United States Department of the Interior

Geological Survey

Strategic Minerals Investigation

PRELIMINARY REPORT AS OF JULY 23, 1943

ON

THE HIGH-ALUMINA CLAY DEPOSIT AT HOBART BUTTE

LANE COUNTY, OREGON

Subject to revision when later drilling results are released

By

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Prepared at Cottage Grove, Oregon

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SUMMARY

The Hobart Butte high-alumina clay deposit is located 16 miles by road south of the railroad at Cottage Grove, in Lane County, Oregon. This is a region of mild and humid climate. The deposit has been mined for refractory clay by the Willamina Clay Company. Since September, 1942, the Columbia Metals Corporation has had a lease on the property. In August, 1942, R. L. Nichols, of the Federal Geological Survey, mapped the deposit and recommended exploration by the Federal Bureau of Mines. Since January 26, 1943 the Bureau of Mines has put down 24 diamond drill holes, totaling 6896 feet. The purpose of this report is to summarize the economic geology revealed by this work.

The regional geology is presented in Bulletin 850 of the U. S. Geological Survey. The Hobart deposit is in the Calapooya formation of upper Eocene age, which is composed of more than 3500 feet of volcanic breccias, conglomerates, mudflows, and lava flows. The high-alumina deposits of kaolinite are found in beds ranging from conglomerate to fine shale or tuff. Generally the ore is conformable to the bedding. Structurally, Hobart Butte appears to be a faulted syncline. Dips are gentle but there is an abrupt change in attitude at the point where the fault is inferred, and the ore body is displaced. Kaolinite is practically the only clay mineral of importance, and this simplicity should favor the extraction of alumina. The sulphide minerals, realgar and stibnite, are widely distributed throughout the clay but in minor quantities.

The clay deposits have been divided into four areas. Two of these have been drilled sufficiently well to be classed as measured ore. These two bodies lie at the top of Hobart Butte and are separated by the cross fault. They are called ore bodies #1 and #2. The first is estimated to contain a total of 9,200,000 tons of dry ore with a grade of 29.9% available Al_2O_3 and 3% available Fe_2O_3. Of this amount it is estimated that 6,500,000 tons has no overburden. Ore body #2 contains 2,700,000 dry tons with nearly an equal amount of overburden. The average grade is 29.3% available Al_2O_3 and 3.6% available Fe_2O_3. The moisture content of both ore bodies has been approximately determined as 3%. These grade and tonnage estimates agree substantially with those of the U. S. Bureau of Mines.

Area #3 lies below ore body #1 on the south end of the Butte. Complete analyses have not yet been received but it is expected that roughly 2,500,000 tons averaging 25% available Al_2O_3 and 10% available Fe_2O_3 will be indicated. Area #4 is situated below ore body #2 at the northeast end of the Butte. The expected grade is 27% available Al_2O_3 but the overburden will be large. A program involving 3000 feet of drilling is just starting in this area.

When the current drilling program is completed it is recommended that no further intensive drilling be started at Hobart Butte until it becomes known definitely that Hobart clay can be used successfully as a source of alumina. Meanwhile, geologic efforts should be continued to locate other similar clay deposits in the surrounding area.

INTRODUCTION

Purpose and Scope

The investigation of high-alumina clay at Hobart Butte has been a joint project initiated by the Federal Geological Survey and drilled by the Federal Bureau of Mines. The purpose of the exploration work, as a part of the strategic mineral program, was to prove or disprove possible large tonnages of high-alumina clay. A report by R. L. Nichols 1/, dated August 28, 1942, estimated a possible reserve of 5,300,000 tons of indicated ore and 6,200,000 tons of inferred ore. This estimate has been substantiated by drilling.

The purpose of this report is to present a preliminary summary of the economic geology after six months exploration which cost approximately $35,000. The drilling has been renewed but it seems advisable to summarize present information now, because the writer may be transferred to another assignment and because the exploration of the most favorable ore areas has been essentially completed.

A total of 6896 feet of diamond drilling has completed the preliminary exploration of the upper portion of Hobart Butte. The writer logged all the core and sampled it. He also designated sites for 130 test pits and sampled them. In addition he took 122 samples from preexisting exposures. With the help of D. L. Snyder, of the U. S. Bureau of Mines as rodman, a topographic map of the Butte was prepared. Surface geology and assays were posted on the map. During the latter half of the drilling the writer also located the drill holes by transit survey. Sections and maps were drawn up contemporaneously with the drilling, as the basis for suggesting additional drill hole locations.

During this field work microscopic studies were not attempted for lack of time. However, specimens of core were taken at an average of 8-foot intervals and were preserved for future reference. These should be valuable in laboratory investigations of structure and origin, but it would have been preferable to have kept a complete file of split core.

