

TN 1
07

The Ore Bin



LIBRARY
Marine Science Laboratory
Oregon State University

FEB 19 1976

Volume 38, No. 1
January 1976



STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

The Ore Bin

Published Monthly By

STATE OF OREGON

DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

Head Office: 1069 State Office Bldg., Portland, Oregon - 97201

Telephone: [503] - 229-5580

FIELD OFFICES

2033 First Street
Baker 97814

521 N. E. "E" Street
Grants Pass 97526

X X X X X X X X X X X X X X X X X X

Subscription Rate

1 year - \$3.00; 3 years - \$8.00

Available back issues - \$.25 at counter; \$.35 mailed

Second class postage paid at Portland, Oregon

X X X X X X X X X X X X X X X X X X

GOVERNING BOARD

R. W. deWeese, Portland, Chairman

Leeanne MacColl, Portland

H. Lyle Van Gordon, Grants Pass

STATE GEOLOGIST

R. E. Corcoran

GEOLOGISTS IN CHARGE OF FIELD OFFICES

Howard C. Brooks, Baker

Len Ramp, Grants Pass

X X X X X X X X X X X X X X X X X X

Permission is granted to reprint information contained herein.

Credit given the State of Oregon Department of Geology and Mineral Industries
for compiling this information will be appreciated.

OREGON'S MINERAL AND METALLURGICAL INDUSTRY IN 1975

Ralph S. Mason, Deputy State Geologist
Oregon Department of Geology and Mineral Industries

Oregon's mineral industry declined 15 percent from 1974, reflecting the overall condition of the economy. Sand and gravel and stone, accounting for 62 percent of the total, were down 27 percent. Offsetting these losses were increases in clay, pumice, and items that could not be disclosed in the U. S. Bureau of Mines canvass. Despite current high values for gold and silver, neither commodity was separately identified this year. A table summarizing the State's production for 1974 and 1975 is shown on page 2.

Recreational interest in placer gold and semi-precious gemstones continued at a high level as vacationers turned to low-cost outings in the hills instead of distant travel.

No new major mining operations were announced during the year although several large companies fielded exploration teams for uranium, copper, molybdenum, and gold.

Industrial Minerals

Although fossil fuels continued to occupy center stage, there was a steadily growing alarm within Oregon over supplies of aggregate. Once regarded as plentiful if not inexhaustible, sand and gravel reserves are now belatedly recognized as finite. In some areas this vital resource will be largely depleted within the next 25 years. Two southern Oregon counties, Jackson and Josephine, have inventoried some of their aggregate supplies under a cooperative arrangement with the Department. Several other counties are planning similar studies to be conducted by Department personnel. In the greater Portland area, competition for land has caused recurrent problems as encroaching urbanization and increased demand for aggregate form two diametrically opposed factions striving to use the same land. Both the developer and the aggregate supplier are necessary for community economic health and growth, but detailed information on the

Table 1. Some of Oregon's minerals at a glance

<u>Mineral</u>	<u>1974</u>	<u>1975*</u>
Clays	\$ 243,000	\$ 328,000
Gemstones	500,000	500,000
Lime	2,818,000	2,545,000
Nickel	W	W
Pumice	1,887,000	3,662,000
Sand and gravel	30,948,000	27,003,000
Silver	42,000	W
Stone	43,406,000	27,387,000
Value of items not disclosed: cement, copper, diatomite, gold, lead, talc, zinc, "W" values above	24,076,000	27,041,000
TOTAL	\$103,920,000	\$88,466,000
W-withheld; *preliminary		

capabilities and liabilities of each parcel of land must be thoroughly assessed if the difficulty is to be resolved.

An ingenious solution to both the problem of aggregate supply and disposal of solid waste has been proposed by Paul W. Hughes, a consultant to the Department. Hughes suggests that unit trains haul milled solid waste from metropolitan centers to up-river sites having large reserves of sand and gravel. (Milled waste is domestic garbage which has been culled of all recyclable materials and then compressed into dense cubes.) At the site the baled waste would be exchanged for aggregate for the return trip.

The inherent economies and flexibility of unit-train haulage should make this system attractive to communities not adjacent to river-barge transportation. Since solid-waste production and aggregate demand are both closely related to population density, it should be possible to work out efficient schedules for collection and delivery. Many of the objections to solid-waste disposal sites would be overcome by Hughes' proposed solution. Milled waste can be deposited in worked-out aggregate pits and covered with topsoil or reject fines from the quarrying operation. Since the material is compact, little or no subsidence follows, and leachate and gas problems are reduced to a minimum.

Fossil Fuels

A study updating the economics of and the technology available to the Coos Bay coal field was completed by the Department early in the year. The study concluded that under present conditions it did not appear to be feasible to open any mines but that the reserves should be protected so that they would be accessible at some later date.

The search for uranium was carried out by several exploration groups, mainly in south-central Oregon. Uranium was produced at two Lake County mines about 15 years ago and a 200-ton-per-day plant was erected near Lakeview. The plant has been idle since the mines closed, and at year's end it was being stripped of all remaining equipment.

The Metals

Oregon continued to be the only state producing primary nickel. Production of nickel increased from 16,618 tons in 1974 to 19,031 tons in 1975. The Department conducted a survey in cooperation with the U.S. Bureau of Mines of nickel reserves in southwestern Oregon. Additional interest in Oregon nickel was indicated by Inspiration Copper and Hanna Nickel, both of whom fielded exploration teams during the year.

Johns Manville Co. continued its investigation of a copper-molybdenum prospect in the Bald Mountain area east of Baker.

A brief flurry of activity at the old Bonanza mine in Baker County died after rather high gold values could not be duplicated with additional drilling.

* * * * *

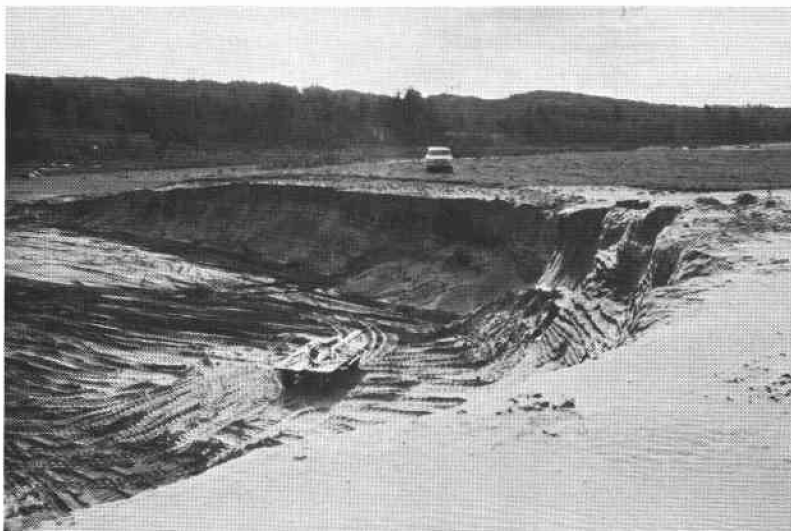
MINED LAND RECLAMATION

Standley L. Ausmus, Administrator, Mined Land Reclamation
Oregon Dept. of Geology and Mineral Industries

Since its enactment by the 1971 Legislative Session, Oregon's Surface Mining Law has undergone some notable changes and revisions, including the modifications by the 1975 Legislature made effective on September 13, 1975.

In spite of the changes, the basic concept remains unchanged, which is: Any surface mining operation conducted after July 1, 1972 requires a permit from the Department of Geology and Mineral Industries. This permit requires an approved reclamation plan for the site. Surface mining is defined in the statute but essentially involves the removal of any mineral material above the minimum quantities (2,500 yards per 12 months or 1 acre of affected area - 1975 amendment). This includes sand, pumice, gravel, rock, topsoil, cinders, gemstone, or any other metallic or nonmetallic mineral substance mined by any above-ground method. Underground mining is not covered by this law. Also excluded are materials removed from any waters of the State, subject to a removal/fill permit issued by the Division of State Lands.

A review of all requirements of this rather complex piece of legislation is clearly beyond the scope of this article. Anyone contemplating any surface mining activity is urged to write to the Department of Geology and Mineral Industries, Division of Mined Land Reclamation, P.O. Box 1028, Albany, Oregon 97321 - telephone (503) 928-5386.



A sand deposit in Clatsop County undergoes concurrent excavation and reclamation. Area of removal is limited to 2 acres; that beyond the pit has already been reclaimed.



Same area as top photo. Pit has been leveled, top soil replaced, and grass seeded for pasture. Excavation is proceeding in foreground.

Although difficulties have been experienced in administering the program, chiefly because of the lack of funds (nearly all funding has come from operator fees), the program has grown noticeably since its beginning in January of 1974. The following table indicates the expanding level of compliance during the past 24 months.

