Problem: The New Mexico District minicomputer provides increased potential for effectiveness and productivity in many projects and hydrologic applications. Good data-base management is essential for the District to more fully realize this potential in data processing, utilization of critical personnel, and data dissemination.

Objective: The project provides new computer applications and improved documentation of existing computer programs. Other project support is provided through management, control, maintenance, and refinements to widely used data bases such as the Ground-Water Site-Inventory file.

Approach: Programs or other computer applications are examined and documented as necessary or as requested. Basic data are transferred from the local data-base to the nationally used Ground-Water Site-Inventory system.

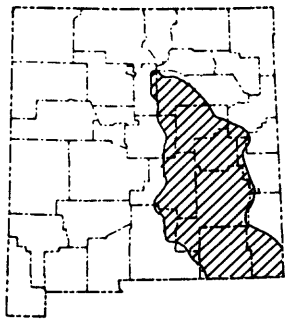
Progress and Significant Results: Data transfer to the Ground-Water Site-Inventory data base has been completed for the following counties: Harding, Doña Ana, Santa Fe, Cibola, Union, Sandoval, Sierra, Rio Arriba, Lincoln, Luna, McKinley, Mora, Otero, San Juan, and Taos. Data transfer for Lea, Chaves, and Eddy Counties is nearing completion.

Plans for FY 86: Continue with project-support efforts. Complete data transfer from the local data-base to the Ground-Water Site-Inventory file.

Reports in Progress: None

Reports Released: None

NM-106 MISCELLANEOUS RIVER-REACH STUDIES, PECOS RIVER, NEW MEXICO



Period of Project: Continuous since 1970

Principal Investigator: Herbert S. Garn

Cooperating Agency: Pecos River Commission

Problem: The Pecos River Commission, which administers the waters of the Pecos River in New Mexico and Texas, requires that certain water data be collected, compiled, and presented to the commission. The commission also often requests special studies about the relation of surface water, ground water, and water quality in specific reaches of the river. These data and the results of hydrologic studies aid the commission in its inflow-outflow computations that are used to apportion water of the Pecos River equitably among users. The U.S. Geological Survey acts as the secretary to the commission.

Objectives: The project relates gains or losses in streamflow and changes in water quality to ground-water flow conditions, transpiration, evaporation, or flow diversions. Necessary administrative services are provided to the Pecos River Commission. An annual report is made to the commission summarizing the special studies of surface water, ground water, and water quality in specific reaches of the Pecos River.

Approach: A continuous record of streamflow is collected at stations in New Mexico and Texas for computation of long-term annual runoff. Ground-water levels are measured and seepage runs are made as needed to evaluate the effects of pumpage and phreatophyte control on streamflow. Three water-quality stations are operated to monitor changes in quality between Carlsbad, N. Mex., and Red Bluff Reservoir, Tex. Administrative services are provided as secretary to the Pecos River Commission, including summaries of data and results of special studies, preparation of annual reports, preparation of minutes of meetings, record keeping, and other tasks.

Progress and Significant Results: Completed streamflow and water-quality data-collection activities supported by the commission. An analysis of minimonitor data was completed and the findings were reported to the commission. Duties as secretary to the commission were met, including preparing the annual report, preparing minutes of the meeting, and completing other administrative tasks. Continued work on the update of the draft report on phreatophyte control. Completed colleague review of the report on statistical correlation of specific-conductance measurements on the Pecos River between Carlsbad and Red Bluff.

Plans for FY 86: Continue routine data-collection activities supported by the Pecos River Commission and serve as secretary to the commission. Complete the pending reports. Analyze the water-level data from the water-table depression near Hagerman and present findings to the commission. Compute base-flow gain in the Acme-to-Artesia reach of the Pecos River.

Reports in Progress:

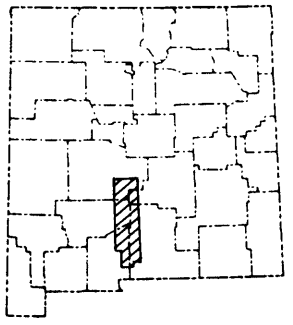
Welder, G. E., Hydrologic observations relating to phreatophyte control, 1967-82, Acme-Artesia reach of the Pecos River, New Mexico.

Marshall, D. H., Statistical correlation of specific-conductance measurements at water-quality stations in the Pecos River between Carlsbad, New Mexico and Red Bluff, Texas.

Reports Released:

U.S. Geological Survey, 1985, Annual report to the Pecos River Commission for 1984. Annual reports have been published since 1982.

NM-109 CONTINUING RECONNAISSANCE AND EVALUATION OF WATER RESOURCES ON THE WHITE SANDS MISSILE RANGE, NEW MEXICO



Period of Project: Continuous since 1960

Principal Investigators: (A) Robert Gene Myers
(B) Dennis W. Risser

Cooperating Agency: White Sands Missile Range

Problem: Because the volume of fresh ground water is limited on the White Sands Missile Range, the effects of pumpage in various well fields must be known with reference to depletion of fresh ground water and possible saline-water encroachment. Several wells provide water throughout the missile range; continued operation of these wells is vital to the range.

Objectives: (A) Obtain water-level and pumpage data so periodic evaluation of ground-water depletion can be made and make short-term site studies where additional water supplies are needed. Evaluate alternatives for economical recovery of the maximum volume of freshwater.
(B) Quantitatively evaluate future water-level declines and water-quality changes in the Post Headquarters well field.

Approach: (A) Monitor water levels semiannually in supply wells, test wells, and boreholes throughout the White Sands Missile Range. Monitor the chemical quality of water in selected wells throughout the missile range. Participate in U.S. Army well-drilling training exercises to improve the monitoring network. Evaluate the water resources of new and existing areas.
(B) Simulate future water-level declines in the Post Headquarters area using three-dimensional, ground-water flow model. Changes in salinity of ground water will be investigated using a cross-sectional, solute-transport model.

Progress and Significant Results: (A) Monitored water levels in supply wells, test wells, and boreholes throughout the White Sands Missile Range. Monitored the chemical quality of water from selected test wells and supply wells, especially in the Post Headquarters area. Participated in U.S. Army well-drilling training program.
(B) Constructed, calibrated, and used the flow model to predict water-level declines from 1982-2017. Simulations indicate declines of as much as 50 feet caused by pumping 2,100 acre-feet per year for 35 years from the Post Headquarters well field. Simulations using the solute-transport model indicate lateral movement of saline water towards the well field is a more likely mechanism of salt-water encroachment than upconing from beneath the well field.

Plans for FY 86: Continue monitoring water levels and water quality throughout the White Sands Missile Range. Evaluate water resources of the Ash Canyon area with existing data and select some sites for test wells.

Reports in Progress:

(B) Risser, D. W., Simulated water-level and water-quality changes in the Post Headquarters area, White Sands Missile Range, New Mexico [colleague review].

Reports Released:

Cruz, R. R., 1984, Annual water-resources review, White Sands Missile Range, New Mexico, 1983: U.S. Geological Survey Open-File Report 84-720, 25 p.

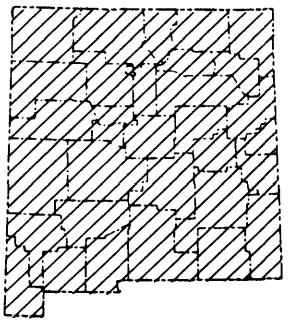
Cruz, R. R., 1985, Annual water-resources review, White Sands Missile Range, New Mexico, 1984: U.S. Geological Survey Open-File Report 85-645, 25 p.

Myers, R. G., and Pinckley, K. M., 1985, Test wells T27 and T28, White Sands Missile Range, Doña Ana County, New Mexico: U.S. Geological Survey Open-File Report 84-809, 19 p.

Myers, R. G., and Pinckley, K. M., 1985, Test wells T23, T29, and T30, White Sands Missile Range and Fort Bliss Military Reservation, Doña Ana County, New Mexico: U.S. Geological Survey Open-File Report 84-805, 28 p.

Water-resources review reports have been published annually since 1968.

NM-203 INVESTIGATION AND ANALYSIS OF FLOOD DISCHARGES FOR UNREGULATED STREAMS IN NEW MEXICO



Period of Project: August 1966 to September 1989

Principal Investigator: Scott D. Waltemeyer

Cooperating Agency: New Mexico State Highway Department

Problem: The State Highway Department needs data on magnitude and frequency of floods for design of highway structures.

Objective: To collect, compute, and compile hydrologic data that can be used in the analysis of flood magnitude and frequency. The flood-frequency data will be regionalized based on basin and climatic characteristics.

Approach: A network of 143 crest-stage gages is operated for determination of annual peak discharges. Basin and climatic characteristics for each basin will be determined for use in regional regression analysis.

Progress and Significant Results: Regional skew for use in flood-frequency computation was developed. Basin and climatic characteristics were developed and found to be significant in regional regression equations. The network of crest-stage gages was monitored routinely and levels were run to 33 stations. Peak-flow data for the 1984 water year were entered into the peak-flow data file.

Plans for FY 86: Measurement of annual peak discharge, which includes discharge determination by indirect means, will continue. The network will be evaluated; an overall reduction in the network of crest-stage gages may occur because of poor hydraulic characteristics at some sites and lack of a stage-discharge rating at some sites.