Location and Access

Hobart Butte is located in the Calapooya Mountains of southwestern Oregon about 16 miles south of Cottage Grove. The greater part of the area lies in southern Lane County although a small part extends into northern Douglas County. The base of the Butte is reached by driving approximately 13 miles from Cottage Grove over a hard-surfaced road of low gradient from there it is 3 miles along a narrow mountain road of perhaps 10% grade. Cottage Grove is on the Siskiyou line of the Southern Pacific Railroad, 144 miles from Portland, Oregon.

Topography, Vegetation and Climate

Hobart Butte is a prominent, elongate, topographic feature which rises more than 1500 feet from the valley of the Coast Fork of the Willamette River to a summit elevation of 2459 feet. Its summit area is narrow, extending about 1/2 mile in a northeast-southwest direction and terminating sharply in all directions. The sides of the Butte slope for the most part over 30° and are heavily timbered on the north side. The areas free from dense timber are covered either by a second growth timber or by heavy brush. This, in addition to a pervasive colluvial mantle, limits outcrops. Artificial cuts give the best exposures of the rocks.

The average annual total precipitation is over 50 inches, based on a comparison with figures for adjacent areas. Precipitation is mainly in the form of rain although snow occasionally accumulates to a depth of a foot or two.

History

According to Wilson and Treasher 2/ Robert Phillips discovered this clay deposit in 1930 while prospecting for cinnabar. Samples were submitted to Hewitt Wilson, of the University of Washington, and he proved them to be a high-grade, refractory clay. In the spring of 1933 the Willamina Clay Products Company obtained a lease on the property and later purchased it. A road was completed to the property and 12,000 to 15,000 tons have since been mined and shipped to the ceramics plant of the Willamina Company for use in the manufacture of refractory materials. In September, 1942 the Columbia Metals Corporation, of Seattle, Washington, secured a lease on the property with the object of using this clay as a source of alumina.

Previous Investigations and Acknowledgments

Wells and Waters 3/ in 1930 investigated the quicksilver deposits of the nearby Blackbutte and Elkhead mines and gave an excellent account of the regional geology. They briefly mention Hobart Butte. The first published reference to Hobart Butte as a clay deposit was made by Wilson and Treasher in 1938 in their survey of refractory clays for the State of Oregon. 2/ This paper included 6 chemical analyses showing total alumina from 38% to 40%. It was these analyses that led Robert L. Nichols, of the United States Geological Survey, to investigate Hobart Butte as a possible source of high-alumina clay in the summer of 1942. In the course of several weeks field work numerous testpits and surface samples were taken by Nichols and analyzed by the U. S. Bureau of Mines for available alumina. As a result Nichols recommended Hobart Butte in a report dated August 28, 1942, as a deposit of sufficient size and grade to warrant drilling by the U. S. Bureau of Mines. Subsequent to Nichols' examination the U. S. Bureau of Mines examined the deposits and their analyses appear in War Minerals Report No. 175. 4/ In January 1938 Hodge published a compendium on Northwest Clays which describes Hobart Butte 5/.

