SOIL SAMPLING AT THE EGNATY CREEK MERCURY PROSPECT, KUSKOKWIM RIVER BASIN, ALASKA

* open-file report

UNITED STATES DEPARTMENT OF THE INTERIOR

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ILLUSTRATIONS

SOIL SAMPLING AT THE EGNATY CREEK MERCURY PROSPECT, KUSKOKWIM RIVER BASIN, ALASKA

by

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ABSTRACT

Augering, trenching, diamond drilling, and soil sampling were done on the Egnaty Creek mercury prospect to develop a method to delineate a potentially large low-grade mercury prospect in Cretaceous sandstones and graywacke. Augering was done with portable gasoline-powered augers; trenching was done with crawler-type tractors; SPO-size core drilling was done with a portable diamond drill. Methods used in analyses of soil samples were the willemite screen, a commercial-type ultraviolet absorption mercury detector, and a vapor absorption method developed and used by the Geological Survey. Soil sampling, using the Geological Survey technique, promises to be a satisfactory method of delineating this prospect.

INTRODUCTION

Reconnaissance work by the Bureau on the Egnaty Creek mercury prospect was done during the field seasons of 1966-67 as part of the Bureau's heavy metals program in the Kuskokwim River Basin. This area has long been a producer of mercury and is recognized as a potential major source of the metal. Augering, trenching, diamond drilling, and soil sampling were tried as a means of delineating a large low-grade disseminated mercury prospect in permanently frozen ground and covered by overburden. Soil sampling, using a method of analysis developed by the Geological Survey, appears to be the most practical way of doing this.

ACKNOWLEDGMENTS

Field work was done by the Alaska Office of Mineral Resources. The Mine Systems Engineering Group, Denver, and the Alaskan Mining Research Laboratory, Juneau, arranged to have the soil samples analyzed by the Geological Survey, Branch of Exploration Research, Denver. The Hanna Mining Co. furnished an excellent large-scale contour map of the area.

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LOCATION AND ACCESSIBILITY

The Egnaty Creek mercury prospect is adjacent to the north bank of the Kuskokwim River at approximately 61°52' N latitude and 157°52' W longitude (figs. 1, 2). It is about 25 river miles downstream from the Red Devil mercury mine, or about 20 airline miles west-northwest of this mine.

There are no roads or airfields at the prospect except a tractor road which extends from the river bank to about 3,000 feet into the prospect. Bush-type float planes land on the river, and large multi-engine planes can land at the Red Devil airfield. Oceangoing freighters dock at Bethel, near the mouth of the Kuskokwim River, and heavy freight and supplies can be shipped from there by river barge, a distance of about 200 river miles.

PHYSICAL FEATURES AND CLIMATE

This prospect is in one of the areas of low rolling hills in the Kuskokwim Mountains. The altitude varies from about 200 feet above sea level at the Kuskokwim River to about 2,000 feet at the highest peak; however, differences in altitude of 1,000 feet between points only 3,000 feet apart horizontally make the topography fairly rugged with hillsides too steep for easy movement of equipment.

Bedrock exposures are few, with only an occasional outcrop on the crests of ridges. Spruce, birch, and cottonwood trees, seldom over 12 inches in diameter, and alder, brush, and moss cover about 5 to 10 feet of residual overburden of frozen weathered sandstone. Permafrost is present to an unknown depth.

The climate is sub-Arctic; temperatures occasionally reach 80° F in the summer and often are minus 60° F in the winter. It is considered one of the colder spots in this area. The usual daytime temperature from May to October is about 40° to 60°, with the nights considerably cooler. The annual precipitation is about 20 inches, with much of it falling as a slow, cold drizzle during the months of July, August, and September. Major wildlife consists of moose, bear, caribou, and large mosquitoes. An occasional beaver and muskrat visited the area; a few grouse are present; fish are abundant in most streams.

GEOLOGY

The geology of the area has been mapped and described on a reconnaissance basis by Cady and others (1)[2] and this brief description is from their report.

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[2]Underlined numbers in parentheses refer to items in the bibliography at the end of this report.

