FIELD REPORT ON EXPLORATION FOR MANGANESE IN THE EAST FORK HILLS, CENTRAL ALASKA

by

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DEPARTMENT OF THE INTERIOR

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INTRODUCTION

The U.S. Bureau of Mines, possibly in conjunction with the U.S. Geological Survey (USGS), discovered the Egries prospect sometime in 1961. R. P. Maloney, formerly with the Bureau, submitted several samples for analysis from this prospect in July, 1961. The analytical sheets from the Bureau's Juneau field office are included as an appendix to this report. The origin of the name Eqries is unknown and has not been used in MAS listings.

The Fairbanks Section of the Alaska Field Office Center (AFOC) - Anchorage Branch, reinvestigated the Egries occurrence during July 2-5, 1990 as part of an emerging effort to assess the manganese resource potential of Alaska. The Egries prospect investigation consisted of sampling and mapping the manganese occurrence, a VLF-EM survey to track pyritic members of the sedimentary rocks, local reconnaissance stream sediment and rock sampling, and collection of a small bulk sample of the pyritic chert-pebble conglomerate material and the Fe-Mn carbonate nodule material.

The East Fork Hills portion of this investigation stemmed from a USGS report (Patton and others (1)) that correlated the sedimentary rocks of the Egries prospect with the rock units that underlie the East Fork Hills located twenty nine miles in an east northeast direction. The current investigation was conducted by two Bureau personnel during the period July 21-23, 1990. The project was cut short and somewhat hampered by raging forest fires located less than 10 miles to the southeast at that time. The East Fork Hills are heavily vegetated. Therefore the investigation was largely limited to collecting stream sediment samples.

LOCATION AND ACCESS

The Egries manganese deposit is located in an outcrop bluff along the north bank of the Kuskokwim River and 4.4 miles, bearing S47°W, from the village of Medfra, Alaska (fig. 1). The USGS quadrangle map Medfra A-4 covers this area. The prospect was accessed by river boat from the village of McGrath with the aid of Jack Whitham, wildlife biologist with the State of Alaska Division of Fish and Game. The prospect could also be accessed by float plane.

The East Fork Hills are located approximately 24 miles east northeast of the village of Medfra in the Medfra A-2 and B-2 quadrangles. Access to a base camp in the central portion of the East Fork Hills was accomplished using a USGS Cadastral Survey helicopter stationed out of McGrath.

PHYSIOGRAPHY

The Egries prospect lies along the southeastern limit of a set of hills with subdued topography. To the southeast the terrain consists of swamps, lakes and abandoned oxbow channels of

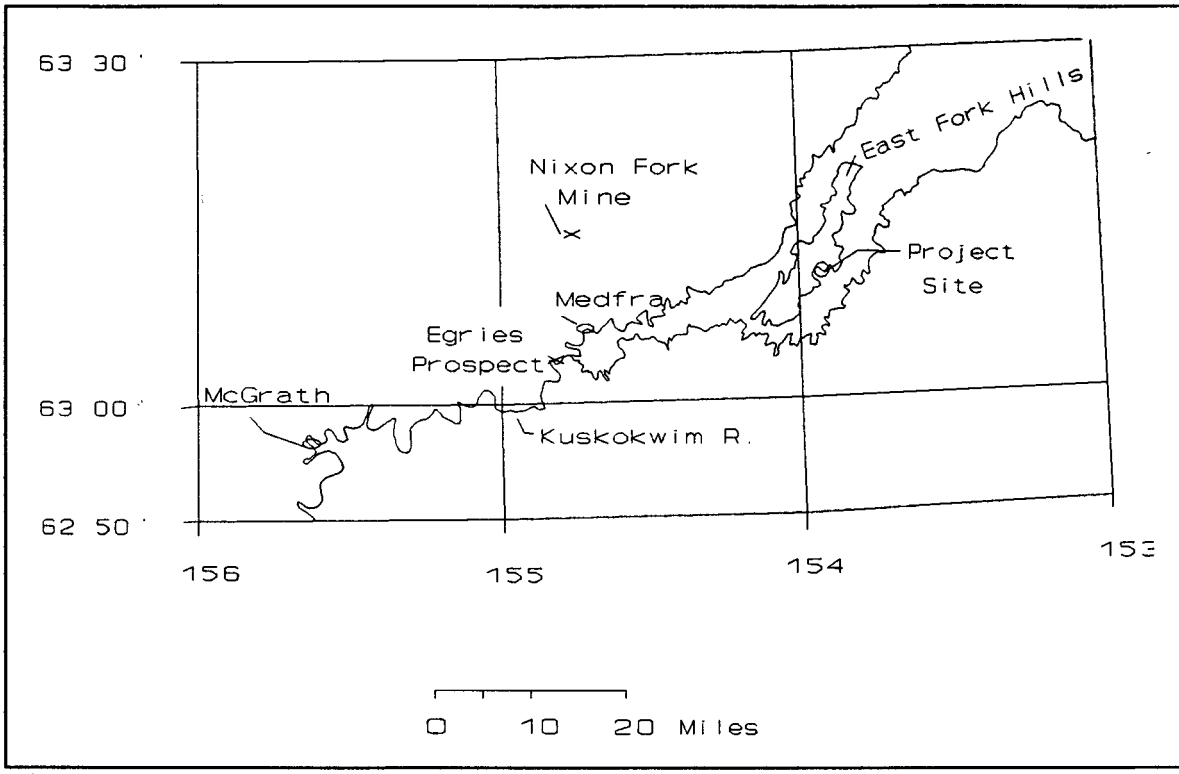

Figure 1. --Location of the Egries prospect and the East Fork Hills project site.

the Kuskokwim River system.

