

Oregon corporation; capitalization 100 shares common, no par value and 1000 shares preferred, \$100 par value; Officers, E.R. Marshall, 504 Rowan Building, Los Angeles, California, Pres.; Joseph McKeown, American Building, Marshfield, Oregon, Sec. Treas.

Property: Lease and option on 159.77 acres known as the George Seik Donation Land Claims, 5 miles north of Bandon and lease on surveyed land known as the Pacific Placer Claims of 155 acres located two miles north of Bandon. Only experimental and sampling work is being done (1937 report to corporation commissioner)

*no more information*

PIONEER (LARGE) BLACK SAND MINES

Beach Area

Consists of 100 acres at the head of "The Lagoons" six miles north of Bandon in sec. 33, T. 27 S., R. 14 W. It is an elevated ancient beach about 170 ft. above sea level.

"This property adjoins the Eagle to the south, and comprises one patented claim of 19.56 acres, reported to have been patented in 1872. The claim was located in 1866 by A.H. Hinch and John Dane, and later sold to Simon Lane, who worked the mine actively until the middle 70's, when it was closed. Some years later the claim was sold to Capt. Smith & Son, of San Francisco, the present owners, but no attempt has been made to work it. At the time of the author's visit, C.W. Smith, one of the owners, was on the ground for the purpose of interesting men in the property.

"The workings are in the same deposit as the Eagle mine, and the methods of mining and treatment were similar to those used at the Eagle.

Ref.: Hornor, 18:21 (quoted)

PIONEER (LANE) BLACK SAND MINES (continued)

"At the time of examination the mine was being operated with sluice boxes suitable for the small head of water then available, and a drag-line scraper was being used to remove 15 or 20 feet of overburden consisting of gray sand.

"The pay streak is a layer of black sand 3 feet or more thick, the richer part of which was mined through drifts said to have been made more than 60 years ago. Some of the mining timbers as well as an occasional huge log of drift wood are exposed by the present workings. Samples of the black sand remaining averaged about 3 percent of magnetite and 55 percent of chromite and ilmenite together. Gold and platinum alloy were being recovered by sluicing. A sample of the platinum alloy as determined by a spectrographic examination by George Steiger in the laboratory of the United States Geological Survey is composed of a relatively very large amount of platinum and smaller amounts of iridium and ruthenium. It contains in addition a possible trace of rhodium but no osmium or palladium.

"Most of the black-sand tailings resulting from former operations at the Pioneer mine were washed down Cut Creek until they reached a ponded area near the sea known as the Lagoons, where they have formed a deposit several acres in extent. A sample from a hole 3 feet deep at one place contained 4 percent of magnetite and 60 percent of chromite and ilmenite. It is said that the tailings in the Lagoons contain unrecovered gold and platinum, and in July 1931 a machine designed to test the deposit for these metals was being installed. The result was not learned.

Ref.: Pardee, 34:38 (quoted)

*(See file for Tacoma Co. operations (1931))*

## BLACK SANDS OF THE SOUTHERN OREGON COAST

Introduction

Concentrations of black sands on ancient marine terraces and on the present beaches occur along the Oregon coast. Those from Coos Bay southward to Port Orford consist primarily of the mineral chromite. In addition, these chromiferous sands contain garnet, magnetite, ilmenite, zircon, rutile, quartz, olivine, pyroxene, epidote, and metallic gold and platinum.

From time to time, over the past 100 years, attempts have been made to successfully extract values from these sands. At present, they are not being worked. There is a multitude of information available on these sand deposits. Some of it has been reviewed with the purpose of determining if, at present, mining and beneficiation of these sands are economically feasible.

History

From the 1850's until 1940, there were sporadic placer operations for gold and platinum on these black sand deposits. Some of it was by drift mining.

Due to the critical chrome situation that the United States found itself in at the start of World War II, efforts were made to develop domestic production. In line with this, the Metals Reserve Company, a government agency, issued contracts to Humphreys Gold Corporation and the Krome Corporation to supply rough chrome concentrates made from these sands. Both contracts were cancelled after plants built by these companies had operated seven months in 1943. As of December 1943, when these operations terminated, the offshore supply of chrome to the United States had materially improved, particularly in regard to Turkish chrome, by the opening of the Mediterranean again to Allied shipping. During this seven month period, Humphreys produced 42,400 long tons of rough concentrate averaging 25%  $\text{Cr}_2\text{O}_3$  from 110,000 long tons of sand averaging 9%  $\text{Cr}_2\text{O}_3$ , and the Krome Corporation produced 36,000 long tons of rough concentrate averaging 24%  $\text{Cr}_2\text{O}_3$  from 233,000 long tons of sand averaging 5.4%  $\text{Cr}_2\text{O}_3$ .

