NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY

E. J. Workman, President

STATE BUREAU OF MINES AND MINERAL RESOURCES

Eugene Callaghan, Director

BIENNIAL REPORT

FOR THE FISCAL YEARS ENDING

30 JUNE 1953-1954

SOCORRO 1954
THE REGENTS
NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY

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To the Board of Regents:

I have the honor of transmitting to you the Biennial Report of the
Bureau of Mines and Mineral Resources for the years ending June 30, 1953-
1954, as required by Section 3, Chapter 115 of the session laws of the 8th
State Legislature, approved March 4, 1927.

Respectfully submitted,

E. J. WORKMAN

President
DUTIES AND OBJECTIVES OF THE BUREAU
OF MINES AND MINERAL RESOURCES

In New Mexico, the mineral industry, which ranks ahead of all
other productive industries in the value of its products and in wages paid,
is of such vital importance to the State that its maintenance through the
finding of new deposits to take the place of those that are depleted, or are
approaching exhaustion, should be of greatest concern to all citizens.

The 8th State Legislature in 1927 established the Bureau as a divi-
sion of the New Mexico School of Mines, as it was then known, and out-
lined its duties with such foresight that the requirements of present tech-
nologic society are fully covered in the authorization.

The State Bureau of Mines and Mineral Resources is the only State
organization charged with the duty of investigating, studying, and report-
ing on the geology and mineral resources such as oil and gas, coal, ground-
water, and metallic and nonmetallic minerals.

The Bureau has no regulatory or law-enforcement functions; its
sole concern is to secure, by means of the proven tools of basic geological
studies and technological research, accurate information on all types of
mineral resources of the State, and to make this information available to
all interested citizens, as well as to companies, to Chambers of Commerce
and similar organizations, to schools and educational institutions, and to
local, State and Federal agencies. Information may be disseminated as
publications and maps, economic studies, lectures to groups and conferences
with individuals. The accumulated experience of a competent permanent staff can be called upon above and beyond the published record.

The Bureau has recognized the duties outlined herewith and is performing them to the limits of its capacities. It is apparent that the very small technical staff and resources now available permit the performance of but a small part of these duties in an adequate manner. The State Bureau of Mines and Mineral Resources should:

1. Prepare a geologic map of New Mexico.

2. Prepare and have for distribution geologic maps of all parts of the State at a scale of one inch to the mile or larger.

3. Prepare detailed maps of individual mineral deposits or of areas recommended for prospecting on appropriate scales.

4. Prepare maps and reports on school or other State lands for administrative use and for guidance in formulating land sales and leasing policy.

5. Prepare maps and reports on a regional inventory of ground-water resources, as well as reports on intensive ground-water studies and techniques of water-finding.

6. Prepare oil, gas, and coal maps and pertinent diagrams and reports that will aid in exploration for these materials.

7. Compile reports on individual mineral commodities or groups of commodities for the State.

8. With the aid of paleontologic and other techniques establish stratigraphic sequences and correlations throughout the State.

9. Provide assay, chemical, mineralogical, and metallurgical laboratories for testing materials for citizens of the State.

10. Provide information requested by persons or firms contemplating establishment of industries in the State.
11. Prepare basic reports for specific areas of land utilization such as irrigation districts or recreational areas.

12. Cooperate with educational institutions and with State and Federal organizations carrying on work having to do with mineral resources of the State.

13. Prepare booklets on State parks or other recreational areas as well as highway guidebooks for use by tourists or other citizens.

14. Prepare educational booklets and maps on mineral resources and their conservation for use by the schools.

15. Keep up-to-date files of information and pictures for accurately answering letters and requests.

16. Prepare statistical and economic reports on mineral resources.

17. Prepare bibliographies of geologic and mineral resource literature concerning the State.

18. Investigate the seismicity of New Mexico and other factors affecting engineering structures.

19. Study application of geophysical techniques to geologic and engineering problems.

20. Publicize the mineral industry of New Mexico through talks before engineering and scientific societies and before lay groups.

21. Preserve records such as mine maps, production records, bore-hole samples and cores from oil well tests, and others.

22. Maintain a museum of New Mexico minerals and raw materials that will serve as a basis for exhibits for State and other fairs.

23. Provide adult education for miners, prospectors, and other interested citizens.

24. Provide in-service training for mineral industry students.

SERVICES

Requests for the many services the Bureau offers increased during the period. Professional engineers and geologists, owners of properties,
prospective investors, miners, and prospectors came to the Bureau offices for consultation with the Bureau personnel and for information and publications. For the benefit of those interested in the discovery of more oil and gas, a rapidly growing sample library is maintained at Socorro, as well as various types of logs and other information. Hundreds of rock and mineral samples were brought to the Bureau for qualitative tests, mineral determinations, and interpretation.

The mining engineer continued to give advice and guidance to prospectors, miners, and operators by means of consultations in the field and in the office, or by letter or telephone. Much time of the mining engineer and the geological staff as well has been devoted to uranium prospectors who asked for information and advice on all possible aspects of their activities. Field examinations of many prospects and mines have been made and brief reports filed for public reference. The work of the mining engineer with the Arkansas-White-Red River Basins Inter-Agency Committee has been largely terminated with release of the report of the New Mexico work group.

Through issuing and distributing publications, the Bureau points out the possibilities as well as the actualities of mineral production in New Mexico and provides a permanent record to which reference can be made at any time. Scientific papers on New Mexico resources and geologic problems are given at State and National meetings and before local groups.

The Bureau also participates in educational activities in the State
and cooperates closely with State institutions of higher learning and the public schools. Talks were given at the Conservation Workshops at Highlands University, New Mexico Western College, and Eastern New Mexico University.

The Bureau was host to a large group of geologists who contributed their knowledge of the basement or oldest rocks of New Mexico and adjoining regions in a Conference on the Precambrian in June 1954. The Association of American State Geologists voted to have their annual meeting in Socorro in March 1955, a very fine recognition of this Bureau.

Members of the staff contribute to the very popular guidebooks of the field conferences of the New Mexico Geological Society and in 1953 served as editors of the guidebook as well as preparing the greater part of the book. The staff participates in the programs of various engineering and scientific organizations whose overall educational program is to improve the services the individual can render to his employers:

**National**

American Association of Petroleum Geologists
American Association of State Geologists
American Institute of Mining and Metallurgical Engineers
American Geological Institute
American Geophysical Union
American Water Works Association
Geological Society of America
Mineralogical Society of America
National Research Council
National Society of Professional Engineers
Nebraska Academy of Sciences
State and Local

Colorado Mining Association
Four Corners Geological Society
New Mexico Geological Society
New Mexico Mining Association
New Mexico Society of Professional Engineers
Roswell Geological Society
Sigma Xi Club of New Mexico
State Mapping Advisory Board

Members of the staff have participated in the activities of these organizations as officers, committee members, and delegates and have contributed many scientific papers and discussions as listed below.


Callaghan, E. (February 1953) Geology of perlite, AIME, Los Angeles.

Baldwin, B. (March 1953) The changing scenery around Santa Fe, lecture, Santa Fe Gem and Mineral Club.


Flower, R. H. (April 1953) Evolution of the nautiloids, lecture, University of Nebraska.


Weber, R. H. (and Stubbs, M. F.) (May 1953) Raw materials in New Mexico available to the chemical industry, New Mexico Geological Society, Roswell.

Baldwin, B. (and Winkler, H. A.) (May 1953) Geology and geophysics of the Santa Fe area, New Mexico, New Mexico Geological Society, Roswell.

Callaghan, E. (May 1953) Pattern of a geological investigation, New Mexico Sigma Xi.

Kottlowski, F. E. (May 1953) Stratigraphy of the Las Cruces and Middle Wells quadrangles, lecture, New Mexico Geological Society, Roswell.

Zeller, Robert A., Jr. (May 1953) Stratigraphy of the Las Cruces and Middle Wells quadrangles, lecture, New Mexico Geological Society, Roswell.

Allen, J. E. (October 1953) Bentonitic shales in upper Mesaverde formation, International Mining Days, New Mexico Miners Association, and AIME.

Bushman, F. X. (October 1953) Discussion to follow paper on water resources of Arizona, AIME, El Paso, Texas.

Balk, R. (October 1953) Spurrite deposit, Tres Hermanas Mountains, New Mexico, lecture, Rocky Mountain division, AIME, El Paso, Texas.