The East Fork Hills consist of a northeast oriented and elongate (25 miles) set of hills which rise up to 1000 feet above East and North Forks of the Kuskokwim River valleys. These river valleys and associated swamps border the hills to the northwest and southeast respectively.

GEOLOGY

Patton and others (1) place the rocks within the Egries prospect and the East Fork Hills within the East Fork subterrane of the Minchumina terrane. The subterrane has been assigned an Early Ordovician to Middle Devonian age and consists entirely of the East Fork Hills formation. Dutro and Patton (2) describe the East Fork Hills formation as " a succession of alternating thin beds of limestone and dolomite that is locally sheared and foliated" with "subordinate amounts of dolomite, dark chert and siliceous siltstone." This subterrane is juxtaposed with the Nixon Fork terrane along a northeast-oriented fault located less than 5 miles to the northwest of the Egries prospect. The Nixon Fork terrane is composed of three stratigraphic packages; 1) Precambrian metamorphic rocks, 2) Early Ordivician to Late Devonian platform carbonate formations and 3) Permian to Early Cretaceous terrigenous, shallow marine sedimentary rocks (1).

Bundtzen and Gilbert (3) include the rocks of the East Fork

Hills and the Egries prospect in Middle (?) to Late Devonian lagoonal to restricted platform environment of marine Cambro-Ordovician to Middle Devonian deep-water Dillinger assemblage rocks.

Egries Prospect

The manganese mineralization at the Egries deposit occurs in cryptocrystalline iron and manganese-rich carbonate (Mn-carbonate) lenses and nodules intercalated within a sequence of carbonate-bearing shale and siltstone. The lens material does not exceed 1 foot in thickness and the nodular occurrences were generally less than six inches in diameter. Since the strata have been severely deformed, carbonate lenses appear dismembered and the nodular material observed in outcrop may be more accurately called mechanically rounded fragments. Due to the deformation and the paucity of outcrop exposure it is impossible to estimate the lateral extent of these manganiferous horizons. At the prospect site Mn-carbonate material was distributed to either side of a section of deformed and tightly jointed, thinly bedded siliceous siltstone (fig. 2). On the upstream side of the siliceous siltstone (east) Mn-carbonate nodules can be plucked from decomposed shales and occur in abundance at the rivers edge. To the west of the siliceous siltstone unit Mn-carbonate material is similarly distributed. However, the far western side of the outcrop contains a lens of pyritic, Fe-claystone, chert-pebble conglomerate approximately one foot thick that is intercalated within otherwise carbonate-bearing, thinly bedded, siltstone and shales. Mn-carbonate material was not found associated with this strata. Like the Mn-carbonate material, the conglomerate lens was also highly dismembered. The carbonates have a high specific gravity due to contained metal and therefore cobble-sized fragments form lag deposits at the rivers edge.

Other than Mn-nodules or pyritic chert-pebble conglomerate layers the samples collected for whole rock analysis usually included several lithologies. Major oxide analysis was performed as an accurate and inexpensive way to collect the broadest amount of information regarding elements of major significance such as phosphate, iron, manganese and sulfur. Overall, low manganese contents were obtained from chip samples collected from across most types of lithology. The highest manganese contents collected in any of the chip samples (3.28% Mn, sample KS27677, table 1) included recognizable layers of manganese nodules. Select specimens of dense nodular carbonate material varied considerably in mineral content. Data in table 1 show that high P_2O_5 values (8.16% P_2O_5) were obtained in a sample initially described as a manganese carbonate nodule with black glassy 'shards' speckled throughout. This sample (KS27798) contains 11.8% CaO, 15.5% Fe_2O_3 and only 2.05% MnO. Nearly all of the samples collected for whole rock analyses contain higher than average phosphate concentrations (0.07% P for shales (4)). The mean phosphate content of the Egries prospect chip samples is

Table 1. --Major oxide analyses for sedimentary and mineralized rocks.

Sample Number	KS27673	KS27674	KS27675	KS27676	KS27677	KS27678	KS27679
SiO2	62.0	61.1	65.0	55.3	64.9	53.8	63.3
TiO2	0.76	0.74	0.74	0.75	0.16	0.75	0.97
Al2O3	15.3	14.7	13.3	15.8	3.32	23.6	15.7
Fe2O3	7.5	7.44	7.94	10.3	13.4	8.0	5.77
MnO	0.46	0.8	0.05	0.73	3.28	1.08	0.05
MgO	2.48	2.38	1.7	2.62	1.36	1.67	1.51
CaO	0.5	0.81	0.45	0.99	2.1	0.8	0.24
Na2O	1.62	1.57	1.49	0.67	0.22	1.16	0.65
K2O	3.01	2.91	2.76	3.52	0.39	2.74	4.14
LOI	6.4	6.78	6.16	7.86	8.6	6.98	7.6
Cr2O3	0.02	0.02	0.02	0.02	0.02	0.03	0.02
P2O5	0.32	0.42	0.35	0.32	0.28	0.27	0.44
Totals	100.35	99.65	99.94	98.86	98.01	100.85	100.37
S Tot	-0.02	0.02	0.02	0.99	3.25	1.21	0.84
BaO	0.15	0.22	0.17	0.09	0.02	0.09	0.12

Sample Number	KS27680	KS27681	KS27798	KS27799	KS27800	KS27802
SiO2	61.6	68.10	43.40	79.70	83.10	71.40
TiO2	0.89	0.84	0.20	0.11	0.15	0.73
Al2O3	13.7	13.40	7.24	2.20	1.64	12.70
Fe2O3	8.04	4.51	15.50	9.81	6.27	5.03
MnO	0.35	0.04	2.05	0.09	1.32	0.14
MgO	1.39	1.14	2.75	0.59	0.45	1.08
CaO	0.37	0.23	11.80	0.27	1.03	0.31
Na2O	0.60	0.61	0.21	0.17	0.20	0.65
K2O	3.60	3.38	0.45	0.24	0.28	2.74
LOI	8.93	5.82	8.06	4.92	3.70	4.45
Cr2O3	0.02	0.02	-0.01	0.04	0.05	0.04
P2O5	0.45	0.36	8.16	0.33	0.31	0.08
Totals	99.92	98.43	99.82	98.43	98.45	99.31
S Tot	1.22	0.59	0.40	4.82	2.11	0.23
BaO	0.10	0.10	0.04	0.01	0.14	0.07

