Focused Regional Module
Prospecting Report
#02-066

Yukon Mineral
Incentives Program

for
Diamonds
in the
Bell/Porcupine/ Lord Creek
Drainages; North Yukon
NTS 116P/5, O/6-11
Dawson Mining Districts

Field work done between August 28-31, 2002

Ron Berdahl

January 2003

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Summary:

The intent of the 2002 project was greenfield exploration for diamonds in an unglaciated portion of the north Yukon.

Diamonds caused the largest staking rush in Canadian history one decade ago. More recently diamonds in the North Slave (Nunavut) and Otish Mountains(Quebec) have rekindled investor interest, and thus grassroots exploration in diamond exploration. There have been various rumors of kimberlite, eclogite and even diamonds in the Yukon but no substantiated occurrences.

The project area was brought to light by YMIP geologist Ken Galambos, after he discovered and posted a few lines from a diary telling of an account of Bishop Andrew Macdonald, an Anglican who had previously served in South Africa and who, at the turn of the last century, was serving the north Yukon. The Bishop had supposedly seen 'blue earth' on the Porcupine River below its confluence with the Bell River. An attempt to find the showing by the applicant and two others in 2000 failed due to helicopter problems. An oil seep was discovered while waiting for a second helicopter.

Further research revealed the GSC discovery of unidentified pink garnets in heavy mineral sampling in the early 1960's (Gleeson, 1963). As well topographic features that could reflect pipes, and map names like "Blue Bank Hill" further encouraged exploration. Nineteen stream samples of -2mm mesh were anticipated. Twelve samples were sent to SRC in Saskatoon for analysis. As of this writing, results are pending. At sample site #4 the discovery of odoriferous natural gas was made.

Location and Access:

The "Yukon Diamond Project" (YDP) is a roughly 1500 mile square area centered 60 km. east southeast of the village of Old Crow, Yukon; Latitude 67 30' N Longitude 138 30' W. Geographically the area is bound on the north and east by the Porcupine River, on the west by a height of land west of Lord Creek, with Johnson Creek at the south extremity. Geologically the area is represented by the Driftwood Basin in the north and the Dave Lord uplift/Canoe depression to the south. The area covers portions of NTS map sheets 116P/5, and 116/O6,7,8,9,10 and 11. The area is administered through the Dawson Mining Recorder, though no map sheets are available for the area.

Access to the area can be made via boat from Old Crow, or during high water, on the Eagle River from where it crosses the Dempster Highway just north of Eagle Plains Lodge. The Eagle flows into the Bell which empties into the Porcupine. Helicopter can be used from Dawson or Inuvik 390km and 270km respectively. A regularly scheduled airline flight arrives from Dawson and Inuvik several times per week.

Topography and Vegetation:

Elevations in the 50 mile x 30 mile area range from 1,000 ft. to 1,600ft. Most of the area is relatively broad flat basins, or valleys with intermittent hills. The basins are filled with muskeg, permafrost and numerous small lakes. Outcrop is not uncommon on ridge tops. Along portions of the Porcupine River black muck of undetermined depth is present.

Vegetation is more robust along river courses than in the less well drained inland areas. Small, scattered, but evenly distributed black or white spruce dominate the area. Larger trees and deciduous species line waterways. Willow and alder and smaller bushes accompany trees in the riparian habitat, while mosses et. al. are the dominate understory in inland spruce 'forests'.

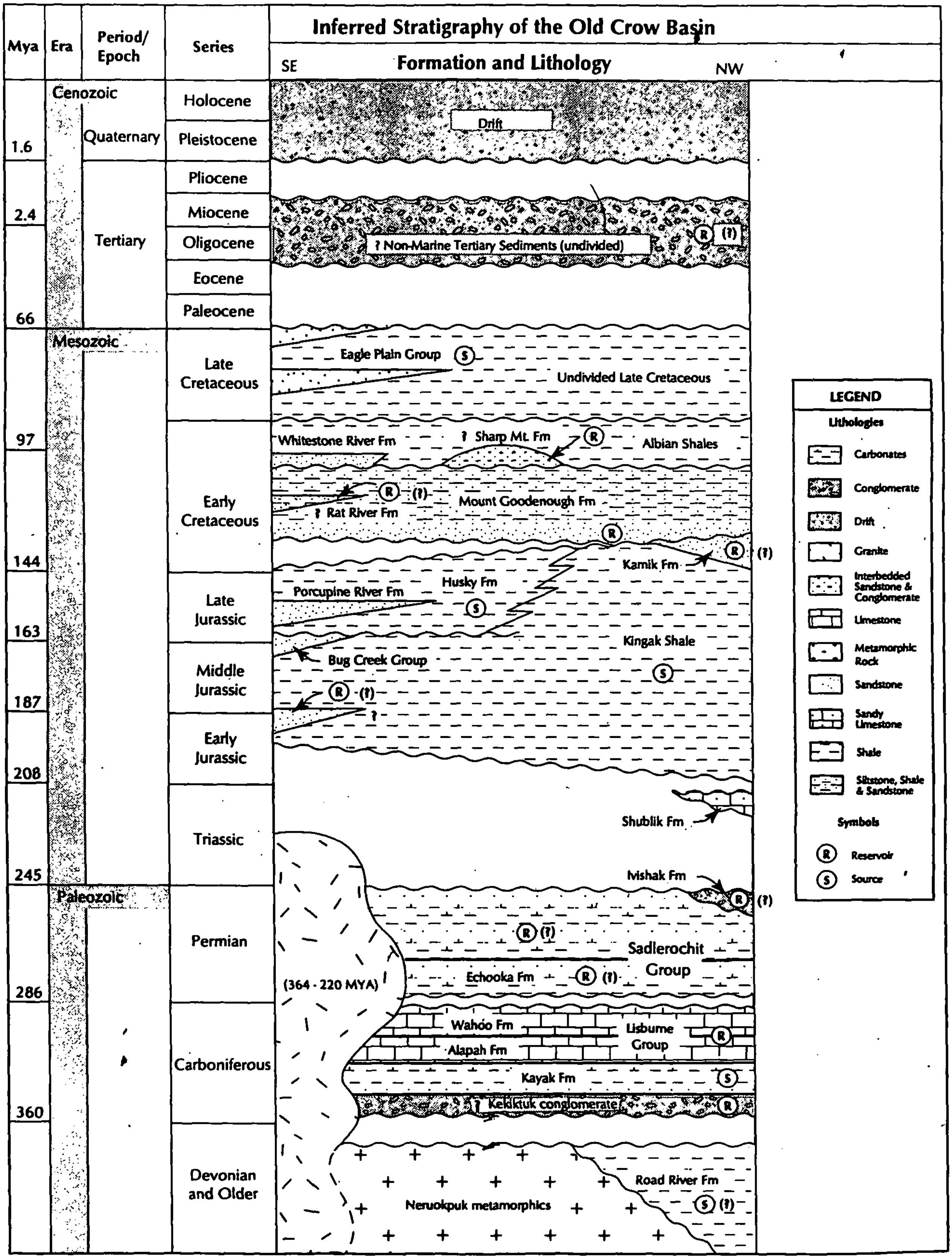
Regional Geology:

The project area is underlian by ancestral North American craton, This area of craton is known as the Interior Platform. It is part of the morphogeological Frontal Belt and is comprised of thick assemblages of older sediments deposited on the relatively stable ancient N.A. margin.(Hannigan,2001)

The western edge of the N.A. craton extended far into the ancient Pacific ocean. The crystalline basement rock is at least 1.7 billion years old. These formed a stable continental platform on which a billion years of sediments accumulated. Two depositional environments ,deep and shallow, gave rise to distinctive, shale and carbonate sediments respectively. These were later faulted against one another. The sediment packages on the Interior Platform ranged in thickness of up to 25km. The limestones originate from shallow quiescent seas, and the sandstones from erosion of the Canadian Shield.

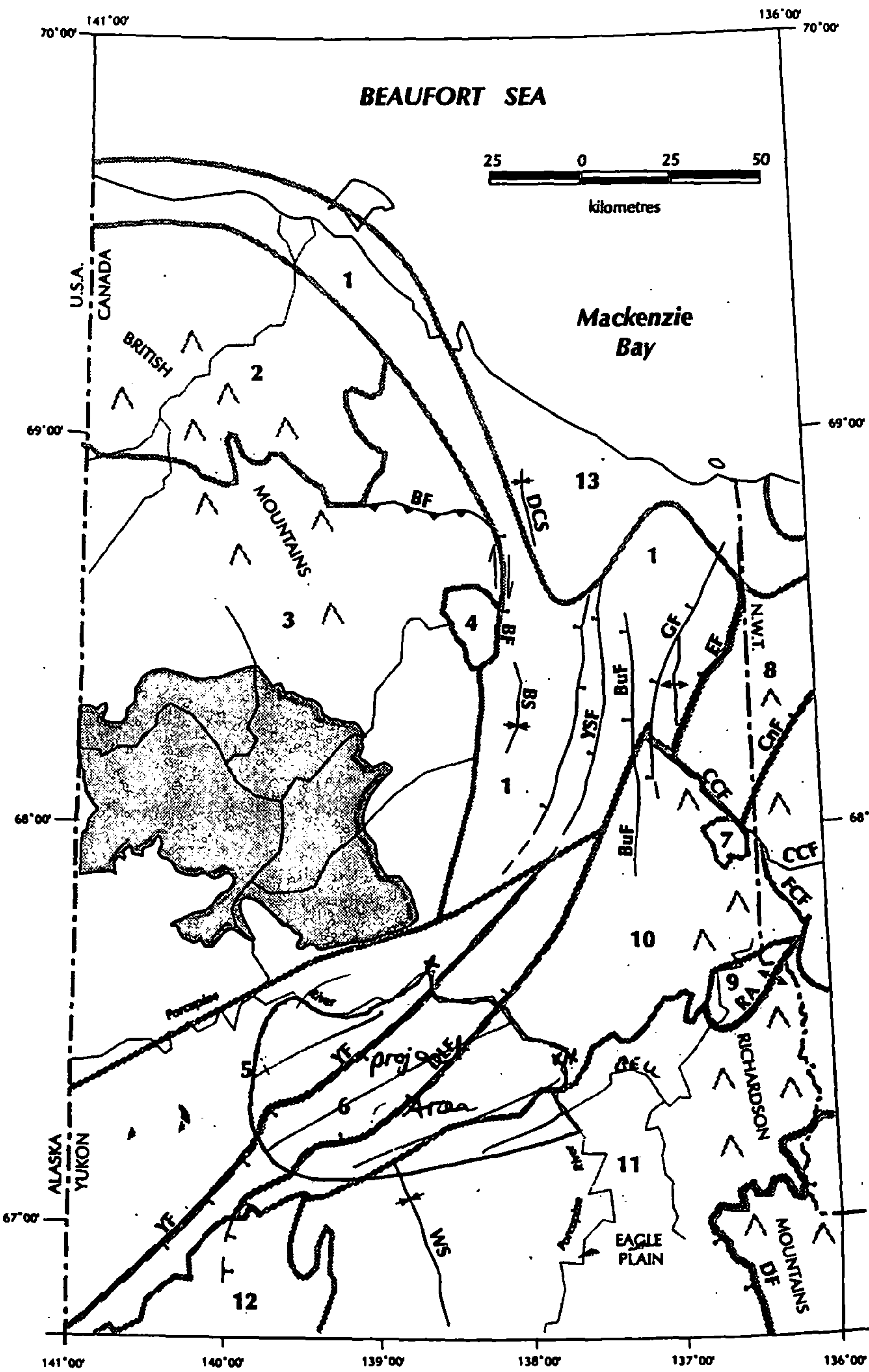
Two major structures intersect the area of interest. These are the sub parallel, northeast striking Yukon and David Lord Faults. The Drift Wood Basin lies to the north of the Yukon Fault, and is more or less bounded on the north by the Porcupine River. The area between the two faults is known as the David Lord Uplift. The Canoe depression lies to the south of that and juxtaposes the Eagle Fold Belt very near the reported Bishop's "blue earth" showing.