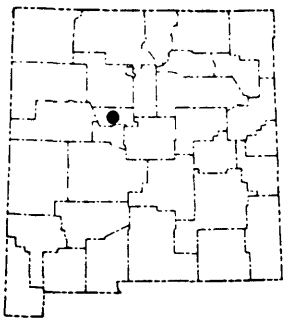
Reports in Progress:

Waltemeyer, S. D., Techniques for estimating flood-flow frequency for unregulated streams in New Mexico [Central Region review].

Reports Released:

Thomas, R. P., and Gold, R. L., 1982, Techniques for estimating flood discharges for unregulated streams in New Mexico: U.S. Geological Survey Water-Resources Investigations Report 82-24, 42 p.

NM-224 URBAN FLOOD HYDROLOGY OF THE ALBUQUERQUE AREA, NEW MEXICO



Period of Project: February 1976 to September 1986

Principal Investigator: John P. Borland

Cooperating Agencies: City of Albuquerque and Albuquerque Metropolitan Arroyo Flood Control Authority

Problem: The City of Albuquerque and the Albuquerque Metropolitan Arroyo Flood Control Authority require reliable flood-frequency data for design of urban drainage structures and regulation of urban development. Present methodology uses unverified empirical relations and data from other urban areas. Few data are presently available regarding the chemical quality of storm runoff in the Albuquerque area.

Objectives: (1) Define the runoff characteristics of urban and nonurban basins in the Albuquerque area; (2) define relations between runoff characteristics and basin and climatic characteristics; and (3) develop techniques for estimating runoff characteristics on the basis of basin and climatic characteristics.

Approach: (1) Collect rainfall and runoff data at sites with different degrees of urbanization; (2) determine basin characteristics for each site; (3) use data to calibrate a model; (4) statistically analyze data; and (5) develop runoff-estimation techniques.

Progress and Significant Results: Nine years of rainfall and runoff data have been collected at some of the sites. The data have been published through 1983.

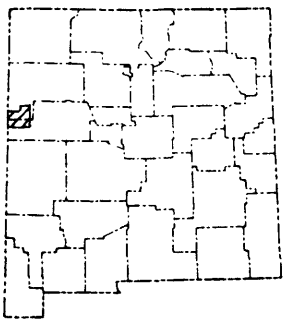
Plan for FY 86: Continue data collection. Apply the data to calibrate a U.S. Geological Survey flow model. Develop estimation techniques.

Reports in Progress: None

Reports Released:

Fischer, E. E., Rote, J. J., and Borland, J. P., 1984, Rainfall-runoff data in the Albuquerque, New Mexico, metropolitan area, 1976-1983: U.S. Geological Survey Open-File Report 84-48, 306 p.

NM-225 WATER RESOURCES OF THE ZUNI RESERVATION, NEW MEXICO



Period of Project: January 1978 to September 1986

Principal Investigator: Thomas M. Crouch

Cooperating Agency: Pueblo of Zuni

Problem: The Pueblo of Zuni requires information on the yield, variability, and quality of existing water supplies, and the possibilities for developing new supplies. Industrial development and expansion of communities on the tribal lands may require new water supplies, which in turn requires an understanding of the water resources.

Objective: Provide a comprehensive analysis of the source, supply, chemical quality, and availability of water from streams, springs, and wells. This analysis will include estimates of the effects of developing additional water supplies on existing water sources.

Approach: Existing wells will be inventoried, sampled, and test pumped; springs and streams will be sampled and gaged. Seismic profiles will be run to determine thickness of the saturated sand. Test holes will be located, sampled, logged, and tested. A geologic map and sections will be prepared showing fracture traces and lineations where fracture permeability may be expected. Aquifer tests will be conducted on wells completed in the Glorieta-San Andres aquifer in the south-boundary area and in the Bidahochi aquifer.

Progress and Significant Results: Test wells were drilled and an aquifer test was conducted in the south-boundary area. Drawdown and water-quality data were obtained. Water-use data were collected and water-level data were recorded from three wells. One seismic profile was run and the Bidahochi aquifer-test site was selected.

Plan for FY 86: Drill two test wells into the Bidahochi aquifer and conduct an aquifer test. Drill two or three additional wells in the south-boundary area for an additional aquifer test. Collect water samples from both tests and analyze samples for chemical quality. Prepare a final report giving drilling and aquifer-test results.

Reports in Progress:

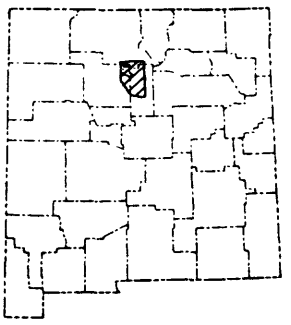
Crouch, T. M., Evaluation of selected aquifers on Zuni tribal lands, McKinley and Cibola Counties, New Mexico [initial preparation].

Reports Released:

Orr, B. R., 1982, Water resources of the Zuni tribal lands, McKinley and Cibola Counties, New Mexico: U.S. Geological Survey Open-File Report 82-1013, 179 p.

Orr, B. R., Water resources of the Zuni tribal lands, McKinley and Cibola Counties, New Mexico: U.S. Geological Survey Water-Supply Paper 2227 [in press].

NM-236 GEOHYDROLOGIC STUDIES OF THE SANTA FE AREA, NEW MEXICO



Period of Project: June 1981 to September 1986

Principal Investigator: Douglas P. McAda

Cooperating Agencies: Santa Fe Metropolitan Water Board and New Mexico State Engineer Office

Problem: Accompanying the continued growth of the Santa Fe area is the increasing demand for water. Recently the problem of declining ground-water levels within the city has aroused public concern. Even though a public water-supply system exists, an increasing number of domestic wells are being drilled. Because the area is expected to continue growing, steps need to be taken to understand the hydrologic system. This knowledge can be used in future planning to optimize the use of the water resources.

Objectives: (1) Simulate the interaction of major hydrologic components and demonstrate how each affects the regional hydrologic system. The simulation and demonstration are achieved by defining pertinent aquifer characteristics and the location and quantity of natural and man-caused recharge and discharge. The effects of existing stresses on the hydrologic system will be simulated and used to develop predictive capabilities on a regional basis. (2) Obtain water-level, aquifer-characteristic, and water-quality data from three observation well nests that will be drilled in areas of the Santa Fe basin where this information was previously unavailable. Information on vertical hydraulic gradients will be obtained. (3) Establish a ground-water-level and water-quality monitoring network to document current ground-water conditions in the Santa Fe area. The monitoring network will be used to document future changes, if any, in water resources in the area.

Approach: (1) Existing hydrologic data will be used to formulate a broad-based three-dimensional ground-water flow model that simulates the hydrologic system of the Santa Fe area. Calibration of the model will be from simulations of the steady-state predevelopment condition and pumping rates from 1947 to 1982. Aquifer characteristics will be adjusted within plausible ranges to match simulated river fluxes and ground-water levels to measured values. The response of the ground-water system to assumed future ground-water pumping rates will be simulated by the model.

(2) Drill three nests of observation wells in areas where little hydrologic information is available. Wells in each nest will be used to monitor hydraulic head at three depths within the Tesuque aquifer to obtain vertical hydraulic gradients. Samples of water will be taken at each depth for water-quality analysis.
(3) Continue monitoring water levels in previously drilled observation wells. Additional observation wells will be added where needed. Continuous recorders will be used to monitor water levels in selected wells. Non-recorder observation wells will be monitored yearly or quarterly.
Existing records will be reviewed to select wells for monitoring water quality. Additional wells will be added. Initial water samples will be collected from these wells. Each year additional wells will be sampled and wells in areas of significant development or expected change will be resampled.
An intensive water-quality and water-level monitoring network will be established in the area of the Santa Fe Country Club Golf Course to assess the effects of using sewage effluent as a source of irrigation water for the golf course.

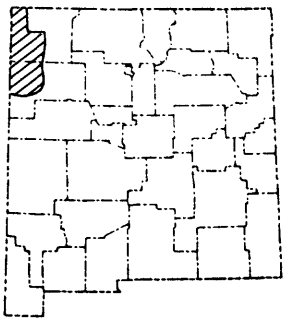
Progress and Significant Results: (1) The ground-water model has been completed and the final report has been submitted for review.
(2) One observation-well nest has been drilled. Contracts for instrumenting the first well nest and drilling additional observation-well nests are in progress.
(3) Water levels are being monitored in 35 wells in the Santa Fe area. Continuous water-level recorders are being maintained on 7 observation wells. Water-quality samples were collected and analyzed from approximately 20 wells in the Santa Fe area during FY 85.

Plans for FY 86: (1) Respond to colleague review comments. Finalize report and submit for approval and publication.
(2) Complete instrumentation of the first observation-well nest and collect water samples. Drill second observation-well nest.
(3) Continue monitoring water-level observation wells and add wells to network in areas where more information is needed. Collect water samples from more wells in the Santa Fe area. Resample wells in the Santa Fe Country Club Golf Course area.

Reports in Progress:
McAda, D. P., and Wasiolek, Maryann, Simulation of the regional geohydrology of the Tesuque aquifer system near Santa Fe, New Mexico [draft completed].

