STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS

Guy R. Martin — Commissioner
Rom G. Schaff — State Geologist

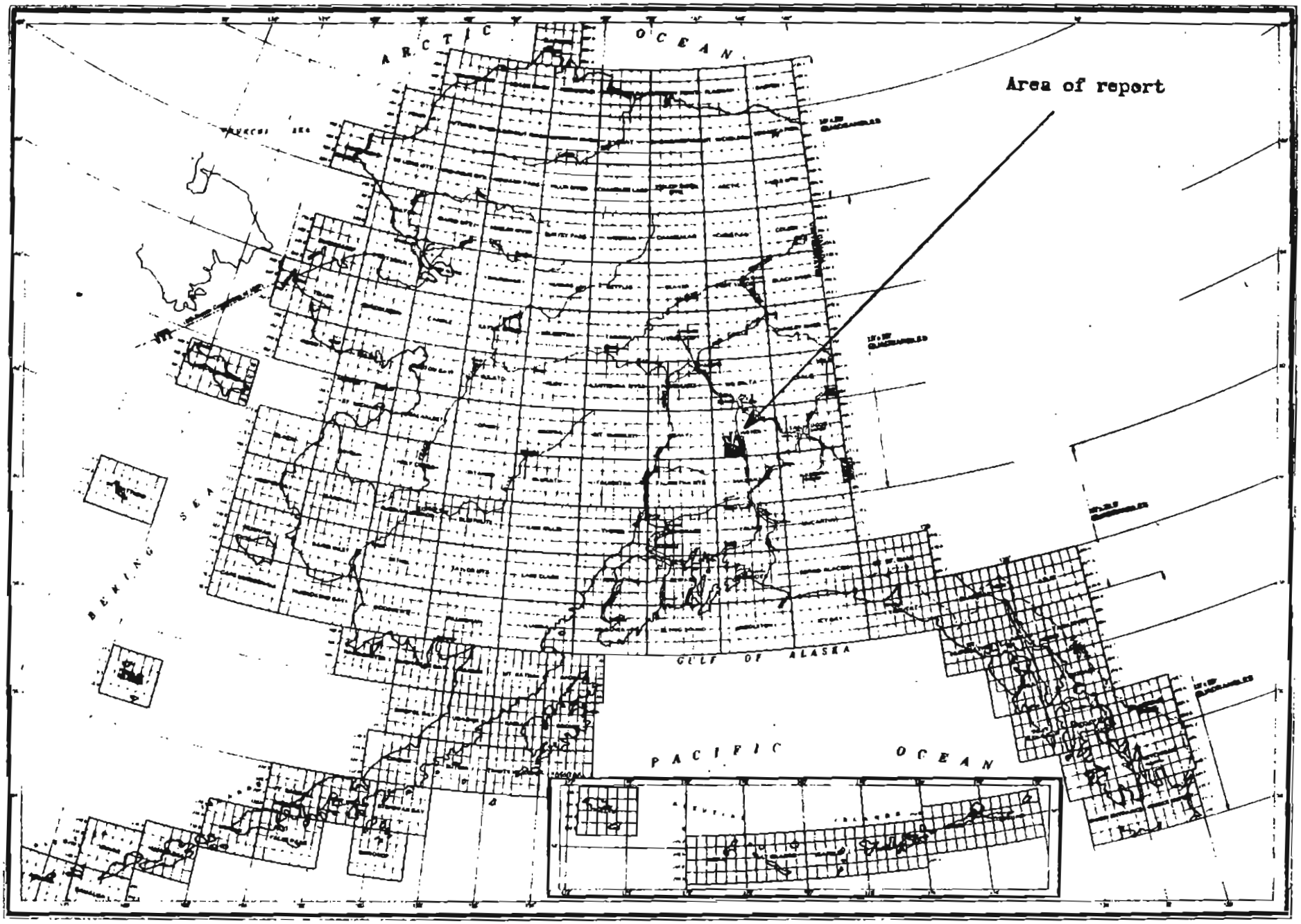
August 1975

This report is preliminary and has not been edited or reviewed for conformity with Alaska Division of Geological and Geophysical Surveys standards.

