STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
Head Office: 1069 State Office Bldg., Portland 1, Oregon
Telephone: CApital 6-2161, Ext. 488

Field Offices

2033 First Street
Baker

239 S.E."H" Street
Grants Pass

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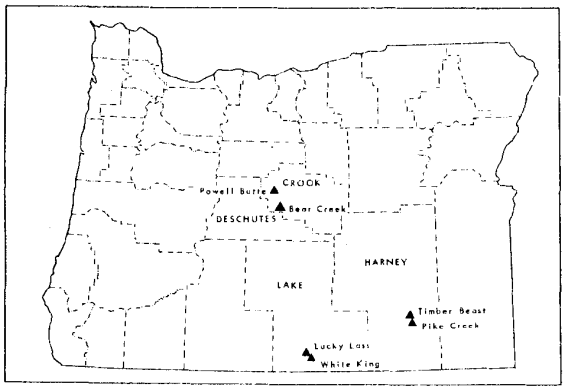
OREGON'S URANIUM PICTURE

By
Norman V. Peterson*

The White King Mine

Location: The White King mine is located about 15 miles northwest of Lakeview, Oregon, near the center of sec. 30, T. 37 S., R. 19 E., Lake County. The mine is in the southern Fremont Mountains at about 6,300 feet elevation and receives 6 to 8 feet of snow in the winter. It is near the west edge of an upland meadow through which Augur Creek meanders. Heavy soil cover and abundant timber are typical of the area.



The discovery of secondary uranium minerals in a surface outcrop of opalized tuff was made by Don Tracy of Lakeview in June 1955. Limited exploration by trenching and drill holes indicated the possibility of a commercial ore body extending out into the Augur Creek meadow. In the fall of 1955, Tracy and his partners, John Roush and Walter Lehman, leased the White King claims to the Lakeview Mining Company, an Oregon corporation. Lakeview Mining Company is headed by Dr. Garth Thornburg, Lakeview, Oregon, and is jointly owned by Dr. Thornburg, his brother Vance Thornburg of Paonia, Colorado; the Murchison interests; and the Richardson-Bass partnership of Fort Worth, Texas.

General geology: All rocks exposed in the general area are Tertiary age and consist of a great variety of volcanics. The oldest rocks in the mine area consist of a series of acid to intermediate tuffs, tuff breccias, crystal tuffs, and welded tuffs which are prominently exposed in northwest-trending ridges with steep northeast-facing fault scarps along Cottonwood Creek and Thomas Creek. A fossil rhinoceros tooth found in this sequence in the summer of 1958 has been identified as being of early Miocene age. These tuffs are overlain, apparently conformably, by less indurated agglomerates, clayey tuffs, and a thick section of tuffaceous lake beds. Fossil leaves have been found in both tuff sequences but have not yet been identified. The younger, less indurated tuffs are in turn usually covered by thin to thick olivine basalt flows which range from a few feet to 750 feet in thickness. The tuffs and basalt have been intruded by glassy flow-banded rhyolite. At some outcrops the rhyolite

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*Geologist, State of Oregon Department of Geology and Mineral Industries.

is massive while at other places it has formed conical rubble cones. Cougar Peak, the highest peak in the area (7925 feet), is one of these cones built on a northwest-trending ridge of the older tuffs.

The topography and drainage are controlled by prominent sets of faults in three directions, N. 45° W., N. 45° E., and N. 15° E. Field work indicates the presence of a rather broad anticline trending N. 45° W., with the axis just east of the mine. The area near the axis of the anticline has been highly faulted. Vertical displacement along the faults does not appear to be great -- a few tens to a few hundreds of feet -- but the faults are so numerous that the stratigraphy and structure is complex.

Except for a small amount of commercial-grade material containing secondary minerals in the oxidized zone near the surface, all of the ore is found in a roughly rectangular area about 400 feet wide and 1200 feet long. Ore bodies are roughly tabular and extend downward and eastward from the original discovery point.