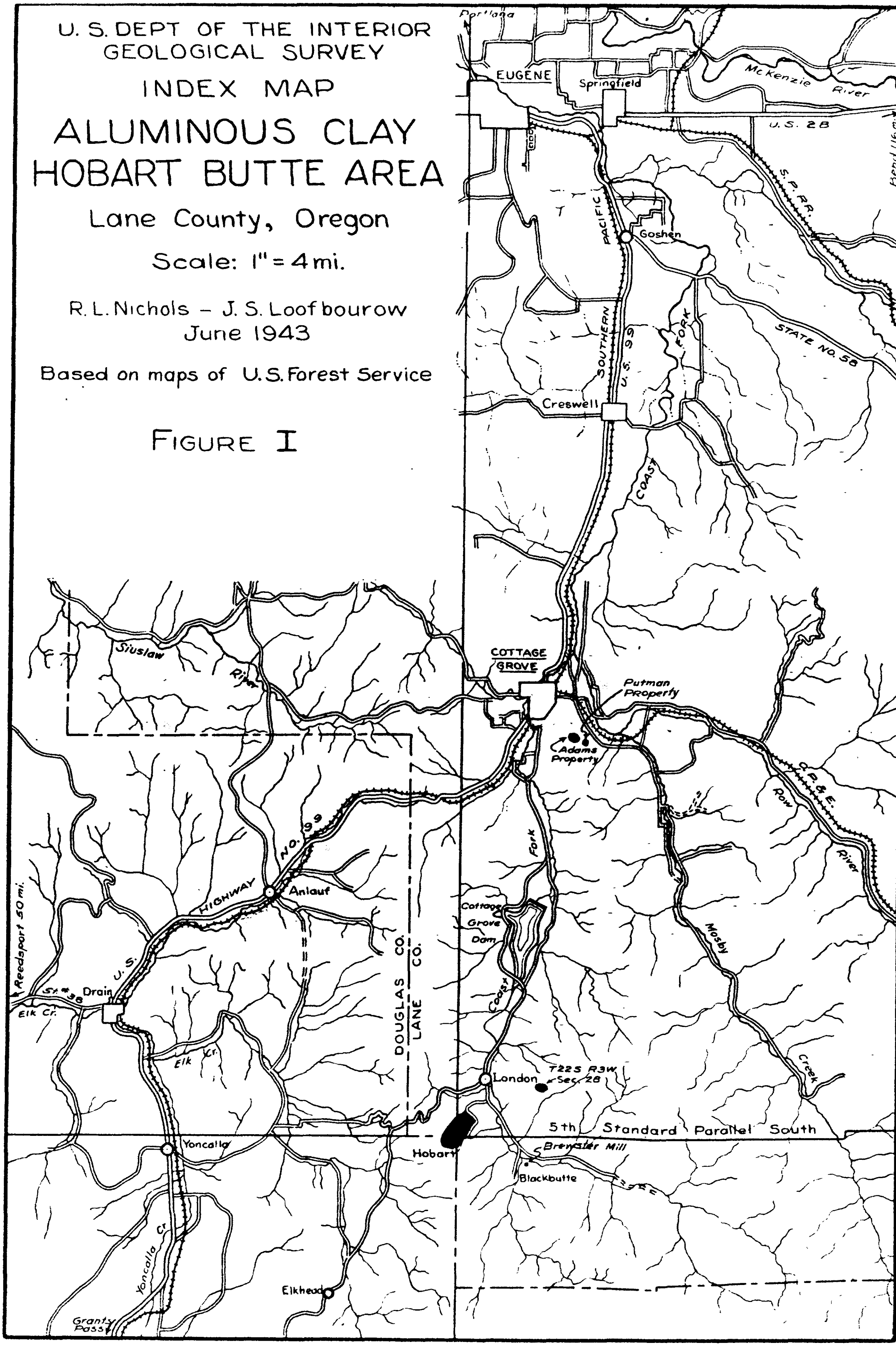
U. S. DEPT OF THE INTERIOR
GEOLOGICAL SURVEY
INDEX MAP
ALUMINOUS CLAY
HOBART BUTTE AREA
Lane County, Oregon
Scale: 1" = 4 mi.
R. L. Nichols – J. S. Loofbourow
June 1943
Based on maps of U.S. Forest Service
Portland
EUGENE
Springfield
McKenzie River
U.S. 28
Bend 116 mi.
S. P. R.R.
PACIFIC
Goshen
SOUTHERN
U.S. 99
FORK
STATE No. 58
Creswell
COAST
COTTAGE GROVE
Putman Property
Adams Property
Siuslaw River
C. R. & E.
Row River
HIGHWAY No. 99
Anlauf
Fork
Cottage Grove Dam
Mosby
Reedsport 50 mi.
U. S.
St. #38
Drain
Elk Cr.
DOUGLAS CO.
LANE CO.
Coast
Elk Cr.
London
T22S R3W Sec. 28
Creek
5th Standard Parallel South
Yoncalla
Hobart
Brewster Mill
Blackbutte
Yoncalla Cr.
Elkhead
Grants Pass

FIGURE I

Throughout the present investigation the writer has benefited by numerous field conferences with Robert L. Nichols under whose supervision the work was undertaken. He also gratefully acknowledges the help of Mr. Nichols and the Northwest Regional Office of the Geological Survey in the preparation of this report. The writer also wishes to express his appreciation to George H. Coughlin, Project Engineer of the U. S. Bureau of Mines, and H. G. Iverson, District Engineer of the U. S. Bureau of Mines, for their cooperation in having samples analyzed, in furnishing assay data, and in extending many courtesies. In particular, Mr. Coughlin is to be thanked for contributing the section on mining to be appended to this geological report. Thanks are also due D. L. Snyder, also of the Bureau of Mines, for his assistance as a rodman and also for his help on mineral identifications in the field.

BIBLIOGRAPHY

1/ Robert L. Nichols, U. S. Geological Survey, August 28, 1942
A Preliminary Report on Hobart Butte, Oregon

2/ Wilson, Hewitt and Treasher, R. C., Preliminary Report of Some of the Refractory Clays of Western Oregon, State of Oregon Dept. of Geol. and Mineral Industries, Bull. No. 6, pp. 68-75, 1938.

3/ Wells, F. G. and Waters, A. C., Quicksilver Deposits of Southwestern Oregon, USGS Bull. 850, pp. 26-35, 1934

4/ Clay, Hobart Butte, Lane County, Oregon
War Minerals Report No. 175, U. S. Dept. Interior, Bureau of Mines, March, 1943.