	1974		1975		
	Jan. 1	June 30	Jan. 1	June 30	Dec. 31
Site registration	-	190	589	918	1,089
Fee sites (included above)	-	70	181	359	452

Site registrations should begin to level off by the end of the biennium, with about 1,500 active sites expected at any one time. Not all of these will produce fee revenue. Fee sites should hold at about the 1,000 to 1,100 figure after 1977. This is essentially the figure projected by the Department in 1973.

The effectiveness of the program must be measured by the number of successful reclamation projects going on and the increased acceptance of the "reclamation ethic" by both the mining industry and the public.

The lawmakers stated the policy quite clearly in these terms: To "...allow the mining of valuable minerals in a manner designed for the protection and subsequent beneficial use of the mined and reclaimed land [and] to provide that the usefulness, productivity, and scenic values of all lands and water resources affected by surface mining shall receive the greatest practical degree of protection and reclamation...." ORS 517.760 1(e) and 2(a).

The accompanying photographs show one type of reclamation practice. Concurrent extraction and reclamation minimizes disturbance of the land and maximizes recovery of the resource but can only be achieved by careful pre-planning and application. In Oregon, 177 reclamation projects are being conducted, with the number increasing each month.

* * * * *

OREGON'S ONE-STOP PERMIT SYSTEM IN OPERATION

Companies or individuals planning to start new industries or expand current operations can now take advantage of the State's "one-stop" permit system administered by the Executive Department's Intergovernmental Relations Division (IRD) in Salem. To utilize the system, a company or individual fills out a master application which IRD circulates to the appropriate agencies, who in turn indicate what permits are required for the applicant's particular program. Utilization of the system is entirely optional. For information call IRD toll free - 800-542-0347.

* * * * *

OIL AND GAS EXPLORATION IN 1975

V. C. Newton, Jr.

Petroleum Engineer, Oregon Dept. of Geology and Mineral Industries

Exploration activity in Oregon continued to increase, as it has for the past two years. It is estimated that by the close of the year, 400,000 acres of oil and gas leases were being held by ten or more organizations and individuals. Another 300,000 acres of Federal lease applications were awaiting approval.

Reichhold Energy Corporation and its partner, Northwest Natural Gas Co., drilled four wildcats in western Oregon during the second half of 1975 (Table 1). There were no commercial discoveries made in these holes but the companies reported that they had obtained some encouraging results. Both firms are based in Oregon; Reichhold Chemical Corp., the parent company, manufactures petrochemicals, and Northwest Natural Gas is one of the main suppliers of natural gas in the State.

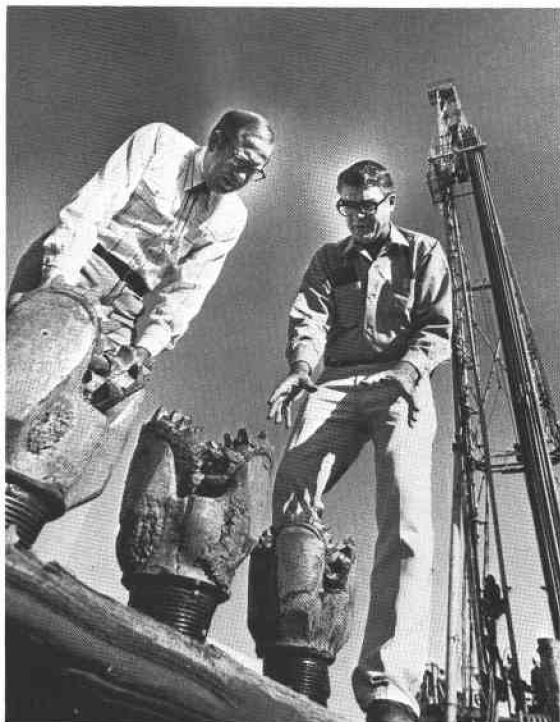
Mobil Oil Co. continued its long-range geological studies in western Oregon in 1975. The work includes geological field studies, geophysical surveys, and geochemical sampling. Mobil has been building a lease position in the western portion of the State for the past 2 years so that its present holdings are scattered over a large area (see Figure 1). This activity suggests that the company is planning to drill several deep test holes in the next 2 or 3 years.

Shell Oil Co. contributed money for geological studies being made by Professor Alan Niem, Oregon State University. Dr. Niem and his students are making detailed investigations of sedimentary features and geologic structures in the Tertiary rocks along the northwest coast of Oregon.

Onshore Leasing

The Bureau of Land Management issued oil and gas leases on 14,079 acres in Columbia County in October 1975 to Gas Producing Enterprises and to persons believed to represent the firm. These were the first Federal oil and gas leases issued in Oregon since a leasing moratorium was placed on Federal lands in Oregon in 1971 (see Table 2). The BLM announced in October that it was proceeding with environmental reviews in order to process other applications covering an estimated 300,000 acres (217 applications) of Federal leases.

Texaco, Inc. continues to hold a large acreage block of Federal land in Crook County (see Figure 1), but is most likely delaying additional drilling until it can acquire the adjacent Federal leases it applied for in 1971. Standard Oil Company of California has also maintained large lease areas of Federal lands in eastern Oregon and very likely has delayed drilling for the same reason.



Wesley Bruer, geologist for Reichhold Energy, describes rotary drilling to Governor Straub at the "Finn No. 1" site. (Photo by Gerry Lewin, Capital Journal, Salem)

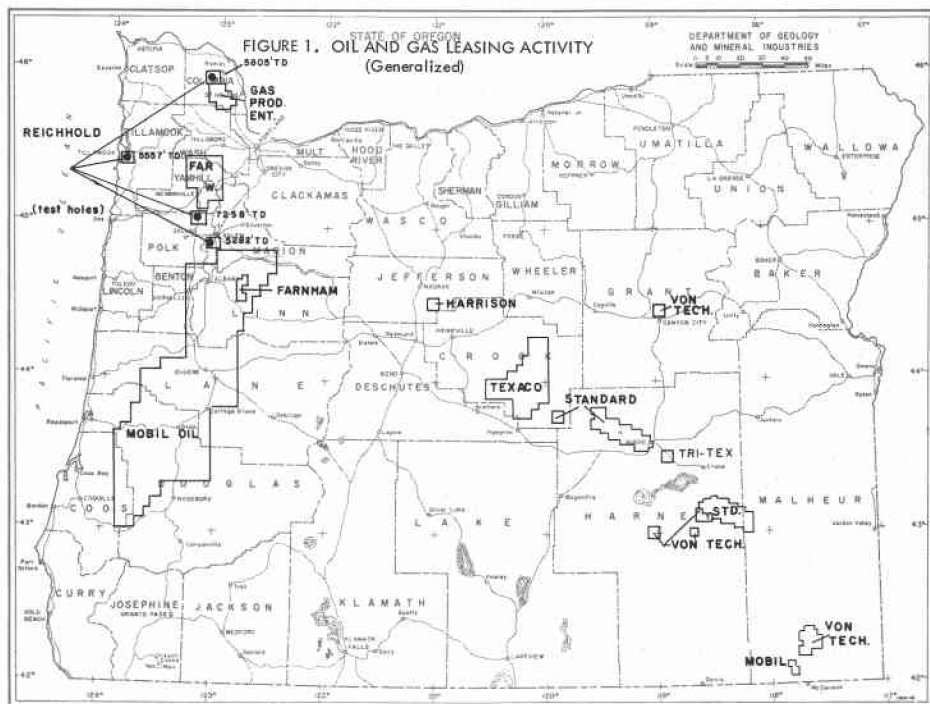


Table 1. Oil and gas drilling in Oregon in 1975

Company	Well name and location	Status
Reichhold Energy Corp. API No. 36-052-00004	NW Natural Gas Co. Crown Zellerbach No. 1 NE $\frac{1}{4}$ sec. 22, 2S, 10W Tillamook County	Abandoned Aug. 21, 1975 5,557' T.D.
Reichhold Energy Corp. API No. 36-053-00021	NW Natural Gas Co. Finn No. 1 SW $\frac{1}{4}$ sec. 17, 6S, 4W Polk County	Abandoned Sept. 21, 1975 7,258' T.D.
Reichhold Energy Corp. API No. 36-047-00007	NW Natural Gas Co. Merrill No. 1 SW $\frac{1}{4}$ sec. 24, 8S, 4W Marion County	Abandoned Oct. 13, 1975 5,282' T.D.
Reichhold Energy Corp. API No. 36-009-00006	NW Natural Gas Co. Crown Zellerbach No. 2 NW $\frac{1}{4}$ sec. 8, 4N, 3W Columbia County	Abandoned Oct. 31, 1975 5,805' T.D.

Nearly 50,000 acres of State lands were under lease, or option to lease, for oil and gas minerals in 1975. Leases run for a 10-year term provided that the annual rental of 50 cents per acre is paid in advance. Royalty is set at 12 $\frac{1}{2}$ percent for noncompetitive leases.