Sample Number	Sample Description
KS27673	4 ft chip sample of decomposed black carbonaceous shale
KS27674	4 inch thick cherty-carbonate horizon in decomposed shale
KS27675	5 ft chip across Fe-stained siliceous shale and siltstone
KS27676	4 ft chip across pyritic (2%) black-brown carbonaceous shale
KS27677	3.5 ft chip of shale-siltstone with nodular Mn-carbonate, 2% pyrite
KS27678	6.1 ft chip of brown-black carbonaceous shale and siltstone with 1% pyrite
KS27679	8 ft chip sample of brown-black shale
KS27680	1.5 ft chip sample across shale with yellow-white precipitate encrustations
KS27681	9.5 ft chip of carbonaceous, pyritic shale and siltstone
KS27798	5 X 8 X 6 in Fe-Mn carbonate-rich nodule; black phosphate mineral grains; <1% pyrite
KS27799	10 X 6 X 6 in pyrite-rich (7%) chert pebble and Fe-claystone conglomerate
KS27800	1 ft thick pyrite-rich (7%) chert pebble and Fe-claystone conglomerate lens
KS27802	8 ft chip sample of pyritic (1%) shale and siltstone

0.18% P. One select sample (KS28070, appendix) of nodular material contained 26.92% Mn and reaffirmed the high manganese values collected by the Bureau in 1961. However, sample KS28070 contained only 0.16% P_2O_5.

Stream Sediment and Soil Survey

A few stream sediment and soil samples were collected from creeks and regions on strike to the northeast of the Egries prospect outcrops. The analytical results are listed in the appendix and show no anomalous concentrations of any metals. Sample locations are plotted on figure 3.

DISCUSSION

The general basis for sedimentary Mn deposit formation is **"low Eh conditions in one part of a marine basin results in manganese-rich, iron depleted water from which a manganiferous precipitate can form in a more oxygenated portion of a basin"**(5). Two facies of sedimentary Mn deposits are generally recognized; carbonate facies and oxide facies. There is general consensus (5,6,7) that reduced carbonate facies may form either on

1) oxidized substrates at the sediment - sea water interface

2) or on top of reduced (oxidized above) substrates below the sediment - sea water interface during early diagenesis.

World class manganese-carbonate deposits are interpreted to have been formed at either of these positions in the sediment - sea water column. The fractionation of Fe and Mn by Fe-sulfide precipitation during anoxic diagenesis is a process advocated by several investigators (5,6,7,8) to account for the formation of Mn-oxide facies deposition on the sediment interface. Low manganese, pyritic shales and siltstone would then become an integral, albeit distal, facies associated with manganese deposits. Fe-sulfide-rich carbonaceous shale units are present at the prospect and mapping (fig. 2) shows that sulfide-rich shale members and pyritic conglomerate strata are spatially separate from the Mn-carbonate material.

The variability of Fe and Mn contents in the Mn-carbonate occurrences and the apparent lack of extensive lateral dimensions of these occurrences (even on an outcrop scale) are the only evidence available to suggest that the Egries Mn deposits were formed in the sediments below the sediment - sea water interface. For Mn-carbonate deposits formed in this environment Force and Cannon (5) conclude that reduced Mn-enriched carbonate facies form by replacement of calcareous substrates by anoxic waters saturated with $MnCO_3$ just below the water column redox interface. This interface exists within the sediments undergoing early diagenesis.

Sugisaki and others (6) discuss Mn-carbonate bands in terms of indicators of hemipelagic (near continental margins and adjacent to abyssal plain) versus pelagic depositional environments. Such deposits by definition (9) contain more than 25% of plus 5 μ material of terrigenous, volcanogenic or neritic origin. Patton and others (1) interpret the rocks of the East Fork subterrane to represent a continental-margin, deep-water

