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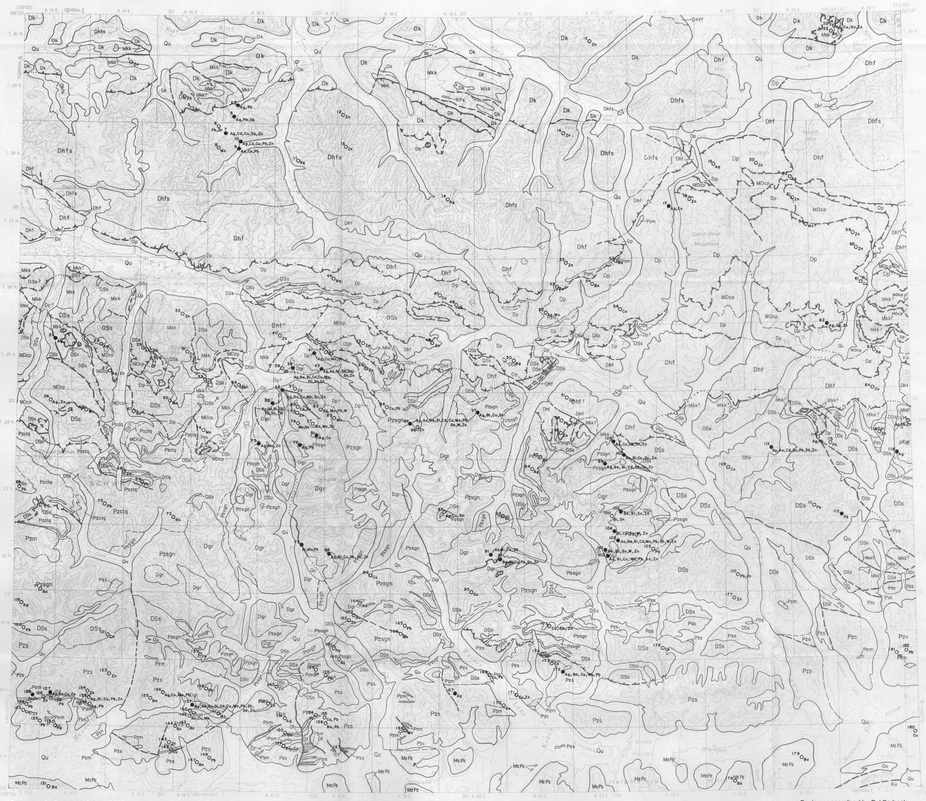
FOLIO OF THE SURVEY PASS QUADRANGLE, ALASKA
MISCELLANEOUS FIELD STUDIES MAP MF-1176-E
GRYBECK AND OTHERS-ROCK SAMPLES AND TRACE METALS

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY



Base by U. S. Geological Survey, 1956

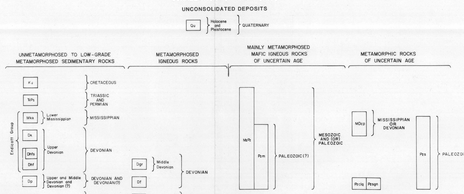
QUADRANGLE LOCATION

SCALE 1:250 000

CONTOUR INTERVAL 200 FEET
DATUM IS MEAN SEA LEVEL

Geology generalized by D.J.Grybeck and S.W.Nelson, 1980. Detailed geologic map published as part of this folio (Nelson and Grybeck, 1980)

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Unconsolidated Deposits

Qs SURFICIAL DEPOSITS, UNDIVIDED

Unmetamorphosed to Low-Grade Metamorphosed Sedimentary Rocks

Ku UNDIVIDED CONGLOMERATE—Quartz-pebble and igneous-rock conglomerate; some interbedded volcanic sandstone

TRPs SHUBLIK AND SIMILKAMEN FORMATIONS (Triassic and Permian)—Predominantly black argillite of Shublik Mountain (Triassic) and black shale and chert of Siksikpuk Formation (Permian)

MISSISSIPPIAN AND DEVONIAN—In map area includes:

MDkk KAYAK SHALE AND KEKIKTUK CONGLOMERATE (Lower Mississippian)—As mapped, unit includes related undifferentiated clastic rocks and a few outcrops of limestone in lower (?) part of Lisburne Group

Dk KANAYUT CONGLOMERATE (Upper Devonian)—Non-marine rusty-weathering quartz sandstone, quartz pebble conglomerate, black carbonaceous and shale. Prominent, resistant layers of black-lichen-covered light-gray quartzite. Rare conglomerate

Dhf HUNT FORK SHALE (Upper Devonian)—Dark-gray phyllite with minor quartz mudstone and sandstone. Upper part includes:

Dhfs Wacker Siltstone Member—Distinctive unit of interbedded rusty-weathering feldspathic sandstone and dark-gray mudstone and shale. Locally includes thin layers of reddish-gray fossiliferous limestone and calcareous sandstone.

Dp GRAY PHYLLITE—Mainly gray, calcareous phyllite and quartz-mica schist. Locally includes layers as thick as 20 m thick. Locally consists of lenses of quartz-pebble conglomerate interbedded with orange-weathering dolomite. Rare layers of dark siliceous phyllite, or siliceous argillite

DSs SKAJIT LIMESTONE (Devonian and Silurian)—Massive white to light-gray granoblastic marble and calcareous quartzite. Rare marble. Some interlayered chlorite schist

Metamorphosed Igneous Rocks

Dgr GNEISSIC GRANITE—Medium- to coarse-grained biotite-muscovite orthogneiss ranging in composition from granite to alkali-feldspar granite. Commonly well-developed augen; locally cataclastically deformed

Df METAFELSITE—Mainly quartz-albite-feldspar schist; locally porphyroblastic muscovite-biotite-quartz-albite-feldspar rocks that retain igneous textures

pMgr GRANITIC GNEISS—Medium-grained porphyroblastic gray biotite-quartz-feldspar schist

Mainly Metamorphosed Mafic Igneous Rocks of Uncertain Age

MMzb MAFIC VOLCANIC ROCKS, PHYLLITE, SANDSTONE, AND CHERT—Consists mainly of interbeds and fault slivers of Devonian(?) to Jurassic pillow basalt, greenstone, and diabase, gray phyllite, wacke sandstone, minor Triassic radiolarian chert, Mississippian radiolarian chert, and Devonian(?) dark-gray limestone. Weakly metamorphosed to unmetamorphosed

Mm MAFIC VOLCANIC AND INTRUSIVE ROCKS—Basalt, greenstone, and altered gabbro. Unmetamorphosed to slightly metamorphosed

Metamorphic Rocks of Uncertain Age

MDcp CALCAREOUS PHYLLITE—Black calcareous phyllite with thin dark-gray limestones

Pzs LOW-GRADE SCHIST—Chlorotoid-bearing quartz-muscovite schist, calcareous quartz-albite-muscovite schist, quartzite, and rare thin limestone beds. Schist locally contains glaucophane

Pzclq CHLORITIC QUARTZITE—Chlorite quartzite and chloritic quartz schist

Pzsgn LOW- TO MEDIUM-GRADE SCHIST AND GNEISS—Interlayered quartz-muscovite schists and orange-weathering gneiss. Medium-grade schist and paragneiss with garnet, biotite, and amphibole near plutons

Contact—Dashed where approximately located; dotted where concealed

Fault—Dashed where approximately located or inferred; dotted where concealed; queried where uncertain

Thrust fault—Dashed where approximately located or inferred; dotted where concealed; queried where uncertain. Sawteeth on upper plate

Location of anomalous rock sample—Map number refers to table 1, and anomalous elements are indicated. Samples generally consisted of grab samples collected to establish geochemical characteristics of a lithologic or stratigraphic unit in which they occur

Location of distinctly anomalous rock sample—Map number refers to table 1, and anomalous elements are indicated. Samples consisted of grab samples, such as described further in Grybeck and Nelson (1980)

INTRODUCTION

In this report we summarize trace-element data from 1,580 rock samples collected in the Survey Pass quadrangle, Alaska, during 1977 and 1978. More specifically, the report establishes the geochemical background for various rock units of the quadrangle and locates anomalous occurrences of these elements. Our work is part of the Survey Pass Alaska Mineral Resource Assessment Program (AMRAP) and follows the sampling strategy outlined in Grybeck (1978). This report is one of several Miscellaneous Investigation Series maps in the MF-1176 series that collectively assess the mineral resources of the Survey Pass quadrangle.

