UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

WATER-RESOURCES STUDIES IN UTAH

BY THE U.S. GEOLOGICAL SURVEY,

JULY 1, 1982, TO JUNE 30, 1983

Compiled by Linda S. Hamblin

Open-File Report 83-531

Salt Lake City, Utah
July 1983

UNITED STATES DEPARTMENT OF THE INTERIOR

JAMES G. WATT, Secretary

GEOLOGICAL SURVEY

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WATER-RESOURCES STUDIES IN UTAH

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INTRODUCTION

This report summarizes the progress on water-resources studies in Utah by the U.S. Geological Survey during the period July 1, 1982, to June 30, 1983. Much of the work was done in cooperation with the State of Utah and local agencies. Additional supporting funds were transferred from other Federal agencies or appropriated directly to the Geological Survey.

The State and local cooperators were:

Utah Department of Natural Resources
  Division of Water Rights
  Division of Water Resources
  Division of Wildlife Resources
  Geological and Mineral Survey
Bear River Commission
Utah Department of Transportation
Salt Lake County
Salt Lake County Division of Flood Control and Water Quality
Central Utah Water Conservancy District
Lower Gunlock Reservoir Corp.

The Federal cooperators were:

Bureau of Land Management
Bureau of Reclamation
Federal Energy Regulatory Commission

The program in Utah at the end of the reporting period consisted of 23 projects, and a discussion of each project is given in the following pages. Short descriptions are given at the end of the report for three proposed projects to be started on or after July 1, 1983.

In addition to the 26 projects mentioned above, work is being completed on reports for 5 other projects. The status of the reports is as follows:

UT 117 "Reconnaissance of geothermal resources of Utah." In press as U.S. Geological Survey Professional Paper 1044-H.

UT 139 "Ground-water hydrology of the Sevier Desert, Utah, with results of digital-computer modeling." In review.

"Three-dimensional digital-computer model of the principal ground-water reservoir of the Sevier Desert, Utah." In review.

UT 140 "Ground-water conditions in the Kaiparowits area, Utah and Arizona, with emphasis on the Navajo Sandstone." In review.

UT 142 "Quality and quantity of runoff and atmospheric deposition in the urban area of Salt Lake County, Utah, 1980-81." In review.

"Surface-water and climatologic data, Salt Lake County, Utah, water year 1981, with selected data for 1980-1982." In press as U.S. Geological Survey Open-File Report (to be duplicated as Utah Hydrologic-Data Report).

UT 149 "Ground water in Utah's densely populated Wasatch Front area-The challenge and the choices." In press as U.S. Geological Survey Water-Supply Paper 2232.

THE FOLLOWING REPORTS WERE RELEASED TO THE OPEN FILE:

Water-resources studies in Utah, July 1, 1981, to June 30, 1982: U.S. Geological Survey Open-File Report 82-643.

Bedrock aquifers in the northern San Rafael Swell area, Utah, with special emphasis on the Navajo Sandstone: U.S. Geological Survey Open-File Report 82-866.

Ground-water reconnaissance of the central Weber River area, Morgan and Summit Counties, Utah: U.S. Geological Survey Open-File Report 82-695.

Selected ground-water data, Sevier Desert, Utah, 1935-82: U.S. Geological Survey Open-File Report 82-910 (duplicated as Utah Hydrologic-Data Report 37).

Selected hydrologic data for northern Utah Valley, Utah, 1935-82: U.S. Geological Survey Open-File Report 82-1023 (duplicated as Utah Hydrologic-Data Report 39).

Hydrology of the Price River basin, Utah, with emphasis on selected coal-field areas: U.S. Geological Survey Open-File Report 83-208.

Chemical and physical characteristics of water and sediment in Scofield Reservoir, Carbon County, Utah: U.S. Geological Survey Open-File Report 83-252.

Selected hydrologic data, Price River basin, Utah, water years 1979 and 1980: U.S. Geological Survey Open-File Report 82-916 (duplicated as Utah Hydrologic-Data Report 38).

Water resources and potential hydrologic effects of oil-shale development in the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Open-File Report 83-216.

Quantity and quality of streamflow in the southeastern Uinta Basin, Utah and Colorado, U.S. Geological Survey Open-File Report 82-688.

Ground water in the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Open-File Report 83-271.

Regional hydrology of the Green River-Moab area, northwestern Paradox Basin, Utah: U.S. Geological Survey Open-File Report 82-107.

Results of hydraulic tests in U.S. Department of Energy's wells DOE-4, 5, 6, 7, 8, and 9, Salt Valley, Grand County, Utah: U.S. Geological Survey Open-File Report 82-346.

THE FOLLOWING REPORTS WERE PUBLISHED:

Water resources data for Utah, water year 1980: U.S. Geological Survey Water-Data Report UT-81-1.

Ground-water conditions in Utah, spring of 1982: Utah Division of Water Resources Cooperative Investigations Report 22.

Reconnaissance of the quality of surface water in the San Rafael River basin, Utah: Utah Department of Natural Resources Technical Publication 72.

Hydrology of the Beryl-Enterprise area, Escalante Desert, Utah, with emphasis on ground water: Utah Department of Natural Resources Technical Publication 73.

Characteristics of suspended sediment in the San Juan River near Bluff, Utah: U.S. Geological Survey Water-Resources Investigations Report 82-4104.

Hydrology of the southern Wasatch Plateau coal-resource area, central Utah: U.S. Geological Survey Water-Resources Investigations Report 82-4009.

Methods for estimating peak discharge and flood boundaries of streams in Utah: U.S. Geological Survey Water-Resources Investigations Report 83-4129.

Hydrogeology of the Gunnison-Fairview-Nephi area, central Utah: in the over Overthrust Belt of Utah: Utah Geological Association Publication 10.

Map showing general availability of ground water in the Alton-Kolob coal-fields area, Utah: U.S. Geological Survey Miscellaneous Investigations Map I-1235-C.

Utah water-use data, public-water supplies, 1980: Utah Department of Natural Resources, Utah Water-Use Report 3.

Utah water-use data, public-water supplies, 1981: Utah Department of Natural Resources, Utah Water-Use Report 4.

CURRENT PROJECTS

COLLECTION OF BASIC RECORDS - SURFACE WATER

Number: UT 00-001-FOICL

Cooperating Agencies: U.S. Bureau of Reclamation; U.S. Bureau of Land Management; Federal Energy Regulatory Commission; Utah Division of Water Rights; Utah Division of Water Resources; Bear River Commission; Salt Lake County; Central Utah Water Conservancy District; Lower Gunlock Reservoir Corp.

Staff: R. W. Cruff, Hydrologist, Project Chief (part time)
Other District personnel as assigned

Period of Project: Continuing

Objective: To obtain data on stream discharge or stage and reservoir or lake stage at selected sites throughout Utah.

Approach: Standard methods for the operation and maintenance of gaging stations and for the computation, computer storage, and publication of streamflow records were used.

Progress: Data collection and computation necessary for the publication of records for 200 streamflow stations, 15 reservoirs, and 2 lake-stage stations continued during the year. The stations are classified as follows:

Current purpose or project related	129
Hydrologic	55
Benchmark or long-term change	12
Regulated	4
Reservoirs (long-term management)	15
Lake stage	2

Gaging stations discontinued were:

Great Salt Lake at Promontory Point
Ash Creek Reservoir near New Harmony
South Ash Creek below Mill Creek, near Pintura
Ash Creek below West Field Ditch, at Toquerville
Surplus Canal at North Temple at Salt Lake City
Lee Creek near Magna
Kanarra Creek at Kanarraville
McElmo Creek near Bluff
Lamb Diversion near Ouray
Otter Creek near Koosharem

