DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

FOLIO OF THE
GOODNEWS AND HAGEMEISTER ISLAND QUADRANGLES REGION
OPEN FILE REPORT 78-9-Q
HESSIN AND OTHERS—GEOCHEMICAL DISTRIBUTION OF MOLYBDENUM, TIN, AND TUNGSTEN

GEOCHEMICAL AND GENERALIZED GEOLOGICAL MAP SHOWING DISTRIBUTION AND ABUNDANCE OF MOLYBDENUM, TIN, AND TUNGSTEN IN THE GOODNEWS AND HAGEMEISTER ISLAND QUADRANGLES REGION, SOUTHWESTERN ALASKA

BY

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1978

HISTOGRAMS

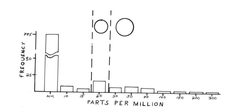
THESE HISTOGRAMS GRAPHICALLY ILLUSTRATE THE FREQUENCY AND ABUNDANCE OF MOLYBDENUM CONCENTRATIONS REPORTED BY HESSIN AND OTHERS (1978); EAKINS (1968)

PAN CONCENTRATE (NON-MAGNETIC FRACTION)

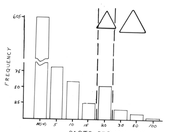
MINUS-80-MESH STREAM SEDIMENT

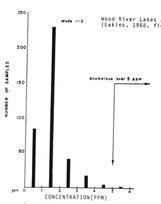
PERCENTILE

95 97



(OXALIC ACID LEACHATE)





(BY ATOMIC ABSORPTION ANALYSES)

MOLYBDENUM

EXPLANATION OF ABUNDANCE SYMBOLS

TIN

- ○ REPRESENTS CONCENTRATIONS OF TIN FROM 20 - 99 PARTS PER MILLION
- ⬡ REPRESENTS CONCENTRATIONS OF TIN GREATER THAN 100 PARTS PER MILLION

TUNGSTEN

- □ REPRESENTS CONCENTRATIONS OF TUNGSTEN FROM 100 - 499 PARTS PER MILLION
- ▢ REPRESENTS CONCENTRATIONS OF TUNGSTEN GREATER THAN 500 PARTS PER MILLION

(AREA OF REPORT: Barnes and others,1978)

(AREA OF REPORT: CLARK, GRYBECK, GREENWOOD and others, 1978
CLARK, GRYBECK, HESSIN and others, 1978)

(AREA OF REPORTS: Eakins, 1968 and 1969)

EXPLANATION

GEOLOGY GENERALIZED FROM HOARE AND COONRAD (1978)

CORRELATION OF MAP UNITS

SURFICIAL DEPOSITS

Qs	QUATERNARY

VOLCANIC, SEDIMENTARY, AND METAMORPHIC ROCKS

Qls	Pleistocene — QUATERNARY
QTs	Plio-Pleistocene — QUATERNARY or TERTIARY
Tv	Early Tertiary — TERTIARY
Kk	Late Cretaceous Maastrichian ? — CRETACEOUS
Kk	Upper and Lower Cretaceous — CRETACEOUS
Kb Kg Kts Kcg	Lower Cretaceous — CRETACEOUS
KJvs	Lower Cretaceous to Middle Jurassic — CRETACEOUS AND JURASSIC
Jk Jvs	Middle to Lower Upper Jurassic — JURASSIC
Jvs	Lower Jurassic — JURASSIC
MzPz	Lower Cretaceous to Lower Ordovician ? — MESOZOIC AND PALEOZOIC
Pzcs	PALEOZOIC
pCk	PRE-CAMBRIAN

INTRUSIVE ROCKS

Tiv Tim Tx	TERTIARY
TKg	TERTIARY AND CRETACEOUS
Jg Jum Ji	JURASSIC AND JURASSIC ?
Pzmg	PALEOZOIC ?

