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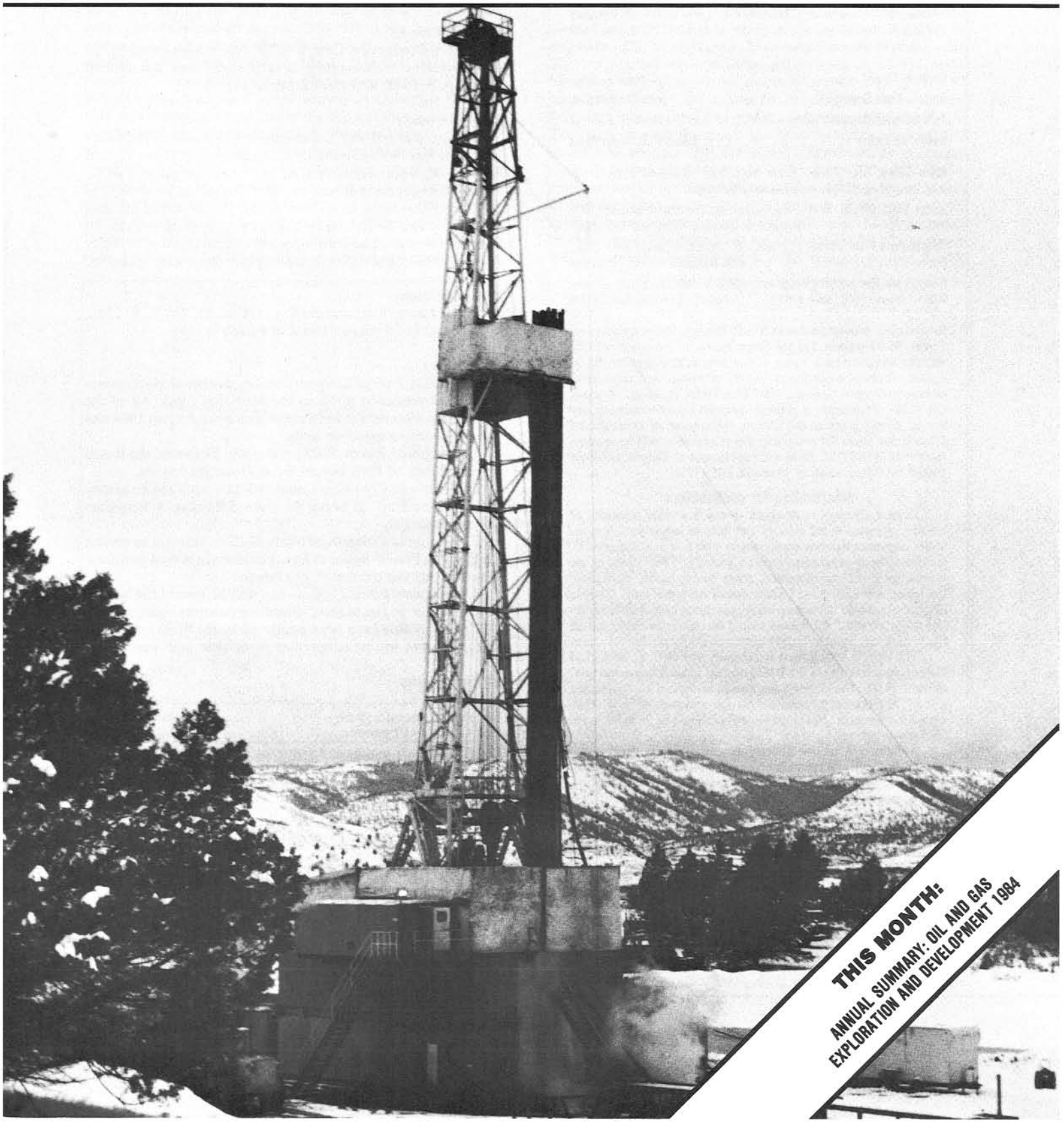

THIS MONTH:
ANNUAL SUMMARY: OIL AND GAS EXPLORATION AND DEVELOPMENT 1984

OREGON GEOLOGY

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Oregon Geology is designed to reach a wide spectrum of readers interested in the geology and mineral industry of Oregon. Manuscript contributions are invited on both technical and general-interest subjects relating to Oregon geology. Two copies of the manuscript should be submitted, typed double-spaced throughout (including references) and on one side of the paper only. Graphic illustrations should be camera-ready; photographs should be black-and-white glossies. All figures should be clearly marked, and all figure captions should be typed together on a separate sheet of paper.

The style to be followed is generally that of U.S. Geological Survey publications (see the USGS manual *Suggestions to Authors*, 6th ed., 1978). The bibliography should be limited to "References Cited." Authors are responsible for the accuracy of their bibliographic references. Names of reviewers should be included in the "Acknowledgments."

Authors will receive 20 complimentary copies of the issue containing their contribution. Manuscripts, news, notices, and meeting announcements should be sent to Beverly F. Vogt, Publications Manager, at the Portland office of DOGAMI.

COVER PHOTO

ROVOR Drilling Company rig, Steele Energy Corporation Keys 1, Wheeler County, Oregon.

OIL AND GAS NEWS

Columbia County — Mist Gas Field

Reichhold Energy Corporation Longview Fibre 42-22 located in NE¼ sec. 22, T. 6 N., R. 5 W., was spudded January 11, 1985, drilled to a total depth of 2,278 ft, and plugged and abandoned January 17, 1985. This well was an offset to a recent producer, Reichhold Columbia County 43-22.

Douglas County

Amoco Production Company "B" No. 1, approximately 22 mi northwest of Roseburg, was plugged and abandoned February 6, 1985, at a total depth of 11,330 ft.

Marion County

Oregon Natural Gas Development Corporation DeShazer 13-22, previously Catchpole 13-22, located in SW¼ sec. 22, T. 5 S., R. 2 W., approximately 1 mi east of the community of St. Louis, was spudded February 7, 1985. Permitted total depth is 3,500 ft. Three wells have been drilled in the immediate area since 1981, two by Reichhold Energy Corporation and one by Oregon Natural Gas Development Corporation. The latter currently has two additional oil and gas drilling permits nearby.

Wheeler County

Steele Energy Corporation Keys 1 in sec. 28, T. 9 S., R. 23 E., approximately 25 mi southwest of Fossil, is idle.

Pool names

Reichhold Energy Corporation has proposed pool names for several unnamed pools in the Mist Gas Field. All of the unnamed pools contain wells completed since August 1984 and will be identified by those wells:

1. Reichhold Busch 14-15 — this will be named the Busch Pool in honor of Fred Busch, the drill-site landowner.
2. Reichhold Columbia County 43-22 — this will be named the Schlicker Pool in honor of Herb Schlicker, a long-time Oregon geologist.
3. Reichhold Columbia County 43-27 — this will be named the Baldwin Pool in honor of Ewart Baldwin, a retired professor of geology at the University of Oregon.
4. Longview Fibre 23-36 — this will be named the Moore Pool in honor of Jim Moore, consulting paleontologist, retired.