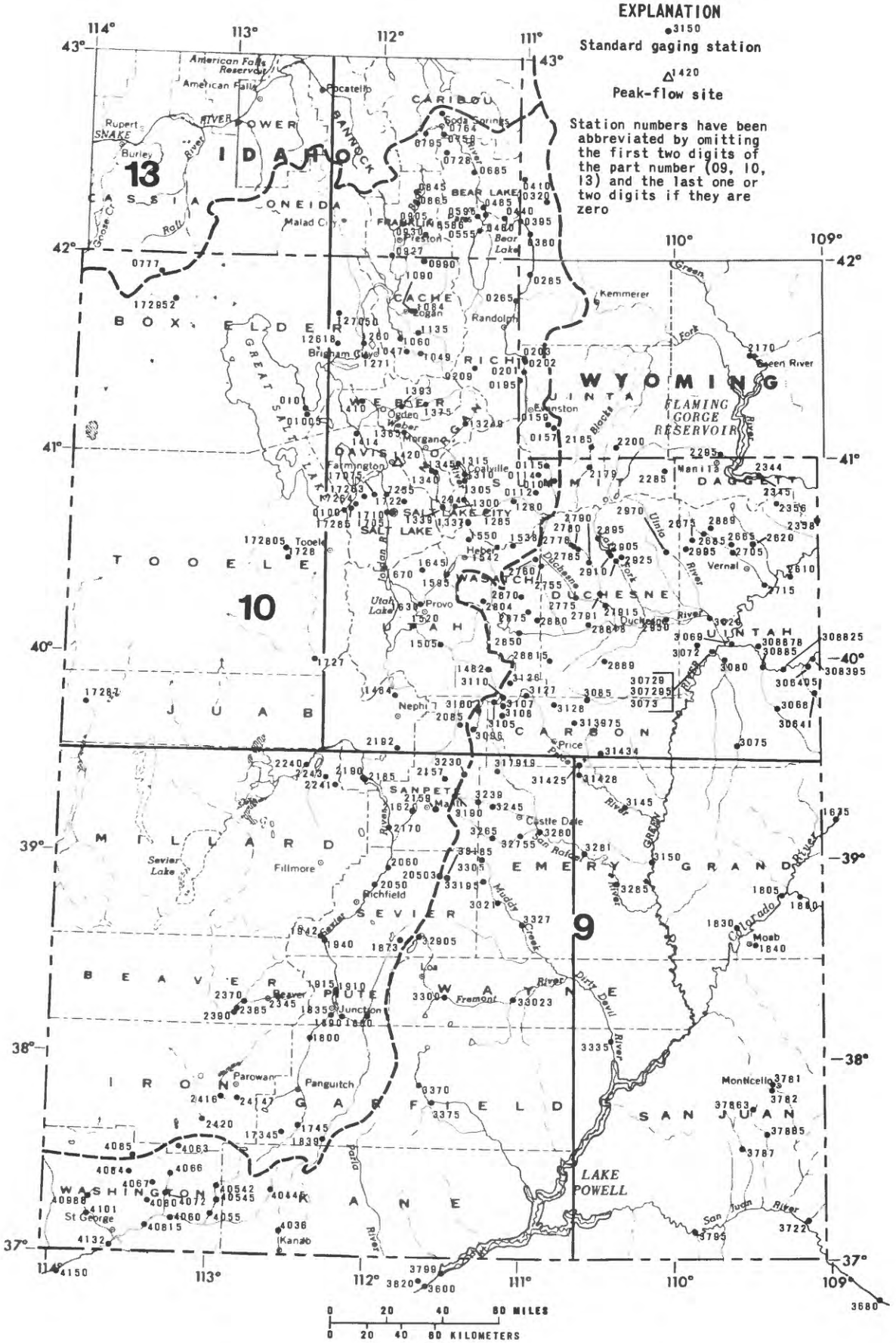
Plans for Next Year: Continue operation of network. Prepare 1983 water-year records for publication.

Reports:

Water resources data for Utah, water year 1981: U.S. Geological Survey Water-Data Report UT-81-1.

Water resources data for Utah, water year 1982: U.S. Geological Survey Water-Data Report UT-82-1 (in press).

"Streamflow and reservoir contents in Upper Colorado River Basin" is issued monthly.



Location of gaging stations in Utah, September 1982.

COLLECTION OF BASIC GROUND-WATER RECORDS AND GROUND-WATER CONDITIONS IN UTAH

Number: UT 00-002-FC

Cooperating Agencies: Utah Division of Water Rights;
Utah Division of Wildlife Resources;
Utah Department of Transportation

Staff: L. R. Herbert, Hydrologic Technician, Project Chief (part time)
M. E. Smith, Hydrologic Technician (part time)
C. B. Burden, Hydrologic Technician (part time)
C. L. Appel, Hydrologist, Editor of annual ground-water report (part time)
C. F. Avery, Hydrologist (part time)
Other District personnel as assigned

Period of Project: Continuing

Objectives: To obtain long-term records on ground-water levels, to determine water-level changes for a yearly or other periods, and to determine witwhdrawals from and status of development of ground-water reservoirs over the State.

Approach: Measure water levels annually or semiannually (normally February-March and September) and operate continuous water-level recorders on selected wells. Visit selected pumped irrigation wells, measure discharge, determine the ratio of water produced to energy consumed, and use the ratio along with energy-consumption data to compute total discharge. Visit selected flowing wells and measure discharge. Obtain estimates of ground water withdrawn by wells for public supply from the Utah Division of Water Rights. Obtain estimates of industrial use of water from wells from users or by rating pumps and using the water produced energy consumed ratio with energy-consumption records. Determine the number and sizes of new wells from well drillers' reports to the Division of Water Rights. Prepare an annual report on ground-water conditions in Utah which includes data, graphs, and maps showing water-level changes, withdrawals from wells, number of wells drilled for defined ground-water basins or areas, and a discussion of yearly ground-water conditions in each basin or area. Store water-level data in computer files and publish selected data in the annual water-resources data report.

Progress: Water levels were measured in about 1,000 wells in February or March, of which about 700 also were measured in September. Thirty-six wells were equipped with continuous water-level recorders. During the irrigation season about 600 pumped irrigation wells were visited, discharge was measured at about one-half of the wells, and water-production energy-consumption ratios were determined. Natural-flow discharge was measured at 50 selected wells. Number and sizes of new wells drilled were calculated. A continuous record of discharge was obtained at one spring. The twentieth in the series of annual reports on ground-water conditions in Utah was completed.

Plans for Next Year: Collecting, recording, and publishing of data on water levels, ground-water withdrawals, and wells drilled will continue. The twenty-first in the series of annual ground-water reports will be submitted in 1984.

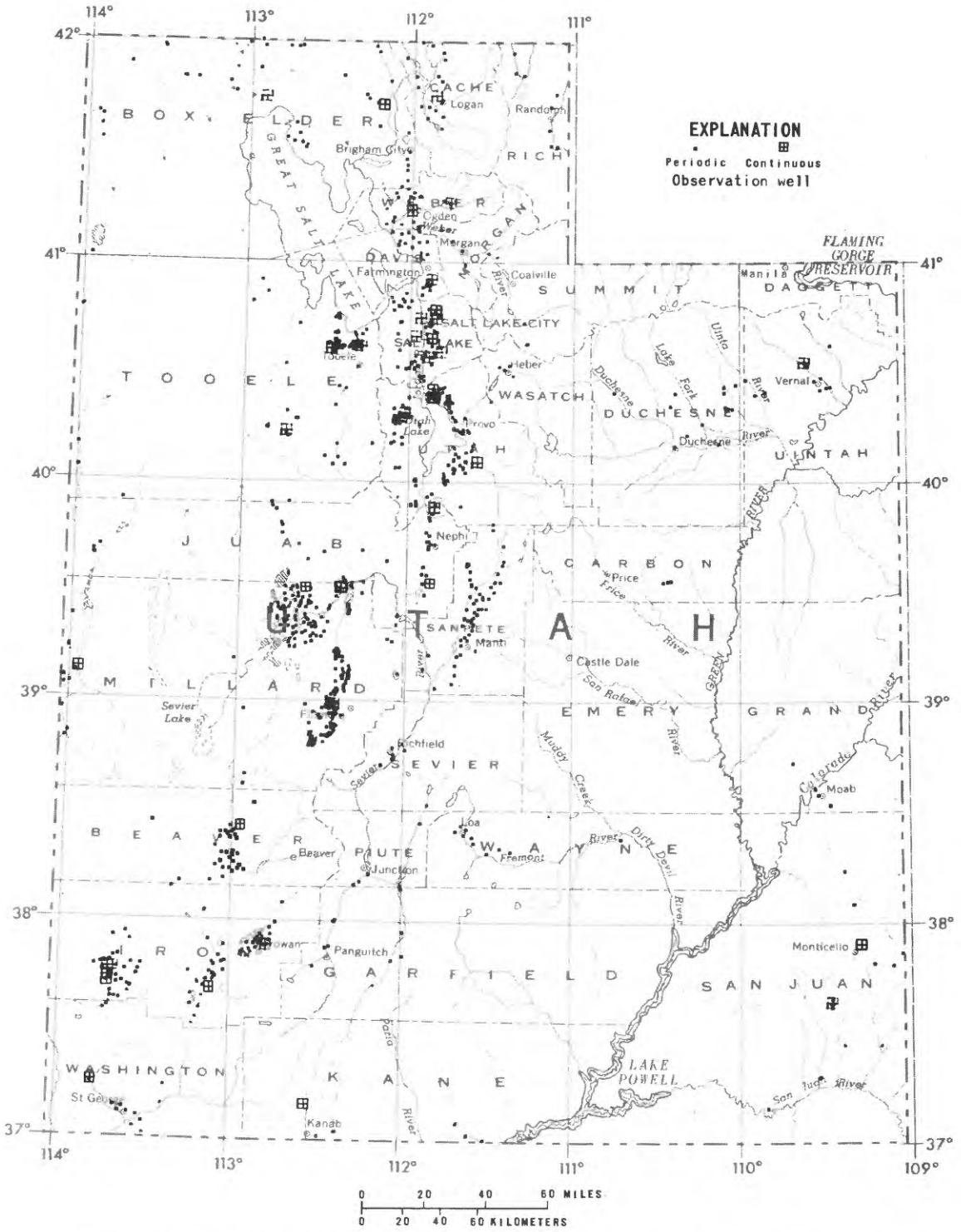
Reports:

Water resources data for Utah, water year 1981: U.S. Geological Survey Water-Data Report UT-81-1.

Water resources data for Utah, water year 1982: U.S. Geological Survey Water-Data Report UT-82-1 (in press).

Water-level-change maps, February or March 1983, for 15 areas in Utah--Issued April 1 as local press releases and distributed to interested individuals.

Appel, Cynthia L., and others, 1983, Ground-water conditions in Utah, spring of 1983: Utah Division of Water Resources Cooperative Investigations Report 23.



Location of observation wells in Utah where ground-water levels were measured.

(no page 12)

COLLECTION OF BASIC RECORDS--WATER QUALITY AND FLUVIAL SEDIMENT

Number: UT 00-003-FOIC; UT 00-004-FOIC

Cooperating Agencies: Utah Division of Water Rights;
Utah Division of Water Resources;
Utah Division of Wildlife Resources;
Utah Geological and Mineral Survey;
U.S. Bureau of Land Management;
U.S. Bureau of Reclamation

Staff: R. W. Cruff, Hydrologist, Project Chief (part time)
Other District personnel as assigned

Period of Project: Continuing

Objectives: To obtain long-term records of the quality of water at selected stream sites, springs, and wells and of sediment at selected stream sites in Utah and to obtain shorter-term records for use by other Federal or State agencies involved in development of water resources or environmental protection.

