

U.S. Department of the Interior
U.S. Geological Survey

Digital Release of Stream-Sediment, Heavy-Mineral-Concentrate,
Soil, and Other Geochemical Data Collected in the
Big Delta 1° x 3° Quadrangle, Alaska

By
S.L. George

PROPERTY OF
DGGG LIBRARY

Open-File Report 95-627

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Any use of trade names is for descriptive purposes only and does not imply endorsement by the U.S. Geological Survey.

U.S. Geological Survey, DFC, Box 25046, MS 973, Denver, CO 80225

1995

DISCLAIMER

This diskette publication was prepared by an agency of the United States Government. Neither the United States Government nor any agency thereof nor any of their employees makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed in this report or represents that its use would not infringe privately owned rights. Reference therein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. Any views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Although all data and software published on this diskette have been used by the U.S. Geological Survey, no warranty, expressed or implied, is made by the U.S. Geological Survey as to the accuracy of the data and related materials and/or the functioning of the software. The sample description and geologic codes reported in the data files reflect the subjective judgement of the individual sample submitters. Therefore the codes were not necessarily reported consistently and some records are more completely coded than others. The data in these files conform with data found in the NGDB as of August 1995. Further studies and information may add or correct data records for this quadrangle dataset in the NGDB.

INTRODUCTION

The historic geochemical data presented here were compiled from the Rock Analysis Storage System (RASS) of the U.S. Geological Survey National Geochemical Database (NGDB). The RASS database consists of multi-element chemical and spectrographic analyses for approximately 700,000 geochemical samples collected from the mid-1960's to the late 1980's.

Reconnaissance geochemical sampling and analysis was conducted in the Big Delta quadrangle in the 1970's as part of the Alaska Mineral Resource Assessment Program (AMRAP). Although collected primarily for mineral resource studies, these geochemical data may be useful for environmental or other mineral resource studies in the region. The purpose of this report is to release these data in a more modern, easy-to-use format. While compiling the data for this report, sample coding and geochemical data were inspected and gross errors were corrected. Most of the chemical data included in this report were previously published in hard-copy format, generally without the sample coding information provided here. The analytical data in this report includes data previously released as an open-file report (O'Leary and others, 1978), as well as previously unpublished data residing within the NGDB.

The Big Delta quadrangle is bounded by latitude 64° N to 65° N and longitude 144° W to 147° W. The analytical results for 1,195 stream-sediment, 546 heavy-mineral-concentrate, 611 organic, and 3 soil samples are given in this report. The data files included on this diskette are separated by sample media type. All data files are in dBase III .dbf format. The first two letters of the filename refer to the quadrangle. Letters following the underscore refer to sample media: CONC, heavy-mineral concentrates, SED, stream sediments, SOIL, soils, and ORG, organic samples.

METHODS OF STUDY

Sample Media

The chemical composition of stream-sediment samples reflects the overall chemistry of rocks contained within the drainage basins. Such information is useful in identifying those basins which contain concentrations of elements that may be related to mineral deposits. Soil samples also reflect the chemistry of underlying rocks, but are more areally restricted.

Heavy-mineral concentrates from stream sediment are selectively enriched in certain minerals, including many that may be ore-related. This concentration process permits detection of some elements that are not easily or reliably detected in bulk stream sediment.

Organic sample media generally refer to vegetation samples collected from specimens growing in the flood plains of a stream or river. These samples were usually collected at or near a corresponding stream-sediment or heavy-mineral-concentrate sample locality. Organic sample media for the Big Delta quadrangle include willow leaves and peat material.

Sample Collection

Stream sediments and heavy-mineral concentrates were obtained from active stream channels. Stream-sediment samples range in size from fine sand and silt to coarse sand. Heavy-mineral concentrates were obtained by panning a bulk stream sediment sample to remove the majority of light minerals. No details are available for the soils and organic samples collected.

Sample Preparation

Stream-sediment samples were sieved through an 80-mesh (0.17 mm) sieve. The minus-80-mesh fraction was saved for analysis.

Many of the stream-sediment samples were prepared with an oxalic-acid leaching technique. The secondary iron and manganese oxides coating stream-sediment grains are scavenging agents that concentrate elements leached from bedrock and colluvium and migrating as free ions in solution. The oxide components are extracted from the minus-80-mesh fraction using a weak, hot oxalic-acid solution (Alminas and Mosier, 1976).

