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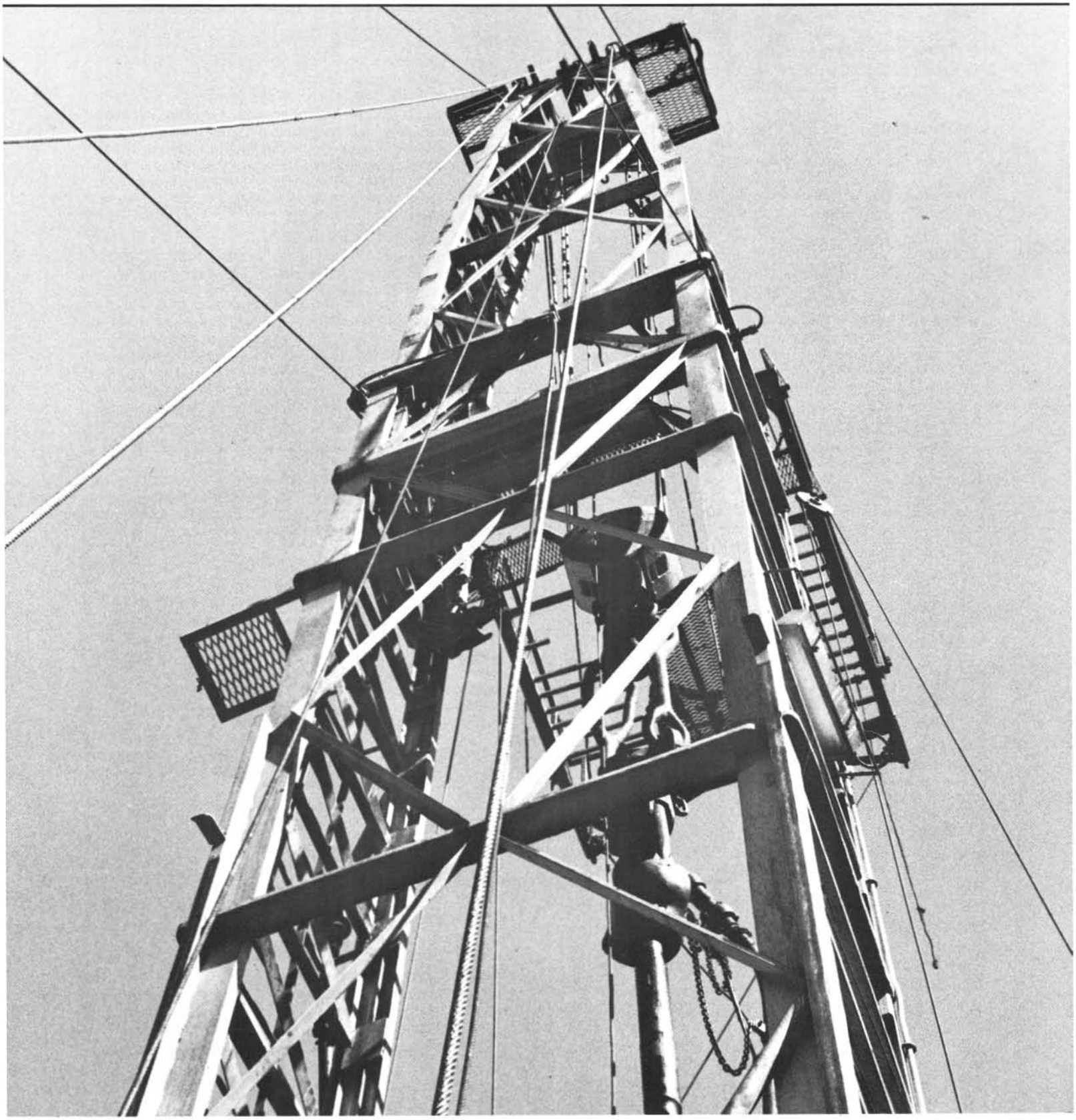

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NEXT MONTH:

Geothermal Exploration in Oregon, 1980, by George R. Priest and Dennis L. Olmstead; and *Surface Mined Land Reclamation in Oregon, 1980*, by Paul F. Lawson.

COVER PHOTO

Derrick owned by Paul Graham Drilling Co. of Rio Vista, Calif., drilling for gas in the Mist Gas Field under contract with Reichhold Energy Corp.

DOGAMI issues lineation study of the northern Cascades of Oregon

The Oregon Department of Geology and Mineral Industries (DOGAMI) announces the completion of a photo and imagery study of the northern Cascades, from the Columbia River on the north to the Willamette Pass area on the south.

The study is released as DOGAMI Special Paper 12, entitled *Geologic Linears of the Northern Part of the Cascade Range, Oregon*. It was prepared by R. Venkatakrishnan, J.G. Bond, and J.D. Kauffman of Geoscience Consultants, Moscow, Idaho, and contains five maps of geologic linears (four at a scale of 1:250,000 and one at a scale of 1:1,000,000) and a 25-page interpretive text.

Linears, or lineaments, can help identify previously unmapped faults and folds, which in turn are used to find areas of mineral deposits and geothermal systems, to assess the earthquake potential, and to develop an understanding of the general mountain-building history of the Cascade Range. Basis for the study are high-altitude (U-2) infrared photos, side-looking airborne radar (SLAR) mosaics, and orbital (LANDSAT) multispectral scanner imagery.

Special Paper 12 may be purchased for $3.00 from the Oregon Department of Geology and Mineral Industries, 1005 State Office Building, Portland, OR 97201. Payment must accompany orders of less than $20.00. □

Oregon diamond find has been verified

Oregon diamonds are fact, not rumor. Although major diamond production is from Africa, other parts of the world, including the United States, have known diamond occurrences. Oregon is but one of several states where reported diamond finds have been verified.

Diamond "finds" have been reported in Oregon since 1890. Kunz (1890) and Blank (1935) reported diamonds in the placer gold gravels of southwestern Oregon. Kunz (1890) also reported microdiamonds in the platinum placer sands of southwestern Oregon.

One authenticated diamond has been discovered in Oregon. This stone is part of the Smithsonian Natural History Museum mineral collection (specimen number R7826). The diamond, which was found prior to 1938 near Wedderburn, Curry County, Oregon, weighs 0.6 carats and is a clear white, flattened hexoctahedron with minor carbon inclusions. This stone was purchased by the Smithsonian Institution from Mr. A. Montgomery on February 15, 1938, for $25.50.

References cited

Blank, E.W., 1935, Diamond finds in the United States, *in* Rocks and minerals: Jersey City, N.J., Colgate-Palmolive-Peet Co., parts III and V.

Kunz, G., 1890, Gems and precious stones of North America: New York, Scientific Publishing Co., p. 28-29.

—Steven R. Munts, Bureau of Mines, E. 360 Third Avenue, Spokane, Wash. 99202 □

CONTENTS

Oil and gas exploration and development in Oregon, 1980

by Dennis L. Olmstead, Petroleum Engineer, Oregon Department of Geology and Mineral Industries

ABSTRACT

1980 was the busiest year to date for oil and gas exploratory drilling in Oregon. The activity, totaling 31 wells and nine redrills, stemmed from the discovery in 1979 of the Mist Gas Field in Columbia County.

Drilling continued at Mist but also spread to the Willamette Valley and the coastal counties of Clatsop, Coos, Douglas, and Lincoln. The State was also the site of much oil and gas leasing, both along the coast and in central and eastern Oregon.

LEASING ACTIVITY

The 1979 gas discovery near Mist, in Columbia County, inspired increased oil and gas leasing during 1980. The activity spread statewide but was slowed by a Bureau of Land Management (BLM) moratorium on all Federal onshore noncompetitive oil and gas leasing.

