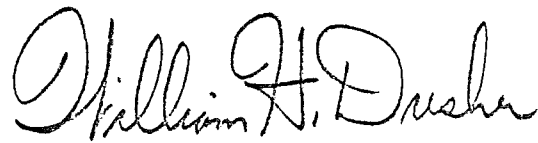


1976-77

ANNUAL REPORT

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WILLIAM H. DRESHER, Director  
July 8, 1977

This report is preliminary and has not been edited or reviewed for conformity with Arizona Geological Survey standards

ARIZONA GEOLOGICAL SURVEY  
OPEN-FILE REPORT

77-4

SUMMARY OF ACTIVITIES DURING 1976-77

The Arizona Bureau of Mines accomplished a major goal during 1976-77 with the passage of legislation by the 33rd Legislature, 1st regular session, which changes the name of this organization to "Bureau of Geology and Mineral Technology" and redefines its duties and objectives so that they are more in accord with the needs of the State in these changed times. Our effort in this endeavor was greatly assisted by the favorable official stand taken by the top University administrative officers and would not have succeeded without that support. . .

The following listing outlines our major activities and accomplishments for 1976-77:

PUBLIC SERVICE...

Performed analyses on 438 sample lots comprising 1,421 samples of rock and minerals brought to the Bureau by members of the public.

Performed metallurgical process amenability tests on 42 lots of ores for members of the public.

Provided consultative advice to 452 individuals who visited the offices of the Bureau seeking advice pertaining to geology, minerals, and mining.

Distributed 45 mineral and rock kits free to public schools for educational purposes.

Distributed 4,846 technical bulletins, 5,960 maps, and 26,742 copies of the Bureau's quarterly publication, FIELDNOTES.

Participated in deliberations of:

- Governor's Advisory Commission on Arizona's Environment
- Steering Committee for Pima County Planning and Zoning
- Governor's Interagency Energy Planning Office

Provided lectures on geology, minerals, and mining at:

- numerous public schools
- Audubon Society's Institute of Desert Ecology
- Grand Canyon College
- environmental education field trip sponsored by the Arizona Sonora Desert Museum

Provided technical assistance to:

- Arizona Department of Mineral Resources
- Arizona State Mine Inspector
- U.S. Forest Service
- U.S. Bureau of Mines
- City of Tucson
- United Nations
- several mining companies

Provided assistance to:

- All Arizona AIME Section meetings
- AIME Section Programs
- several professional journals

RESEARCH...

Completed survey and index of mining properties in Yuma County (reported as Bulletin 192, in press).

Completed a field study of geologic hazards in the Canada del Oro-Santa Cruz Valley area for the United States Geological Survey.

Conducted research into the possible use of City of Tucson-municipal sewage water effluent in copper mining and milling operations under the sponsorship of the Office of Water Resources Research.

Assisted the United States Bureau of Mines in the collection of mineral production statistics in the State of Arizona.

Served as Arizona Collaborator in Seismology with the National Oceanic and Atmospheric Administration and the United States Geological Survey.

Completed resource and marketability study on peridot deposits on the San Carlos Apache Indian Reservation.

Conducted research on the application of geology in land-use planning.

Completed a study for the United States Bureau of Mines titled "Recommendations for the Inventory of the Public Lands of the United States for their Availability to Mineral Exploration and Development."

Conducted research into the occurrence of geothermal energy sources in southern Arizona under a contract sponsored by the Energy Research and Development Administration.

### MAJOR STRENGTHS

The Arizona Bureau of Mines is the earth science and mineral resource experimental and informational agency of the State. Its major strength lies in its affiliation with the University of Arizona and the College of Mines. This affiliation affords the Bureau the freedom from the regulatory, promotional, and policy-making responsibilities of most state agencies and the opportunity to be objective in its scientific and practical interpretation of natural phenomena. Further, the Bureau, being a public service agency, requires accessibility to the public. Its location near the University campus, in the heart of the major mineral-producing area of the State, is a decided asset to its mining and metallurgical services.