Approach: Standard methods for the collection and analysis of chemical-quality and fluvial-sediment samples and computer storage and publication of datawere used.

Progress: Data on the quality of surface water were collected at 37 sites in Utah. Daily chemical-quality records were collected at 10 stream sites and periodic chemical-quality records at 27 stream sites. Data on the specific conductance of surface water were obtained at an additional 181 stream-gaging stations in Utah. Daily sediment records were collected at 5 sites and periodic sediment records at 23 sites. Daily water-temperature data were obtained at 10 sites and monthly temperature data at about 180 sites. Data on the quality of ground water were collected at about 375 wells in Utah.

All water-quality records were compiled for inclusion in the annual water-resources data report.

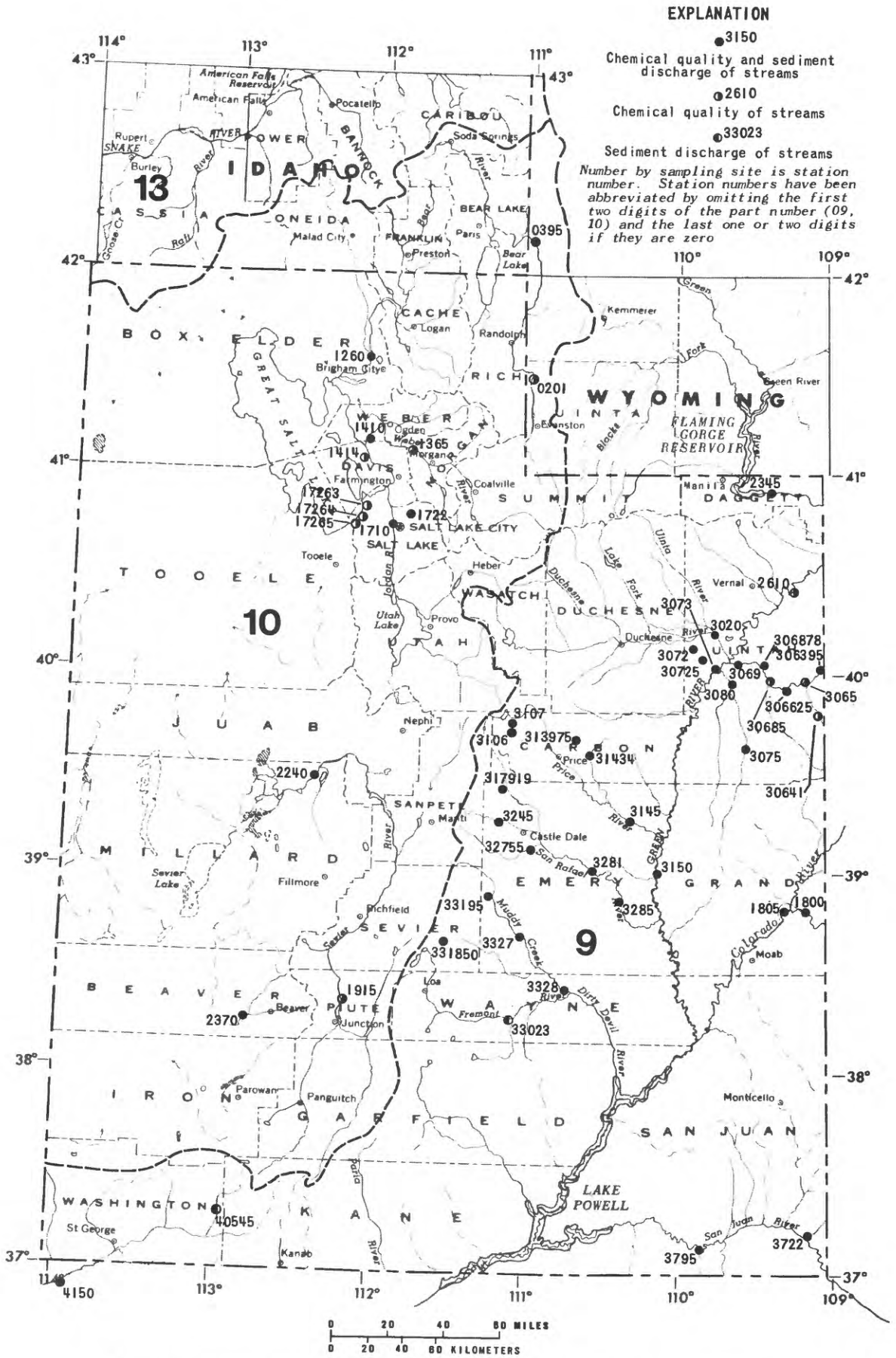
Plans for Next Year: Continue collecting and processing data and preparing records for publication.

Reports:

Water resources data for Utah, water year 1981: U.S. Geological Survey Water-Data Report UT-81-1.

Water resources data for Utah, water year 1982: U.S. Geological Survey Water-Data Report UT-82-1 (in press).

Thompson, Kendall R., 1982, Characteristics of suspended sediment in the San Juan River near Bluff, Utah: U.S. Geological Survey Water-Resources Investigations Report 82-4104.



Location of surface-water quality stations in Utah, September 1982.

STATEWIDE WATER USE

Number: UT 00-007-C

Cooperating Agency: Utah Division of Water Rights

Staff: R. W. Cruff, Hydrologist, Project Chief (part time)
D. Hooper, Engineer, Utah Division of Water Rights
R. Schwarting, Utah Division of Water Rights
Other State personnel as assigned

Period of Project: Began July 1977, continuing

Objective: To obtain Statewide information about withdrawals and return flows of water for various uses, and consumptive use of water in connection with each type of withdrawal.

Approach: Field inventory and measurement of surface-water diversions and some types of ground-water diversions, verification of user measurements and records, and acreage and crop surveys to aid in computing consumptive use by irrigation.

Progress: Mail surveys were made of water use of public suppliers and of major self-supplied and public-supplied industries. Approximately 100 public suppliers and industries were visited to verify the data during the year. The 1980 and 1981 water-use data reports were published and distributed.

Plans for Next Year: Data for public-supply and industrial uses will continue to be collected and verified. The water-use report for 1982 will be prepared. Data will be submitted to the National water-use data base in Reston. Work will begin on determining areas of irrigated acreage and water use by irrigation.

Reports:

Hooper, David, and Schwarting, Richard, 1982, Utah water-use data, public water supplies, 1980: Utah Department of Natural Resources, Utah Water-Use Report 3, 94 p.

Hooper, David, and Schwarting, Richard, 1982, Utah water-use data, public water supplies, 1981: Utah Department of Natural Resources, Utah Water-Use Report 4, 97 p.

CANAL-LOSS STUDIES

Number: UT 74-107-C

Cooperating Agency: Utah Division of Water Rights

Staff: R. W. Cruff, Hydrologist, Project Chief (part time)
L. R. Herbert, Hydrologic Technician (part time)
Other District personnel as assigned

Period of Project: July 1973 to June 1984

Objectives: To determine the amount of water lost by seepage from canals in irrigated areas throughout the State. This information will contribute to current and future cooperative areal investigations as well as to location and measurement of water losses for the users.

Approach: Gaging-station and measuring sites are selected, based on a reconnaissance of the canals. Seepage runs are made three to five times during an irrigation season. The seepage measurements are adjusted for fluctuations in stage of the canal during the course of each seepage run. Each set of canal studies spans a 2-year period.

Progress: Measurements were completed on the Utah and Salt Lake, Utah Lake Distributing, and Provo Reservoir Canals on the west side of Salt Lake (Jordan) Valley. The Draper Irrigation, East Jordan, and Jordan-Salt Lake Canals on the east side of valley were selected for study and a reconnaissance was made of each canal. Gages were installed and measuring sites selected. One set of seepage measurements was made.

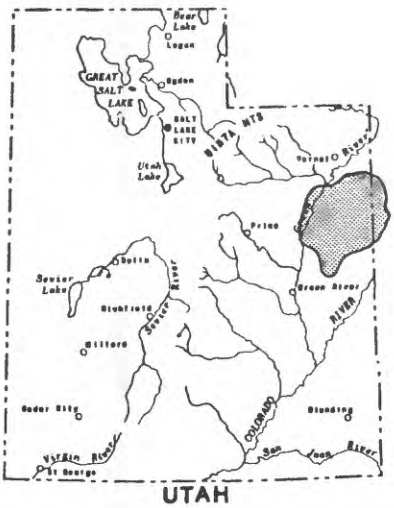
Plans for Next Year: Continue the seepage measurements on the Draper Irrigation, East Jordan, and Jordan-Salt Lake Canals. Analyze the data from all six canals and prepare a report.

Reports: None.

HYDROLOGY OF THE OIL-SHALE AREA, UINTA BASIN

Number: UT 75-113-F

Cooperating Agencies: (for related basic-data collection only)
U.S. Bureau of Land Management;
Utah Department of Natural Resources



Staff: R. W. Cruff, Hydrologist, Project Chief (part time)
G. C. Andersen, Hydrologist (part time)
D. M. Batty, Hydrologic Technician (part time)
Other District personnel as assigned

Period of Project: October 1974 to September 1983

Objective: Monitor surface and ground water in the southeastern part of the Uinta Basin in order to obtain baseline hydrologic data prior to and during oil-shale development.

