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Report No. 14-B



RESEARCH

ANNUAL REPORT
OF
RESEARCH PROGRESS

JANUARY 1967 - JULY 1968

RESOURCES

Mineral Industry Research Laboratory
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*University of Alaska
College, Alaska 99701*

FORWARD

This report has been prepared as an addendum to MIRL Report No. 14-A, "Annual Report of Research Progress, 1967." In the future the MIRL Annual Report will be presented on a fiscal year basis rather than on the calendar year.

The report briefly describes research conducted during the interim of January 1 to July 1, 1968.

MINERAL INDUSTRY RESEARCH LABORATORY STAFF

Earl H. Beistline, Dean, College of Earth Sciences and Mineral Industry and
Professor of Mining Engineering.

Donald J. Cook, Head, Department of Mineral Engineering and Professor of
Mineral Beneficiation.

*Pemasani D. Rao, Associate Professor of Coal Technology.

*Lawrence E. Heiner, Assistant Mineral Engineer.

Frederick C. J. Lu, Assistant Professor of Mineral Economics.

Ernest N. Wolff, Associate Professor of Geology. (Now at Colorado State
University.)

Bruce I. Thomas, Mining Engineer, representing the Bureau of Mines, U. S.
Department of the Interior, in a cooperative agreement in the study of
Factors Affecting Lode Mining in the Fairbanks District, Central Alaska.

Contributions by:

Steven A. Wulf, Research Assistant, Mineral Engineering Department.

William H. Smith, Research Assistant, Geology Department.

Kenneth L. Zonge, Assistant Professor, Electrical Engineering Department.

Eskil Anderson, Consulting Engineer.

Charles F. Herbert, Consulting Engineer.

Marvin J. Andresen, Consulting Geologists, Geonomics.

*Full time basis.

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I. RESEARCH

A brief description of research currently being conducted is contained in this section, as well as short resumes of research proposals which have been received from various agencies for funding. Funded research gained through grants, contracts and cooperative research with other agencies increases the capabilities of the Laboratory both financially and by broadening the scientific disciplines available to it.

COMPLETED RESEARCH

Mineral Potential of the North

This project, discribed briefly in MIRL Report No. 14-A, has been completed and a limited number of copies are available to the public. The report describes the mineral resources of the Northern Alaska Region, Northwestern Alaska Region, Yukon River Region, and the Seward Peninsula Region. A table of 105 pages lists each mineral occurrence in Northern Alaska, references to its location, and lists remarks concerning the occurrence as well as giving names of people or companies having worked the property. A statistical evaluation of Alaska indicating the dollar value yet to be found in the state is included. Sections on the geology of Northern Alaska and selection of favorable areas based upon geology are contained in the report. Finally the report contains sections on mineral policy, Airborne Geophysical Prospecting and reports by various consultants. These reports are by Marvin J. Andresen, Charles F. Herbert, and Ekil Anderson.

Distribution of Certain Minor Elements in Alaskan Coals

This project has been completed and results are reported in MIRL Report No. 15. The following gives a summary of results and conclusions:

Seventy-five coal samples were collected from various coal fields in Alaska and the ash was analyzed for lead, gallium, copper, barium, beryllium, nickel, tin, titanium, vanadium, zirconium, cobalt, chromium, and germanium. Quantitative spectrochemical methods were used for the analysis. Other elements of significance that were identified from the spectrograms of the various samples were, gold and silver, detected in No. 2 seam from Nenana Field and silver in coals from Chickaloon area in the Matanuska Field. Forty-one samples were sink-floated to obtain a lower density organic (coal) fraction and a higher density inorganic (shale) fraction. The two fractions were ashed and analyzed to study the distribution of the elements between organic and inorganic phases of the coals. Analytical results are presented as concentrations of raw coals, raw coal ash, and ash of float and sink fractions. Recovery of the elements in float fractions were calculated.

Although none of the elements analyzed were in a high enough concentration to be of economic significance by present day standards, ever increasing demands for these elements will necessitate search for alternate sources. It is therefore necessary to have such data available to meet the future needs. However, a detailed study of the distribution of gold and silver in Nenana and Chickaloon coals merit further detailed study.

The concentration of trace elements in Alaskan coals fall in ranges found for coals in the lower 48 States. The organic affinity series obtained from percent element associated with floats and also from the ratio of concentration in float and

sink ash was: Ge, (V, Be, Co,) Ni, (Cr, Ba, Zr,) Ti, (Ga, Cu,) and Pb. The concentration of minor elements is higher in the ash of float fractions compared to sink ash in high rank coals. The low rank coals showed only minor increase in concentrations in float ash.