BLM noncompetitive leases are issued on land where there are no known producing geological structures. Over-the-counter (OTC) leases are granted on new applications, while simultaneous oil and gas (SOG) or "lottery" leases are granted on property previously leased but then relinquished, expired, terminated, or canceled. Former Interior Secretary Cecil Andrus suspended both OTC and SOG leasing from late February to June 1980 to correct abuses disclosed by a BLM investigation. Upon resumption of application processing in June, the BLM began to computerize the leasing system to enable the agency to monitor it more closely.

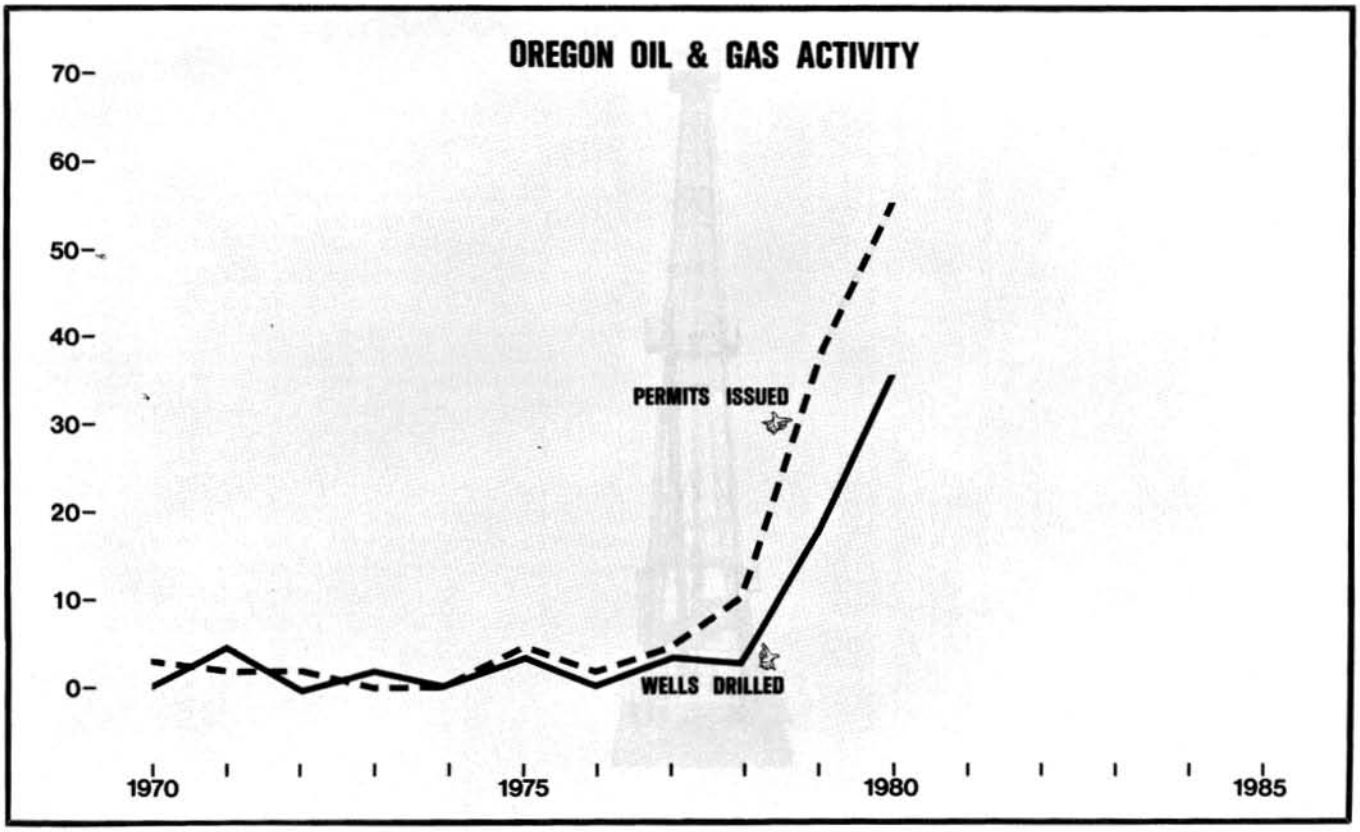
By the end of 1980, statewide Federal leaseholds totaled 723,537 acres, with pending applications for 4,511,924 acres more.

Three lease sales where bidders offered bonus payments to win leases in twelve counties were held by the Oregon Division of State Lands during the year. Bonus bids of up to $287 per acre were offered on parcels of land totaling nearly 70,000 acres. Bonus payments to the State reached a sum of $3.7 million. The western Oregon counties of Clatsop, Columbia, and Douglas were the sites of the most leased acreage; while lands adjacent to the gas production at Mist received the highest bids, interest was much lower for other parts of the State. Rental terms for State leases are one dollar per acre per year and ⅛ royalty in the event of a discovery.

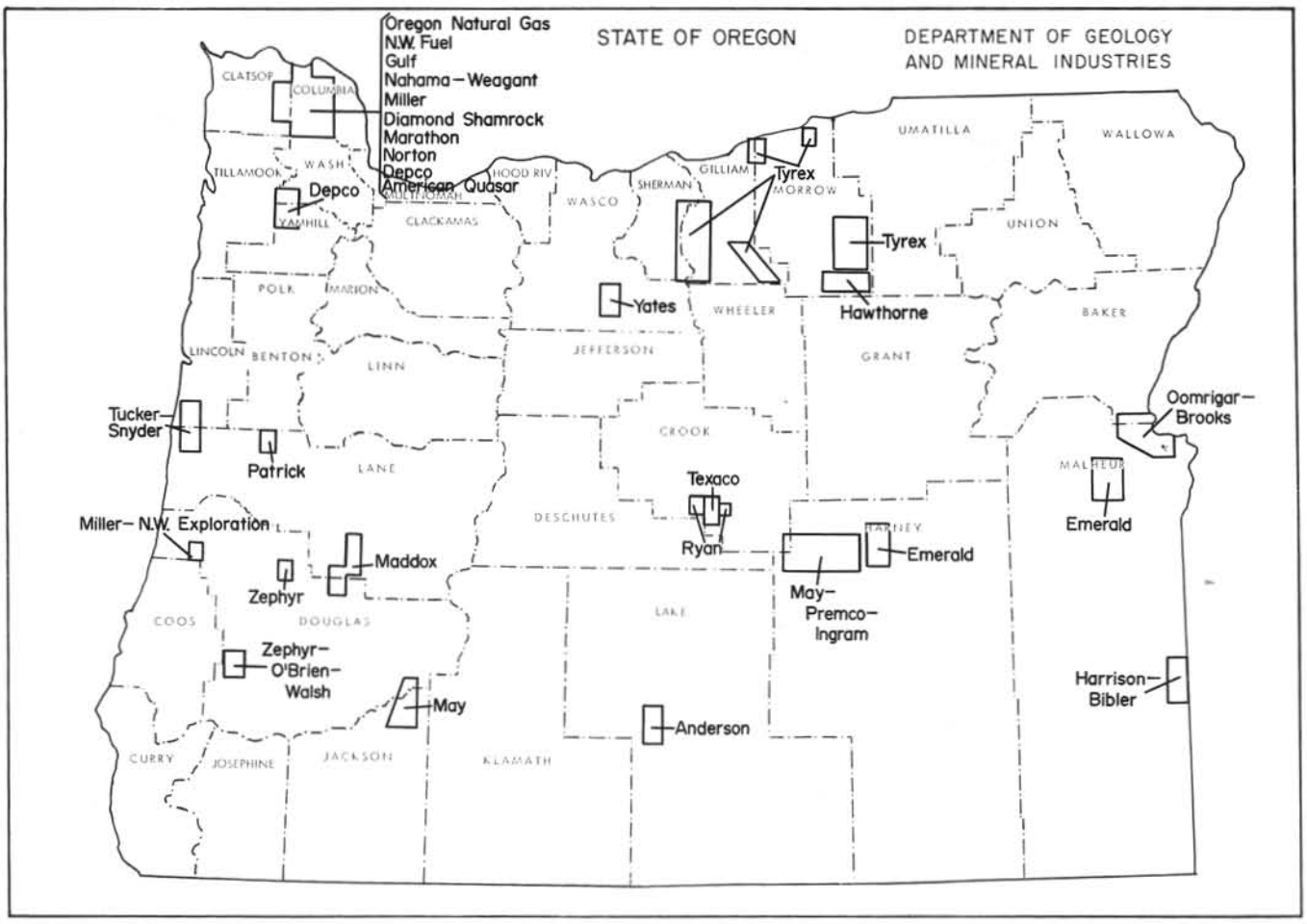
Fee leasing also increased during 1980, but in many cases leases were not recorded with the counties. Eastern Oregon counties, especially those bordering the Columbia River, saw a rapid increase in leasing activity.