The purposes of this geochemical investigation are:

1) to furnish trace-element background data for interpretation of geochemical exploration samples and samples collected during another part of AMRAP and for interpretation of similar samples that may be collected in the future;

2) to identify the mineralized rocks directly; and

3) to aid in interpretation of the metallogeny of the quadrangle by delineating the trace-element content of the different rock types, to establish geochemical associations of the mineralization, and to suggest possibilities for undiscovered types of mineralization.

Samples for geochemical background were routinely collected at almost all geologic stations; mineralized rocks, where encountered, were sampled only if they were part of a considerable amount of time examining previously known mineral occurrences, in following up stream-sediment and panned-concentrate anomalies, or in areas of favorable host rock environments for mineralization. This sampling work generated a large number of analytical data, which are summarized here or, where anomalous, are shown on the accompanying map and listed in table 1. We emphasize that our work is generally reconnaissance in character and that it does not adequately evaluate any area with respect to sampling or searching for mineral occurrences.

All samples were analyzed for 30 elements by the six-step semiquantitative emission spectrographic method (Grimes and Marranzino, 1968) and for zinc by atomic absorption spectrophotometry (Ward and others, 1969). The analytical data for the 1,580 rock samples summarized in this report will be published in a table similar to table 2 of Grybeck and others (1980) for anomalous rock samples and the analytical results for selected elements. The map shows the locations of anomalous rock samples and of distinctly anomalous rock samples (see below). The sampling of samples collected from known mineral deposits or of other distinctly anomalous samples is described in another report in the series that summarizes the mineral deposits of the Survey Pass quadrangle (Grybeck and Nelson, 1981).

BACKGROUND TRACE ELEMENT CONTENT OF ROCKS

The trace elements contained in rocks of the Survey Pass quadrangle can conveniently be divided into three groups.

In the first group are elements of potential economic significance that occur above the levels of analytical detection and that vary markedly in abundance in the different rock units. These elements are: barium, copper, lead, and zinc (as determined by semiquantitative spectrographic analyses). These four elements are illustrated in a series of histograms (fig. 1) arranged by geochemical rock units.

During fieldwork, the rocks collected for analysis were divided into 17 geochemical rock units correlated with the lithologic units used in mapping. These 17 units have then been consolidated on the basis of similar trace-element content into eight units that have a distinct geographic distribution and related either with the geologic units and explanation used in this report or with combinations of these geologic units. The eight geochemical rock units are listed in table 2.

In the second group are elements of less likely economic significance that occur above the levels of detectability but which vary relatively little in abundance among the different rock units and do not appear to define any economic mineral deposits, and are not generally anomalous in terms of average crustal abundances of the elements that might be expected in the rocks of the Survey Pass quadrangle. These elements are: cobalt, chromium, lanthanum, niobium, nickel, scandium, strontium, vanadium, yttrium, and zirconium. Histograms illustrating the distribution of these elements for the aggregate of all rocks analyzed are shown in figure 2.

In the third group are elements that commonly are associated with mineral deposits but whose detectability by spectrographic analyses is erratic or poor. These elements are: beryllium. These elements are: silver, gold, arsenic, bismuth, cadmium, molybdenum, antimony, tin, tungsten, and (spectrographically determined) zinc.

ANOMALOUS ROCK SAMPLES

Anomalous rock samples as shown on the map and listed in table 1, are defined by the criteria listed in table 3.