Reports Released: None

NM-238 EFFECTS OF GROUND-WATER DEVELOPMENT ON WATER SUPPLIES, SAN JUAN BASIN, NEW MEXICO



Period of Project: October 1981 to December 1985

Principal Investigators: G. E. Welder and R. L. Klausing

Cooperating Agencies: Navajo Indian Nation and New Mexico State Engineer Office

Problem: Exploration and development of uranium, coal, and petroleum have taken place on Indian, public, and private lands in the San Juan Basin. Use of ground water for mineral development has caused concern about possible effects on the aquifers (as shown by drawdowns and water-quality changes in supply wells) and about the future availability of ground water.

Objective: Basic ground-water data are being collected, particularly in the western part of the basin on the Navajo Reservation, in order to describe the sandstone aquifers and ground-water reserves.

Approach: Existing geohydrologic records will be reviewed and the records checked by visiting wells in the field. A computer data base will be made and a monitoring network expanded. The Morrison aquifer will be mapped.

Progress and Significant Results: About 200 wells have been inventoried in the field. Potentiometric, structure, and thickness maps of the Morrison Formation are almost completed.

Plans for FY 86: Complete atlas report and submit it for review and approval. Inventory and estimate discharge of uncontrolled flow from large artesian wells.

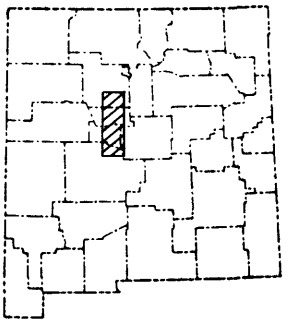
Reports in Progress:

Welder, G. E., and Klausing, R. L., Hydrologic atlas of the Morrison Formation in the northwest part of the San Juan Basin, New Mexico [initial preparation].

Reports Released:

Klausing, R. L., and Welder, G. E., 1983, Data for ground-water studies of the San Juan Basin, New Mexico, 1982-83: U.S. Geological Survey Open-File Report 84-135, 46 p.

NM-240 GROUND-WATER LEVEL MONITORING IN THE ALBUQUERQUE-BELEN BASIN, NEW MEXICO



Period of Project: Continuous since 1982

Principal Investigator: G. E. Kues

Cooperating Agency: City of Albuquerque

Problem: Ground water is used for all domestic and industrial purposes in the basin. A population increase of approximately 100 percent from 1960 to 1980 has increased the demand for water, increasing stress on the ground-water system.

Objectives: Develop a data base in order to better document the basin's hydrologic system. In the short-term, monitor changes in ground-water levels as the system responds to increased stress.

Approach: Establish a water-level monitoring network using available wells. Equip several wells with continuous-recording equipment and measure other wells at regular intervals, usually monthly.

Progress and Significant Results: Continued water-level data collection and network evaluation. Data were entered into computer files and provided to the cooperator in informal reports. Water levels in early spring 1984 recovered approximately to spring 1983 levels in the vicinity of the city of Albuquerque. Water levels in other areas are remaining relatively stable.

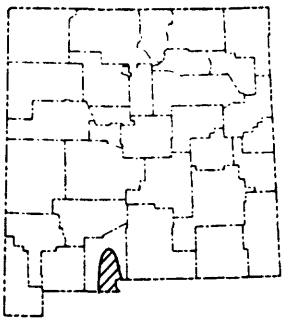
Plans for FY 86: Continue data collection and network evaluation. Prepare a data report and submit it for review, approval, and publication.

Reports in Progress:

Kues, G. E., Interim data report for Albuquerque-Belen Basin ground-water level monitoring project, water years 1982-85 [initial preparation].

Reports Released: None

NM-243 RECONNAISSANCE AND EVALUATION OF WATER RESOURCES OF THE MESILLA BASIN, NEW MEXICO



Period of Project: November 1982 to January 1987

Principal Investigator: Edward Nickerson

Cooperating Agencies: New Mexico State Engineer Office, City of El Paso, and City of Las Cruces

Problem: Hydrologic data in the Mesilla Basin are insufficient to adequately define the relationship between hydrologic systems related to Tertiary and Quaternary aquifers and the Rio Grande. In addition, in some areas, historical geohydrological data are not available to describe the availability of water.

Objectives: The objectives of the study are to better define horizontal and vertical flow in the Santa Fe Group and flood-plain alluvium, and to establish a data base for parts of the Mesilla Basin where geohydrologic data are not presently available.

Approach: Establish an observation-well network to monitor current ground-water levels, water quality, and direction of ground-water flow in the Mesilla Basin. Define aquifer properties by conducting an aquifer test of the flood-plain alluvium and Santa Fe Group.

Progress and Significant Results: The observation-well network for the Mesilla Basin has been established. Draft of a data report was completed.

Plans for FY 86: Conduct a multiple-well aquifer test of the Santa Fe Group and flood-plain alluvium. Sample approximately 50 wells for chemical analyses. Continue to monitor observation wells. Publish data report. Continue data interpretation and preparation of an interpretive report that describes the ground-water/surface-water relationships, aquifer properties, and water quality in the Mesilla Basin.

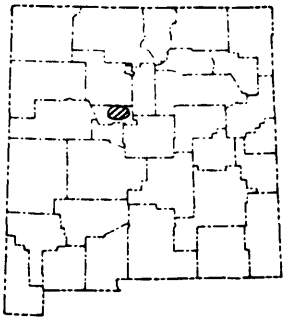
Reports in Progress:

Nickerson, E. L., Selected geohydrologic data for the Mesilla Basin, Doña Ana County, New Mexico, and El Paso County, Texas [in press].

Nickerson, E. L., Aquifer characteristics in the Mesilla Basin, New Mexico [initial preparation].

Reports Released: None

NM-244 URBANIZATION EFFECTS UPON SURFACE AND SUBSURFACE FLOW TO THE RIO GRANDE, ALBUQUERQUE METROPOLITAN AREA, NEW MEXICO



Period of Project: October 1982 to October 1987

Principal Investigator: Carole L. Goetz

Cooperating Agencies: City of Albuquerque and New Mexico State Engineer Office

Problem: The city of Albuquerque's water right is based upon timing and magnitude of flow delivery to the Rio Grande as determined in the mid-1950's. Since then the city's population and land area have quadrupled. Any change in flow delivery to the Rio Grande because of changed physical conditions from those of the 1950's could affect the city's water right. The city and the State Engineer are interested in equity and in defining the actual quantitative changes, if any, and in assessing the effects of urbanization on flow in the Rio Grande.

Objectives: (1) To identify, describe, and quantify the hydrologic processes that change due to urbanization in a semiarid area; (2) to evaluate the potential magnitude of the aggregate changes in the Albuquerque urban area from the 1950's to the 1980's; and (3) to develop and evaluate techniques for quantifying hydrologic processes in the urban environment.

Approach: Investigations will be directed toward analyzing precipitation, streamflow, and ground-water data in order to define net changes in surface runoff, ground-water levels, and storage since the 1950's. In order to identify and attempt to quantify the components influencing the net changes, instrumented test sites will be established in areas of typical natural, residential, and commercial development. Components to be measured are precipitation, soil moisture, water level, temperature, discharge, and evapotranspiration. The data will be used in an energy budget and micro-hydrologic budget analysis to quantify the present system.

Progress and Significant Results: Preliminary evapotranspiration data indicate that evapotranspiration peaks are greater over grass-cover type than over gravel- and plastic-cover type. Preliminary data from 23 tensiometer observations indicate that soil-moisture movement within the first 5 feet below land surface can be upward in part of the profile and downward in another part of the profile. Soil-moisture monitoring at 18 sites, each about 20 feet deep, has shown that most wetting fronts after precipitation events are confined to the upper 5 feet of soil. Clay layers have become quite wet and show little drainage. Thirty-one infiltration events have been recorded in an unlined, $\frac{1}{2}$-mile-long arroyo between March 1984 and June 1985. Infiltration ranged from 864 cubic feet to 4,320 cubic feet for any single event and totaled 38,000 cubic feet for the period of record.

Plans for FY 86: Complete the evapotranspiration, soil-moisture, tensiometer and infiltration data-collection effort. Continue to edit and update the data base. Continue to plot data and make preliminary analyses.

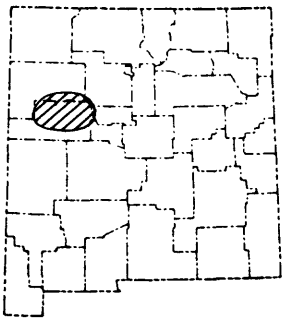
Reports in Progress:

Goetz, C. L., Urbanization effects upon ground-water and surface-water resources in Albuquerque, New Mexico [initial preparation].

Goetz, C. L., and Duncan, S. G., Techniques and methodology used to quantify components of the hydrologic system in the Albuquerque metropolitan area, New Mexico [initial preparation].

Reports Released: None

NM-246 HYDROLOGY OF THE SAN ANDRES-GLORIETA AQUIFER SYSTEM, PUEBLOS OF ACOMA AND LAGUNA, NEW MEXICO



Period of Project: October 1983 to December 1987

Principal Investigator: Peter Frenzel

Cooperating Agencies: New Mexico State Engineer Office, Pueblo of Acoma, and Pueblo of Laguna

Problem: The Pueblos of Acoma and Laguna need additional ground water. The San Andres-Glorieta aquifer is a possible source of water, but there is uncertainty regarding the amount and distribution of available freshwater, and there is concern about the effects that additional ground-water development might have on existing users.

