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INVESTIGATION OF SALEM HILLS BAUXITE DEPOSITS

Second Progress Report

By  
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Introduction

Ferruginous bauxite together with associated bauxite nodules was discovered in the Salem Hills, Marion County, by the State Department of Geology and Mineral Industries during a reconnaissance of laterized basalt areas in the Willamette Valley in 1945. Results of this reconnaissance were included in Department Bulletin No. 29, Ferruginous Bauxite Deposits in Northwestern Oregon. This bulletin, however, dealt primarily with the deposits in Columbia and Washington counties where hand auger drilling by the Department indicated a fairly large tonnage of bauxitic material.

In the summer of 1953 field work in the Salem Hills was recommenced and a drilling program was begun in the more promising-looking areas. In September 1954 a progress report on this locality was made in the Department's monthly publication, The Ore.-Bin. The report included a brief description of the deposits and results of chemical analyses of the first 13 drill holes.

Location

The deposits are located in the southwestern portion of the Salem Hills in a strip approximately 3 miles wide, 6 miles long, and having a general northwesterly trend. The area lies approximately 7 miles south of Salem in Marion County and is easily accessible from U.S. Highway 99E via a network of graded secondary county roads. Topographic maps of the Salem and Stayton quadrangles cover the area of interest.

General geology

The ferruginous bauxite in the Salem Hills is developed on Miocene basalts and appears to be similar in age and origin to the deposits found in Washington and Columbia counties to the north. The basalts overlie Oligocene marine sediments of the Eugene formation. The processes of laterization and bauxitization of the basalt have been described by Libbey, Lowry, and Mason (1945) and Allen (1948). Later uplift and subsequent erosion of the bauxitized lavas in the Salem Hills resulted in a "patchwork" distribution of the deposits which now occur as topographic highs separated by stream channels.

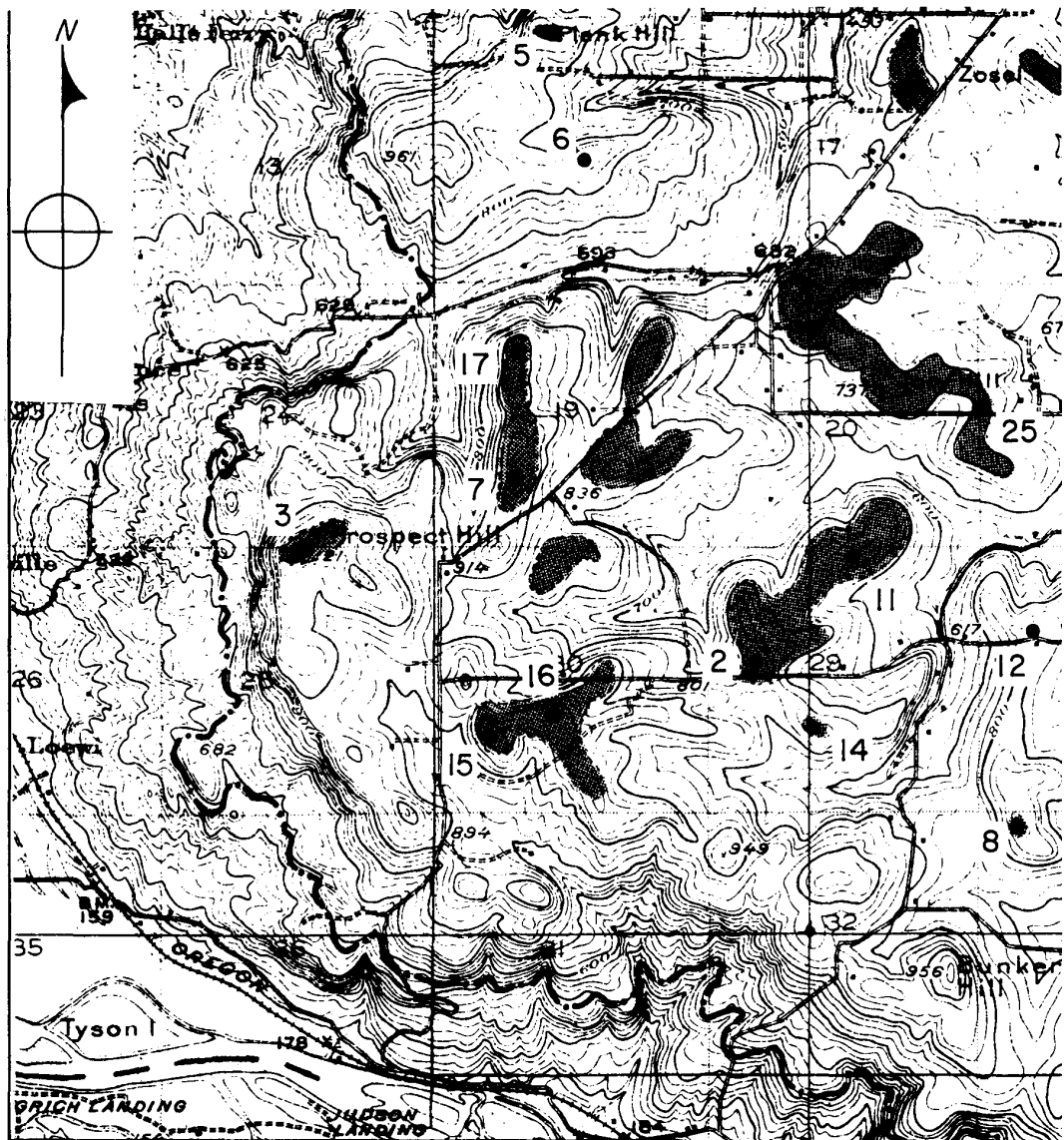
The Miocene flows dip gently to the east and northeast with the strike changing from N. 45° W. in the south to N. 15° W. toward the northwest. The hills slope north and east approximately 150 to 200 feet per mile and reflect the dip slope of the underlying lavas.