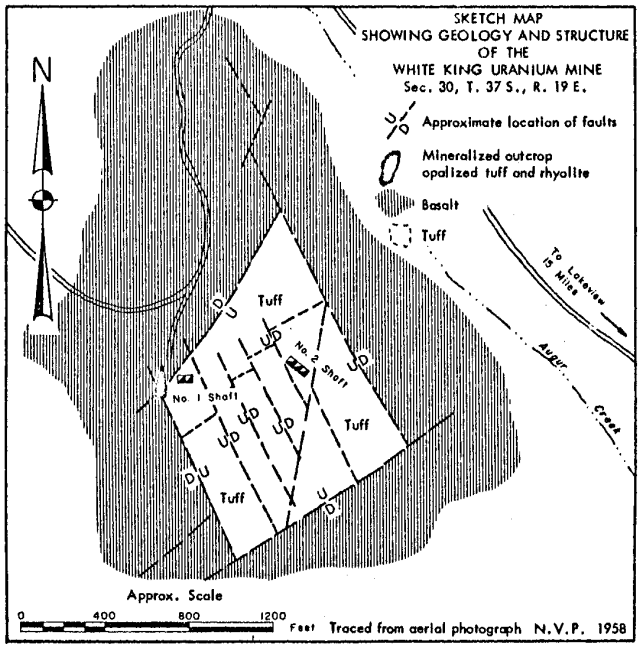
The mineralization appears to be directly related to the intrusive rhyolite, and localization of the mineralization is the result of faulting. The mineralization is found in a horst of younger tuffs and agglomerate surrounded on all sides by down-faulted basalt flows. Intrusive flow-banded rhyolite occurs both at the surface and underground in the mine. A variety of minerals indicates the possibility of at least two periods of mineralization. The earlier mineralization period contains low-temperature minerals such as cinnabar, realgar, stibnite, and opal. A suite of medium-temperature minerals including sooty pitchblende, coffinite, galena, pyrite, and jordisite is believed to have originated at some later time. A new mineral, lakeviewite, a uranyl arsenate, has been described by mineralogists from the Atomic Energy Commission from the oxidized part of the deposit. It is a yellow-green fluorescent, autunite-type mineral. A vivid blue mineral, ilsemmanite, a hydrous molybdenum oxide, is also found as an oxidation product of the jordisite.

The clayey tuffs and agglomerates, in which most of the ore occurs, have been highly altered. Underground the rocks are mottled gray and black and are colored by the orange and yellow arsenic minerals. Fault zones are sometimes difficult to see but are usually marked by a gouge zone of several inches of clay. Later faulting has broken the ore body into roughly tabular blocks. More than 30 faults have been recognized in the mine and they offset blocks of ore and complicate the geology underground.

Exploration and development: Early exploration by the Lakeview Mining Company was supervised by James H. Polous, General Manager, and Howard Dutro, Chief Geologist, (now Assistant General Manager). Surface exploration and a drilling program were followed by underground development.

Drilling in the mine area totals about 125,000 feet. More than 250 vertical drill holes averaging about 500 feet deep have explored the area mainly to the east of the original discovery. Company-owned truck-mounted "Sullivan" rotary drills are used for shallow holes (less than 500 feet) and a large "Mayhew 2000" rig sinks the deeper holes (to 1700 feet). Mineralization is determined both by probing the holes and interval checking of the drill cuttings with a geiger counter.

Underground exploration and development work now totals well over 4,000 feet. Development and mining through the No. 1 shaft are being carried out on three main levels at 70, 160, and 260 feet below the surface. The latest step in the development of the mine is the sinking of a Number 2 shaft about 600 feet east of the Number 1 shaft. This 3-compartment shaft will be about 700 feet deep and will tap haulage levels to permit mining of the deepest ore bodies. The Number 2 shaft required extensive new installations at the mine site. These included a hoist house, compressor building, change room, and an all-steel headframe 96 feet high. A station being cut at the 6130-foot level will be the main connection to the older mine workings to the west.



Mining methods: Normal mining methods are being used and there are no unusual safety hazards. Mining is conducted on a 3-shift basis, 6 days a week. Miners live in Lakeview and are transported by company buses. Ore is presently being mined by square-set stoping but plans call for extensive use of a modified top-slicing method. Since ore ane waste cannot be determined visually the face drill holes and exploratory long holes are probed before blasting. Each face is then scanned with geiger counters and channel samples are taken after each round. After grinding and drying, samples are analyzed with a binary scaler, a device for determining equivalent uranium content. Since the ore has not reached equilibrium, a positive correction factor is applied to indicate the U_3O_8 content. Chemical analyses are made at frequent intervals to check radiometric determination. Working faces are marked with paint from a spray can, "O" for ore and "W" for waste. In some areas soft ground enables the use of spade bits for mining ore or muck. Mucking machines load mine cars and the ore or waste rock is dumped into slusher pockets at the shaft station for loading into ore buckets and hoisting to surface ore bins. Each mine car is probed before dumping as a further check. Small dump trucks then haul the ore to appropriate stockpiles.