5/ Hodge, Edwin T., Market for Columbia River Hydroelectric Power Using Northwest Minerals. Section IV-Northwest Clays, Vol. IV, pp. 873-883, part 3, 1938.

GENERAL GEOLOGY

U. S. G. S. Bulletin 850 by Wells and Waters 3/ is the basis for this summary of the regional geology and Figure 2 is a reproduction of their geologic map.

Hobart Butte is in the upper Eocene Calapooya formation, which is composed primarily of volcanic material in the form of volcanic breccias, tuffs, conglomerates, lava flows, and mud flows. The rocks do not vary greatly in composition but they are strikingly dissimilar in appearance. This characteristic prevails throughout the formation, and even its individual members show marked local variations. In the vicinity of Hobart Butte these sedimentary rocks attain a total thickness of at least 3500 feet, with the top not exposed. East of Hobart Butte lavas predominate while west of the Butte tuff predominates. Fossil leaves date this formation. Wood and charcoal are also common.

Underlying the Calapooya formation, and separated by an angular unconformity, is the Umpqua formation which consists of a thick series of marine sandstones, shales, conglomerates, and interbedded basalt flows. A study of dips on the geologic map of Wells and Waters 2/ indicates an anticline to the northwest of Hobart Butte, and a syncline extending through Hobart Butte. The anticline is best developed in the lower Eocene Umpqua formation but it is also slightly developed in the upper Eocene Calapooya formation, which comprises the clay deposits of Hobart Butte. Faults that have been mapped in the Black Butte and other mining areas are normal, with a northeast strike and show displacements up to a few hundred feet. In the adjacent Black Butte and Elkhead mining district hydrothermal mineralization is characterized by cinnabar, realgar, and stibnite deposits in the Eocene rocks.

ORE DEPOSITS

General Features

At Hobart Butte the high-alumina clay occurrences have been divided into four areas. Ore bodies #1 and #2 are at the top of the Butte and are separated by a fault. Area #3 occurs below ore body #1 at the south end of the Butte and Area #4 crops out at the north end of the Butte below ore body #2. Ore bodies #1 and #2 have been sufficiently well defined by drilling and test-pitting to be classed as measured ore. The other areas are not sufficiently well-known to permit an estimation of reserves. Most of ore body #1 has no overburden. Ore body #2 has almost as much overburden as ore. All the high-alumina clay at Hobart has been found to occur at fairly well defined horizons, generally parallel with the bedding, and terminating against the hillside, or by lensing out, or faulting. In only a few cases does the ore body cross the bedding.

Lithologic Features

Nearly all the rocks on Hobart Butte contain appreciable amounts of available alumina but only a relatively small quantity of the rocks are of a high enough grade to merit economic interest. Most of the rock material is of volcanic origin that has been deposited as breccias, conglomerates, sandstones, shales or tuff. The relative amounts of fluvial and subaerial deposits have not been determined. There is no evidence of marine deposition. Bedding is generally obscure and only in a few drill holes is it well developed. Throughout the section fragments of carbonized wood are common and some logs were found up to a foot in diameter and several feet in length. Leaf imprints have been noted in several widely separated localities.

The rocks comprising ore bodies #1 and #2 are mainly gray, but in some places they are white, which may be a result of hydrothermal bleaching. Red and reddish purple beds are common in ore bodies #3 and #4, and these colors occur occasionally in the upper ore bodies. Surface alteration changes the gray beds to a yellowish tint but the red beds are apparently but little affected.

A conspicuous feature of some portions of ore body #1 are white rounded to angular, and often ovoid pellets of nearly pure kaolinite. They range from microscopic size to over 1/4" in diameter and occur in a gray argillaceous matrix. They often constitue as much as 75% of the rock and form high-grade areas. According to V. T. Allen* microscopic studies show that these pellets are made up of kaolinite that was soft at the time of deposition and was molded around grains of quartz and rock fragments. These are interpreted as being of sedimentary origin.

In the high-alumina rocks most of the grains can be easily scratched by a knife, often by the fingernail, but there are some fine-grained rock fragments of non-clayey material that are generally harder

*Commodity Geologist, High-alumina Clay, U. S. Geological Survey Personal Communication February 5, 1943.