The threshold levels for barium, copper, lead, and zinc (as determined by semiquantitative spectrographic analyses) are shown on the histograms in figure 1, combined with consideration of the average crustal abundances of those elements expected in the different geochemical rock units (Following Levinson, 1974). These threshold levels generally fall well above the 95th percentile of the data, except for the geochemical rock units of samples analyzed from the quadrangle. Note that different values are used for zinc as determined by atomic-absorption as compared with semiquantitative spectrographic analyses. The values for the same sample as determined by the two methods generally tend to agree, many exceptions occur that can be attributed to the different techniques of sample preparation during analysis. Zinc values were considered anomalous above the 95th percentile, that is, greater than 200 ppm as determined by semiquantitative and above 300 ppm as determined by spectrographic analysis.

The relatively few samples containing silver, arsenic, bismuth, cadmium, and antimony above the detection limits all contain well above their average crustal abundances. Most such samples are associated with quartz veins that were locally mineralized in the field. Molybdenum and molybdenum commonly are present in detectable amounts, whereas tin and tungsten occur less frequently; these four elements were generally detected only in samples collected at the margins of the granitic orthogneiss bodies or in rocks of the Kayak Shale and Kekiktuk Conglomerate, therefore set somewhat above their detection levels in consideration of the abundances that might be expected in rocks associated with granitic rocks. Gold and beryllium were detected at beryllium threshold levels lower than the values here considered anomalous only reinforces the association of these elements with the peripheries of the plutons.

The elements boron, cobalt, chromium, lanthanum, niobium, nickel, scandium, strontium, vanadium, yttrium, and zirconium are not present in anomalous amounts. The abundances of these elements in the rocks of the Survey Pass quadrangle can be explained by the average crustal abundances of these elements to be expected in the different rock types of the quadrangle.

REFERENCES CITED

Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.

Grybeck, Donald, and Nelson, S. W., 1981, Mineral deposits map of the Survey Pass quadrangle, Brooks Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1176-F, scale 1:250,000.

Levinson, A. A., 1974, Introduction to exploration geochemistry: Calgary, Alberta, Canada, Applied Publications Ltd., 612 p.

Nelson, S. W., and Grybeck, Donald, 1980, Geologic map of the Survey Pass quadrangle, Brooks Range, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-1176-A, scale 1:250,000.

Ward, F. N., Nakagawa, H. M., Harms, T. F., and Vanderloe, G. R., 1969, Atomic-absorption methods of analysis useful in geochemical exploration: U.S. Geological Survey Bulletin 1289, 45 p.

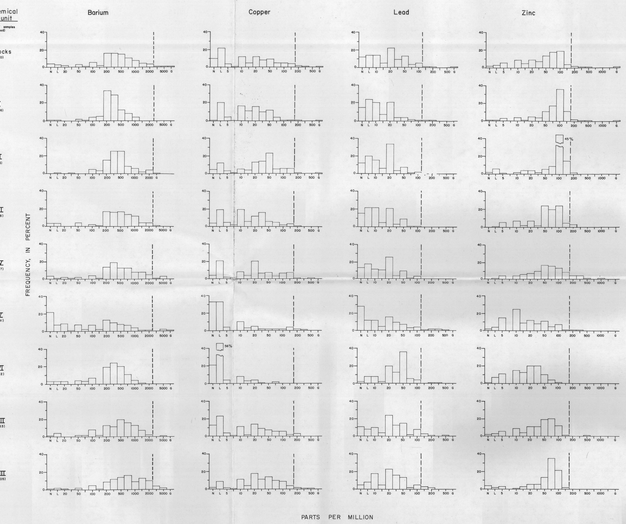


Figure 1.—Frequencies of barium, copper, lead, and zinc in rock geochemical units of the Survey Pass quadrangle, Alaska. All analyses by atomic absorption. Histograms reported to nearest value in series 1, 2, 5, 10, 15, 20, 30, 50, 70, 100, which represent approximate midpoints of group data on a geometric scale. R, looked for but not found; L, amount of element present is greater than next lower value. Values for each element, N, semiquantitative spectrographic analyses; A, atomic-absorption analyses. Vertical dashed line for each element, N, semiquantitative spectrographic analyses by K. F. Cooley; atomic-absorption analyses by R. M. O'Leary.