The proposals have been approved by the State Geologist, and the names will be adopted as permanent pool names.

Recent permits

Permit no.	Operator, well, API number	Location	Status, proposed total depth (ft)
287	Reichhold Energy Columbia County 43-34 009-00138	SE¼ sec. 34 T. 6 N., R. 5 W. Columbia County	Application; 2,500±.
288	Nahama & Weagant Jewell 1-23 007-00017	SE¼ sec. 23 T. 5 N., R. 7 W. Clatsop County	Application; 3,600. □

Symposium on cyanide in mining to be held in La Grande

A symposium, "Cyanide in Mining," will be held April 25, 1985, at Eastern Oregon State College (EOSC) in La Grande. Sponsored by EOSC, E.I. Dupont DeNemours and Company, Inc., and the Oregon Department of Geology and Mineral Industries, the symposium is designed for people regulating the use of cyanide in mining. For additional information, contact Dan Geary, phone toll-free 1-800-452-8639. □

Oil and gas exploration and development in Oregon, 1984

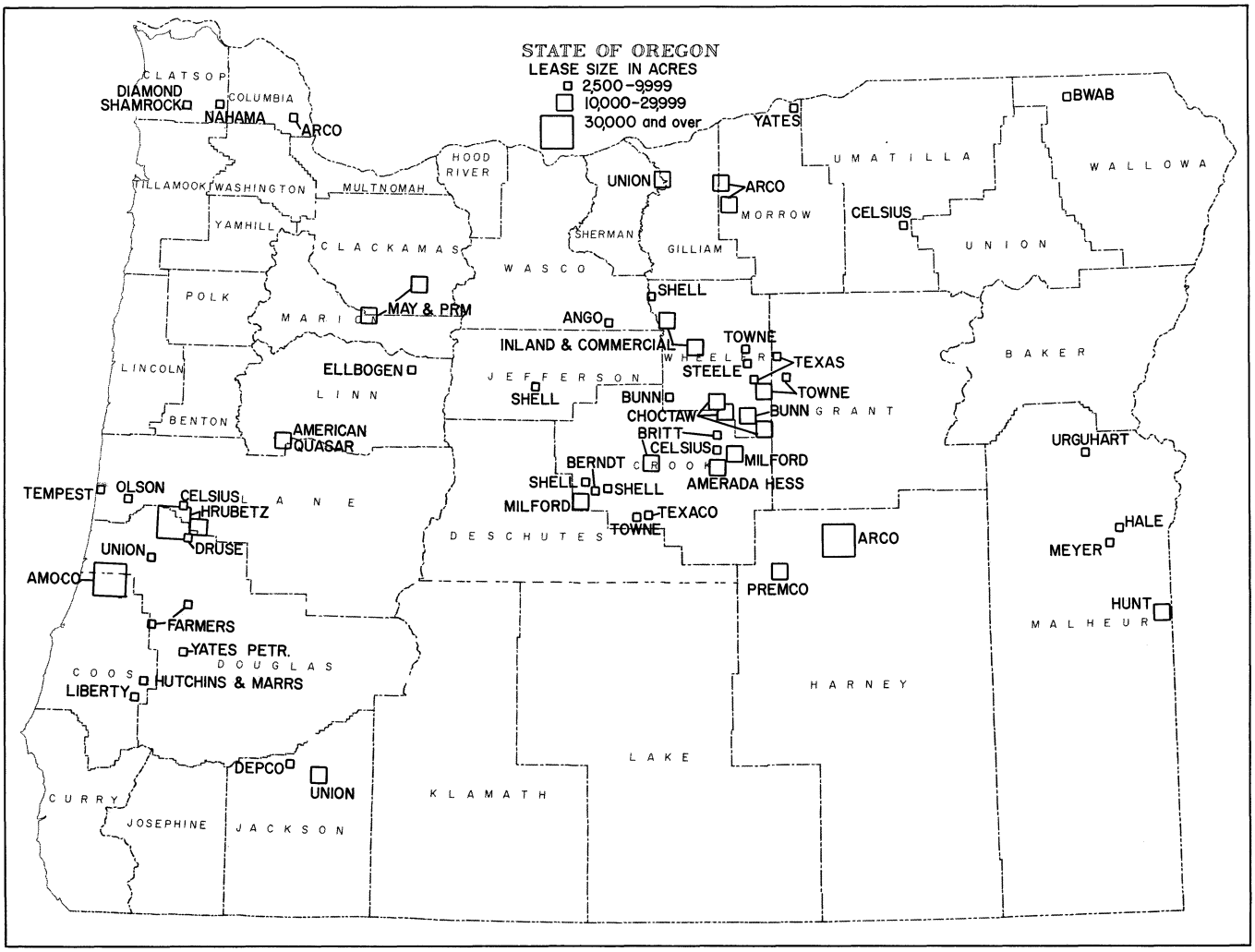
by William L. King, Oregon Department of Geology and Mineral Industries

ABSTRACT

Leasing of federal acreage decreased during 1984 as did terminations, an indication that the speculative activity of the past several years has diminished. No lease sales of state lands were held during the year. The number of leases in effect at year's end decreased 16 percent. The rate at which leases were surrendered in eastern Oregon increased. County-owned mineral rights were leased in Coos, Douglas, and Marion Counties. Drilling showed an 80-percent increase over the previous year, with most of the activity in Columbia County. Five new operators were active in the state, four in western Oregon and one in eastern Oregon. Footage drilled increased 111 percent over 1983. Three new producing wells were completed in the Mist Gas Field, each from a separate pool. The salt-water disposal program continued with an increase of almost 90,000 barrels over the previous year. The Governing Board of the Oregon Department of Geology and Mineral Industries (DOGAMI) met five times in various parts of the state. Gas production at the Mist Gas Field was monitored by DOGAMI personnel. Geophysical exploration was active, especially in western Oregon.