Objectives: Under several assumed scenarios of development, determine the quantity and quality of water that can be withdrawn from the San Andres-Glorieta aquifer near and beneath the Acoma and Laguna lands; determine, as much as possible, the effect of previous and new development upon water users.

Approach: Study the geohydrologic framework. Collect existing and new data pertaining to aquifer characteristics. Define the ground-water/surface-water interconnection, natural recharge and discharge, water quality, water use, and hydraulic head changes. Interpret the data and simulate the hydrologic system.

Progress and Significant Results: Estimated current discharge from Ojo del Gallo. Contracted a seismic study on San Rafael fault. Measured water levels in about 40 wells semiannually, and maintained continuous records on several other wells. Collected several water-quality samples. Continued geohydrologic studies.

Plans for FY 86: Write a geohydrology report. Continue data-collection activities. Interpret geochemical data. Continue design of a digital model and continue work on a report describing the simulation of the hydrologic system.

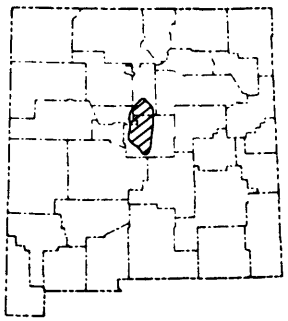
Reports in Progress:

Baldwin, J. A., and Frenzel, P. F., Hydrologic data and geohydrologic framework of the San Andres-Glorieta aquifer system, Pueblos of Acoma and Laguna, New Mexico [initial preparation].

Frenzel, P. F., and Baldwin, J. A., Simulation of the San Andres-Glorieta aquifer system, Pueblos of Acoma and Laguna, New Mexico [initial preparation].

Reports Released: None

NM-249 GEOHYDROLOGY OF THE ESTANCIA VALLEY, NEW MEXICO



Period of Project: October 1985 to September 1988

Principal Investigator: Robert R. White

Cooperating Agency: New Mexico State Engineer Office

Problem: The Estancia Valley is a closed basin in which ranching and irrigated farming are the predominant occupations. The water table is declining in the irrigated area, which increases pumping costs and enhances the possibility of saline-water encroachment. There is a possibility of some industrial development. Increasing population has caused an increase in water use in the mountain foothills area.

Objectives: Conduct a comprehensive study of the occurrence, movement, and quality of ground water in the basin and the relationship between ground water and surface water. The emphasis of the study will be on the alluvial aquifer.

Approach: Water-level measurements will be made and water-quality samples collected to determine current conditions so that a detailed comparison can be made with historical data. Streamflow measurements will be made as a means of determining the nature of the connection between ground water and surface water.

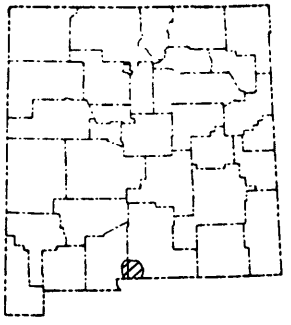
Progress and Significant Results: About 75 water-level measurements were made in February 1985, mostly in the irrigated area. These measurements revealed water-level declines of about 2 feet per year in much of the area.

Plans for FY 86: An intensive data-collection effort is planned. Current water-level data will be compared with data from the 1950's and as far back as 1909, so that the decline in the water table can be accurately delineated. Water-quality analyses will be used to determine the nature and extent of any quality changes.

Reports in Progress:
White, R. R., Geohydrology of the Estancia Valley, central New Mexico [initial preparation].

Reports Released: None

NM-250 FRESHWATER AVAILABILITY AND THE
EFFECTS OF FUTURE GROUND-WATER DEVELOPMENT
IN THE HUECO BOLSON, SOUTH-CENTRAL NEW MEXICO



Period of Project: January 1984 to September 1987

Principal Investigator: Brennon R. Orr

Cooperating Agencies: New Mexico State Engineer Office and the City of El Paso.

Problem: The city of El Paso, Texas, has filed applications with the New Mexico State Engineer Office for development of 60 water-supply wells in the northern part of the Hueco Bolson in New Mexico. At present, lack of hydrologic data precludes a quantitative understanding of the effects of this potential development on existing resources.

Objectives: (1) To determine the extent and thickness of water-bearing sediments and the distribution of water-quality in those sediments; and (2) to determine changes in water levels, water in storage, and water quality that would result from additional pumpage in New Mexico.

Approach: Compile water-use, water-level, water-quality, and other geohydrologic information. Construct ground-water models, including a preliminary three-dimensional flow model and cross-sectional solute-transport model. Collect additional data, including surface electrical-geophysical soundings, to define the extent and thickness of water-bearing sediments and water-quality zones. Refine models using additional information.

Progress and Significant Results: An inventory of wells and water use was conducted. Preliminary interpretation of the surface electrical-resistivity data was accomplished. This interpretation will help to determine the extent and thickness of water-bearing sediments and water-quality zones for modeling. Geohydrologic data including borehole-geophysical logs and water samples were collected from four recently drilled test wells. Modeling efforts continued with development of a three-dimensional steady-state flow model.

Plans for FY 86: Modeling efforts will continue with development of transient three-dimensional flow and cross-sectional solute-transport models. Surface-electrical data and well data will be used to construct the models. Geohydrological sections will be constructed using surface electrical-resistivity data and well data to determine the extent and thickness of water-bearing units and the distribution of water-quality zones in these units. Open-file reports, including a report that provides an interpretation of surface electrical-sounding data and a report documenting basic data, will be released. Work will continue on the final interpretive report.

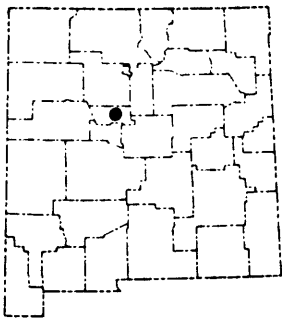
Reports in Progress:

Orr, B. R., Freshwater resources of the northern part of the Hueco Bolson and the projected effects of these resources from future well development in Doña Ana and Otero Counties, New Mexico, and El Paso County, Texas [initial preparation].

Reports Released:

Orr, B. R., and White, R. R., 1985, Selected hydrologic data from the northern part of the Hueco Bolson, New Mexico and Texas: U.S. Geological Survey Open-File Report 85-696, 88 p.

NM-252 HYDROLOGY OF THE ALBUQUERQUE SOUTH VALLEY, NEW MEXICO



Period of Project: October 1984 to September 1987

Principal Investigator: Kathy D. Peter

Cooperating Agency: New Mexico Environmental Improvement Division

Problem: Hydrocarbon and nitrate contamination have been identified at specific sites in the Albuquerque South Valley alluvial deposits that provide water to domestic and city wells in the area. The rates and directions of ground-water flow in the area are not fully understood though there may be potential for degradation of domestic and municipal supplies.

Objective: Provide hydrologic information on the shallow ground-water flow system for use in assessing site-specific investigations of the contamination.

Approach: Review geohydrologic reports and data. Describe two cross sections with piezometers at depths of 50 to 150 feet. Measure vertical and horizontal gradients. Prepare water-level maps for selected horizons. Perform pumping aquifer tests of selected wells. Evaluate test results using simulation of the flow system in cross section.

Progress and Significant Results: Twenty-four piezometers were installed, 12 each along Montano Road and Rio Bravo Boulevard. Water levels in each piezometer are being recorded. Hydrographs of the water levels are being updated twice monthly.

Plans for FY 86: An aquifer test will be performed using the piezometers along Rio Bravo Boulevard. Stage recorders will be installed on Barr Canal and the Riverside Drains on Rio Bravo Boulevard. The flow in the shallow aquifer along Rio Bravo Boulevard will be simulated.

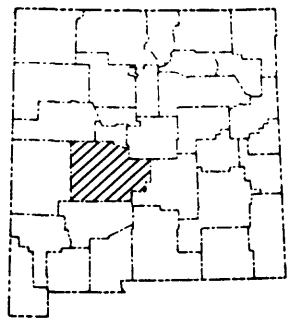
Reports in Progress:

Peter, K. D., Ground-water flow and aquifer characteristics in the shallow aquifer of the Rio Grande valley, Bernalillo County, New Mexico [initial preparation].

Reports Released:

Kues, G. E., Ground-water levels and direction of ground-water flow in the central part of Bernalillo County, New Mexico. U.S. Geological Survey Water-Resources Investigations Report 85-4325 [in press].

NM-253 GROUND-WATER RESOURCES OF SOCORRO COUNTY, NEW MEXICO



Period of Project: October 1984 to September 1986

Principal Investigator: F. E. Roybal

Cooperating Agencies: New Mexico Bureau of Mines and Mineral Resources and New Mexico State Engineer Office

Problem: Although a number of hydrologic investigations have been made in various parts of Socorro County, a comprehensive study of the entire county has not been done. Most domestic- and public-water supplies in the county are from ground water and significant quantities of ground water are used in agriculture, mining, and manufacturing. The potential development of energy resources such as coal will have an impact on ground-water resources in the county.

Objective: To describe the ground-water resources of Socorro County.