Smaller lease holdings in the State, consisting mostly of private lands, are controlled by Reichhold Energy Corp., Gas Producing Enterprises, Far West Oil, Farnham Chemical Co., Tri Tex Petroleum, R. F. Harrison, and Von Tech. Reichhold has drilled one hole on each of its lease blocks, and Harrison and Associates have one deep test hole on their leases. All of the other lease areas await test drilling.

Offshore Interest

No leases have been held off the Oregon Coast since Union Oil Company's two Federal tracts 35 miles west of Yachats off the central Coast. The southern Oregon Coast was included with northern California OCS lands in a tentative U.S. Bureau of Land Management offshore lease offering for 1978. Lag time in environmental reviews makes this date questionable. Interest is still maintained in the shelf along the Oregon and Washington coasts by several companies (see Table 3).

One of the most interesting areas on the basis of onshore geology is the offshore extension of the Coos Basin, which is located along the southwestern Oregon Coast. Tertiary sediments may be as much as 20,000 feet thick on the continental shelf off Coos Bay. Sizeable coal deposits occur near Coos Bay, and deep holes drilled in the basin have encountered shows of oil and gas.

Table 2. Onshore leases for oil and gas exploration

Federal Lands ¹		Acres
47 leases Texaco, Inc.		89,056
39 leases Standard of California		83,505
8 leases Mobil Oil Company		9,973
7 leases miscellaneous		5,559
Applications pending December 31, 1975		300,000
State Lands ²		
Mobil Oil Company (pending)		40,000
Texaco, Inc.		7,844
Von Tech		640
Private Lands		
Estimated total area		180,000

¹State Office, U.S. Bureau of Land Management, Portland, Oregon²State Division of Lands, Salem, Oregon

Table 3. Offshore geophysical exploration permits

Company	Permit No.	Type survey	Date issued 1975
Federal Shelf Lands			
Texaco, Inc.	OCS Ore 64-13	Geological	April
Western Geophysical	OCS Ore 75-24	Seismic	May
Gulf Oil Co.	OCS Ore 75-26	Seismic	Oct.
Shell Oil Co.	OCS Ore 75-27	Geophysical	Sept.
Texaco, Inc.	OCS Ore 75-28	Geophysical	Oct.
Aero Service Div.	OCS Ore 75-29	Airborne-magnetic	Nov.
Western Geophysical Co.		survey	
State Submerged Lands ¹			
Standard Oil Co.		Seismic	Oct.
Gulf Oil Co.		Seismic	Oct.
Shell Oil Co.		Seismic	Oct.

¹State Division of Lands, Salem, Oregon

GEOHERMAL ACTIVITY IN 1975

Donald A. Hull* and V. C. Newton, Jr.**

Summary of Exploration

Geothermal investigations in Oregon by both industry and research groups increased in 1975 as compared to prior years (Figure 1). This increased activity by industry partly reflected the accelerated leasing of both Federal and State lands. In addition, a revised State geothermal law, which became effective on July 1, 1975, facilitated drilling activities. The expanded level of geothermal exploration was paralleled by an increase in research by government agencies and university groups due to the availability of Federal funds for geothermal studies.

Exploration by industry during 1975 involved the utilization of a variety of geological, geophysical, and geochemical tools. Geological studies included mapping and age-dating of young volcanic rocks. Geophysical work consisted mainly of a variety of electrical, magnetic, and gravity techniques. Electrical methods included various resistivity arrays such as roving dipole and dipole-dipole as well as telluric and magnetotelluric techniques. The electrical methods were used both to locate potential areas and to provide depth data over known geothermal resource areas (KGRAs). Geochemical analyses of hot spring waters were used to calculate estimated reservoir temperatures.

Shallow drilling programs, with holes 100 to 500 feet deep for temperature gradient measurements, were undertaken by exploration groups in several areas in northeastern, south-central, and southeastern Oregon. Three deep holes designed to locate and test potentially productive geothermal reservoirs have been drilled in Oregon. One hole was started in 1975. San Juan Oil Company began drilling late in the year near Adel in Lake County and reached its objective depth of 7,516 feet.

Several geothermal research projects were underway in Oregon during 1975 with the purpose of evaluating various exploration methods and assessing the geothermal resource potential of favorable areas. The U.S. Geological Survey continued studies relating to geothermal resources in several areas in Oregon. Geologic mapping and age dating by Norman S. MacLeod and others continued in the Cascade Range and Newberry Volcano areas. Geophysical studies were carried out in various KGRAs in preparation for lease sales. An evaluation of heat flow and ground water in the Klamath Falls area was directed by E. A. Sammel and John H. Sass.

Four geothermal research projects were conducted by the Oregon Department of Geology and Mineral Industries. These included completion of

*Geothermal Specialist, Oregon Dept. of Geology and Mineral Industries

**Petroleum Engineer, Oregon Dept. of Geology and Mineral Industries

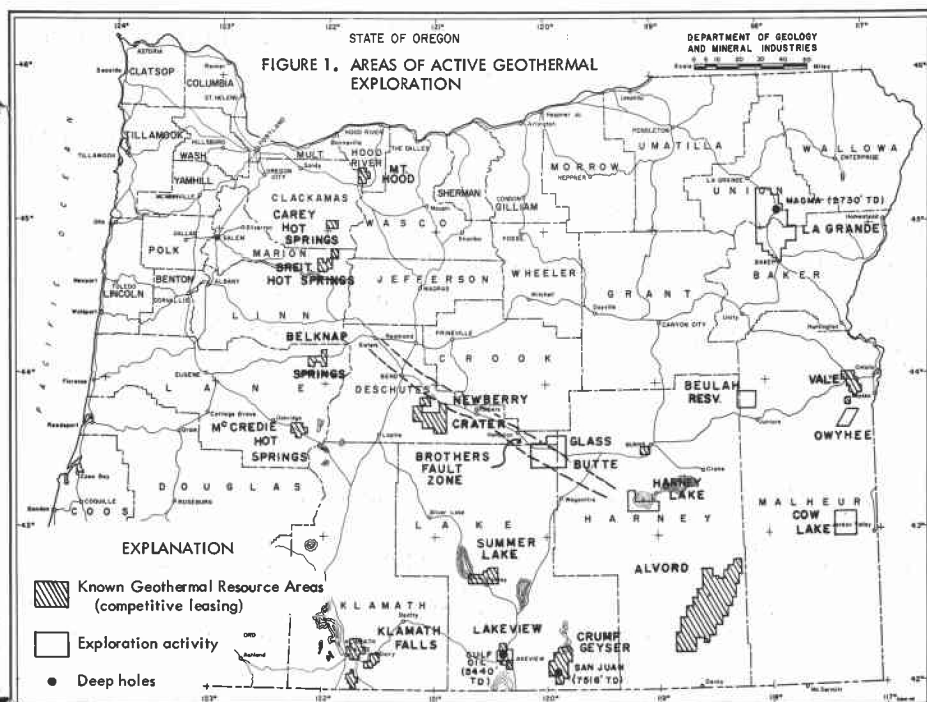


Table 1. Geothermal leases in Oregon in 1975

	Acres
Federal land ¹	
6 Noncompetitive	7,668
22 Competitive	98,117
Applications pending, December 31, 1975	900,000
Private land	
Estimated	240,000
State land ²	
Intercontinental Energy Co.	1,960
Max Millus	2,240
AMAX, Inc.	1,280
Chevron Oil	2,720

¹State office of U.S. Bureau of Land Management,
Portland, Oregon

²State Division of Lands, Salem, Oregon

a study of heat flow in the Vale area funded by the U.S. Bureau of Mines; initiating a heat-flow study along the Brothers Fault Zone in central Oregon with funds provided by the U.S. Geological Survey; and undertaking an electrical resistivity study utilizing dipole-dipole and Schlumberger techniques at Glass Buttes in northern Lake County jointly with E.R.D.A.'s Los Alamos Scientific Laboratory. A geological reconnaissance of hot-spring areas in the Western Cascade Range was begun by the Department as the initial phase of a heat-flow study to be continued in 1976.

