



Bergvesenet

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Rapportarkivet

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Tittel Thin section studies Klinkenberg, Røros (Ingolf Rui in ASPRO report 2448) Chemical data and plot maps over Klinkenberg, Røros (Denis Schlatter)				
Forfatter Rui, Ingolf Schlatter, Denis		Dato År 2000	Bedrift (Oppdragsgiver og/eller oppdragstaker) Crew Development Corporation Mindex ASA	
Kommune Røros	Fylke Sør-Trøndelag	Bergdistrikt	1: 50 000 kartblad 17203	1: 250 000 kartblad Røros
Fagområde Geologi Geokjemi	Dokument type		Forekomster (forekomst, gruvefelt, undersøkelsesfelt) Klinkenberg	
Råstoffgruppe Malm/metall	Råstofftype Cu Zn			
Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse Thin section studies Klinkenberg, Røros (Ingolf Rui in ASPRO report 2448) Chemical data and plot maps over Klinkenberg, Røros (Denis Schlatter) and map showing results of Geological mapping, sample locatin and position of baselines.				



PROSPEKTERING

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Title: Klinkenberg Mine Area, Røros District Thin section studies			
Project: KLINKENBERG		Ordered by: MINDEX ASA	
Author: Ingolf J. Rui		Project leader: BERNT RØSHOLT	
Land/county: NORWAY/ RØROS		District: E TRONDHEIM REGION	
Map sheet 1:250 000: RØROS		Map sheet 1:50 000: RØROS	

Summary:

13 THIN SECTIONS FROM THE KLINKENBERG MINE AREA HAVE BEEN STUDIED UNDER THE MICROSCOPE. SHORT DESCRIPTIONS OF ESSENTIAL MINERALS AND ROCK TYPES. SEMI-QUANTITATIVE ESTIMATES OF MINERAL DISTRIBUTION.

Key Words	Microscopy	
	Thin section	
	Mineralogy	
Distribution	Prospektering A/S	
	Mindex ASA	

Klinkenberg Mine Area, Røros District

Thin section studies

In November 1999 Prospektering AS was asked by Denis Schlatter, Mindex ASA to make microscopic studies of 13 thin sections from the Klinkenberg Mine area, situated to the north of lake Aursunden by Røros. The thin sections have been prepared from samples of sedimentary rocks belonging to the Røros Schist Formation which have undergone metamorphic transformation in greenschist facies. Whole rock analyses (XRF) have been performed of all the rock samples.

Principal minerals present in all thin section studied include: Quartz, albite-oligoclase, biotite, muscovite, and chlorite. Epidote usually occurs in subordinate amounts, up to a few percent. Carbonate is present in 4 thin sections and is essential in 2 of them. Commonest accessories are apatite and opaques, but small garnets and tourmaline may also occur (Table). A short comment on the most prominent optical properties for identification for the different species are given below:

Quartz – Albite-oligoclase: These two minerals are not easily distinguished under the microscope since the feldspar 1) rarely is twinned, and 2) the refractive index are not very different from quartz. Quantitative figures of the two minerals are, therefore, difficult to estimate. An approach to the problem could be aided by the whole rock XRF-analyses since the feldspar is the only significant sodium-bearing mineral, containing some 10 % Na₂O.

Biotite: This mineral characteristically shows flaky habit, strong pleochroism, usually Y and Z = deep brown, X = faint yellow. Colours are somewhat different in thin section no. 214 and 216, Y and Z = being greenish brown (olive), whereas very dark brown to almost black pertain to the very same principal directions in thin section no. 215. There are obviously differences in chemistry.

Muscovite: Most easily distinguished by flaky habit, colourless appearance and brilliant, high order interference colours.

Chlorite: Characterised by flaky habit, which show low 1. order grey interference colours. Elongation (+), which means 2V positive. Pleochroism X and Y = light bluish green, Z = faint yellow.

Epidote: High relief, pleochroism faint yellowish, and brilliant interference colours.