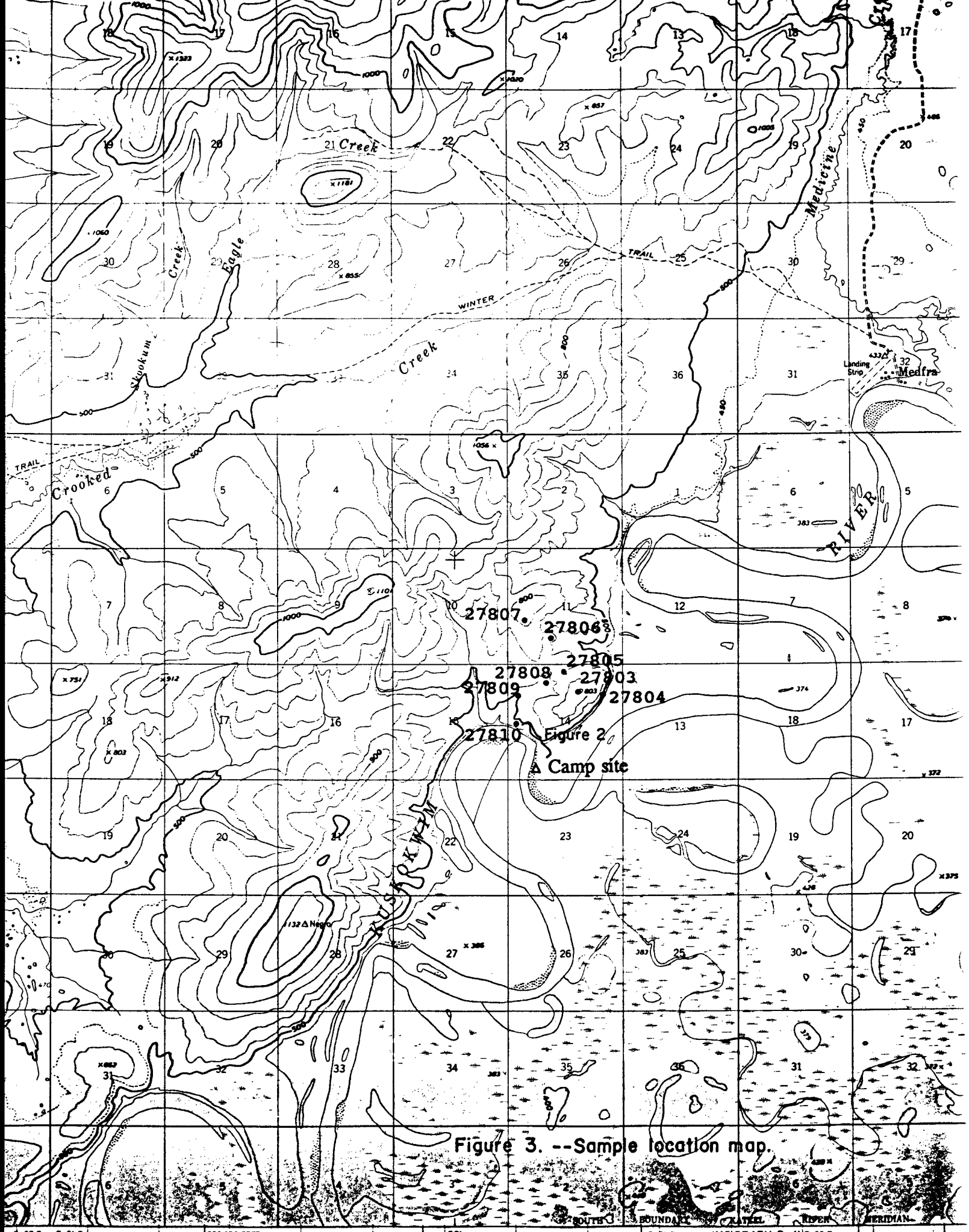

Figure 3. --Sample location map.

ed by the Geological Survey

assemblage. The Egries prospect rocks contain a considerable silt fraction and the chert-pebble conglomerate lens intercalated within the siltstone and shale indicates a close proximity to a source of coarse sediment material.

Egries Prospect - VLF-EM Survey

A Vlf-EM survey was conducted perpendicular to the average strike of the strata exposed in the river bluff outcrop described in figure 2. This survey intended to ascertain whether the sulfide-rich shale members could be traced with an electro-magnetic survey. The baseline of the survey grid (fig. 4) is also referenced on figure 2. Figure 4 presents the raw in phase and quadrature data in profile form. These profiles do not indicate any conductors or resistors and the variations in the profiles probably represent topographic effects.

East Fork Hills

A reconnaissance exploration project for sedimentary manganese deposits in the East Fork Hills of Central Alaska was initiated following an examination of the Egries manganese occurrence along the Kuskokwim River in early July, 1990. A description of these rocks is presented above in the geology section. Figure 5 depicts the area traversed by Bureau geologists during this reconnaissance survey. The dense vegetation of the area precluded any attempt at bedrock mapping or sampling and only three small outcrops were encountered. Therefore reconnaissance consisted largely of stream sediment sampling. Multi-element, induced coupled plasma (ICP) spectrometry analysis of all stream sediment samples are presented in the table 2. None of the samples showed significant concentrations of manganese, base, or precious metals. The only element that showed interesting concentrations was tantalum. However, it is not known if these high tantalum values are an artifact of the analytical procedure.

CONCLUSIONS

The Egries prospect clearly represents a sedimentary Mn-carbonate type deposit. The lack of any indication that the Mn-carbonate occurrences were deposited during normal sedimentation, detrital or precipitate, suggests that these occurrences represent an early diagenesis type of Mn-carbonate mineralization. The high cobalt and trace element concentrations typical of deep-sea Mn-nodule formations is not indicated in samples from the Egries prospect. The sedimentary environment characterized by USGS and DGGS geologists (1,3) suggests that deposition occurred in a deep-sea continental shelf environment (hemipelagic).

The rocks observed in stream gravel and the few outcrops in the East Fork Hills were both dolomitic and highly calcareous