Geologic Time Table/ Structural Setting (from Hannigan 2001)



Inferred stratigraphy of the Old Crow Basin (adapted from Morrell and Dietrich, 1993).

Location map for principal elements and structures in northern Yukon (adapted from Norris, 1997b).



LEGEND

Old Crow Basin

Boundary between tectonic elements

Strike-slip fault

Fault, Extension (solid circle indicates downthrown side, defined, approximate)

Fault, Contraction (teeth indicate upthrust side)

Syncline

Anticline

1. Rapid Depression
2. Romanzof Uplift
3. Old Crow - Babbage Depression
4. Barn Uplift
5. Keele Block
6. Dave Lord Uplift
7. White Uplift
8. Cache Creek Uplift
9. Scho Uplift
10. Canoe Depression
11. Eagle Foldbelt
12. Taiga - Nahoni Foldbelt
13. Mackenzie-Beaufort Basin

BF	Barn Fault
BS	Blow Syncline
BuF	Buckland Fault
CCF	Cache Creek Fault
CnF	Canoe Fault
DLF	Dave Lord Fault
DF	Deception Fault
DCS	Deep Creek Syncline
EF	Eagle Fault
FCF	Fish Creek Fault
GF	Gilbert Fault
RA	Rat Anticline
WS	Whitestone Syncline
YF	Yukon Fault
YSF	Yukon (Skull) Fault

Property geology:

The "property" geology is more or less described under regional geology for this focused regional program. The Geologic time table's left side most closely reflects the conditions in the Drift Wood Basin. The Drift Wood is probably underlain by a Lower Paleozoic carbonate facies (reservoir potential for gas) not found under the Old Crow Basin. (Hannigan,2001)

River rocks, especially along the Porcupine had a surprising amount of sulfides. Intrusive float were also present, as was considerable conglomerate and quartz.

Methodology:

The central idea is that diamond indicator elements, which are found within kimberlites in much greater abundance than the diamonds themselves, can be found and traced back to their kimberlitic or eclogitic source.
Twelve of nineteen proposed stream sediment samples were collected from a network of waterways draining the program area. The area covers approximately 1,500 square miles and has not been glaciated. The northern portion of the area is covered in lacustrian sediments. Sampling sites were predetermined to allow for maximum covered of the area. Once in the field some sites were combined at the confluences of creeks as it was evident that a second sample would simply duplicate the drainage coverage. In other areas no appropriate sample medium could be found . Some new sites where sampled to fill in these areas (e.g. a bar in the main river below the unsamplable streams) Stream sediment samples were taken as opposed to the more traditional till samples as seen in the NWT as this area was never glaciated. In discussion with SRC and others it was determined each sample should consist of 12 kilos of -2mm sediments collected from the mid section of gravel bars. This area, in an idealized setting, would theoretically hold minerals with a mid range density (gold and heavy elements dropping out at the head, up river side of the bar, and lighter minerals trailing toward the foot of the bar). The diamond indicator elements, such as pyrope garnets, eclogitic garnets chrome diopsides, have medium densities. Some chromites and illmenites would also be caught in this section of a bar. All sites were sampled using conical pans and a series of decreasing sized screens. One person would shovel material while the second person 'panned' the material underwater in the collection bucket. Water was continually added to the bucket during panning (by the shovel man). Variations in site conditions are noted under sample site descriptions. Samples were marked inside and outside of double bagged containers and sent via Air North to Dawson and Kluane Frieghtways to Whitehorse. Timing and weight restrictions did not allow travel with the samples. The twelve samples were eventually sent to the Saskatchewan Research Council in Saskatoon, Saskatchewan, and were processed by their Geoanalytical Laboratories, which specializes in diamonds and diamond indicator minerals. The results are pending as of this writing. SRC visually separates possible indicator elements and then does micro probe analysis to determine

mineral types, i.e. G10 or G9 garnets (high or low Ca content). ICP was also requested to consider other deposit types.

Results:

Of twelve samples analyzed, ten had indicator minerals present. SRC observes for pyropes, chrome diopsides, eclogite garnets, olivines picro-ilmenites and chromites. These indicator minerals are initially placed in one of two categories, possible or definite, meaning they are possibly or definitely from a kimberlite/eclogite at the observation stage. Minerals are then subjected to probing at the clients request.

The observation process is detailed in the attached circular from SRC. The Old Crow samples were only 'anomalous' in possible chromite. The material then has to first scanned, to determine if these are actually Cr, and then if so, probed to determine if they have a kimberlitic or lamproitic origin. Chromites from mantle-derived sources (kimberlites, lamproites and ultramafic lamprophyres) and those from komatities plot in different fields when comparing Co/Zn ratios as well as Ni and Mn content. (Shixin Yao, Macquarie University, see attached).

While it was disappointing that chromites were the only indicator mineral, and one researcher at SRC thought that that might imply a lamproitic origin (pers comm. Alan Holsten). Yao considers the chromite material to be of particular significance because "it is very resistant to weathering and thus remains in the 'regolith after other indicators such as garnets are destroyed."

The two samples that were indicator mineral free, the duds, came from the headwater of Johnson creek (#4) (where the gas was smelled) and in the bar in the Porcupine below "Blue Bank Hill" (topo graphic feature). The highest concentration was from sample #14, with 50 hits in the 20% of the sample observed. (2.5 hours are devoted to sample observation, most samples were "100% observed in that time period). Sample #14 was at a dog leg creek just where it meets the Porcupine, it would be difficult to assign what percentage of the sample came from the immediate creek sample and what was from the flooding Porcupine basin (though #8 was taken in mid river just below the Bell and had a low count, 3 minerals.) The sample just below the alleged Bishop's showing had the second lowest count (#10 with only 4 grains). Sample #17 was also in the main river below David Lord Creek, an area of mag and visual anomalies.

Two sets of ICP were run a 15 'element' and 47 element. The results do not point to a heavily mineralized system. Given rocks present on beaches this data is somewhat surprising.