Approach: The study involves maintaining a data network and publishing the acquired data, and modifying the network where required to obtain the best possible baseline data and determine hydrologic impacts of the developing oil-shale industry.

Progress: Monitoring continued at seven streamflow sites and one well in alluvium. The streamflow monitoring included: Flow--continuous; conductivity and temperature, common ions, nitrate plus nitrite and phosphate--quarterly; sediment--continuous at two sites and miscellaneous at others; and trace metals and biological sampling at selected sites. Water levels and water-quality information are obtained monthly for the well.

Plans for Next Year: Continue monitoring the seven streamflow sites and the one well until September 30, 1983.

Reports:

Holmes, W. F., and Kimball, B. A. (in press), Ground water in the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Water-Supply Paper.

Lindskov, K. L., and Kimball, B. A. (in press), Quantity and quality of streamflow in the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Water-Supply 2224.

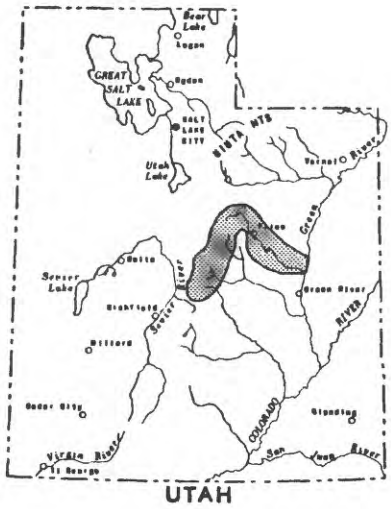
Lindskov, K. L., and Kimball, B. A. (in press), Water resources and potential hydrologic effects of oil-shale development in the southeastern Uinta Basin, Utah and Colorado: U.S. Geological Survey Professional Paper.

Water resources data for Utah, water year 1981: U.S. Geological Survey Water-Data Report UT-81-1.

Water resources data for Utah, water year 1982: U.S. Geological Survey Water-Data Report UT-82-1 (in press).

WATER-RESOURCES MONITORING - CENTRAL UTAH COAL REGION

Number: UT 77-129-F



Staff: R. W. Cruff, Hydrologist, Project Chief (part time)
Other District personnel as assigned

Period of Project: Began August 1978, continuing

Objectives: To determine the characteristics of the regional surface-water system and to detect and document changes in water quantity and quality that may be associated with coal mining.

Approach: Evaluate the existing basic-data collection program for its regional surveillance value and add additional data sites or upgrade existing sites as needed. Evaluate the data as they are collected so that changes due to coal mining may be detected and documented.

Progress: The operation of seven gaging stations continued. Data on flow, water quality, and suspended sediment were collected during the 1982 and 1983 water years. All data were included in the annual water-resources data report.

Plans for Next Year: After September 30, 1983, two stations will be operated.

Reports:

Water resources data for Utah, water year 1981: U.S. Geological Survey Water-Data Report UT-81-1.

Water resources data for Utah, water year 1982: U.S. Geological Survey Water-Data Report UT-82-1 (in press).

GROUND-WATER CONDITIONS IN NORTHERN UTAH VALLEY, WITH PREDICTIONS OF THE EFFECTS OF FUTURE WITHDRAWALS USING A DIGITAL-COMPUTER MODEL

Number: UT 80-143-C

Cooperating Agency: Utah Division of Water Rights

Staff: D. W. Clark, Hydrologist, Project Chief
C. L. Appel, Hydrologist
C. G. Oviatt, Hydrologic Field Assistant (part time)

Period of Project: January 1980 to June 1983

Objectives: On the basis of data obtained since 1963 and using a three-dimensional digital-computer model, determine changes in ground-water levels and quality, and update and revise concepts of ground-water occurrence, particularly: (1) Location and amount of recharge from seepage from streams and irrigation, subsurface flow from consolidated rocks, and precipitation; and location and amount of discharge from springs and wells, evapotranspiration, diffuse seepage into Utah Lake, seepage to drains, streams, and sewers, and subsurface outflow into Jordan Valley; (2) predict effects of continued present or increased future pumping on water levels in the four defined aquifers, and estimate effects on the chemical quality of ground water; and (3) estimate, if possible, the effects of potential importation of surface water by the Central Utah Project on the ground-water system.

Approach: All applicable historical data will be compiled and put in computer storage. A field inventory of large wells drilled since 1963 will be completed and an observation-well network will be established, including those wells used in the Statewide observation program, in order to improve definition of the potentiometric surfaces for all four aquifers. Quantification of discharge and recharge will be made from field measurements, pumpage records, and various methods of estimation. Water from selected wells, springs, and surface sources will be sampled for chemical analysis. Aquifer tests will be made to determine hydraulic coefficients and their possible vertical and horizontal variations. Geophysical logs will be made on all available and suitable wells. A water budget will be prepared. A three-dimensional digital-computer model will be designed and calibrated and will be the principal tool used in analyzing hydraulic properties of the ground-water

reservoir, relationships of individual aquifers with each other, effects of changes in ground-water withdrawals on water levels, and as a means of qualitatively estimating changes in chemical quality of the water.

Progress: Completed basic-data report and a draft of the final interpretive report. The digital-model report is in preparation. Editing of computer files is being completed.

Plans for Next Year: None.

Reports:

Appel, Cynthia L., Clark, David W., and Fairbanks, Paul E., 1982, Selected hydrologic data for northern Utah Valley, Utah, 1935-82: U.S. Geological Survey Open-File Report 82-1023 (duplicated as Utah Hydrologic-Data Report 39).

Clark, David W. (in preparation), A digital-computer model of the principal ground-water reservoir in northern Utah Valley, Utah: U.S. Geological Survey Open-File Report.

Clark, David W., and Appel, Cynthia L. (in review), Ground-water resources of northern Utah Valley, Utah: Utah Department of Natural Resources Technical Publication.

Clark, David W., and Zohdy, A. A. R. (in preparation), Schlumberger soundings and total field measurements in northern Utah Valley, Utah: U.S. Geological Survey Open-File Report.

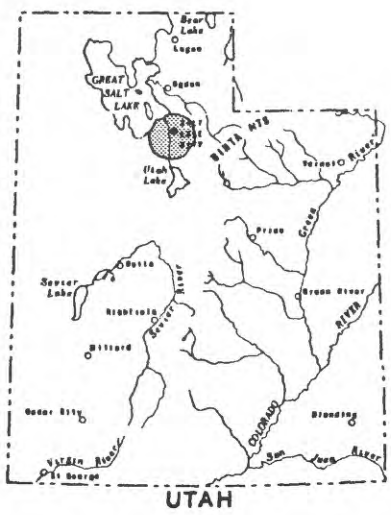
JORDAN RIVER QUALITY

Number: UT 80-144-C

Cooperating Agency: Salt Lake County Division of Flood Control and Water Quality

Staff: D. W. Stephens, Hydrologist, Project Chief (part time)
K. R. Thompson, Hydrologist (part time)
J. F. Weigel, Hydrologist (part time)

Period of Project: December 1979 to September 1983



Objectives: To provide Jordan River basin planners and managers with sound technical information and methods, based on definition of cause-effect relationships, to use in evaluating impacts of planning alternatives on the water quality of the Jordan River.

Approach: Determine, in conjunction with concerned city, county, State, and Federal agencies, water-quality problems of the Jordan River that should be evaluated during the study. Determine the river hydrologic characteristics. Select applicable evaluation methods to assess water-quality problems. Review available data and consider the data that will be provided by the Urban-Runoff Study, then plan necessary field and laboratory programs to collect additional data at the intensity appropriate to adequately assess the problems. Analyze the data and formulate the evaluation method to provide predictive capability for each problem. Forecast the impacts of planning alternatives on each problem.

Progress: Monthly sampling was done at five sites from the Jordan Narrows to 500 North in Salt Lake County through October 1982. One time-of-travel and oxygen-reaeration study was completed for the reaches 6400 South Street to 1700 South and 1700 South to 500 North in September-October 1982. Sampling of water and sediment for metals and selected pesticides was completed during August 1982. Drafts of the four substudy reports (on turbidity, toxic substances, sanitary quality, and dissolved oxygen) have been completed.

Plans for Next Year: None.

Reports:

Stephens, Doyle W. (in review), Characterization of the dissolved oxygen regime of the Jordan River, Utah: U.S. Geological Survey Water-Resources Investigations Report.

Stephens, Doyle W. (in preparation), Water-resources investigations on the Jordan River, Utah, 1980-82: U.S. Geological Survey Water-Resources Investigations Report.

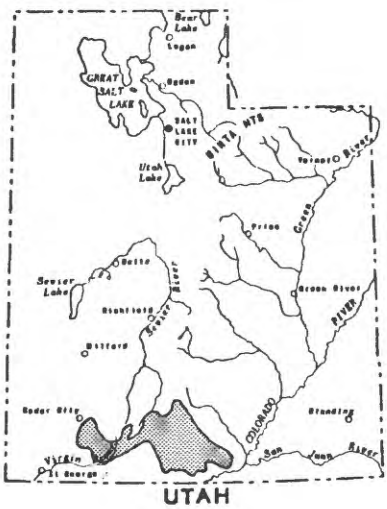
Thompson, Kendall R. (in review), Reconnaissance of toxic substances in the Jordan River, Utah: U.S. Geological Survey Water-Resources Investigations report.

Thompson, Kendall R. (in review), Sanitary quality of the Jordan River, Utah: U.S. Geological Survey Water-Resources Investigations Report.