Allen, J. E. (November 1953) Mineral resources of a part of the Navajo Reservation, lectures, Four Corners Geological Society, the Navajo Tribal Council, and AIME, El Paso, Texas.

Kottlowski, R. E. (November 1953) Float blocks in Tertiary volcanics of southwestern New Mexico, Geomorphology Section of Geological Society of America, Toronto, Canada.


Jicha, H. L., Jr. (May 1954) Paragenesis of the ores of the Palomas (Hermosa) district, New Mexico, New Mexico Geological Society.

Balk, R. (May 1954) Kimberlitic tuff plugs in northeastern Arizona, lecture, Volcanology Section, American Geophysical Union.

Dr. Callaghan was an invited delegate to the Mid-Century Conference on Resources for the Future, and also attended meetings of the Minerals, Materials, and Fuels Economic Subcommittee.
### Statistics of Services

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<td>Circulars and annual reports distributed free</td>
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<td>1208</td>
<td>2807</td>
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<td>Qualitative determinations</td>
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<td>932</td>
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<td>Small and special mineral collections to schools, etc.</td>
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<td>691</td>
<td>899</td>
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935 names on Bureau's notification list as of June 30, 1954.

### Oil and gas:

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<td>Drillers' logs on file</td>
<td>6875</td>
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FIELD AND RESEARCH ACTIVITIES

Field and laboratory work is carried on by both the permanent and the temporary personnel. In addition to research work much of the time of the permanent staff must be devoted to service activities such as meetings with visitors, responses to inquiries, determinations of samples and related activities. The temporary staff devotes all its time to field work and does its laboratory work and preparation of reports on personal time. This applies also to the field assistance fellows who, for the most part, are candidates for the Ph.D. degree in major universities throughout the country. They receive a salary of only a dollar a month and a per diem allowance while in the field.

All projects are designed to aid in the search for minerals, rocks, fuels, and ground water that may be of present or future economic importance to New Mexico. Regional mapping provides data for all economic categories as well as supplying data for classification of land and proper conservation and development of new resources.

Field projects and projects which are concerned with the whole State or with investigations that have a wide range of application are assigned a permanent number and are listed numerically below. Brief descriptions of these projects and the status of the work as of June 30, 1954 are given below:

1. Costilla and Latir Peak quadrangles (in cooperation with Fuels Branch, U. S. Geological Survey), by Philip F. McKinlay (formerly with Bureau, now in private employment). Materials of economic interest are ground water in San Luis Valley, gravel, granite, pegmatites, graphite and
gold. Map and brief text are being edited for publication.


4. El Rito quadrangle, by Harry B. Groom (Harvard University). The area contains pegmatite deposits in Precambrian rocks as well as Tertiary and Quaternary formations. Field work partly completed but inactive currently.

5. Water resources of the Santa Fe area (in cooperation with Ground Water Branch U. S. Geological Survey, and Research and Development Division of New Mexico Institute of Mining and Technology), by Brewster Baldwin, Frank E. Kottlowski, and Wayne Bundy (Bureau), Zane Spiegel (U. S. Geological Survey), and Hartmut Winkler (Research and Development Division). An intensive study of local geology and of water resources available to city of Santa Fe. Manuscript in hands of U. S. Geological Survey for editing and publication.

6. Cerrillos district, by Alan E. Disbrow (University of New Mexico). Detailed geology of complex intrusives and volcanic rocks and of base metal mines. Area was once famous as a source of turquoise. Manuscript being edited for publication.

7. Thoreau quadrangle, by Clay T. Smith (New Mexico Institute of Mining and Technology). Geology of part of Grants uranium area. Published as Bulletin 31, "Geology of the Thoreau quadrangle, McKinley and Valencia counties, New Mexico."


12. Area east of Socorro (in cooperation with Fuels Branch, U. S. Geological Survey), by R. H. Wilpolt and A. A. Wanek (U. S. Geological Survey). Stratigraphy and structure of a large area in Socorro County are shown as well as the Carthage coal field. Published as Map OM121, Oil and Gas Investigations, U. S. Geological Survey.


14. Capitan quadrangle, by John E. Allen (Bureau) and Stewart Jones (formerly on faculty of New Mexico Institute of Mining and Technology). Materials of economic interest are iron, coal, and precious metals. Field work is partly completed.

15. Sacramento Mountains area, by Lloyd C. Pray (California Institute of Technology). This report will provide detailed information on the stratigraphy and structure of this part of New Mexico. Manuscript being rewritten for publication.

16. Lookout Mountain quadrangle, by David Llewellyn (Stanford University). Precious metals, tin ores, and clay have been found in this area. Field work is completed. Inactive currently.

17. Winston and Sugarloaf Mountain quadrangles, by Richard H. Jahns (California Institute of Technology). Several noted precious metal districts, as well as deposits of iron, beryllium, and tungsten occur in this area. Field work is being continued.

18. Geologic section of Black Range, by Frederick J. Kuellmer (University of Chicago). Detailed study of stratigraphy and structure which includes Kingston mining district. In process of publication as Bulletin 33, "Geologic section of the Black Range at Kingston, New Mexico."


succession. Contains Cooks Peak and Lake Valley mining districts. Manuscript being edited for publication.


24. Columbus and Hermanas quadrangles, by Robert Balk (Bureau). Detailed mapping of intrusives and associated rocks with contact and other mineral deposits. Field work completed.

25. Picuris Range, by Arthur Montgomery (Harvard University). This report is a notable contribution to the knowledge of crystalline rocks and a variety of minerals of economic importance. Published as Bulletin 30, "Precambrian geology of the Picuris Range; north-central New Mexico," June 1953.


30. Post Office Flat, Mt. Sedgwick, Valle Largo, and Paxton Springs, 7.5-minute quadrangles, by Clay T. Smith (New Mexico Institute of Mining and Technology) (in cooperation with E. N. Goddard, Mineral Deposits

31. Tohatchi and Fort Defiance quadrangles, by John Eliot Allen and Robert Balk (Bureau). This mineral resource study includes detailed geologic mapping and is financed wholly by Federal funds under contract with the U. S. Bureau of Indian Affairs, as provided by the Navajo-Hopi Rehabilitation Act of 1950. Manuscript in process of publication as Bulletin 36, "Mineral resources of Fort Defiance and Tohatchi quadrangles, Arizona and New Mexico."

32. Pelona NE and NW quadrangles, by Charles E. Stearns (Harvard University). The purpose of this study is an understanding of the geology of the San Agustin Plains as a basis for evaluation of ground-water resources. Field work is in progress.

33. Hansonburg mining district, by Frank E. Kottlowski (Bureau). The map shows parts of the Hansonburg district and details of stratigraphy and structure affecting mining operations. Published as Circular 23, "Geology and ore deposits of a part of the Hansonburg mining district, Socorro County, New Mexico."

34. Las Tablas quadrangle by Fred Barker (California Institute of Technology). The purpose of this project is to show the regional geology of many of the pegmatite deposits as well as to provide basic information on the succession of volcanic and sedimentary rocks. Manuscript being edited for publication.

35. Foster Canyon quadrangle, by Clay T. Smith (New Mexico Institute of Mining and Technology). Distribution and structure of uranium-bearing formations will be shown. The manuscript is being prepared for publication.

36. Bland mining district, by Wayne M. Bundy (Indiana University). Detailed geology, both underground and at the surface, is shown for this precious metal district. Manuscript being edited for publication.

37. Socorro manganese district, by Alfred T. Miesch (Indiana University). The sequence of volcanic rocks is shown as well as the geologic setting of manganese oxide deposits. Manuscript is being edited for publication.

39. Oil and Gas Map of New Mexico, by Robert A. Bieberman (Bureau) (in cooperation with Fuels Branch, U. S. Geological Survey). A new edition of this popular and important map is being prepared. The last was issued in 1949. In process of publication by U. S. Geological Survey as OM-159, "Map of New Mexico showing test wells for oil and gas, oil and gas fields, and pipelines," accompanied by Circular 333, "Wells drilled for oil and gas in New Mexico."

40. Geologic Map of New Mexico. The staff of the Bureau in cooperation with the Fuels Branch, U. S. Geological Survey is undertaking the preparation of a new edition of the State geologic map. The remarkable Darton map has been out of print for some time. Field work and compilation in progress.

41. Characteristics of petroleum in New Mexico. Inactive.

42. Tertiary volcanic rocks of New Mexico. The staff of the Bureau is continuing field mapping and laboratory study of these rocks with which so many mineral deposits are closely related.