Approach: The study includes a well and spring inventory and water-quality analyses. Water-use information will be assembled for determination of total ground-water discharge, and a hydrogeologic map of the county will be compiled.

Progress and Significant Results: A geologic map of Socorro County has been compiled by the New Mexico Bureau of Mines and Mineral Resources. Wells have been inventoried and a table of well information that contains 589 sites has been compiled.

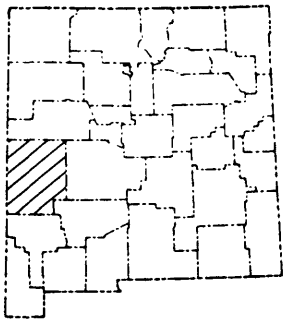
Plans for FY 86: First draft of the final report will be completed. Report will be submitted for review and approval.

Reports in Progress:

Roybal, F. E., Ground-water supplies in Socorro County, New Mexico [initial preparation].

Reports Released: None

NM-254 GROUND-WATER RESOURCES OF CATRON COUNTY, NEW MEXICO



Period of Project: October 1984 to September 1987

Principal Investigator: Robert Gene Myers

Cooperating Agencies: New Mexico State Engineer Office and New Mexico Bureau of Mines and Mineral Resources

Problem: Demand for water supplies for public, domestic, agricultural, and coal-mining uses has increased. Surface waters are fully appropriated and ground-water supplies need to be described.

Objective: To describe the availability and quality of ground-water resources of the county.

Approach: Using data assembled in a previous Catron County project, determine where additional data need to be collected. Update geohydrologic maps where necessary. Describe the aquifers and their potential for water-supply development.

Progress and Significant Results: Collected data from other agencies and measured water levels in selected wells in the northwestern part of the county.

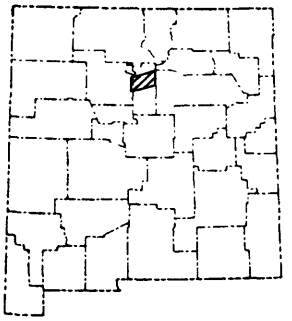
Plans for FY 86: Prepare report outline; begin compiling and plotting data.

Reports in Progress:

Myers, R. G., Ground-water resources of Catron County, New Mexico [initial preparation].

Reports Released: None

NM-256 MEASUREMENT OF ANNUAL EVAPOTRANSPIRATION RATES



Period of Project: May 1985 to September 1989

Principal Investigator: David W. Wilkins

Cooperating Agency: Santa Fe Metropolitan Water Board

Problem: Most of the water that recharges the alluvial basins of the Rio Grande valley above Presidio, Texas, is consumed by evapotranspiration (ET). Experience gained through the Southwest Alluvial-Basins RASA project, including simulations of the hydrologic systems in the San Luis, Albuquerque-Belen, and Mesilla Basins, has demonstrated that: (1) ET is a significant part of the total water budget for a basin; (2) as modeled, the hydrologic system is sensitive to the volume of ET from a basin; (3) the volume of ET reported from lysimeter studies and current estimates may not be the actual ET used by a specific vegetation type under particular climatic conditions; and (4) deviations of reported values from actual values are not known.

Objectives: The objectives are to determine the rate of ET from irrigated crops most commonly grown in the valley of the Rio Grande, and riparian vegetation in the flood plain, including changes in the ET rate caused by changes in ground-water levels.

Approach: Use the Bowen-ratio method and chilled-mirror vapor-pressure sensors that draw air from two different levels above the vegetation. Data will be collected at selected sites for one growing season. During the next growing season, another vegetation type or different hydrologic environment will be selected for ET-rate evaluation. Results will be compared to existing results using different data-collection techniques.

Progress and Significant Results: Evaluation of existing instrumentation used by a New Mexico District project quantifying ET for various urban settings has been made. Ratings of the relative-humidity probes used by that project, using the Assman psychrometer, have been completed and analyzed. The ratings and comparison of the humidity and ambient temperature humidity are not the best measures of water-vapor content for quantifying ET in the field. Dew-point sensors using the chilled-mirror principle will be used for determining water-vapor gradient. Numerous State, water-district, and city agencies have been contacted about cooperating in the project. Several presentations to commissions and boards of directors have been made.

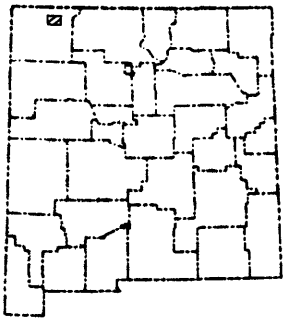
Plans for FY 86: Install equipment at sites selected in conjunction with cooperators, and collect one growing season's data.

Reports in Progress:

Wilkins, D. W., Evapotranspiration rates for irrigation crops and phreatophytes, Santa Fe Basin, New Mexico [initial preparation].

Reports Released: None

NM-257 GROUND-WATER FLOW CHARACTERISTICS AND CHEMICAL QUALITY IN THE ANIMAS, LA PLATA, AND SAN JUAN RIVER VALLEYS, NEW MEXICO



Period of Project: July 1985 to June 1988

Principal Investigator: Douglas P. McAda

Cooperating Agencies: San Juan County Commission, New Mexico Oil Conservation Division, and New Mexico Environmental Improvement Division

Problem: Numerous domestic wells are completed in the alluvium of the Animas, La Plata, and San Juan River valleys upstream from Farmington. The potential for contamination of ground water is great because of possible seepage from irrigation water, septic tanks, and oil-disposal pits. Surface water is fully appropriated and potable ground water is in short supply.

Objectives: To determine the direction and rate of ground-water flow and its relation to river stage. To determine the concentrations of nitrogen, phosphorus, chloride, sulfate, and certain organic compounds such as benzene in the ground water. To provide information that may indicate sources of chemical contamination in ground water.

Approach: Existing stream-discharge and surface- and ground-water-quality data will be analyzed. Water samples will be collected from about 40 wells. Piezometers will be installed at a valley cross section. Ground-water flow directions and rates will be determined. Water-level and water-quality maps will be prepared.

Progress and Significant Results: A reconnaissance was made, and a site for a cross section was selected. Information on depths to water in the valley alluvium near the cross section and composition of the alluvium was collected by hand augering. Water samples were collected at 10 sites for chemical-quality analysis.

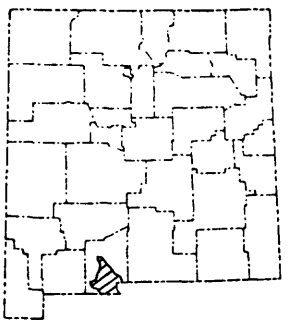
Plans for FY 86: Install a streamflow gage and piezometers at the cross section. Collect approximately 40 water samples for analysis. Prepare maps of the extent of the valley alluvium and water-level altitudes.

Reports in Progress:

McAda, D. P., Hydrology and water quality of the San Juan River alluvium, northwestern New Mexico [initial preparation].

Reports Released: None

NM-258 DETERMINATION OF VERTICAL HYDRAULIC CONDUCTIVITY AND GROUND-WATER VELOCITY FROM TEMPERATURE PROFILES IN WELLS IN NEW MEXICO



Period of Project: February 1986 to September 1989

Principal Investigator: Kenneth E. Stevens

Cooperating Agency: New Mexico State Engineer Office

Problem: Ground-water pumpage from alluvial aquifers in arid basins of the southwestern United States eventually captures surface water. In New Mexico, the amount of captured Rio Grande water may affect the capability to deliver the specified amount of water to downstream users as dictated by compact and treaty. The amount of water that leaks from the river to underlying sediments is controlled by the vertical hydraulic conductivity. The leakage rate and hydraulic conductivity are not known, and the methods for determining these values are expensive and uncertain.

Objectives: Develop and apply convective transport of heat methods to determine vertical flow rates and vertical hydraulic conductivity. Compare vertical flow rates and vertical hydraulic conductivity values with those obtained using conventional aquifer-test methods. Develop and apply an optimization procedure for estimating vertical flow from the Rio Grande and vertical hydraulic conductivity between the river and the alluvial aquifer. Evaluate the transferability of the heat-transfer method results to other basins along the Rio Grande.

Approach: Drill small diameter holes cased with nonperforated 2-inch-diameter steel tubing. Temperature log in the tubes to determine temperature differences that may be associated with different lithologies in the heterogeneous sedimentary material. Use the SUTRA simulation program to determine aquifer properties that could account for the temperature profile in the tube. Use existing aquifer-test data to compute vertical flow rates and vertical hydraulic conductivity, and compare these results with results of the temperature method. Develop an optimization routine for simulations. Test transferability of aquifer properties using the temperature-profile technique against more conventional aquifer-test methods in other basins along the Rio Grande.

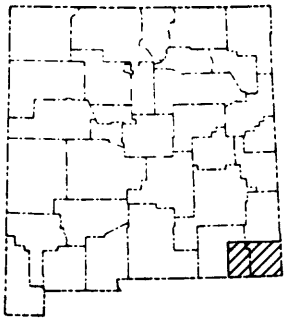
Progress and Significant Results: New project. Successfully ran an example data set through SUTRA. Assigned and have on board a project chief.

Plans for FY 86: Select specific sites for the well tubes. Drill and complete the well tubes so quarterly temperature logging can begin. Collect data and begin simulating temperature profiles using SUTRA.