Haulage of ore from the mine to the mill in Lakeview has been contracted to the Lakeview Logging Company. Specially designed "belly dump" trucks with a 50-ton capacity will be used for the 15-mile haul over private roads.

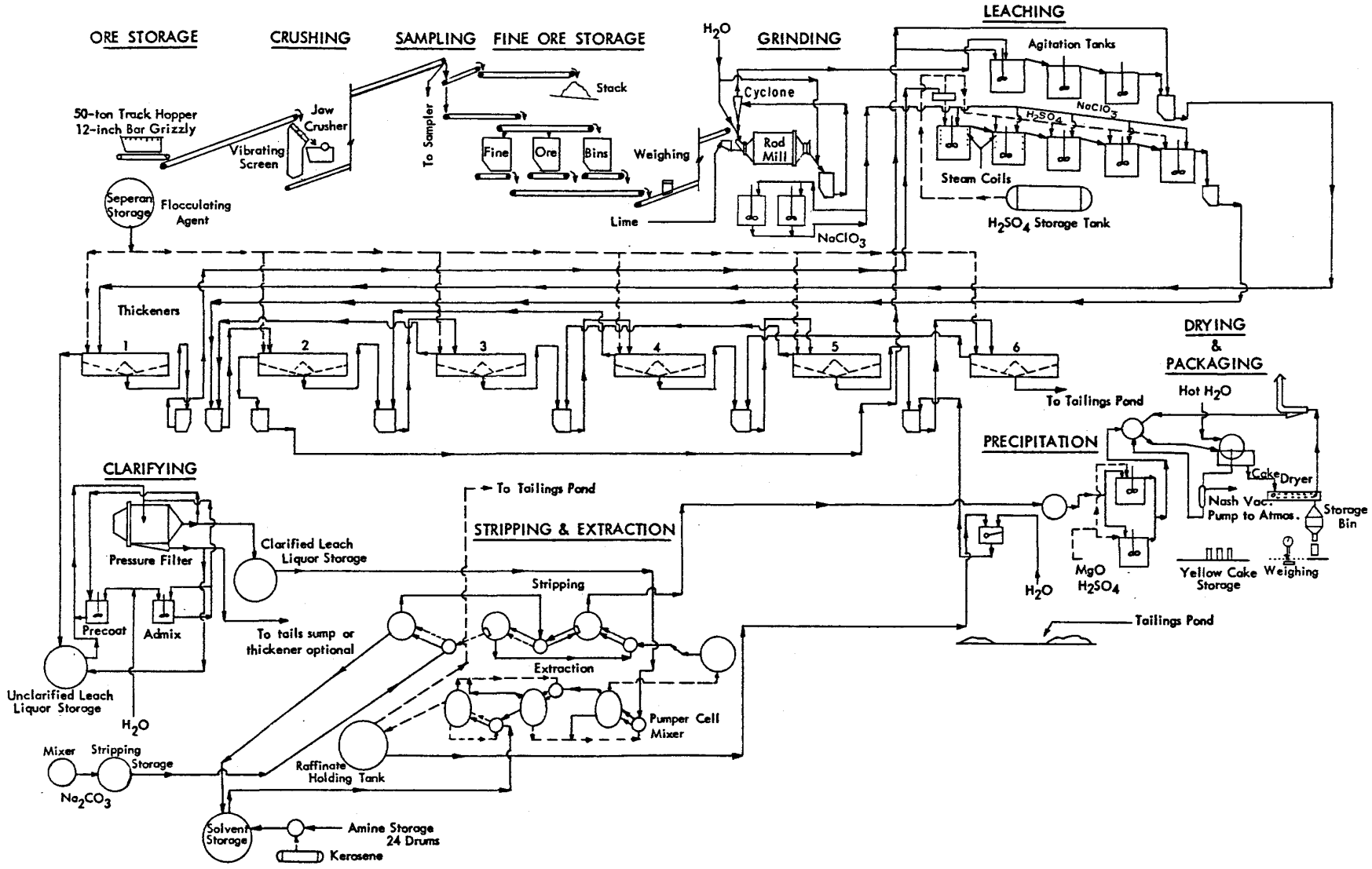
Lakeview Mining Company Uranium Mill

Early in 1957 the Lakeview Mining Company entered into negotiations with the Atomic Energy Commission for a contract that would enable it to build a uranium mill. In November 1957 a contract was signed that authorized the construction of a 210-ton per-day capacity mill. A site just north of Lakeview was obtained and by June 1, 1958, construction was well underway. Lakeview Mining Company acted as its own general contractor with Burr Johnson as mill construction superintendent. The mill, designed by Galigher Company, Salt Lake City, is complete. Ore grinding was started on November 28, 1958. The first "yellow cake" will be recovered before Christmas, 1958.