Conclusion and Recommendations:

Conclusions are less than stellar. If the scanning indicates Cr, and the scanning indicates mantle origin then the program has been a success. I am not certain how the glacial lake, and non glaciatian would influence grain distribution.

Recommendations depend on results. If any indicator elements are present, staking will ensue. ICP results could lend credibility to an IOGC type deposit.

References:

Gleeson, C.F.
1963: Reconnaissance Heavy-Mineral Study in the Northern Yukon Territory; GSC Paper 63-32; 10p

Hannigan, P.K.
2001: Petroleum Resource Assessment Old Crow Basin Yukon Territory, Canada; YTG Yukon Economic Development Department; 64p.

SRC Circular

Shixin Yao info, internet www.es.mq.edu.au/GEMOC/postgrads/shixin.htm

Sample Location Descriptions:

Sample	GPS coordinates	Description
#1902	139 52'W 67 18'N	mid section of Lord Creek 8m wide, gravel site
#1904	07 W 0593949E 7461388N	Upper Johnson Creek gravel 4 in. plus, smell of CH4 gas
#1905	07 W 0602909E 7471286N	confluence of left .limit trib. and Johnson Creek
#1907	07 W 0616983E 7460977N	lower Johnson Creek, sand and <3" cobbles in willow, crk 10m wide.
#1908	08 W 0377769E 7466761N	silty gravel bar in Porcupine River @ confluence of Bell
#1909		no sample medium
#1910	08 W 0379954E 7474613N	East bank of Porcupine below 'Bishop Showing', muddy
#1911	07 W 0626202E 7484497N	5 plus ft. organics, no sample
#1912	07 W 0623018E 7488580N	left limit steam at Porcupine sand on bedrock
#1913	07 W 0595933E 7502156N	mid Porcupine River, below Blue Bank Hill, very course or silty sed.
#1914	07 W 0602490E 7495252N	sample porcupine @ left limit creek mouth; fines to course
#1915	07 W 0601037E 7496230N	left limit creek, no gravel bars. sample off sandstone bedrx.
#1916	07 W 0580187E 7491617N	David Lord Creek, good sandy mid creek bar, crk 10+m.
#1917	07 W 0575412E 7491348N	Porcupine R. gravel bar below Lord Creek, good sample

Geoanalytical Laboratories SRC
125-15 Innovation Blvd., Saskatoon, SK., S7N 2X8
Phone:306-933-5426 Fax:306-933-5656
* IS FOR WHEN WE DIDNT FRANTZ THE PARTICULAR SAMPLE

M1043 BERDAHL JANUARY 28 2003 (13) [DI INDICATORS]
1 SAMPLE WEIGHT IN KG (SWT) OT02.241
2 MID FRACTION -1.00+0.25MM DRY WEIGHT IN GRAMS (MWT)
3 FRANTZ LOWERS @ 0.34 AMPS IN GRAMS (LW1)
4 FRANTZ LOWERS @ 0.19 AMPS IN GRAMS (LW2)
5 DEFINITE PYROPE GARNET GRAIN COUNT (PYR)
6 DEFINITE CLINOPYROXENE GRAIN COUNT (CPX)
7 DEFINITE PICROILMENITE GRAIN COUNT (ILM)
8 DEFINITE CHROMITE GRAIN COUNT (CHR)
9 % MAGS PROCESSED (%)

	SWT	MWT	LW1	LW2	PYR	CPX	ILM	CHR	%
1902	13.26	5650	10.94	*	0	0	0	0	100
1904	11.27	6929	3.66	*	0	0	0	0	100
1905	16.18	13236	29.88	21.27	0	0	0	0	100
1907	16.56	12316	20.51	*	0	0	0	0	100
1908	15.26	9694	19.75	11.01	0	0	0	0	100
1910	11.48	2783	7.30	*	0	0	0	0	100
1912	8.71	3763	14.40	*	0	0	0	0	100
1913	12.10	4962	7.44	*	0	0	0	0	100
1914	16.88	9615	41.64	39.01	0	0	0	0	100
1915	13.09	5458	3.49	*	0	0	0	0	100
1916	15.87	12012	2.73	*	0	0	0	0	100
1917	16.38	13065	19.95	6.70	0	0	0	0	100
1913R					0	0	0	0	

Kimberlite Indicator Mineral Grain Description Sheet **Group: OT02:241**

LW1 ☐ Preliminary Results ☑ Finalized Data

REP- Repicked Sample B-Blank def-Definite pos-Possible

No.	Sample Name	pyr		cpx		ecl	olv	%	Observ
		def	pos	def	pos	pos	pos	Observ	picked by
1	1902	0	0	0	0	0	0	100	0
	Comments:								DR
2	1904	0	0	0	0	0	0	100	0
	Comments:								MMG
3	1905	0	0	0	0	0	0	100	0
	Comments:								BR
4	1907	0	0	0	0	0	0	100	0
	Comments:								BR
5	1908	0	0	0	0	0	0	100	0
	Comments:								MMG
6	1910	0	0	0	0	0	0	100	0
	Comments:								MMG
7	1912	0	0	0	0	0	0	100	0
	Comments:								JW
8	1913	0	0	0	0	0	0	100	0
	Comments:								BR
9	1914	0	0	0	0	0	0	80	0
	Comments:								DR
10	1915	0	0	0	0	0	0	100	0
	Comments:								MMG
11	1916	0	0	0	0	0	0	100	0
	Comments:								DR
12	1917	0	0	0	0	0	0	100	0
	Comments:								BR
	Repick: 1913	0	0	0	0	0	0	100	0
	Comments:								DR