Table 1.—Analytical data for selected metallic and associated elements in anomalous rock samples of the Survey Pass quadrangle, Alaska

[All values in parts per million. The criteria used to determine threshold of anomaly are listed in table 3, and analytical methods used are discussed in text. Samples analyzed by semiquantitative spectrographic analysis are reported to nearest value in series 1, 0.7, 0.5, 0.3, 0.2, 0.1, 0.07, 0.05, 0.03, 0.02, 0.01, which represent approximate midpoints of group data on a geometric scale. Values for each element, N, semiquantitative spectrographic analyses; A, atomic-absorption analyses. Vertical dashed line for each element, N, semiquantitative spectrographic analyses by K. F. Cooley; atomic-absorption analyses by R. M. O'Leary.]

Map no.	Field no.	Ag (0.5)	Ag (200)	Ba (20)	Be (1)	Bi (10)	Cu (5)	Mo (5)	Pb (10)	Sb (100)	Sn (20)	W (5)	Zn (200)	Zn (5)	Description
		Semiquantitative spectrographic analyses (ppm)												Atomic absorption analyses (ppm)	
1	77WP570B	N	N	500	1.0	N	5	N	N	N	N	N	200	250	Limonitic metasandstone
2	77WP601A	N	N	700	<1.0	N	<5	N	N	N	N	N	<200	150	Limonite gossan
3	77WD619B	N	N	100	2.0	N	50	N	<10	N	N	N	300	45	Hematitic jasper in black shale
4	78WD684A	70.0	N	70	<1.0	N	100	N	1,200	600	N	N	300	5	Floats; quartz stockworks containing galena
5	78WD693A	30.0	N	150	<1.0	N	70	N	5,000	100	N	N	200	100	Floats; quartz stockworks containing galena
6	78WD693B	7.0	N	200	<1.0	N	100	N	1,500	200	N	N	200	100	Floats; quartz stockworks containing galena
7	78WD632B	7.0	N	50	<1.0	N	50	N	300	70	N	N	200	600	Floats; black silicified shale
8	78WD632C	3.0	N	200	<1.0	N	50	N	500	200	N	N	200	500	Floats; black argillite cemented by brecciated argillite cemented by quartz and sphalerite
9	78WD230A	N	N	300	1.0	N	50	N	20	N	N	N	N	120	Slaty phyllite
10	78WD231C	10.0	N	200	<1.0	N	20,000	N	200	N	N	N	N	200	Quartz vein containing 10 percent chalcopyrite
10	78WD230A	2.0	N	2,000	<1.0	N	300	N	5,000	N	N	N	10,000	13,000	Floats; quartz boulder containing; epidote
10	78WD230B	100.0	100.0	500	<1.0	N	20,000	100	5,000	N	N	N	7,000	30	Floats; quartz and galena cementing brecciated black shale
10	78WD230D	5.0	N	150	<1.0	N	10,000	N	50	N	N	N	N	7,200	Floats; quartz boulder containing about 15 percent chalcopyrite
11	78WD230C	5.0	N	200	<1.0	N	1,500	N	50	N	N	N	N	5	Rusty quartz sandstone
11	77WD204A	1.0	N	300	1.0	N	50	N	20	N	N	N	N	100	Dark-gray sandstone
12	77WD191A	N	N	200	<1.0	N	30	N	20	N	N	N	<200	100	Dark-gray semilustr
13	77WD192A	N	N	500	<1.0	N	100	N	20	N	N	N	300	140	Black slate; boulder containing epidote
14	77WD321A	3.0	N	<20	<1.0	N	<5	N	N	N	N	N	200	45	Gray quartzite
15	77WD337B	N	N	500	1.0	N	5	N	<10	N	N	N	500	100	Sandstone
16	77WD221B	N	N	150	1.0	N	20	N	20	N	N	N	300	100	Quartz-pebble conglomerate
17	77WD124C	5.0	N	1,000	1.0	N	1,500	N	N	N	N	N	N	55	Copper-stained phyllite
18	77WD206A	2.0	N	<20	N	N	10	N	10	N	N	N	200	500	Copper-stained phyllite
19	77WD175A	1.0	N	200	<1.0	N	10	N	<10	N	N	N	300	200	Quartz stockwork
20	77WD164A	1.0	N	1,000	1.0	N	20	N	20	N	N	N	300	140	Shaly siltstone
21	77WD161A	N	N	700	1.0	N	50	N	20	N	N	N	300	240	Black phyllite
22	77WD179A	5	N	700	1.0	N	5	15	10	N	N	N	N	10	Black phyllite
23	77WD164B	5.0	N	5,000	2.0	N	150	N	500	N	N	N	300	300	Black slate
24	78WD148A	2.0	N	200	<1.0	N	700	N	150	N	70	N	500	440	Floats; quartz vein with copper staining
25	78WD588A	1.0	N	1,500	2.0	N	300	N	300	N	N	N	300	70	Calcareous black phyllite
26	78WD780A	2.0	N	1,500	1.0	N	150	10	10	N	N	N	500	300	Calcareous black phyllite
27	78WD508A	1.0	N	1,500	1.0	N	20	N	20	N	N	N	1,200	360	Black shale
27	78WD638A	2.0	N	150	N	N	20	N	20	N	N	N	500	220	Black shale
28	78WD638B	3.0	N	150	N	N	20	N	20	N	N	N	300	70	Muscovite phyllite
29	78WD587B	1.0	300	500	1.0	N	50	N	<10	300	N	N	N	5	Muscovite pyrite altering to limonite
30	78WD638B	N	N	2,000	1.5	N	20	70	<10	N	N	N	N	10	Black siliceous semischist
31	78WD840C	N	N	20	<1.0	N	500	N	10	N	N	N	200	45	Greenish-gray phyllite with siderite bands
32	77WD240B	N	N	300	1.0	N	500	N	20	N	N	N	N	440	Gray phyllite