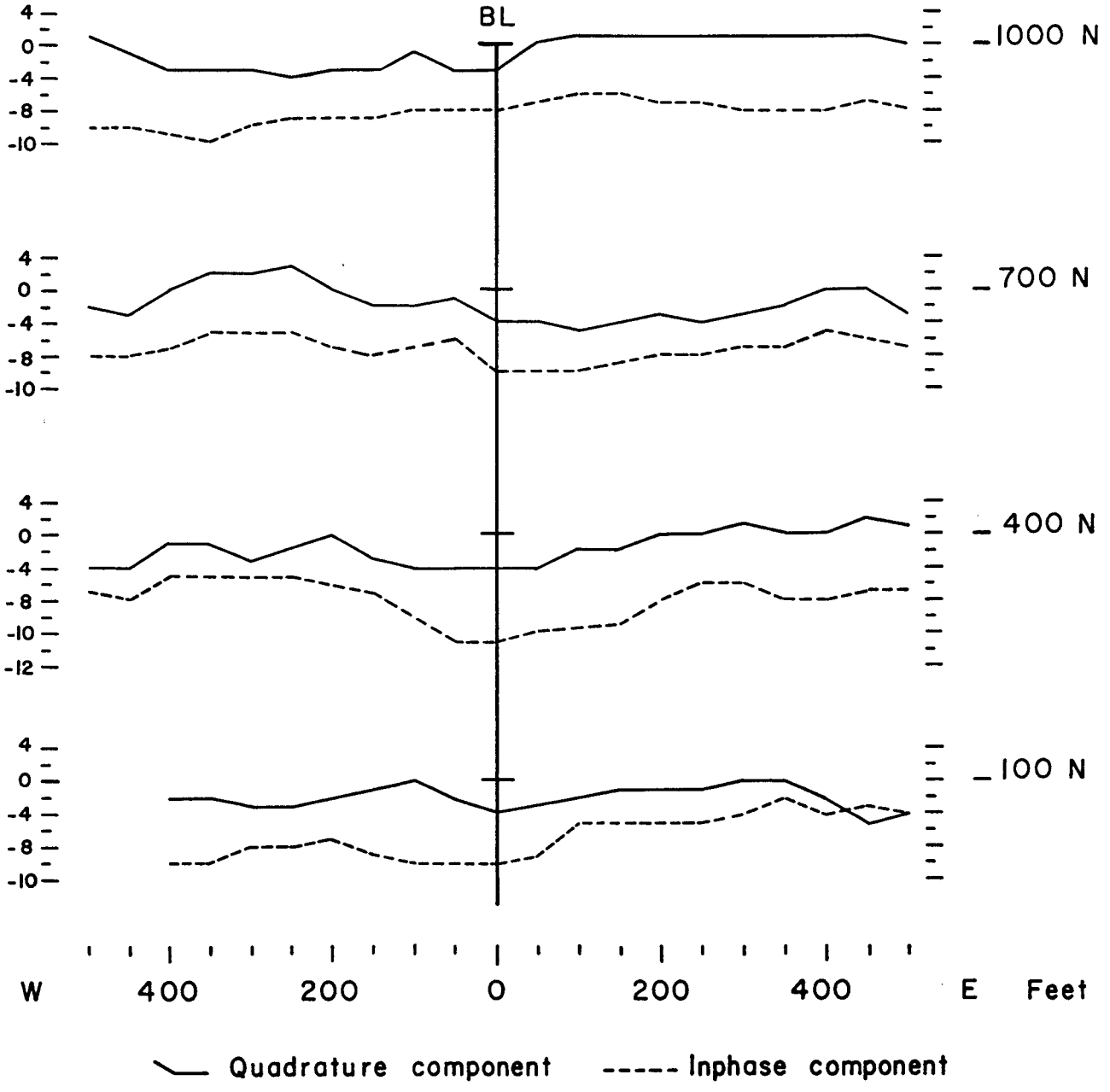

Figure 4. -- VLF-EM survey data profiles for the Hawaii station.

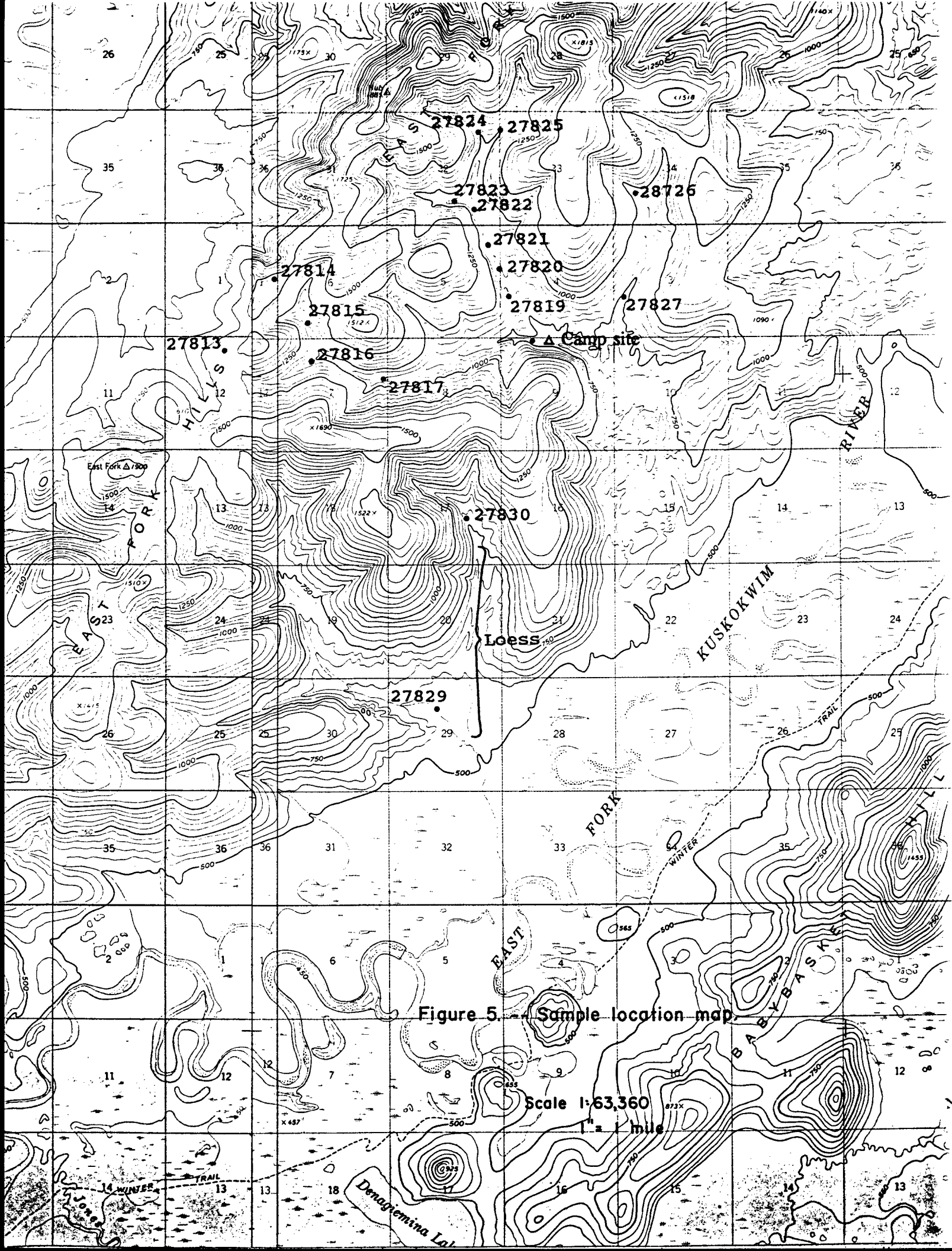

Figure 5.--Sample location map.