DRILLING ACTIVITY

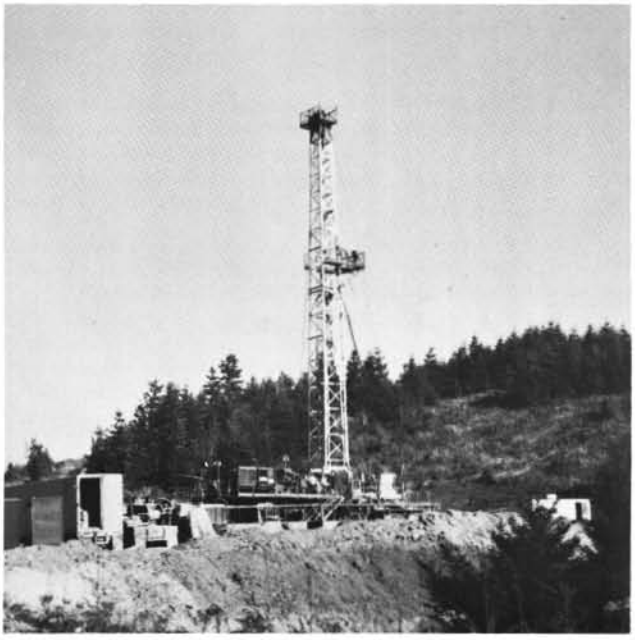
Oregon's new status as a producing state resulted in a dramatic increase in drilling during 1980. From a total of two wells in 1978 and sixteen in 1979, there was an increase to 31 exploratory and development wells drilled during 1980, as well as many redrills. This dramatic increase in just two years is graphic proof that the energy industry now takes Oregon seriously. Still, major companies have been cautious about



Oil and gas activity in Oregon since 1970.



Oil and gas leases obtained in Oregon, 1980.



Northwest Exploration Company drilling Coos County 1, north of Coquille, Oregon, to a depth of 6,821 ft. The well was abandoned as a dry hole.

moving into Oregon, and the drilling activity has been conducted by local companies and independents.

The Mist Gas Field in Columbia County (see *Oregon Geology*, December 1980) was the site of most of the drilling effort for the year, with 18 wells drilled within the field boundaries and four more within a radius of a few miles. The remaining nine wells were drilled in coastal counties and in the Willamette Valley, where only subcommercial amounts of hydrocarbons have been found in the past.

Seven different operators drilled wells in Oregon during 1980; four had drilled no previous holes in the State. Wells were drilled to modest depths again, the deepest hole penetrating to 7,068 ft in Clatsop County. Nevertheless, total footage, including redrills, set a new State record at 128,000 ft, an increase of 36 percent over 1979 footage. The trend toward increased footage and the spread of drilling to diverse points of the State give the industry a better chance of making another discovery in Oregon. 1980 activity, however, resulted in only two new gas wells at Mist, one of them productive enough to be immediately piped to market. No new fields were discovered.

Reichhold Energy Corporation and its partners Diamond Shamrock and Northwest Natural Gas Company continue to be the only producers at Mist, but American Quasar Petroleum Company has also continued intensive drilling in the area. American Quasar also expanded its exploratory effort into the Willamette Valley in 1980 (Table 1), drilling one well and scheduling two more. These companies were joined in the

Table 1. *Oil and gas permits and drilling activity in Oregon, 1980*

Permit no.	Operator	Well name	Location	TD: Total depth (ft) RD: Redrill depth (ft)	Status
73 RD	Reichhold Energy Corp.	Longview Fibre 1	SW¼ sec. 11 T. 6 N., R. 5 W. Columbia County	RD: 2,803	Abandoned; dry hole.
115	Reichhold Energy Corp.	Columbia County 12	NW¼ sec. 14 T. 6 N., R. 5 W. Columbia County	TD: 3,160 RD: 3,365	Suspended.
116	Oregon Natural Gas Development Corp.	Crown Zellerbach 1	NW¼ sec. 13 T. 2 S., R. 10 W. Tillamook County	TD: 6,158	Abandoned; dry hole.
117	John T. Miller	John Stump 1	NW¼ sec. 26 T. 8 S., R. 5 W. Polk County	TD: 1,502	Suspended; dry hole.
119	American Quasar Petroleum Co.	Wall 24-21	SW¼ sec. 24 T. 6 N., R. 5 W. Columbia County	TD: 2,810	Abandoned; dry hole.
121	American Quasar Petroleum Co.	Longview Fibre 25-32	NE¼ sec. 25 T. 6 N., R. 5 W. Columbia County	TD: 2,902 RD: 3,261	Abandoned; dry hole.
122	American Quasar Petroleum Co.	Crown Zellerbach 14-21	NW¼ sec. 14 T. 5 N., R. 5 W. Columbia County	TD: 1,832	Abandoned; dry hole.
123	Reichhold Energy Corp.	Columbia County 11-10	NW¼ sec. 10 T. 6 N., R. 5 W. Columbia County	–	Permit issued.
124	Reichhold Energy Corp.	Columbia County 33-3	SE¼ sec. 3 T. 6 N., R. 5 W. Columbia County	TD: 2,777	Completed, gas; Mist Gas Field.
125	Reichhold Energy Corp.	Columbia County 43-11	SE¼ sec. 11 T. 6 N., R. 5 W. Columbia County	TD: 3,326 RD: 3,626	Abandoned; dry hole.
126	Reichhold Energy Corp.	Crown Zellerbach 42-1	NE¼ sec. 1 T. 6 N., R. 5 W. Columbia County	TD: 2,892	Completed, gas; Mist Gas Field.
127	Reichhold Energy Corp.	Longview Fibre 34-12	SE¼ sec. 12 T. 6 N., R. 5 W. Columbia County	–	Permit issued.
128	Reichhold Energy Corp.	Libel 44-15	SE¼ sec. 15 T. 6 N., R. 5 W. Columbia County	–	Permit issued.
129	Reichhold Energy Corp.	Columbia County 44-4	SE¼ sec. 4 T. 6 N., R. 5 W. Columbia County	TD: 3,061	Abandoned; dry hole.
130	Reichhold Energy Corp.	Columbia County 21-10	NW¼ sec. 10 T. 6 N., R. 5 W. Columbia County	–	Permit issued.
131	Reichhold Energy Corp.	Columbia County 32-3	NE¼ sec. 3 T. 6 N., R. 5 W. Columbia County	TD: 3,395	Suspended.
132	Reichhold Energy Corp.	Laubach 34-13	SE¼ sec. 13 T. 6 N., R. 5 W. Columbia County	–	Permit issued.
133	Reichhold Energy Corp.	Libel 22-15	NW¼ sec. 15 T. 6 N., R. 5 W. Columbia County	–	Permit issued.
134	Reichhold Energy Corp.	Longview Fibre 33-12	SE¼ sec. 12 T. 6 N., R. 5 W. Columbia County	–	Permit issued.