Weigel, Jay F. (in review), An assessment of turbidity and suspended sediment in Jordan River, Utah: U.S. Geological Survey Water-Resources Investigations Report.

HYDROLOGY OF THE KAIPAROWITS, ALTON, AND KOLOB COAL FIELDS, SOUTHERN UTAH

Number: UT 81-146-I



Cooperating Agency: U.S. Bureau of Land Management

Staff: G. G. Plantz, Hydrologic Technician, Project Chief
Don Price, Hydrologist (part time)
L. S. Conroy, Hydrologic Technician (part time)
Other District personnel as assigned

Period of Project: October 1980 to September 1983

Objectives: The main objective of the study is to define the hydrologic system, namely the seasonal variations in surface-water quantity and quality and the extent, characteristics, and recharge-discharge relationships of aquifers above, within, and directly below coal-bearing rocks. The second objective is to predict qualitatively, where possible, the effects of coal mining on the water resources.

Approach: Standard techniques of hydrologic investigations will be used, including: a thorough literature and file search for existing data, flow measurements and sampling of surface water to define seasonal variations, an extensive well and spring inventory, inventory of present mining and water production in the area, observations of water-level fluctuations in wells, aquifer tests to determine aquifer coefficients, base-flow measurements on streams to determine gaining and losing reaches, and perhaps radioisotope or fluorocarbon dating of ground water.

Progress: Spring inventory and base-flow measurement and sampling of streams was completed. A basic-data report and a draft of the interpretive map report were completed.

Plans for Next Year: None.

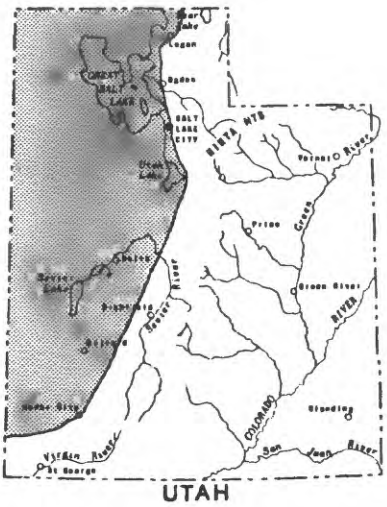
Reports:

Plantz, Gerald G. (in press), Selected hydrologic data, Kolob-Alton-Kaiparowits coal-fields area, south-central Utah: U.S. Geological Survey Open-File Report (Hydrologic-Data Report).

Plantz, Gerald G. (in review), Hydrologic reconnaissance of the Kolob-Alton-Kaiparowits coal-fields area, south-central Utah: U.S. Geological Survey Hydrologic Investigations Atlas.

GREAT BASIN REGIONAL AQUIFER SYSTEMS ANALYSIS

Number: UT 81-147-F



Staff: J. L. Mason, Hydrologist, Project Chief
J. S. Gates, Hydrologist (part time)
J. W. Atwood, Hydrologic Field Assistant (part time)

Period of Project: October 1980 to September 1984

Objectives: This study is one in a series of national studies of regional aquifer systems that together will cover much of the United States. The Great Basin study is headquartered in Carson City, Nevada, with part of the work located in the Utah District office. The overall objective is to assemble hydrologic information and create predictive capabilities necessary for effective management. The Great Basin is made up of individual basins that have alluvial-fill aquifers of similar origin, but these aquifers are either not connected hydrologically or have limited connection, sometimes by way of consolidated-rock aquifers underlying the uplands that separate basins. Specific objectives are to establish common principles governing occurrence, recharge, movement, discharge, and quality of water in the aquifers of the Great Basin, and to construct digital-computer ground-water models of representative basins or groups of hydrologically connected basins. The models will be used to help understand the natural (pre-development) flow and geochemical systems and to predict effects of future development and differences in the effects of various management strategies.

Approach: Computer simulation will be the main tool used to analyze the existing hydrogeologic regime and to provide the capabilities of predicting the effects of future development. The simulations will incorporate hydraulic effects, and will be initiated early in the study to help determine the overall nature of the flow system, to identify sensitive parameters and data needs, and to determine what segments of the system, if any, can be treated independently. Assembling available hydrogeologic data on the Great Basin is an important part of the work, and collection of new data needed for successful simulation may require fieldwork. The present distribution of water quality throughout the area will be described using available and project-collected data. These data will be used to interpret the water-quality distribution in terms of the original flow pattern and geochemical processes, and an effort will be made to predict water-quality changes in response to future development, waste disposal, or artificial recharge.

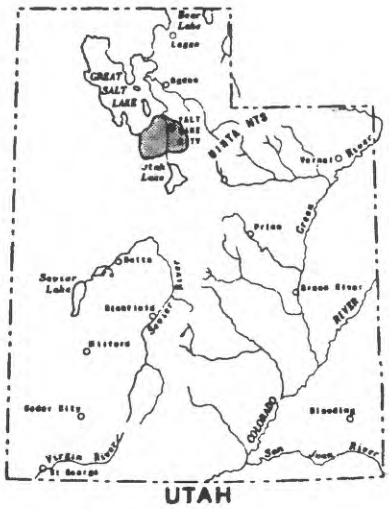
Progress: Construction of the digital-computer model of the Milford area continued. Water levels were measured in the Milford area in the spring of 1983 and will be used in the digital model. The pumpage inventory of the Milford area that began during the 1981 irrigation season was continued in 1982. A resistivity survey consisting of about 100 electrical soundings was made in Tule Valley. A seismic refraction profile also was made across Tule Valley. The set of gravity data collected in 1981 was interpreted and presented in map form. We have taken over, from the U.S. Air Force, 11 production and associated observation wells and 28 shallow plastic-cased wells drilled under the MX-missile siting program for our statewide observation-well network. Water levels in two stock wells and several MX test holes indicated that ground water moves from the Sevier Lake playa toward Tule and Wah Wah Valleys to the northwest and southwest. Six shallow observation wells (10-20 foot) were augered and 12 deeper wells (100 and 200 foot) were drilled around the playa to obtain additional water-level data. In addition, three 200-foot test holes were drilled in the north end of the Milford area to better define the potentiometric surface for the digital model.

Plans for Next Year: Complete seismic-refraction survey in Tule Valley. Run gamma-ray logs on all MX test holes taken over for the statewide observation-well network and place protective steel casing over the plastic casing. Jet water from all test holes around Sevier Lake to insure wells are open and water levels are representative and to obtain water samples if possible. Obtain data from a series of geothermal test holes drilled by a private company in Tule Valley. Interpret resistivity, seismic, and gravity data in Tule Valley and prepare a report which infers thickness and lithology of basin fill and ground-water quality in Tule Valley. Use these data to improve the preliminary digital model of Tule Valley. Complete digital model of Milford area and prepare a report. Prepare a brief report on test drilling and ground-water movement in the Sevier Lake area. Complete digital model of the Fish Springs flow system (work to be done in the Nevada District).

Reports: None.

GROUND-WATER CONDITIONS IN SALT LAKE (JORDAN) VALLEY, WITH ANALYSIS BY FLOW AND SOLUTE-TRANSPORT MODELS

Number: UT 81-150-C



Cooperating Agencies: Utah Division of Water Rights; local water-management agencies and municipalities

Staff: K. M. Waddell, Hydrologist, Project Chief
R. L. Seiler, Hydrologist
S. M. Theobald, Hydrologic Field Assistant (part time)
B. O. Elwell, Hydrologic Field Assistant (part time)
T. R. Bodell, Hydrologic Field Assistant (part time)

Period of Project: July 1981 to June 1985

Objectives: (1) To determine the current state of the Salt Lake (Jordan) Valley's ground-water system in terms of water levels, recharge, movement, discharge, water quality, and volumes of water of various qualities in storage; (2) to construct digital-computer models of the system that will be able to simulate ground-water flow and transport of dissolved solids; and (3) to determine, at least in a preliminary sense, the potential for land subsidence related to water-level declines.

Approach: (1) Update files of data on water levels, withdrawals and natural discharge, and water quality; (2) supplement available information with additional data collected on water levels and quality, recharge and discharge, aquifer and confining-bed parameters, and water in storage; (3) construct a three-dimensional digital model of the system to simulate ground-water flow and several cross-section solute-transport models to simulate movement of dissolved solids. Use the models to simulate changes in water levels and chemical quality resulting from potential ground-water development; and (4) publish results as a Utah Department of Natural Resources Technical Publication.

Progress: Drilled 55 shallow wells during the summer of 1982 and sampled and monitored water levels in these wells since the fall of 1982. Completed a draft of a report on shallow ground water. Participated in an aquifer test in the Vitro tailings area to determine vertical hydraulic conductivities of confining layers. Collected sufficient water-quality data to define plume of water containing a high concentration of dissolved solids associated with leaching of the Vitro tailings.

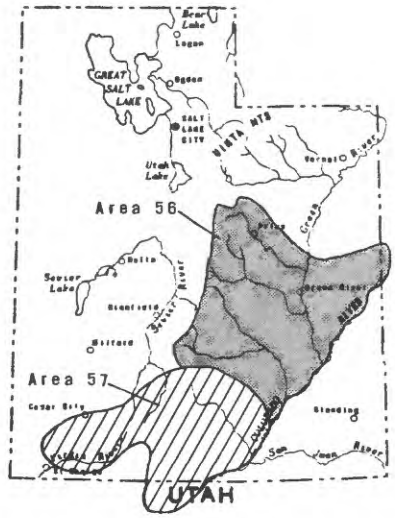
Plans for Next Year: Complete construction of a three-dimensional digital-flow model and prepare a report on the model. Prepare a proposal for a more detailed water-quality investigation, including study of selected hazardous waste areas (e.g. Vitro tailings), and age-dating of ground water for the entire valley.