LEASING ACTIVITY

There was a marked reduction of leasing of federal lands for oil and gas exploration in Oregon during 1984. Applications numbered 270, a reduction of 24 percent from the previous year. The acreage involved in these applications, 1,205,093 acres, however, was only 6 percent less than in 1983. During 1984, 95 leases were issued, for a total of 237,034 acres, a 58-percent reduction in leases and à 41-percent reduction in leased acreage. The counties with the most lease activity were Crook (45,943 acres) and Douglas (41,824 acres). Terminations decreased radically from 5,119,914 acres in 1983 to 1,054,777 acres in 1984, a decrease of 79 percent. This marked contrast is due, probably to the fact that a considerable amount of eastern Oregon speculative acreage acquired during 1981 and 1982 had already been dropped. The Simultaneous Oil and Gas (SOG) program, which had been discontinued in 1983, was resumed in August

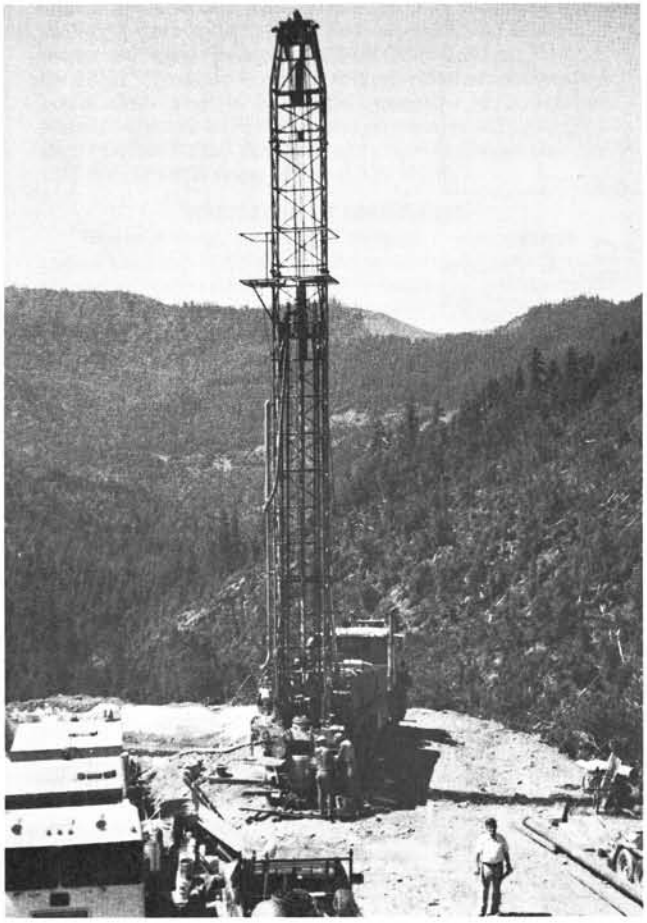


Major areas of oil and gas leasing activity in Oregon, 1984. Map shows acreage applied for, issued, and assigned. Lease data courtesy Dolores Yates, LANDATA Reporting and Services.

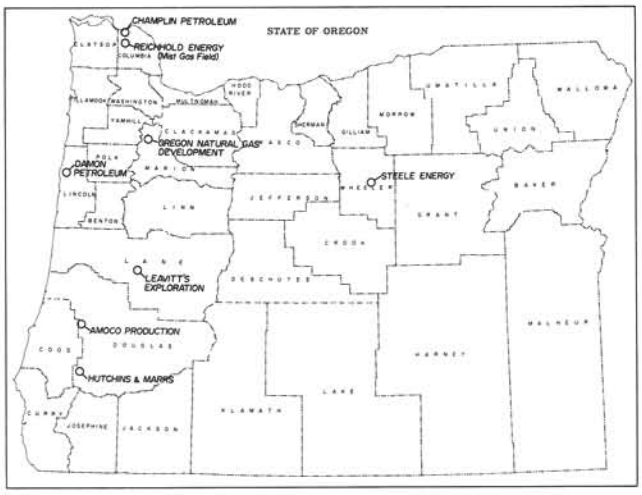
1984. Acreage that was previously leased and then relinquished is offered through this program. Drawings are held every other month. Applications for over-the-counter (OTC) leases were minimal during the year. At the end of 1984, 1,932 leases comprising 4,203,225 acres were in effect on federal land in Oregon.

Oil and gas lease sales are scheduled by the Oregon Division of State Lands, contingent on the number of lease applications received. Applications were minimal during 1984, and for the second successive year no oil or gas lease sales of state lands were held. The number of leases in effect on state lands at the end of the year decreased 16 percent compared to 1983 to a year-end total of 657. Total acres under lease decreased 19 percent to a year-end total of 260,708. Counties with the most remaining lease acreage were Clatsop (78,165 acres), Coos (51,098 acres), Malheur (40,065 acres), Douglas (18,829 acres), and Harney (15,658 acres). These same counties also had the most remaining leased acres in 1983. There was a significant increase in the 1984 rate of surrender in Malheur, Douglas, and Harney Counties, however. The Malheur and Harney County surrenders were probably part of the recent pattern of lease surrenders of speculative acreage in eastern Oregon. The Douglas County surrenders were by two lessees who have discontinued their exploration efforts in that area. Total lease-rental income for the year was $297,915, which includes rentals from 31,202 acres under lease option to Mobil Oil.

County-owned mineral rights were leased in Coos, Douglas, and Marion Counties during 1984. A total of 9,274 net acres with a five-year term was leased in those three counties. In Coos County, Jerry Ryan leased 155 net acres, and Selmar Hutchins and Mayo Marrs leased 498 net acres for $2 per acre. In Douglas County, Selmar Hutchins and Mayo Marrs completed the leasing procedure for 8,599 net acres at $1.25 per acre. (This transaction, which was initiated in 1983, was reported in last year's annual oil and gas review.) In Marion County, Reichhold Energy Corporation leased 22 net acres for $1 per acre.



E.M. Jannsen drilling rig on site at Hutchins and Marrs Great Discovery 2, Douglas County, Oregon.



Oil and gas drilling sites in Oregon, 1984.

DRILLING ACTIVITY

Eighteen oil and gas test wells were drilled in Oregon in 1984, an increase of eight wells, or 80 percent, compared to 1983. DOGAMI's procedure for counting wells in a given year includes only those wells that reached total depth during the year. Two wells, Amoco Weyerhaeuser "B" No. 1 and Steele Energy Keys 1, had not yet reached total depth and were drilling ahead at year's end. They, therefore, were not included in the total well count for 1984. Data from these two wells, i.e., footage drilled, however, will be included in the 1984 statistics, and references to these two wells will be made in this article.

Repeating last year's pattern, most of the activity was in Columbia County, where Champlin drilled one well and Reichhold drilled 13. All of the wells, with the exception of Steele Energy Keys 1, were in western Oregon, west of the Cascades (see map, *Oil and gas drilling sites in Oregon, 1984).* During 1984, 31 oil and gas drilling permits were issued, an increase of seven percent over the preceding year.

Five new operators were active in Oregon in 1984. Amoco spudded a deep wildcat well 22 mi northwest of Roseburg in Douglas County. Champlin drilled 3 mi northwest of Clatskanie in Columbia County. Damon Petroleum reentered and deepened the Ehrens Longview Fibre 1, 2 mi south of Depoe Bay in Lincoln County. Leavitt Exploration drilled a well 2 mi south of Creswell in Lane County. Steele Energy spudded a deep wildcat well 24 mi south of Fossil in Wheeler County.