Alaska Open File Report 68

SUMMARY OF ANALYSES OF STREAM-SEDIMENT SAMPLES, MT. HAYES A-4, A-5, B-4, and B-5 QUADRANGLES, ALASKA

By
James H. Stout


ARCTIC OCEAN
Area of report
BERING SEA
GULF OF ALASKA
PACIFIC OCEAN

SUMMARY OF ANALYSES OF STREAM-SEDIMENT SAMPLES, MT. HAYES, A-4, A-5, B-4, AND B-5 QUADRANGLES, ALASKA

Introduction

During the field season of 1973, 249 stream sediment samples were collected for geochemical analysis as part of a broader resource evaluation program by the Alaska Division of Geological and Geophysical Surveys. This report summarizes the results of this investigation, and attempts to identify various geochemical anomalies with the known bedrock geology (Stout, 1975).

Portions of the area covered in this report have been studied by previous investigators, notably Rose (1965, 1966) and Rose and Saunders (1965). These studies are confined to a large extent to selected areas where previous claims or surface mineralization has been noted. Analyses of stream sediments as a result of these studies reveal scattered anomalies for copper, nickel, chromium, lead, and zinc. Similar anomalies as part of the present study are presented below.

Copper

Copper analyses of stream sediments derived from the Boulder Creek Volcanics (see map) are generally higher than in sediments derived from other volcanic formations in the area. The table shows that several groups of samples (e.g., 166-177, 217-230, and 254-279) are from streams that drain the Boulder Creek Volcanics exclusively. Because this formation is the youngest recognized in the Amphitheater Group and is in the core of the west-plunging Amphitheater Syncline, the formation is found only in the mountains west of the Delta River and Tangle Lakes.

By contrast, 17 samples from streams that drain the Paxson Mountain Formation near Paxson Mountain and in the gentle terrane south of the Denali Highway have a mean Cu value of only 50 ppm. Generally low values are also associated with the Tangle Lakes Formation, also volcanic but consisting mainly of pyroclastic and tuffaceous rocks. All the mineralized quartz veins reported by Stout (1975)

are from the Boulder Creek Volcanics. The veins are near vertical, and occupy a predominant northeast-trending joint system. The joint system pervades all three volcanic formations, but copper mineralization is found only in those veins that intrude the Boulder Creek Volcanics.

The joint system along which copper mineralization occurs is apparently younger than the formation of the Amphitheater Syncline. Hence the mineralization is much younger than the Upper Triassic host rocks, and may be Tertiary or younger in age. In view of the generally high Cu values in the stream sediments that are derived exclusively from the Boulder Creek Volcanics, it seems reasonable to conclude that the aqueous solutions associated with the quartz veins derived their copper from the immediately surrounding volcanic rocks.

Many analyses of stream sediments collected near bedrock in the northwest-trending mountains along the north side of Seven Mile Lake have Cu values over 200 ppm, well above the continental crustal average (55 ppm), and some have values above the threshold value of 290 ppm. This correlates with observed copper mineralization associated with gabbro dikes and sills that trend N. 65° W. parallel to the north limb of the Amphitheater Snycline (Stout, 1975). The mineralization consists primarily of malachite-stained fractures in the medium-grained gabbro.

Other notable Cu values are from streams that drain the Rainy Creek dunite and associated ultramafic intrusives. Many values over 200 ppm and some as high as 500 ppm are found (table). This is particularly true in the headwaters of Ann Creek, the north fork of Rainy Creek, and the upper reaches of Broxson Gulch. These are the areas where the surface exposures of the Rainy Creek dunite are greatest. The belt narrows futher west, and is apparently not found west of the Maclaren River. Outrcops of gabbro and mafic gabbro within this belt reveal disseminated copper sulfides, mainly chalcopyrite. Pyrrhotite is also present in some localities, but is less common.