Table 1. *Oil and gas permits and drilling activity in Oregon, 1980—Continued*

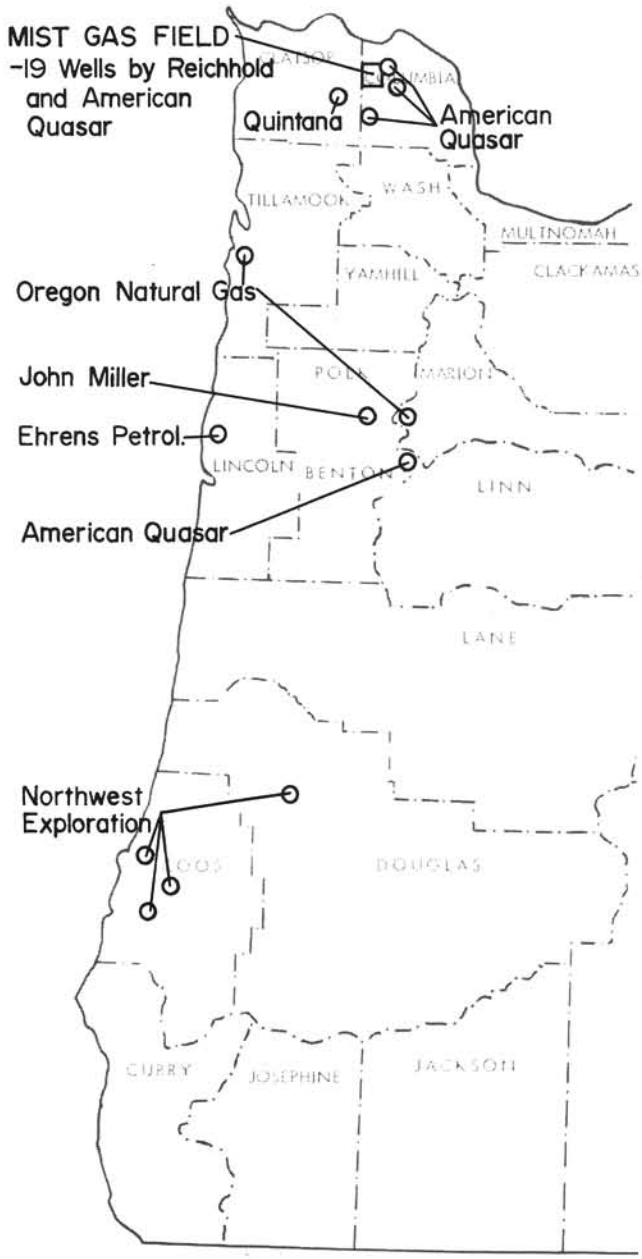
Permit no.	Operator	Well name	Location	TD: Total depth (ft) RD: Redrill depth (ft)	Status
135	Reichhold Energy Corp.	White 33-13	SE¼ sec. 13 T. 6 N., R. 5 W. Columbia County	TD: 2,708	Abandoned; dry hole.
136	Northwest Exploration Co.	Coos County 1	NE¼ sec. 14 T. 27 S., R. 13 W. Coos County	TD: 6,821	Abandoned; dry hole.
137	Northwest Exploration Co.	Westport 1	NW¼ sec. 16 T. 26 S., R. 13 W. Coos County	TD: 3,700	Abandoned; dry hole.
138	Northwest Exploration Co.	Fat Elk 1	SW¼ sec. 15 T. 28 S., R. 13 W. Coos County	TD: 3,110	Abandoned; dry hole.
139	Northwest Exploration Co.	Sawyer Rapids 1	NE¼ sec. 3 T. 23 S., R. 9 W. Douglas County	TD: 5,563	Abandoned; dry hole.
140	Reichhold Energy Corp.	Longview Fibre 24-12	SW¼ sec. 12 T. 6 N., R. 5 W. Columbia County	TD: 2,839	Suspended.
141	Northwest Exploration Co.	Fish Trap 1	NE¼ sec. 32 T. 28 S., R. 13 W. Coos County	–	Permit issued.
142	Reichhold Energy Corp.	Adams 32-34	NE¼ sec. 34 T. 7 N., R. 5 W. Columbia County	–	Permit issued.
143	Reichhold Energy Corp.	Adams 24-34	SW¼ sec. 34 T. 7 N., R. 5 W. Columbia County	TD: 3,377	Abandoned; dry hole.
144	Reichhold Energy Corp.	Adams 23-34	SW¼ sec. 34 T. 7 N., R. 5 W. Columbia County	–	Permit issued.
145	Reichhold Energy Corp.	Columbia County 21-34	NW¼ sec. 34 T. 7 N., R. 5 W. Columbia County	–	Permit issued.
146	Reichhold Energy Corp.	Columbia County 11-33	NW¼ sec. 33 T. 7 N., R. 5 W. Columbia County	–	Permit issued.
147	Reichhold Energy Corp.	Columbia County 12-9	NW¼ sec. 9 T. 6 N., R. 5 W. Columbia County	TD: 2,918	Suspended.
148	Reichhold Energy Corp.	Columbia County 32-5	NE¼ sec. 5 T. 6 N., R. 5 W. Columbia County	–	Permit issued.
149	Reichhold Energy Corp.	Columbia County 31-3	NE¼ sec. 3 T. 6 N., R. 5 W. Columbia County	–	Permit issued.
150	Reichhold Energy Corp.	Columbia County 42-4	NE¼ sec. 4 T. 6 N., R. 5 W. Columbia County	–	Permit issued.
151	Reichhold Energy Corp.	Columbia County 22-3	NW¼ sec. 3 T. 6 N., R. 5 W. Columbia County	–	Permit issued.
152	Reichhold Energy Corp.	Longview Fibre 23-12	SW¼ sec. 12 T. 6 N., R. 5 W. Columbia County	–	Permit issued.
153	Reichhold Energy Corp.	Columbia County 13-2	SW¼ sec. 2 T. 6 N., R. 5 W. Columbia County	TD: 3,709 RD: 3,823	Suspended.

Table 1. *Oil and gas permits and drilling activity in Oregon, 1980—Continued*

Permit no.	Operator	Well name	Location	TD: Total depth (ft) RD: Redrill depth (ft)	Status
154	American Quasar Petroleum Co.	Investment Management 34-21	NW¼ sec. 34 T. 6 N., R. 4 W. Columbia County	TD: 4,080	Abandoned; dry hole.
155	American Quasar Petroleum Co.	Larkins 23-33	SE¼ sec. 23 T. 6 N., R. 5 W. Columbia County	TD: 2,940	Abandoned; dry hole.
156	American Quasar Petroleum Co.	Rau 18-14	SW¼ sec. 18 T. 6 N., R. 4 W. Columbia County	TD: 2,434 RD: 2,440	Abandoned; dry hole.
157	American Quasar Petroleum Co.	Crown Zellerbach 30-33	SE¼ sec. 30 T. 6 N., R. 4 W. Columbia County	TD: 2,350	Abandoned; dry hole.
158	Reichhold Energy Corp.	Columbia County 14-2	SW¼ sec. 2 T. 6 N., R. 5 W. Columbia County	TD: 3,582	Suspended.
159	Reichhold Energy Corp.	Sweet 14-1	SW¼ sec. 1 T. 6 N., R. 5 W. Columbia County	—	Permit issued.
160	Oregon Natural Gas Development Corp.	Independence 12-25	NW¼ sec. 25 T. 8 S., R. 4 W. Marion County	TD: 4,826	Abandoned; dry hole.
161	Reichhold Energy Corp.	Baganoff 23-28	SW¼ sec. 28 T. 5 S., R. 2 W. Marion County	—	Permit issued.
162	Reichhold Energy Corp.	Crown Zellerbach 22-6	NW¼ sec. 6 T. 6 N., R. 4 W. Columbia County	TD: 3,671 RD 1: 2,264 RD 2: 2,431	Abandoned; dry hole.
163	Northwest Exploration Co.	Fat Elk 2	NE¼ sec. 11 T. 28 S., R. 13 W. Coos County	—	Permit issued.
164	American Quasar Petroleum Co.	Investment Management 20-21	NW¼ sec. 20 T. 6 N., R. 4 W. Columbia County	TD: 2,281 RD: 2,145	Abandoned; dry hole.
165	American Quasar Petroleum Co.	Wilna Inc. et al. 6-43	SE¼ sec. 6 T. 6 N., R. 4 W. Columbia County	—	Permit issued.
166	Texaco Inc.	USL-OR 17-1	NE¼ sec. 17 T. 19 S., R. 20 E. Crook County	—	Drilling.
167	Ehrens Petroleum & Development, Inc.	Longview Fibre 1	NE¼ sec. 20 T. 9 S., R. 11 W. Lincoln County	—	Drilling.
168	Ehrens Petroleum & Development, Inc.	Longview Fibre 2	NW¼ sec. 28 T. 9 S., R. 11 W. Lincoln County	TD: 2,004	Idle.
169	Reichhold Energy Corp.	Columbia County 14-34	SW¼ sec. 34 T. 7 N., R. 5 W. Columbia County	—	Permit issued.
170	Quintana Petroleum Corp.	Watzek et al. 30-1	NW¼ sec. 30 T. 6 N., R. 6 W. Clatsop County	TD: 7,068	Abandoned; dry hole.
171	John T. Miller	Bork 1	SE¼ sec. 26 T. 8 S., R. 5 W. Polk County	TD: 1,030	Idle.
172	American Quasar Petroleum Co.	Hickey 9-12	NW¼ sec. 9 T. 12 S., R. 2 W. Linn County	—	Drilling.