Table 2. -- Geochemical analyses for stream sediment samples in the East Fork Hills

Sample ID	Ag ppm	Cu ppm	Pb ppm	Zn ppm	Mo ppm	Ni ppm	Co ppm	Cd ppm	Bi ppm	As ppm	Sb ppm	Fe pct	Mn ppm	Te ppm	Ba ppm	Cr ppm	V ppm
KS27815	-0.5	21	10	59	-1	37	10	-0.5	-5	16	-5	2.63	388	-25	465	84	109
KS27816	0.8	18	9	59	-1	33	12	-0.5	-5	31	6	2.57	398	-25	469	80	100
KS27817	-0.5	15	14	62	-1	36	11	-0.5	-5	-5	-5	2.98	467	-25	531	96	110
KS27818	-0.5	13	14	52	-1	30	8	-0.5	-5	27	-5	2.38	375	-25	546	78	92
KS27819	-0.5	16	6	57	-1	31	10	-0.5	-5	25	6	2.79	510	-25	562	89	101
KS27820	-0.5	16	6	55	-1	31	10	-0.5	-5	-5	-5	2.78	448	-25	568	86	101
KS27823	-0.5	15	9	57	-1	32	11	-0.5	-5	18	-5	2.98	488	-25	565	95	104
KS27824	-0.5	15	4	57	-1	30	12	-0.5	-5	24	-5	2.94	526	-25	578	105	104
KS27825	-0.5	15	12	55	-1	27	10	-0.5	-5	43	-5	2.61	476	-25	571	87	93
KS27826	-0.5	13	10	56	-1	29	11	-0.5	-5	34	-5	2.9	480	-25	522	88	98
KS27827	-0.5	20	15	59	3	35	9	-0.5	-5	-5	-5	3.31	558	-25	471	113	125
KS27828	-0.5	20	-2	55	-1	29	8	0.9	-5	14	-5	2.44	340	-25	565	68	94
KS27829	-0.5	14	6	50	-1	28	9	-0.5	-5	16	-5	2.52	396	-25	538	78	91
KS27830	-0.5	15	3	51	-1	27	7	-0.5	-5	17	12	2.67	425	-25	537	78	96
KS27831	-0.5	13	9	51	-1	29	8	1.7	-5	17	-5	2.63	431	-25	535	86	94

Sample ID	W ppm	Li ppm	Ga ppm	La ppm	Sc ppm	Ta ppm	Ti pct	Al pct	Mg pct	Ca pct	Na pct	K pct	Nb ppm	Sr ppm	Y ppm	Zr ppm	Sn ppm
KS27815	-20	28	16	-5	-10	62	0.55	1.4	0.59	1.18	1.31	0.89	9	66	-5	60	-20
KS27816	-20	26	-10	11	-10	22	0.48	1.46	0.83	1.27	1.28	0.95	-5	91	6	36	-20
KS27817	-20	27	20	17	-10	57	0.6	1.98	1.02	1.38	1.3	1.0	-5	113	9	43	-20
KS27818	-20	20	12	14	-10	18	0.48	1.96	0.81	1.4	1.39	0.95	-5	129	8	36	-20
KS27819	-20	22	14	19	-10	-5	0.54	2.04	0.91	1.62	1.38	0.97	5	140	11	40	-20
KS27820	-20	22	-10	15	-10	23	0.54	2.26	0.92	1.56	1.36	0.96	-5	139	10	43	-20
KS27823	-20	24	11	17	20	25	0.53	2.2	0.98	1.63	1.34	0.96	5	136	11	48	-20
KS27824	-20	24	18	21	41	70	0.56	2.34	0.93	1.58	1.38	0.94	-5	141	12	50	-20
KS27825	-20	21	-10	17	31	-5	0.46	2.24	0.86	1.57	1.32	0.91	-5	146	12	42	-20
KS27826	-20	23	13	15	16	-5	0.49	2.02	0.92	1.55	1.37	0.94	-5	125	8	41	-20
KS27827	-20	21	15	21	23	26	0.74	1.29	0.83	1.64	1.32	0.79	9	98	7	44	-20
KS27828	-20	22	-10	9	-10	27	0.4	1.4	0.72	1.3	1.38	0.96	-5	106	7	30	-20
KS27829	-20	19	-10	13	23	36	0.45	1.63	0.76	1.49	1.39	0.9	-5	120	7	34	-20
KS27830	-20	20	14	14	17	58	0.5	1.55	0.77	1.58	1.39	0.89	-5	120	7	36	-20
KS27831	-20	19	12	14	10	7	0.48	1.98	0.86	1.51	1.37	0.89	-5	132	7	40	-20

siltstone and thinly bedded limestones. There was no indication of manganese mineralization in the East Fork Hills area.