Various university groups were active in geothermal research in 1975. Geothermal hydrology and geochemistry of the Klamath Falls area are being studied by John Lund at Oregon Institute of Technology. Detailed geophysical investigations in the Vale area in Malheur County were directed by

Table 2. Permits for deep geothermal wells in Oregon

Permit No.	Date issued	Company	Location	Status
1	Sept. 7, 1973	Gulf Mineral Resources	Lakeview NE $\frac{1}{4}$ sec. 17, 39 S., 20 E. Lake County	Hole drilled to 5,440' TD; abandoned Nov. 15, 1973
2	Sept. 7, 1973	Gulf Mineral Resources	Meadow Lake NE $\frac{1}{4}$ sec. 19, 38 S., 10 E. Klamath County	Permit issued and is still valid; no drilling done to date
3	July 25, 1974	Magma Energy	La Grande NW $\frac{1}{4}$ sec. 9, 4 S., 39 E. Union County	Hole drilled to 2,730' TD; abandoned Sept. 27, 1974
4	July 25, 1974	Magma Energy	La Grande NW $\frac{1}{4}$ sec. 9, 4 S., 39 E. Union County	Never drilled; permit cancelled
5	July 25, 1974	Magma Energy	Vale SE $\frac{1}{4}$ sec. 28, 18 S., 45 E. Malheur County	Never drilled; permit cancelled
6	July 25, 1974	Magma Energy	Vale NE $\frac{1}{4}$ sec. 28, 18 S., 45 E., Malheur County	Never drilled, permit cancelled
7	Oct. 27, 1975	San Juan Oil Company	NW $\frac{1}{4}$ sec. 22, 39 S., 24 E. Lake County	Hole drilled to 7,516' TD; abandoned Dec. 15, 1975
8	Oct. 28, 1975	Weyerhaeuser Pacific Power & Light Co.	NW $\frac{1}{4}$ sec. 15, 37 S., 7 E. Klamath County	Hole drilled to 250', 7" casing set at 250'; pro- jected depth 2,000'

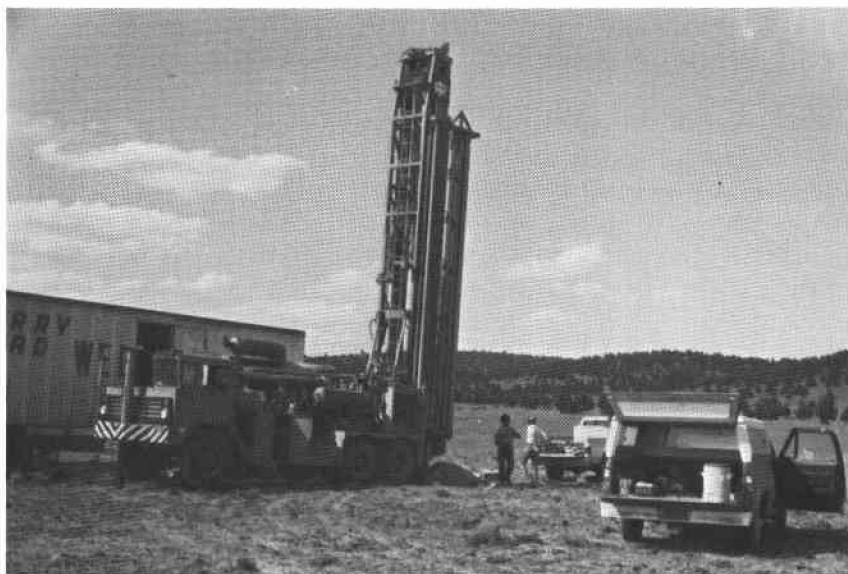
Richard Couch of Oregon State University. Some of the significant publications in 1975 resulting from geothermal research activities are listed at the end of this article.

The geothermal industry faces an exciting but uncertain future. Research projects and initial exploration by industry have outlined a number of promising areas as yet untested by deep drilling. Development of Oregon's geothermal potential will progress slowly, however, due to the twin constraints of environmental regulation and a lack of financial incentives. There is significant overlap of regulations at various levels of government along with

Table 3. Permits for shallow prospect wells in Oregon

Permit No.	Company	Location	Date Issued
*	Thermal Power Co.	Klamath Falls Klamath County	November 1972
*	U.S. Geological Survey	Blue Mountain Malheur County	May 1974
*	Ore. Dept. of Geol. and Mineral Industries	Malheur County	U.S. Bur. of Mines research project
*	U.S. Geological Survey	Klamath Falls Klamath County	August 24, 1974
*	Union Oil Co.	Vale area, Malheur County	November 1974
1	Gulf Research & Development Co.	Warner Valley Lake County	July 24, 1974
2	Geothermal Surveys (Anadarko Oil Co.)	Alvord Desert Harney County	January 16, 1975
3	AMAX Exploration Co., Inc.	La Grande Union County	February 10, 1975
4	AMAX Exploration Co., Inc.	Vale, Malheur County	February 18, 1975
5	AMAX Exploration Co., Inc.	Beulah Reservoir Malheur County	February 26, 1975
6	AMAX Exploration Co., Inc.	Burns, Malheur County	March 14, 1975
7	AMAX Exploration Co., Inc.	Paisley, Lake County	March 10, 1975
8	Phillips Petroleum	Alvord Desert Harney County	March 10, 1975
9	Ore. Dept. of Geol. and Mineral Industries	Vale, Malheur County	April 9, 1975
10	Ore. Dept. of Geol. and Mineral Industries	Burns, Harney County	July 21, 1975
11	Thermal Power Co.	Klamath Hills Klamath County	August 8, 1975
12	Phillips Petroleum	Newberry Crater Deschutes County	August 14, 1975
13	Union Oil Co.	Alvord Desert Harney County	September 23, 1975
14	Al Aquitaine	Alvord Desert Harney County	November 5, 1975
15	Phillips Petroleum	Glass Butte Lake County	December 12, 1975

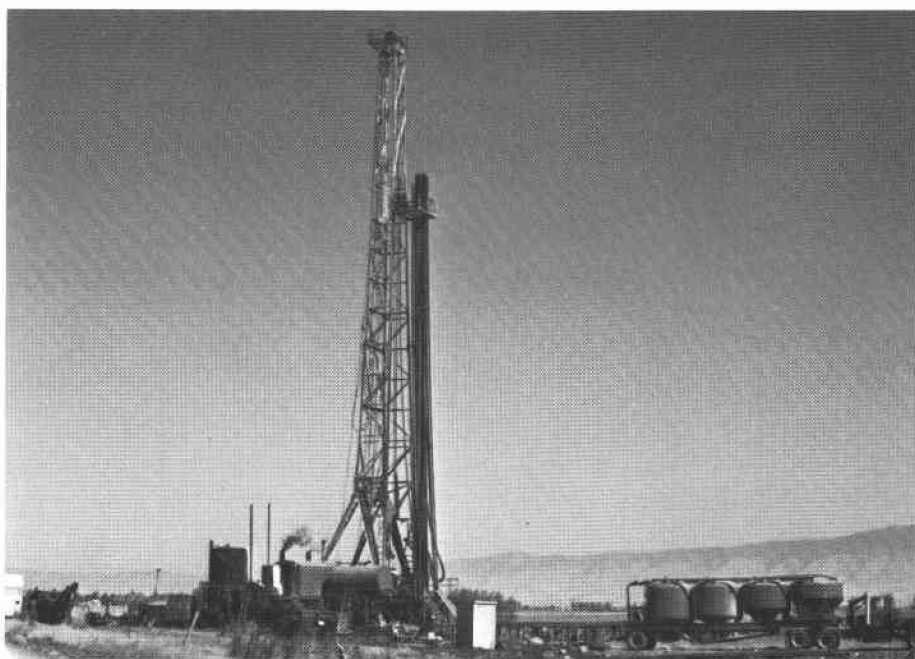
* Prior to permit number assignment



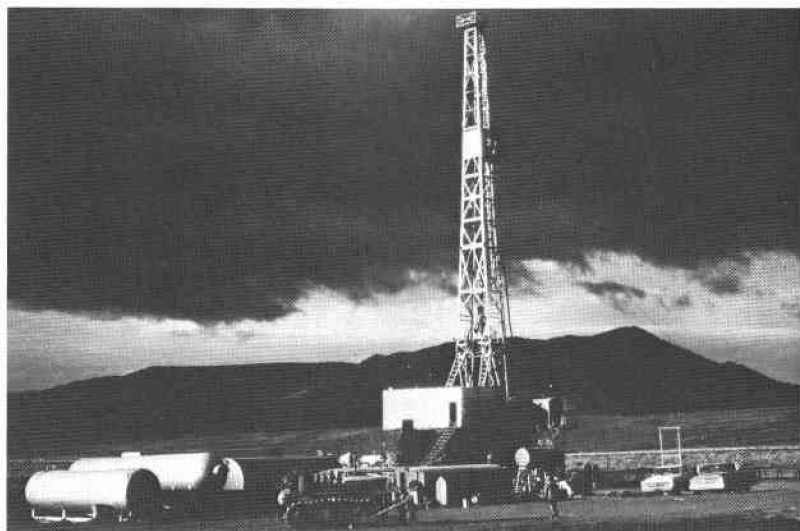
Department's geothermal-gradient test hole being drilled with a rotary air rig near the Brothers Fault Zone 17 miles west of Burns.



Close-up of air drill showing the automatic pipe-handling rack. Rubber skirts catch and hold cuttings around bore hole.



Abandonment cementing operations at the Magma Energy steam-test hole drilled near Hot Lake, Union County, in October 1974.



San Juan Co. "Wolfson Ranch No. 1" steam-test hole drilled to 7,516 feet near Adel in Warner Valley December 1975.

leasing procedures which are cumbersome and expensive. It is not yet certain whether the increasing level of geothermal exploration will be maintained in the years ahead without viable financial incentives and a revision of geothermal leasing policies.