Carbonate: Very high interference colours, and very high double refraction. Rhombohedral cleavage.

Table: Mineral composition of Klinkenberg rock samples. Rough percentage from thin sections.								
TS No.	quartz	ab.-olig.	biotite	muscov	chlorite	epidote	carbon	access.
328205	(20-30)	(10)	X	20-25	40-50	-	-	opq
328206	(20-30)	(35-40)	10-15	-	25-30	-	-	opq,ap
328207	(40-50)	(35-40)	10	-	10-15	X	-	opq,ap
328208	(20-30)	(0-5)	10-15	20-25	25-35	X	-	opq,ap,gn

328209	(40-50)	(5-10)	15-20	10-15	X	X	-	opq,ap,gn
TS No.	quartz	ab.-olig.	biotite	muscov.	chlorite	epidote	carbon	access.
328210	(60-65)	(15-20)	15-20	X	X	X	-	opq,ap,gn
328211	(40-50)	(20-25)	8-10	X	X	?	-	opq
328212	60-70		5-10	2-3	10-15	-	-	opq,ap
328213	(30-40)	(20)	10-15	10-15	20-30	-	1	opq,gn,tur
328214	(60-70)	(20-25)	10-15	2-3	X	5	15-20	opq,ap,gn
328215	(45-50)	(25-30)	10	5	3	2-3	5-10	opq,ap
328216	(25-30)	(20-25)	5-10	10-15	20-30	2-3	-	opq,ap,tur
328217	(40-50)	(25-30)	15	X	X	2-3	5-10	opq,ap

Estimates partly based on chemical XRF-analyses. Sodid plagioclase (ca. 10-11% Na₂O), biotite and muscovite (each some 9-11% K₂O), ankeritic carbonate (some 30% CaO) and epidote (20-25% CaO) account for most of these elements in the specimens.

(X): minor, (-): not recorded

Here follows short comments to the individual thin sections:

TS 205: Muscovite-chlorite schist, scattered larger porphyroblasts of biotite. No twinning in feldspar.

TS 206: Chlorite-biotite schist. Similar to TS 205 in mineralogy and structure/texture, but no muscovite and more biotite. Twinned feldspar not recorded.

TS 207: Metagreywacke. More coarse grained and richer in quartz and feldspar, the latter shows twinning.

TS 208: Chlorite-muscovite-biotite schist. Chlorite and muscovite intimately intergrown as fine flakes, biotite as larger porphyroblasts. A few small, idioblastic garnets.

TS 209: Biotite-muscovite schist. A few small, mostly idioblastic garnets. Twinning in feldspar recorded occasionally.

TS 210: Metagreywacke. Rather similar to TS 207, abundant grains of twinned feldspar. A few anhedral grain of garnet.

TS 211: Metagreywacke. Quartz-rich specimen, strongly stained by rust, thus, somewhat difficult to study. Biotite as rather large flakes. Grains of twinned feldspar rather common.

TS 212: Banded schist. Composed of 1) fine-grained, qz/ab-rich bands with abundant chlorite and a little muscovite. A few larger flakes of biotite. Feldspar twinning rarely recorded. 2) Coarser mica-rich bands, essentially quartz/feldspar (50-60%), biotite, and muscovite. Some chlorite. Feldspar rarely twinned.

TS 213: Chlorite-muscovite-schist, abundant larger porphyroblasts of biotite. Scattered brown spots of weathered carbonate, probably initially iron-rich (ankeritic). Twinned feldspar not recorded.

TS 214: Quartz-biotite schist with abundant deep brown to almost opaque spots of carbonate. Biotite differ from the ordinary type being darker greenish brown/olive. Muscovite as

abundant small flakes. Chlorite of the ordinary type in accessory amount, most often clearly as an alteration product of biotite. Epidote rather abundant. Twinned feldspar not recorded.