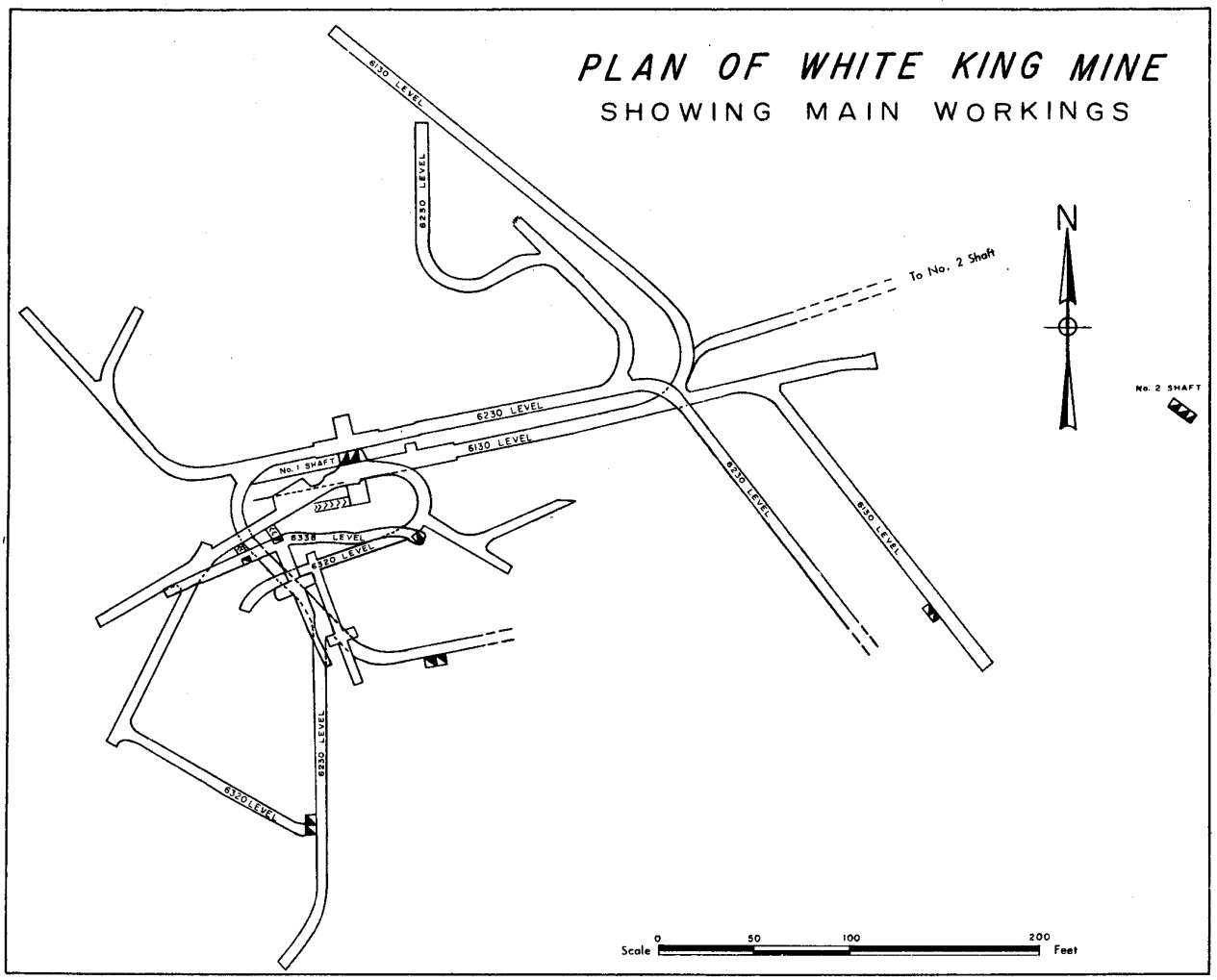
A straightforward "solvent extraction" process will be used to extract the uranium oxide from the clayey ore. Recovery is expected to be 90 percent. After grinding to minus-35 mesh in a 6 by 12-foot rod mill, the ore, containing an average of about 0.3 percent U_3O_8, is automatically weighed and sampled and fed to sulfuric acid leaching tanks. The leach liquor after dissolving the uranium from the ore is fed to thickeners and clarifiers and then is mixed with an organic solvent (a 5-percent lauryl amine solution in kerosene). Then the organic solvent and aqueous phases are allowed to separate. During the time the two are in contact the solvent selectively extracts the uranium from the acid liquor leaving a raffinate (a barren leach liquor) which is discarded or recycled. The pregnant solvent is then stripped of its uranium by a sodium carbonate solution which has a greater affinity for the uranium than the