Leasing and Drilling Data

An estimated 370,000 acres of geothermal leases were active in Oregon at the close of 1975 (Table 1), and an additional 900,000 acres applied for on Federal lands are pending environmental assessment. More than 30 exploration companies are involved in the Oregon activity.

During 1975, the Oregon Department of Geology and Mineral Industries issued two deep-drilling permits and 14 shallow-hole permits for geothermal exploration; Tables 2 and 3 list all permits issued thus far by the Department. The U.S. Bureau of Land Management granted permits to three companies to conduct geophysical studies on Federal lands for geothermal assessment (Table 4).

The U.S. Bureau of Land Management held five competitive geothermal lease sales in 1975 (Table 5). Competition was not as great as expected; however, there was a considerable time lag between the date of application and the lease sales. In addition, inflation, excessive regulation, and shrinking exploration capital all undoubtedly had a depressing influence on the bidding. Additions were made in 1975 to the Vale, Crump Geyser, Summer Lake, Klamath Falls, and Breitenbush KGRAs because of overlapping filings. If areas applied for overlap by 50 percent or more, they must be leased by competitive bidding. Future lease sales are scheduled for the Klamath Falls KGRA in May 1976 and for the Summer Lake KGRA in July 1976.

Table 4. Permits for geophysical exploration on Federal lands in Oregon

Company	Location	Date issued
Chevron Oil Co.	Lakeview Basin	April 1975
	Lake County	Geophysical Surveys
Hunt Oil Co.	Klamath Falls	August 1975
	Klamath County	Geophysical Surveys
Southern Union	Alvord Valley	October 1975
Production Co.	Harney County	Geophysical Surveys
Southern Union	Warner Valley	October 1975
Production Co.	Lake County	Geophysical Surveys
Southern Union	Klamath Falls	November 1975
Production Co.	Klamath County	Geophysical Surveys

Table 5. Federal geothermal lease sales in Oregon¹

KGRA	Date	Company	No. of tracts	Acreage	Average bid per acre
1. Vale Hot Spring	June 27, 1974	Republic Geothermal	1	1,347	\$10.26
2. Alvord (Mickey H.S.)	May 22, 1975	Al Aquitaine	3	7,520	5.88
3. Alvord (Alvord H.S.)	May 29, 1975	Republic Geothermal	5	15,000	4.44
4. Alvord (Alvord H.S.)	May 29, 1975	Chevron Oil	1	2,560	17.90
5. Alvord (Borax Lake)	June 5, 1975	Mapco, Inc.	3	6,333	4.50
6. Alvord (Borax Lake)	June 5, 1975	Getty Oil Co.	1	2,126	5.25
7. Alvord (Borax Lake)	June 5, 1975	So. Union Prod. Co.	1	2,560	2.53
8. Crump Geyser	July 31, 1975	Chevron Oil	4	9,462	3.19
9. Vale Hot Spring	Sept. 25, 1975	Union Oil	2	4,486	16.16
10. Vale Hot Spring	Sept. 25, 1975	Geothermal Resource	1	2,560	3.00

¹State office, U.S. Bureau of Land Management, Portland, Oregon

References

- Bowen, R. G., 1975, Geothermal gradient data: Oregon Dept. Geol. and Mineral Indus. open-file report O-75-3, 133 p.
- Bowen, R. G., and Blackwell, D. D., 1975, The Cow Hollow geothermal anomaly, Malheur County, Oregon: Ore Bin, v. 37, no. 7, p. 109-121.
- Bowen, R. G., Blackwell, D. D., and Hull, D. A., 1975, Geothermal studies and exploration in Oregon: Oregon Dept. Geol. and Mineral Indus. open-file report O-75-7, 65 p.
- Couch, Richard, French, Wm., Gemperle, Michael, and Johnson, Ansel, 1975, Geophysical measurements in the Vale, Oregon geothermal resource area: Ore Bin, v. 37, no. 8, p. 125-129.
- Hull, D. A., 1975, Geothermal gradient data, Vale area, Malheur County, Oregon: Oregon Dept. Geol. and Mineral Indus. open-file report O-75-4, 18 p.
- MacLeod, N. S., Walker, G. W., and McKee, E. H., 1975, Geothermal significance of eastward increase in age of upper Cenozoic rhyolite domes in southeastern Oregon: U.S. Geol. Survey open-file report 75-348, 22 p.
- Mariner, R. H., Presser, T. S., Rapp, J. B., and Willey, L. M., 1975, The minor and trace elements, gas and isotope compositions of principal hot springs of Nevada and Oregon: U.S. Geol. Survey open-file report, 27 p.
- Plouff, Donald and Conradi, Arthur, Jr., 1975, Gravity and magnetic profiles and maps, Crump Geyser area, Oregon: U.S. Geol. Survey open-file report 75-346, 2 p.
- White, D. E., and Williams, D. L., ed, 1975, Assessment of geothermal resources of the United States - 1975: U.S. Geol. Survey Circ. 726, 155 p.

* * * * *

FIELD-ORIENTED GEOLOGY STUDIES IN OREGON DURING 1975

John D. Beaulieu
Geologist, Oregon Dept. Geology and Mineral Industries

During the 1975 field season at least 115 geologic investigations were conducted in Oregon. The list below includes those of which the Oregon Department of Geology and Mineral Industries is aware. For convenience, the State is divided roughly into six geographic sections, and several investigations of more regional extent are included in a seventh category - Regional. Listings within categories are alphabetical according to the investigator's name.

The Department would appreciate receiving information about studies in progress in the State which are not listed here. The resumes received thus far have been invaluable in completing this list, and the compiler is grateful for this assistance. An annotated list will be issued later in 1976 as a Department open-file report, and availability of copies of that report at cost will be announced in The ORE BIN.

The Department has no information on completion date of research or reports; inquiries should be directed to the individuals named in the listing.

Northwestern Oregon

1. Neogene molluscan stages of Oregon and Wash.: W. Addicott, USGS, Menlo Park
2. Columbia River Basalt stratigraphy using geochemistry: M. Beeson, prof., PSU
3. Erosion processes of the Willamette Basin: W. M. Brown, S. A. Vickers, USGS, Menlo Park, and David Rickert, USGS, Portland
4. Environmental geology of a portion of n.w. Clackamas County: M. J. Brunengo, master's cand., Stanford U
5. Foraminifera of the type Nestucca Fm.: Arden Callender, master's cand., PSU
6. Environmental geology of the Astoria area: Jim Carter, master's cand., OSU
7. Factor analysis of mass movement: V. Cimmery, master's cand., Dept. Geog. PSU
8. Geology of Breitenbush Hot Springs area: M. Clayton, master's cand., PSU
9. Astoria Fm., petrology, stratigraphy, and paleoenvironment: M.D. Cooper, Ph.D. cand., OSU
10. Structural geology of east Portland: Jan Donovan, master's cand., PSU
11. Geology of the Bagby Hot Springs area: R. F. Dyrhman, master's cand., OSU
12. Ground water of coastal Lincoln County: F. J. Frank and A. Laenen, USGS, Portland, in coop. with State Dept. Water Resources
13. Ground-water of the Newberg area: F. J. Frank, USGS, Portland, in coop. with State Dept. of Water Resources
14. Tillamook Bay area Quaternary sedimentation: Wayne Frye, Ph.D. cand., U of O
15. Aftershocks of the Dec. 1974 Mount Hood earthquake: M. Gemperle, G. Conrad, K. Keeling, and R. McAlister, grad. stud., Dept. Oceanog., OSU
16. Estuarine sedimentation of Tillamook Bay: Jerry Glenn, USGS, Denver
17. Geology of the upper Clackamas and Santiam River area - geothermal resource potential: Paul Hammond, prof., PSU
18. Foraminifera of the mudstone at Oswald West State Park: C. Hansen, master's cand., PSU
19. Environ. Geology of Johnson Creek drainage: B. Henderson, master's cand. PSU
20. Early Tertiary mollusks: C.S. Hickman, Smithsonian Institution, Wash., D.C.