RESEARCH IN PROGRESS

Distribution of Gold and Silver in Alaskan Coals

In the course of a previous investigation on the "Distribution of Certain Minor Elements in Alaskan Coals," (MIRL Report No. 15) gold and silver were discovered in some coal samples. It was therefore decided to determine the distribution of these two elements in the ash of Alaskan coals. Work is in progress in developing a suitable analytical procedure using an Atomic Absorption Spectro-photometer.

Heavy Mineral Investigations

This is a continuing research project which is summarized in MIRL Report 14-A.

A portion of this program included a cooperative project with the Institute of Marine Science of the University of Alaska in their investigation of the Marine Mineral Resources of the Alaska Continental Shelf. The MIRL portion of this study has been completed and a report submitted to the Institute of Marine Science.

Development of a Lightweight Digital Electromagnetic Prospecting Unit

A two loop, moving transmitter-receiver ground Electromagnetic unit is currently under development by this laboratory in cooperation with the Department of Electrical Engineering. The instrumentation will be completely solid state, using as many commercially available modules and "black boxes" as possible in order to

try to make the unit reproducible by the layman. The information readout will be an instantaneous display using digital techniques.

Electromagnetic units are used to locate buried massive sulfide deposits. They have played an important role in the development of Canada's Mineral Industry.

Determination of Gold Size Distribution in Alluvial Material from Selected Off-Shore and On-Shore Locations

The project is sponsored by the United States Bureau of Mines. The project will involve collection of samples from placer, off-shore and beach samples, size analysis up to subsieve ranges and determination of size, shape and quantity in the various size fractions.

Work Completed: A gold concentrate from a placer mining operation was obtained to determine the size distribution of gold actually being recovered in placer mining. The weights of gold recovered from each size fraction were recorded. A beach sample from the Nome area has been obtained.

Work Planned: It is planned to obtain samples from:

1. Dredging operations—bucket line and tail sluice samples.
2. Selected off-shore samples.
3. Placer samples from various properties.
4. Selected beach samples.
5. Sediments carried in suspension by Glacier streams.
6. Sample to be furnished by U. S. Bureau of Mines, Juneau.

Handbook of Geophysical Prospecting Methods for the Alaskan Prospector

An informative report describing the major geophysical prospecting methods, theory, utilization, and costs is nearing completion. This handbook is intended to

provide the layman prospector with an introduction to the methods of Geophysical Prospecting. Due to the highly technical nature of some of the methods, this handbook will only briefly explain the theory and procedures involved with the common methods, list the types and where possible the cost of the equipment, and act as a guide to where geophysical services and supplies can be obtained. If the prospector knows what can and cannot be done with geophysics, he may then use this knowledge to his benefit.

Known and Potential Resources of Some Metals on the Seward Peninsula, Alaska

This project is being accomplished under contract with the Corps of Engineers. It is composed of two parts. Part one concerns factual information pertaining to known production statistics. Part two is a mathematical model which will attempt to predict ore reserves yet to be found on the Peninsula.

Geological-Geochemical Investigation, Forty Mile District

Partial funding for the Master of Science thesis project for William H. Smith of the University of Alaska was granted by MIRL on March 20, 1968. The thesis, "A Geological and Geochemical Investigation of Mineralization of Hill 3560 Forty Mile District, Alaska," includes a program of geochemical stream sediment sampling, bed-rock sampling, and geological mapping. The field area is bounded on the north by the Taylor highway between mile 76.5 and mile 82 and covers an area of 30 square miles to the south. Field mapping and sampling was started on May 10 and completed on July 15, 1968.

Preliminary results indicate that the area includes both the Birch Creek schist, predominantly quartzites, quartz hornblende schist, and quartz biotite schist, with

minor marbles; and metamorphosed Paleozoics predominately greenstones, greenschist and marbles. The area has been intruded on its northern border by a quartz diorite pluton. Mineralization is apparently of a sparse and disseminated nature. Minor occurrences of copper, zinc, lead, silver, and gold have been located. Specific information is not now available pending analytical results.

The stream sediment samples are being analyzed for trace amounts of copper, lead, zinc, and molybdenum. Ten selected vein and bedrock samples will be spectrophotographically analyzed for 30 elements. A report of findings will be made to MIRL the first quarter of 1969, and published thereafter by MIRL.