Kimberlite Indicator Mineral Grain Description Sheet Group: OT02:241

LW2

☐ Preliminary Results ☑ Finalized Data

REP- Repicked Sample def-Definite pos-Possible

No.	Sample Name	ilm		chr		% Observ	Observ
		def	pos	def	pos		picked by
1	1902	0	0	0	9	100	0
	Comments:						DR
2	1904	0	0	0	0	100	0
	Comments:						MMG
3	1905	0	0	0	10	30	0
	Comments:						BR
4	1907	0	0	0	13	100	0
	Comments:						BR
5	1908	0	0	0	3	100	0
	Comments:						MMG
6	1910	0	0	0	4	100	0
	Comments:						MMG
7	1912	0	0	0	10	70	0
	Comments:						JW
8	1913	0	0	0	0	100	0
	Comments:						BR
9	1914	0	0	0	50	20	0
	Comments:						DR
10	1915	0	0	0	14	100	0
	Comments:						MMG
11	1916	0	0	0	7	100	0
	Comments:						DR
12	1917	0	0	0	29	100	0
	Comments:						BR
	Repick: 1913	0	0	0	0	100	0
	Comments:						DR

Kimberlite Indicator Mineral Grain Description Sheet

GROUP	OT02:241										
								SURFACE			
SAMPLE	FRACTION	GRAIN TYPE *	COLOR	FORM	SHAPE	CLARITY	LUSTRE	FEATURE	COMMENT	DATE	OBSERV
1902	-0.50/0.25 mm	chr	black	sbhed	sbrnd	opaque	metal	rough		22/01/03	dr
1902	-0.50/+0.25 mm	chr	black	sbhed	sbang	opaque	metal	rough		22/01/03	dr
1902	-0.50/0.25 mm	chr	black	sbhed	sbang	opaque	metal	smooth		22/01/03	dr
1902	-0.50/+0.25 mm	chr	black	euh	ang	opaque	metal	smooth		22/01/03	dr
1902	-0.50/+0.25 mm	chr	black	sbhed	ang	opaque	metal	rough		22/01/03	dr
1902	-0.50/+0.25 mm	chr	black	sbhed	sbang	opaque	metal	rough		22/01/03	dr
1902	-0.50/+0.25 mm	chr	black	sbhed	ang	opaque	metal	rough		22/01/03	dr
1902	-0.50/+0.25 mm	chr	black	sbhed	sbang	opaque	metal	rough		22/01/03	dr
1902	-0.50/+0.25 mm	chr	black	anh	sbrnd	opaque	metal	rough		22/01/03	dr
1905	-0.50/+0.25 mm	chr	black	sbhed	sbrnd	opaque	metal	rough		23/01/03	br
1905	-0.50/+0.25 mm	chr	black	sbhed	sbrnd	opaque	metal	rough		23/01/03	br
1905	-0.50/+0.25 mm	chr	black	sbhed	sbrnd	opaque	metal	rough		23/01/03	br
1905	-0.50/+0.25 mm	chr	black	sbhed	sbrnd	opaque	metal	rough		23/01/03	br
1905	-0.50/+0.25 mm	chr	black	sbhed	sbrnd	opaque	metal	rough		23/01/03	br
1905	-0.50/+0.25 mm	chr	black	sbhed	sbrnd	opaque	metal	rough		23/01/03	br
1905	-0.50/+0.25 mm	chr	black	sbhed	sbrnd	opaque	metal	rough		23/01/03	br
1905	-0.50/+0.25 mm	chr	black	sbhed	sbrnd	opaque	metal	rough		23/01/03	br
1905	-0.50/+0.25 mm	chr	black	sbhed	sbrnd	opaque	metal	rough		23/01/03	br
1905	-0.50/+0.25 mm	chr	black	sbhed	sbrnd	opaque	metal	rough		23/01/03	br
1907	-1.00/+0.50mm	chr	black	anh	ang	opaque	metal	rough		24/01/03	br
1907	-1.00/+0.50mm	chr	black	anh	ang	opaque	metal	rough		24/01/03	br
1907	-1.00/+0.50mm	chr	black	anh	ang	opaque	metal	rough		24/01/03	br
1907	-1.00/+0.50mm	chr	black	anh	ang	opaque	metal	rough		24/01/03	br
1907	-1.00/+0.50mm	chr	black	anh	rnd	opaque	metal	smooth		24/01/03	br
1907	-1.00/+0.50mm	chr	black	sbhed	sbrnd	opaque	metal	rough		24/01/03	br
1907	-1.00/+0.50mm	chr	black	sbhed	sbrnd	opaque	metal	rough		24/01/03	br
1907	-1.00/+0.50mm	chr	black	sbhed	sbrnd	opaque	metal	rough		24/01/03	br
1907	-1.00/+0.50mm	chr	black	sbhed	sbrnd	opaque	metal	rough		24/01/03	br
1907	-1.00/+0.50mm	chr	black	sbhed	sbrnd	opaque	metal	rough		24/01/03	br
1907	-1.00/+0.50mm	chr	black	sbhed	sbrnd	opaque	metal	rough		24/01/03	br
1907	-1.00/+0.50mm	chr	black	sbhed	sbrnd	opaque	metal	rough		24/01/03	br
1907	-1.00/+0.50mm	chr	black	sbhed	sbrnd	opaque	metal	rough		24/01/03	br
1908	-0.50/+0.25mm	chr	black	euh	sbang	opaque	metal	rough		24/01/03	mmg
1908	-0.50/+0.25mm	chr	black	euh	sbang	opaque	metal	rough		24/01/03	mmg
1908	-0.50/+0.25mm	chr	black	sbhed	sbang	opaque	metal	rough		24/01/03	mmg
1910	-0.50/+0.25mm	chr	black	sbhed	sbrnd	opaque	metal	rough		27/01/03	mmg
1910	-0.50/+0.25mm	chr	black	sbhed	sbrnd	opaque	metal	rough		27/01/03	mmg
1910	-0.50/+0.25mm	chr	black	anh	rnd	opaque	metal	rough		27/01/03	mmg
1910	-0.50/+0.25mm	chr	black	anh	sbrnd	opaque	metal	rough		27/01/03	mmg