TS 215: Quartz-biotite schist with scattered, rather coarse lensoid grains of carbonate. Biotite differs from the ordinary type being very deep brown. Twinned feldspar rather common.

TS 216: Muscovite-chlorite-biotite schist, much like TS 208. Large flakes of biotite. Twinned feldspar not recorded. Biotite of the dark greenish brown/olive type as in TS 214. Epidote rather common.

TS 217: Quartz-biotite schist with abundant carbonate. Tiny flakes of muscovite. Twinned feldspar scarcely recorded.

Lysaker 25 November 1999



Ingolf J. Rui

Sample Ident	Rock type, minerals	local N	local E	UTM X	UTM Y	sampled y.	Au ppb	SiO2 %	Al2O3 %	CaO %	MgO %	Na2O %	K2O %	Fe2O3 %	MnO %	TiO2 %	P2O5 %	Cr2O3 %	LOI %	Sum %	Rb ppm	Sr ppm	Y ppm	Zr ppm	Nb ppm
Detection Limit							1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.001	0.01	0.01	0.01A	0.01	2	2	2	2	2
KLIN 328205	chlorite sericite schist	-1282.21	543.62	635891.39	6958692.52	1999	5	37.3	22.2	0.5	9.9	1.01	2.5	17.4	0.15	1.073	0.25	0.03	6.2	98.7	68	63	14	181	11
KLIN 328206	sandstone with biotite blasts, "sandy"	-1267.90	576.53	635924.64	6958706.30	1999	2	58.8	17.4	1.61	5.01	4.1	1.05	8.18	0.12	0.911	0.17	0.03	2.75	100.2	43	130	27	159	16
KLIN 328207	siliceous coarse grained sandstone	-1233.57	594.90	635962.21	6958695.63	1999	2	66.7	13.6	1.57	4.13	3.73	0.89	5.52	0.07	0.723	0.14	0.04	1.95	99.1	39	110	24	174	12
KLIN 328208	garnet biotite schist, chlorite?	-1238.37	608.83	635968.46	6958709.01	1999	1	53.1	17.4	0.52	7.28	0.32	3.67	11.9	0.27	0.95	0.19	0.05	4.2	99.9	116	31	21	183	14
KLIN 328209	biotite micas schist with qz	-1239.11	646.31	635994.03	6958736.58	1999	12	69.9	11.2	0.71	2.44	0.89	3.08	6.98	0.22	0.561	0.13	0.05	1.9	98.5	76	54	11	166	11
KLIN 328210	quartzite with specs of sulfide	-1302.83	691.39	635979.47	6958813.49	1999	20	80	8.7	0.75	1.51	1.81	1.63	4.08	0.11	0.412	0.09	0.03	0.8	100	46	62	10	135	9
KLIN 328211	sericite and silicified altered sandstone, rusty	-1144.05	601.77	636031.58	6958638.21	1999	16	74.1	9.09	0.53	1.34	2.65	0.94	6.7	0.12	0.582	0.09	0.05	2.7	98.9	21	68	6	185	2