43. Tertiary intrusive rocks of New Mexico. The staff of the Bureau continues to assemble data on these rocks with which most of the base metal deposits of the State are associated.

44. Stratigraphy of New Mexico, by R. H. Flower and staff of the Bureau. A fundamental knowledge of the sequence and relationships of all rocks will aid greatly in maintaining our future oil and gas production as well as assisting in exploration for mineral deposits.

45. Stratigraphy and paleontology of the El Paso limestone, by R. H. Flower (Bureau). Field and laboratory work is continuing on this basic stratigraphic study of a prominent formation of southern New Mexico.

46. Coal in Capitan quadrangle, by Marc W. Bodine (Columbia University). The geology of a small area of coal beds is outlined in this study. Manuscript being edited for publication.

47. Ojo Caliente area, by Richard H. Jahns (California Institute of Technology) and Clay T. Smith (New Mexico Institute of Mining and Technology). A small area of Precambrian rocks as well as included pegmatite deposits is covered in this study. Manuscript is being prepared for publication.

49. Hermosa district, by Richard H. John (California Institute of Technology). An intensive study of a famous old silver camp. Manuscript in preparation for publication. Manuscript of a laboratory investigation of the ores by Henry L. Jicha, Jr. (Bureau) is in process of printing in Economic Geology and will be reprinted as Circular 27, "Paragenesis of the ores of the Palomas (Hermosa) district, southwestern New Mexico."

50. Mud Springs Mountains quadrangle, by John D. Hill (University of New Mexico). Paleozoic rocks are delineated for a small but well-exposed area. Field work is essentially completed. Manuscript in preparation for publication.


52. Ore deposits of the High Rolls district by S. E. Jerome, et al. A detailed study by staff of New Jersey Zinc Exploration Company of base metals in sedimentary rocks. Manuscript is being edited for publication.

53. Mineral deposits of Questa mine area by John H. Schilling (Harvard University). This is an intensive study of the Questa molybdenite mine and the surrounding area. Field work is in progress.

54. Inscription Rock quadrangle, by Clay T. Smith (New Mexico Institute of Mining and Technology). Stratigraphy and structure in the Zuni uplift area are being delineated in this study. Field work is in progress.

55. Hillsboro quadrangle, by Frederick J. Kuellmer (Bureau). This very complex area contains the Hillsboro and Kingston mining districts. Field work is in progress.

56. Pennsylvanian stratigraphy in Fresnal Canyon in Sacramento Mountains. Inactive.

57. This is a survey under contract between the Bureau and the U.S. Bureau of Indian Affairs of the 4,000 square miles of the Navajo Indian Reservation in the northwest corner of New Mexico, to determine the presence and location of any rocks and minerals, exclusive of uranium, coal, oil, gas, and water which might have a present or potential value to the Navajo nation. By June 30, 1954, a total of nearly 4,000 miles of road had been mapped on aerial photographs and 600 hogans had been visited and the occupants interviewed with an interpreter.

58. The metal resources of New Mexico and their economic features by E. C. Anderson (Bureau). A compilation of data on metalliferous deposits
by county for the entire state. Manuscript is being edited for publication.

59. Bibliography of geology and mineral resources of New Mexico through 1951, by Marian Burks (Bureau). Manuscript is being edited for publication.

60. Pyramid Mountains in Lordsburg quadrangle, by Fred R. Flege (Washington University in St. Louis). Detailed study of groups of volcanic rocks, one of which contains notable deposits of perlite. Field work nearly completed.

61. Cerro Verde SW quadrangle by Henry L. Jicha, Jr. (Bureau). Stratigraphy and structure in a possible uranium area are being delineated. Field work in progress.


63. Guidebook of southwestern New Mexico, Fourth Field Conference, New Mexico Geological Society, October 1953. The Bureau staff, in cooperation with the Mineral Deposits Branch of the U. S. Geological Survey, prepared the annual guidebook for a route extending from El Paso, Texas, to Caballo Reservoir, to Silver City and thence through Lordsburg to the vicinity of Wilcox, Arizona. Much original field work was necessary in order to prepare the route maps. Published October 1953.

64. Cambrian cephalopods, by R. H. Flower (Bureau). A study of the earliest forms in this group of important guide fossils for the Paleozoic of New Mexico. In process of publication as Bulletin 40, "Cambrian cephalopods."

65. Middle Well quadrangle, by Frank E. Kottlowski (Bureau). A continuation of study of stratigraphy and structure of Lower Rio Grande Valley in New Mexico. Field work in progress.


68. Walnut Wells quadrangle, by Allen Alper (Columbia University). Mapping of an area of volcanic rocks, and of sedimentary rocks containing
mineral deposits. Field work being initiated.

69. Steins area, by Elliot Gillerman (University of Texas). Detailed mapping of complex area of sedimentary and volcanic rocks containing mineral deposits. Field work in progress.


72. Paleozoic stratigraphy in south-central New Mexico, by Frank E. Kottlowski, R. H. Flower (Bureau), and M. L. Thompson (University of Kansas). Field work in progress.

73. North Magdalena area, by James T. Johnson (New Mexico Institute of Mining and Technology). Detailed mapping of north end of Magdalena mining district and adjacent area. Field work in progress.
PALEONTOLOGY AND STRATIGRAPHY

The last three years have been devoted primarily to the beginning of a collection of paleontological materials of New Mexico. Thus far, work has been concentrated primarily on the older strata, involving stratigraphically made collections, preparation, illustration, and description, for easily two-thirds of the forms are previously undescribed. As a result, detailed correlation is becoming possible, not only among the New Mexico sections, but bringing our knowledge of the New Mexico succession into line with the successions known in other parts of North America. A paper is well advanced describing the first fossils diagnostic as to age, found in the Bliss sandstone, with implications as to the age of the Bliss sandstone, its depositional history, and interpretation. Similar results are being obtained for the El Paso limestone, though the amount of new forms still being found indicates that the material thus far collected is only a small portion of the complete faunas. The same is true for the Montoya, and Devonian. Work on other formations is less advanced, but already a large Permian collection has been accumulated, and illustrations and descriptions of Permian and some younger forms are now completed for publication.
GROUND WATER

In view of the extreme importance of ground water to every citizen and to all phases of the economy of the State, whether it be city-dwelling, manufacturing, mining, stock- or crop-raising, petroleum production, or almost any conceivable activity, the Bureau has turned a large part of its effort toward the problems of the location and evaluation of ground-water supplies, whether large or small. Administratively, the Bureau shares with other organizations in the investigation of ground-water resources. Of the sum of $20,000 appropriated annually to the Bureau for cooperative basic geology and ground-water surveys, $10,000, less anticipated publication costs and overhead, is turned over to the Ground Water Branch of the U. S. Geological Survey to be matched by Federal funds. With this sum the Federal organization carries on countywide inventory studies of ground-water resources. Since the inception of this program reports on eastern Colfax, San Miguel, and Eddy Counties have been published by the Bureau. Reports on Torrance County and on two parts of Socorro County are essentially complete. Projects are underway in Quay and Lea Counties under this program.

In view of the serious water shortage at Santa Fe in 1951, the Bureau initiated with the Ground Water Branch of the U. S. Geological Survey a very intensive study of the ground-water conditions and supply in that area. The geology was mapped in great detail by the Bureau staff using funds from its general appropriation. The U. S. Geological Survey, using the cooperative funds, undertook the engineering phases of the ground-water
study. The geophysical section of the Research and Development Division of New Mexico Institute of Mining and Technology carried out a detailed geophysical survey using several techniques aimed at outlining groundwater areas. The Topographic Division of the Geological Survey gave special priority to the preparation of a large-scale topographic base. The maps and reports are all prepared and await publication by the U. S. Geological Survey.

At Tucumcari in Quay County another type of cooperation designed to aid that city was carried out and a report submitted to the city. The city appropriated a sum to be matched by the Federal agency. The hydrologic engineer of the Bureau cooperated in supplying engineering direction.

A special project in water-finding in the vicinity of Socorro has been carried on in cooperation with the Research and Development Division. The geologic and engineering phases have largely been carried out by J. F. Waldron, a Ph.D. candidate at Stanford University. The report is near completion.

The ground-water hydrologist conducts water surveys in each of the areas being mapped geologically so that he may have the cooperation and guidance of the geologist in the field.

Close cooperation is maintained with the scientists of the Research and Development Division in research in water-finding and in development of instrumentation.

An inventory of water supplies in the western part of the San Agustin
Plains in Catron County was completed and published as Circular 26, "Water well records and well water quality in southwestern San Agustin Plains, Catron County, New Mexico."