*unless otherwise stated, all grains are considered possible

Kimberlite Indicator Mineral Grain Description Sheet

GROUP	OT02:241										
								SURFACE			
SAMPLE	FRACTION	GRAIN TYPE *	COLOR	FORM	SHAPE	CLARITY	LUSTRE	FEATURE	COMMENT	DATE	OBSERV
1912	+0.50/-1.0mm	chr	black	sbhed	ang	opaque	metal	rough		27/01/03	jw
1912	+0.25/-0.50mm	chr	black	sbhed	ang	opaque	metal	rough		27/01/03	jw
1912	+0.25/-0.50mm	chr	black	sbhed	sbrnd	opaque	metal	rough		27/01/03	jw
1912	+0.25/-0.50mm	chr	black	anh	sbrnd	opaque	metal	rough		27/01/03	jw
1912(x3)	+0.25/-0.50mm	chr	black	sbhed	ang	opaque	metal	smooth		27/01/03	jw
1912(x3)	+0.25/-0.50mm	chr	black	sbhed	sbang	opaque	metal	rough		27/01/03	jw
1914 (x10)	+0.25/-0.50mm	chr	black	euh	ang	opaque	metal	rough		27/01/03	dr
1914 (x11)	+0.25/-0.50mm	chr	black	euh	sbang	opaque	metal	rough		27//01/03	dr
1914 (x17)	+0.25/-0.50mm	chr	black	sbhed	sbrnd	opaque	metal	rough		27/01/03	dr
1914 (x3)	+0.25/-0.50mm	chr	black	anh	sbang	opaque	metal	rough		27/01/03	dr
1914 (x9)	+0.25/-0.50mm	chr	black	sbhed	sbang	opaque	metal	rough		27/01/03	dr
1915 (x2)	+0.50/-1.00mm	chr	black	sbhed	sbrnd	opaque	metal	rough		27/01/03	mmg
1915 (x5)	+0.25/-0.50mm	chr	black	anh	sbrnd	opaque	metal	rough		27/01/03	mmg
1915 (x7)	+0.25/-0.50mm	chr	black	euh	sbang	opaque	metal	rough		27/01/03	mmg
1916 (x1)	+0.25/-0.50 mm	chr	black	shed	sbang	opaque	metal	rough		27/01/03	dr
1916 (x3)	+0.25/-0.50 mm	chr	black	euh	ang	opaque	metal	rough		27/01/03	dr
1916 (x3)	+0.25/-0.50 mm	chr	black	anh	sbang	opaque	metal	rough		27/01/03	dr
1917 (x11)	+0.25/-0.50mm	chr	black	anh	rnd	opaque	metal	rough		27/01/03	br
1917 (x2)	+0.25/-0.50mm	chr	black	euh	sbang	opaque	metal	smooth		27/01/03	br
1917 (x3)	+0.25/-0.50mm	chr	black	sbhed	sbrnd	opaque	metal	smooth		27/01/03	br
1917 (x4)	+0.25/-0.50mm	chr	black	euh	sbang	opaque	metal	rough		27/01/03	br
1917 (x9)	+0.25/-0.50mm	chr	black	sbhed	sbrnd	opaque	metal	rough		27/01/03	br

* unless otherwise stated, all grains are considered possible

Data sheet prepared by
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M1045 BERDAHL JANUARY 29 2003 (14) PG 1218 [.500 G AR DIG]
OT02.241

1 Ag ppm HCL/HNO3 ICP
2 As ppm HCL/HNO3 ICP
3 Bi ppm HCL/HNO3 ICP
4 Co ppm HCL/HNO3 ICP
5 Cu ppm HCL/HNO3 ICP
6 Ge ppm HCL/HNO3 ICP
7 Hg ppm HCL/HNO3 ICP
8 Mo ppm HCL/HNO3 ICP
9 Ni ppm HCL/HNO3 ICP

	Ag	As	Bi	Co	Cu	Ge	Hg	Mo	Ni
LS3	<0.1	9.7	<0.2	36.8	46.8	<0.2	<0.2	17.3	48.3
-106 1902	0.1	9.9	<0.2	11.7	17.9	<0.2	<0.2	1.0	30.6
-106 1904	0.1	10.1	<0.2	14.7	22.4	<0.2	<0.2	1.2	41.1
-106 1905	<0.1	12.2	<0.2	12.5	16.6	<0.2	<0.2	1.8	36.7
-106 1907	0.1	9.7	<0.2	11.2	18.8	<0.2	<0.2	1.3	33.0
-106 1908	0.1	13.6	<0.2	21.4	18.5	<0.2	<0.2	1.8	54.7
-106 1910	0.2	11.6	<0.2	11.1	20.1	<0.2	<0.2	1.7	37.7
-106 1912	0.3	17.7	<0.2	5.2	15.0	<0.2	<0.2	1.2	27.9
-106 1913	0.2	11.0	<0.2	10.9	21.2	<0.2	<0.2	1.5	36.6
-106 1914	0.2	13.3	<0.2	13.1	23.8	<0.2	<0.2	1.6	42.9
-106 1915	0.1	12.8	<0.2	15.3	18.8	<0.2	<0.2	0.9	29.1
-106 1916	0.1	10.7	<0.2	12.1	15.3	<0.2	<0.2	1.1	26.6
-106 1917	0.2	12.4	<0.2	13.7	17.2	<0.2	<0.2	1.7	36.3
-106 1913R	0.2	10.9	<0.2	9.9	21.2	<0.2	<0.2	1.5	37.3

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M1045 BERDAHL JANUARY 29 2003 (14) PG 1218 [.500 G AR DIG]
1 Pb ppm HCL/HNO3 ICP OT02.241
2 Sb ppm HCL/HNO3 ICP
3 Se ppm HCL/HNO3 ICP
4 Te ppm HCL/HNO3 ICP
5 U ppm HCL/HNO3 ICP
6 V ppm HCL/HNO3 ICP
7 Zn ppm HCL/HNO3 ICP
8
9