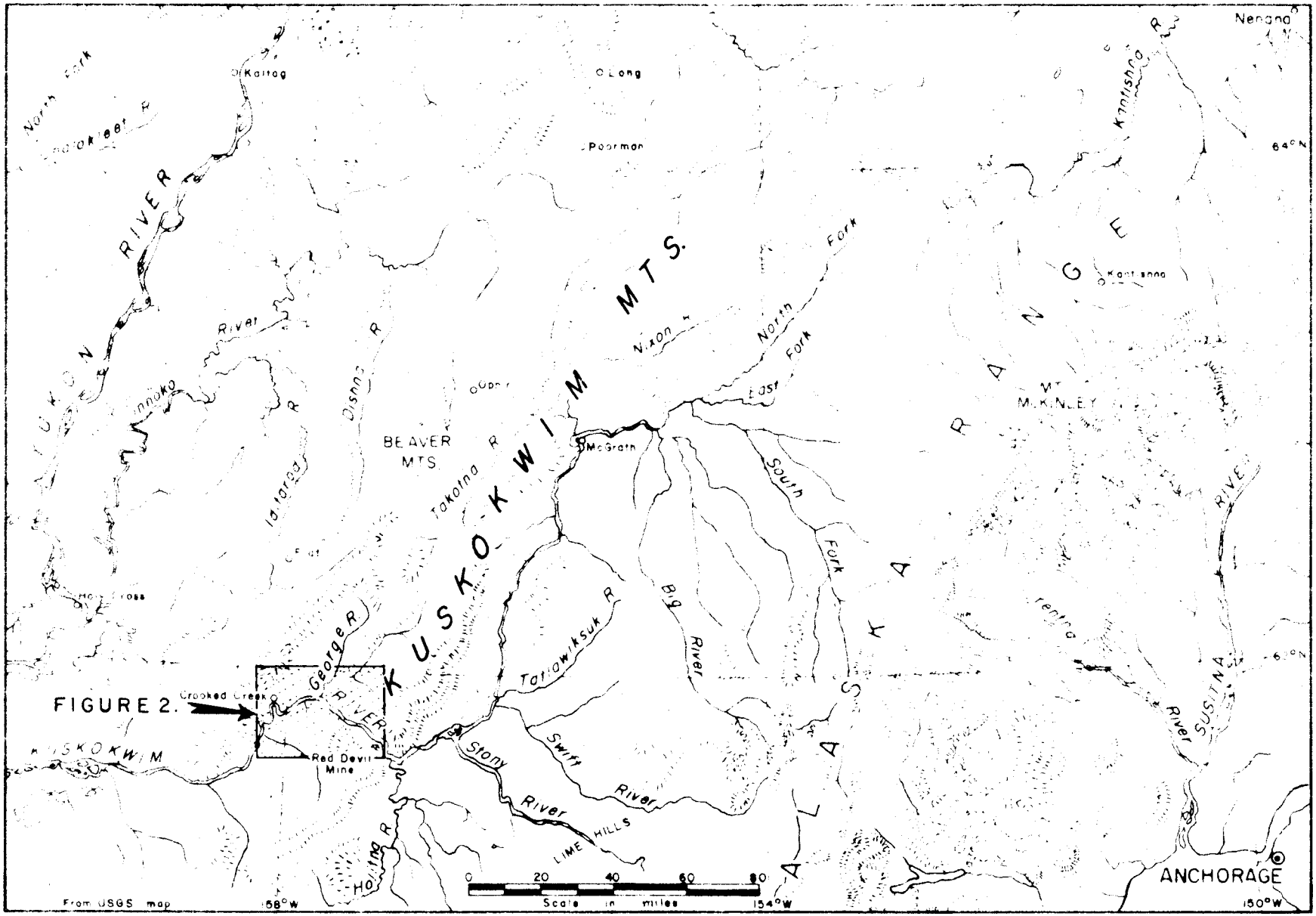

FIGURE 2.

FIGURE 1.-Index map, Kuskokwim Region, Southwestern Alaska.