Studies of both ground and surface water were completed as part of the study of the Navajo Reservation in Project 31.

In addition to all these investigations the Bureau has undertaken a complete inventory of the ground-water resources of Union County, an area of 3817 square miles and many hundreds of wells. Both geological personnel and the ground-water hydrologist are assigned to this work. The scope of the work is such that the results will be valuable to petroleum and uranium exploration as well as to water-finding and evaluation. A detailed study of the volcanic flows in the vicinity of Capulin Mountain National Monument and the soils of the famous Folsom man locality have been included in this study which is about half completed.

Numerous local investigations of ground-water supplies have been made by the ground-water hydrologist and by the geologists most familiar with the area.

GROUND WATER INVENTORY STUDIES


C. North Socorro County (in cooperation with Ground Water

D. Socorro-Magdalena area, by John H. Waldron (Stanford University). Manuscript is in preparation for publication.


F. Tucumcari (in cooperation with Ground Water Branch, U. S. Geological Survey, and city of Tucumcari), by F. X. Bushman (Bureau) and Fred Trauger (U. S. Geological Survey); preliminary manuscript prepared. To be incorporated in report on Quay County.


H. Union County, by F. X. Bushman and Brewster Baldwin (Bureau), and William Muehlberger (University of Texas). Field work is in progress.

J. Quay County (in cooperation with Ground Water Branch, U. S. Geological Survey), by Charles F. Berkstresser (U. S. Geological Survey). Field work to be extended from Tucumcari area.

K. Wells in western San Agustin Plains, by F. X. Bushman and C. P. Valentine (Bureau). Published as Circular 26, "Water well records and well water quality in southwestern San Agustin Plains, Catron County, New Mexico."
RESEARCH CONTRACTS WITH U.S. BUREAU OF INDIAN AFFAIRS

Publication during 1954 of Bulletin 36, "Mineral resources of Fort Defiance and Tohatchi quadrangles, Arizona and New Mexico", by John Eliot Allen and Robert Balk (192 pp., 19 tables, 21 figures, 16 plates) completed the contract undertaken by the Bureau with the U. S. Bureau of Indian Affairs in June 1952, for the mapping of 484 square miles in McKinley County, New Mexico, and Apache County, Arizona. This survey located large reserves of coal and bentonitic shales, and assessed the ground-water resources of the area. The geologic maps and detailed stratigraphic data will be of value in search for uranium and oil and gas in this part of the San Juan Basin. Deposits of building stone, sand, ornamental stone, gravel and crushed rock, and semiprecious stones were located and described.

A second contract between the Board of Regents of the New Mexico Institute of Mining and Technology and the Bureau of Indian Affairs, U. S. Department of the Interior, under authority of the Navajo Rehabilitation Act of 1950, requires the Bureau of Mines and Mineral Resources to conduct a mineral survey, exclusive of uranium, gas, oil, coal, and water, of that part of the Navajo reservation within the State of New Mexico, excluding only the area covered by the previous contract; to locate as many deposits of minerals or rocks of present or future value to the Navajo people as is possible to find; to prepare detailed maps of the deposits that appear to have the greatest value, to test the rocks or minerals by latest scientific methods; and to prepare a report, including an economic analysis, and a
map showing the location of all the deposits.

The field work has been completed, and testing of samples and preparation of the map and report is now underway.
BUREAU COOPERATION WITH ARKANSAS-WHITE-RED RIVER BASINS INTER-AGENCY COMMITTEE

Active participation of Bureau personnel in the Arkansas-White-Red River Basins investigations was concluded early in 1954.

The task of the "Sub-Work" group to which Bureau personnel devoted its efforts was a study of the mineral resources and the needs for a geologic mapping program in that portion of the basins within New Mexico. This work was nearly completed at the beginning of 1954. A report has been prepared, reviewed, and approved by the New Mexico Committee and presented to the AWRBIA Committee at Tulsa, Oklahoma, to become the New Mexico section of the overall AWR Basins report, which is scheduled to go to the President and the Congress not later than June 1955.

The New Mexico report is comprehensive and will, we believe, be effective in apprising the Congress of the economic possibilities of that portion of the State and the feasibility of developing it.
URANIUM

Uranium is fast becoming a major element of the mineral industry in New Mexico and interest in prospecting has increased enormously. During the past eighteen months, no less than 1500 persons have visited the Bureau Offices or have written requesting information regarding this fabulous material. Most of the people have wanted to know where to go to look for it, how to recognize it if they found it, and then what to do about it.

The Bureau Staff has assisted these people in every way possible. Maps of the State showing the location of proven discoveries are available. A free circular has been prepared that gives the actual location of known deposits by sections, township, and range, the geologic formation in which the mineral occurs; the status of the discovery as of a certain date, that is, whether it is a raw prospect, under development, a producing mine, or a mined-out property. Also samples of ore from the various districts are available for inspection and study by the expectant prospector. Our staff also has tried to be of assistance to the prospector in his relations with the State Land Office, the U. S. Bureau of Land Management, and the owners of blocks of lands—such as old Spanish and Mexican grants.

In all its efforts to assist in the discovery and production of uranium ore in the State, the Bureau has always had the cordial cooperation of the U. S. Atomic Energy Commission personnel at Albuquerque, Grants, and Grand Junction, and of the established ore producers.
Uranium production has become big business in New Mexico. A multimillion dollar industry has developed in a matter of months, and the end is not in sight.
PUBLICATIONS

A complete list of Bureau publications is given on the final pages of this report. Following are descriptions of publications issued during the two-year period.


Bulletin 31, "Geology of the Thoreau quadrangle, McKinley and Valencia Counties, New Mexico," by Clay T. Smith. Text of 36 pages and colored geologic map and section. Includes a part of the Grants uranium area and shows the stratigraphy of the uranium deposits. Extra copies of map were printed and may be purchased separately.

Ground-Water Report 3, "Geology and ground-water resources of Eddy County, New Mexico," by G. E. Hendrickson and R. S. Jones. Prepared by the U. S. Geological Survey in cooperation with the State Bureau of Mines and Mineral Resources and the State Engineer. Contains 166 pages, 6 plates, 11 figures, a geologic map of Eddy County, records of wells and springs, and chemical analyses of water from wells and springs.

Circular 23, "Geology and ore deposits of a part of the Hanson-
burg mining district, Socorro County, New Mexico," by Frank E. Kottlowski. The area is known for its deposits of barite, quartz, fluorite, and galena and includes Precambrian, Pennsylvanian, mid-Tertiary, and Quaternary rocks. Contains geologic map and section.

Circular 24, "Subsurface completion data of wells drilled for oil and gas during 1952," compiled by Robert A. Bieberman and Florence B. Crespin. This circular includes records of all wells completed during 1952 in New Mexico.


Circular 26, "Water well records and well water quality in southwestern San Agustin Plains, Catron County, New Mexico," by F. X. Bushman and C. P. Valentine. The southwestern part of the San Agustin Plains is being mapped geologically by Dr. Charles Stearns, of Harvard University. The data on wells and water supply is a part of this study.

Circular 28, "Subsurface completion data of wells drilled for oil and gas during 1953," compiled by Robert A. Bieberman and Florence B. Crespin.

"Biennial report for the fiscal years ending June 30, 1951-1952," by Eugene Callaghan, director, was released for distribution in October 1952.
A preliminary geologic map of Puertecito quadrangle, Socorro County, New Mexico, was printed in June 1954. This map will be included in a forthcoming publication on the geology of Puertecito quadrangle, by William H. Tonking, Princeton University.

Supplements I, II, and III to Circular 22, entitled "Index to samples from oil and gas well tests in library at Socorro, New Mexico," were issued during the two-year period, bringing this circular up to date as of January 1954.

Manuscripts in press


**Bulletin 33, "Geologic section of the Black Range at Kingston, New Mexico,"** by Frederick J. Kuellmer. Contains colored geologic map and section, 100 pages, 13 tables, 28 figures, 3 plates.

**Bulletin 37, "Geology and mineral deposits of Lake Valley quadrangle, Sierra, Grant, and Luna Counties, New Mexico,"** by Henry L. Jicha, Jr. Contains colored geologic map and sections, 93 pages, 8 tables, 13 figures, 6 plates.

Oil and gas map of New Mexico and circular (in cooperation with

Circular 27, "Paragenesis of the ores of the Palomas (Hermosa) district, southwestern New Mexico," by Henry L. Jicha, Jr. Reprint from "Economic Geology," to be distributed as circular.