Recently, the position of the Bureau was greatly strengthened by the passage of H.B. 2060, which establishes the organization as the "Bureau of Geology and Mineral Technology" and specifically places the geologic function for State government firmly within our structure through the creation of our Geological Survey Branch, to be headed by the "State Geologist." There is evidence that this change in status is already influencing the thinking of other State agency personnel, in that some are now recognizing our function and have started to invite us to participate as partners in their project planning where geology is a factor. There is little doubt that this will improve and enlarge our image as a useful and needed State agency.

The staff of the Arizona Bureau of Mines is extremely well-suited for the service role of the organization. Their patience and diligence in this respect has been outstanding. The expertise of the staff covers a variety of specialities and a broad background of knowledge concerning the State and its resources. These strengths complement the informational responsibilities of the Bureau and enable it to fulfill the major duty of a state geological survey--"to provide answers to local problems in applied geology based on the intimate knowledge of the staff."<sup>1</sup>

<sup>1</sup>Linn Hoover, former Executive Director, American Geological Institute.

## MAJOR LIMITATIONS

The major limitation of the Arizona Bureau of Mines is its small size compared to similar agencies in other states. The Bureau serves as the geological survey of the State, and as such its operations and services should be comparable to those of other states. The State of Arizona is one of the larger states (approximately 115,000 square miles), has the largest non-fuel mineral industry, and is one of the fastest growing states in the nation. In spite of this, the Arizona Bureau of Mines has one of the smallest budgets of any of the survey organizations in the United States and, consequently, has one of the smallest professional staffs.

The budgeting treatment of the Arizona Bureau of Mines as a research unit of the University is a detriment to its operations in times of budget restrictions to education. This is well demonstrated by the funding restrictions the Bureau has suffered in the 1977-78 budget for professional salaries. The Arizona Bureau of Mines is a statutory unit of State government and, therefore, is a research and information arm of State government. While funding is sought and obtained from non-state sources, it is entirely appropriate for the State to be the major contributor to the Bureau's budget.

The Bureau suffers from the lack of a full-time individual who is responsible for the programs and well-being of the organization. Arizona is only one of two states to have the responsibility for the organization to be shared by that of a college dean...a practice which has been common only to a few western states. The output of the Bureau in terms of information derived and disseminated about the natural environment of the State suffers as a consequence of its small size and from having only a part-time director.

Space has continued to be a major problem for the Bureau during 1976-77-- both with regard to amount and location. The Bureau has only one laboratory equipped to carry out research and ore testing. At times as many as five simultaneous projects are conducted in this laboratory. Such diverse and crowded use of one laboratory leads to confusion, low efficiency, mistakes, and safety hazards. The Bureau needs additional, well-equipped laboratory space if it is to function as a viable research-service organization.

The mineral technology staff is involved in both service and investigative research. The nature of the research requires a large amount of technical support for a small amount of research. Since there is no technical support staff for mineral technology, the professional staff members must be their own technicians. This is not only a wasteful use of manpower, but it limits the amount of research that can be accomplished and eliminates other functions in which the Bureau should be involved. The mineral technology branch needs a metallurgical technician and an analytic technician to free the professional staff for more productive work.

The Bureau is responsible for the crushing facilities that are jointly used by the Bureau, College of Mines, and College of Earth Sciences. In addition to normal University use, the crushing equipment is used by non-University personnel. The dust control system in the crushing laboratory is very poor and needs to be replaced with an improved system that will remove most of the dust from the air.

## FUTURE PLANS

Continuing its efforts to grow apace with the needs of our changing society, the Geological Survey Branch will continue its studies of geologic hazards and how they affect the continuing urban development of the State, and also try to develop recommendations on how to alleviate some of the more common detrimental effects.

Negotiations have been completed between the Bureau and the U.S. Geological Survey whereby the Bureau will take over the servicing and monitoring of the Tucson station of the World-Wide Seismic Net through a telemetered circuit. The hardware for this project will be installed prior to October 1, 1977, and the contract will take effect on that date with renewals planned to be effective on an annual basis. It is our intention to use the station with modifications, to establish an Arizona seismic net in cooperation with the Department of Geosciences.