The deepest hole drilled in Oregon in 1984 was by Amoco, drilling ahead at 10,613 ft at year's end. Champlin's well in Columbia County was next with a total depth of 5,720 ft. The average well depth for the year was 3,340 ft. Total footage drilled was 66,792 ft, an increase of 111 percent over 1983's total. Columbia County accounted for most of the footage drilled, 41,884 ft, followed by Douglas County with 14,123 ft. Seventy-eight percent of the wells drilled were in the Mist Gas Field area. The remainder were wildcats.

GAS PRODUCTION

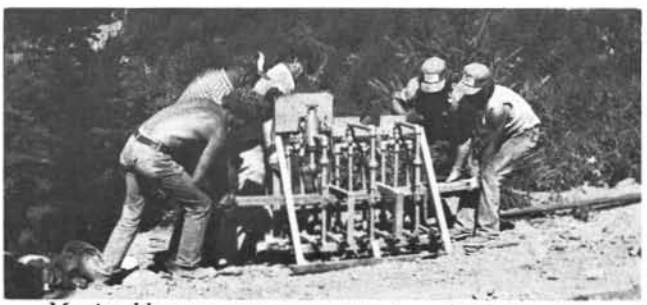
Three producing wells were completed in the Mist Gas Field during 1984, increasing the total to 15. These 15 producers comprise 12 separate pools. To date, nine have been named, and

Table 1. *Oil and gas permits and drilling activity in Oregon, 1984*

Permit no.	Operator, well, API number	Location	Status, depth (ft) TD=total depth PTD=proposed TD, RD=redrill
191	Reichhold Energy Corp. Paul 34-32 009-00089-01 009-00089-02	SE¼ sec. 32 T. 7 N., R. 5 W. Columbia County	Abandoned, dry hole; RD1: 2,915 RD2: 2,719.
232	Reichhold Energy Corp. Polak 31-12 009-00115	NE¼ sec. 12 T. 6 N., R. 5 W. Columbia County	Abandoned, dry hole; TD: 2,750.
234	Oregon Nat. Gas Dev. Werner 34-21 047-00014	SE¼ sec. 21 T. 5 S., R. 2 W. Marion County	Suspended, TD: 2,808.
238	Leavitt Exploration Maurice Brooks 1 039-00005	NE¼ sec. 34 T. 19 S., R. 3 W. Lane County	Abandoned, dry hole; TD: 952.
248	Reichhold Energy Corp. Crown Zellerbach 23-26 009-00118	SE¼ sec. 26 T. 6 N., R. 4 W. Columbia County	Abandoned, dry hole; TD: 4,382
249	Reichhold Energy Corp. Busch 14-15 009-00119	SW¼ sec. 15 T. 6 N., R. 5 W. Columbia County	Completed, gas; TD: 2,258.
253	Reichhold Energy Corp. Adams 32-34 009-00122 009-00122-01	NE¼ sec. 34 T. 7 N., R. 5 W. Columbia County	Abandoned, dry hole; TD: 3,284 RD: 3,109.
255	Reichhold Energy Corp. Columbia County 13-34A 009-00123	SW¼ sec. 34 T. 7 N., R. 5 W. Columbia County	Permit issued; PTD: 2,800.
256	Reichhold Energy Corp. Columbia County 43-22 009-00124	SE¼ sec. 22 T. 6 N., R. 5 W. Columbia County	Completed, gas; TD: 2,252.
257	Reichhold Energy Corp. Columbia County 21-27 009-00125	NW¼ sec. 27 T. 6 N., R. 5 W. Columbia County	Permit issued; PTD: 4,000
258	Reichhold Energy Corp. Crown Zellerbach 34-28 009-00126	SE¼ sec. 28 T. 6 N., R. 4 W. Columbia County	Suspended; TD: 3,654.
259	Hutchins & Marrs Great Discovery 2 019-00023	NW¼ sec. 20 T. 30 S., R. 9 W. Douglas County	Idle; TD: 3,510.
260	Amoco Production Co. Weyerhaeuser 1-26 019-00024	SW¼ sec. 26 T. 25 S., R. 9 W. Douglas County	Permit issued; PTD: 15,000
261	Amoco Production Co. Weyerhaeuser 1-34 019-00025	NW¼ sec. 34 T. 25 S., R. 9 W. Douglas County	Permit issued; PTD: 15,000.
262	Amoco Production Co. Weyerhaeuser 1-1 011-00020	SE¼ sec. 1 T. 25 S., R. 11 W. Coos County	Permit issued; PTD: 14,800.
263	Champlin Petroleum Co. Puckett 13-36 009-00128	SW¼ sec. 36 T. 8 N., R. 5 W. Columbia County	Abandoned, dry hole; TD: 5,720.
264	Reichhold Energy Corp. Columbia County 11-10 009-00129	NW¼ sec. 10 T. 6 N., R. 5 W. Columbia County	Abandoned, dry hole; TD: 3,215.
265	Reichhold Energy Corp. Columbia County 43-27 009-00127	SE¼ sec. 27 T. 6 N., R. 5 W. Columbia County	Completed, gas; TD: 2,441.
266	Reichhold Energy Corp. Columbia County 23-4 009-00130	SW¼ sec. 4 T. 6 N., R. 5 W. Columbia County	Abandoned, dry hole; TD: 3,034.
267	Amoco Production Co. Weyerhaeuser 1-6 019-00026	SW¼ sec. 6 T. 25 S., R. 8 W. Douglas County	Application; PTD: 13,500.
268	Amoco Production Co. Weyerhaeuser "B" No. 1 019-00027	SW¼ sec. 13 T. 25 S., R. 9 W. Douglas County	Permit issued; PTD: 13,500.