Circular 29, "Occurrences of uranium ores in New Mexico," by E. C. Anderson.

Manuscripts prepared and in process of revision or being edited for printing


Bulletin 35, "The geology of a part of the Sacramento Mountains in the vicinity of Alamogordo, Otero County, New Mexico," by Lloyd Pray.

Bulletin 38, "Geology and mineral resources of Dwyer quadrangle, Grant, Luna, and Sierra Counties, New Mexico," by Wolfgang E. Elston.

Bulletin 39, "The metal resources of New Mexico and their economic features," by E. C. Anderson.

A map and text entitled, "Geology of Costilla and Latir Peak quadrangles, Taos County, New Mexico," by Philip F. McKinlay, in cooperation with U. S. Geological Survey.

A map and text entitled, "Geology of Questa and Eagle Nest quadrangles, Taos County, New Mexico," by Philip F. McKinlay, in cooperation with U. S. Geological Survey.

"Kyanite deposits of the Petaca district, Rio Arriba County, New
Mexico," by Allen Frank Corey.

"Geology of Puertecito quadrangle, Socorro County, New Mexico," by William H. Tonking.

"Geology and water resources of the Santa Fe area, New Mexico," by Brewster Baldwin, Frank Kottlowski, Wayne Bundy, Zane Spiegel, and Hartmut Winkler (in cooperation with U. S. Geological Survey, and Research and Development Division of New Mexico Institute of Mining and Technology).

"The geology of the Cerrillos Hills area, Santa Fe County, New Mexico," by Alan E. Disbrow and Walter C. Stoll.

"Late Pennsylvanian and early Permian stratigraphy of the northern Sacramento Mountains, Otero County, New Mexico," by Carel Otte, Jr.

"Precambrian and Tertiary geology of Las Tablas quadrangle, New Mexico," by Fred Barker.

"Geology and ore deposits of the Sacramento (High Rolls) mining district, Otero County, New Mexico," by S. E. Jerome, et al.

"Bibliography of geology and mineral resources of New Mexico," by Marian Burks. To supersede Bulletin 22.

"Geology and ground-water resources of northern Socorro County, New Mexico," by Zane Spiegel, in cooperation with U. S. Geological Survey.

"Geology and ground-water resources of Torrance County, New Mexico," by Ralph Smith, in cooperation with U. S. Geological Survey.
Petroleum exploration map of Colfax County, New Mexico, by Robert A. Bieberman.

Petroleum exploration map of Roosevelt County, New Mexico, by Robert A. Bieberman.

Petroleum exploration map of Curry County, New Mexico, by Robert A. Bieberman.

Members of the staff also published articles in outside journals representing work done in New Mexico or before they joined the staff.


Baldwin, Brewster (1953) (abs) Late Cenozoic structure and sedimentation of the Santa Fe area, New Mexico, Geol. Soc. Amer. Bull., v 64.

Balk, Robert (1952) Fabric of quartzites near thrust faults, Jour. Geol., v 60.


Bieberman, R. A. (1953) Mineral resources of San Juan Basin, revised, to be published in Rinehart's "Four Corners Area Book."

Callaghan, Eugene (1953) Contributions on perlite to be incorporated in Summary report on the perlite resources of the United States, to be published by U. S. Geological Survey. (Additional material on this subject contributed by R. H. Weber.)

Callaghan, Eugene (1953) Volcanic rocks of southwestern New Mexico,
New Mexico Geological Society, Guidebook of southwestern New Mexico, Fourth Field Conference.

Callaghan, Eugene (1953) Basin and range structure in southern New Mexico, New Mexico Geological Society, Guidebook of southwestern New Mexico, Fourth Field Conference.


Flower, R. H. (1953) Franklin Mountains section, New Mexico Geological Society, Guidebook of southwestern New Mexico, Fourth Field Conference.

Flower, R. H. (1953) Paleozoic sedimentary rocks of southwestern New Mexico, New Mexico Geological Society, Guidebook of southwestern New Mexico, Fourth Field Conference.


Jicha, H. L. Jr. (1952) Gypsum--its occurrence, uses, and marketing, New Mexico Miner, July.


PERSONNEL

Little change has occurred in the scientific and engineering staff of the Bureau since the last biennium.

Mr. Roy Foster, who received his B.S. at Ohio State University and who was for a time employed by an oil company, has replaced Mr. Wilbur D. Pennington as assistant petroleum geologist. Mr. Pennington has resigned to take private employment.

Mr. Robert Zeller was appointed as economic geologist to complete his work on the Big Hatchet area and to carry on special studies of Lower Cretaceous stratigraphy in southwestern New Mexico. Mr. Zeller received his B. A. from Pennsylvania State University and his M.A. from the University of New Mexico. His work for the Ph.D. has been at the University of California at Los Angeles.

Mr. William Arnold was appointed scientific illustrator to take the place of Mr. Wright W. Putney, who resigned to complete his college training. Mr. Arnold attended Iowa State College and was for a time a lithographer in commercial work.

The services of Professor William R. Muehlberger, of the University of Texas, were obtained on a temporary basis for mapping the Des Moines quadrangle in Union County. Dr. Muehlberger received his Ph.D. from the California Institute of Technology. The services of Professor M. L. Thompson, distinguished authority on Pennsylvanian and Permian foraminifera, were obtained for a special project in this field.
The Field Assistance Fellowship program was continued with favorable results for the State. Ten new fellowships were granted for the period and prior fellowships were terminated with completion of the work.

Oscar Strongin and David Givens were given brief temporary appointments as geologists in order to complete projects. Messrs. Joel L. Van Sant and Stanley A. Mayer were employed temporarily as mining engineers on the Navajo Project (No. 57), and Robert E. Ahkeah, son of Sam Ahkeah, chairman of the Navajo Tribal Council, was employed as interpreter and guide.
FINANCIAL STATEMENT

THE COMPTROLLER of New Mexico Institute of Mining and Technology, under whose supervision Bureau finances are handled, has submitted the following statement:

RECEIPTS AND DISBURSEMENTS

STATE BUREAU OF MINES--GENERAL

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<thead>
<tr>
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<tr>
<td>Outstanding obligations and carry-over from previous fiscal year.</td>
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<td>$ 4,876.57</td>
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<td><strong>$190,469.99</strong></td>
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Disbursements and Commitments:

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<th>1952-1953</th>
<th>1953-1954</th>
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## Financial Statement

### BASIC GEOLOGY AND GROUND WATER SURVEYS

#### Receipts:

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#### Disbursements and Commitments:

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BUDGETS
STATE BUREAU OF MINES--GENERAL

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<td>TOTAL</td>
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<td>$206,500</td>
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<td>Printing and publications</td>
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<td>TOTAL</td>
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### BUDGETS

**BASIC GEOLOGY AND GROUND WATER SURVEYS**

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**Proposed Disbursements:**

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<td>Printing and publications</td>
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<td>postage, freight, etc.)</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$22,165</strong></td>
<td><strong>$20,000</strong></td>
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THE MINERAL INDUSTRY OF NEW MEXICO

By law, it is not yet possible for any agency to publish complete figures on uranium production, though it is understood that the value of the product in New Mexico in the last two years would be in the millions of dollars. In spite of the lack of total figures on uranium the total value of mineral production in New Mexico has increased markedly in the past two years. This has been due largely to increase in oil, natural gas, natural gasoline, potash, and construction materials. These gains have more than offset the losses suffered by the coal industry and the producers of zinc and lead and fluorspar.