21. Ferruginous bauxite and high-alumina clays: John Hook, DOGAMI
22. Gravity interpretation of Portland Hills structure: Ansel Johnson, M. H. Beeson, and G. T. Benson, profs., PSU
23. Microearthquake activity of the Portland area: Ansel Johnson, prof., PSU
24. Beach erosion at Netarts Spit: Paul D. Komar, prof., Dept. Oceanog., PSU
25. Applied geology of the Sandy River drainage: Ron Lee, master's cand., PSU
26. Ground water of northern Clackamas County: Al Leonard, USGS, Portland in coop. with State Dept. Water Resources
27. Microfauna of the Keasey Fm., Kirstin McDougall, USGS, Menlo Park
28. Post-Columbia River Basalt lavas of the Portland and Columbia River Gorge areas: Gary Millhollen, prof., Purdue U
29. Structures of natural gas storage, n.w. Coast Range: Vern Newton, DOGAMI
30. Stratigraphy of the Columbia River Basalt in Clackamas River area: Francis Olson, master's cand., PSU
31. Fossil birds: S. L. Olson, Smithsonian Institution, Washington, D.C.
32. Saddle Mtn. and Humbug Mtn. areas - geology: P. Penoyer, master's cand. OSU
33. Recon. geothermal investigations in Breitenbush Hot Springs - Oakridge area: Norm Peterson and Walt Youngquist, DOGAMI
34. Biostratigraphy of Astoria Fm. - foraminiferal interpretations: Weldon Rau, Wash. Dept. Natural Resources, for Alan Niem, prof., OSU
35. Fossil Pinnipeds (sea lions, etc.): Clayton Ray, Smithsonian Inst., Wash., D.C.
36. Geology of the Mount Bruno-Marion Forks area: A. Rollins, master's cand. OSU
37. Fossil fishes: C. C. Swift, Los Angeles County Museum
38. Elasmobranchs (sharks, etc.): Bruce Weldon, Ph.D. Cand., U of Cal, Berkeley
39. Geology of Detroit area, Western Cascades: Craig White, Ph.D. cand., U of O
40. Fossil Cetaceans (whales, etc.): F. C. Whitmore and E. D. Mitchell, USGS, Wash.

Southwestern Oregon

1. Eocene stratigraphy of s.w. Oregon: E. M. Baldwin, prof., U of O
2. Environmental geology of western Curry County: John Beaulieu, DOGAMI
3. Pacific Coast sediments: H. E. Clifton, USGS, Menlo Park
4. Petrology of alpine ultramafic rocks: R. G. Coleman, USGS, Menlo Park
5. Josephine peridotite: Henry Dick, Woods Hole Oceanog. Inst., Ph.D. cand.
6. Petrology of Mount Ashland Pluton: Mary Donato, master's cand., U of O
7. Flood-plain deposits and processes of Alsea and Siuslaw flood plains: Joe Feiereisen, Dept. Geography, U of O
8. Late Jurassic ophiolite (Rogue Fm. and associated ultramafics): Michael Garcia, Ph.D. cand., UCLA
9. Geology of n.w. quarter of Roseburg quad.: Zubair Haq, master's cand., U of O
10. Microearthquakes of Blanco Fracture Zone: S. Jones, prof., and P. Jones, Dept. Oceanog., OSU
11. Sources of hypersthene in s. Oregon beach sands: T. Judkins, master's cand. UO
12. Man-caused vibrations and environmental impacts: G. Ness, B. Brown, R. McAlister, W. French, and R. Couch (prof.), Dept. of Oceanog., PSU
13. Medford-Coos Bay quads. - geology and mineral deposits: N.J. Page, USGS Menlo Park
14. Pacific Coast sedimentology: R. L. Phillips, USGS, Menlo Park
15. Ground water of the Drain-Yoncalla area: J. H. Robison, USGS, Portland, in coop. with State Water Resources Dept.

16. Gravel resources of Josephine County: Herbert Schlicker, DOGAMI
17. Examination of cobalt deposits: U. S. Bureau of Mines, Spokane
18. Galice, Dothan, and Josephine units: Scott Vail, Ph.D. cand., OSU
19. Remote sensing of debris avalanche-prone terrain: Roger Vickers, Stanford Res. Inst.; Byron Thomas, BLM; John Beaulieu, DOGAMI

North-central Oregon

1. Devonian of central Oregon: Tom Amundson, master's cand., PSU
2. Clarno Fm. of Lawson Mtn. and Stephenson Mtn. quads: H. Enlows and E. Taylor, profs., OSU
3. Type section and distribution of Rattlesnake Fm.: H. Enlows, prof., OSU (DOGAMI Short Paper 25, in press)
4. Pleistocene-Holocene geology of The Table-south Mount Jefferson area: Brian Gannon, master's cand., PSU
5. Ammonites of the Snowshoe Fm.: Ralph Imlay, USGS, Reston, Va.
6. Petrographic, geochemical, and X-ray study of rock weathering in H. J. Andrews Exp. Forest: Michael James, master's cand., U of O
7. Mineral deposits of the Quartzville mining dist.: S. Munts, master's cand., U O
8. Gravity investigation of Newberry Caldera area: Steve Pitts, U of O
9. Geologic hazards of John Day area: H. Schlicker and H. Brooks, DOGAMI
10. Paleontology of Snowshoe Fm., central Oregon: Paul Smith, master's cand. PSU
11. Geology of Mount Jefferson: Kenneth Sutton, master's cand., U of O
12. Geodimeter studies of Cascade volcanoes: D. A. Swanson, USGS, Menlo Park
13. Geology of Broken Top Volcano and Tam McArthur Rim area: E. Taylor, prof., OSU
14. High Cascade pyroclastic flows near Bend: E. Taylor, prof., OSU

South-central Oregon

1. Glacial geology of s. Cascades: Gary Carver, prof., Humboldt State U
2. Mazama pumice flow: R. V. Fisher, U of Cal., Santa Barbara
3. Geochemical exploration for geothermal energy: J. Matlick, master's cand., Arizona State U
4. Crater Lake as a model for eruptive mechanisms: J. Ritchey, Ph.D. cand. U of O
5. Structure and gravity of north end of Summer Lake graben: P. Travis, U of O
6. Compilation of gravity map of Klamath Falls and vicinity: John Van Deusen, master's cand., U of O
7. Geology of Drakes Peak rhyolite complex: Ray Wells, master's cand., U of O

Northeastern Oregon

1. Desolation Butte and Bates quads.-structure: Hans Ave Lallement, prof., Rice U
2. Baker AMS sheet: Howard Brooks, DOGAMI
3. Huntington 15' quad. - geology: Howard Brooks, DOGAMI
4. Ground water of Umatilla Indian Reserv.: J. B. Gonthier, USGS, Portland, in coop. with State Dept. of Water Resources
5. Columbia River Basalt stratigraphy: P. R. Hooper, Dept. Geology, WSU
6. Seismic refraction data - Vale area: Ansel Johnson, PSU, and R. W. Couch, Dept. Oceanograph. OSU, profs.
7. Gravity survey of Owyhee-Vale KGRA: Kevin Larsen, Ph.D. cand., U of O

8. Geology of Greenhorn District, Sumpter quad.: James Perkins, master's cand., U of O
9. Structure and petrology of Sparta quad.: David Phelps, Ph.D. cand., Rice U
10. Volcanic history and petrology of Strawberry Volcanics: Thomas Robyn, Ph.D. cand., U of O
11. Zeolites of Pliocene lakebeds: R. A. Sheppard, USGS, Menlo Park
12. Small-scale structures of Columbia River Basalt from Wallula Gap to Hood River, dikes in the Minam River area: W. H. Taubeneck, prof., OSU
13. Geology and geochemistry of Strawberry Mountain Wilderness: Tom Thayer, USGS, Reston, Va.
14. Mineral resource appraisal of Hells Canyon Recreational Area: U.S. Bureau of Mines, Spokane
15. Baker Observatory - seismic monitoring: M. Carlson, USGS
16. Seismic reflection data of the Vale area: Robert Lillie, master's cand., Dept. Oceanog. OSU

Southeastern Oregon

1. Mineral resources of Sheldon Antelope Range (primarily Nevada): Robert Greene, USGS, Menlo Park
2. Stratigraphy and petrology of Grassy Mtn. Fm.: Allen Storm, master's cand. U O
3. Volcanic rocks and related tectonics: Geo. Walker, USGS, Menlo Park
4. Geology of n. Beulah Reservoir area: John Wood, master's cand., PSU

Regional

1. Marine magnetic anomalies off the Oregon Coast: Richard Blakely, prof., Dept. Oceanog., OSU
2. Volcanic hazards of the Cascades: D. R. Crandell, USGS, Menlo Park
3. Geothermal geophysics: G. P. Eaton, USGS, Menlo Park
4. Stream sediment geochemistry of eastern Oregon: Don Hull, DOGAMI
5. Geothermal investigation of Vale area, Brothers Fault Zone, and Glass Buttes area: Don Hull, DOGAMI
6. Inventory of copper and zinc deposits: Don Hull and Howard Brooks, DOGAMI
7. Field trips in Oregon and Wash.: J. H. Hyde, prof., Tacoma Commun. College
8. Mesozoic studies (Jurassic of North America): R. W. Imlay, USGS, Menlo Park
9. Cretaceous of the Pacific Coast: David Jones, USGS, Menlo Park
10. Oregon geothermal recon.: Norman MacLeod, USGS, Menlo Park
11. Nickel resources of Oregon: Len Ramp, DOGAMI
12. Cenozoic vertebrates of Pacific Coast: C. A. Repenning, USGS, Menlo Park
13. General paleobotany: R. A. Scott, USGS, Menlo Park
14. Continental margin: Parke D. Snavely, Jr., USGS, Menlo Park
15. Columbia River Basalt: D. A. Swanson, USGS, Menlo Park
16. Geology of chromium: Tom Thayer, USGS, Reston, Va.
17. Evidence of fossil burrows of freshwater pelecypods in relation to current direction: Richard Thoms, prof., PSU
18. State geologic map: George Walker, USGS, Menlo Park
19. Dispersion of elements in zone of weathering: R. W. White, USGS, Menlo Park

* * * * *

GOLD AND MONEY PROCEEDINGS PUBLISHED

If you have not sent your \$5.00 for "Proceedings of the Fifth Gold and Money Session, and Gold Technical Session," please do so promptly since a limited number of copies are being published. Delivery from the printer is expected in February.