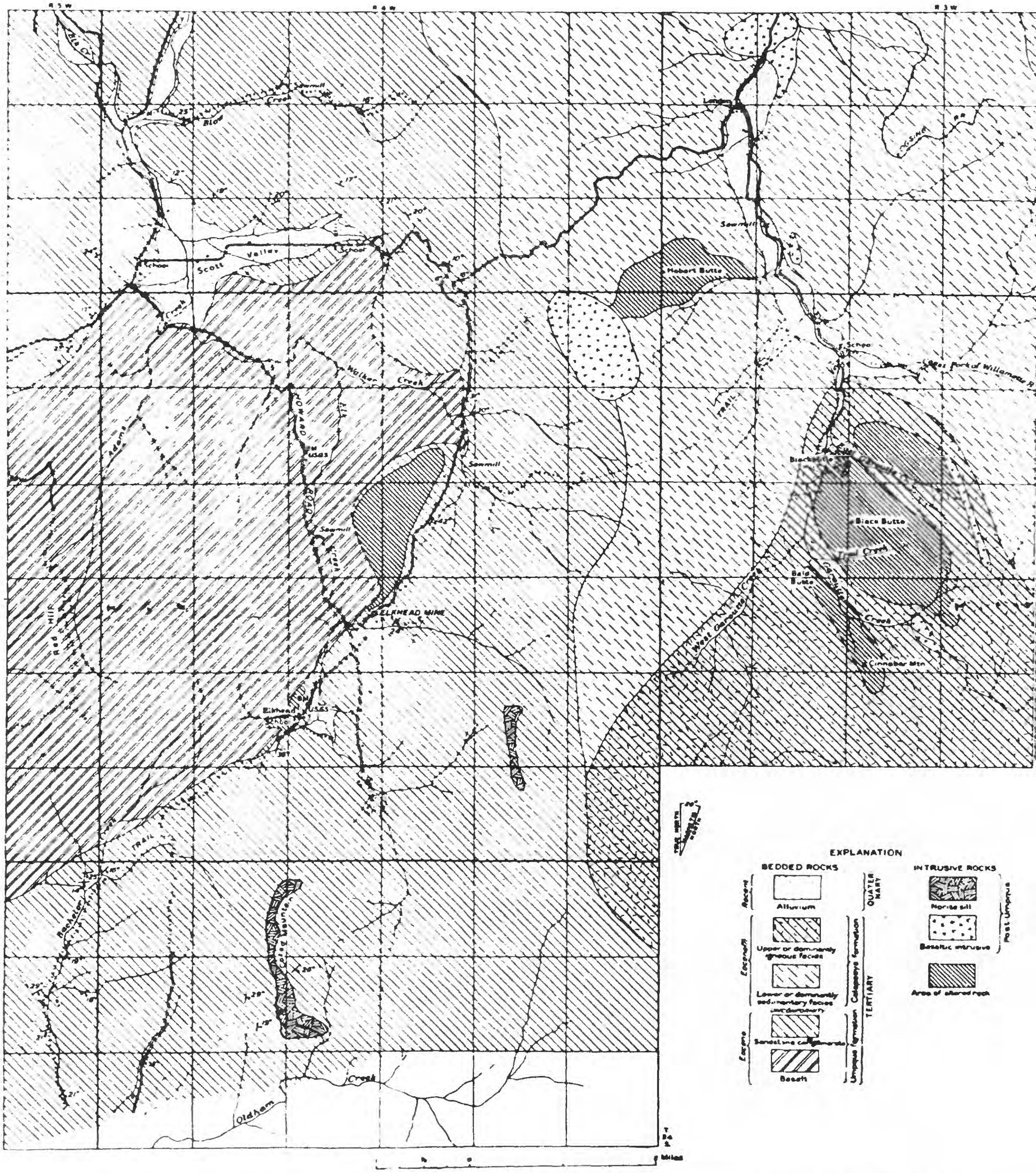

FIGURE 2 GEOLOGIC MAP OF HOBART BUTTE AREA. (FROM GEOL. SURVEY BULL. 850, PLATE 7.)

than steel or are quite difficult to scratch with it. Many of the rocks relatively low in alumina may be scratched by a knife but this is mainly the result of tearing apart of poorly cemented grains, and a definite grittiness usually results.

High-grade material nearly always exhibits a conchoidal fracture. This property is one of the most reliable guides. The fracture always breaks across all the grains to produce a smooth curved surface. The low-grade material breaks with an irregular, rough surface that has been developed by pulling apart of most of the grains.

The luster of the high-alumina rocks is commonly porcelainous. These features of hardness, fracture and luster, as described above, are found to apply not only to the gray and white beds but also to the red beds.

Mineralogy

Kaolinite ($Al_2O_3.2SiO_2.2H_2O$)

Kaolinite is the only clay mineral as yet described at Hobart Butte. This statement is based on the results of thermal analyses by Dr. Joseph A. Pask, of the University of Washington and the Northwest Experiment Station of the U. S. Bureau of Mines, and on petrographic examinations by Victor T. Allen, of the Geological Survey. This simplicity of mineralogy should facilitate the extraction of alumina from the clay.