RECOMMENDATIONS

There is no potential for mineral exploration to the south of the Kuskokwim River near the Egries prospect due to swamps and river lowlands. The vegetation to the north of the river is thick and the outcrop density is low. Future exploration efforts should concentrate on the densely vegetated set of hills immediately to the north, west and southwest of the Egries prospect, if warranted. At this time no further work is recommended in the East Fork Hills until exploration efforts have been focussed in the vicinity of the Egries prospect.

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Appendix --Additional analytical results for rock, stream sediment, and soil samples from the Egries prospect

Sample ID	Au	Ir	Ag	Zn	Mo	Ni	Co	Cd	As	Sb	Fe	Se	Te	Ba	Cr	BaO	Sn	W
	ppb	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	pct	ppm	ppm	ppm	ppm	pct	ppm	ppm
KS27673	8	-100	-5	-200	5	110	51	-10	21	1.6	4.4	-10	-20	1700	130	0.15	-200	-2
KS27674	16	-100	-5	-200	-2	130	46	-10	19	1.5	4.9	-10	-20	2500	130	0.22	-200	-2
KS27675	6	-100	-5	-200	-2	87	24	-10	27	1	5.1	-10	-20	2000	150	0.17	-200	-2
KS27676	8	-100	-5	-200	-2	150	35	-10	28	2	6.4	-10	-20	1100	160	0.09	-200	-2
KS27677	29	-100	-5	220	5	120	33	-10	66	3.8	8	-10	-20	290	170	0.02	-200	-2
KS27678	17	-100	-5	-200	3	84	35	-10	37	1.5	5.8	-10	-20	1000	240	0.09	-200	-2
KS27679	5	-100	-5	-200	-2	51	10	-10	21	1.1	3.7	-10	-20	1400	210	0.12	-200	-2
KS27680	5	-100	-5	-200	-2	78	17	-10	21	1.1	5.1	-10	-20	1300	220	0.1	-200	-2
KS27681	8	-100	-5	-200	-2	51	-10	-10	15	1	2.9	-10	-20	1300	190	0.1	-200	-2
KS27682	8	-100	-5	-200	-2	87	18	-10	15	1	5.5	-10	-20	1000	230	-9	-200	-2
KS27797	6	-100	-5	200	-2	76	46	-10	27	1.4	4.3	-10	-20	2100	220	-9	-200	-2
KS27798	8	-100	-5	-200	-2	140	22	-10	16	0.5	10	-10	-20	450	72	0.04	-200	-2
KS27799	57	-100	-5	-200	4	130	46	-10	94	3.7	5.4	-10	-20	100	290	0.01	-200	-2
KS27800	26	-100	-5	-200	3	63	15	-10	32	1.5	3	-10	-20	1400	370	0.14	-200	-2
KS27801	8	-100	-5	-200	-2	-50	-10	-10	13	0.6	3.8	-10	-20	1100	210	-9	-200	-2
KS27802	-5	-100	-5	-200	-2	-50	-10	-10	8	0.5	2.8	-10	-20	750	210	-9	-200	-2
KS27803	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KS27804	13	-100	-5	-200	-2	-50	-10	-10	2	1.1	1.6	-10	-20	4700	120	-9	-200	-2
KS27805	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KS27806	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KS27807	7	-100	-5	-200	-2	57	11	-10	10	1.6	2.8	-10	-20	930	66	-9	-200	-2
KS27808	-5	-100	-5	-200	-2	-50	13	-10	12	1.2	2.7	-10	-20	850	120	-9	-200	-2
KS27809	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KS27810	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KS27811	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KS28070	-5	-100	-5	-5	-2	-50	66	-10	2	0.3	2.1	-10	-20	400	-50	-	-200	-2

Appendix continued

Sample ID Number	Cs ppm	La ppm	Ce ppm	Sm ppm	Eu ppm	Tb ppm	Yb ppm	Lu ppm	Sc ppm	Hf ppm	Ta ppm	Th ppm	U ppm	Na pct	Br ppm	Rb ppm	Zr ppm	Ag oz/ton	Mn ppm	Mn pct
KS27673	5	25	70	4.9	-2	-1	-5	-0.5	16.0	-2	1	8.1	2.5	0.90	-1	120	-500	-	-	-
KS27674	5	24	67	5.3	-2	1	-5	-0.5	16.0	3	1	6.9	2.6	0.94	-1	120	-500	-	-	-
KS27675	5	26	59	5.3	-2	-1	-5	-0.5	15.0	4	-1	8.5	3.0	0.75	-1	130	-500	-	-	-
KS27676	8	35	100	8.0	-2	2	-5	0.6	15.0	3	2	11.0	4.0	0.44	-1	140	-500	-	-	-
KS27677	-1	9	17	2.0	-2	-1	-5	-0.5	3.7	-2	-1	2.3	1.5	0.13	-1	17	-500	-	-	-
KS27678	7	32	89	6.2	-2	-1	-5	0.6	12.0	4	1	10.0	3.9	0.53	-1	110	-500	-	-	-
KS27679	9	40	82	6.1	-2	-1	-5	0.5	13.0	5	2	13.0	4.3	0.39	-1	160	-500	-	-	-
KS27680	10	37	79	7.3	-2	1	-5	0.5	13.0	4	2	12.0	4.6	0.37	-1	150	620	-	-	-
KS27681	7	37	81	6.4	-2	-1	-5	0.6	12.0	7	2	12.0	3.8	0.40	-1	140	-500	-	-	-
KS27682	6	32	66	6.0	-2	-1	-5	-0.5	10.0	5	1	10.0	3.3	0.37	-1	110	-500	-	-	-
KS27797	6	27	69	5.6	-2	-1	-5	-0.5	16.0	3	-1	8.3	3.0	0.65	-1	120	-500	-	-	-
KS27798	-1	24	100	23.0	9	9	11	1.7	12.0	-2	-1	2.5	4.9	0.15	-1	14	-500	-	-	-
KS27799	-1	-5	-10	0.7	-2	-1	-5	-0.5	1.8	-2	-1	1.3	0.6	0.10	-1	-10	-500	-	-	-
KS27800	-1	6	14	1.3	-2	-1	-5	-0.5	1.5	-2	-1	1.7	0.5	0.10	-1	-10	-500	-	-	-
KS27801	7	30	64	5.5	-2	-1	-5	-0.5	10.0	6	2	10.0	2.9	0.40	-1	110	790	-	-	-
KS27802	5	26	62	4.9	-2	-1	-5	-0.5	8.3	6	2	8.7	2.8	0.37	-1	120	-500	-	-	-
KS27803	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7	290	-
KS27804	3	16	35	4.4	-2	-1	-5	-0.5	8.4	3	-1	3.3	1.4	0.25	-1	63	-500	-	-	-
KS27805	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	743	-
KS27806	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	592	-
KS27807	2	22	50	5.3	-2	-1	-5	-0.5	10.0	7	-1	8.4	2.9	1.1	-1	72	-500	-	765	-
KS27808	2	27	63	5.6	-2	-1	-5	-0.5	10.0	9	1	9.4	3.2	1.2	-1	54	-500	-	666	-
KS27809	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-
KS27810	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-0.1	-	-
KS27811	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	-	-
KS28070	-1	8	18	2.2	-2	-1	-5	-0.5	7.2	-2	-1	1.9	1.2	0.07	-1	21	-500	-	-	26.92