Analyses of samples

The accompanying map shows the location of all the holes drilled through December 1954. Assays for holes 24 through 27 have not been completed. Hole 15 was deepened to 85 feet

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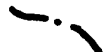
GEOLOGIC MAP OF PART OF THE  
**SALEM HILLS**  
 MARION COUNTY, OREGON



Laterized areas

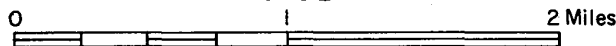


Auger Hole

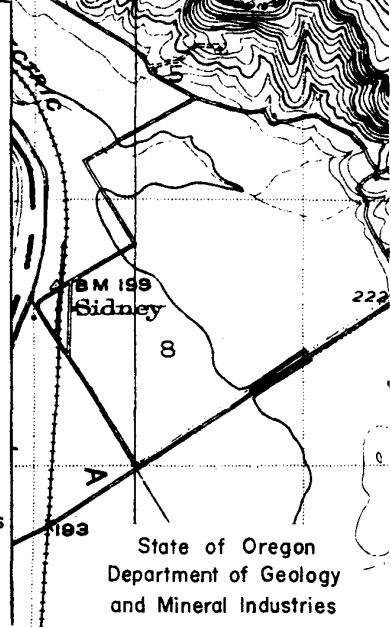


Eugene—Stayton Lava Contact

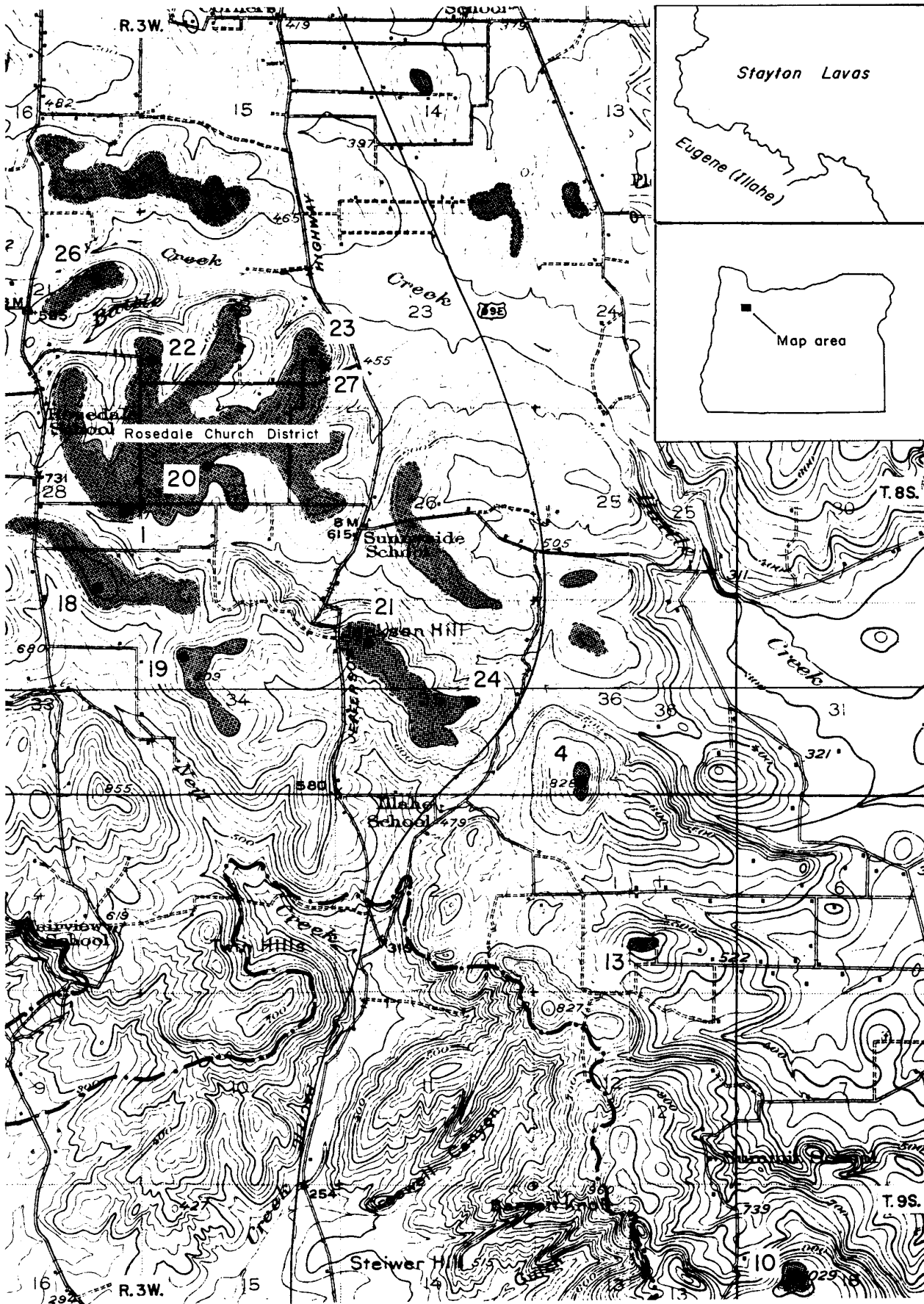
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APRIL 1955



State of Oregon  
 Department of Geology  
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and holes 24 and 25 were drilled to 45 feet and 35 feet respectively by a power auger operated by the State Highway Commission with sampling by the senior author. All three of these holes bottomed in varicolored kaolinitic clay (lithomarge) similar to that found beneath the bauxite zones in the other holes drilled in this area. Vibration of the steel against the wall during the drilling of the holes caused some of the side material to work downward and become mixed with the material being taken from the bottom of the hole. Accuracy of the samples below 20 to 25 feet was therefore believed to be questionable because of the increasing amount of contamination from this source. No chemical analyses have as yet been made on the power augered holes, but differential thermal analyses of some of the samples at 15 to 20 feet indicate that these may still be within the bauxite zone.