These rough concentrates were delivered to the Defense Plant Corporation's secondary concentrator located at Beaver Hill Station on the Southern Pacific Railroad. These 30,000 tons of Krome Corporation's concentrates and 1700 tons of the Humphreys concentrates were upgraded to 10,635 long tons of chromite averaging 39.4%  $\text{Cr}_2\text{O}_3$  with a Cr/Fe ratio of 1.5 to 1, and 2100 long tons of zircon concentrates were produced averaging 27%  $\text{ZrO}_2$ . The remaining 46,500 long tons of rough concentrates were stockpiled. The reconcentrating plant was shut down by the end of 1943 and later dismantled.

The untreated stockpile remained until 1954 when Chromium Mining and Smelting Corporation, through its subsidiary, Pacific Northwest Alloys, Inc. of Spokane, Washington, contracted with the General Services Administration to dispose of the stockpile.

Pacific Northwest Alloys built an upgrading plant to beneficiate the stockpile by high tension and magnetic dry processing. This plant, constructed at an overall cost of \$300,000, went into operation in April 1955 and completed work on the stockpile in August 1956. In all, 65,000 long tons were treated at the rate of 175 tons per day, from which 80 or 90 long tons per day of chromite, assaying 42-43% Cr<sub>2</sub>O<sub>3</sub> with a Cr/Fe ratio of 1.5 to 1, were produced. In addition to the chromite concentrate, other products produced and marketed were zircon concentrate of 66% ZrO<sub>2</sub>, a garnet fraction, and a magnetite and ilmenite fraction. The chrome concentrate was shipped to the Pacific Northwest Alloys works at Spokane for processing to ferroalloys.

Plans were made to continue the operation after the exhaustion of the stockpile, and to this end, deposits were acquired and explored and mine plant engineered. Unforeseen circumstances forced Chromium Mining & Smelting Company to abandon these further plans and the plant was shut down and dismantled.

### Deposits

Along the southern Oregon coast there are at least three ancient marine terraces besides the present beaches that contain black sand concentrations. A review of the available information leads to the conclusion that the deposits found on the Seven Devils Terrace at an elevation of 300-350 feet, in T. 26 and 27 S., R. 14 W.W.M. southwest of Coos Bay, present the most favorable for mining. It was on this terrace that the Krome Corporation mined. While the chrome content of the Humphreys material was higher, it came from reworking tailings from gold operations on the next lower terrace, the Pioneer, and it is not believed that sufficient tonnage now remains in these tailings to support a long term mining operation.

There are three deposits that have been extensively drilled on the Seven Devils Terrace. Analysis of the drilling indicates the following:

<u>Location</u>	<u>Tonnage in Long Tons</u>	<u>Thickness</u>	<u>% Cr<sub>2</sub>O<sub>3</sub></u>	<u>Overburden Thickness</u>
Sec. 33 T. 26 S., R. 14 W.	1,600,000	12.5 ft.	5 %	5.5 ft.
Sec. 4 T. 27 S., R. 14 W.	260,000	3.6 ft.	6.6 %	3.8 ft.
Sec. 10 T. 27 S., R. 14 W. (North)	840,000	14.3 ft.	6.7 %	35.0 ft.
(South)	750,000	20.3 ft.	5.8 %	16.0 ft.

From this it is assumed that there are 3,500,000 long tons, averaging 6% Cr<sub>2</sub>O<sub>3</sub> with an overburden to sand ratio of 1 to 1.

Known black sand occurrences, but unproven, in sections 3, 4, 9, 10 and 15, T. 27 S., R. 14 W.W.M. if explored, would probably double the tonnage figure. Reference is called to the attached sketch of property ownership which also shows the location of these deposits.