KLIN 328212	sulfide ore, strongly silicified, chlorite, biotite	-1078.58	523.19	636024.07	6958535.91	1999	1160	11.6	3.23	0.33	1	-0.01	0.88	26.9	0.07	0.278	0.05	0.04	19.2	60.8	45	14	-2	38	3
KLIN 328213	sericite biotite schist, carbonates	-1260.65	442.99	635836.84	6958604.90	1999	3	60.4	15.8	2.62	4.15	2.13	2.45	7.55	0.08	0.86	0.14	0.04	2.95	99.2	99	125	29	163	14
KLIN 328214	quartzite with garnet and biotite, carbonates	-1245.71	410.67	635825.09	6958571.17	1999	9	66.5	11.8	5.25	2.2	2.76	1.39	4.79	0.08	0.678	0.14	0.05	3.05	98.8	68	208	24	207	11
KLIN 328215	quartz rich sandstone, feldspars	-1256.87	360.72	635782.24	6958542.91	1999	2	67.8	12.3	4.03	2.35	3	1.63	5.27	0.08	0.755	0.15	0.06	2.6	100.2	64	241	26	243	14
KLIN 328216	sericite, chlorite altered schist, biotites, carbonates	-1229.89	340.85	635787.86	6958509.78	1999	6	52.2	19.7	2.56	5.52	2.31	2.34	9.32	0.12	1.025	0.19	0.04	3.95	99.3	74	157	27	179	12
KLIN 328217	quartzite with garnet and biotite, carbonates, feldspars, specs of sulf	-1274.15	297.02	635725.38	6958509.00	1999	4	68.5	12	3.95	2.7	2.76	1.58	5.07	0.08	0.729	0.14	0.04	2.5	100.1	63	216	23	186	12
KLIN 328221	Quartzite/greywacke, garnet, pyrite, cpy, pyrotite	-1382.81	661.77	635901.14	6958847.85	1999	5	73.3	10.6	1.48	2.54	2.74	1.81	5.36	0.13	0.567	0.12	0.04	1.3	100.1	52	87	6	143	7
KLIN 328222	Feldspar porphyritic biotite schist, chalcopryrite, malachite	-1474.39	712.18	635870.19	6958948.02	1999	30	64.8	11.1	2.46	1.42	2.14	1.71	7.09	0.2	0.958	0.17	0.04	1.96	94.2	42	150	24	214	21
KLIN 328223	Biotite schist, chalcopryrite	-1513.22	676.46	635817.29	6958949.31	1999	60	69.5	10.6	0.35	2.57	1.66	3.27	7.7	0.14	0.632	0.15	0.04	1.4	98.3	77	74	13	220	8
KLIN 399688	ore in situ	-1355.29	525.87	635826.30	6958730.63	1998	41																		
KLIN 399691	ore	-1295.14	523.42	635867.99	6958686.95	1998	438																		
KLIN 400053	ore in situ	-1120.91	475.50	635960.31	6958530.99	1998	778																		
KLIN 400054	ore in situ	-1131.36	485.09	635959.44	6958545.19	1998	756																		
KLIN 400055	ore in situ	-1131.87	476.69	635953.23	6958539.49	1998	644																		
KLIN 400056	ore in situ	-1127.95	490.28	635965.52	6958546.56	1998	737																		