Hole 26 was drilled to explore further the Rosedale Church block after the analyses of holes 22 and 23 showed this to be the thickest section of bauxitic material so far encountered in the Salem area. Hole 26 unfortunately was drilled during the rainy season in December 1954 when the water table was near the surface. Excessive inflow of ground water at 18 feet resulted in contamination of samples forcing discontinuation of drilling at 20 feet. Differential thermal analysis of the 18- to 20-foot interval indicates that the material is still within the bauxite zone. It may be of interest to note that there is a 20- to 30-foot fluctuation of the ground-water table in these hills between the wet and dry seasons.

During the course of the field work a basement excavation was studied that showed gibbsitic material in place approximately 28 feet vertically below the top of the knoll on which hole 1 was drilled. Since the results of hole 1 indicated probably no more than 20 feet of bauxite on the top of the hill, the bauxite horizon appeared therefore to be "draped" over the topographic high at this locality. Hole 27 was later drilled on the hillside approximately 150 yards southeast and 35 to 37 feet vertically below hole 23 to test this possibility. Although chemical analyses are not yet available, a differential thermal analysis of the 14- to 16-foot interval (i.e., approximately 51 feet below the top of the hill at hole 23) indicates that the material is still within the bauxite section at that depth and that the "draping" idea may be valid generally.

Chemical analyses of holes 1, 11, 21, and 22 have been plotted (see graphs on p. 28) to show graphically the variation in chemical composition with depth at each 2-foot interval. These four holes were chosen because they show typical bauxite sections taken from various scattered localities in the area.

The accompanying tabulation gives average analyses of the drill holes obtained by arithmetical averages of samples from each hole over intervals of 2 feet. An ore thickness was arbitrarily selected as shown in the table by using a cutoff point of 10 percent  $\text{SiO}_2$  except in holes 8 (cutoff of 10.63%  $\text{SiO}_2$ ) and 21 (cutoff of 11.60%  $\text{SiO}_2$ ).

Final averages were obtained by weighting the averages of each hole against its ore thickness. It is realized that many more holes in the bauxite section would be necessary in order to obtain an accurate average of the value of the ore bodies but it is believed that these averages as given are indicative of results that may be obtained by close drilling.

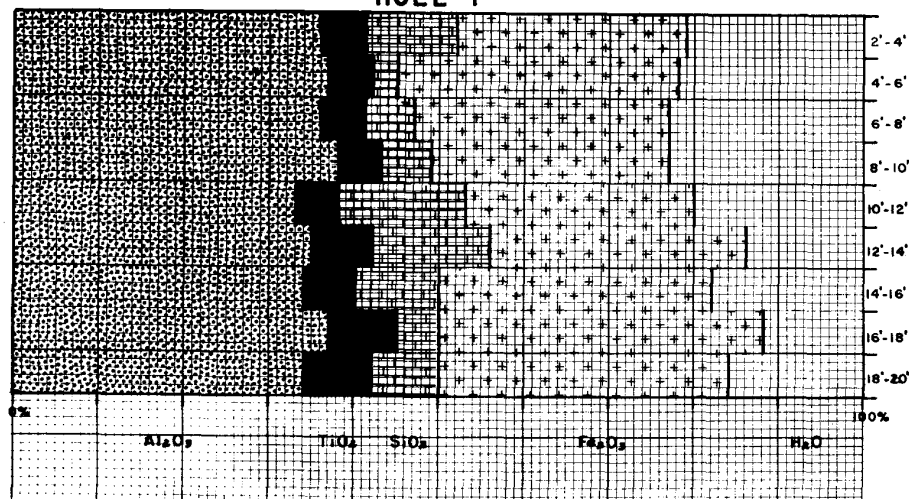
### Conclusion

No estimate of ore reserves is given because of the small number of drill holes for such a large area. However, it is estimated that a total area in excess of 1500 acres is underlain with bauxitic laterite having an average thickness of about  $14\frac{1}{2}$  feet and with an overburden to be handled of about  $3\frac{1}{2}$  feet in thickness. As determined by the Department for the bauxitic section of bauxitic laterite in Washington County, the weight-volume factor is believed to be 17 cubic feet to the ton. The greatest tonnage of bauxite in the Salem Hills is thought to be concentrated in the northeastern part where seemingly the bauxitic section not only has the greatest areal extent but also contains the greatest thickness of ore. A plane table survey of the Rosedale Church district of this northeastern