The Proceedings volume is an outgrowth of the Fifth Gold and Money Session held in April 1975 at the Pacific Northwest Metals and Minerals Conference. The 201-page publication consists of two parts. Four papers and a panel discussion by international consultants on monetary problems related to gold comprise the first part of the Proceedings. Ten papers by geologists and mining experts from the U.S. and foreign countries on types of gold deposits, new discoveries, treatments, origin, and mining methods make up the second part.

To order a copy, send a check for \$5.00 payable to "Gold and Money Session" to the Oregon Dept. of Geology and Mineral Industries, 1069 State Office Building, Portland, Oregon 97201.

* * * * *

UPPER CHETCO GEOLOGY AND MINERALS DESCRIBED

"Geology and Mineral Resources of the Upper Chetco Drainage Area, Oregon," by Len Ramp, Economic Geologist with the Department, has been published as Bulletin 88. The 47-page bulletin is illustrated with numerous photographs, a colored geologic map, and a mineral resources map. Bulletin 88 is for sale by the Department's offices in Portland, Grants Pass, and Baker for \$4.00.

The Upper Chetco drainage area lies in southern Curry County in a remote and rugged part of the Klamath Mountains and includes the Kalmiopsis Wilderness and Big Craggies Botanical Areas. The area has had a complex geologic history involving pre-Tertiary rocks in a zone of crustal collision resulting in an unusual variety of rocks, minerals, and structures. In spite of the difficult terrain, the region has been the locale of sporadic mining activity for more than 100 years. Among its metallic minerals are gold, platinum, chromite, copper, cobalt, manganese, and nickel.

* * * * *

GEOPHYSICAL SURVEYS IN GEOTHERMAL AREAS ON OPEN FILE

The following reports have been placed on open file in the Department's library, or copies can be obtained at the Portland office at prices indicated:

1. "Audiomagnetotelluric apparent resistivity maps, southern Warner Valley, Oregon," by D. E. Gregory and R. J. Martinez. Four maps at a scale of 1:62,500; U.S. Geol. Survey open-file report 75-652. Price \$5.00, folded.
2. "Electrical resistivity survey and evaluation of the Glass Buttes geothermal anomaly, Lake County, Oregon," by Don Hull, Department Geothermal Specialist; includes as an appendix: "Report of a reconnaissance dipole-dipole resistivity survey in the Glass Buttes area, Lake County," prepared for the Department by Phoenix Geophysics, Inc., 26 pages of text and 6 plates. Department open-file report O-76-1. Price \$8.00.

* * * * *

INDEX TO THE ORE BIN
Volume 37, 1975

- Aggregate, every Oregonian's share, by R. S. Mason (37:10:170)
Allen goes to Nevada Bureau of Mines (37:10:170)
Alsea Spit, shoreline changes, by J. E. Stembridge (37:5:77-82)
BLM gets new director (37:8:142)
Ballast rocks (Geol. and marine archaeology) by J. S. White (37:10:167-168)
Bowen resigns to do consulting (37:1:10)
Coastal landforms, Curry County, by E. H. Lund (37:4:57-76)
Comments and suggestions from ORE BIN readers (37:3:56)
Craft, Archie, gets Washington post (37:5:87)
Earthquake predictions, plan proposed (37:11:185)
Energy Research and Development Admin. submits plan (37:8:144)
Fibers from basalt (37:10:163)
Field-oriented studies in 1974, by J. D. Beaulieu (37:1:11-16)
Field trip guidebook (Lunar Conf. Bull. 57) reprinted (37:8:142)
Geol. map of western Oregon reprinted (37:3:49)
Geothermal activity in 1974, by R. G. Bowen (37:1:9-10)(see also "Open-file Reports")
Cow Hollow anomaly, by R. G. Bowen, D. D. Blackwell (37:7:109-121)
Drilling in Oregon (tabulated) (37:7:123); Law revised (37:7:122)
Inquiries, where to make (37:5:85); Correction (37:6:106)
Leases (37:1:7-8) (37:3:54) (37:5:84) (37:5:85) (37:6:107) (37:9:158)
Mitchell Butte quad., seismic study, by OSU Geophys. Group (37:8:129-137)
Permits to drill, Adel area (37:11:188); Klamath Falls (37:11:188)
Utah test shows promise (37:7:122)
Vale area, Geophys. measure., by R. Couch and others (37:8:125-129)
Gravity maps, by K. Larson and R. Couch (37:8:138-142); Studies in, by Don Hull (37:6:104-106)
Well records released (37:10:163)
Glendonites from Oregon and Wash., by Sam Boggs (37:6:89-103)
Gold and Money Conf. (37:2:37-38); Proceedings (37:5:83)
Grant County geology tour (37:7:124)
Historical material on mining wanted (37:8:144)
Hug Point State Park geology, by A. R. Niem (37:2:17-36)
Ice age coming? (37:5:88)
Icebergs may be towed to arid lands (37:6:108)
Interior Dept. appointments (37:9:159) (37:12:203)
Let's get into the swing (reprint, Mobil Oil) (37:10:171)
MacColl, Leeanne, new Dept. Governing Board member (37:7:124)
Metal Mines Handbooks reprinted by Wash. firm (37:5:86) (37:7:123)
Meteorite, have you found one? (37:9:160)
Mineral and Metal. Indus., summary, 1974, by R. S. Mason (37:1:1-3)
Mineral resources and environment (NAS rpt. review) (37:3:52-53)
Mineral supply in jeopardy (37:10:164-166)
Minerals - value of U.S. output soars in 1974 (37:3:51)
Mining activity in southwestern Oregon (37:9:160)

Mining bills: Hardrock (37:2:38); Surface mining (37:2:39)
 Mining course offered at Colo. School of Mines (37:2:39)
 Mining restraints (reprint, Pa. Geol., by A. A. Socolow) (37:5:87)
 Mount St. Helens volcano, by Crandell, Mullineaux, Rubin (37:3:41-48)
 Nixon, Earl (first Dept. Director) dies (37:2:40)
 Northwest Mining Assoc. moves (37:3:55); Dec. mtg. announced (37:10:171)
 Oil and gas exploration in 1974, by V. C. Newton (37:1:4-7)
 Lease applications, action resumed by BLM (37:10:166)
 Leases issued in Columbia County (37:11:188)
 Records released (37:10:163); Offshore lands (37:3:49)
 Reichhold Energy Corp. activity (37:7:122) (37:9:159) (37:11:183)
 Oldest rocks (37:3:53)
 Open-file reports announced (Department):
 Coos Bay coal (37:9:157)
 Field studies summary for 1974 (37:3:49)
 Geothermal studies in Oregon (37:9:158) (37:3:50)
 Mount Hood bibliography (37:8:144)
 Nickel deposits (Grants Pass office) (37:3:50)
 Open-file reports announced (USGS):
 Idaho geothermal report (37:5:86)
 Oregon: Age of rhyolite domes (37:8:143); Alvord Valley (37:8:143);
 Crump Geyser (37:8:143)
 Opie Dilldock is back (Ore. Geographic Names) (37:10:169)
 Pipeline and archaeology (reprint from Compressed Air) (37:10:172)
 Project Independence report submitted to Pres. (37:3:55)
 Publications announced (Department):
 Citizens Forum on Energy (37:6:107); Coos, Douglas Cos. environ. geol.
 (37:11:184); Josephine Co. aggregate (County publ.) (37:6:108); ORE
 BIN Index (37:10:166); Snake River Canyon (37:1:16)
 Publications announced (USGS):
 Coal resources (37:10:172); Mount Rainier Quat. geol. (37:12:202);
 Nation's geothermal resources (37:10:172); Pleistocene lakes, Gr. Basin
 (37:5:86); U.S. Geol. map (37:2:40)
 Publications announced (Misc.):
 Coastal erosion, Bay Ocean, Siletz Spits (37:11:188); Geotherm. work-
 shop proc. (37:5:88); Minerals in U.S. economy (37:8:143); Oregon lakes
 inventory continues (37:5:82); State energy rpt. (37:3:51); Wash. mining
 law bull. (37:3:55)
 Publications prices go up (Department) (37:6:108) (37:7:124)
 Public land withdrawals (37:10:164-166); Jordan Craters area (37:12:203)
 Radiocarbon dates in Portland area, by P. E. Hammond (37:10:161-162)
 Stewart, R. C., in memoriam (37:11:184)
 Theses on Oregon added to Dept. library (list) (37:11:186-187)
 U.S. Bureau of Mines improves functions (37:3:54)
 USGS establishes Office of Land Information (37:5:88)
 Volcanic hazards of Cascade Range, by Crandell, Mullineaux (37:11:173-183)
 Volcanism, Mount St. Helens, by Crandell, Mullineaux, Rubin (37:3:41-48)
 Volcanoes of Portland area, by J. E. Allen (37:9:145-157)
 Youngberg retires from AEC (37:3:51)
 Wallowa "ice cap," by J. E. Allen (37:12:189-202)

AVAILABLE PUBLICATIONS

(Please include remittance with order; postage free. All sales are final - no returns. Upon request, a complete list of Department publications, including out-of-print, will be mailed.)