The importance of finding new materials and new supplies has been amply demonstrated in New Mexico in the past few years. The exploration for oil, gas, and potash which has been pushed vigorously has been rewarded with greatly increased supplies, production, and consequent income. The finding of large supplies of uranium with a guaranteed market has offset the concurrent decline in lead-zinc mining owing to the drop in price of lead and zinc below the economic limit in New Mexico. Technical personnel and some miners from the one industry have moved into the other. Perlite especially is an example of a new material that is giving industrial impetus to the State. Others must be found if it is at all possible and all possibilities must be explored to the limit.
<table>
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<th>Value</th>
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<td>73,497,181 bbls.</td>
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<td>Natural Gas 2/</td>
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<td>445,300,000 MCF</td>
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<td>Natural Gasoline and allied products 2/</td>
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<td>16,715,160</td>
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<td></td>
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<td>$206,725,781</td>
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**METALS 3/**

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<td>Columbite</td>
<td>0</td>
<td>0</td>
<td>1,550 lbs.</td>
<td>7,500</td>
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<tr>
<td>Copper</td>
<td>75,352 tons</td>
<td>39,338,365</td>
<td>63,745 tons</td>
<td>37,865,307</td>
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<tr>
<td>Gold</td>
<td>2,599 ozs.</td>
<td>87,697</td>
<td>3,295 ozs.</td>
<td>114,510</td>
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<tr>
<td>Iron</td>
<td>2,644 tons</td>
<td>15,440</td>
<td>350 tons</td>
<td>2,450</td>
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<tr>
<td>Iron-manganese</td>
<td>42,000 tons</td>
<td>168,000</td>
<td>8,200 tons</td>
<td>32,800</td>
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<tr>
<td>Lead</td>
<td>5,703 tons</td>
<td>1,659,801</td>
<td>2,093 tons</td>
<td>456,866</td>
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<tr>
<td>Manganese</td>
<td>9,189 tons</td>
<td>278,790</td>
<td>38,703 tons</td>
<td>1,113,568</td>
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<tr>
<td>Molybdenum</td>
<td>554 tons</td>
<td>621,212</td>
<td>699 tons</td>
<td>787,565</td>
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<tr>
<td>Selenium</td>
<td>13,735 lbs.</td>
<td>13,735</td>
<td>7,451 lbs.</td>
<td>7,451</td>
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<tr>
<td>Silver</td>
<td>346,874 ozs.</td>
<td>309,678</td>
<td>139,668 ozs.</td>
<td>122,303</td>
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<tr>
<td>Uranium</td>
<td>not available</td>
<td></td>
<td></td>
<td>3,019,463</td>
</tr>
<tr>
<td>Vanadium</td>
<td>21,867 tons</td>
<td>529,048</td>
<td>0</td>
<td>78,401</td>
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<tr>
<td>Zinc</td>
<td>35,004 tons</td>
<td>8,377,408</td>
<td>3,819 tons</td>
<td>817,993</td>
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<td></td>
<td></td>
<td></td>
<td>Total $51,431,174</td>
<td>$44,465,807</td>
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**NONMETALS 3/**

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<tbody>
<tr>
<td>Barite</td>
<td>6,767 tons</td>
<td>108,272</td>
<td>5,757 tons</td>
<td>100,000</td>
</tr>
<tr>
<td>Brick and tile</td>
<td>20,792 tons</td>
<td>77,246</td>
<td>12,767 tons</td>
<td>27,018</td>
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<tr>
<td>Crushed rock ballast</td>
<td>129,401 cu. yds.</td>
<td>132,720</td>
<td>201,343 cu. yds.</td>
<td>176,520</td>
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<tr>
<td>Diatomaceous earth</td>
<td>1,600 tons</td>
<td>25,600</td>
<td>3,730 tons</td>
<td>4,476</td>
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<tr>
<td>Drilling mud</td>
<td>1,460 tons</td>
<td>11,680</td>
<td>1,300 tons</td>
<td>10,400</td>
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<tr>
<td>Fire clay</td>
<td>4,406 tons</td>
<td>40,433</td>
<td>1,926 tons</td>
<td>5,776</td>
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<tr>
<td>Fluorspar</td>
<td>24,300 tons</td>
<td>803,463</td>
<td>20,470 tons</td>
<td>689,660</td>
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<tr>
<td>Gravel (pit-run)</td>
<td>79,810 cu. yds.</td>
<td>40,705</td>
<td>88,370 cu. yds.</td>
<td>25,919</td>
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<tr>
<td>Gravel (screened)</td>
<td>877,422 cu. yds.</td>
<td>803,565</td>
<td>750,391 cu. yds.</td>
<td>585,491</td>
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<tr>
<td>Perlite</td>
<td>60,846 tons</td>
<td>399,571</td>
<td>94,723 tons</td>
<td>642,699</td>
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<tr>
<td>Pottashe</td>
<td>8,729,047 tons</td>
<td>44,834,413</td>
<td>9,527,119 tons</td>
<td>48,336,221</td>
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<tr>
<td>Punice</td>
<td>188,992 tons</td>
<td>407,763</td>
<td>129,028 tons</td>
<td>212,386</td>
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<tr>
<td>Salt</td>
<td>7,310 tons</td>
<td>23,499</td>
<td>3,329 tons</td>
<td>16,873</td>
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<tr>
<td>Sand (pit-run)</td>
<td>8,077 cu. yds.</td>
<td>11,662</td>
<td>2,176 cu. yds.</td>
<td>2,176</td>
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<tr>
<td>Sand (screened)</td>
<td>374,996 cu. yds.</td>
<td>515,807</td>
<td>366,456 cu. yds.</td>
<td>595,788</td>
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<tr>
<td>Sowra</td>
<td>344,776 tons</td>
<td>309,396</td>
<td>281,146 tons</td>
<td>326,907</td>
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<tr>
<td>Shale</td>
<td>0</td>
<td>0</td>
<td>32,000 tons</td>
<td>32,000</td>
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<td></td>
<td>Total $48,545,795</td>
<td>$51,790,310</td>
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1/ New Mexico Oil Conservation Commission
2/ U. S. Bureau of Mines
3/ New Mexico State Inspector of Mines
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
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<tbody>
<tr>
<td>Eugene Callaghan</td>
<td>Director</td>
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<tr>
<td>E. C. Anderson</td>
<td>Mining Engineer</td>
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<tr>
<td>Willow M. Burand (Navajo Project; employed 7-6-53; resigned 8-16-53)</td>
<td>Mining Engineer</td>
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<tr>
<td>Joel L. Van Sant (Navajo Project; employed 8-24-53; resigned 11-6-53)</td>
<td>Mining Engineer</td>
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<tr>
<td>Stanley A. Mayer (Navajo Project; employed 1-25-53; resigned 5-21-54)</td>
<td>Mining Engineer</td>
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<tr>
<td>John E. Allen</td>
<td>Economic Geologist</td>
</tr>
<tr>
<td>Brewster Baldwin</td>
<td>Economic Geologist</td>
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<tr>
<td>Robert Balk</td>
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<tr>
<td>Henry L. Jicha, Jr.</td>
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<td>Frank E. Kottlowski</td>
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<td>Frederick J. Kuellmer</td>
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<tr>
<td>Robert H. Weber</td>
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<tr>
<td>Max E. Willard</td>
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<td>Robert A. Zeller (employed 10-1-52)</td>
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<tr>
<td>Robert A. Bieberman</td>
<td>Petroleum Geologist</td>
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<tr>
<td>Francis X. Bushman</td>
<td>Hydrologic Engineer</td>
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<td>Rousseau H. Flower</td>
<td>Stratigraphic Geologist</td>
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<td>Ming-Shan Sun</td>
<td>Mineralogist Petrographer</td>
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<tr>
<td>Wright W. Putney (resigned 9-7-53)</td>
<td>Scientific Illustrator</td>
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<tr>
<td>William E. Arnold (employed 1-4-54)</td>
<td>Scientific Illustrator</td>
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<tr>
<td>Wayne M. Bundy (resigned 12-1-52)</td>
<td>Geological Technologist</td>
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</table>
Alfred T. Miesch (resigned 9-1-52) . . . . . . . Geological Technologist
Charles P. Valentine (resigned 9-30-53) . . . . . . . Junior Geologist
Wilbur D. Pennington (resigned 4-7-53) . . . . . . . Junior Petroleum Geologist
Ray W. Foster (employed 11-19-53) . . . . . . . . . . . Junior Petroleum Geologist
Mrs. Marian R. Burks . . . . . . . . . . . . . . . . Office Manager
Mrs. Jean K. Burand (resigned 10-2-53) . . . . . . . Stenographer
Mrs. Emily C. Putney (resigned 9-7-53) . . . . . . . Stenographer
Florence B. Crespin . . . . . . . . . . . . . . . . . . . . . Stenographer
Myrtie M. Morris (employed 5-11-53) . . . . . . . Stenographer
Mrs. Barbara A. Detterick (employed 9-21-53) . . . . . . . Stenographer

ON LOAN FROM U. S. GEOLOGICAL SURVEY

Ralph E. Smith (transferred) Geologist, Ground Water Survey
Zane E. Spiegel (transferred) . . . Geologist, Ground Water Survey
Alexander Nicholson, Jr. (employed 12-30-52) Geologist, Ground Water Survey
Charles F. Berkstresser, Jr. (employed 7-20-53) Geologist, Ground Water Survey