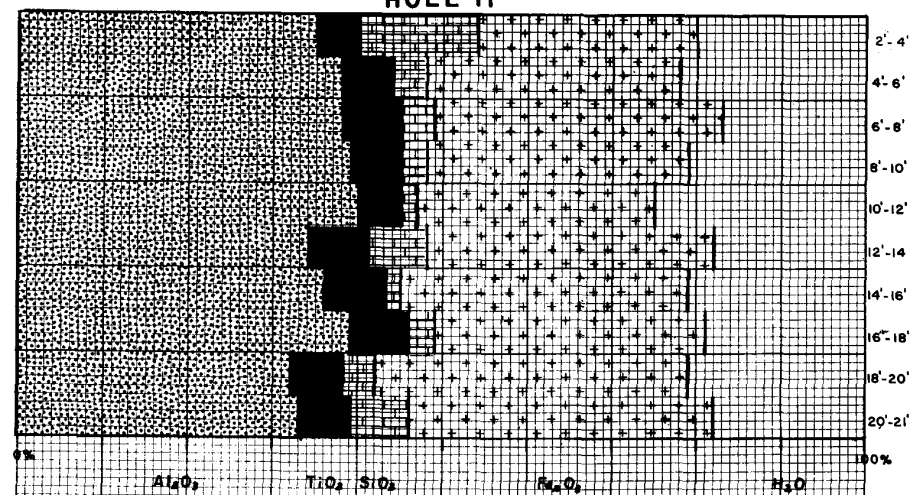
Average Analyses of Drill Hole Samples in Ore Section of Salem Hills Area

Hole	Depth	Over-burden	Ore Interval	Ore Thickness	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	Loss on Ignition	Remarks
1	20'	2'	2' - 20'	18'	35.51%	8.75%	30.9%	6.20%	18.64%	At bottom SiO <sub>2</sub> = 7.66%
2	40'	2'	2' - 14'6"	12'6"	38.83	6.92	29.1	3.17	19.50	At 21' SiO <sub>2</sub> = 23.68%; at 14'6" SiO <sub>2</sub> = 4.9%
3	10'	---	none	---	---	---	---	---	---	Average SiO <sub>2</sub> = 21.31%
4	20'	---	none	---	---	---	---	---	---	Average SiO <sub>2</sub> = 17.14%
5	11'8"	2'	2' - 10'	8'	35.74	9.37	29.2	6.21	19.48	At bottom SiO <sub>2</sub> = 20.08%; at 10' SiO <sub>2</sub> = 14.22%
6	14'	---	none	---	---	---	---	---	---	Average SiO <sub>2</sub> = 25.41%
7	20'	2'	2' - 18'	16'	34.09	8.13	31.2	6.76	19.82	At bottom SiO <sub>2</sub> = 17.04%; at 18' SiO <sub>2</sub> = 5.8%
8	10'	2'	2' - 8'	6'	31.01	10.63	32.7	6.91	18.75	At bottom SiO <sub>2</sub> = 20.8%; at 8' SiO <sub>2</sub> = 10.5%
9	---	---	none	---	---	---	---	---	---	In weathered basalt below overburden
10	12'	---	none	---	---	---	---	---	---	Average SiO <sub>2</sub> = 23.94%
11	21'	2'	2' - 21'	19'	36.47	5.28	32.3	6.13	19.82	At bottom SiO <sub>2</sub> = 7.48%
12	20'	---	none	---	---	---	---	---	---	Average SiO <sub>2</sub> = 26.02%
13	20'	8'	8' - 20'	12'	35.87	6.23	29.3	6.99	21.61	At bottom SiO <sub>2</sub> = 5.96%
14	20'	2'	2' - 8'	6'	32.31	6.48	36.9	6.00	18.31	At bottom SiO <sub>2</sub> = 22.28%; at 8' SiO <sub>2</sub> = 10.50%
15	85'	2'	2' - 24'	22'	37.85	4.28	30.9	6.94	20.02	At 24' SiO <sub>2</sub> = 9.02%; below 24' no analyses
16	24'	2'	2' - 22'	20'	37.37	4.14	32.4	7.14	18.95	At bottom SiO <sub>2</sub> = 13.74%; at 22' SiO <sub>2</sub> = 10.40%
17	20'	2'	2' - 12'	10'	34.36	7.92	33.1	7.00	17.62	At bottom SiO <sub>2</sub> = 28.04%; at 12' SiO <sub>2</sub> = 13.44%
18	20'	4'	4' - 18'	14'	32.84	5.85	32.7	6.58	22.03	At bottom SiO <sub>2</sub> = 20.32%; at 18' SiO <sub>2</sub> = 11.28%
19	20'	8'	8' - 14'	6'	33.85	7.51	32.0	6.00	20.64	At bottom SiO <sub>2</sub> = 21.06%; at 14' SiO <sub>2</sub> = 7.68%
20	20'6"	8'	8' - 21'	13'	31.20	7.46	33.2	6.80	21.34	At bottom SiO <sub>2</sub> = 8.68%
21	20'	4'	4' - 18'	14'	38.02	11.60	22.3	5.34	22.74	At bottom SiO <sub>2</sub> = 12.24%; at 18' SiO <sub>2</sub> = 9.16%
22	25'	4'	4' - 25'	21'	36.84	5.12	32.8	6.84	18.40	At bottom SiO <sub>2</sub> = 2.40%
23	32'	4'	4' - 32'	28'	33.80	5.79	32.7	7.19	20.52	At bottom SiO <sub>2</sub> = 5.86%
Weighted Average		3.4'		14.4'	35.40%	6.67%	30.60%	6.56%	19.90%	