BULLETINS

26. Soil: Its origin, destruction, preservation, 1944: Twenhofel.	\$0.45
33. Bibliography (1st suppl.) geology and mineral resources of Oregon, 1947: Allen	1.00
35. Geology of Dallas and Valsetz quadrangles, Oregon, rev. 1964: Baldwin	3.00
36. Papers on Tertiary foraminifera: Cushman, Stewart & Stewart. vol. 2-	1.25
39. Geology and mineralization of Morning mine region, 1948: Allen and Thayer	1.00
44. Bibliography (2nd suppl.) geology and mineral resources of Oregon, 1953: Steere.	1.00
46. Ferruginous bauxite deposits, Salem Hills, 1956: Corcoran and Libbey	1.25
49. Lode mines, Granite mining district, Grant County, Oregon, 1959: Koch	1.00
52. Chromite in southwestern Oregon, 1961: Ramp	5.00
53. Bibliography (3rd suppl.) geology and mineral resources of Oregon, 1962: Steere, Owen	3.00
57. Lunar Geological Field Conf. guidebook, 1965: Peterson and Groh, editors	3.50
60. Engineering geology of Tualatin Valley region, 1967: Schlicker and Deacon	7.50
61. Gold and silver in Oregon, 1968: Brooks and Ramp	7.50
62. Andesite Conference Guidebook, 1968: Dole	3.50
64. Geology, mineral, and water resources of Oregon, 1969	3.00
65. Proceedings of the Andesite Conference, 1969: McBirney, editor (photocopy)	10.00
66. Geology and mineral resources of Klamath and Lake Counties, 1970.	6.50
67. Bibliography (4th suppl.) geology and mineral industries, 1970: Roberts	3.00
68. Seventeenth biennial report of the Department, 1968-1970	1.00
69. Geology of the southwestern Oregon Coast, 1971: Dott	4.00
70. Geologic formations of western Oregon, 1971: Beaulieu	2.00
71. Geology of selected lava tubes in the Bend area, 1971: Greeley	2.50
72. Geology of Mitchell quadrangle, Wheeler County, 1972: Oles and Enlows	3.00
73. Geologic formations of eastern Oregon, 1972: Beaulieu	2.00
75. Geology, mineral resources of Douglas County, 1972: Ramp	3.00
76. Eighteenth biennial report of the Department, 1970-1972.	1.00
77. Geologic field trips in northern Oregon and southern Washington, 1973.	5.00
78. Bibliography (5th suppl.) geology and mineral industries, 1973: Roberts and others	3.00
79. Environmental geology inland Tillamook Clatsop Counties, 1973: Beaulieu.	7.00
80. Geology and mineral resources of Coos County, 1973: Baldwin and others	6.00
81. Environmental geology of Lincoln County, 1973: Schlicker and others	9.00
82. Geol. Hazards of Bull Run Watershed, Mult. Clackamas Counties, 1974: Beaulieu	6.50
83. Eocene stratigraphy of southwestern Oregon, 1974: Baldwin	4.00
84. Environmental geology of western Linn Co., 1974: Beaulieu and others.	12.00
85. Environmental geology of coastal Lane Co., 1974: Schlicker and others	12.00
86. Nineteenth biennial report of the Department, 1972-1974	1.00
87. Environmental geology of western Coos and Douglas Counties, Oregon, 1975	9.00
88. Geology and mineral resources of upper Chetco River drainage, 1975: Ramp	4.00

GEOLOGIC MAPS

Geologic map of Oregon west of 121st meridian, 1961: Wells and Peck \$2.00; mailed -	2.50
Geologic map of Oregon (12" x 9"), 1969: Walker and King	0.25
Geologic map of Albany quadrangle, Oregon, 1953: Allison (from Bulletin 37)	1.00
Geologic map of Galice quadrangle, Oregon, 1953: Wells and Walker	1.50
Geologic map of Lebanon quadrangle, Oregon, 1956: Allison and Felts	1.50
Geologic map of Bend quadrangle, and portion of High Cascade Mtns., 1957: Williams	1.50
GMS-1: Geologic map of the Sparta quadrangle, Oregon, 1962: Prostka	2.00
GMS-2: Geologic map, Mitchell Butte quadrangle, Oregon: 1962	2.00
GMS-3: Preliminary geologic map, Durkee quadrangle, Oregon, 1967: Prostka	2.00
GMS-4: Gravity maps, Oregon onshore & offshore; [set only]: at counter \$3.00, mailed	3.50
GMS-5: Geology of the Powers quadrangle, 1971: Baldwin and Hess	2.00
GMS-6: Preliminary report, geology of part of Snake River Canyon, 1974: Vallier.	6.50

[Continued on back cover]

Marine Science Center
Marine Science Drive
Newport, Oregon 97365

The ORE BIN
1069 State Office Bldg., Portland, Oregon 97201

The Ore Bin

Second Class Matter
POSTMASTER: Form 3579 requested



Available Publications, Continued:

SHORT PAPERS

18. Radioactive minerals prospectors should know, 1955: White and Schafer \$0.30
19. Brick and tile industry in Oregon, 1949: Allen and Mason 0.20
21. Lightweight aggregate industry in Oregon, 1951: Mason 0.25
24. The Alameda mine, Josephine County, Oregon, 1967: Libbey 3.00
25. Petrography, type Rattlesnake Fm., central Oregon, 1976: Enlows in prep

MISCELLANEOUS PAPERS

1. Description of some Oregon rocks and minerals, 1950: Dole 1.00
2. Oregon mineral deposits map (22 x 34 inches) and key (reprinted 1973): 1.00
5. Oregon's gold placers (reprints), 1954 0.50
6. Oil and gas exploration in Oregon, rev. 1965: Stewart and Newton 3.00
7. Bibliography of theses on Oregon geology, 1959: Schlicker 0.50
(Supplement) Bibliography of theses, 1959 to Dec. 31, 1965: Roberts 0.50
8. Available well records of oil and gas exploration in Oregon, rev. 1973: Newton . 1.00
11. A collection of articles on meteorites, 1968 (reprints from The ORE BIN) . . . 1.50
12. Index to published geologic mapping in Oregon, 1968: Corcoran 0.50
13. Index to The ORE BIN, 1950-1974. 1.50
14. Thermal springs and wells, 1970: Bowen and Peterson 1.50
15. Quicksilver deposits in Oregon, 1971: Brooks 1.50
16. Mosaic of Oregon from ERTS-1 imagery, 1973: 2.50
18. Proceedings of Citizens' Forum on potential future sources of energy, 1975 . . . 2.00

OIL AND GAS INVESTIGATIONS

1. Petroleum geology, western Snake River basin, 1963: Newton and Corcoran . . . 3.50
2. Subsurface geology, lower Columbia and Willamette basins, 1969: Newton . . . 3.50
3. Prelim. identifications of foraminifera, General Petroleum Long Bell No. 1 well . . 2.00
4. Prelim. identifications of foraminifera, E. M. Warren Coas Co. 1-7 well: Rau . . 2.00

MISCELLANEOUS PUBLICATIONS

- Landforms of Oregon: a physiographic sketch (17" x 22"), 1941 0.25
- Mining claims (State laws governing quartz and placer claims) 0.50
- Oregon base map (22" x 30"). 0.10
- Geologic time chart for Oregon, 1961 1.00
- Postcard - geology of Oregon, in color 10¢ each; 3 - 25¢; 7 - 50¢; 15 - 1.00
- The ORE BIN - Annual subscription (\$8.00 for 3 yrs.) 3.00
- Available back issues, each 25¢; mailed 0.35
- Accumulated index - see Misc. Paper 13

GOLD AND MONEY SESSION PROCEEDINGS

- Second Gold and Money Session, 1963 [G-2]. 2.00
- Third Gold and Money Session, 1967 [G-3] 2.00
- G-4 Fifth Gold and Money Session, Gold Technical Session 5.00