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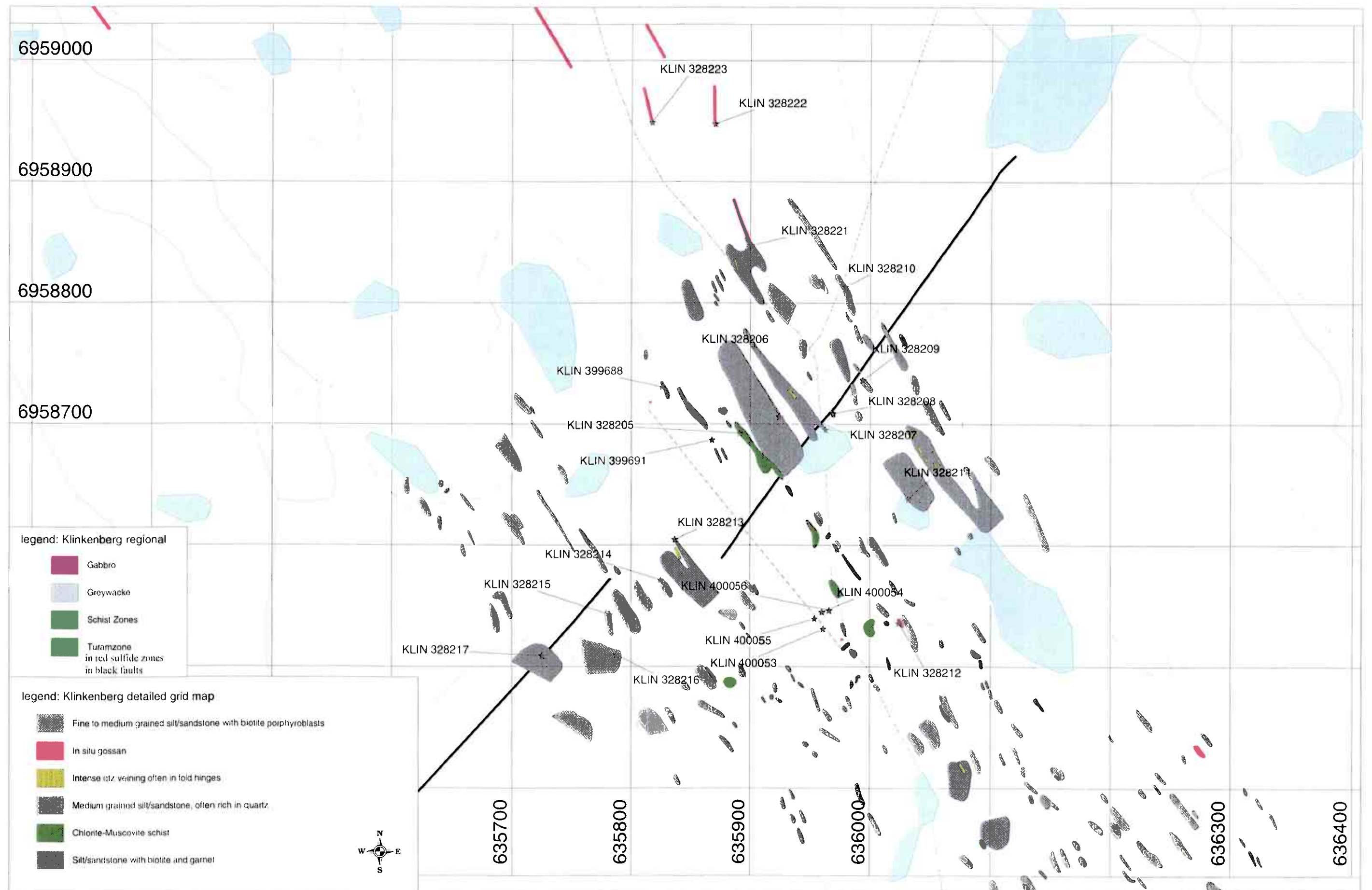
Sample Ident	Ba ppm	Zn ppm	Cu ppm	Pb ppm	Be ppm	Na %	Mg %	Al %	P %	K %	Ca %	Sc ppm	Ti %	V ppm	Cr ppm	Mn ppm	Fe %	Co ppm	Ni ppm	Cu ppm	Zn ppm	As ppm	Sr ppm	Y ppm	Zr ppm	Mo ppm	Ag ppm	Cd ppm	Sn ppm	Sb ppm	Ba ppm	La ppm	W ppm	Pb ppm	Bi ppm
Detection Limit	20	2	2	2	0.5	0.01	0.01	0.01	0.01	0.01	0.01	0.5	0.01	2	1	2	0.01	1	1	0.5	0.5	3	0.5	0.5	0.5	1	0.2	1	10	5	1	0.5	10	2	5
KLIN 328205	1110	259	24	10	0.5	0.02	3.72	4.47	0.1	0.34	0.22	6.5	0.03	88	83	566	7.02	28	63	14.2	168	-3	5.3	7.6	11.1	5	0.4	-1	-10	-5	79	10.3	-10	3	-5
KLIN 328206	185	185	29	12	-0.5	0.05	2.3	2.78	0.08	0.61	0.18	12.5	0.07	104	113	502	4.07	18	66	23.8	152	-3	4.7	11.1	11.4	-1	-0.2	-1	-10	-5	68	33.8	-10	-2	-5
KLIN 328207	92	153	34	60	-0.5	0.06	2.02	2.21	0.06	0.7	0.18	7.7	0.08	69	129	320	3.12	15	42	29.8	154	-3	8	11.2	9.4	-1	0.2	-1	-10	-5	67	19.8	-10	21	-5
KLIN 328208	869	231	39	15	0.7	0.04	3.16	3.77	0.08	1.24	0.18	5.4	0.1	75	90	803	5.63	21	62	31.3	180	-3	3.8	5.3	10.7	-1	0.3	-1	-10	-5	137	7.3	-10	5	-5
KLIN 328209	3170	815	431	191	-0.5	0.04	1.26	1.98	0.05	1.47	0.09	3.1	0.2	50	120	384	4.23	11	16	481	899	-3	4.1	2.2	5.1	-1	1.1	2	-10	-5	946	8.3	-10	180	-5
KLIN 328210	705	8679	972	356	-0.5	0.05	0.8	1.26	0.04	1.01	0.16	3.1	0.16	46	136	423	2.63	17	17	928	8210	-3	2.9	7	4.3	4	3.2	18	-10	-5	311	12.1	-10	350	-5
KLIN 328211	272	215	551	92	-0.5	0.05	0.68	0.98	0.04	0.33	0.02	2	0.05	39	156	212	4.2	3	4	584	216	-3	9.1	1	6.5	-1	4.4	-1	-10	-5	64	17.9	-10	77	-5