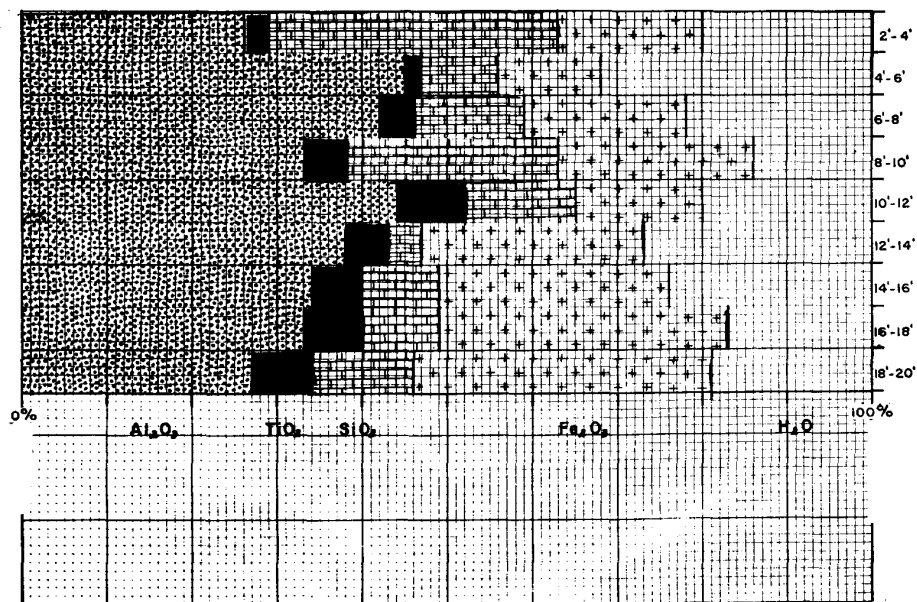
HOLE I



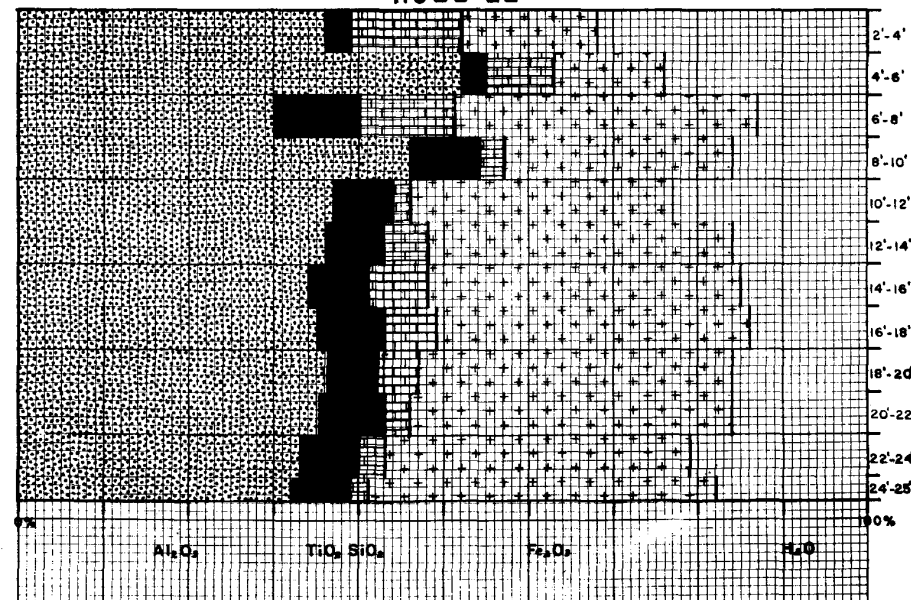
HOLE II



HOLE 21



HOLE 22



part (see map) is being made in order to outline more closely the contained bauxite area which may be the largest in the field.

As was pointed out in the previous progress report (Corcoran, 1954) the soil cover over the bauxitic section in place contains gibbsite nodules in widely varying concentrations and ranging in size from less than an inch to as much as 30 inches or more in greatest dimension. It seems likely that the gibbsite in this overlying material could be recovered by coarse screening and hand sorting, possibly combined with washing.

#### Bibliography

Allen, V. T.

1948 Formation of bauxite from basaltic rocks in Oregon: Econ. Geology, vol. 43, no. 8, Dec. 1948.

Corcoran, R. E.

1954 Investigation of Salem Hills, Oregon, bauxite deposits: Oregon Dept. Geol. and Min. Ind. The Ore.-Bin, vol. 16, no. 9, Sept. 1954.

Libbey, F. W., Lowry, W. D., and Mason, R. S.

1945 Ferruginous bauxite deposits in northwestern Oregon: Oregon Dept. Geol. and Min. Ind. Bull. 29, 1945.

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#### NEW DRILLING PERMITS

Drilling permit no. 8 was issued March 29, 1955, to Riddle Oil and Gas Producers, W. M. Parnell, Manager, Riddle, Oregon. The location of the test is given as SW $\frac{1}{4}$  of SW $\frac{1}{4}$  sec. 34, T. 30 S., R. 6 W., Douglas County. The lessor is Harry Dayton, Riddle, Oregon.

Drilling permit no. 9 was issued April 1, 1955, to Standard Oil Company of California. The location of the test is stated to be SW $\frac{1}{4}$  of SE $\frac{1}{4}$  sec. 11, T. 7 N., R. 10 W., Clatsop County. The lessors are William J. and Anna Hoagland, Astoria, Oregon.

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#### MINING LAW REVISION

Congressman Harris Ellsworth has introduced H.R. 5577 to amend the mining laws. This bill is similar to the D'Ewart bill introduced in the last Congress. The Ellsworth bill has received the endorsement of both the Interior and Agriculture departments as well as the American Mining Congress Public Lands Committee and the American Forestry Association. The bill appears to contain provisions which will satisfy the various groups who sought to make much more drastic revisions of the law without taking into consideration the harm such changes would do to the mining industry. The Ellsworth bill removes sand, stone, gravel, pumice, pumicite, and cinders from entry and location under the mining laws unless these materials contain locatable minerals, and places such materials under the Materials Disposal Act. Up to the time of patenting, mining claims will be subject to federal government management of surface resources other than minerals. The miner would be guaranteed his full rights for prospecting and developing his claim and the use of such timber as would be required in such development. After patenting, title to the claim with all surface resources would be acquired by the claimant as under present law.