Placer Mining and Gravel Washing Operations in Alaska

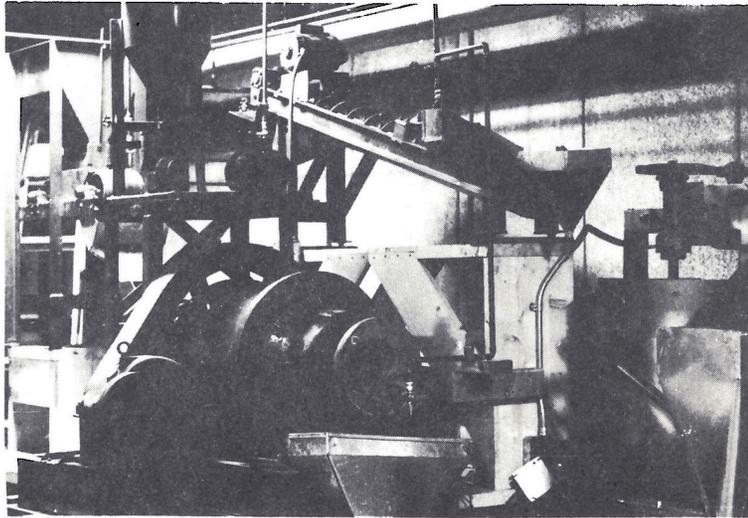
The Mineral Industry Research Laboratory is cooperating with the Federal Water Pollution Control Administration on a project to "note and compare the changes in stream characteristics associated with placer and gravel mining operations." The objectives of the project are two-fold:

1. To measure the changes and determine the effects of placer and gravel mining operations upon the stream characteristics, and
2. to document these changes in a report.

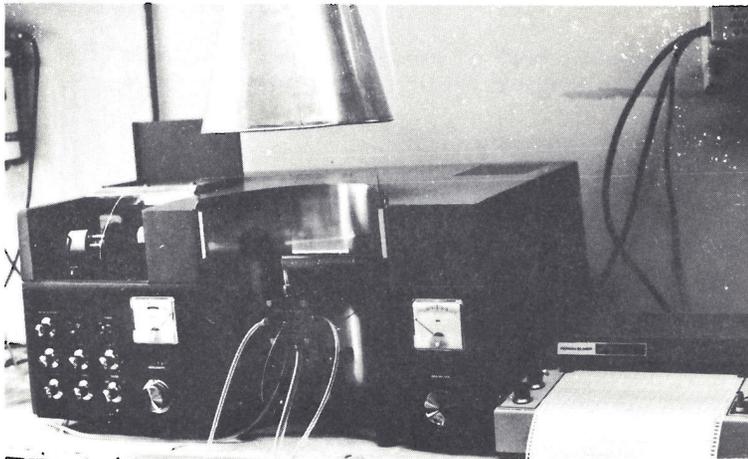
Characteristics and Utilization of Fly Ash from Power Plants

Fly ash, generated by Power Plants using coal as fuel, is collected to prevent atmospheric pollution. It is a waste product from Power Plants and present problems in disposal. A preliminary study is intended to help the potential consumer by giving the characteristics of the fly ash locally available and the producer by presenting an appraisal of the potential Alaskan markets.

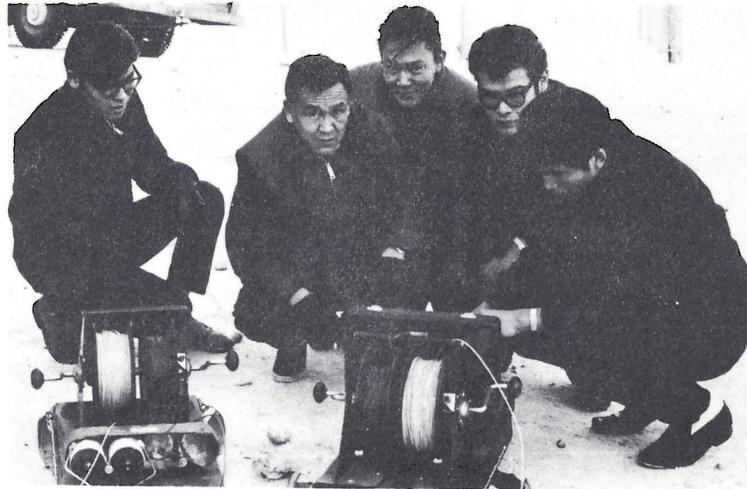
Samples of fly ash were collected from Power Plants operated by Golden Valley Electric Association at Healy, University of Alaska at College, City of Fairbanks Municipal Utilities System at Fairbanks, and United States Army at Fort Wainwright. The samples will be analyzed for chemical and physical properties and potential markets will be evaluated. The project is being conducted with the cooperation of the Alaska Department of Highways located at the University of Alaska.



A view of the University Ore Beneficiation Pilot Mill,
now operational and located in the Duckering Building.



Perkin Elmer Model 303 Atomic Absorption Unit aids
research by enabling rapid analytical results.



MINERAL AND PETROLEUM TECHNICIAN STUDENTS STUDY THE SELF POTENTIAL AND RESISTIVITY METHODS OF PROSPECTING. LEFT TO RIGHT: PAUL KOYUKUK, ALEX SOCALOFF, MONROE EAKON, GARY THOMAS AND RAY TITUS.