LAKEVIEW MINING COMPANY URANIUM MILL

SIMPLIFIED FLOW SHEET



solvent. The barren solvent from this step is recycled for further leach liquor extraction. To the now pregnant stripping solution that contains from 30 to 60 grams of U_3O_8 per liter, magnesium oxide is added which precipitates the uranium concentrate as "yellow cake." The "yellow cake" has a chemical composition of MgU_2O_7 and contains about 80 percent uranium oxide. After drying, the "yellow cake" is packed in metal containers for sale to the Atomic Energy Commission.



For typical operating conditions the consumption of chemicals is estimated to be:

Sulfuric acid - 80 lbs/ton
Sodium chlorate - 5 lbs/ton
Sodium carbonate - 10 lbs/ton
Lauryl amine solvent loss - small amount from entrainment
MgO for precipitation - 0.1 lb/ton
Flocculating agent - .75 lb/ton

Water supply for the mill comes from two deep wells which deliver water to the mill at 90° F.

The mill schedule has been set up to process 231 dry tons per day for continuous operation. The capacity of the mill will allow for processing of about 300 tons per day on a 10-day-on and a 4-day-off operating schedule. Mill superintendent C. Oliver Hower will

operate the mill on a 3-shift basis with a total of 35 employees. Other staff members are John Vecchies, assistant superintendent; Dale Cutting, chief chemist; and Al Legard, maintenance superintendent.

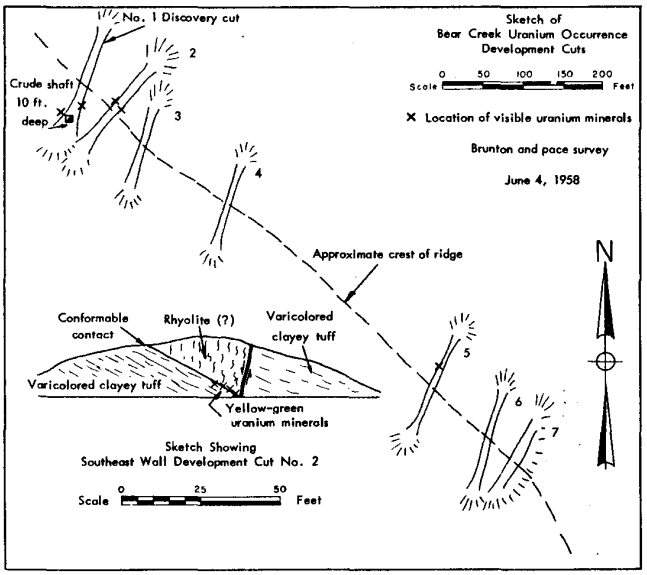
Under the contract with the Atomic Energy Commission, 30 percent of the mill capacity must be reserved for processing of custom ore. Custom ore must be amenable to the "solvent extraction" process.