#### Property ownership

A search of the Coos County records shows that all of the land on which the deposits listed above occur is deeded. The key tract of approximately 1500 acres: Wm. Mark Muchow as trustee for the United States Chromium, Inc. and for Strategic Metals Corporation. In 1943, this tract included the mining area of the Kross Corporation, and was leased from Muchow. Later, in 1955, Murphy-Oregon, Inc. leased the land from Muchow. Apparently Murphy-Oregon, Inc. were working in connection with further operations by Pacific Northwest Alloys. The terms of the lease are not on the record in Coos County, but were set forth in a separate document. It is not believed that this lease is now in effect.

Most of the other tracts covering these deposits were also acquired in 1955 by Murphy-Oregon, Inc. Some were on a straight royalty with modest monthly minimum payments, and others were options to purchase. Typical of the terms were \$50.00 per month minimum payment, with 7½% of the precious metals recovered and 25 cents per long dry ton for each of the other metals or minerals recovered. It is also believed that Murphy-Oregon has abandoned all of these leases and options.

#### Proposed Black Sand Recovery Operations

In order to determine the economic feasibility of working these black sands, the following suggested method is proposed.

- (1) Stripping by tractor and carry-all.
- (2) Mining 900 tons per day for 300 days per year of black sands either by a dipper shovel or front-end loader.
- (3) Making a rough concentrate at the mine site by hydraulic concentration either by the use of Humphreys spirals, or jigs. Rougher concentrate would average 24% Cr<sub>2</sub>O<sub>3</sub> with 80% recovery, so that five long tons of bank run 6% Cr<sub>2</sub>O<sub>3</sub> sand would make one long ton of rough concentrate.
- (4) Trucking rough concentrate to a finishing concentrator site on deep water and rail in Coos Bay area.
- (5) Treating 180 tons of rough concentrates per day by high tension and magnetic dry processing.

Products Made by Proposed Operation

In a 300 day operation, the following tonnage and assumed sales value products would be produced:

	<u>Total Value</u>
(1) 27,000 long tons of 43% Cr <sub>2</sub> O <sub>3</sub> chromite @ \$20/long dry ton .	\$ 540,000
(2) 2,160 long tons of 66% ZrO <sub>2</sub> zircon @ \$50/long dry ton . . .	108,000
(3) 9,180 tons of magnetite and ilmenite @ \$10/ton . . . . .	91,800
(4) 7,560 tons of garnet @ \$20/ton . . . . .	151,200
(5) 648 tons of rutile, 96% TiO <sub>2</sub> @ \$100/ton . . . . .	64,800
(6) Gold and platinum valued at 10¢/long ton in place . . . . .	27,000

The total gross value of the recovered products per year amounts to \$982,800, or \$3.64 per long ton of black sand.

Schedule of Operating Costs and Earnings

	<u>Per long ton of black sand in place</u>
Direct Costs:	
Stripping	25¢/yard .16
Mining	25¢/yard .16
Hydraulic separation	10¢/yard .07
Haul of rough conc.	
15 mi. @ 7¢/long ton mile	.21
High tension separation @ \$3.50/long ton of feed	.70
Total Direct Cost	<u>\$ 1.30</u>

Yearly Balance Sheet

Gross sale of products	\$ 982,800
Direct costs, 270,000 x \$1.30	\$ 351,000
Royalties	27,000
Administration and Sales	50,000
Property Taxes	13,000
Depreciation	20,000
Depletion (15% of first marketable prod.)	<u>147,000</u>
Total Costs	<u>608,000</u>
Profit before Taxes	375,000
Federal Income Taxes	187,000
State Excise Taxes	<u>22,500</u>
Net Profit After Taxes	\$ 165,500

### Capital Outlay Requirements

Exclusive of land purchases of mineral deposits, it is believed that \$500,000 would provide necessary capital requirements. The high tension and dry magnetic concentrator would be a duplicate of the plant built by Pacific Northwest Alloys at a total cost of \$300,000. The balance would be required for mine and primary concentrating equipment. Trucking and perhaps stripping would be contracted.

### Markets

Chrome: Considerable tonnages of like grade chrome are imported each year from Africa. The present price is \$19 to \$20 per long ton at Atlantic ports. Much of it finds a market in the production of high carbon, low chromium (50%) ferroalloy.