	Pb	Sb	Se	Te	U	V	Zn
LS3	15.7	<0.2	0.6	<0.2	36.8	95.0	188
-106 1902	10.2	<0.2	<0.2	<0.2	2.2	37.2	107
-106 1904	11.4	<0.2	0.6	<0.2	2.1	46.3	159
-106 1905	9.49	<0.2	0.2	<0.2	2.6	49.7	132
-106 1907	9.73	<0.2	<0.2	<0.2	1.4	38.0	119
-106 1908	10.1	<0.2	0.2	<0.2	3.2	47.4	186
-106 1910	9.13	<0.2	0.3	<0.2	1.9	33.5	137
-106 1912	9.71	<0.2	0.4	<0.2	1.5	32.8	111
-106 1913	9.42	<0.2	<0.2	<0.2	2.1	31.5	131
-106 1914	11.9	<0.2	0.3	<0.2	2.3	39.7	147
-106 1915	9.97	<0.2	0.2	<0.2	1.4	36.7	106
-106 1916	11.0	<0.2	0.3	<0.2	1.8	35.2	97.9
-106 1917	9.38	<0.2	0.4	<0.2	1.9	32.1	129
-106 1913R	9.51	<0.2	0.7	<0.2	2.2	32.6	130

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M1044 BERDAHL JANUARY 29 2003 (14) PG 1217 [.125 G HF DIG]

1	Ag	ppm	HF/HNO3/HCLO4	ICP OT02.241
2	Al2O3	wt %	HF/HNO3/HCLO4	ICP
3	Ba	ppm	HF/HNO3/HCLO4	ICP
4	Be	ppm	HF/HNO3/HCLO4	ICP
5	CaO	wt %	HF/HNO3/HCLO4	ICP
6	Cd	ppm	HF/HNO3/HCLO4	ICP
7	Ce	ppm	HF/HNO3/HCLO4	ICP
8	Co	ppm	HF/HNO3/HCLO4	ICP
9	Cr	ppm	HF/HNO3/HCLO4	ICP

	Ag	Al2O3	Ba	Be	CaO	Cd	Ce	Co	Cr
CG509	0.3	11.5	922	1.5	2.79	<0.2	73	8	205
-106 1902	0.5	10.3	755	1.5	0.87	0.4	50	15	71
-106 1904	0.5	10.7	806	1.5	1.16	0.8	51	17	77
-106 1905	0.3	7.91	586	1.2	0.67	<0.2	38	13	60
-106 1907	0.4	10.0	710	1.4	0.63	0.3	46	13	69
-106 1908	0.5	11.7	1290	1.8	2.66	0.9	50	26	93
-106 1910	0.6	10.0	1160	1.4	1.98	1.1	43	13	76
-106 1912	0.6	11.2	792	1.7	0.77	<0.2	49	8	98
-106 1913	0.5	9.95	1000	1.4	1.62	0.7	43	11	74
-106 1914	0.3	11.6	1300	1.8	1.42	1.3	47	14	90
-106 1915	0.3	10.4	1050	1.4	1.12	1.0	45	18	72
-106 1916	0.7	8.95	770	1.3	0.70	0.2	46	16	62
-106 1917	0.5	9.62	1080	1.4	1.51	0.7	44	16	71
-106 1913R	0.6	9.96	966	1.4	1.65	0.6	40	12	74

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M1044 BERDAHL JANUARY 29 2003 (14) PG 1217 [.125 G HF DIG]
1 Cu ppm HF/HNO3/HCLO4 ICP OT02.241
2 Dy ppm HF/HNO3/HCLO4 ICP
3 Er ppm HF/HNO3/HCLO4 ICP
4 Eu ppm HF/HNO3/HCLO4 ICP
5 Fe2O3 wt % HF/HNO3/HCLO4 ICP
6 Ga ppm HF/HNO3/HCLO4 ICP
7 Gd ppm HF/HNO3/HCLO4 ICP
8 Hf ppm HF/HNO3/HCLO4 ICP
9 Ho ppm HF/HNO3/HCLO4 ICP

	Cu	Dy	Er	Eu	Fe2O3	Ga	Gd	Hf	Ho
CG509	3	2.3	1.2	1.2	3.29	15	4.3	4.6	1.1
-106 1902	20	1.8	1.6	1.1	4.78	16	4.8	3.3	1.4
-106 1904	25	1.7	1.7	1.3	5.24	15	5.3	3.2	1.5
-106 1905	18	1.5	1.1	1.1	6.16	13	4.3	3.1	1.1
-106 1907	21	1.8	1.4	1.1	5.33	17	4.5	3.7	1.2
-106 1908	20	1.2	1.4	1.4	6.84	18	5.8	3.3	1.5
-106 1910	23	2.0	1.4	1.1	4.65	14	4.5	3.0	1.3
-106 1912	18	2.6	1.7	1.0	4.71	18	4.6	3.5	1.3
-106 1913	23	1.8	1.4	1.1	4.58	16	4.5	3.0	1.4
-106 1914	27	1.9	1.7	1.3	6.02	19	5.4	3.1	1.4
-106 1915	21	1.7	1.3	1.2	4.69	17	4.8	3.0	1.4
-106 1916	17	1.6	1.3	1.1	4.85	14	4.5	3.8	1.1
-106 1917	20	1.2	1.5	1.1	4.91	15	4.8	3.2	1.4
-106 1913R	23	1.6	1.2	1.1	4.58	16	4.4	2.9	1.3

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M1044 BERDAHL JANUARY 29 2003 (14) PG 1217 [.125 G HF DIG]
OT02.241

1 K2O wt % HF/HNO3/HCLO4 ICP
2 La ppm HF/HNO3/HCLO4 ICP
3 Li ppm HF/HNO3/HCLO4 ICP
4 Lu ppm HF/HNO3/HCLO4 ICP
5 MgO wt % HF/HNO3/HCLO4 ICP
6 MnO wt % HF/HNO3/HCLO4 ICP
7 Mo ppm HF/HNO3/HCLO4 ICP
8 Na2O wt % HF/HNO3/HCLO4 ICP
9 Nb ppm HF/HNO3/HCLO4 ICP