Reports:

Seiler, R. L., and Waddell, K. M. (in review), Reconnaissance investigation of the shallow unconfined aquifer in Salt Lake (Jordan) Valley, Utah: U.S. Geological Survey Water-Resources Investigations Report.

HYDROLOGY OF AREAS 56 AND 57, ROCKY MOUNTAIN
COAL PROVINCE, UTAH, COLORADO, AND ARIZONA

Number: UT 81-151-F



Staff: G. C. Lines, Hydrologist, Project Chief (part time)
Don Price, Hydrologist, (part time)

Period of Project: February 1981 to September 1983

Objectives: To describe the hydrology of Area 56 (the Wasatch Plateau, Book Cliffs, Emery, and Henry Mountains coal fields) and Area 57 (the Kaiparowits Plateau, Alton, and Kolob coal fields) in clear and concise reports that can be used by both the coal-mining industry and regulatory government agencies.

Approach: (1) A topic outline will be prepared for each report area. Topics will be assigned to District hydrologists for data analysis and writing based on discipline specialties. (2) For each topic, all available hydrologic information will be assembled, summarized, and interpreted as needed; no new data will be collected. (3) Each topic will be discussed in a text not to exceed one page, accompanied by maps, graphs, and tables as needed (STOP format). The report for Area 56 will be submitted for approval by September 30, 1982; the report for Area 57 will be submitted by September 30, 1983.

Progress: The report for Area 56 has been completed; the report for Area 57 is about 80 percent complete.

Plans for Next Year: None.

Reports:

Lines, G. C., and others (in press), Hydrology of Area 56, Northern Great Plains and Rocky Mountain Coal Provinces, Utah and Colorado: U.S. Geological Survey Water-Resources Investigations Report 83-38.

Price, Don, and others (in preparation), Hydrology of Area 57, Northern Great Plains and Rocky Mountain Coal Provinces, Utah and Colorado: U.S. Geological Survey Water-Resources Investigations Report.

GROUND-WATER CONDITIONS IN THE TRAIL MOUNTAIN
COAL-RESOURCE AREA, CENTRAL UTAH

Number: UT 81-152-I

Cooperating Agency: U.S. Bureau of Land Management

Staff: G. C. Lines, Hydrologist, Project Chief (part time)
Other District personnel as assigned

Period of Project: March 1981 to September 1983

Objectives: (1) Determine aquifer characteristics, recharge-discharge relationships, hydraulic connection between aquifers and with streams, and chemical quality of water in water-bearing zones within, above, and immediately below coal in the Blackhawk Formation. (2) Predict, quantitatively where possible, the effects of underground coal mining on the ground-water system, including ground-water discharge to streams.

Approach: (1) Five coal-exploration holes were completed as test wells; most wells tapped multiple water-bearing zones and were tested with expandable packers in order to define differences in aquifer characteristics, water quality, and head with depth in the ground-water system. (2) An extensive spring inventory was completed. (3) Base flow along streams was measured. (4) Hydraulic conductivity and porosity of representative core samples from aquifers and confining beds were determined in the laboratory. (5) Surface and ground water were sampled for chemical analysis. (6) A digital-computer model was used to make semiquantitative predictions of effects of underground mining on the system.

Progress: Data collection and interpretation are completed. A draft of the final report has been completed.

Plans for Next Year: None.

Reports:

Lines, G. C. (in preparation), The ground-water system and possible effects of underground mining in the Trail Mountain coal-resource area, central Utah: U.S. Geological Survey Water-Supply Paper.

REGIONAL AQUIFER SYSTEMS ANALYSIS-MESOZOIC SANDSTONE AQUIFERS IN THE UPPER COLORADO RIVER BASIN

Number: UT 81-154-F

Staff: J. W. Hood, Hydrologist, Project Chief
G. W. Freethey, Hydrologist
B. E. Thomas, Hydrologist
E. J. Weiss, Hydrologist
(Colorado District, part time)
B. A. Kimball, Hydrologist
(Colorado District, part time)
Vacancy, Hydrologic Technician
D. E. Wilberg, Hydrologic Field Assistant (part time)
J. W. Atwood, Hydrologic Field Assistant (part time)

Period of Project: October 1981 to September 1985

Objectives: This study is one of the series of national studies of regional aquifer systems that together will cover much of the United States. In the Upper Colorado River Basin, aquifers that are truly regional include the complex of thick sandstones of Jurassic and Triassic age and carbonate and sandstone aquifers of Mississippian and Permian age. This study will target the thick sandstones of the Mesozoic System and locally related aquifers of lesser extent. The study is intended to (1) provide a basin-wide data base; (2) define and quantify recharge, occurrence, movement, discharge, and quality of ground water; (3) model the system(s) in order (a) to understand the natural (pre-development) flow and geochemical system(s) and (b) to evaluate or predict the effects of future development and differences in these effects due to various management strategies.

Approach: Computer simulation will be the main tool used to analyze the hydrogeologic regimen of the Mesozoic aquifers system. The results of prior local, areal, and regional studies will be collected and combined, and basic data from those studies will be updated. Concurrently, a preliminary regional flow model(s) will be constructed in order to test provisional hypotheses and show areas where additional data are needed. Following will be a period of data collection, during which the model(s) will be updated as field data are obtained. Final analyses will incorporate consideration of the effects of development on the ground-water flow regimen and storage, on surface-water flow, and on possible water-quality changes that would accompany development. Results of the study will appear as a planning document, data report(s), hydrologic atlases, model documentation, and a final interpretive report.

Progress: Progress was again slowed by constraints on personnel. The last hydrologist arrived in February and one hydrologic field assistant was added on a part-time basis. Base maps were obtained; automated computer plotting was put on line to provide rapid, uniform plotting of maps and cross sections. Ground-water basic data conversion and entry was not completed but is progressing satisfactorily. In addition, geologic and drill-stem test data were obtained from petroleum wells, and outcrop permeability data were obtained from the Minerals Management Service. A direct-entry computer program for ground-water data was nearly completed and under test; this program should speed entry of basic data. Initial ground-water sampling was done and the second round of sampling was begun in late spring 1983. A contract was let for laboratory analyses of rock samples; initial rock samples were collected in June 1983. One subregional digital model was completed, a second was near completion, and a third was being designed in June. The report on the first model was due June 30, 1983; the report as the second was started. The composite regional planning report is in review in Denver. Search of the literature continued.

Plans for Next Year: Conversion and computer storage of existing data will continue. Preliminary modeling of one or two additional subregions will be done as a guide to the construction of the principal ground-water system model(s). The initial version(s) of regional model(s) will be assembled. Fieldwork, including water-quality studies and collection of aquifer samples for laboratory analysis will continue. The series of preliminary hydrologic atlases will be completed.

Reports:

Taylor, O. James, Hood, J. W., and Zimmerman, Everett A. (in review), Plan of study for the regional aquifer systems analysis of the Upper Colorado River Basin in Colorado, Utah, and Wyoming: U.S. Geological Survey Water-Resources Investigations Report.

Thomas, B. E. (in preparation), Digital-computer model of the interaction of the Navajo Sandstone aquifer and Lake Powell near Wahweap Bay, Utah and Arizona: U.S. Geological Survey Water-Resources Investigations Report.

Taylor, O. James, and others (in preparation), General geohydrology of the Upper Colorado River Basin of Arizona, Colorado, Utah, and Wyoming: U.S. Geological Survey Hydrologic Investigations Atlas.

RECONNAISSANCE OF THE CHEMICAL QUALITY OF
SURFACE WATER OF THE VIRGIN RIVER BASIN

Number: UT 81-155-C

Cooperating Agency: Utah Division of Water Rights

Staff: K. R. Thompson, Hydrologist, Project Chief (part time)
G. W. Sandberg, Hydrologist (part time)
L. G. Sultz, Hydrologic Technician (part time)
Other District personnel as assigned

Period of Project: July 1981 to June 1983

Objectives: The basic objective is to define the general chemical characteristics of surface water in the 5,090-square-mile Virgin River basin upstream from Littlefield, Arizona. A secondary objective is to define specific problem areas or stream reaches for future intensive investigation.

Approach: Available data will be inventoried and compiled. These data, along with information on geology, irrigation, soils, vegetation, mineral development, and runoff will be used as the basis for design of a network of about 100 water-quality observation sites. From these 100 sites about 35 will be designated as major sampling sites and sampled more frequently. Data on the general chemistry of surface water will be obtained seasonally during the period July 1981 to September 1982. Trace-element, pesticide, and bacteriologic data will be collected at selected sites.

Progress: All data collection has been completed and the final report has been written. Water quality in the upper Virgin River basin is good with a principal water type of calcium carbonate. Dissolved solids increase in a downstream direction due principally to geology, irrigation-return flow and inflow from a saline thermal spring located at LaVerkin, Utah. Sodium, sulfate, and chloride ions also increase in a downstream direction in the Virgin River. Data collection has been completed and report has been written.

Plans for Next Year: None.

Reports:

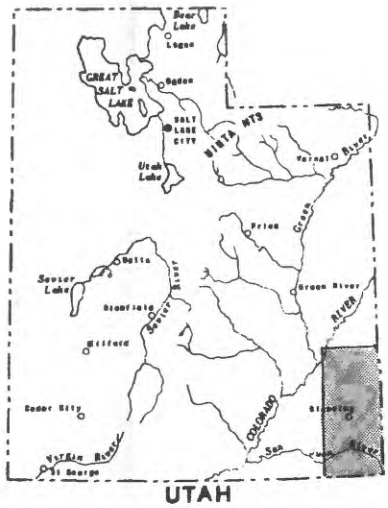
Sandberg, G. W., and Sultz, L. G. (in review), Water-quality reconnaissance of the Virgin River basin, Utah, Nevada, and Arizona: Utah Department of Natural Resources Technical Publication.