The panned heavy-mineral-concentrate samples were sieved through a 20-mesh (0.8 mm) screen in the laboratory, then further separated with bromoform (specific gravity, 2.86) to remove the remaining light minerals. Following heavy-liquid separation, magnetite and other strongly magnetic minerals were removed from the heavy-mineral fraction by use of a hand magnet and a Frantz isodynamic magnetic separator set at 0.2 ampere and saved for analysis. The remaining fraction was again sent through the Frantz separator at a setting of 0.6 amperes and the non-magnetic fraction was retained for analysis.

The willow leaves and peat material samples initially were air dried in cloth bags, then pulverized in a blender and ashed in a muffle furnace at a peak temperature of 500° C. The ash was saved for analysis.

Sample Analysis

Stream sediments were analyzed using a semiquantitative, direct-current arc emission spectrographic method (Grimes and Marranzino, 1968). Spectrographic results were determined by visually comparing spectra derived from the sample against spectra obtained from laboratory reference standards. Standard concentrations are geometrically spaced over any given order of magnitude of concentration such that values reported for each sample are reported in the geometric sequence 10, 15, 20, 30, 50, 70, 100 etc. The precision of the Grimes and Marranzino (1968) method is plus or minus one reporting interval at 83 percent, or two intervals at 96 percent confidence (Motooka and Grimes, 1976). The elements analyzed and their nominal limits of determination are listed in Table 1. Selected stream-sediment samples were analyzed for gold, copper, lead, and zinc by atomic-absorption methods (Ward and others, 1969). Mercury was determined by a mercury-vapor detector developed by Vaughn and McCarthy (1964). The lower limits of determination for these elements in parts per million (ppm) are: gold, 0.05; copper, 5; lead, 5; zinc, 5; and mercury, 0.02.

Heavy-mineral concentrates were analyzed by the Grimes and Marranzino (1968) emission spectrographic procedure as described above, with the following modification: to eliminate the spectral interferences caused by high concentrations of iron, 5 mg of prepared sample was used instead of 10 mg, thus raising the lower limit of determination by two steps (Table 1).

The ashed willow leaves were analyzed by a semiquantitative, direct-current arc emission spectrographic method developed by Mosier (1972) for the analysis of plant ash.

DESCRIPTION OF DATA

Sample description, geologic, and analytical data are presented in each of the sample media files. Sample site locations are given as latitude and longitude both in decimal degree and degree-minute-second formats in the tables. The following list summarizes table structure and sample description column headings. For table structures, "A8" refers to an alphanumeric format eight characters wide, while "N" indicates a numeric column format. Sample description code explanations are listed in Appendix A.

Table Structure	Column Identifier	Description
A6	Jobnum	assigned laboratory job number
A7	Labnum	assigned sample laboratory number
A8	Fieldnum	sample field identification number
A8	Date_sub	date sample submitted to laboratory
A20	Submitter	submitter name
A20	Subm2	secondary submitter name
A9	Lat_dms	latitude in degree-minute-second
A11	Lon_dms	longitude in degree-minute-second
N	D_lat	latitude in decimal degrees
N	D_lon	longitude in decimal degrees
A2	LL_precis	latitude/longitude precision
A1	St	type of sample media
A1	Mc	method sample collected
A1	Sc	sample source
A1	Rt	rock type
A1	Ss	structural setting
A1	M	matrix
A1	Os	oxidation state
A1	A	alteration
A1	Om	ore minerals
A1	Mdf	mineral deposit form
A1	Ga	geologic age
A2	Ms	mesh/sieve code
A2	Sd	additional sample description information
A2	Sd3	additional sample description information
A2	Sd4	additional sample description information
A2	Sd5	additional sample description information
A2	Sp1	sample lab preparation information
A2	Sp2	sample lab preparation information
A2	Sp3	sample lab preparation information
A2	Ft	field treatment
A2	Cm	lab/submitter comments

Chemical data follows the above sample description information in the data files. The chemical data are accurate to two significant digits. Trailing zeros are nonsignificant. Columns in which the element headings contain the prefix "S" represent emission-spectrographic data; the prefix "Aa" indicates atomic absorption analyses; and "Inst" indicates instrumental method (mercury detector). The suffix "p" indicates a partial digestion and "sw" indicates sample weight in grams. The results for all elements are reported in parts per million (ppm) except for iron, magnesium, calcium, titanium, and sodium, which are given in percent (pct). Definitions of the qualifier codes used in the tables are as follows: B, sample not analyzed for this element; N, not detected at the specified level of detection; L, detected, but below the specified limit of determination; G, greater than the specified upper limit of determination; and H, values not determined due to interference.