Some success has been achieved in expanding our publication program through cooperation with the Geology Department at Arizona State University and steps are being taken to extend our cooperative efforts to other schools and State agencies. In this regard, preliminary plans are being made with the Oil and Gas Conservation Commission, the State Land Department, the Water Commission, and possibly other State agencies to develop a new, more accurate, and more detailed State geologic map designed for the specific needs of these various agencies.

Efforts to obtain grant monies from Federal and private sector sources to fund projects of importance and benefit to Arizona will be continued at an accelerated rate.

In the Mineral Technology Branch of the Bureau, research to determine the feasibility of using municipal waste water in copper milling and processing operations will be continued for at least one year, and a new project will be initiated to study the recovery of copper from leach solution by cementation.

The Mineral Technology Branch conducts a wide variety of metallurgical amenability tests each year. Although many of the ore tests are very similar, no standard procedures have been developed for ore tests. Thus, standard procedures for the most common ore tests will be developed by the mineral technology staff.

A cooperative research effort with the Department of Metallurgical Engineering will be initiated to develop laboratory experiments in mineral processing and to accumulate operating data on pilot scale equipment.

Improved liason with the mining industry and government organizations will be pursued through visits to mining properties, attendance at mining and mineral processing professional meetings, and contacts with individuals.

A short course entitled, "Elements of Extractive Metallurgy," will be presented at the All Arizona Section Meeting of the AIME in December 1977. The purpose of this course will be to provide an elementary introduction to extractive metallurgy for individuals working in the mining industry who have little technical training in metallurgy. The course will be offered as a joint venture with the Department of Metallurgical Engineering.

PRO FORMA

1976-77 EXPENDITURE BY CATEGORY

	<u>AMOUNT*</u>	<u>PERCENTAGE</u>
<u>TECHNICAL AND ENVIRONMENTAL SERVICES</u>		
Mineral and Rock Identification	\$ 14,197	4.8
Metallurgical Process Amenability	19,332	6.5
Consultation to Citizens and Other State Agencies	60,994	20.6
Subtotal	\$ 94,523	31.9
<u>MINERAL RESOURCE AND GEOLOGICAL INFORMATION</u>		
Mineral and Rock Collections	\$ 250	0.1
Oil and Water Well Repository	4,530	1.5
Geologic Research	32,678	11.0
Metallurgical Research	19,447	6.6
Fieldnotes	17,178	5.8
Teaching, College of Mines	2,800	0.9
Attendance and Participation, Prof. Soc. Activities	12,100	4.1
Reprinting out-of-print Maps and Bulletins	3,000	1.0
Yuma County Mine Index Project (Bull. in Preparation)	18,750	6.3
Uranium Favorability of Paleozoic Rocks (Circ. 19)	7,050	2.4
Chemical Analyses of Coal Samples, Black Mesa (Circ. 18)	3,510	1.2
Geology of the White Mtns. (Bull. in Preparation)	9,409	3.2
Geology of Southern Tucson Mtns. (Bull. in Preparation)	13,017	4.4
Geologic Map and Sections of Arizona (Map 14)	6,306	2.1
Subtotal	\$151,525	50.6
<u>ADMINISTRATION</u>		
Operations Direction	\$ 32,014	10.8
Clerical	19,922	6.7
Subtotal	\$ 51,936	17.5
TOTAL	\$296,484	100.00
<u>SOURCES OF INCOME</u>		
Operating Budget	\$278,208	
Service Charges	5,653	
Transferred		
--Publications fund	\$ 1,348	
--Grants	11,275	
	\$ 12,623	
TOTAL	\$296,484	

\*Exclusive of fringe benefits  
to employees and university overhead

PUBLICATIONS FUND (REVOLVING)\*\*

Carry-over from 1975-76	\$18,310
Collections (7/1/76--6/30/77)	<u>13,656</u>
TOTAL INCOME	\$31,965

Expenditures	
--Publications Cost	\$1,348
--Refunds	<u>5</u>
TOTAL EXPENDITURE	\$ 1,353

Carry-over to 1977-78	\$30,612
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