Table 1. *Oil and gas permits and drilling activity in Oregon, 1980—Continued*

Permit no.	Operator	Well name	Location	TD: Total depth (ft) RD: Redrill depth (ft)	Status
173	American Quasar Petroleum Co.	Henschel 17-34	SE¼ sec. 17 T. 10 S., R. 3 W. Linn County	TD: 2,856	Abandoned; dry hole.
174	American Quasar Petroleum Co.	M & P Farms 33-24	SW¼ sec. 33 T. 11 S., R. 4 W. Linn County	—	Permit issued.
175	American Quasar Petroleum Co.	Wilna et al. 5-23	SW¼ sec. 5 T. 6 N., R. 4 W. Columbia County	TD: 4,503	Abandoned; dry hole.



Oil and gas drilling sites in Oregon, 1980. All drilling was in western Oregon.

During 1980, Northwest Natural Gas Company installed a gathering line for Columbia County 10 in the Mist Gas Field.

area by Oregon Natural Gas Development Company and John T. Miller, who also carried out exploratory drilling.

GAS PRODUCTION

Initial gas production from the Mist Gas Field occurred during the final days of 1979, with one well on line. Subsequent installation of a gathering line brought the number of wells on line to five and the total daily production of the field to 21 million cubic feet per day. Two additional wells are capable of production but do not have gathering lines. Of the seven capable wells, two were drilled and completed in 1980, with a capacity of 7 million cubic feet of gas per day. This decrease in the number of completed wells is the only statistic that dropped at the Mist Field.

The value of the gas produced at Mist is based on its heating value and is set by Federal price guidelines. Mist gas provides about 9.2 "therms" per thousand cubic feet (Mcf), and the price rose during the year from $0.2358 per therm in

(Continued, p. 38)

Mineral industry in Oregon, 1980

by Jerry J. Gray, Economic Geologist, Albany Field Office; Howard C. Brooks, Resident Geologist, Baker Field Office; Norman V. Peterson, District Geologist, and Len Ramp, Resident Geologist, Grants Pass Field Office, Oregon Department of Geology and Mineral Industries

MINERAL PRODUCTION STATISTICS

Oregon's mineral production values for 1979 and 1980 are summarized in Table 1. This table does not include an additional estimated $600 million from the production of aluminum, carbide, nickel, steel, titanium, and zirconium at metallurgical plants employing approximately 11,000 people.

During 1978, a Federal reorganization caused the U.S. Bureau of Mines to stop canvassing for mineral production statistics for crude petroleum, petroleum, natural gas liquids, natural gas, anthracite and bituminous coal, lignite, and uranium. This change did not affect Oregon until 1980 because none of these minerals were being produced in the State. However, a major change occurred in Oregon mineral output during the last month of 1979: natural gas from the Mist Gas Field started flowing to market. At $2.34 per thousand cubic feet, $3,000 of natural gas was produced during 1979. During 1980, the first full production year, $11.6 million was produced. The value of mineral production value in Table 1 will not be comparable to that formally published by the Bureau of Mines because of the extra value from natural gas.

The Bureau's preliminary figures for 1980 indicate that the national high interest rate with its corresponding drop in construction has caught up with Oregon's historical mineral-production mainstay, rock materials (clay, pumice, sand and gravel, and stone), causing a 14-percent drop in value of output. During 1979, rock material accounted for 68 percent of the total; however, with natural gas output, in 1980 rock material production dropped to 57 percent of total production. The year 1980 also saw a new mineral, zeolite, added to the production list.

Table 1. *Oregon's mineral production values for 1979 and 1980*

Mineral commodity	1979 Value ($1,000)	1979 Percent	1980 Value* ($1,000)	1980 Percent*
Stone	65,074	39	56,300	33
Cement, copper, diatomite, gold, nickel, silver, talc, zeolite	51,891	31	61,760	36
Sand and gravel	45,829	28	39,000	23
Natural gas	3	–	11,552	7
Pumice	1,644	1	2,005	1
Gemstones	500	0.3	486	0.3
Clays	263	0.2	251	0.2
TOTAL	165,210	99.5**	171,354	100.5**

* Preliminary data provided by U.S. Bureau of Mines.
** Percentages do not total 100 because of individual rounding.

METALS

Placering

With the price of gold in the range of $500-$650 per ounce, great numbers of men, women, and children have taken up gold placering for fun and profit. Others are selling small-scale placering equipment for profit. If statistics could be obtained, they might show that the value of placering equipment sold is far greater than the value of gold found with that equipment.

The largest output of placer gold was produced at the U.S. Army Corps of Engineers construction site for the rock-filled Applegate River Dam (Point 29*). All of the gravel that was used in the fill and as aggregate for the concrete was screened, and the minus-⅜th-mesh material was run through a gold-recovery system. Total gold recovered was about $2.5 million, with the Corps' share being $0.8 million. The gravel averaged about $1 per yard in recovered gold. Other gold placer operations which operated all field season were Mormon Basin Mines Company (Point 17) and Delta Investors (Point 18), both on Basin Creek in Malheur County; Gallagher's on Sucker Creek (Point 32); and Bentley's on Fry Gulch near the old town site of Waldo (Point 33). The Eagle and the Pioneer chrome/gold beach-sand mines (Point 23) near Bandon are being operated by W-S Mining. The firm is processing about 250 cu yd per day through screens and sluice boxes to recover the gold and platinum metals. The chromite-rich black-sand concentrates are being saved.

Lode mining

Output of contained nickel in ferronickel from Hanna Mining Company's mine at Nickel Mountain (the nation's only domestic mine source of nickel) and their smelter complex at Riddle (Point 24) rose from 15,065 tons in 1979 to 16,117 tons in 1980.

About 150 tons of ore per day from the Iron Dyke mines (Point 11) is trucked by Silver King Mining 22.5 mi to the firm's 800-tons-per-day flotation mill near Cuprum, Idaho, for concentration. Employment at the mine averaged 35.