KLIN 328212	62	201160	15600	1550	1.2	0.02	0.6	0.77	0.02	0.3	0.03	-0.5	0.03	41	91	311	18.8	72	24	13760	>10000	52	1.8	1.7	11.1	5	26.5	400	12	-5	21	3.4	-10	1500	INF
KLIN 328213	258	211	73	16	-0.5	0.04	2.06	2.63	0.06	0.97	0.74	7	0.09	76	111	463	4.18	19	61	69.8	247	-3	9.5	10.5	6.2	-1	0.2	-1	-10	-5	62	26.3	-10	4	-5
KLIN 328214	199	732	62	22	-0.5	0.06	1.21	1.26	0.06	0.89	1.93	2.8	0.11	49	137	490	2.47	12	39	65	783	-3	20.1	4.8	6.3	-1	0.4	2	-10	-5	87	20.8	-10	11	-5
KLIN 328215	404	71	18	11	-0.5	0.05	1.23	1.33	0.06	0.89	1.34	3.6	0.12	51	151	443	2.4	13	38	14.8	75.5	-3	23.3	8.2	6.5	-1	0.4	-1	-10	-5	155	25.8	-10	3	-5
KLIN 328216	320	213	39	13	-0.5	0.04	2.61	3.09	0.08	0.74	0.29	4.7	0.07	67	98	520	4.51	23	75	35.5	198	-3	12.3	5.7	8.4	-1	-0.2	-1	-10	-5	53	22.7	-10	3	-5
KLIN 328217	294	69	45	14	-0.5	0.06	1.45	1.58	0.06	1.17	1.11	3.4	0.15	66	162	494	2.78	13	38	41.8	73.8	-3	16.8	5.5	6	-1	0.3	-1	-10	-5	179	19.7	-10	4	-5
KLIN 328221	1010	271	52	434																															
KLIN 328222	637	21150	2420	110																															
KLIN 328223	2250	3120	2770	32																															
KLIN 399688		856	14000	54																															
KLIN 399691		245000	3883	5317																															
KLIN 400053		26800	50000	797																															
KLIN 400054		43000	31600	2110																															
KLIN 400055		73200	21600	1889																															
KLIN 400056		107300	26000	2877																															