Table 1. *Oil and gas permits and drilling activity in Oregon, 1984 — continued*

Permit no.	Operator, well, API number	Location	Status, depth (ft) TD=total depth PTD=proposed TD, RD=redrill
269	Reichhold Energy Corp. Longview Fibre 13-23 009-00131	SW¼ sec, 23 T. 6 N., R. 5 W. Columbia County	Permit issued; PTD: 2,600.
270	Hutchins & Marrs Great Discovery 3 019-00028	SW¼ sec. 20 T. 30 S., R. 9 W. Douglas County	Permit issued; PTD: 3,500
271	Hutchins & Marrs Great Discovery 4 019-00029	SW¼ sec. 20 T. 30 S., R. 9 W. Douglas County	Permit issued; PTD: 3,500.
272	Hutchins & Marrs Great Discovery 5 019-00030	SW¼ sec. 20 T. 30 S., R. 9 W. Douglas County	Permit issued; PTD: 3,500.
273	Oregon Nat. Gas Dev. Corp. Buck 44-16 047-00016	SE¼ sec. 16 T. 5 S., R. 2 W. Marion County	Permit issued; PTD: 3,500.
274	Oregon Nat. Gas Dev. Corp. Cunningham 32-21 047-00017	NE¼ sec. 21 T. 5 S., R. 2 W. Marion County	Permit issued; PTD: 3,500.
275	Oregon Nat. Gas Dev. Corp. Catchpole 13-22 047-00018	SW¼ sec. 22 T. 5 S., R. 2 W. Marion County	Permit issued; PTD: 3,500.
276	Steele Energy Corp. Keys 1 069-00008	NW¼ sec. 28 T. 9 S., R. 23 E. Wheeler County	Permit issued; PTD: 8,000.
167D	Damon Petroleum Co. Longview Fibre 1 041-00004	NE¼ sec. 20 T. 9 S., R. 11 W. Lincoln County	Permit issued; PTD: 2,000.
277	Reichhold Energy Corp. Longview Fibre 23-36 009-00132	SW¼ sec. 36 T. 6 N., R. 5 W. Columbia County	Completed, gas; TD: 1,879.
278	Reichhold Energy Corp. Investment Mgt. 22-20 009-00133	NW¼ sec. 20 T. 6 N., R. 4 W. Columbia County	Permit issued; PTD: 2,500.
279	Reichhold Energy Corp. Longview Fibre 42-22 009-00134	NE¼ sec. 22 T. 6 N., R. 5 W. Columbia County	Permit issued; PTD: 2,600.
280	Reichhold Energy Corp. Columbia County 44-10 009-00135	SE¼ sec. 10 T. 6 N., R. 5 W. Columbia County	Permit issued ; PTD: 3,000.
281	Leavitt's Exploration Jackson 1 039-00006	NW¼ sec. 14 T. 19 S., R. 4 W. Lane County	Application; PTD: 3,000.
282	Leavitt's Exploration Jackson 2 039-00007	SE¼ sec. 11 T. 19 S., R. 4 W. Lane County	Application; PTD: 3,000.
283	ARCO Banzer 34-16 009-00136	SE¼ sec. 16 T. 6 N., R. 5 W. Columbia County	Permit issued; PTD: 3,500.
284	ARCO Columbia County 44-21 009-00137	SE¼ sec. 21 T. 6 N., R. 5 W. Columbia County	Permit issued; PTD: 3,500.



Moving blowout-preventer control manifold, Hutchins and Marrs Great Discovery 2, Douglas County, Oregon.

Table 2. *Cancelled oil and gas permits in Oregon, 1984*

Permit no.	Operator, well name, API no.	Location	Issue date	Cancellation date	Reason
78	Farnham Chemical Co. W. Smith 1 043-00005	NW¼ sec. 32 T. 11 S., R. 1 W. Linn County	9-12-78	11-13-84	Improper bonding.
79	Farnham Chemical Co. K. Barr 1 043-00006	NE¼ sec. 31 T. 11 S., R. 1 W. Linn County	10-14-78	11-13-84	Improper bonding.
80	Farnham Chemical Co. Normarc 1 043-00007	NE¼ sec. 31 T. 11 S., R. 1 W. Linn County	10-14-78	11-13-84	Improper bonding.
83	Farnham Chemical Co. Normarc 2 043-00010	NW¼ sec. 31 T. 11 S., R. 1 W. Linn County	12-01-78	11-13-84	Improper bonding.
84	Farnham Chemical Co. Normarc 3 043-00011	NW¼ sec. 31 T. 11 S., R. 1 W. Linn County	12-01-78	11-13-84	Improper bonding.
85	Farnham Chemical Co. Normarc 4 043-00012	NE¼ sec. 36 T. 11 S., R. 2 W. Linn County	12-01-78	11-13-84	Improper bonding.
210	Reichhold Energy Corp. Investment Management 33-26 009-00101	SE¼ sec. 26 T. 5 N., R. 4 W. Columbia County	2-10-82	2-10-84	Expired.
220	Reichhold Energy Corp. Crown Zellerbach 31-33 009-00105	NE¼ sec. 33 T. 6 N., R. 4 W. Columbia County	8-30-82	8-30-84	Expired.
227	Diamond Shamrock State of Oregon 23-33 007-00013	NE¼ sec. 33 T. 6 N., R. 7 W. Clatsop County	2-09-83	2-09-84	Operator's request.
235	Diamond Shamrock Watzek Trust 23-4 007-00015	SW¼ sec. 4 T. 6 N., R. 6 W. Clatsop County	5-03-83	5-03-84	Expired.
236	Diamond Shamrock Watzek Trust 31-4 007-00016	NE¼ sec. 4 T. 6 N., R. 6 W. Clatsop County	5-03-83	5-03-84	Expired.
239	Petroleum and Mineral Analysis Keech 1 047-00015	NE¼ sec. 15 T. 9 S., R. 2 W. Marion County	6-02-83	4-11-84	Operator's request.
244	Hutchins and Marrs Lord's Will 1 019-00018	SW¼ sec. 3 T. 27 S., R. 7 W. Douglas County	10-14-83	10-14-84	Expired.
245	Hutchins and Marrs Lord's Will 2 019-00019	SE¼ sec. 34 T. 26 S., R. 7 W. Douglas County	10-14-83	10-14-84	Expired.
246	Hutchins and Marrs Lord's Will 3 019-00020	NE¼ sec. 3 T. 27 S., R. 7 W. Douglas County	10-14-83	10-14-84	Expired.
252	Hutchins and Marrs Great Discovery 1 019-00022	SE¼ sec. 3 T. 27 S., R. 7 W. Douglas County	10-14-83	10-14-84	Expired.
262	Amoco Production Co. Weyerhaeuser 1-1 011-00020	SE¼ sec. 1 T. 25 S., R. 11 W. Coos County	5-25-84	8-24-84	Operator's request.

six remain unnamed. At the end of the year, six wells were producing, seven were shut in, one was abandoned, and one had been converted to a salt-water disposal well. Production rates during the year ranged from 6 to 10 million cubic feet per day (MMcfd). The number of producing wells varied from 6 to 11. All of the gas produced in 1984 was sold at a monthly negotiated price that was lower than the federally controlled ceiling price. Contract prices during the year ranged from $2.50 per million British thermal units (MMbtu) to $3.097 per MMbtu, or from $2.36 per thousand cubic feet (Mcf) to $2.92 per Mcf. Total gas produced was 2.79 billion cubic feet. The value of the gas at contract prices was $7.76 million. Cumulative production at the end of 1984 was 19.21 billion cubic feet.