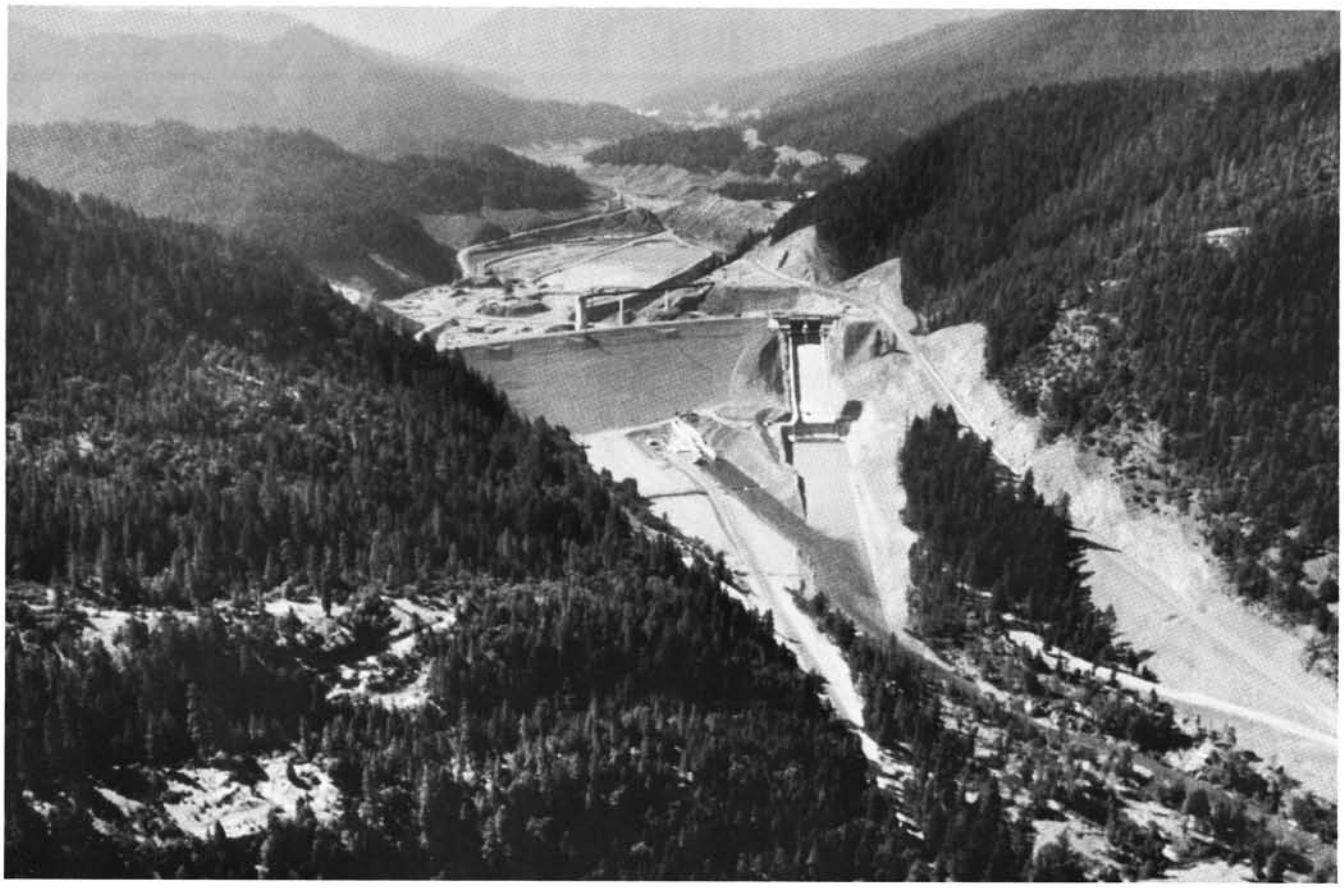
The Buffalo Mining Company's flotation mill (Point 12) was operated part of the year at the rate of 2 tons of ore per hour, 16 hours per day, from ore obtained from the 600- and 500-adit levels of the Buffalo Mine. Rehabilitation work continues on these levels.

Metal processing

Because the Bonneville Power Administration (BPA) curtailed the delivery of interruptible electric power, Reynolds Metals Company closed down one of its five pot lines from March to July, at its Troutdale aluminum plant (Point 3). The line was restarted with power purchased outside of BPA grids. By year's end, all pot lines were back to full production. Total production loss for the year amounted to about 16 percent.

A Danish firm, Bergsoe Metal Corporation, is building a $25-million lead-recycling plant at St. Helens (Point 1). Construction began in March 1980 and is to be completed by fall of 1981. The plant will have the capacity to reclaim 50,000 tons of

* All point numbers refer to locations shown on the location map.



Aerial view of the recently constructed Applegate Dam. Gold valued at $2.5 million was recovered from gravel excavated from area now covered by dam and pond and used for dam fill and concrete.

Ground level view of Mormon Basin Placer, Inc., gold placer operation on Basin Creek, showing draglines and gold recovery plant.

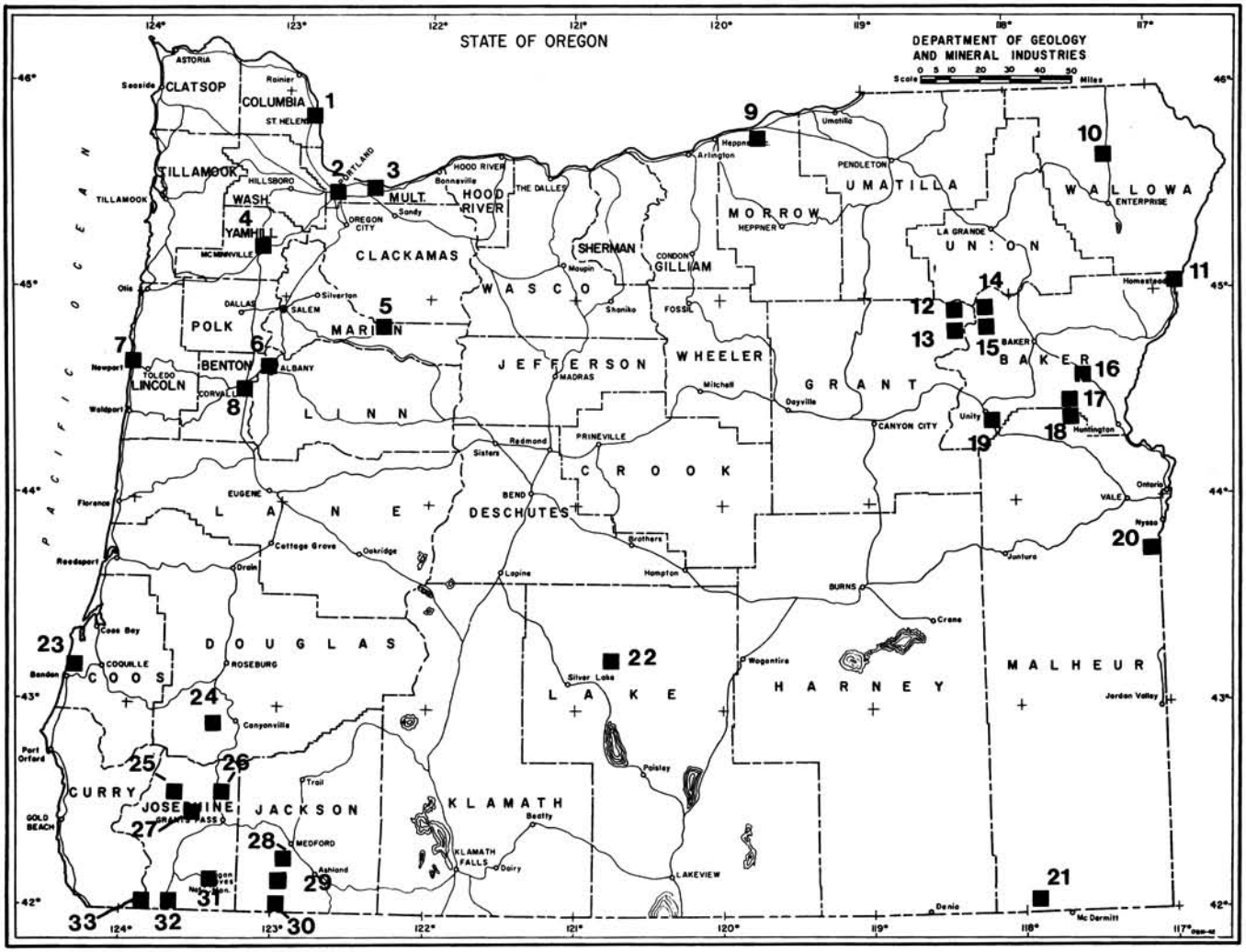
lead (equivalent to 2.5 million car batteries) annually from storage batteries.