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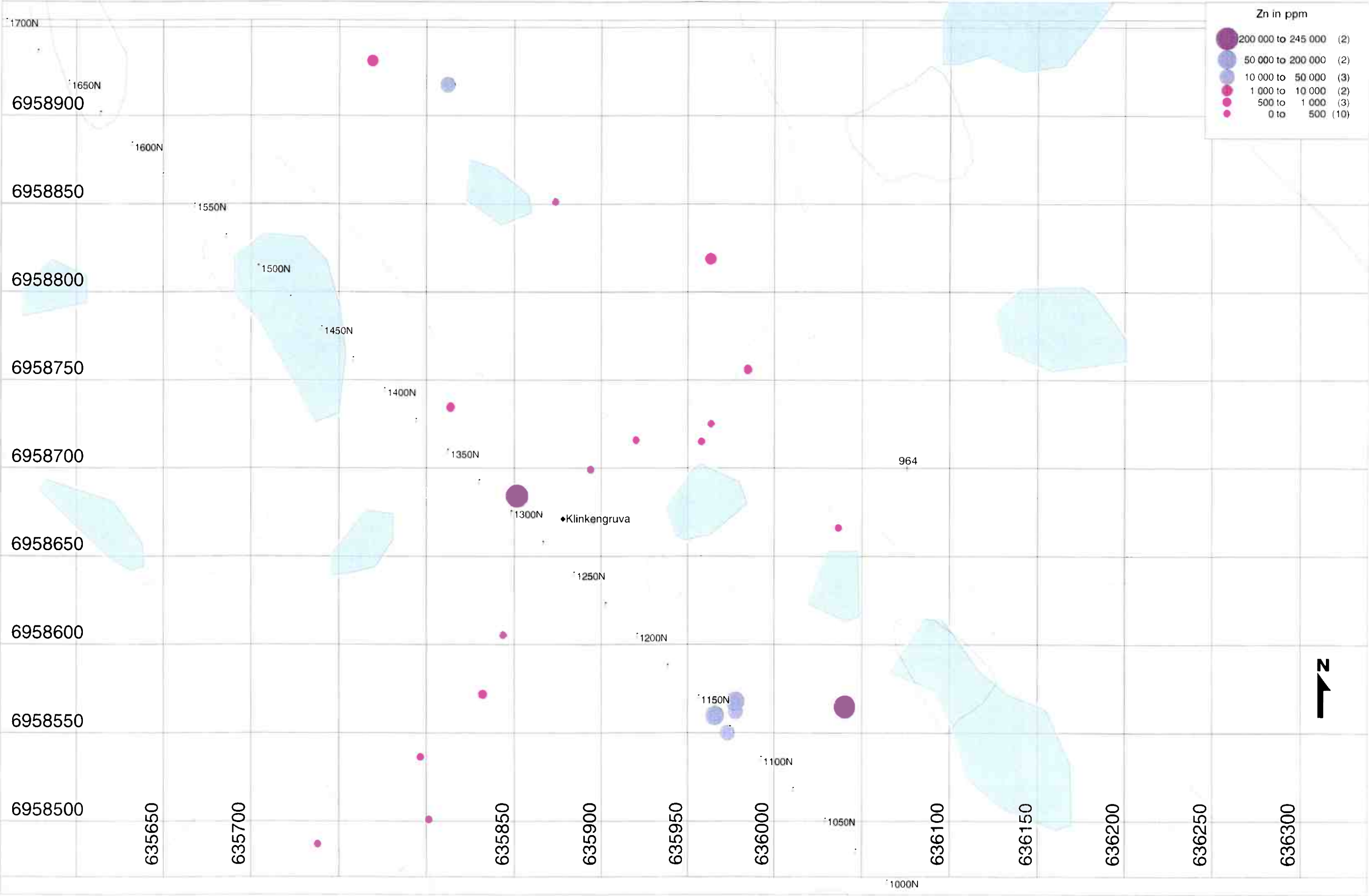
Klinkenberg: 1:3'000; UTM 32, WGS 84