Sample Number	Sample Description
KS27673	4 ft chip sample of decomposed black carbonaceous shale
KS27674	4 inch thick cherty-carbonate horizon in decomposed shale
KS27675	5 ft chip across Fe-stained siliceous shale and siltstone
KS27676	4 ft chip across pyritic (2%) black-brown carbonaceous shale
KS27677	3.5 ft chip of shale-siltstone with nodular Mn-carbonate, 2% pyrite
KS27678	6.1 ft chip of brown-black carbonaceous shale and siltstone with 1% pyrite
KS27679	8 ft chip sample of brown-black shale
KS27680	1.5 ft chip sample across shale with yellow-white precipitate encrustations
KS27681	9.5 ft chip of carbonaceous, pyritic shale and siltstone
KS27798	5 X 8 X 6 in Fe-Mn carbonate-rich nodule; black phosphate mineral grains; <1% pyrite
KS27799	10 X 6 X 6 in pyrite-rich (7%) chert pebble and Fe-claystone conglomerate
KS27800	1 ft thick pyrite-rich (7%) chert pebble and Fe-claystone conglomerate lens
KS27801	6 ft chip of decomposed, foliated, multi-colored shales; minor plant fossils
KS27802	8 ft chip sample of pyritic (1%) shale and siltstone
KS27803	micaceous siliceous siltstone
KS27804	finely laminated shale and cherty siltstone
KS27805	4.5 ft deep hole; soil sample in fine silt or loess (unfrozen)
KS27806	3 ft deep hole; soil sample in sandy river sediments
KS27807	5 foot deep hole; soil sample in micaceous slit or loess
KS27808	stream sediment sample
KS27809	stream sediment sample
KS27810	black, salt and pepper, sandy siltstone
KS27811	pyritic black graphitic shale with fossil worm ? tubes containing fine-grained pyrite
KS28070	dense black manganese carbonate nodule

DS

SAMPLE RECORD
Bureau of Mines
Area VIII

Date Submitted: 3/12/68

Type: Lode - Mo

Location: Equies Mo., Medfra, Alaska

Submitted by: R. P. Foraker

Remarks: Recall for gold & silver assays

Charge No. _____
Priority _____

Grind: Original Pulps

Instructions: Samples taken in 1961. Have been run for Mo

Reject Bin No. _____

Chemical Laboratory Report

Lab. No.	Description	Lot No.	Oz./T. Au	Mo%	Oz./T. Ag					
61-698	0-8'	60	N.I	2.74	N.I					
61-699	8-16'	61	N.I	2.53	N.I					
61-700	16-24'	62	N.I	.58	N.I					
61-701	24-32'	63	N.I	1.61	N.I					
61-702	32-40'	64	N.I	.55	N.I					
61-704	Composite 60-61	—	N.I	2.23	N.I					
61-601	Rich grade Mo float	1	Nil	20.46	Nil					
61-603	" " "	3	N.I	21.54	N.I					
61-605	20' thick section Mo	7	N.I	6.35	N.I					

Date Reported: 3/25/68 _____ (Analyst)

SAMPLE RECORD
Bureau of Mines
Alaska District - Region I

Date Submitted: 7/28/61
Type: Lode. Mn.
Location: Wedfea, Alaska
Submitted by: F. P. Malone
Remarks: "Egries Mn." marked on esple. tag.

Charge No.
Priority
Grind: -80
Instruction: ✓
Reject: Bin No. Save. Save

CHEMICAL LABORATORY REPORT

Lab No.	Description	Lot No.	% Mn
61-501	Float - black dense Sh?	1	20.46
502	Decomposed black muck at water edge.	2	0.32
503	Float at water edge - Sh	3	21.54
———	Float - Mn?	5	No sple. tagged #5
504	" - 12"x14"	6	5.30
505	In place 20' thick	7	5.35
506	Float ? stained Sh	8	0.10
507	Black decomposed Sh?	9	0.36
508	Sh at riversedge in place	10	0.30
509	Black Sh [illegible]	11	0.50
510	[illegible]	4A	23.01
511		4B	20.28

{Rec'd record 8-2-61
" sples. 8-2-61}

Date reported: Aug 10, 1961 C. Birch (Analyst)

{Note: "4A sack has brown draw-string (Cantholdol)
"4B " " White tape ties (Angular; zoned)
See specimens in Malone's desk of "4A & "4B