Ferrochrome is produced in the Pacific Northwest. The sources of chromite for this Northwest production are probably foreign. Pacific Northwest Alloys is using the chrome concentrate that was produced from the Beaver Hill stockpile in 1955-56, reported no apparent operational difficulties were noted. Dr. Perry Weston of that company is quoted as saying that these concentrates are usable sources of chromium, but that they cost 30 percent more than comparable low grade foreign ores. How Dr. Weston arrives at the cost figure is not known. The operating costs of the Beaver Hill plant were \$7.00 per long ton of chromite concentrate produced. If the plant cost of \$300,000 is charged against the operating period of a few months more than a year, there would be a capital outlay cost of \$10 per ton, plus what was paid for the rough concentrate in the stockpile. It appears doubtful if any foreign chromes can now be obtained by Pacific Northwest Alloys' Spokane plant for less than \$20 per long ton, plus freight from Atlantic ports. This should make Coos Bay chrome concentrates at \$20 per long ton at plant competitive in the Pacific Northwest.

One further observation as to potential markets: apparently the processing to ferrochrome has one factor in common with the aluminum industry in that the electrical energy used is a major cost item. It appears that a ferrochrome plant at Coos Bay, based on concentrates from these sands, low cost Northwest power, and offshore shipping to the markets of the world has distinct possibilities.

Zircon: The present quoted price for zircon sands (65% ZrO<sub>2</sub>) at Atlantic ports is \$50 per long ton. In the past few years, Wah Chang Corporation has built one of the major zircon reduction works in the United States in western Oregon.

Garnet: Pacific Northwest Alloys reported that they were able to dispose of the garnet fraction from their Beaver Hill operation at Pacific Coast centers for sand blasting and abrasive use. The assigned value of \$20 per ton for garnet sands is a conservative one. There is some question as to the size range of the garnet in that it is finer than what is normally used for sand blast material. Some fine garnet sizes bring a premium. The

U. S. Navy at San Diego has recently paid in excess of \$100 per ton for fine sizes, but their requirements of these sizes are limited to a few hundred tons per year. It has yet to be determined if 7500 tons of fine sized garnet can be marketed.

Magnetite and Ilmenite: A combination of these sands was marketed by the Beaver Hill operation to the roofing paper manufacturers. They could also be used as weighting sand and in heavy media separations. A figure of \$10 per ton for these sands is considered to be conservative.

Rutile: While no rutile fraction was produced at the Beaver Hill operation it is reported that test work indicated a high grade rutile concentrate could be produced. Information available indicates that the rutile fraction of the black sands in place averages 0.30%. The quoted price for 95% concentrates is \$100 per ton.

Gold and Platinum: The metallic gold and platinum content of these black sands is very erratic. A number of years ago, the writer recovered by amalgamation the equivalent of \$2.60 and \$0.90 per ton in gold from two samples of approximately 100 pounds each from black sands at the Pioneer Mine on the Pioneer Terrace. The amount of platinum present was estimated at 10% of that of the gold by weight. For purposes of this estimate, a figure of 10 cents per ton of sand in place is taken for the combined recoverable value of gold and platinum.

Portland, Oregon  
November 28, 1960

Leslie C. Richards  
Mining Engineer

List of references attached



REFERENCES

- "Beach Placers of the Oregon Coast", J. D. Pardee, U.S. Geological Survey Circular 8, 1934.
- "Origin of the Black Sands of the Coast of Southwest Oregon", W.H. Twenhofel, Oregon Dept. of Geology & Mineral Industries, Bulletin 24, 1943.
- "Chromite-Bearing Sands of the Southern Part of the Coast of Oregon", Allan B. Griggs, U.S. Geological Survey Bulletin 945-E, 1945.
- "Chromite Sand Deposits in the Coos Bay Area, Coos County, Oregon", Robert J. Hundhausen, U.S. Bureau of Mines, R.I. 4001, 1947.
- "Beneficiation of Southwest Oregon Beach Sands by High Tension and Magnetic Dry Processing", J. F. Hunt, Pacific Northwest Metals and Minerals Conference, A.I.M.E., 1960.
- Personal report by L.C. Richards on the Pioneer Mine, Coos County, Oregon, 1950.
- Records of Coos County Assessor and Clerk.

MAY 2 1940  
STATE DEPT OF GEOLOGY  
& MINERAL INDS.

Mrs. Agnes R. Sengstacken, O'Connell Apts. # 1., Marshfield, Oregon.