Geological mapping and sample location, position of baseline (pt 1350N/500E and pt 1100N/500E)

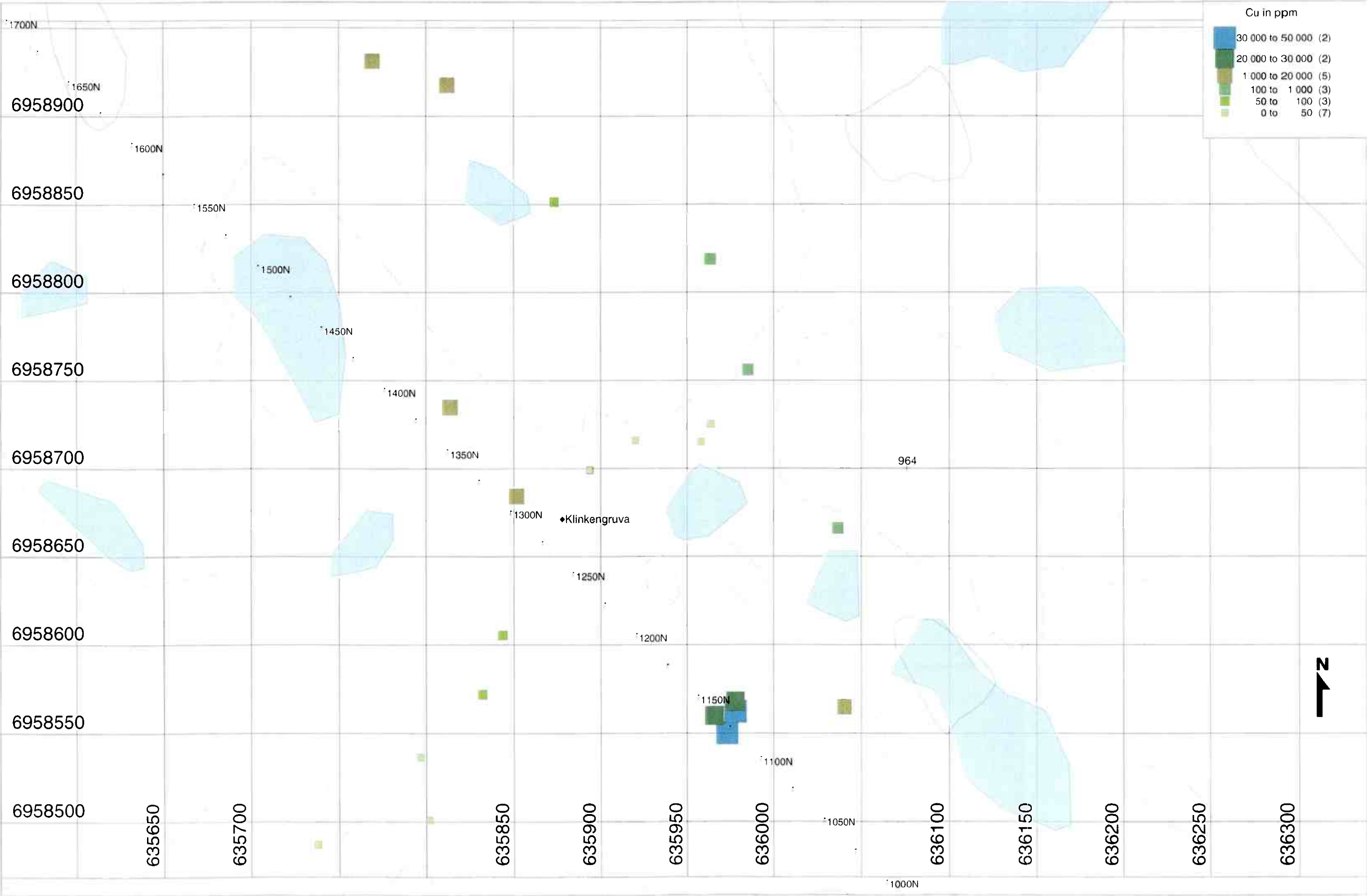
prepared by D. Schlatter, 26.01.2000 (based on Noranda captured JV data)



Klinkenberg: Zinc



Klinkenberg: Copper



Klinkenberg: Gold