REFERENCES CITED

- Alminas, H.V., and Mosier, E.L., 1976, Oxalic acid leaching of rock, soil, and stream-sediment samples as an anomaly-accentuation technique: U.S. Geological Survey Open-File Report 76-275.
- Grimes, D.J., and Marranzino, A.P., 1968, Direct-current arc and alternating current spark emission spectrographic field methods for the semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.
- Mosier, E.L., 1972, A method for semiquantitative spectrographic analysis of plant ash for use in biochemical and environmental studies: Applied Spectroscopy, v. 26, no. 6, p. 636-641.
- Motooka, J.M., and Grimes, D.J., 1976, Analytical precision of one-sixth order semiquantitative spectrographic analysis: U.S. Geological Survey Circular 738, 25 p.
- O'Leary, R.M., Cooley, E.F., Day, G.W., Hessin, T.D., McDougal, C.M., McDanal, S.K., and Clark, A.L., 1978, Spectrographic and chemical analyses of geochemical samples from the Big Delta quadrangle, Alaska: U.S. Geological Survey Open-File Report 78-571, 127 p.
- Vaughn, W.W., and McCarthy, J.H., Jr., 1964, An instrumental technique for the determination of submicrogram concentrations of mercury in soils, rocks, and gas, in Geological Survey research 1964: U.S. Geological Survey Professional Paper 501-D, p. D123-D127.
- Ward, F.N., Nakagawa, H.M., Harms, T.F., and Van Sickle, G.H., 1969, Atomic-absorption methods of analysis useful in geochemical exploration: U.S. Geological Survey Bulletin 1289, 45 p.

Table 1.--Limits of determination for Emission Spectrographic Analysis
Numbers in () were limits before 1988

Elements	Sediments		Concentrates	
	Lower limit	Upper limit	Lower limit	Upper limit
Percent				
Iron (Fe)	.05	20	.1	50
Magnesium (Mg)	.02	10	.05	20
Calcium (Ca)	.05	20	.1	50
Sodium (Na)	.2	5	.5	10
Titanium (Ti)	.002	1	.005	2
Phosphorus (P)	.2	5	.5	10
Parts per million				
Silver (Ag)	.5	5,000	1.0	10,000
Arsenic (As)	200	10,000	500	20,000
Gold (Au)	10	500	20	1,000
Boron (B)	10	2,000	20	5,000
Barium (Ba)	20	5,000	50	10,000
Beryllium (Be)	1	1,000	2	2,000
Bismuth (Bi)	10	1,000	20	2,000
Cadmium (Cd)	20	500	50	1,000
Cobalt (Co)	(5) 10	2,000	(10) 20	5,000
Chromium (Cr)	(5) 10	5,000	(10) 20	10,000
Copper (Cu)	5	20,000	10	50,000
Gallium (Ga)	5	500	10	1,000
Germanium (Ge)	10	100	20	200
Indium (In)	2	--	--	--
Lanthanum (La)	(20) 50	1,000	(50) 100	2,000
Lithium (Li)	200	--	--	--
Manganese (Mn)	10	5,000	20	10,000
Molybdenum (Mo)	5	2,000	10	5,000
Niobium (Nb)	(10) 20	2,000	(20) 50	5,000
Nickel (Ni)	5	5,000	10	10,000
Lead (Pb)	10	20,000	20	50,000
Palladium (Pd)	--	--	5	1,000
Platinum (Pt)	--	--	20	1,000
Antimony (Sb)	100	10,000	200	20,000
Scandium (Sc)	5	100	10	200
Tin (Sn)	10	1,000	20	2,000
Strontium (Sr)	100	5,000	200	10,000
Thorium (Th)	100	2,000	200	5,000
Thallium (Tl)	2	--	--	--
Vanadium (V)	10	10,000	20	20,000
Tungsten (W)	(50) 20	10,000	(100) 50	20,000
Yttrium (Y)	10	2,000	20	5,000
Zinc (Zn)	200	10,000	500	20,000
Zirconium (Zr)	10	1,000	20	2,000