PART-TIME ASSISTANTS

Robert E. Ahkeah (Navajo Project – Interpreter), Shiprock, New Mexico
A. K. Armstrong, University of New Mexico
Fidelia M. Baldonado, Socorro, New Mexico
Billy Dean Bobbit, Clayton, New Mexico
Wilgus B. Creath, St. Louis, Missouri
Richard N. Cowles, New Mexico Institute of Mining and Technology
Gerald J. Monroe, Clayton, New Mexico
Kendyl K. Monroe, Clayton, New Mexico
Byron Nixon, New Mexico Institute of Mining and Technology
Eugene O'Connor, New Mexico Institute of Mining and Technology
Andrew J. Parker, Hachita, New Mexico
Robert V. Shull, New Mexico Institute of Mining and Technology
Robert Simonson, Baltimore, Maryland
Kenneth E. Sorenson, Jr., New Mexico Institute of Mining and Technology
Thomas A. Vorhees, New Mexico Institute of Mining and Technology
Kent Wainwright, New Mexico Institute of Mining and Technology

GEOLOGISTS ON SPECIAL PROJECTS

Richard H. Johns, California Institute of Technology
William R. Muehlberger, The University of Texas
Clay T. Smith, New Mexico Institute of Mining and Technology
Charles E. Stearns, Harvard University
M. L. Thompson, University of Wisconsin
L. M. Cline, Texas Technological College and University of Wisconsin

TEMPORARY EMPLOYEES

A. K. Armstrong, Jr., geologist
David Givens, geologist
Oscar Strongin, geologist

FIELD ASSISTANCE FELLOWSHIPS

William S. Bassett, Columbia University
Fred Barker, California Institute of Technology
Donald W. Boyd, Columbia University
Allen F. Corey, University of Michigan
R. Fred Fleige, Jr., Washington University
John L. Gehrig, University of Wisconsin
Elliot Gillerman, The University of Texas
David B. Givens, University of California
Harry B. Groom, Harvard University
Charles H. Hewitt, University of Michigan
John D. Hill, University of New Mexico
James T. Johnson, New Mexico Institute of Mining and Technology
William C. Kelly, Columbia University
Carel Otte, Jr., California Institute of Technology
Robert F. Schmalz, Harvard University
Oscar Strongin, Columbia University
William D. Tipton, New Mexico Institute of Mining and Technology
William H. Tonking, Northwestern University
John H. Schilling, Harvard University
FIELD PROJECTS – 1954

The field projects listed below and located on the attached map are described in this report.

Regional and special projects

1. Costilla and Latir Peak quadrangles.
2. Questa and Eagle Nest quadrangles.
3. Big Rock and other kyanite deposits.
4. El Rito quadrangle.
5. Santa Fe area.
6. Cerrillos Hills area.
7. Thoreau NE quadrangle.
8. South Manzano Mountains
10. Magdalena perlite deposits.
11. Socorro perlite deposit.
12. Area east of Socorro.
15. Sacramento Mountains area.
16. Lookout Mountain quadrangle.
17. Winston and Sugarloaf Mountain quadrangles.
18. Geologic section of Black Range.
20. Lake Valley quadrangle.
23. Topical study of gossans.
24. Columbus and Hermanas quadrangles.
25. Picuris Range.
26. Las Cruces quadrangle.
27. Three Rivers area.
28. La Luz area.
29. Datil NE quadrangle.
30. Mt. Sedgwick quadrangle.
31. Fort Defiance and Tohatchi quadrangles.
32. Pelona NE and NW quadrangles.
33. Hansonburg mining district.
34. Las Tablas quadrangle.
35. Foster Canyon quadrangle.
36. Bland mining district.
37. Socorro manganese district.
38. Contact metamorphism in Sierra Rica and other areas.
46. Coal in Capitan quadrangle.
47. Ojo Caliente area, Rio Arriba County (included in area of Project 4).
48. Iron Mountain tungsten, Sierra County (included in area of Project 17).
49. Hermosa district.

50. Mud Springs Mountains quadrangle.

51. Questa Mine area.

54. Inscription Rock quadrangle.

55. Hillsboro quadrangle.

56. Fresnal Canyon, Sacramento Mountains.

57. Mineral survey of the Navajo Reservation in New Mexico.

60. Pyramid Mountains, Lordsburg quadrangle.

61. Cerro Verde SW quadrangle.

62. Pennsylvanian stratigraphy and paleontology in Whiskey Canyon, Mud Springs Mountains.

65. Middle Well quadrangle.

66. Cienega area.

67. Wallrock alteration in Bland district.

68. Walnut Wells quadrangle.

69. Steins area.

70. Gila River area.

71. Uranium associated with fluor spar at Monticello.

73. North extension of Magdalena district.

Ground-water Studies:

A. San Miguel County.

B. Torrance County.

C. North Socorro County.

D. Socorro-Magdalena area.
E. Eddy County,
F. Tucumcari, Quay County.
G. South Lea County.
H. Union County.
J. Quay County.
FIELD PROJECTS - 1954

FIELD WORK IN PROGRESS

- Ground-Water resources
- Regional mapping

FIELD WORK COMPLETED

- Ground-Water resources
- Regional mapping
NEW MEXICO BUREAU OF MINES & MINERAL RESOURCES
NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY
CAMPUS STATION
SOCORRO, NEW MEXICO

Publications

(Revised September 1, 1954)

PUBLICATIONS OF THE MINERAL RESOURCES SURVEY

<table>
<thead>
<tr>
<th>No.</th>
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<th>Date</th>
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<tr>
<td>1</td>
<td>The Mineral Resources of New Mexico; Fayette A. Jones</td>
<td>1915</td>
<td>Out of print</td>
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<tr>
<td>2</td>
<td>Manganese in New Mexico; E. H. Wells</td>
<td>1918</td>
<td>Out of print</td>
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<tr>
<td>3</td>
<td>Oil and Gas Possibilities of the Puertecito District, Socorro and Valencia Counties, New Mexico; E. H. Wells</td>
<td>1919</td>
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PUBLICATIONS OF THE NEW MEXICO BUREAU OF MINES AND MINERAL RESOURCES