Among the other minerals distributed throughout many of the beds at Hobart Butte are the hydrothermal sulphides. Most abundant are realgar and stibnite. These minerals commonly occur in close association with the high-alumina rocks. Realgar was nearly always found associated with rocks assaying more than 20% available alumina. In only about 5% of the occurrences was the grade of alumina less than 20%. The same is true of stibnite. These two minerals occur in very minor quantities, probably not more than a pound to the ton, but they volatilize readily, and the arsenic and antimony might be recovered at an early stage in the metallurgical process.

Realgar (As S) and Orpiment (AS_2S_3)

Realgar has two principal modes of occurrence: (1) as irregularly distributed flecks scattered through the host rock; and (2) as concentrations along fractures. In the latter case the mineral is often found coating over 90% of the fracture surface, and where there are slickensides the realgar gives emphasis to the grooved structure. In neither case does the mineral occur in concentrations sufficiently large to be of economic importance in itself. It is nearly always massive, but a few instances have been noted where it occurs as crystals in small cavities. Small amounts of orpiment were seen but it appears to be limited to near surface occurrences.

Stibnite

Stibnite is characteristically found scattered in the host rock. It is always crystalline, and is found either as clusters of radiating prismatic needles, or as groups of needles irregularly oriented. In some places isolated needles of stibnite are seen. As in the case of realgar, stibnite is sometimes found on fracture surfaces. Here the crystals are generally very fine and occur in random orientation. The longest stibnite needles are rarely over 1/8 inch in length. Several unidentified alteration products of stibnite were noted.

Pyrite (FeS_2) Arsenopyrite (FeAsS)

Pyrite and arsenopyrite are occasionally found associated with realgar and stibnite. These two minerals are often found together although their characteristically small size sometimes makes them difficult to differentiate. In many cases, however, they are found in sufficiently large crystals to be identified with certainty. They are commonly found distributed at random in the host rock, but occasionally are concentrated in veinlets.

There are probably several other sulphide minerals, both metallic and non-metallic, at Hobart Butte but they were not identified during this investigation. A. C. Waters * has recognized cinnabar (HgS) and calomel (HgCl) crystals.

Some minerals were found whose origin may be either hypogene or supergene:

Siderite ($FeCO_3$)

Siderite is a common mineral at Hobart Butte though small in quantity. It characteristically occurs in tiny, honey-colored globules but occasionally in small barrel-shape forms. These occur as disseminated grains or in clusters. Siderite is somewhat more common in the rocks of intermediate alumina content.

Calcite ($CaCO_3$)

Calcite is not often seen but in the core of hole #10 it was found filling interstices of the host rock. One vein nearly 1/4 inch in width was noted. The mineral was not found in any of the high-alumina rocks.

*Personal communication.

Several minerals were found of definite supergene origin:

Limonite ($2Fe_2O_3.3H_2O$)

Limonite occurs as ribs and stainings in nearly all of the rocks near the surface of the Butte. It is also common at considerable depth where it is thought surface waters have penetrated. Often, the rock is so profoundly oxidized and stained by limonite that it is difficult to determine the original nature of the specimen. In the oxidized areas casts were found of what were once radiating needles of stibnite. Also small globular-shaped limonite forms occur which probably were originally siderite or pyrite. Hematite (Fe_2O_3) has a similar occurrence but is rare.

Scorodite ($FeAsO_4.2H_2O$)

Scorodite was previously determined by Reynolds M. Denning, of Stanford University and confirmed by A. F. Rogers and A. C. Waters*. Scorodite is common in the clay quarry and appears as green noncrystaline crusts especially near crevices in the rock. A. F. Rogers and A. C. Waters also recognized pitticite ($FeAsSH_2O$) with the scorodite.

Structure

Hobart Butte is thought to be a faulted syncline. The evidence for the structural interpretations is not completely satisfactory as it depends on only one accurate dip reading on the surface; and a dozen others of questionable accuracy. In addition the drill core shows bedding in several dozen instances but the orientations are of course indefinite. However, the evidence does combine to form the picture presented on the nine accompanying cross-sections. These sections show the evidence for a gentle syncline pitching at a low angle to the northeast. The snycline is poorly exposed,especially as its northwest flank is mostly eroded. However, there does seem to be enough evidence to outline its trend as approximately north 65° east with a plunge of 5 or 10 degrees in that directions.

Near the northeast end of the Butte there is an abrupt change in the dip of the beds and in the location of the ore body. This is taken to indicate the presence of a fault though no evidence was directly observable on the surface. On the south side of the supposed fault the beds appear to form a gentle syncline pitching to the northeast, whereas on the north side of the fault the bedding appears to dip to the

*Personal communication March 28, 1943.

northwest as a homocline. Probably the fault strikes northwest and dips southwest on the basis of the drill hole data and a correlation of assay data on each side of it on the surface.