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Qu — UNCONSOLIDATED SEDIMENTARY DEPOSITS

SEDIMENTARY, VOLCANIC, AND METAMORPHIC ROCKS

Qls — TOGIAK BASALT
QTs — SEMICONSOLIDATED MARINE BEACH SEDIMENTS
Tv — VOLCANIC ROCKS AND VOLCANOGENIC SEDIMENTS - Chiefly andesitic flows and tuffs
Kk — SUMMIT ISLAND FORMATION - Nonmarine conglomerate, sandstone, shale, and carbonaceous mudstone
Kk — KUSKOKWIM GROUP - Conglomerate overlain by interbedded graywacke, siltstone, and shale; commonly micaceous; mostly marine
Kk — BUCHIA RIDGE GRAYWACKE - Chiefly interbedded calcareous graywacke, siltstone, and conglomerate with local coquinoes of Aucella shells
Kkg — LOW GRIT AND LIMESTONE - Chiefly angular grit cemented by bioclastic limestone
Kts — TUFFS AND SEDIMENTARY ROCKS - Varied assemblage of andesitic tuffs, graywacke, siltstone, impure limestone, and tuffaceous chert; tuff and tuffaceous sediments commonly laumontitized
Kcg — GRAYWACKE AND CONGLOMERATE - Marine graywacke, siltstone, and conglomerate; commonly calcareous
KJvs — VOLCANIC AND SEDIMENTARY ROCKS - Interbedded intermediate to mafic flows, tuffs, tuffaceous sedimentary rocks, and argillite; intermediate composition tuffaceous rocks commonly laumontitized
Jk — KILIUDAK GRAYWACKE - Chiefly very hard lithic graywacke and siltstone with local conglomerate
Jvs — VOLCANIC AND SEDIMENTARY ROCKS - Andesitic, trachytic, and basaltic flows and breccias interbedded with volcanogenic sedimentary rocks
Jtvs — VOLCANIC AND SEDIMENTARY ROCKS - Mafic flows and breccias interbedded with volcanogenic sedimentary rocks; fractures commonly coated with laumontite
MzPz — MESOZOIC AND PALEOZOIC ROCKS UNDIVIDED - Widespread marine unit including mafic to intermediate volcanic rocks, tuffaceous sedimentary rocks, chert, argillites, siltstone, graywacke, conglomerate, and limestone
Mzb — VOLCANIC AND SEDIMENTARY ROCKS (Upper Triassic) - Locally differentiated marine unit of chert, tuffaceous cherty rocks, argillite, siltstone, wackes, conglomerate, limestone, and mafic flows and breccia
Pv — VOLCANIC ROCKS (Permian) - Locally differentiated marine unit of pillow basalts, massive mafic flows, breccia, and tuff
Pl — LIMESTONE (Permian) - Locally differentiated thin unit of marine limestone; generally tuffaceous, commonly has strong fetid odor
DOl — LIMESTONE - Thin-bedded to massive limestone with minor interbedded tuff and mafic flows; locally recrystallized to marble with interbedded quartzite and quartz-chlorite schist
Pzcs — CALCAREOUS SCHIST (Permian or older)
pEm — KANEKTOK METAMORPHIC COMPLEX - Gneiss, schist, amphibolite, and marble; upper greenschist to lower amphibolite facies
pEl — MARBLEIZED LIMESTONE - Locally differentiated

INTRUSIVE ROCKS

Tiv — FELSIC INTRUSIVE ROCKS - Chiefly rhyolitic to dacitic dikes and sills; locally mapped
Tim — MAFIC INTRUSIVE ROCKS - Diabase, basalt, diioritic, and gabbroic dikes and sills locally mapped
Tx — HARQUAHAR COMPLEX - Quartz-rich porphyritic felsite intrusive-extrusive complex of dikes, sills, tuff, and breccia
TKg — GRANITIC ROCKS - Chiefly quartz monzonite, granodiorite, and quartz diorite stocks
Jg — GABBROIC ROCKS - Commonly shows compositional layering and generally associated with ultramafic rocks
Jum — ULTRAMAFIC ROCKS - Serpentinite, dunite, and websterite
Ji — TRONDHJEMITE - Associated with serpentinite and gabbro
Pzmg — METAGABBRO AND GREENSTONE - Probable dismembered ophiolite complex of mafic flows, dikes, volcaniclastic rocks, and gabbro altered by greenschist facies metamorphism and calcium metasomatism