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<tr>
<td>4</td>
<td>Fluorspar in New Mexico; W. D. Johnston, Jr. (Superseded by Bulletin 21)</td>
<td>1928</td>
<td>Out of print</td>
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<tr>
<td>5</td>
<td>Geologic Literature of New Mexico; T. P. Wootton (Superseded by Bulletin 22)</td>
<td>1950</td>
<td>Out of print</td>
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<tr>
<td>6</td>
<td>Mining and Mineral Laws of New Mexico; Charles H. Fowler (Superseded by Bulletin 16)</td>
<td>1950</td>
<td>Out of print</td>
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<tr>
<td>7</td>
<td>The Metal Resources of New Mexico and Their Economic Features; S. G. Lasky and T. P. Wootton</td>
<td>1955</td>
<td>Out of print</td>
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<tr>
<td>8</td>
<td>The Ore Deposits of Socorro County, New Mexico; S. G. Lasky</td>
<td>1952</td>
<td>.50</td>
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<tr>
<td>9</td>
<td>The Oil and Gas Resources of New Mexico; Dean E. Winchester (First edition; superseded by Bulletin 18)</td>
<td>1953</td>
<td>Out of print</td>
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<tr>
<td>10</td>
<td>The Geology and Ore Deposits of Sierra County, New Mexico; G. Townsend Harley</td>
<td>1954</td>
<td>Out of print</td>
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<tr>
<td>11</td>
<td>The Geology of the Organ Mountains, with an Account of Dona Ana County, New Mexico; Kingsley Charles Dunham</td>
<td>1955</td>
<td>Out of print</td>
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<td>12</td>
<td>The Non-Metallic Mineral Resources of New Mexico and their Economic Features (Exclusive of Fuels); S. B. Talmage and T. P. Wootton</td>
<td>1936</td>
<td>.50</td>
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<td>13</td>
<td>Geology and Economic Features of the Pegmatites of Taos and Rio Arriba Counties, New Mexico; Evan Just</td>
<td>1937</td>
<td>.50</td>
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<td>14</td>
<td>Some New Mexico Fusulinidae; G. E. Needham</td>
<td>1937</td>
<td>.50</td>
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<tr>
<td>15</td>
<td>The Geology and Ore Deposits of Northeastern New Mexico (Exclusive of Colfax County); G. Townsend Harley</td>
<td>1940</td>
<td>Out of print</td>
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<tr>
<td>16</td>
<td>Mining, Oil, and Mineral Laws of New Mexico; C. H. Fowler and S. B. Talmage (Superseded Bulletin 6)</td>
<td>1941</td>
<td>.75</td>
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<td>17</td>
<td>Pennsylvanian System in New Mexico; M. L. Thompson</td>
<td>1942</td>
<td>Out of print</td>
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<td>18</td>
<td>The Oil and Gas Resources of New Mexico; compiled by Robert L. Bates (Second edition; superseded Bulletin 9)</td>
<td>1942</td>
<td>Out of print</td>
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<td>19</td>
<td>Manganiferous Iron-ore Deposits near Silver City, New Mexico; Lawson P. Entwistle</td>
<td>1944</td>
<td>Out of print</td>
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<tr>
<td>20</td>
<td>Stratigraphy of the Colorado Group, Upper Cretaceous, in Northern New Mexico; Charles H. Rankin</td>
<td>1944</td>
<td>Out of print</td>
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<tr>
<td>21</td>
<td>Fluorspar Resources of New Mexico; H. E. Roebrock, C. H. Johnson, and A. D. Hahn (Superseded Bulletin 4)</td>
<td>1946</td>
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<tr>
<td>22</td>
<td>Geologic Literature of New Mexico Through 1944; Robert L. Bates and Marian R. Burks (Superseded Bulletin 5)</td>
<td>1945</td>
<td>Out of print</td>
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</table>
25 Stratigraphy and Oil-producing Zones of the Pre-San Andres Formations of Southeastern New Mexico—A Preliminary Report; Robert E. King
24 Building Blocks from Natural Lightweight Materials of New Mexico; Donn M. Clippinger
25 Mica Deposits of the Petaca District, Rio Arriba County, New Mexico, with Brief Descriptions of the Ojo Caliente District, Rio Arriba County, and the Elk Mountain District, San Miguel County; Richard H. Jahns
26 Geology of the Gran Quivira Quadrangle, New Mexico; Robert L. Bates, Ralph H. Wiltolt, Archie J. MacAlpin, and Georges Vorbe
27 Contributions of New Mexico's Mineral Industry to World War II; compiled by T. D. Benjovayky
28 Pumice Aggregate in New Mexico—Its Uses and Potentials; Donn M. Clippinger and Walter E. Gay
29 Pre-San Andres Stratigraphy and Oil-producing zones in Southeastern New Mexico—A Progress Report; E. Russell Lloyd
30 Pre-Cambrian Geology of the Picuris Range: North-Central New Mexico; Arthur Montgomery
31 Geology of the Thoreau Quadrangle, McKinley and Valencia Counties, New Mexico (includes map); Clay T. Smith
32 Compilation of State Tax Law Relating to Oil, Gas and Mining Properties in New Mexico; E. P. Ripley (Supercies Circular 13)
33 Geologic Section of the Black Range at Kingston, New Mexico; Frederick J. Kuebler
34 Mineral Resources of the Fort Defiance and Tohatchi Quadrangles, Navajo Indian Reservation, Arizona and New Mexico; John Elliot Allen and Robert Balk
40 Cambrian Cephalopods; Rousseau H. Flower

(Guideline 84-39 in preparation)

GROUND-WATER REPORTS

*1 Geology and Ground-Water Resources of the Eastern Part of Colfax County, New Mexico; Roy L. Griggs
*2 Geology and Ground-Water Resources of San Miguel County, New Mexico; R. L. Griggs and G. E. Hendrickson
*3 Geology and Ground-Water Resources of Eddy County, New Mexico; G. E. Hendrickson and R. S. Jones

OIL AND GAS REPORTS

4-A New Mexico Oil and Gas Statistical Data for 1948; compiled by E. E. Kinney, Lea County Operators Committee, and New Mexico Oil Conservation Commission
4-B New Mexico Oil and Gas Engineering Data for 1948, compiled by E. E. Kinney, Lea County Operators Committee, and New Mexico Oil Conservation Commission
4-C San Juan Basin, New Mexico, Oil and Gas Data Summary Cumulative to January 1, 1949; compiled by E. E. Kinney
5-A New Mexico Oil and Gas Statistical Data for 1949; compiled by E. E. Kinney, Lea County Operators Committee, and New Mexico Oil Conservation Commission
5-B New Mexico Oil and Gas Engineering Data for 1949; compiled by E. E. Kinney, Lea County Operators Committee, and New Mexico Oil Conservation Commission

CIRCULARS

1 An Outline of the Mineral Resources of New Mexico; E. H. Wells
2 Geology and Ore Deposits of the Ground Hog Mine, Central District, Grant County, New Mexico; S. G. Lasky

* Prepared in cooperation with the U. S. Geological Survey and the State Engineer of New Mexico.
** Prepared under contract for the Bureau of Indian Affairs.
First, Second, and Third Annual Reports of the Director, and Preliminary Report for the Fourth Year; E. H. Wells... 1931 Out of print
The Hobbs Field and Other Oil and Gas Areas, Lea County, New Mexico; Dean E. Winchester... 1931 Out of print
Gold Mining and Gold Deposits in New Mexico; E. H. Wells and T. P. Wootton, 1932; revised by T. P. Wootton... 1940 No charge
Carbon Dioxide in New Mexico; E. H. Wells and A. Andreas (Superseded by Circular 8) ... 1938 Out of print
Outlook for Further Ore Discoveries in the Little Hatchet Mountains, New Mexico; S. G. Lasky... 1940 Out of print
Selected Bibliography on Coal in New Mexico; Robert L. Bates... 1948 No charge
Carbon Dioxide in New Mexico; Sterling B. Talmage and A. Andreas (Reprinted from Bulletin 18)... 1942 No charge
Natural Light-weight Building-block Materials of New Mexico; T. D. Benjovsky and D. M. Clippinger... 1945 Out of print
Reconnaissance Survey of the Headstone Mining District, Rio Arriba County, New Mexico; T. D. Benjovsky... 1945 Out of print
Future Oil Possibilities of New Mexico; Robert L. Bates... 1946 Out of print
Compilation of State Tax Law Relating to Mineral Properties in New Mexico; E. P. Ripley (Superseded by Bulletin 32)... 1946 Out of print
Oil and Gas Production Data, Eddy County, New Mexico, 1943-1945; compiled by N. Raymond Lamb and W. B. Macey... 1947 Out of print
Tables of Fluorescent and Radioactive Minerals; compiled by Robert L. Hershey... 1947 No charge
New Mexico Oil and Gas Production Data for 1946 (Exclusive of Lea County); compiled by N. Raymond Lamb and W. B. Macey... 1947 No charge
Caprock Pool Statistical Report, Chaves and Lea Counties, New Mexico; compiled by N. Raymond Lamb and William E. Macey... 1947 Out of print
Geology and Ore Deposits of Red River and Twining Districts, Taos County, New Mexico—A Preliminary Report; Charles F. Park, Jr., and Philip F. McKinlay... 1948 Out of print
New Mexico Oil and Gas Statistical Data for 1947; compiled by N. Raymond Lamb and Lea County Operators Committee... 1948 Out of print
New Mexico Oil and Gas Engineering Data for 1947; compiled by N. Raymond Lamb and Lea County Operators Committee... 1948 Out of print
New Mexico Oil and Gas Summary Data for 1948; compiled by Lea County Operators Committee... 1949 Out of print
Barite of New Mexico; compiled by Donn M. Clippinger... 1949 No charge
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Geology of a Part of Northwestern Mora County, New Mexico; George O. Bachman. Scale 2 inches to 1 mile. *Map* OM137, Oil and Gas Investigations 1953 .50

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Map Showing Geologic Structures of the Southern Part of the San Juan Basin, including Parts of San Juan, McKinley, Sandoval, Valencia, and Bernalillo Counties, New Mexico; compiled by C. B. Hunt and C. H. Dane. Scale 1 inch to 2 miles. *Map* OM158, Oil and Gas Investigations 1954 .50

Total intensity aeromagnetic maps of parts of Guadalupe and De Baca Counties, N. M., (R. 21 E.-R. 26 E. and T. 3 N.-T. 6 N.); W. J. Dempsey and M. E. Hill. Scale 1 inch to 1 mile; contour interval, 10 gammas. *Map* GP 15, Geophysical Investigations 1950 .20

*Prepared in cooperation with the New Mexico Bureau of Mines and Mineral Resources.
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