MINERAL AND PETROLEUM TECHNICIAN STUDENTS STUDY SURVEYING. LEFT TO RIGHT: REX OKAKOK, GEORGE PAULSON, MONROE EAKON, KEITH GORDAOFF, SAM DEMIENTIEFF, STEVE BERGMAN, ALEX SOCALOFF, AND ALBERT WASHINGTON.

II. FINANCES AND CONTRIBUTIONS

For purposes of clarity the Mineral Industry Research Laboratory funding for the 1967-1968 fiscal year is contained here-in its entirety. This includes some of the information contained in MIRL Report No. 14-A. This statement now is accurate on a fiscal basis rather than a calender basis.

Support provided by the 1967 State Legislature for continued research.	\$ 45,000
Usibelli Coal Mine Inc. final payment on a grant of \$25,000 for the establishment of a Coal Research Laboratory.	11,500
Research project funded by the State of Alaska NORTH Commission for study of the Mineral Potential of the North.	34,500
Cooperative research with the Institute of Social Economic, and Government Research on a study entitled, "Natural Resource Base of the Fairbanks North Star Borough." Study funded by the North Star Borough.	3,600
Cooperative research with the Institute of Marine Science on "Sedimentology and Geochemistry of Marine Mineral Resources of the Alaska Continental Shelf."	4,515
*Contract with the Corps of Engineers for a study of "Known and Potential Resources of Some Metals on the Seward Peninsula, Alaska."	6,000
*Contract with the U. S. Bureau of Mines for a study of gold size distribution in alluvial material from selected off-and-on-shore locations.	12,215
<u>TOTAL</u>	<u>\$117,330</u>

* These projects were funded just prior to July 1, 1968 and the work is to be completed during fiscal year 1968-69.

III. PUBLICATIONS

Published Reports available from MIRL, College of Earth Sciences and Mineral Industry, University of Alaska, College, Alaska 99701.

- *ANNUAL REPORT OF RESEARCH PROGRESS, MIRL Report No. 1.
- *THE MARKET POTENTIAL FOR ALASKAN CLAY PRODUCTS, MIRL Report No. 2, January 1965.
- *ALASKA CEMENT MARKETS AND OPPORTUNITIES FOR REGIONAL PRODUCTION, Published as research Monograph No. 4 by the Institute of Business, Economics and Government Research of the University of Alaska in cooperation with MIRL, February 1965.
- PETROGRAPHIC EVALUATION OF COKING POTENTIAL OF SELECTED ALASKAN COALS AND BLENDS, MIRL Report No. 3, February 1965.
- MARKET FOR INSULATION IN ALASKA AND FEASIBILITY OF REGIONAL MANUFACTURE, MIRL Report No. 4, July 1965.
- *ANNUAL REPORT OF RESEARCH PROGRESS 1965, MIRL Report No. 5, January 1966.
- INVESTIGATIONS OF LIGHTWEIGHT AGGREGATES IN ALASKA, MIRL Report No. 6, December 1966.
- ANNUAL REPORT OF RESEARCH PROGRESS 1966, MIRL Report No. 7, January 1967.
- *NATURAL RESOURCE BASE OF THE FAIRBANKS NORTH STAR BOROUGH, MIRL Report No. 8, March 1967.
- FORTRAN IV TREND-SURFACE PROGRAM for the IBM 360 MODEL 40 COMPUTER, MIRL Report No. 9.
- TRACE ELEMENT COPPER DISTRIBUTION AND AREAL GEOLOGY IN A PORTION OF THE CLEARWATER MOUNTAINS, ALASKA, MIRL Report No. 10, May 1967.
- APPLICATIONS OF TREND SURFACE ANALYSIS AND GEOLOGIC MODEL BUILDING TO MINERALIZED DISTRICTS IN ALASKA, MIRL Report No. 11, June 1967.
- GEOCHEMICAL-GEOPHYSICAL INVESTIGATIONS FAIRBANKS DISTRICT, ALASKA, MIRL Report No. 12, June 1967.

*PRELIMINARY REPORT - MINERAL RESOURCES OF NORTHERN ALASKA, MIRL
Report No. 13, November 1967.

ANNUAL REPORT OF RESEARCH PROGRESS 1967, MIRL Report No. 14,
January 1968.

DISTRIBUTION OF CERTAIN MINOR ELEMENTS IN ALASKAN COALS, MIRL
Report No. 15, June 1968.

FINAL REPORT - MINERAL RESOURCES OF NORTHERN ALASKA, MIRL Report
No. 16, June 1968.

DEVELOPMENT OF A LIGHT-WEIGHT LOW COST SELF POTENTIAL UNIT, MIRL
Report No. 17, June 1968.

*Out of print - available at the University of Alaska Library.