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#### GRANTS PASS OFFICE OPEN ON SATURDAYS

Beginning on April 16, 1955, the field office of the State Department of Geology and Mineral Industries at 239 S.E."H" Street, Grants Pass, which has been closed on Saturdays during winter months, will be open on Saturdays until further notice.

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## DOMESTIC METAL PRICES

From E&amp;MJ Metal and Mineral Markets

Copper - 35.7 cents per pound Connecticut Valley.  
 Lead - 15 cents per pound New York.  
 Zinc - 12 cents per pound East St. Louis.  
 Quicksilver - \$317-320 per flask New York.  
 Silver - (foreign) 87 cents per ounce New York; (domestic) 90½ cents government price.  
 Aluminum - per pound f.o.b. shipping point (freight allowed) 30-pound ingot 99+ percent, 23.2 cents per pound; in pigs, 21½ cents.  
 Antimony - 99½ percent grade, domestic, bulk, Laredo, 28.5 cents per pound.  
 Bismuth - \$2.25 per pound in ten lots.  
 Cadmium - delivered, \$1.70 per pound.  
 Cobalt - per pound in 500- to 600-pound containers, \$2.60.  
 Cobalt ore - per pound of cobalt contained f.o.b. Cobalt, Ontario, 9-percent grade, \$1.30; 10 percent, \$1.40.  
 Gallium - per gram in 1000-gram lots, \$3.00.  
 Germanium - per pound \$295.  
 Iridium - per ounce troy \$90-100.  
 Lithium - per pound 98 percent \$11-14.  
 Nickel - per pound electrolytic cathodes f.o.b. Port Colborne, Ontario, 64½ cents duty included.  
 Osmium - per ounce troy \$80-100.  
 Palladium - per ounce troy \$17-19.  
 Platinum - per ounce troy \$76-80.  
 Selenium - per pound \$6.  
 Titanium - per pound 99.3+ percent maximum .3 percent iron, \$3.95.  
 Titanium ore - per long ton, ilmenite 59.5 percent TiO<sub>2</sub> f.o.b. Atlantic Seaboard \$18-20; rutile per pound, minimum 94 percent, concentrate 8-8½ cents.  
 Tungsten - per pound 98.8 percent, \$4.39.  
 Zirconium - per pound, sponge, \$10.

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## RIDDLE NICKEL

According to the Wall Street Journal, the M. A. Hanna nickel smelter at Riddle, Oregon, is operating on a two-furnace basis and the company expects to produce between four and five million pounds of nickel this year. Last year when the smelter was started, production was about 300,000 pounds. As reported, company officials believe that the smelting process, not heretofore used in this country, has great promise.

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## BILL TO EXTEND GOVERNMENT PURCHASE PROGRAM

S. 922 by Senator Goldwater of Arizona seeks to extend to 1963 the government's purchase program for manganese, tungsten, chrome, mica, and asbestos. It is reported by Mining World that, except for manganese producers, strategic mineral people have not evidenced very much concern to their congressmen over the fate of this bill. There will be considerable opposition by the Budget Bureau and some other government agencies to extending this purchase program and, if individual producers do not show a great deal more interest to their congressmen in support of the bill, it will have hard sledding.

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## STRATEGIC MATERIALS TO BE EXCHANGED FOR SURPLUS FARM PRODUCTS

It is reported that the government's barter program under which surplus farm products will be exchanged for strategic materials such as manganese, cobalt, mercury, platinum, nickel, tin, lead, and zinc, will include a contract to exchange 100,000 tons of surplus wheat for Turkish chromite. It is not stated what value is to be placed on the wheat.

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