Reports in Progress: None

Reports Released: None

NM-324 HYDROLOGIC INVESTIGATIONS RELATED TO A RADIOACTIVE-WASTES REPOSITORY IN SALT, SOUTHEASTERN NEW MEXICO



Period of Project: October 1975 to September 1987

Principal Investigator: Peter B. Davies

Cooperating Agency: U.S. Department of Energy

Problem: The Waste Isolation Pilot Plant (WIPP) is a U.S. Department of Energy project with the dual objectives of providing a facility for the permanent disposal of approximately 6 million cubic feet of transuranic waste and providing research on the interaction of high-level waste with a bedded-salt environment. Assessment of the ground-water flow system is a key component in evaluation of the potential for radionuclide transport to the biosphere and in the design and evaluation of a long-term monitor network.

Objective: To define the direction and rate of ground-water flow in the Rustler Formation in the vicinity of the WIPP site and the surrounding region.

Approach: Construct numerical models that simulate the ground-water flow system using existing site and regional hydrologic data. Examine the effects of variations in fluid density on flow patterns using variable-density modeling codes.

Progress and Significant Results: A survey of variable-density ground-water modeling codes was completed. Variable-density flow behavior in relatively simple systems was examined using the SUTRA code. A project data base was constructed using INFO data-base software. Work was begun on construction of a preliminary model of variable-density flow in the Culebra Dolomite Member of the Rustler Formation.

Plans for FY 86: Complete the project data base and preliminary flow model. Extend the model boundaries out to "natural" hydrologic boundaries and incorporate the Magenta Member of the Rustler Formation and the contact between the Rustler and Salado Formations.

Reports in Progress:

Richey, S. F., Hydrologic data from wells at hydrologic test pads H-7, H-8, H-9, and H-10, near the proposed Waste Isolation Pilot Plant site, southeastern New Mexico [initial preparation].

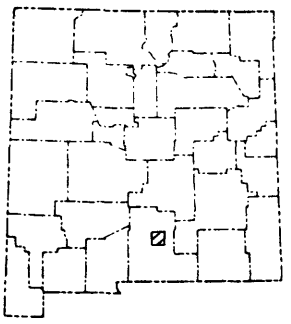
Richey, S. F., Preliminary hydrologic data for wells tested in Nash Draw near the proposed Waste Isolation Pilot Plant site, southeastern New Mexico [colleague review completed].

Davies, P. B., Analyses of the regional ground-water flow system in the Waste Isolation Pilot Plant area, southeastern New Mexico [initial preparation].

Reports Released:

Stevens, Ken, and Beyeler, Walt, 1985, Determination of diffusivities in the Rustler Formation from exploratory shaft construction at the Waste Isolation Pilot Plant in southeast New Mexico: Water-Resources Investigations Report 85-4020, 32 p.

NM-344 SIMULATED WATER-LEVEL DECLINES CAUSED BY GROUND-WATER WITHDRAWALS NEAR HOLLOMAN AIR FORCE BASE, NEW MEXICO



Period of Project: November 1981 to July 1986

Principal Investigator: D. L. Hart

Cooperating Agency: U.S. Department of Air Force, Holloman Air Force Base

Problem: Water levels are being lowered by ground-water withdrawals in an area east of Holloman Air Force Base. The amounts and rates of decline that are likely to occur during the next 20 years at various rates of withdrawal need to be assessed.

Objective: Determine the ground-water level decline that may be likely based on withdrawal rates and future estimated rates supplied by the Holloman Air Force Base.

Approach: Determine aquifer characteristics and develop a two-dimensional ground-water flow model that simulates the ground-water system. Use the model under various levels of withdrawal to determine potential water-level declines.

Progress and Significant Results: Development and calibration of the ground-water flow model have been completed and a draft of the final report has been prepared. Results of modeling indicate that water-level declines of as much as 55 feet may occur along the mountain front near heavily stressed areas.

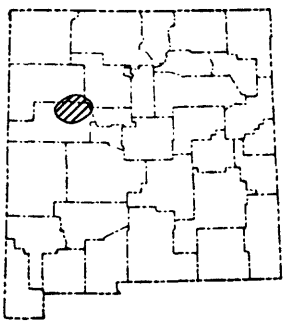
Plans for FY 86: Submit final report for review and approval. Prepare camera-ready copy and publish the report.

Reports in Progress:

Burns, A. W., and Hart, D. L., Predicted responses of water levels to stresses on the ground-water system, Holloman Air Force Base area, southeastern Tularosa Basin, New Mexico [Central Region review].

Reports Released: None

NM-345 EXPLORATION OF THE SAN ANDRES-GLORIETA AQUIFER SYSTEM, PUEBLOS OF ACOMA AND LAGUNA, NEW MEXICO



Period of Project: October 1983 to December 1987

Principal Investigator: Peter Frenzel

Cooperating Agency: U.S. Bureau of Indian Affairs

Problem: The Pueblos of Acoma and Laguna seek to develop additional ground water. The San Andres-Glorieta aquifer system yields sufficient quantities of water for irrigation in other places but is unexplored in the area of the Pueblos.

Objective: Determine the productivity and water quality of the San Andres-Glorieta aquifer system in the area beneath the Pueblos of Acoma and Laguna.

Approach: Drill as many as four wells for aquifer tests and water-quality determinations. Collect and analyze water samples at selected sites for geochemical interpretation.

Progress and Significant Results: Assisted U.S. Bureau of Indian Affairs and Pueblo of Acoma with site selection and contract oversight for drilling "Acoma 1" test hole. Discovered high-yielding cavernous limestone and water of near-potable quality at Acoma 1. Sampled water at other selected sites.

Plans for FY 86: Contract the drilling and testing of as many as three additional holes.

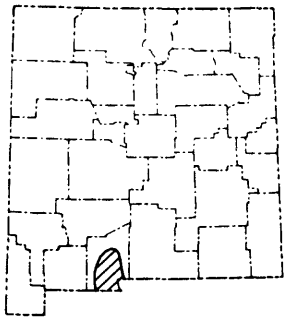
Reports in Progress:

Baldwin, J. A., and Frenzel, P. F., Hydrologic data and geohydrologic framework of the San Andres-Glorieta aquifer system, Pueblos of Acoma and Laguna, New Mexico [initial preparation].

Frenzel, P. F., and Baldwin, J. A., Simulation of the San Andres-Glorieta aquifer system, Pueblos of Acoma and Laguna, New Mexico [initial preparation].

Reports Released: None

NM-346 EVALUATION OF GROUND-WATER/SURFACE-WATER RELATIONSHIPS OF THE MESILLA BASIN, NEW MEXICO



Period of Project: November 1982 to January 1987

Principal Investigator: Edward L. Nickerson

Cooperating Agencies: U.S. Bureau of Reclamation, and International Boundary and Water Commission

Problem: Hydrologic data in the Mesilla Basin are insufficient to adequately define the relationship between hydrologic systems related to Tertiary and Quaternary aquifers and the Rio Grande.

Objectives: To better define the horizontal and vertical flow in the Santa Fe Group and flood-plain alluvium and to define the role of the Rio Grande more completely.

Approach: Evaluate ground-water/surface-water relationships by constructing three hydrologic sections across the Mesilla Valley to monitor river stage and associated head changes within the aquifer system with respect to depth and distance from the Rio Grande.

Progress and Significant Results: Construction of three hydrologic sections across the Mesilla Valley was completed. Draft of data report "Selected Geohydrologic Data for the Mesilla Basin, Doña Ana County, New Mexico, and El Paso County, Texas" was completed.

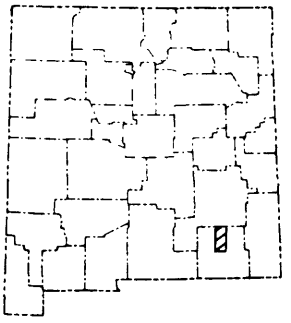
Plans for FY 86: Continue to monitor three hydrologic sections. Publish data report. Prepare interpretive reports describing ground-water/surface-water relationships.

Reports in Progress:

Nickerson, E. L., Selected geohydrologic data for the Mesilla Basin, Doña Ana County, New Mexico, and El Paso County, Texas [in press].

Reports Released: None

NM-347 HYDROLOGY OF THE MCMILLAN DELTA AND RELATED AREAS IN BRANTLEY RESERVOIR, PECOS RIVER, NEW MEXICO



Period of Project: July 1983 to June 1986

Principal Investigator: Thomas M. Crouch

Cooperating Agency: U.S. Bureau of Reclamation

Problem: McMillan Delta is within the maximum reservoir area of the Pecos River Brantley Dam project that is scheduled for completion in about 4 years. The U.S. Bureau of Reclamation intends to drain ponded areas in the delta. Hydrologic data are needed for drainage-network design and assessment of ground- and surface-water changes that might occur in the reservoir as a result of the drainage network.

Objectives: The principal objectives are to provide hydrologic information that can be used to determine the following: (1) the depth of drains and possible leakage from the drainage network, (2) the possible changes in ground-water discharge from the Roswell Basin that will be reflected in the flow of Major Johnson Springs, and (3) the possible changes in surface-water flow through the delta.