Oregon Metallurgical Corporation, Albany (Point 6), started the construction of a new titanium sponge facility which will increase the company's sponge capacity by 50 percent from 3,000 tons to 4,500 tons. The plant is expected to be completed by mid-1981 and to cost $7-10 million. Also under construction is a titanium mill-products plant which will allow the company to take its large ingots and forge them down to smaller billets which can be handled by more firms. Teledyne Wah Chang of Albany (Point 6), a producer of zirconium, continued to curtail employment because of low demand for the metal. Cascade Steel Rolling Mills, McMinnville (Point 4), announced a $6-million expansion of its mill facilities, to be completed in early 1981. The firm uses scrap to produce electric-furnace steel which is rolled into reinforcing bags and steel fence posts.

NONMETALS

Oregon Portland Cement Company completed its first-year run of its new cement plant near Durkee (Point 16). Capacity of the new plant is about 500,000 tons of cement per year, which is twice the size of the replaced plant at Lime, a few miles to the south. Limestone for the new plant is quarried at the same site.

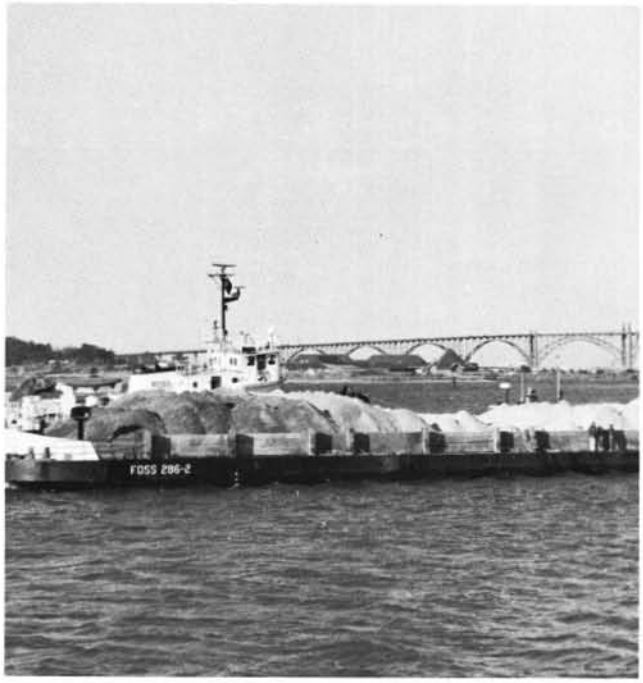
Limestone marketing in the Willamette Valley has been changed by the importation by barge of limestone from Texada Island, B.C., to Newport (Point 7). Prior to this time, Morse Brothers, Inc., supplied limestone to the valley by barge



EXPLANATION

1. St. Helens (Pb)
2. Portland (sand and gravel)
3. Troutdale-Gresham (Al, brick)
4. McMinnville (steel)
5. Santiam mining district (Cu)
6. Albany (Ti-Zr)
7. Newport (limestone, stone)
8. Corvallis (limestone, sand and gravel)
9. Boardman (fly ash)
10. Flora (coal)
11. Iron Dyke Mine (Cu, Au)
12. Buffalo Mine (Au, Ag)
13. Cougar-New York Mine (Au, Ag)
14. Meadow Lake (Cu-Mo)
15. Bourne (Au)
16. Durkee (cement)
17. Mormon Basin Mine (Au)
18. Basin Creek Mine (Au)
19. Unity (Cu)
20. Adrian (bentonite, zeolite)
21. McDermitt (U)
22. Christmas Valley (diatomite)
23. Eagle, Pioneer Mines (Au, Cr)
24. Nickel Mountain (Ni)
25. Black Bear Mine (Au)
26. Greenback Mine (Au)
27. Last Flat Mine (Au)
28. Sugarloaf Hill (Au)
29. Applegate Dam (Au)
30. Steatite of Oregon (soapstone)
31. Boswell, Rainbow Mines (Au)
32. Sucker Creek, Queen of Bronze Mine (Cu, Au)
33. Turner-Albright Mine, Fry Gulch (Cu, Co, Au)

Mineral industry activity, exploration, and development in Oregon in 1980. Point numbers in text refer to location numbers shown on this map.



A barge load of Texada Island, B.C., limestone docking at Newport, Oregon. A 6,000-ton barge load of 3-in. minus limestone is being pushed to a dock at Newport. The barge will be unloaded in 8 hours and moved to a nearby stockpile by Morse Brothers, Inc., equipment waiting dockside.

Morse Brothers, Inc., limestone crushing-screening plant at Corvallis, the crushing-screening plant for Texada Island, B.C., limestone imported to Newport. The limestone is used as back haul for trucks bringing gravel from Corvallis to Morse Brothers, Inc., ready-mix plant in Newport.

from Texada Island to Portland, then south by rail. However, transportation cost increases kept driving up the price of the delivered stone. Meanwhile, because the Pacific Coast area at Newport lacks concrete-grade aggregate, Morse Brothers was supplying it by truck from Corvallis (Point 8), a distance of 55 mi. Because the trucks did not have a load to haul back, they were driven back empty. Now the limestone provides a back haul, which divides the cost of the trucking between two commodities, aggregate to Newport, limestone to Corvallis. The 6,000-ton barge load of minus-3-in. limestone is unloaded and trucked to a nearby stockpile in 8 hours. It is then trucked to the Corvallis plant, where it is crushed and screened for use in paper manufacture and agriculture.

Construction was started on a $6-million brick-manufacturing plant for Columbia Brick Works at Gresham (Point 3). The new plant is to have an annual capacity of 48 million bricks. The old plant employed about 25 persons and produced about 17 million bricks per year.

Oil-Dri West continues to mine and process diatomaceous earth for pet litter and floor-sweep absorbent from its Christmas Valley site (Point 22). Diatomaceous earth is composed of clay and diatoms (skeletons of microscopic aquatic plants).

Steatite of Oregon continues to mine and market block soapstone from its Jackson County deposit (Point 30) for art carving and other specialty uses.

Teague Mineral Products still produces bentonite from its Malheur County site. The clay, mined from pits near the head of Sucker Creek, is used for a binder in sandcasting molds and for hay cubes, pond sealants, and fire retardants. The firm bought a Raymond grinding mill from the Midwest and had it shipped to its Adrian drying-bagging plant (Point 20). After the mill was reassembled, it was used to fine-grind zeolite from a deposit 30 mi south of the bentonite pits. The zeolite was used as a hog-feed supplement.

When the Boardman coal-fired power plant (Point 9) comes on line in July, it will produce large amounts of fly ash. Fly ash can be used for pozzolan. Up to one-third of the cement in concrete can be replaced with pozzolan. The pozzolan

Aerial view of Yaquina Head, major source of rock material for Newport area. Federal law requires that the Bureau of Land Management purchase this landmark from Yaquina Head Quarries, Inc., by 1982.

produces a stronger and more durable, watertight, easily placed, and worked concrete. Coal for the plant is mined from the Gillette, Wyoming, area. It is transported from the mine to the plant by a 100-car unit train. The round trip is 2,400 mi; 10,000 tons are carried each trip which takes 2½ days.

The Portland City Council approved a conditional use permit for Ross Island Sand and Gravel Company (Point 2), which allows the firm to continue to mine at about the same rate as in the past (1 million cu yd per year). Mining at the site could go on for another 35 years, and part of the island would be rebuilt from dredging spoils. At this time, plans to deed the island after mining and reclamation to the city as an open-space park are under consideration.