NEW POOL DISCOVERIES

Three new pools were discovered in the Mist Gas Field by Reichhold Energy Corporation during 1984. These discoveries increase the field total to 12 separate pools. Columbia County 43-22, located in sec. 22, T. 6 N., R. 5 W., was drilled to a total depth of 2,254 ft and completed as a gas well on February 29, 1984, flowing 1.29 MMcfd. Busch 14-15, located in sec. 15, T. 6 N., R. 5 W., was drilled to a total depth of 2,258 ft and completed as a gas well on August 11, 1984, flowing 3.04 MMcfd. Columbia County 43-27, located in sec. 27, T. 6 N., R. 5 W., was drilled to a total depth of 2,441 ft and completed as a gas well on September 2, 1984, flowing 1.46 MMcfd. All of these discoveries were west and southwest of the community of Mist.

The first production in this southern part of the field was established in late 1983 by Reichhold's Columbia County 23-22.

SALT-WATER DISPOSAL

Disposal of salt water from the Mist Gas Field continued during 1984. This program commenced in 1983 and is authorized by permits issued by the Oregon Department of Environmental Quality and DOGAMI, allowing disposal by injection and surface spreading.

In the injection procedure, the water produced by three Reichhold wells, Columbia County 4 RD, Longview Fibre 12-33, and Paul 34-32, is transferred by vacuum truck from a holding tank at each of the wells to a holding tank at Columbia County 13-1 RD, the injection well. It is injected by gravity feed augmented by pumping. During 1984, a total of 101,465 barrels was injected.

In the surface-disposal procedure, salt water is spread on unpaved roads and along road rights-of-way under dry weather conditions. A total of 18,689 barrels of salt water was spread in this way during 1984.

OTHER ACTIVITY

The DOGAMI Governing Board met five times during 1984. Meetings were held in Portland, Roseburg, Baker, Bend, and St. Helens. Board review and action included integration orders, exceptions to field rules, a plugging and abandoning agreement, drilling activities, and releases of bonds.

Two contested-case oil and gas hearings were held during the year. One involved a spacing exception, the other involved a price increase on gas production.

Seventeen oil and gas drilling permits were cancelled during the year. Reasons for the cancellations were expiration, operator's request, and improper bonding (see Table 2, *Cancelled oil and gas permits, 1984*).

DOGAMI personnel monitored three wells in the Mist area to confirm production figures reported by the companies. Interest in this procedure has been expressed by Columbia County, the Division of State Lands, and the Department of Revenue. Monitoring included visits to witness calibration of well-site meters and determination of production figures from gas company meter charts of random wells. For this confirmation procedure, DOGAMI will also continue to monitor monthly production reports for each well.

Taylor Drilling Company Rig 4, Reichhold Busch 14-15, Mist Gas Field.

Geophysical exploration continued in 1984. The Oregon Department of Transporation issued seismic permits authorizing activities in both eastern and western Oregon. Eastern Oregon exploration was near the The Dalles in Wasco County, near Heppner in Morrow County, near Burns in Harney County, and from Sisters in Deschutes County to Prineville in Crook County. The majority of the permits issued were in western Oregon for exploration in Lane County to the south, and northward through Linn, Lincoln, Benton, Marion, Yamhill, Washington, and Columbia Counties. □

Reclamation bids to be sought

The Mined Land Reclamation (MLR) office of the Oregon Department of Geology and Mineral Industries (DOGAMI) will seek bids for reclamation of abandoned gold mining sites in Douglas, Grant, Josephine, and Baker Counties later this year.

The Douglas County site covers approximately 2 acres and is located along Starveout Creek east of Azalea (sec. 29, T. 32 S., R. 4 W.). Work will consist of smoothing the disturbed gravels, respreading topsoil, and seeding. Total cost will probably be less than $2,500.

The Baker County site is in the Virtue Flat area west of Baker (sec. 8, T. 9 S., R. 42 E.) and covers approximately 18 acres. Work will consist of fence and equipment removal, extensive smoothing of stockpiled rock, respreading of topsoil, and seeding. Total cost will be approximately $20,000.

The Grant County site is near John Day (sec. 21, T. 13 S., R. 31 E.) and covers approximately 16 acres. Work will include scrap removal, smoothing, and planting. The estimated cost will be no more than $8,000.

The Josephine County site is adjacent to Sucker Creek (sec. 1, T. 40 S., R. 7 W.). Work will consist of filling in some ponds, smoothing the disturbed areas, respreading topsoil, and seeding. Total cost will be less than $2,000.

For further information, contact Paul Lawson or Allen Throop of DOGAMI's MLR office at 1129 SE Santiam Road, Albany, OR 97321, phone (503) 967-2039. □

DOGAMI offices move

The Administrative Offices and Library of the Portland office of the Oregon Department of Geology and Mineral Industries (DOGAMI) have moved to new locations in the State Office Building, 1400 SW Fifth Avenue, Portland. New room numbers are as follows: Administrative Offices and Library, Room 910, and Geothermal Office, Room 901. The following offices have not moved: Business Office/Publication Sales, Room 906, and Oil and Gas Office, Room 912. The phone number of the Department is still the same: (503) 229-5580.

The Baker Field Office has also moved. The new address is: 1831 First Street, Baker, OR 97814. The phone number is still the same: (503) 523-3133. □

Oregon's contemporary stone age: Aggregate resources in perspective

by Randall S. Hledik, Director of Land Use and Environmental Affairs, Wildish Sand and Gravel Company, P.O. Box 7428, Eugene, OR 97401

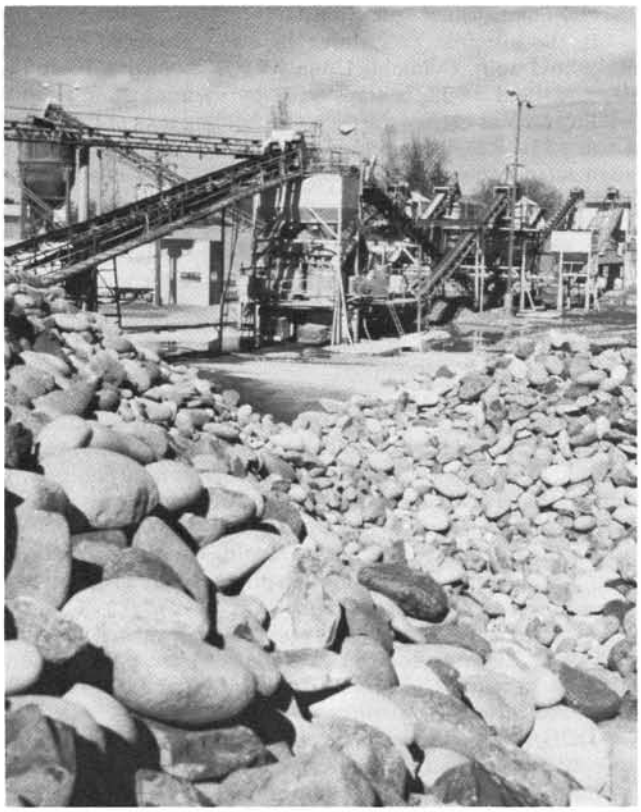
The aggregate resource industry deals with the extraction of sand and gravel and the quarrying of crushed stone for a variety of uses. In Oregon, the term "aggregate" has been expanded to include industrial minerals and gemstones. Oregon's aggregate industry is alive and functioning despite the last three or four years of economic doldrums and a decade of land use battles.