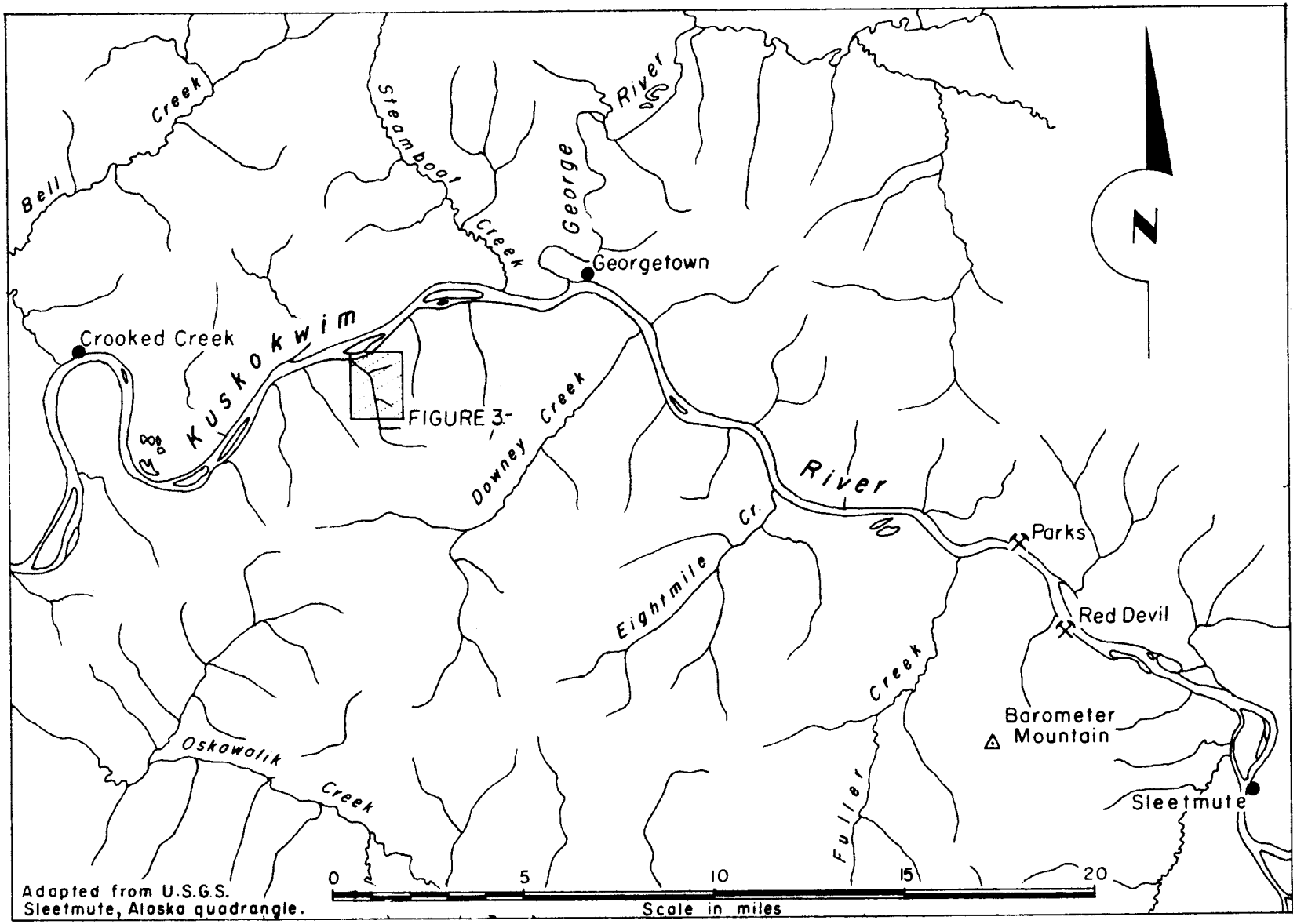

FIGURE 2.- Location map, Egnaty Creek vicinity, Southwestern Alaska.