WATER IN BEDROCK IN EASTERN SAN JUAN COUNTY, WITH SPECIAL EMPHASIS ON THE NAVAJO SANDSTONE AND RELATED AQUIFERS

Number: UT 81-156-C

Cooperating Agency: Utah Division of Water Rights

Staff: C. F. Avery, Hydrologist, Project Chief
Other District personnel as assigned



Period of Project: July 1981 to June 1984

Objectives: To determine: (1) occurrence of ground water and its quality in the area, (2) potential yields of water from wells in the major aquifers, (3) whether those yields can be sustained for the production of fresh or otherwise usable water, and (4) what effect sustained, large, well withdrawals will have on water levels and water in the Colorado River.

Approach: Define the general hydrologic system using methods of general areal studies, and locate all available ground-water data and utilize results of all previous studies. Integrate field operations with the Upper Colorado River Basin RASA (UT-154) where possible. Concentrate field-data collection on determining recharge and discharge rates, aquifer coefficients, the potentiometric surface, and ground-water quality. Preliminary digital-computer modeling of the aquifer will be used to guide data acquisition and refined modeling will help assess effects of withdrawals.

Progress: Well inventory is nearly complete. Water levels, well discharge, and field water quality were measured, when possible. Forty-eight water samples have been collected for common ion determination; 11 samples were analyzed for trace elements. Seepage runs were run on Indian Creek and South Cottonwood Creek. Two aquifer tests were conducted. An abandoned oil test was perforated so that a water level and sample could be obtained but the water level is too deep to be measured periodically as an observation well.

Plans for Next Year: Fieldwork will terminate in June or July 1983 with collection of miscellaneous ground-water data and drilling a 1,500- to 2,000-foot test hole. A water level, water sample, and possibly some aquifer-coefficient data will be obtained from the test hole. The final report will be prepared.

Reports: None.

HYDROLOGY OF 11 TAR-SAND AREAS IN EASTERN UTAH

Number: UT 82-157-I

Cooperating Agency: U.S. Bureau of Land Management

Staff: K. L. Lindskov, Hydrologist, Project Chief
H. F. McCormack, Hydrologist
G. E. Pyper, Hydrologic Technician (part time)
W. Dorman-Ligh, Hydrologic Field Assistant (part time)
Other District personnel as assigned

Period of Project: July 1982 to June 1984

Objectives: Describe the existing hydrologic system in 11 Special Tar-Sand Areas, and prepare hydrologic maps for the Argyle Canyon--Willow Creek and Sunnyside Special Tar-Sand Areas. Where possible, predict hydrologic impacts of tar-sand production.

Approach: Describe the hydrologic system by utilizing available hydrologic information, mainly from oil-shale studies and all other previous studies in and near the 11 areas. Prepare an interim report for submission to BLM by April 1, 1983, which describes the hydrology, primarily using existing data and interpretations available from previous studies. During the summer of 1983, update existing well and spring inventories and collect additional samples, where needed, to further refine definition of the chemical quality of surface and ground water in the Argyle Canyon--Willow Creek and Sunnyside areas. Prepare a final report, a series of five hydrologic maps, for the Argyle Canyon--Willow Creek and Sunnyside areas. Maps for normal annual precipitation, average discharge of streams, sediment yield, quality of ground water, and quality of streamflow will be included.

Progress: The interim report was furnished to BLM in April 1983. Planning for fieldwork and preparation of hydrologic maps was begun.

Plans for Next Year: Update well and spring inventories in the Argyle Canyon--Willow Creek and Sunnyside areas, and where necessary collect samples to further refine chemical quality of surface and ground water. Complete final report (maps).

Reports:

Lindskov, K. L., and others (in review), Hydrologic impacts of a tar-sand industry in 11 Special Tar-Sand Areas in eastern Utah: U.S. Geological Survey Water-Resources Investigations Report.

HYDROLOGY OF THE PARK CITY AREA

Number: UT 82-158-C

Cooperating Agency: Utah Division of Water Rights

Staff: W. F. Holmes, Hydrologist, Project Chief
M. Enright, Hydrologic Technician
K. R. Thompson, Hydrologist (part time)
Other District personnel as assigned

Period of Project: July 1982 to June 1985

Objectives: Define the surface-water and ground-water hdyrology and the relationship between them. Characterize consolidated and unconsolidated rock aquifers. Determine the effects of ground-water withdrawals from both aquifers and the effects of surface-water diversions and construction of a large reservoir on the system. Determine ground-water quality and the effects of continued development on water quality.

Approach: Define surface-water hydrology using existing records, additional monitoring sites, and two new gages, to estimate average surface-water inflow and outflow in the study area and their quality. Estimate evapotranspiration by mapping phreatophytes, water surfaces, and wetland. Inventory all wells, drain tunnels, mines, and springs. Conduct seepage runs along major canals and streams to determine recharge or discharge. Determine direction of ground-water movement by measuring water levels in existing wells. Determine geologic characteristics such as strike, dip, fracturing or jointing, that may control ground-water occurrence and its flow direction. Determine hydraulic characteristics of aquifers by testing. Collect samples from wells and springs, surface water, and mines for chemical analysis; and determine water quality for all parts of the system. Characterize ground-water quality in both aquifers, and use data to infer source and movement of ground water. If feasible, construct a ground-water model to test the conceptualized ground-water system. If funds are available, drill test holes in both unconsolidated and consolidated rocks.

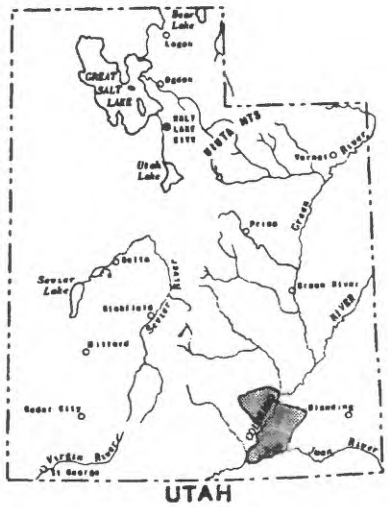
Progress: Gaging-station and partial-record sites have been constructed and operated for about 1 year. Some water-quality samples have been collected. Water levels have been obtained from about 15 wells. Some data has been placed in computer storage.

Plans for Next Year: Complete inventory of wells and springs, continue operation of gaging stations and partial-record sites, collect additional water-quality samples, and measure water levels in existing wells. Conduct seepage runs on major tributaries. Complete computer storage of ground-water data. Participate in drilling and testing of large-diameter production well.

Reports: None.

BEDROCK AQUIFERS IN THE NORTHERN LAKE POWELL AREA, UTAH, WITH EMPHASIS ON THE NAVAJO SANDSTONE

Number: UT 82-159-C



Cooperating Agency: Utah Division of Water Rights

Staff: P. J. Blanchard, Hydrologist, Project Chief
Other District personnel as assigned

Period of Project: July 1982 to June 1984

Objectives: Determine the occurrence, recharge, movement, discharge, and quality of water in bedrock aquifers, with emphasis on the Navajo Sandstone. Additionally, determine hydraulic characteristics of the Navajo Sandstone and other significant aquifers and the relationships between surface water and ground water.

Approach: Existing data from the files of the U.S. Geological Survey, Utah Division of Water Rights, other government agencies, and private sources (including petroleum companies) will be integrated with data collected in the field. Field-data collection will include well and spring inventories, borehole geophysical logging, seepage studies on selected stream reaches, shallow-core sampling and laboratory analyses of cores for hydraulic properties, and both ground- and surface-water samples for chemical analysis. Abandoned oil-tests will be converted to observation wells, if feasible. Short-term aquifer tests will be performed where possible. The assembled data will be used to determine a hydrologic budget, potentiometric surface, and structural surface of the Navajo Sandstone; and the occurrence, amount, movement, and quality of water in the Navajo. If feasible, a simplified digital-computer model of the ground-water system will be prepared, and an attempt will be made to determine the relations between Lake Powell and the ground-water system.

Progress: A planning document has been completed. Searches of the files of the Utah Division of Water Rights, of the oil and gas operations of the Bureau of Land Management, and of the computer files of the U.S. Geological Survey have been made for data. Well and spring inventories are in progress, and equipment has been assembled for shallow-core sampling. Sites for single-well aquifer tests have been investigated and selected.

Plans for Next Year: Complete field data collection. Interpret data and complete interpretive report.

Reports: None.

SEDIMENT AND TRACE-METALS TRANSPORT IN STREAMS IN THE PLEASANT VALLEY COAL-RESOURCE AREA, CENTRAL UTAH, AND THEIR EFFECTS ON SCOFIELD RESERVOIR

Number: UT 83-160-I

Cooperating Agency: U.S. Bureau of Land Management

Staff: D. W. Stephens, Hydrologist, Project Chief (part time)
J. F. Weigel, Hydrologist (part time)
Other District personnel as assigned

Period of Project: October 1982 to September 1985

Objectives: Determine sediment and common trace-metal loads in selected streams in the Pleasant Valley coal-resource area and determine if coal-mining and coal-washing operations have increased loads. Determine loads entering Scofield Reservoir and their effects on reservoir geochemistry.