A great many of the diamond drill cores and much of the material in the test pits showed a considerable degree of slickensiding and fracturing. This could be the result of slight deformational movements or of volume changes by hydrothermal alteration.

Ore Body #1

Ore body No. 1 lies along the summit of Hobart Butte and extends from it southwest and northeastward to the cross fault. It is composed mainly of gray and white beds. It has been penetrated by 11 diamond drill holes, numbered 13, 18, 10, 25, 7, 17, 16, 3, 22, and 4. It is terminated in all directions by the hillsides except to the northeast where it may be faulted against low-grade rock and except to the west where the available alumina content is below 27%. The total outcrop length of ore body #1 is nearly 1600 feet and the average width of its base is over 500 feet. Its greatest stratigraphic thickness is at least 200 feet.

Ore Body #2

Ore body No. 2 lies to the northeast of ore body #1, extending from the cross fault to the northeast side of the Butte. It is lithologically similar to ore body #1, but correlation is not certain. It is terminated in all directions by the hillside except to the southwest where it is offset by the fault. It is covered by nearly an equal quantity of low-grade material forming a ratio of overburden to ore of nearly 1 to 1. Based on a 45° slope only a small peripheral area would have a mining ratio of less than 1 to 1. The ore body is about 80 feet in thickness and dips about 20° to the northwest. It has been prospected by 8 diamond drill holes numbered: 2, 1, 20, 8, 6, 23, 21 and 26.

Area #3

Area #3 lies under the southerly end of ore body #1 several hundred feet stratigraphically and topographically below ore body #1. It has a maximum thickness of about 100 feet and is composed mainly of red beds. It has been prospected by 4 diamond drill holes numbered: 11, 14, 12 and 19, for which all assay returns have not yet been received.

Area #4

Area #4 lies to the northeast of ore body #2 and several hundred feet lower both stratigraphically and topographically. It is composed of varicolored beds. Under the renewed exploration program this area will be prospected by some 3000 feet of drilling.

Origin

The problem relating to the origin of the kaolinite must of necessity be treated in a perfunctory manner because time has not been available during this field work to study the rocks microscopically. Four principal hypotheses have been considered: first, the clay is a result of residual weathering in situ; second, the deposit consists of transported clays; third, the clay is the result of hydrothermal alteration of sedimentary rocks in situ; fourth, the deposit consists of both transported and hydrothermal clay.

Recent drilling suggests that the theory of residual weathering is unsatisfactory, for the clay is too thick and no profile of weathering is apparent, neither conformable with the present topography nor with any pre-existing topography.

That the kaolinite is of sedimentary origin is favored by the petrographic studies of V. T. Allen, who states that flattened pellets of kaolinite, which are common in certain ore beds, are originally sedimentary structures. Moreover, if the pellets were originally kaolinite some of the matrix must also have been originally kaolinite. Similar pellets occur in the clays at Castle Rock, Washington and in the Mississippi Valley, and in both cases they are considered as being of sedimentary origin.

That some of the kaolinite is of hydrothermal origin is suggested by the occurrence of the hydrothermal sulphide minerals, chiefly realgar and stibnite. Not only do these sulphides occur in general association with the ore, but it can be said that in many cases the quantity of realgar or stibnite. Exceptions have been noted in the section on mineralogy, but it would not be unusual to have erratic deposition from hydrothermal solutions. Another point in favor of a hydrothermal origin of some of the kaolinite is that on sections D-D' and E-E' the ore body is shown to cross the bedding at a sharp angle.

In view of apparently valid arguments in favor of both the sedimentary and hydrothermal origin for the clay mineral at Hobart Butte, this field investigation can only conclude that both may have been operative and suggest that at some convenient time detailed microscopic and field studies be made in an attempt to decide the relative effect of the two processes.

RESERVES

Method of calculation

The methods used are not detailed because the deposit is in general uniform and because this is only a preliminary field estimate. Also, by definition, measured ore permits a maximum error of 20%, and these estimates are believed to be within this limit.

For calculating tonnages the ore bodies were divided into easily measurable geometric shapes, which were calculated and added to obtain a total volume figure. This was divided by 14.5, the number of cubic feet per ton of crude ore, based on specific gravity determinations by the U. S. Bureau of Mines. From within the ore bodies 39 specific gravity samples of drill core were found to have an average density of 2.2 and the maximum variation was only 14%. These figures apply to natural rock. The Bureau's moisture determination on 32 sample from within the ore bodies indicate an average of 3% H_2O. These also were drill core samples and hence are subject to some question, but no important discrepancy is expected.