Approach: Field work will include installing 38 piezometers, measuring ground-water levels, making seepage runs, and collecting lithologic samples. Maps of water level, aquifer thickness, and lithology will be prepared. Gain and loss distribution and the relation between aquifer heads, surface-water stages, and temporary aquifer storage will be analyzed in order to determine sources of spring flow. An inflow-outflow study of the Pecos River and tributaries in the Artesia-Carlsbad area for 1964-83 will be analyzed to determine the upper limits of potential ground-water salvage in the reach above Brantley Dam.

Progress and Significant Results: Drilled and sampled 28 alluvial test holes in the Pecos River flood plain. Prepared a soils and geologic map of the delta and vicinity. Measured and recorded water levels in delta piezometers and other wells. Compiled and graphed data for Lake McMillan, several reaches of the Pecos River, and an index well.

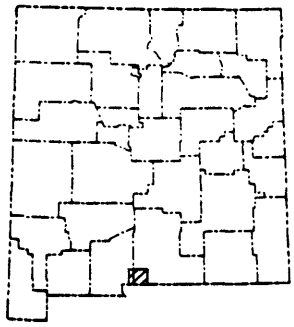
Plans for FY 86: Analyze soils and provide data to the Bureau of Reclamation. Make seepage runs on the Pecos River through the delta. Complete the analysis of the Major Johnson Springs aquifer and its likely interaction with the new Brantley Reservoir at various lake stages. Complete the final project report.

Reports in Progress:

Crouch, T. M., Hydrology of the McMillan Delta and Brantley Reservoir areas, Pecos River, New Mexico [initial preparation].

Reports Released: None

NM-349 FRESHWATER AVAILABILITY AND THE EFFECTS OF FUTURE GROUND-WATER DEVELOPMENT IN THE HUECO BOLSON, SOUTH-CENTRAL NEW MEXICO



Period of Project: January 1984 to September 1987

Principal Investigator: Brennon R. Orr

Cooperating Agency: U.S. Department of the Army (Fort Bliss)

Problem: The U.S. Department of the Army (through Fort Bliss) must ensure a sufficient supply of fresh ground water is retained in strategic reserve before allowing additional development of freshwater resources in the New Mexico part of the Hueco Bolson. At present, lack of hydrologic data precludes a quantitative understanding of the effects of development on existing resources.

Objectives: (1) To determine the present distribution and availability of fresh ground water in the New Mexico part of the Hueco Bolson; and (2) to determine changes in water levels, water in storage, and water quality that would result from additional pumpage in the northern part of the Hueco Bolson.

Approach: Available water-level, water-quality, well-completion, geophysical, and pumpage data will be obtained. A water-level and water-quality monitoring network will be established. A preliminary three-dimensional flow model will be developed using available data to identify data needs. Additional data will be collected where available. Surface electrical-resistivity lines will be run to determine the thickness of freshwater-saturated sediments. From three to five test wells will be drilled to calibrate geophysical data and to provide data where well data previously were unavailable. The model will be refined using additional data.

Progress and Significant Results: An inventory of wells in the New Mexico part of the Hueco Bolson was conducted. Wells were selected for the water-level and water-quality monitoring network. Water-use data were obtained. Four test wells were drilled and completed for assistance in interpretation of geophysical surveys and for long-term monitoring. Modeling efforts continued with development of a steady-state three-dimensional flow model.

Plans for FY 86: Modeling efforts will continue with development of transient three-dimensional flow and cross-sectional solute-transport models. Geophysical data and well data will be used to construct geohydrological sections to determine the extent and availability of freshwater. A data report will be released to the open file and an interpretive report will be prepared.

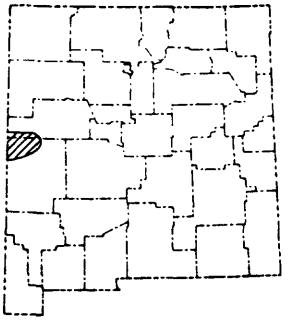
Reports in Progress:

Orr, B. R., Freshwater resources of the northern part of the Hueco Bolson and the projected effects on these resources from future well development in Dona Ana and Otero Counties, New Mexico, and El Paso County, Texas [initial preparation].

Reports Released:

Orr, B. R., and White, R. R., 1985, Selected hydrologic data from the northern part of the Hueco Bolson, New Mexico and Texas, 1985: U.S. Geological Survey Open-File Report 85-696, 88 p.

NM-350 GROUND-WATER HYDROLOGY OF FRENCHS ARROYO NORTHEAST OF ZUNI SALT LAKE, CATRON AND CIBOLA COUNTIES, NEW MEXICO



Period of Project: June 1984 to September 1986

Principal Investigator: Robert Gene Myers

Cooperating Agency: U.S. Bureau of Land Management

Problem: The leasing of coal deposits in the San Agustin Coal Field is being considered by the U.S. Bureau of Land Management. Description of the ground-water hydrology is needed to determine the effects of coal-mining activities in and adjacent to the area under consideration.

Objectives: (1) Describe the ground-water hydrology of the Frenchs Arroyo area. (2) Assess the potential effects of coal mining on the Zuni Salt Lake area. (3) Describe the possible effects of coal mining on the ground-water resources of the area.

Approach: (1) Collect and identify existing hydrologic data. (2) Identify, measure, and sample selected wells. (3) Selectively sample springs and lakes in the vicinity of Zuni Salt Lake.

Progress and Significant Results: Installed a gage and recorder in the arroyo below Smith Spring in Zuni Salt Lake Maar. Installed a water-level recorder and rain gage on Zuni Salt Lake. Installed a water-level recorder on the cinder-cone lake in the Zuni Salt Lake Maar. Measured water levels in selected wells throughout the study area. Selectively sampled wells, springs, and lakes in the vicinity of the Zuni Salt Lake Maar.

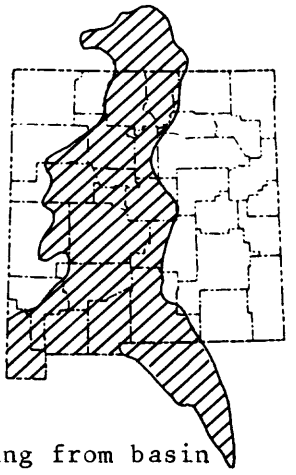
Plans for FY 86: Continue operating the recorders installed in FY 85 and sampling the cinder-cone lake and Zuni Salt Lake. Complete draft of report and submit for review and approval.

Reports in Progress:

Myers, R. G., Geohydrology of the Frenchs Arroyo area, Catron and Cibola Counties, New Mexico [initial preparation].

Reports Released: None

NM-408 SOUTHWEST ALLUVIAL BASINS REGIONAL AQUIFER-SYSTEM ANALYSIS, NEW MEXICO



Period of Project: October 1979 to September 1986

Principal Investigator: David W. Wilkins

Cooperating Agency: Federal Program

Problem: The Rio Grande drainage basin from north of Alamosa, Colorado to Presidio, Texas, is experiencing rapid population growth. In addition to population growth, a recent drought caused increased pumping from basin aquifers and a search for new sources of fresh ground water. Increasing use of ground water has produced declines in ground-water levels, affected through-flowing streams, and initiated water-quality changes. The magnitude and areal extent of these effects are undefined for the aquifer system.

Objectives: Define the hydrology of the regional water system. Specific objectives for study of selected basins are to define: (1) The extent of the aquifers, their hydraulic properties, and water quality; (2) the relationship between ground and surface water; (3) the hydraulic connection between adjacent basins; and (4) past and present stresses.

Approach: Selected basins will be characterized according to their geology, water quality, existing stress, and other common features. Digital models capable of simulating the hydrologic systems of selected basins will be developed. New and existing data will be compiled and stored in computer data bases.

Progress and Significant Results: All data compilation, collection, and storage have been completed. Surface-geophysical data have been collected and interpreted. Recharge to basin aquifer systems has been estimated. Digital models of selected basins have been completed and documented. The project is complete except for final reports publication.

Plans for FY 86: Have all reports approved and prepared for publication.

Reports in Progress: Note--Unless otherwise indicated, reports will be published in the Water-Resources Investigations Report series.

Anderholm, S. K., Ground-water geochemistry of the Albuquerque-Belen Basin, central New Mexico [Central Region review].

Frenzel, P. F., and Kaehler, C. A., Geohydrology and digital model of the Mesilla ground-water basin, Doña Ana County, New Mexico, and El Paso County, Texas, with a section on Geochemistry by S. K. Anderholm [colleague review completed].

Hearne, G. A., and Dewey, J. D., Model analysis of hydrology in the Rio Grande Basin above Embudo, New Mexico [colleague review].

Kaehler, C. A., Hydrogeologic characterization of alluvial aquifers in selected basins in the Rio Grande rift region, Colorado, New Mexico, and Texas [initial preparation].

Kernodle, J. M., Summary report of U.S. Geological Survey ground-water flow models in the southwestern alluvial basins region, Colorado, New Mexico, and Texas [colleague review].

Kernodle, J. M., and others, Three-dimensional digital computer model of transient ground-water flow in the Albuquerque-Belen Basin, New Mexico [Reston review].

Wilkins, D. W., Well construction and aquifer tests of three wells, west of Albuquerque, Bernalillo County, New Mexico [Central Region review].