Request for inspection of BLACK SANDS and RADIUM.

Mrs. Sengstacken owns land in secs. 18, 19, 20, 29, 30, T. 26 S., R. 13 W., and secs. 24, 25, T. 26 S., R. 14 W. near the ocean, a total of 1871 acres. The attached sheets show the location of her property, and the portions on which she thinks she has black sand of value.

None of the ~~sand~~ sand deposits are opened. A number of years ago, a man did some drilling on some of the land, and took a quantity of samples. She will write to him to see if some clues can be gotten as to the quality of the sand. There was little I could do or offer for this inspection. I felt that I was not justified in going out to do pick and shovel work to open these deposits, at the present time, particularly as I have been advised by Mr. Deemy that the Governor is going to make a special appropriation for a blank sand survey. So I am turning this information over to the Portland office, so that this "survey" will have the information when they begin work.

She was unable to accompany me to the property. It is in the "Seven Devils" area, and the Seven Devils road is the one the local residents name when they want to give someone the horrors. Further, it has been raining with great gusto, and knowing the inability of the state jalopy to pull the hat off one's head, I decided that discretion was the better part of the investigation.

Mrs. Sengstacken is also bothered by a radium complex. Unfortunately she does not know the spot from which this material came, but I had her permission to search her 1871 acres to find the radium-bearing-ore. I countered with the suggestion as how to test radio-active materials, by the use of an unexposed photographic plate and suggested that when her tenant could find the locality that they could perform the test as well as we. Needless to say, I was not quite this blunt (believe it or not), but this is the general gist of what I had to offer.

Ray C. Treasher,  
April 30, 1940.

(Reported in Catalogue)



# MINERAL INDUSTRY SURVEYS

U. S. DEPARTMENT OF THE INTERIOR  
BUREAU OF MINES  
WASHINGTON, D. C. 20240



Fred J. Russell, Acting Secretary

Elburt F. Osborn, Director

For information call Robert G. Clarke  
Telephone: (703) 557-0605

Annual, Preliminary

## ZIRCONIUM AND HAFNIUM IN 1970

Zircon output from beach sand mining operations in Florida and Georgia decreased over ten percent in both quantity and value according to the Bureau of Mines, U. S. Department of the Interior.

Through October, general imports were as follows: Zircon, 83,500 short tons; zirconium, unwrought, other than alloys, and waste and scrap, 201,000 pounds; zirconium, wrought, 12,500 pounds; zirconium, unwrought alloys, 35,400 pounds; zirconium oxide, 129,000 pounds; other zirconium compounds, 1,540,000 pounds. Total value of metals and alloys was \$1.0 million; that of oxides and other compounds, \$450,000. Imports of unwrought hafnium and waste and scrap totaled 42 pounds valued at \$4,179.

Also through October, exports included: Unwrought zirconium, its alloys, waste and scrap, 187,793 pounds; and wrought zirconium and its alloys, 298,883 pounds. Total value of metal and alloys was \$5.2 million.

Zircon was used largely in foundry sands, but it was also used for making refractories, abrasives, ceramics, and zirconium and hafnium metals and their alloys and compounds. The main use for zirconium and hafnium metals and alloys was in nuclear reactors, but some industrial applications were for corrosion resistance in chemical plants.

On June 30, 1970, the national stockpile contained 16,514 tons of baddeleyite containing 11,162 tons of zirconium dioxide, and 1,720 tons of other zirconium bearing material, containing 398 tons of zirconium dioxide.

COPVILLE DR  
Zircon

EXTRACT FROM REPORT OF  
BLACK SAND (ZIRCON) DEPOSITS  
OF THE WEST COAST OF THE UNITED STATES

by  
J. H. Morley  
December 16, 1944

Sample "A" - Zircon Concentrates.

A pile of dirty zircon concentrates was stored back of the office on boards laid directly on the ground. A sample was taken from various points on the pile which was measured and found to be roughly, 20 feet wide by 12 feet deep by 50 feet long, and represented approximately 900 tons.

The sample ran 41.10%  $ZrO_2$ .

On examination under the microscope there were considerable black opaque grains which were probably low iron chromite, several silicates other than zircon were noted, perhaps garnet and epidote. The zircon grains were coated or stained with iron oxide, thereby colored yellow, rather than clear white.