33	77WD240A	N	N	700	2.0	N	70	N	20	N	N	N	500	500	Chlorite-muscovite schist
34	78WD999B	N	N	300	<1.0	N	10	N	20	N	N	N	500	500	Hornblende skarn containing minor molybdenite, chalcopyrite, and arsenopyrite
35	77WD127C	N	70	300	1.0	N	20	N	300	N	500	N	500	120	Float magnetite
35	77WD128C	N	N	20,000	100	N	20	N	300	N	1,000	N	<200	200	Float, garnet-magnetite skarn
35	77WD128A	2.0	N	<1,000	1.0	N	15	50	N	N	N	N	500	300	Quartz-calcite vein containing fluorite, chalcopyrite, and sphalerite
36	77WD248A	1.0	N	1,500	<1.0	N	300	N	20	N	N	N	300	300	Garnet-epidote skarn
36	78WD644C	3.0	N	1,000	<1.0	N	500	70	20	N	50	N	300	300	Garnet-quartz-epidote skarn
37	77WD124A	3.0	N	3,000	1.0	N	20	70	15	N	N	N	1,000	320	Altered marble containing disseminated pyrrhotite
37	77WD141A	N	N	200	N	N	15	N	N	N	N	N	200	200	White quartz vein in black phyllite
37	77WD142A	N	N	500	N	N	20	N	N	N	N	N	300	270	Altered zone in interbedded phyllite and limestone
37	77WD181A	30.0	N	500	1.0	<5	3,000	100	500	N	100	N	>10,000	31,000	White quartz vein containing minor galena in black phyllite
39	77WD146A	2.0	N	1,500	1.0	N	150	70	15	N	N	N	300	200	Normfaulted phyllite
39	78WD146A	3.0	N	500	N	70	100	<10	N	500	N	300	300	120	Graphitic muscovite schist containing minor pyrite
39	78WD146C	<.5	N	7,000	10.0	<10	N	200	N	500	N	500	300	20	Black layer in marble
39	78WD146D	N	N	5,000	100.0	150	200	N	500	N	N	N	300	300	Quartz-muscovite-garnet skarn with copper staining and arsenopyrite
40	78WD838A	N	N	1,500	2.0	N	70	N	300	N	N	N	300	110	Pyrite-limonite altered gray phyllite
41	77WD188A	N	N	500	N	70	50	N	N	N	N	N	300	5	Black slate
41	77WD188B	3.0	N	200	N	N	200	N	N	100	N	N	N	N	Graphitic muscovite schist
42	78WD788A	1.0	N	300	<1.0	N	300	70	300	N	N	N	300	200	Muscovite-quartz schist
43	78WD188A	10.0	1,500	200	<1.0	50	7,000	N	20	N	20	N	1,500	7,000	Quartz-muscovite schist
44	78WD188C	N	N	500	1.0	N	20	N	20	N	N	N	300	300	Chlorite-muscovite schist
45	78WD188D	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
46	78WD188E	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
47	78WD188F	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
48	78WD188G	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
49	78WD188H	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
50	78WD188I	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
51	78WD188J	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
52	78WD188K	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
53	78WD188L	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
54	78WD188M	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
55	78WD188N	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
56	78WD188O	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
57	78WD188P	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
58	78WD188Q	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
59	78WD188R	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
60	78WD188S	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
61	78WD188T	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
62	78WD188U	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
63	78WD188V	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
64	78WD188W	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
65	78WD188X	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
66	78WD188Y	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
67	78WD188Z	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
68	78WD188AA	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
69	78WD188AB	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
70	78WD188AC	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
71	78WD188AD	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
72	78WD188AE	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
73	78WD188AF	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
74	78WD188AG	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
75	78WD188AH	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