Approach: Monitor and compute sediment loads at existing gaging stations on (1) Pleasant Valley Creek near its point of inflow to Scofield Reservoir and (2) in Eccles Canyon (a tributary to Pleasant Valley Creek) downstream from an extensive area clearcut for mining and associated roads and downstream from a coal-washing plant. Also construct and maintain a gaging station and sediment-monitoring site on one other tributary to Pleasant Valley Creek that is unaffected by mining; or on Fish Creek, which has experienced no mining, and is the major inflow source for Scofield Reservoir. Analyze for the types and weights of metal oxides attached to selected sediment samples in order to compute trace-metal loads. Collect a set of reservoir-sediment core samples and analyze for trace-metal content; and collect soil samples in undisturbed areas and areas disturbed by mining and analyze for available ions. Analytical work will be performed in the U.S. Geological Survey Central Laboratory. Predict effects of present and future sediment and trace-metal transport into Scofield Reservoir on reservoir geochemistry. Prepare interpretive report by October 1985.

Progress: A gaging station was constructed on Boardinghouse Creek to provide continuous-stage records, and water-quality samples were collected from Boardinghouse, Eccles, and Mud (Pleasant Valley) Creeks. Stream-bottom sediments also were collected at all sites. Preparations were made to collect storm-runoff samples using automatic samplers at each site during the spring of 1983.

Plans for Next Year: Collect cores of reservoir-bottom sediment and submit cores for analysis. Continue collection of water-quality and sediment data on the reservoir and inflowing streams.

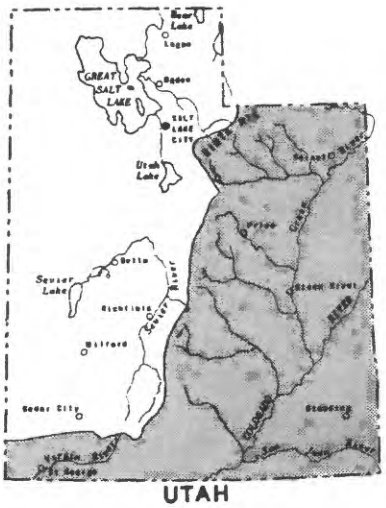
Reports: None.

SUMMARY OF AND REGIONALIZATION OF STREAMFLOW CHARACTERISTICS FOR THE COLORADO RIVER BASIN, UTAH

Number: UT 83-161-I

Cooperating Agency: U.S. Bureau of Land Management

Staff: R. C. Christensen, Hydrologist, Project Chief
E. B. Johnson, Hydrologist (part time)



UTAH

Period of Project: October 1982 to September 1984

Objectives: (1) Compute and summarize streamflow characteristics for gaging stations in the Colorado River Basin, Utah. Using standard techniques, compute frequency curves for peak flow, 1-, 3-, 7-, and 15-day flood flow, and 1-, 7-, 14-, 30-, 60-, and 90-day low flow. (2) Provide methods for transferring streamflow characteristics from gaged to ungaged sites.

Approach: (1) Using Geological Survey computer programs, data in the WATSTORE files will be processed and statistics tabulated for all stations in the Colorado River Basin, Utah. The statistics will include listings of high- and low-flow summaries, flow duration, variability of monthly and annual flow values for active and discontinued stations with 1 or more complete years of daily flow, and annual peaks for all stations including the crest-stage partial records. Frequency curves will be computed for stations with 10 or more years of record and the high- and low-flow values will be tabulated depending on record length for recurrence intervals of 2, 5, 10, 25, 50, and 100 years. The information will be published in an interim report with a short manuscript for each station followed by the statistics. A brief text will define terms and give examples of how to use the data. (2) The second phase will be the regionalization of selected flow characteristics. The equations will be developed by relating flow to basin characteristics using multiple-regression techniques. Accuracy of these relations for transferring flow characteristics from gaged to ungaged sites will be compared to equivalent years of record at gaging stations. Derived relations will be matched and adjusted to available results from adjacent states. A final report will outline procedures for using the relations to determine flow characteristics at ungaged sites.

Progress: Mean daily flow data and annual peaks in the WATSTORE files for approximately 300 gaging stations have been processed and the statistics outlined in item 2 for Approach have been computed. The compilation of the streamflow statistics for the interim report was started. The regionalization of selected flow characteristics was initiated by establishing computer-data files for selected streamflow, basin, and precipitation characteristics.

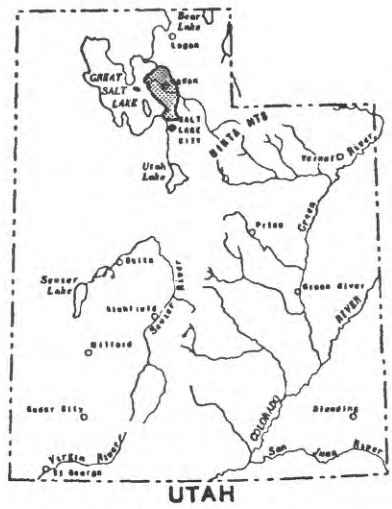
Plans for Next Year: Complete the interim report on streamflow statistics. By multiple-regression techniques, develop relations between streamflow and basin and precipitation characteristics. Prepare final report outlining procedures for using the relations to determine flow characteristics at ungaged sites.

Reports: None.

PROPROSED PROJECTS

GROUND-WATER HYDROLOGY OF THE EAST SHORE AREA

Cooperating Agency: Utah Division of Water Rights



Staff: D. W. Clark, Hydrologist, Project Chief
C. L. Appel, Hydrologist

Period of Project: July 1983 to June 1986

Objectives: (1) To assess current conditions in terms of recharge, movement, and discharge of ground water, water levels, ground-water quality, and volumes of water of various qualities in storage. (2) To increase knowledge and understanding of the ground-water system of the East Shore area and how it functions. (3) To construct a digital-computer model of the system that can simulate its past and current conditions and potential future effects of changes in discharge and recharge.

Approach: (1) Update well and spring data, including water-level and water-quality data, and put them in computer storage. (2) Conduct a comprehensive inventory of ground-water discharge, including that from wells and springs; to drains, streams, and sewers; by evapotranspiration by phreatophytes; and to Great Salt Lake. (3) Estimate recharge, where feasible, by streams, irrigation, precipitation, and by subsurface flow from consolidated rock. (4) Conduct aquifer tests to add to knowledge on hydraulic characteristics of the basin fill. (5) Construct a three-dimensional digital model of the area to simulate ground-water flow and effects of changes in the system. (6) Prepare basic-data, model, and overall interpretive report, for publication by the Utah Department of Natural Resources.

Plans for Next Year: Prepare a planning document and design an updated base map. Compile all available historical water-level and well-discharge data and well drillers' logs. Begin field inventory of new large diameter wells. Set up an expanded observation-well network for spring water-level measurements, and discharge measurements. Conduct preliminary aquifer tests if possible. Construct a preliminary digital model to use as a tool in determining areas where additional field data are needed.

CORRELATION ANALYSIS OF STREAMFLOW DATA

Staff: R. W. Cruff, Hydrologist, Project Chief
Other District personnel as assigned

Cooperating Agency: Utah Division of Water Resources

Period of Project: July 1983 to June 1985

Objectives: Correlate flows at pairs of stations within a river basin. Where the correlations are within a certain accuracy, determine regression equations that can be used to predict flow at one site from flow data at another site. These equations can then be used to evaluate whether the number of gages in an area can be reduced.

Approach: The correlation and regression analyses will be done using standard computer programs, such as those available on SAS or STATPAC. A report on the procedures and results will be prepared by June 30, 1985.

Plans for Next Year: Make correlation and regression analysis using standard computer programs.

ROCK FRACTURES AND COAL CLEATS AND THEIR EFFECTS ON GROUND-WATER HYDRAULICS IN COAL FIELDS OF CENTRAL UTAH

Cooperating Agency: U.S. Bureau of Land Management

Staff: G. C. Lines, Hydrologist, Project Chief (part time)
Other District personnel as assigned

Period of Project: October 1983 to September 1986

Objectives: In the Wasatch Plateau, Book Cliffs, and Emery coal fields, determine the general frequency, orientation, and continuity of rock fractures and coal cleats and their relation to faults and folds, to lineaments identified on aerial photographs, to depth of burial, to lithology, and to land subsidence related to coal mining. Where possible, determine the effects of fractures and cleats on aquifer permeabilities and anisotropy, on local and regional movement of ground water, and on inflow to underground mines.

Approach: (1) Literature search and review on rock fracturing and land subsidence. (2) Review of existing aquifer tests, spring inventories, and lab-permeability data in the project area. (3) Identify lineaments on aerial photographs (Landsat and low level), field check, and relate to geologic features shown on geologic maps. (4) Map fractures and coal cleats on outcrops concentrating on nine mine areas distributed throughout the study area (Emery, Dog Valley, SUFCo, Trail Mountain, Wilberg-Deer Creek, Coop, Skyline, Soldier Creek, and Sunnyside Mines) and unleased tracts along Muddy Creek and near Scofield. (5) Map coal-cleat orientation and bedrock fractures in nine underground mines. (6) Map subsidence features and relate to mine orientation and to local fracture patterns. (7) Study water production in mines and relate to fractures and cleats and to mine orientation. (8) Locate springs with large discharges and relate to geologic setting, and local and regional movement of ground water. (9) Conduct aquifer tests on selected wells. (10) Prepare interpretive report for review by March 31, 1986.

Plans for Next Year: Begin literature search and review. Collate existing hydrologic data. Prepare a planning document. Begin interpretation of features on aerial photographs and mapping of fractures and coal cleats, study water production in underground mines, and conduct aquifer tests where possible.