Average grades were obtained from U. S. Bureau of Mines' assays by using a cut-off of 27% available Al_2O_3 as a minimum, with available Fe_2O_3 unrestricted. The ore interval in each hole was averaged and then the holes in each ore body were combined to reach the average grade of the deposit. The holes were not weighted by their area of influence because the grades are so uniform. The maximum deviation from the average was only 14%. The distance between holes ranges from 200 to 500 feet, but again the uniform grade is the compensating factor.

The District Engineer of the U. S. Bureau of Mines used different shapes in preliminary measurements of the deposit but the results are in substantial agreement with the figures in this report. The differences are expected to be well within the 20% error permitted in the definition of measured ore.

Ore Body #1

Ore body #1 is described in general on page 14. It is thought to have been drilled sufficiently well to be considered as measured ore. A total of approximately 137,800,000 cu. ft. was calculated. On a basis of 14.5 cu. ft. to the ton there should be approximately 9,500,000 wet tons, or slightly over 9,200,000 tons of dry ore. Of this amount at least 6,500,000 tons could be mined without stripping any overburden. Another 1,500,000 tons might have a ratio of overburden to ore of less than 1 to 1. The remaining tonnage has a ratio greater than 1 to 1. The average grades in 11 drill holes range from 27.8% to 34.1% available alumina. The average grade is 29.9% available Al_2O_3 and 3.0% available Fe_2O_3.

Ore Body #2

Ore body #2 has also been drilled sufficiently to be considered as measured ore. The average grades in 8 holes range from 27.1% to 32.2% available Al_2O_3. The average grade is 29.3% available Al_2O_3 and 3.6% available Fe_2O_3. The greatest extreme in grade is only 10% from the average. The total volume has been calculated as approximately 42,000,000 cu. ft. On a basis of 14.5 cu. ft. to the ton this would equal approximately 2,750,000 wet tons or 2,700,000 dry tons roughly. The maximum thickness of overburden is about 100 ft. and the total tonnage of overburden is nearly equal to the tonnage of ore. On the north side of the Butte some ore is available at less than a 1 to 1 stripping ratio but it amounts to only a few hundred thousand tons.

Area #3

Area #3 has not been calculated as assay data are not complete. However, it can be said tentatively that the drilling may indicate about 2,500,000 tons averaging 25% available Al_2O_3 and 10% available Fe_2O_3 with a large amount of overburden. The high iron content also makes this area of secondary interest at present, but overburden may be excessive.

Area #4

Area #4 has not been drilled but on the basis of a few surface assays available and a knowledge of the geology, it can be inferred that the proposed drilling program would define several million tons averaging greater than 27% available alumina.

Other Areas

On the basis of present exposure no additional ore bodies are apparent on Hobart Butte. However, it is intended to make a geologic reconnaissance of the region in the hope of finding other deposits similar to Hobart Butte. The most promising area is the group of hills lying east of the Cottage Grove Dam extending from Cottage Grove to London (figure 1) and possibly the area of altered rocks surrounding the Elkhead mine (figure 1 and figure 2). The Blackbutte quicksilver mine appears unfavorable as only 4 out of 29 samples showed more than 27% available alumina, and no particular part of the mine looked promising as a possible location for future development (figures 1 and 2).

CONCLUSIONS AND RECOMMENDATIONS

The Hobart Butte clay deposit is being considered as a source of alumina under the War Minerals Program. The points in favor of this deposit are:

1. A total of 10,700,000 dry tons averaging 29% available Al_2O_3 and 3% available Fe_2O_3 with a maximum ratio of overburden to ore of 1 to 1.

2. 6,500,000 dry tons of the above grade with no overburden.

3. The moisture content of the crude ore is only 3%.

4. The available Fe_2O_3 content is only 3%.

5. The grade in the various drill holes deviates from the average grade of the ore bodies by a maximum of 14%.

6. Kaolinite is practically the only clay mineral which should make the extraction of alumina comparatively simple.

7. The rock is non-plastic and homogenous. It should be easy to mine in wet weather and should have uniform grinding properties.

8. The topographic relief is adequate to obviate any problem of draining an open pit mine.

The points against the Hobart Butte clay deposit as a source of alumina are:

1. Transportation. It is 14 miles from the nearest railroad station at Cottage Grove which is 144 miles by rail from Portland.

2. It is dubious that high-grade reserves can be increased substantially.

3. The rock is hard enough so that some blasting will be necessary.

When the present drilling program is completed, it is recommended that there be no further intensive drilling at Hobart until it becomes known definitely that Hobart clay can be used successfully as a source of alumina. Meanwhile, geologic efforts and possibly reconnaissance drilling should be continued to locate other similar clay deposits in the surrounding area.

Respectfully submitted,

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Field Geologist
High-Alumina Clay

Cottage Grove, Oregon
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