Today, approximately 3,200 acres (Oregon Mined Land Reclamation Advisory Committee, 1984) of the state are being mined, primarily for sand and gravel and quarry stone, under those provisions of the Mined Land Reclamation act that require bonding and reclamation. (A substantial additional number of acres being mined is excluded from such requirements.) About 0.1 percent of Oregon is being or has been mined; nationally, about 0.3 percent of the 48 contiguous states has been mined since 1776 (American Institute of Professional Geologists, 1981). Although Oregon's aggregate industry affects only a relatively small land area, it is important to the state's economy; yet, its activity still sparks some intense environmental controversies.

An estimated 12-15 tons of aggregate are produced annually for each man, woman, and child in the state. The crushed rock, concrete, and pavement produced from this raw resource are used in the construction of homes, offices, factories, streets, highways, airports, and many other private and public projects. A 1,500-sq-ft home, for example, requires about 146 cu yd of rock products for the foundation, garage slab, driveway, sidewalk, and half the street leading to the home. This amount of material would fill that house approximately 2½ ft deep.

About 50 percent of the sand and gravel and 75 percent of the quarry stone produced in Oregon go into the construction of the state's roads and highways. A 1-mi stretch of two-lane road, 30 ft wide, with a standard base and shoulder, requires approximately 16,000 tons of rock. Sewer lines are about 90 percent concrete pipe (statistical data in this paragraph and the preceding one from Oregon Concrete and Aggregate Producers Association, Inc./Asphalt Pavement Association of Oregon, 1981).

Bringing sand and gravel up from a deposit near the confluence of the McKenzie and Willamette Rivers with a shovel-and-conveyor belt system. (Photo courtesy Wildish Sand and Gravel Co.)



Raw material ready to be run through a series of screens and crushers for the production of various sizes of aggregate. (Photo courtesy Oregon Concrete and Aggregate Producers Association, Inc., and Asphalt Pavement Association of Oregon [OCAPA/APA])

In 1979, aggregate accounted for 67 percent of the state's total dollar volume of mineral production. This dropped to approximately 52 percent in 1981 (still the majority of production value, however) but rose again in 1983 to about 62 percent of the total. In the banner year of 1979, the actual value of sand, gravel, and stone rose to $111 million. In 1982, this had slipped to $73 million, which matched the 1975 level. In 1983, the dollar value turned upward, as mentioned above, reaching $82 million (Ferns and others, 1984). In terms of employment and annual payrolls, in 1979, 4,377 people earning a payroll of $83,882,611 were involved with mining and processing aggregate. In 1983, these figures changed to 2,869 employees earning $62,710,467 (Ken Rocco, Oregon Employment Division, Eugene, personal communication, December 1984).

Exhibiting characteristics common to other mineral resource industries, the aggregate industry is site-specific, and its resource is nonrenewable. As ubiquitous as rock may seem, there are certain physical constraints associated with it, such as economically extractable quantities, hardness, cleanliness, and depth of overburden, that must be considered when the

potential of any deposit is evaluated. Since aggregate is a bulky commodity, transporation is another key factor in determining the economic viability of an aggregate source. Accessibility of the extraction site and close proximity to markets are significant considerations, since dump trucks average about 4 mi per gallon of fuel, and it costs about $0.14 to haul one ton of rock a distance of 1 mi.

Environmental considerations are obviously another major concern that must be addressed whenever an extraction or processing operation is contemplated. Dust, noise, traffic, and adverse effects on water supplies and wildlife habitat must nearly always be controlled during the course of an operation. Specific concern for the preservation of salmon spawning sites has led to elimination of all but the scalping of river bars in many Oregon streams. These bars were once a relatively easy-to-extract source of good quality material, and their periodic removal provided other benefits as well. As many are now realizing, farmers and recreationists benefited from removal activity, since it helped check stream-bank erosion and made small-boat navigation easier. In some areas, in fact, there is pressure from these groups to return to a managed removal system.

With the reduction in volume of aggregate available from the state's streams, upland sources of aggregate have increased in importance. Ideally, planners would require extraction of the mineral commodity to be followed by backfilling or other preparation so the land may be used for something else. Furthermore, deeds in rapidly developing areas would contain covenants that make sure that purchasers are aware and tolerant of mining when they move in.

In reality, however, major problems often arise. In those areas where an extraction and processing site is immediately adjacent to a growing community, encroachment of urban uses on the site jeopardizes the continued use of the resource. Either the deposit is paved over without being removed and the land is put to an economically higher use or the operational characteristics of the extraction and processing facility become incompatible nuisances to encroaching land uses such as a residential subdivision.

When this happens, aggregate production facilities are forced to relocate to new mining sites in the countryside, far from city uses but still close enough to conserve energy and keep transportation costs reasonable. In the country, however, extraction of aggregate encounters conflicts with the preservation of farm and forest land and wildlife habitat. Oregon's statewide land use planning program includes provisions that require that local sources of sand, gravel, and stone be identified and protected for future use. Several jurisdictions have complied with this requirement by appropriately zoning viable sources for extraction and processing purposes. But there are still instances where such zoning is not in effect, and the merits of proposed operations have to be publicly debated on a case-by-case basis. This often results in a lengthy and costly legal process for all parties involved. It also discourages an operator from making desired capital investments in an operation, since the permit granted in these instances is often of a limited duration and provides no long-term security for the operator.

A clean, landscaped ready-mix plant is acceptable to a community. (Photo courtesy OCAPA/APA)

When a pit or quarry is mined out, the land can be reclaimed to a variety of beneficial uses. (Photo courtesy OCAPA/APA)

An issue that is always raised when an extraction activity is proposed is the condition or reuse of the site once the mining operation has been completed. Neighbors and the general public often fear that an unsightly and hazardous hole will be left into which either children will fall or people will deposit their refuse. The Mined Land Reclamation Act administered by the Oregon Department of Geology and Mineral Industries (DOGAMI) provides assurance that this will not occur and that, instead, a worthwhile use of the area will result.

Since the inception of the Mined Land Reclamation Program in the late 1960's, over 500 required reclamation plans have been approved by DOGAMI and other reviewing agencies, and over 1,400 acres have actually been reclaimed (Paul F. Lawson, personal communication, 1985). It is noteworthy that 98 percent of this acreage has been reclaimed by the pit or quarry operator without need for DOGAMI's direct intervention. Nearly half this reclaimed acreage has gone into agricultural production; approximately one-quarter has reverted to forest uses. The remainder has gone to a variety of uses, such as sites for parks, shopping centers, land fills, public buildings, and wildlife habitat (Oregon Mined Land Reclamation Advisory Committee, 1984).