Other Uranium Occurrences In Oregon

Other uranium and radioactive occurrences of small size have been discovered at several places in the State. Those that have been actively explored during 1958 are briefly described below.

Lucky Lass

The Lucky Lass deposit is in sec. 25, T. 39 S., R. 19 E., Lake County, about a mile northwest of the White King mine. A group of Lakeview people discovered it in June 1955 soon after the White King discovery was made public. A few thousand tons of ore have been mined from this deposit. The ore body is roughly triangular and bounded on all sides by faults. Secondary minerals similar to those found at the White King coat fractures and fill voids in the tuffs and vesicular basalt fragments which have been pulled into fault zones. The mineralization has lessened with depth and no more minable ore is known at the present time. A continuing drilling program is being carried on by the Lakeview Mining Company.



Bear Creek

This radioactive occurrence is in sec. 13, T. 18 S., R. 16 E., Crook County, near Bear Creek southeast of Bend. It showed some promise on its discovery in 1955 but intermittent exploration to November 1958 has not uncovered a minable amount of commercial-grade ore.

During 1958, Leonard Lundgren of Bend leased and explored the claims and, on deepening and cleaning out the older bulldozer excavations, found minor occurrences of uranium minerals (see sketch map). Individual samples in the 1-percent U_3O_8 range have been reported. The minerals found in small lenses of breccia in slickensided zones were identified by the Atomic Energy Commission as primary uraninite (?) and secondary autunite. The zones containing the cemented breccia are very narrow, discontinuous, and show small horizontal displacements. Additional exploration included a detailed radiometric survey and a shallow drilling program. This work was supervised by James Barlow, a former AEC geologist. No new radioactive zones were encountered.

Powell Butte

The occurrence is on Powell Butte in sec. 13, T. 16 S., R. 14 E., Crook County, about 8 miles south of Prineville. The discovery of small amounts of mercury mineralization along with the moderate radioactivity has been the only encouraging development during 1958.

The radioactivity occurs with iron-oxide coatings of fractures and joints in small isolated occurrences in the rhyolite flows that make up Powell Butte. The claimants, Harley Dosser and Eldon McCoin of Redmond, plan further exploration as time permits.

Pike Creek - Kiska Mine

The mine is in sec. 20, T. 34 S., R. 34 E., Harney County, and is being explored by the Solar-X Corporation of Boise, Idaho. The radioactive occurrence is in the steep-walled gorge of Pike Creek, along the east scarp of the Steens Mountains. Exploration has been concentrated on the original discovery claim where uranium mineralization occurs in a banded rhyolite breccia along a high-angle, northeast-trending normal fault. Surface trenching has exposed the narrow brecciated zone for a distance of about 150 feet. Five samples of the rhyolite breccia from the fault zone recently analyzed by the Lakeview Mining Company varied from 0.14 to 0.95 percent U_3O_8. A selected sample of the breccia from near the creek level assayed by the Department contained 0.37 percent U_3O_8. Future exploration will be an attempt to discover minable widths of the mineralized breccia and associated tuffaceous sediments.

Timber Beast Claims

The prospect is located in secs. 8 and 9, T. 34 S., R. 34 E., Harney County, on Little Alvord Creek just north of the Pike Creek claims. During 1957-1958 the Timber Beast Mining Company, with the aid of a DMEA loan, drove about 270 feet of underground tunnels. A drift was driven along the west side of a fine-grained basic dike for 180 feet to intersect an east-west trending fault along which minor uranium mineralization had been found at the surface. A drift was then driven eastward along the fault for about 90 feet. No ore-grade material has been developed. The underground workings show zones of weakly radioactive material along fractures in the volcanics adjacent to the dike and also in the gouge zones along the intersecting fault. The radioactivity is generally associated with thin, but in places numerous and closely spaced, seams of ilsemannite (a hydrous molybdenum oxide). However, much of the ilsemannite-bearing material is not radioactive. The U. S. Bureau of Mines reports that the Company's DMEA contract was terminated by mutual agreement effective June 6, 1958.