GEOLOGIC SYMBOLS

- Contact. Known, approximately located, preadolonal, and inferred. Most contacts between bedded rock units are probably faults
- Fault or fault zone. Dashed where approximately located, inferred, or concealed
- Thrust fault. Dashed where approximately located, inferred, or concealed. Sawteeth on upper plate
- Hornfels

GEOCHEMICAL SYMBOLS

- RED MOUNTAIN ULTRAMAFIC BODY
- RED MOUNTAIN CONTACT ZONE

GEOCHEMICAL SAMPLE SITES

- ROCK (CLARK, GRYBECK, GREENWOOD, AND OTHERS, 1978; COONRAD, AND OTHERS, 1978)
- CONCENTRATE (OVERSTREET, AND OTHERS, 1973)
- OFFSHORE AND ONSHORE SEDIMENTS (BARNES, AND OTHERS, 1978)
- BEACH AND STREAM SEDIMENTS (BERRYHILL, 1963)
- STREAM DRAINAGE SEDIMENT (HESSIN, AND OTHERS, 1978)
- STREAM DRAINAGE SEDIMENT (CLARK, GRYBECK, HESSIN, AND OTHERS, 1978)
- STREAM DRAINAGE SEDIMENT (EAKINS, 1968, 1969)

ABUNDANCE

- ▼20 NUMBER WITH SOLID ROCK SAMPLE-SITE SYMBOL REPRESENTS GEOCHEMICAL CONCENTRATION OF MOLYBDENUM IN PARTS PER MILLION (PPM)
- ● SOLID STREAM-DRAINAGE SAMPLE-SITE SYMBOL INDICATES GEOCHEMICAL ABUNDANCE OF 90TH PERCENTILE VALUE OR GREATER IN TWO OR MORE GEOCHEMICAL DETERMINATIONS AS SHOWN IN HISTOGRAMS
- ○ △ ABUNDANCE SYMBOLS REPRESENTING 95TH PERCENTILE OR GREATER CONCENTRATIONS DETERMINED IN ○ STREAM-DRAINAGE SITE SAMPLES ARE SHOWN WITH □ HISTOGRAMS

REFERENCES CITED

Barnes, P. W., Tagg, A. R., and Coonrad, W. L., 1978, Nearshore survey for platinum off Goodnews Bay, Southwestern Alaska: U.S. Geol. Survey Open-file Rept. 78-9-E, 5 sheets, scale 1:125,000.

Berryhill, R. V., 1963, Reconnaissance of beach sands, Bristol Bay, Alaska: U.S. Bur. Mines Rept. Inv. 6214, 48 p.

Clark, A. L., Grybeck, Donald, Greenwood, W. R., Taufen, r. M., Yount, M. E., and Coonrad, W. L., 1978, Geochemical analyses of rock samples in the vicinity of Platinum, Goodnews and Hagemeister Island quadrangles region, southwestern Alaska: U.S. Geol. Survey Open-file rept. 78-9-F, scale 1:125,000.

Clark, A. L., Grybeck, Donald, Hessin, T. D., Yount, M. E., and Coonrad, W. L., 1978, Geochemical analyses of stream-sediment samples in the vicinity of Platinum, Goodnews and Hagemeister Island quadrangles region, southwestern Alaska: U.S. Geol. Survey Open-file Rept. 78-9-G, scale 1:125,000.

Coonrad, W. L., Hoare, J. M., Taufen, P. M., and Hessin, T. D., 1978, Geochemical analyses of rock samples in the Goodnews and Hagemeister Island quadrangles region, southwestern Alaska: U.S. Geol. Survey Open-file Rept. 78-9-H, 2 sheets, scale 1:250,000.

Eakins, G. R., 1968, A geochemical investigation of the Wood River-Tikchik Lakes area, southwestern Alaska: Alaska Div. Mines and Minerals Geochem. Rept. 17, 31 p.

_____1969, A geochemical investigation of the Wood River-Tikchik Lakes area: Alaska Div. Mines and Geology Geochem. Rept. 17, Suppl., 6 p.

Hessin, T. D., O'Leary, R. M., Cooley, E. F., McDanal, S. K., McDougal, C. M., and Yount, M. E., 1978, Geochemical analyses of stream-sediment and vegetation samples in the Goodnews and Hagemeister Island quadrangles region, southwestern Alaska: U.S. Geol. Survey Open-file Rept. 78-9-I, scale 1:250,000.