While no one wants a gravel pit or stone quarry in his neighborhood, without these pits and quarries we would not have neighborhoods. The local, state, and federal laws that have evolved during the last decade and a half have increased the safety-consciousness and environmental awareness of the industry and have gone a long way toward ensuring that both private and public interests are accommodated. As pressures for land development and conservation continue to mount, however, so will the need for the public to recognize the overall importance of protecting aggregate sites for future utilization and for bringing this recognition level on a par with that for Oregon's other natural resources.

REFERENCES CITED

American Institute of Professional Geologists, 1981, Metals, minerals, mining: Golden, Colo., Colorado Section Special Issue, 2nd rev. ed., p. 4

Ferns, M.L., Ramp, L., Brooks, H.C., and Gray, J.J., 1984, Mineral industry in Oregon, 1983: Oregon Department of Geology and Mineral Industries, Oregon Geology, v. 46, no. 3, p. 29.

Oregon Concrete and Aggregate Producers Association, Inc., and Asphalt Pavement Association of Oregon, 1981, Oregon's future aggregate resources in perspective (information brochure), 7 p.

Oregon Mined Land Reclamation Advisory Committee, 1984, Report and recommendations to the 1985 Oregon Legislative Assembly: Salem, Oreg., p. 1-8. □

MMS publishes call for information regarding offshore minerals leasing

The Minerals Management Service (MMS) of the U.S. Department of the Interior has published a call for information on mineral leasing areas on the Outer Continental Shelf (OCS) and Exclusive Economic Zone (EEZ). The purpose of the announcement, published in the January 15, 1985, issue of the *Federal Register*, is to assist the government in delineating areas of interest for strategic and other nonenergy minerals. Five groups of resources are being considered: construction materials, placer deposits, phosphorite deposits, polymetallic sulfide deposits, and cobalt-rich manganese oxide crusts.

Three of the groups — construction materials, placers, and polymetallic sulfides — are of potential economic value off the coast of Oregon. Construction materials include mainly sand and gravel. Sand and gravel deposits exist off many of Oregon's coastal rivers. Placer deposits contain metals or minerals including gold, platinum, titanium, chromium, iron, and zirconium. These heavy mineral occurrences have been reported offshore of Oregon, seaward of the Nehalem, Rogue, Siltcoos, and Umpqua Rivers to water depths of 185 m. Polymetallic sulfides are found along sea-floor spreading centers and include zinc, copper, silver, manganese, cadmium, and iron. The Gorda Ridge is a potential source of polymetallic sulfides, but an earlier scheduled lease has been postponed indefinitely.

Information submitted in response to the call will be used to establish priority areas to be included in more detailed resource, environmental, and economic reviews for possible leasing of minerals.

Comments should be postmarked or hand delivered no later than May 15, 1985, to Minerals Management Service, Office of Strategic and International Minerals, Attention: Program Manager, 11 Golden Shore, Suite 260, Long Beach, CA 90802. For further information, call or write (address above): Reid T. Stone, phone (213) 548-2901. □

GSOC meetings announced

The Geological Society of the Oregon Country (GSOC) holds noon luncheon meetings in the Standard Plaza Building, 1100 SW Sixth Ave., Portland, Oregon, in Room A adjacent to the third floor cafeteria, and evening lectures (8 p.m.) at Portland State University, Room 371, Cramer Hall. Upcoming meetings, topics, and speakers are:

March 15 (luncheon)—*Impact of Missoula Flood on the Surface Geology of the Portland Area and Vicinity*, by Donald Barr, 1968 GSOC president and naturalist.

March 22 (lecture)—*Trout Creek Mountains: A Proposed BLM Wilderness Area*, by Minda S. Craig, BLM wilderness coordinator for the Portland Audubon Society.

April 5 (luncheon)— *Morocco*, by Irma Greisal, history and geology commentator, and Marian Ott, photographer and commentator.

April 19 (luncheon)— *The Landslide at The Dalles*, by John D. Beaulieu, Deputy State Geologist, Oregon Department of Geology and Mineral Industries.

For additional information about the lectures or luncheons, contact Viola L. Oberson, GSOC president, phone (503) 282-3685. □

Bureau of Mines to host chromite/chromium conference in Albany in June

A conference covering the entire scope of the U.S. Bureau of Mines chromite/chromium activities will be held June 4-5, 1985, at the Albany Research Center, Albany, Oregon. Following an introductory address by Robert C. Horton, Director of the Bureau of Mines, a series of 20 presentations will describe the Bureau's broad ranging activities for this strategic and critical material.

The conference will be of interest to individuals, government agencies, academic institutions, and industrial firms concerned with the following:

- U.S. chromite and chromium usage patterns
- World resources and potential for domestic chromite resources
- Field studies on significant new domestic resources
- Research activities in:
  - Mineral beneficiation
  - Extractive and pyrometallurgical processing
  - New low-Cr alloy and coating substitutes
  - Corrosion and oxidation
  - Recycling of chromium-bearing scrap and wastes.

For additional information contact Charles B. Daellenbach, Albany Research Center, P.O. Box 70, Albany, OR 97321, phone (503) 967-5833. □

USGS names new Cascades Volcano Observatory chief

Norman S. MacLeod, a U.S. Geological Survey (USGS) geologist known especially for his extensive studies of volcanic rocks in the northwestern United States, has been named scientist-in-charge of the David A. Johnston Cascades Volcano Observatory in Vancouver, Washington.

MacLeod succeeds Donald W. Peterson, who had headed work at the USGS Observatory since its inception in the summer of 1980 following the eruption of Mount St. Helens.

As scientist-in-charge, MacLeod will direct a staff of 35 scientists, technicians, and support personnel who are engaged principally in studies of the Mount St. Helens eruptions and who also monitor other volcanoes of the Cascade Range.

MacLeod, of Ridgefield, Washington, has been serving with the USGS for the past 23 years. His geologic work has been concentrated particularly on the Coast and Cascade Ranges of Oregon and Washington, earning him a reputation as one of the outstanding field geologists of the Survey's Branch of Western Mineral Resources. His work at Newberry Volcano in Oregon has provided observational data that led to the successful drilling and identification of a major geothermal resource. He has also been working with USGS geologist George W. Walker of Menlo Park, California, in preparing a geologic map of Oregon, which has required new geologic mapping in the Cascade Range. □

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If it's green or wiggles, it's biology.
If it stinks, it's chemistry.
If it doesn't work, it's physics.
If it can't be explained, it's geology.

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