The formation at Egnaty Creek is the Kuskokwim group of Cretaceous sandstone and graywacke, with shale interbeds. The beds strike approximately S 35° W and dip about 45° to 50° south. This sequence of sedimentary rocks is reported to be probably thousands of feet thick. Intrusives were not found at the prospect; the closest is a rhyolite outcrop exposed in the north bank of the Kuskokwim River about 1-1/2 miles upstream and across the river from Egnaty Creek.

WORK BY THE BUREAU OF MINES

During the 1966 field season about 350 2-inch diameter holes were augered through the frozen overburden to depths varying from 2 to 15 feet, and averaging about 6 to 7 feet, with a portable auger powered by a gasoline chain saw motor. Holes were spaced about 100 feet apart in parallel lines 200 feet apart and up to 8,000 feet long (fig. 3). A 3-man crew averaged 10 holes per day; all equipment had to be hand carried as much as 2 miles one way.

Fine-grained cinnabar (about 100 mesh) was found in about 100 holes by panning the augered material. Chemical assays were made of all holes. When there are only a few colors or grains (100 mesh) of cinnabar, they can be detected by panning, and this was found to be as good or a better method of determining very small amounts of cinnabar than assaying; between the two methods significant amounts of mercury were found in over half the holes despite the poor (20 to 50 percent) recovery of auger material.

Bedrock was partially exposed in about 3,500 feet of bulldozer trenches; overburden averaged about 5 to 6 feet deep, and trenching was difficult because of permafrost and steep hillsides. Track guards were installed on both crawler-type tractors and proved very useful in preventing loss of tracks on the steep and slippery hillsides.

Cinnabar was found in few places in the exposed bedrock, but could be panned from most of the trench walls. Some selected samples of graywacke and sandstone bedrock, exposed by blasting and trenching, assayed almost 1 percent mercury, but disseminated cinnabar was usually too fine to be seen except with a hand lens. No mineralization was found in the thin shale beds which probably comprise less than 10 percent of the formation. Arsenic and antimony were found in only trace amounts.

Including trenches and auger holes, cinnabar was found for about 10,000 feet north and south along the hillsides paralleling Egnaty Creek and about 5,000 feet east and west. Panning of streams indicates that these are not the limits and the exact size of the mineralized area is not known.

Eighteen diamond-drill holes (SPO-size) averaging about 60 feet in length were completed before soil sampling was started. They were located on the results of auger holes and some minor stripping to bedrock by hydraulic methods (fig. 4). Analyses of core and sludge are not completed, but

erratic and very fine-grained cinnabar, which had to be magnified to be seen, was present in several holes. The best mineralization was noticed in hole 5. Core and sludge recovery were generally poor.

Over 400 soil samples were taken 100 feet apart along 15 parallel lines 200 feet apart and 2,600 feet long, making a grid 2,800 by 2,600 feet (fig. 4). Samples were taken about 6 inches below the surface of the ground under the moss. Each sample was 1/2 pint in volume and was collected in a plastic bag.

Methods used in determining parts per million mercury in the samples were the willemite screen, a commercial-type ultraviolet absorption mercury detector, and the vapor absorption technique as described in U.S. Geological Survey Circular 540 by W. W. Vaughn. (2) Results are on figure 4. The willemite screen and the commercial detector were not sensitive enough to give satisfactory results; they were too uniform, and it was thought that organic material, water, and other sulfides interferred and influenced the results. The Geological Survey vapor absorption method appears to give accurate analyses and mercury mineralization, exposed in bedrock between lines 1 and 2 by trenching, drillholes, and hydraulic stripping, supports this accuracy, and indicates that soil sampling, using this method for analyses, can be used in delineating mercury mineralization.

Tests made by screening some of the soil samples indicate that most mineralization is in the minus 80 mesh material; however, most of the samples were not screened.

A more extensive soil sampling program on the Egnaty Creek prospect, greatly extending the present grid, is planned this field season (1968). In addition, soil samples from known mercury prospects in the area will be taken and results compared with those of Egnaty Creek. Loess of undetermined thickness probably covers some sections of the area, and will add complications to the soil sampling program.

BIBLIOGRAPHY

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2. Vaughn, W. W. A Simple Mercury Vapor Detector for Geochemical Prospecting. U.S. Geol. Survey Circ. 540, 1967, 8 pp.