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DOMESTIC URANIUM RESERVES ESTIMATED

Measured, indicated, and inferred ore reserves of uranium in the United States were estimated by the Atomic Energy Commission to total 78,500,000 tons on June 30, 1958. These are determined in accordance with the definitions for measured, indicated, and inferred ore reserves as adopted by the U. S. Geological Survey and the U. S. Bureau of Mines and include only material metallurgically amenable to treatment. Distribution of ore reserves by states is approximately as follows:

	Thousand Tons	Percent U_3O_8
New Mexico	52,800	0.26
Wyoming	11,100	0.30
Utah	5,100	0.36
Colorado	3,700	0.29
Arizona	1,400	0.32
Washington, Oregon, Nevada	2,000	0.23
North and South Dakota	600	0.26
Others:		
Texas, California, Montana, Idaho, Alaska	1,800	0.23
Total Reserves	78,500	0.27

(From: U.S. Atomic Energy Commission Press Release No. 219, September 23, 1958.)

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PROPOSED RECREATION WITHDRAWAL

The U.S. Forest Service has filed an application for the withdrawal of 152 acres along the Illinois River, Curry County, approximately 2 miles south of Agness adjacent to Oak Flat. The Forest Service desires this land for a public recreation area. If the withdrawal is consummated, the land will be subject to valid existing rights but withdrawn from all forms of appropriation under the general mining laws. All persons who wish to submit comments, suggestions, or objections in connection with the proposed withdrawal should write to the State Supervisor, U.S. Bureau of Land Management, 809 N.E. Sixth Avenue, Portland, Oregon, before January 15, 1959. The lands involved in the application are located as follows: Sec. 19: Lot 7, $NE\frac{1}{4}NW\frac{1}{4}$, $NE\frac{1}{4}SW\frac{1}{4}$; Sec. 29: Lots 5, 9, and 11, T. 35 S., R. 11 W., (approximately 151.88 acres).

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CHEMICAL LIME CHANGES MANAGERS

Robert Vervaeke, General Manager of the Chemical Lime Company since 1956, resigned as of November 1. Appointed in his place is Hans Leuenberger, a native of Switzerland and, since 1950, Assistant Administrative Manager of Technology with a branch of Union Carbide Corporation of Niagara Falls.

The Chemical Lime Company is located 5 miles north of Baker. Owners are Tony Brandenthaler and Thomas Dant, Sr. According to the new General Manager, Leuenberger, both kilns are in operation at the lime plant and lime rock is still being transported from the quarry. The plant will continue to operate during the winter from the stockpile accumulated since spring.

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AEC LIMITS URANIUM PURCHASE GUARANTEE

The Atomic Energy Commission has announced a change in its policy governing purchases or uranium concentrate. Effective November 21, the AEC said, its guarantee to buy concentrates produced and delivered between April 1, 1962, and December 1, 1966, will apply only to "appropriate quantities" from reserves already developed. Developed reserves, according to an AEC spokesman, include indicated and inferred reserves in known districts.

Purchases from already developed reserves in 1962-1966 will be at the previously established price of $8 per pound of uranium oxide in an acceptable concentrate, the agency said. Production from reserves developed hereafter, the AEC added, will be bought in 1962-1966 only as needed and "on such terms and conditions and at such prices" as the AEC may determine.

The action was taken to "guard against overproduction" of uranium and "is not due to any forecast of a reduction in the Commission's uranium requirements or in the potential requirements for commercial atomic power," the AEC said. "However, it is in the best interest of both the industry and the Government to hold uranium production in reasonable balance with requirements."

Buying policies from now until 1962 are not affected by the new policy. Under existing contracts, annual concentrate production is expected to run about 20,000 tons by 1962, with privately owned uranium mills processing about 23,400 tons of ore daily.

(From: American Mining Congress Bulletin Service No. 23, November 28, 1958.)

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FRED BARTELS

Fred J. Bartels of Springfield died November 12. He was 76 years old and had been a resident of the State since 1900. Long associated with the mining industry in the Bohemia District of Lane County, Bartels installed and operated a cyanide mill on the Evening Star claim in 1922-1932 and was associated with the H & H operation of the Champion mine 1939-1942. With a partner he again produced shipping-grade ore from the Evening Star, now part of the Champion group, 1945-1947. With a brother and nephew, co-owners, he mined both milling and shipping ores at the Champion 1948-1949 and retained an interest in the property to time of death.

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