In contrast to the Rainy Creek dunite, the dunites and associated gabbros in the Wild Mountain belt may be relatively impoverished in copper. This is borne out by low (less than background) Cu values in most stream-sediment analyses for material collected along the belt. This belt extends from beneath the glacier at the headwaters of the east fork of the Maclaren River in a S. 70° E. direction for about 18 miles. The surface exposures of the belt are terminated at the Delta River by a thick cover of glacial till and Tertiary gravels. All stream-sediment analyses from this region give less than background values for Cu.

Nickel

Stream sediments are generally high in nickel ($\geq$ 100 ppm) only for samples taken near dunites and related ultramafic rocks. This includes the Rainy Creek dunite and the Wild Mountain dunite on both sides of Fish Lake. Each of these analyses also has a relatively high Cr value, indicative of an ultramafic source rock. The only nickel sulfide observed in the region is pendlandite. It occurs in sheared serpentinite zones around the margins of the Rainy Creek dunite and related mafic rocks.

Chromium

Stream sediments are generally high in chromium ($>$ 5000 ppm) in the vicinity of the Rainy Creek dunite and the Wild Mountain dunite. The probable source is a chrome spinel which exists as a primary phase coexisting with forsteritic olivine in the dunites. The spinel consists of less than 1 percent by volume of the average hand specimen. In a few outrcops along the south flank of Wild Mountain, chrome spinel is concentrated into 1-mm-thick primary igneous bands.

Analyses 194, 195 and 239 from the Delta River and an eastern tributary (see map) are notable because their high Cr suggests the presence of the Wild Mountain dunite in the subsurface beyond the easternmost exposures.

Lead

The only anomolous Pb analyses are from two samples, one taken from Rainy

Creek (30 ppm) near the Rainy Creek dunite and the other from the northeast side of Wild Mountain (100 ppm) near the Wild Mountain dunite. The threshold value for Pb is 26 ppm in this area. Analysis of this sample also gives anomolous zinc, arsenic, mercury, silver, nickel, and chromium. The presence of the last two elements, coupled with the field relationships, argue in favor of an ultramafic source rock.

Zinc

Two specific areas within the region give highly anomolous Zn values relative to a threshold value of 210 ppm. The first seems associated with the Boulder Creek Volcanics and the anomolies (500 ppm) occurring in stream sediments (analyses 155, 253) near the western limit of exposure of this formation. Analyses 260 and 306 are above the threshold value for zinc as well, and are also of sediments derived from the Boulder Creek Volcanics. The exact source of the anomolies is unknown. No zinc minerals were observed.

The second area which gives anomolous Zn values is the vicinity around the glacier at the head of the East Fork of the Maclaren River. Analyses 6 and 7 are of sediments derived from highly sheared and altered diorite and quartz monzonite that occupies a generally east-west trending belt in this area. The specific source of the mineralization is unknown however. It is perhaps notable that even one of the analyses (115) from the outwash at the base of the above-mentioned glacier has zinc above threshold value.

The atomic absorption analyses for Zn (see table) show two anomolies (42 and 131) that are not revealed by emission spectrography. The former is of outwash sediment from the base of a small glacier just west of Broxson Gulch, implying that the source lies to the north.

REFERENCES

Rose, A.W., 1965, Geology and mineral deposits of the Rainy Creek area, Mt. Hayes quadrangle, Alaska: Alaska Div. Mines and Minerals geologic rept. 15, 51 p.

Rose, A.W., 1966, Geological and geochemical investigations in the Eureka Creek and Rainy Creek areas, Mt. Hayes quadrangle, Alaska: Alaska Div. Mines and Minerals geologic rept. 20, 36 p.

Rose, A.W., and Saunders, R.H., 1965, Geology and geochemical investigations near Paxson, northern Copper River Basin, Alaska: Alaska Div. Mines and Minerals geologic rept. 13, 18 p.

Stout, J.H., 1975, Geology of the Eureka Creek area, east-central Alaska Range: Alaska Div. Geol. and Geophy. geolgic rept. 46, in preparation.