76	78WD188AI	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
77	78WD188AJ	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
78	78WD188AK	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
79	78WD188AL	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
80	78WD188AM	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
81	78WD188AN	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
82	78WD188AO	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
83	78WD188AP	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
84	78WD188AQ	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
85	78WD188AR	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
86	78WD188AS	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
87	78WD188AT	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
88	78WD188AU	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
89	78WD188AV	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
90	78WD188AW	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
91	78WD188AX	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
92	78WD188AY	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
93	78WD188AZ	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
94	78WD188BA	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
95	78WD188BB	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
96	78WD188BC	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
97	78WD188BD	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
98	78WD188BE	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
99	78WD188BF	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
100	78WD188BG	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
101	78WD188BH	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
102	78WD188BI	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
103	78WD188BJ	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
104	78WD188BK	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
105	78WD188BL	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
106	78WD188BM	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
107	78WD188BN	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
108	78WD188BO	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
109	78WD188BP	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
110	78WD188BQ	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
111	78WD188BR	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
112	78WD188BS	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
113	78WD188BT	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
114	78WD188BU	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
115	78WD188BV	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
116	78WD188BW	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
117	78WD188BX	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
118	78WD188BY	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
119	78WD188BZ	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
120	78WD188CA	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
121	78WD188CB	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
122	78WD188CC	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
123	78WD188CD	N	N	500	N	N	20	N	20	N	N	N	300	300	Muscovite-quartz schist
124	78WD206A	N	N	1,500	2.0	N	20	N	150	N	N	N	<200	60	Muscovite-quartz schist
125	78WD206B	N	N	1,500	1.0	N	200	N	50	N	N	N	<200	2,400	Magnetite-quartz felsic schist
126	78WD208B	N	N	1,500	2.0	N	20	N	50	N	N	N	300	440	Metatuffite
127	78WD208C	N	N	1,500	2.0	N	500	N	50	N	N	N	<200	300	Muscovite-quartz schist
128	78WD208D	N	N	1,500	2.0	N	200	N	50	100	N	N	<200	200	Copper-stained muscovite-quartz schist
129	78WD208E	N	N	1,500	1.0	N	20	N	50	N	N	N	<200	200	Felsic schist
130	78WD208F	N	N	1,500	1.0	N	15	N	200	N	N	N	<200	5	Felsic phyllitic schist
131	78WD208G	N	N	2,000	2.0	N	<5	N	150	N	N	N	<200	95	Muscovite-quartz schist
132	78WD208H	N	N	1,500	1.0	N	20	N	100	N	N	N	<200	95	Muscovite-quartz schist
133	78WD208I	N	N	1,500	1.0	N	20	N	100	N	N	N	N	30	Micaceous quartzite