We ran this sample over our magnetic separator, and found 3% magnetics. The non-magnetic fraction was then leached in 1:1 hydrochloric acid, and we found a further loss of approximately 3%. This acid wash cleaned up the zircon grains.

Sample "B" - Ilmenite-Magnetite Concentrate.

This pile represented approximately 60 tons, and it was said to be the only product which had been shipped away from the plant. It had been used as the sand aggregate in a concrete mix to be placed in the keels of Liberty Ships, in order to lower the center of gravity, raised by placing armament on their top sides.

Sample "C" - Finished Chromite Concentrates.

This was a large pile and represented the entire production of the plant. It was approximately 40 feet wide by 20 feet deep by 150 feet long, containing some 9,000 tons. The sample was taken all over the top and sides, and gave the following results:

41.26  $Cr_2O_3$

Under the glass this concentrate shows considerable garnet, with some zircon and epidote.



Sample "D" - Krome Corporation Concentrates.

Back of the mill, and stock-piled on the ground there, was a large pile of Krome Corporation's concentrates, measuring some 40 feet wide by 40 feet deep by 150 feet long, containing approximately 18,000 tons. These concentrates said to contain at least 25% chromite, had all come from the Krome plant, situated about 9.7 miles distant. These concentrates were feed to the Defense Plant which in its short existence, had worked only on these concentrates. Hence, the above products had all come from the Krome Plant, or the second marine terrace.

The sample as taken, ran 6.14% ZrO<sub>2</sub>.

The zircon from Krome Corporation shows iron oxide stain on the grains. This is more pronounced than the zircon from the Lagoons where Humphreys Brothers operated, and which was washed down from the first marine terrace.

This sample was run over our magnetic separator, and gave the following results:

Magnetic	78.70%
Non-magnetic	21.30

The non-magnetic fraction, showing stained zircon grains, was leached with 1:1 Hydrochloric acid and lost 6.0% by weight. The yellow stained grains came out clear and bright. An analysis of this product seems erroneous, but Ledoux found:

ZrO <sub>2</sub>	17.64%
Cr <sub>2</sub> O <sub>3</sub>	0.96%
Iron	4.70%

Sample "E" - Humphreys Concentrates from the Lagoons.

Back of the mill, and up against the pile of Krome Corporation concentrates, there was a pile of concentrates running 25% chromite or better, from the Humphreys Brothers plant which treated sands washed down from the old Pioneer Mine located on the first marine terrace. It was said that none of these concentrates had been milled by the Defense Plant Corporation's mill. This pile was about 75 feet wide by 48 feet deep by 180 feet long, and contained approximately 48,600 tons. A sample taken from all over the pile and well mixed, ran:

3.92% ZrO<sub>2</sub>

The zircon contents of these concentrates were clear and bright. They did not show as much iron stain as the second marine terrace material. There were several different shades of garnet, chromite, olivine, and sand present in the sample. At the Lagoons there were some 1400 tons

additional of these concentrates, which were ready, but never delivered to the Defense Plant. So in all, there are some 50,000 tons of these concentrates.

Samples "E" and "I" ("I" representing 1400 tons at the Lagoons) were joined and run over our magnetic separator, with the following results:

Magnetic	94.0%
Non-magnetic	6.0%

Without leaching in Hydrochloric acid, the non-magnetic fraction was sent to Ledoux, with the following results which appear to me to be perhaps low:

ZrO <sub>2</sub>	24.64%
Cr <sub>2</sub> O <sub>3</sub>	2.48%
Iron	2.75%

There are, then, at the Defense Plant Corporation's mill, the following unfinished concentrates and products:

<u>Tons</u>	<u>Concentrates</u>	<u>Analyses</u>
18,000	Unfed - from Krome Corporation	6.14% ZrO <sub>2</sub>
48,600	Unfed - from Humphreys Brothers	3.92% "
900	So-called finished Zircon	41.10% "
60	So-called Ilmenite-Magnetite	
18,000	So-called finished Chromite	41.26% Cr <sub>2</sub> O <sub>3</sub>

It was said the Krome Corporation's contract called for 200,000 tons per year of 25% chromite, or better. The Humphreys contract called for \$8.00 minimum, per ton, f.o.b. Defense Plant Corporation's mill, for concentrates 25% chromite.