Hoare, J. M., and Coonrad, W. L., 1978, Geologic map of the Goodnews and Hagemeister Island quadrangles region, southwestern Alaska: U.S. Geol. Survey Open-file Rept. 78-9-B, 1 sheet, scale 1:250,000.

Hoare, J. M., Coonrad, W. L., Hessin, T. D., Barnes, D. F., Clark, A. L., Griscom, Andrew, Singer, D. A., and Steele, W. C., 1978, The Alaskan Mineral Resources Assessment Program; background information to accompany folio of geologic, geochemical, geophysical, and mineral resource maps of the Goodnews and Hagemeister Island quadrangles region, southwestern Alaska: U.S. Geol. Survey Open-file Rept. 78-9.

Overstreet, W. C., Hamilton, J. C., Boerngen, J. G., Rosenblum, Sam, Marsh, W. R., and Salisbury, C. L., 1973, Minor elements in non-magnetic concentrates from Alaska: U.S. Geol. Survey open-file rept., 440 p. (also available NTIS (1975) PB-238 989/AS, 440 p.)

DISCUSSION OF GEOCHEMISTRY

THIS REPORT SHOWS THE DISTRIBUTION AND ABUNDANCE OF MOLYBDENUM, TIN, AND TUNGSTEN AS GEOCHEMICALLY DETERMINED IN VARIOUS SAMPLE MEDIA COLLECTED FROM LOCATIONS THROUGHOUT THE GOODNEWS AND HAGEMEISTER ISLAND QUADRANGLES REGION. DATA PRESENTED HAVE BEEN COMPILED FROM ANALYSES AND LOCATIONS REPORTED BY CLARK, GRYBECK, GREENWOOD, AND OTHERS (1978); CLARK, GRYBECK, HESSIN, AND OTHERS (1978); COONRAD AND OTHERS (1978); EAKINS (1968); HESSIN AND OTHERS (1978); AND OVERSTREET AND OTHERS (1973).

MOLYBDENUM.--THE INCLUDED HISTOGRAMS HAVE BEEN USED TO IDENTIFY STREAM-DRAINAGE SAMPLES THAT CONTAIN CONCENTRATIONS OF MOLYBDENUM THAT MIGHT BE ANOMALOUS. THE AMOUNT OF MOLYBDENUM DETECTED IN ROCK SAMPLES IS INDICATED BY A NUMBER SHOWING CONCENTRATION IN PARTS PER MILLION (PPM).

TIN AND TUNGSTEN.--THE LOWER LIMITS OF THE SYMBOLIZED VALUES OF BOTH TIN AND TUNGSTEN WERE ARBITRARILY SELECTED FROM A SMALL SAMPLE POPULATION OF STREAM-DRAINAGE SAMPLES SHOWING DETECTABLE CONCENTRATIONS. THE FEW ROCK SAMPLES IN WHICH TIN OR TUNGSTEN WERE DETECTED HAVE THE CONCENTRATION SHOWN IN PARTS PER MILLION.

THE GENERALIZED GEOLOGIC MAP DATA INCLUDED IN THIS REPORT AND THE MORE DETAILED GEOLOGIC MAP OF THE REGION (HOARE AND COONRAD, 1978) SHOULD BE UTILIZED IN CONSIDERING POSSIBLE SIGNIFICANCE OF THE MOLYBDENUM, TIN, AND TUNGSTEN THAT HAS BEEN GEOCHEMICALLY DETECTED IN VARIOUS SAMPLES.

BASE MAP INDEX

Base compiled from U.S. Geological Survey 1:63,360 (A) and 1:250,000 (B) scale topographic series 1952-1957 and advance field completion material (C) 1976 by Menlo Park Base Map Section

SCALE 1:250 000

CONTOUR INTERVALS 50, 100, AND 200 FEET
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION, 1976

BACKGROUND INFORMATION RELATING TO THIS REPORT IS PUBLISHED AS U.S. GEOLOGICAL SURVEY OPEN-FILE REPORT 78-9 (AVAILABLE FROM THE SAME SOURCE AS THE MAP).

This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards and nomenclature.