Wilkins, D. W., Summary report of the Southwest Alluvial Basins Regional Aquifer-Systems Analysis, parts of Colorado, New Mexico, and Texas [initial preparation].

Williams, R. S., and Hammond, S. E., Reconnaissance evaluation of ground- and spring-water quality in the San Luis Basin in Colorado and New Mexico [colleague review].

Reports Released:

Anderholm, S. K., 1983, Hydrogeology of the Socorro and La Jencia Basins, Socorro County, New Mexico, in Guidebook to Socorro Region, II: New Mexico Geological Society 34th Field Conference, p. 303-310.

_____ 1985, Clay-size fraction and powdered whole-rock x-ray analyses of alluvial-basin deposits in central and southern New Mexico: U.S. Geological Survey Open-File Report 85-173, 18 p.

_____ Hydrogeology of the Socorro and La Jencia Basins, Socorro County, New Mexico: U.S. Geological Survey Water-Resources Investigations Report 84-4342 [in press].

Crouch, T. M., 1984, Potentiometric surface, 1980, and water-level changes, 1969-80, in the unconfined valley-fill aquifers of the San Luis Basin, Colorado and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas 683.

Hearne, G. A., 1983, Supplement to the New Mexico three-dimensional model (supplement to Open-File Report 80-421): U.S. Geological Survey Open-File Report 82-857, 90 p.

Kernodle, J. M., and Scott, W. B., Three-dimensional simulation of steady-state ground-water flow in the Albuquerque-Belen Basin, New Mexico: U.S. Geological Survey Water-Resources Investigations Report 84-4353 [in press].

Wilkins, D. W., 1984, Geology and hydrology of the Rio Grande rift: ASCE Specialty Conference Proceedings, Flagstaff, Arizona, July 1984, 8 p.

_____ Geohydrology of the Southwest Alluvial Basins Regional Aquifer-Systems Analysis, parts of Colorado, New Mexico, and Texas: U.S. Geological Survey Water-Resources Investigations Report 84-4224 [in press].

Wilkins, D. W., Scott, W. B., and Kaehler, C. A., 1980, Planning report for the Southwest Alluvial Basins (east) Regional Aquifer-Systems Analysis, parts of Colorado, New Mexico, and Texas: U.S. Geological Survey Open-File Report 80-564, 39 p.

Reports Completed by Contractors for the U.S. Geological Survey:

Birch, F. S., 1980, Three-dimensional gravity modeling of basin hydrologic parameters in New Mexico: Report prepared by the University of New Mexico in fulfillment of contract no. 1408000117879, 26 p.

_____ 1980, Geophysical evaluation of basin hydrologic characteristics in central Rio Grande, Part 1: Gravity models of the Albuquerque-Belen Basin: Report prepared by the University of New Mexico in partial fulfillment of contract no. 1408000117879, 30 p.

Jiracek, G. R., 1982, Geophysical evaluation of basin hydrological characteristics in the central Rio Grande rift, Part III: Electrical-resistivity investigations: Report prepared by the University of New Mexico in partial fulfillment of contract no. 1408000117879, 109 p.

Kentron International Inc., 1980, Revised three-dimensional water-resources flow model: Report prepared in fulfillment of contract no. GS07502335 task 80-0001, 39 p.

O'Brien, K. M., and Stone, W. J., 1981, Water-level data compiled for hydrogeologic study of Animas Valley, Hidalgo County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-File Report 130, 55 p.

_____ 1982, Water-quality data compiled for hydrogeologic study of Animas Valley, Hidalgo County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-File Report 131, 25 p.

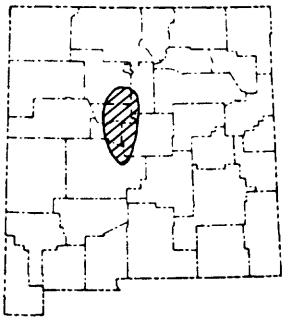
_____ 1982, Drill-hole testing data compiled for hydrogeologic study of Animas Valley, Hidalgo County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-File Report 132, 79 p.

_____ 1983, A two-dimensional hydrologic model of the Animas Valley, Hidalgo County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-File Report 133, 60 p.

Stone, W. J., and Mizell, N. H., 1979, Availability of geological and geophysical data for the eastern half of the U.S. Geological Survey's Southwest Alluvial Basins Regional Aquifer Study: New Mexico Bureau of Mines and Mineral Resources Open-File Report 109, 80 p.

Utitti, P. B., 1980, Interpretation of seismic reflection data from southern San Luis Valley, south-central Colorado: Colorado School of Mines, Golden, Colorado, unpublished M.S. thesis.

NM-421 ORGANIC AND HEAVY-METAL CONTAMINATION OF GROUND WATER IN THE ALBUQUERQUE-BELEN BASIN, NEW MEXICO



Period of Project: April 1984 to September 1987

Principal Investigator: Scott Anderholm

Cooperating Agency: Federal Program

Problem: Several localities in the Albuquerque-Belen Basin may be sources of and are affected by ground-water contaminants of various types. The source and movement of the contaminants generally are not clearly understood. Land-use practices may have different impacts on the ground-water quality.

Objectives: (1) Describe current regional ground-water quality in the Albuquerque-Belen Basin. (2) Investigate the relationship between land-use practices and ground-water quality.

Approach: Existing ground-water-quality data will be compiled and computerized. New ground-water-quality data will be collected. Twenty-four piezometers will be drilled and installed to examine ground-water-quality variation with depth below land surface. Ground-water-quality data will be studied to examine the effect that land-use practices have on ground-water quality.

Progress and Significant Results: Existing ground-water-quality data were compiled and computerized. New ground-water-quality data were collected in selected areas. Twenty-four piezometers were installed and instrumented. A report was written describing the current ground-water quality in the Albuquerque-Belen Basin and the possible effects that land use has on ground-water quality.

Plans for FY 86: Answer review comments on the reports. Collect ground-water-quality data in the Albuquerque area. Perform statistical tests on the water-quality and land-use data.

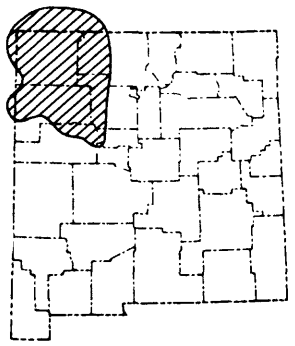
Reports in Progress:

Anderholm, S. K., Reconnaissance of land use, hydrology, ground-water quality, and effects of land use on ground-water quality in the Albuquerque-Belen Basin, New Mexico [colleague review completed].

Anderholm, S. K., Piezometer nests in the Albuquerque area, Bernalillo County, New Mexico [draft completed].

Reports Released: None

NM-423 SAN JUAN STRUCTURAL BASIN REGIONAL AQUIFER-SYSTEM ANALYSIS, NEW MEXICO



Period of Project: October 1984 to September 1988

Principal Investigator: Gary W. Levings

Cooperating Agency: Federal Program

Problem: Competition for limited ground-water supplies in the San Juan Basin among mining, electric-power and other companies, municipalities, and Indian communities is increasing. Surface waters are fully appropriated, and ground-water use is projected to triple in the next 20 years. The quantity, quality, and availability of ground water are not well known, and aquifer systems are not well defined.

Objectives: To define the regional hydrogeologic systems; to define quantitatively the individual aquifer-flow systems; and to assess the effects of past, present, and future ground-water use on aquifers and streams.

Approach: Assemble and evaluate existing hydrologic data. Determine the need for additional data and collect same. Determine the availability of ground water for each pertinent water-bearing unit by analyzing the geohydrologic data, constructing hydrologic maps, and describing the geohydrologic framework. Simulate the hydrologic system with a digital model. Assess the possible effects of ground-water development on the system.

Progress and Significant Results: Staff vacancies were filled in August and September 1985. The plan of study was prepared and approved. Data collection was initiated in June and approximately 200 wells were inventoried. An observation-well network was established.

Plans for FY 86: Well inventory will continue. Wells will be selected for detailed geochemical sampling. Several sites for test drilling will be selected and drilling contracts prepared. The WATSTORE, BRINEFILE, and PI data bases will be analyzed, updated, and used in preparing hydrologic-investigations maps for the Morrison Formation and Dakota Sandstone aquifers. Reports on selected geochemical references and well-inventory data will be prepared. Project personnel will establish and maintain contacts with the Geologic Division, State agencies, university personnel, Indian tribes, and private consultants.

Reports in Progress:

Craigg, S. D., Selected geologic and hydrogeologic map references for the San Juan structural basin and adjacent areas, New Mexico, Colorado, Arizona, and Utah [initial preparation].

Ross, D. P., and Bernero, C. A., Interim report on field inventory of water wells, San Juan Basin, New Mexico [initial preparation].

Stevens, K. E., Aquifer coefficients and hydrologic boundaries of a Jurassic Cretaceous aquifer system near Crownpoint, New Mexico [colleague review completed].

Reports Released:

Welder, G. E., Plan of study for the Regional Aquifer-System Analysis of the San Juan structural basin, New Mexico, Colorado, and Arizona: U.S. Geological Survey Water-Resources Investigations Report 85-4294 [in press].

☆ U S GOVERNMENT PRINTING OFFICE: 1986—671-460/45,158 REGION NO 8