APPENDIX A
Explanation of sample description codes

Sample Type (St)	Structural setting (Ss)
A rock	A fracture/joint
B unconsolidated sediment	B shear or fault
C organic material	C other
D soil	
E water	Matrix (M)
F other	A silica
G gas	B fe/mn
	C carbonate
Method collected (Mc)	D clay
A single (grab)	E other
B composite	
C channel	Oxidation state (Os)
D other	A oxidized
	B partially oxidized
Sample source (Sc)	C unoxidized
A outcrop	
B mine	Alteration (A)
C dump or prospect pit	A propylitic
D float	B argillitic
E drill hole, well	C siliceous
F marine	D sericitic
G other	E feldspathic
H stream	F other
I spring	G zeolitic
J lake	H iron/manganese
K aquaduct, canal, irr. ditch	I supergene
L atmosphere	
	Ore minerals (Om)
Rock type (Rt)	A base metals
A unidentified rock	B precious metals
B sedimentary rock	C mixed base and precious metals
C metamorphic rock	D other
D igneous rock	E radioactive
E unconsolidated sediment	F rare earths
F conglomerate	
G sandstone	Mineral deposit form (Mdf)
H siltstone	A vein
I claystone	B replacement
J shale	C disseminated
K limestone or dolomite	D other
L carbonate	E magmatic segregation
M gneiss	F carbonatite
N schist	G greisen
O quartzite	H pegmatite
P marble	I contact metamorphic
Q skarn	J porphyry/stockwork
R phyllite or slate	K massive sulfide
S felsic igneous	L lithophile metals in volcanic rocks
T intermediate igneous	M stratiform
U mafic igneous	N sandstone uranium
V ultramafic igneous	O chemical sediments
W feldspathoidal	P hot springs
X chert or jasperoid	Q placer
Y other	R residual

Geologic age of sample (Ga)

A Precambrian undifferentiated
 B Early Precambrian
 C Middle Precambrian
 D Late Precambrian
 E Paleozoic undifferentiated
 F Cambrian
 G Ordovician
 H Silurian
 I Devonian
 J Mississippian
 K Pennsylvanian
 L Permian
 M Mesozoic undifferentiated
 N Triassic
 P Jurassic
 Q Cretaceous
 R Tertiary undifferentiated
 S Paleocene
 T Eocene
 U Oligocene
 V Miocene
 W Pliocene
 X Quaternary undifferentiated
 Y Pleistocene
 Z Holocene

Mesh/sieve fraction (Ms)

A unknown, assumed to be -80 mesh
 B identified as -80 mesh
 C identified as -100 mesh
 D identified as -120 mesh
 E identified as -150 mesh
 F identified as -200 mesh
 G identified as -60 mesh
 H identified as -40 mesh
 I identified as -35 mesh
 J identified as -30 mesh
 K identified as -24 mesh
 L identified as -20 mesh
 M identified as -30+80 mesh

Sample description (Sd)

AL alluvium
 AS ash
 CL clay
 CV colluvium
 C pan or artificial concentrate
 C1 concentrate, high magnetic fraction
 C2 concentrate, moderate magnetic fraction
 C3 concentrate, low or non-magnetic fraction
 GV gravel
 GT grit
 HS heavy sand
 LO loess
 MD mud
 OZ ooze
 SN sand
 SD stream sediment
 SI silt
 TI till

Sample description (Sd3)

AN animal parts
 CS combined split of
 heavy-mineral-
 concentrate
 DM detrital magnetites
 MS splits of magnetites
 NS non-magnetic splits
 from heavy-mineral-
 concentrate
 OA oxalic acid leachate
 VG vegetation

Sample description (Sd4)

GD glacial debris
 MT moss-trap-sediment sample
 PT peat material
 SP spruce

Sample description (Sd5)

MI mill tailings
 MT moose pellets
 WL willow leaves

Sample preparation (Sp1)

AD ashed
 BR bromoform
 GR ground

Sample preparation (Sp2)

FR Frantz isodynamic separator
 PV pulverized

Sample preparation (Sp3)

FS fire assay PGE
HG hand ground
HM separated by hand magnet
RT split into red tops

Lab/submitter comments (Cm)

HG high organic content
RS rock/soil survey
VG visible gold

Field treatment (Ft)

A air-dried
B sieved
C panned concentrate
D washed
E other

Lat/lon precision (LL_precis)

A apparently accurate to nearest
second
B apparently accurate to nearest
minute
C apparently accurate to nearest
degree