A Federal law was passed which requires the Bureau of Land Management to purchase the Yaquina Head Quarries, Inc., quarry site on Yaquina Head near Newport (Point 7) by 1982. The quarry is the main source of stone for the Newport area. Other sources will require much higher transportation costs to serve the Newport market.

EXPLORATION AND DEVELOPMENT

For the northwest portion of the State, specifically the Santiam mining district (Point 5), the leasing of Shiny Rock Mining Company mineral rights by AMOCO is significant. The Santiam district contains zoned mineralization with copper in the center. The two firms each had controlled about one-half of the center zone. After several years of diamond drilling on its side of the center zone, AMOCO started exploring the Shiny Rock side through geological, geochemical, and geophysical studies.

On the northeast side of the State, a joint venture of Brooks Minerals, Inc., and AMAX Exploration, Inc., began reopening old workings of the North Pole and E and E gold mines near Bourne (Point 15). Work involved rehabilitation of part of the North Pole No. 2 and the E and E 400-adit levels, plus surface mapping, sampling, and diamond drilling. The two mines are on the northern part of the North Pole-Columbia lode, which produced more than $8 million between 1894 and 1916. The geology of the Bourne quadrangle and part of the Mount Ireland quadrangle was mapped during the 1980 field season by Oregon Department of Geology and Mineral Industries (DOGAMI) geologists H.C. Brooks and M.L. Ferns. The Bourne map will be placed on open file in early 1981. Maps of the Mount Ireland quadrangle and the adjacent Granite quadrangle are scheduled for completion in 1981. W.A. Bowes and Associates continued exploration and

(Continued, p. 38)

Abstracts of Department geothermal papers given at OAS

These abstracts of papers given at the Oregon Academy of Science, February 28, 1981, at Portland State University in Portland summarize some of the findings of the Oregon Department of Geology and Mineral Industries' current research on low-temperature geothermal assessment and geothermal potential assessment of the Western and High Cascades.

GEOLOGY OF THE COUGAR RESERVOIR AREA, LANE COUNTY, OREGON, *by George R. Priest and Neil Woller, Oregon Department of Geology and Mineral Industries, 1005 State Office Building, Portland, Oregon 97201.*

The study area is located along Cougar Reservoir about 67 km (40 mi) east of Eugene. Volcanic rocks of the Western Cascades predominate, but basaltic lavas from upper Miocene to Pliocene High Cascade vents to the east cap ridges. The following informal volcanic units were used: Tuffs of Cougar Reservoir (laharic and epiclastic tuffs, Oligocene?); Basalts of East Fork (olivine tholeiite altered, early Miocene?); Strube ash-flow tuffs and andesites (early Miocene); Lavas of Cougar Dam (two-pyroxene andesite or basaltic andesite + mafic dikes and diatremes, 16.3 ± 1.8 m.y.); Tuffs of Rush Creek (dacite ash-flow tuffs, 13.9 ± 0.8 m.y.); Andesites of Walker Creek (two-pyroxene andesite, top flow at Katsuk Butte is 11.5 ± 0.5 m.y., top flow at Lookout Ridge is 8.93 ± 0.34 m.y.); Dacite of Castle Rock (hypersthene dacite plug dome, 9.31 ± 0.44 m.y.); Lavas of Tipsoo Butte (diktytaxitic basalt and basaltic andesite, 8.39 to 3.88 m.y.). Important observations include: 1. A major N-S-trending fault zone here called the Cougar Fault follows the east side of Cougar Reservoir; minimum offset is 152 m down to the east; 2. The Cougar Fault controls intrusion of the dike-like mass of lavas of Cougar Dam; 3. The youngest unit offset by the Cougar Fault is 11.5 m.y. but younger movements may have occurred; 4. Between 8.39 ± 0.36 m.y. and 8.93 ± 0.34 m.y., volcanism switched from silicic lavas from Western Cascade vents (Andesites of Walker Creek) to mafic lavas from the High Cascades (Lavas of Tipsoo Butte).

PRELIMINARY GEOLOGY AND GEOTHERMAL RESOURCE EVALUATION OF THE POWELL BUTTES AREA, OREGON, *by David E. Brown, Gary D. McLean, Gerald L. Black and John R. Petros, Oregon Department of Geology and Mineral Industries, 1005 State Office Building, Portland, Oregon 97201.*

During the past two years, the State of Oregon Department of Geology and Mineral Industries has been carrying out a preliminary geothermal resource evaluation of Powell Buttes, a John Day Formation (25-35 m.y.) vent in Crook County, Oregon, under DOE Grant No. DE-FC07-79ET27220. Preliminary logging of existing water wells revealed geothermal gradients 70 to 164°C km^{-1}, centered on an ovoid anomaly along the northwest to western margins of the buttes, which prompted subsequent drilling of eight 500-ft temperature-gradient holes and one 2,000-ft gradient hole. Initial evaluation of available data indicates the buttes are a complexly faulted horst of locally highly altered John Day material surrounded by slightly altered Deschutes Formation basalts, ash flows, and sediments. Boundary faults probably control the geothermal system. Detailed geophysics and deep drilling are necessary to confirm the above geothermal model. □

Oil and gas briefs:

1980: Approximately 3,200 drilling rigs explored for oil and gas in the United States.
1981: Approximately 3,800 drilling rigs are predicted.

1980: Domestic production of oil was 8.6 million Bbl/day, with consumption about 16 million Bbl/day.
1981: Domestic production will be about 8 million Bbl/day.
Mid-1980's: Domestic production will probably reverse the decline and increase to 9 or 10 million Bbl/day.

1980: 62,704 wells were drilled for oil and gas domestically. Previous record for a year was 57,111 (1956). This increase is due to higher prices and profits. OPEC price increases are also spurring domestic search for cheaper crude.
1981: Predictions are that 66,000 wells, an all-time high, will be drilled.

— Oil Daily

(Oil and gas, *continued from p. 32*)

January to $0.2640 in December. Gas production for the year is valued at about $11.5 million, which is 7 percent of the statewide mineral production for 1980. This is the first time natural gas has been a significant factor in these mineral production statistics. Production leveled off during the last half of the year, and future production trends will depend on the number of new completions.

Reservoir pressures at Mist have declined since the beginning of gas withdrawal, but the life of the field cannot yet be estimated with accuracy. Northwest Natural Gas Company is proceeding with plans to use the field as a gas storage site when the gas reserves are depleted. □

(Mineral industry, *continued from p. 37*)

development work for gold and silver at the Cougar Mine in the Granite district of Grant County (Point 13).

Preussag, Canada, Ltd., terminated its exploration efforts on the Johns-Manville copper-molybdenum prospect in the Camp Creek-Bull Run Creek area south of Unity (Point 19). Johns-Manville continued some shallow diamond drilling during the summer field season. The firm also shallow-drilled and hand-trenched its Meadow Lake copper prospect (Point 14) near the head of the North Powder River.

Utah International, Inc., Salt Lake City, Utah, requested a conditional use permit from the Wallowa County Planning Commission to excavate a bulk sample of coal from a bed reported to underlie the Flora area (Point 10). The sample is to be used for large-scale testing.

Uranium exploration in southeastern Oregon's Malheur County continued at a high level. In 1978, Placer Amex, Inc., announced the discovery of an ore body located in the McDermitt Caldera (Point 21) tuffaceous lake sediments of late Miocene age and estimated to contain 13 million tons of 0.05 to 0.06 percent U_3O_8.

In southwestern Oregon, work by Baretta Mining, Ltd., on the massive sulfide Turner-Albright copper-cobalt mine (Point 33) included mapping, claim staking, and operating three core drills. Dennison Mining of Toronto, Canada, has optioned the Queen of Bronze Mine (Point 32) and carried out some exploration work. Continental Minerals of Las Vegas has been exploring Sugarloaf Hill (Point 28) for gold mineralization.

Exploration and/or development activities for gold took place at the Black Bear (Point 25), Boswell (Point 31), Greenback (Point 26), Last Flat (Point 27), and Rainbow (Point 31) mines. □

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