	K2O	La	Li	Lu	MgO	MnO	Mo	Na2O	Nb
CG509	2.44	37	19	0.3	1.29	0.052	3	2.89	5
-106 1902	1.56	24	49	0.8	1.10	0.067	<1	0.70	7
-106 1904	1.54	25	51	0.9	1.17	0.099	<1	0.74	6
-106 1905	1.13	19	41	0.2	0.940	0.063	1	0.53	5
-106 1907	1.68	22	45	0.9	1.06	0.056	1	0.53	5
-106 1908	1.92	24	59	0.3	2.42	0.168	2	0.55	7
-106 1910	1.64	21	49	0.8	1.86	0.054	1	0.50	6
-106 1912	1.74	27	69	0.9	1.12	0.023	<1	0.34	5
-106 1913	1.65	22	48	0.8	1.67	0.066	1	0.57	7
-106 1914	1.96	23	54	0.2	1.84	0.073	1	0.72	6
-106 1915	1.59	22	44	0.8	1.08	0.072	<1	0.69	5
-106 1916	1.39	22	43	0.8	0.882	0.092	<1	0.50	5
-106 1917	1.59	21	48	0.8	1.57	0.097	1	0.55	6
-106 1913R	1.64	20	49	0.8	1.68	0.066	1	0.58	6

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M1044 BERDAHL JANUARY 29 2003 (14) PG 1217 [.125 G HF DIG]
1 Nd ppm HF/HNO3/HCLO4 ICP OT02.241
2 Ni ppm HF/HNO3/HCLO4 ICP
3 P2O5 wt % HF/HNO3/HCLO4 ICP
4 Pb ppm HF/HNO3/HCLO4 ICP
5 Pr ppm HF/HNO3/HCLO4 ICP
6 Sc ppm HF/HNO3/HCLO4 ICP
7 Sm ppm HF/HNO3/HCLO4 ICP
8 Sn ppm HF/HNO3/HCLO4 ICP
9 Sr ppm HF/HNO3/HCLO4 ICP

	Nd	Ni	P2O5	Pb	Pr	Sc	Sm	Sn	Sr
CG509	29	16	0.233	9	6	5	4.5	4	357
-106 1902	23	41	0.177	15	4	10	3.8	1	115
-106 1904	24	51	0.176	16	4	11	3.8	1	124
-106 1905	17	44	0.191	11	2	7	3.1	2	76
-106 1907	20	42	0.158	13	4	9	3.4	1	86
-106 1908	23	71	0.311	14	4	10	4.7	1	112
-106 1910	20	49	0.209	13	3	9	3.7	1	103
-106 1912	24	42	0.158	15	5	10	3.8	1	113
-106 1913	20	49	0.203	12	3	9	3.7	1	101
-106 1914	22	56	0.256	16	3	11	3.7	1	100
-106 1915	21	40	0.202	15	3	10	3.4	1	125
-106 1916	21	36	0.184	15	3	9	3.5	1	93
-106 1917	21	47	0.217	13	3	9	3.3	4	96
-106 1913R	19	46	0.202	13	3	9	3.6	1	99

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M1044 BERDAHL JANUARY 29 2003 (14) PG 1217 [.125 G HF DIG]
OT02.241

1 Ta	ppm	HF/HNO3/HCLO4	ICP
2 Tb	ppm	HF/HNO3/HCLO4	ICP
3 Th	ppm	HF/HNO3/HCLO4	ICP
4 TiO2	wt %	HF/HNO3/HCLO4	ICP
5 U	ppm	HF/HNO3/HCLO4	ICP
6 V	ppm	HF/HNO3/HCLO4	ICP
7 W	ppm	HF/HNO3/HCLO4	ICP
8 Y	ppm	HF/HNO3/HCLO4	ICP
9 Yb	ppm	HF/HNO3/HCLO4	ICP

	Ta	Tb	Th	TiO2	U	V	W	Y	Yb
CG509	1	<0.3	8	0.407	6	54	7	14	1.6
-106 1902	1	<0.3	7	0.568	4	148	1	19	2.5
-106 1904	2	<0.3	8	0.547	4	167	1	22	2.7
-106 1905	1	<0.3	6	0.416	2	134	1	17	2.2
-106 1907	2	<0.3	8	0.434	3	156	1	17	2.4
-106 1908	2	0.3	8	0.508	4	198	1	22	1.9
-106 1910	1	0.3	7	0.456	2	166	<1	19	2.4
-106 1912	<1	<0.3	8	0.541	4	233	2	20	2.1
-106 1913	2	<0.3	6	0.492	2	157	<1	19	2.4
-106 1914	2	0.3	9	0.508	4	181	<1	21	1.9
-106 1915	1	<0.3	8	0.421	2	145	<1	18	2.3
-106 1916	2	<0.3	7	0.409	3	131	<1	19	2.4
-106 1917	2	<0.3	7	0.456	2	152	<1	19	2.4
-106 1913R	1	<0.3	7	0.457	2	156	<1	18	2.3

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M1044   BERDAHL   JANUARY 29   2003   (14)   PG 1217   [.125 G HF DIG]
1 Zn   ppm HF/HNO3/HCLO4   ICP   OT02.241
2 Zr   ppm HF/HNO3/HCLO4   ICP
3
4
5
6
7
8
9

	Zn	Zr
CG509	26	197
-106 1902	137	102
-106 1904	195	98
-106 1905	156	96
-106 1907	146	107
-106 1908	228	86
-106 1910	170	88
-106 1912	146	103
-106 1913	160	88
-106 1914	184	87
-106 1915	131	83
-106 1916	122	118
-106 1917	168	88
-106 1913R	161	79

Statement of Costs:

Focused Regional 02- 000

Truck Whse/Dawson Rtn. 1000Km. @ 48.5/km	485.00
Trans North chopper, ferry from Dawson and work (shared ferry) 3.6hrs.	4,366.14
Eight man days in field Aug 28-31 @ $250/man/day	2,000.00
Two man days organizing/shipping etc. @ $250/man day	500.00
Per Diem @ $35/man/day x 8 field days	280.00
Sample shipping Old crow to Dawson Air North	340.04
Sample shipping Dawson to Whse, Kluane Freightways	57.00
Sample shipping Whse to Saskatoon Northwest Transport	nnnnnnn 150
SRC analysis costs 12 samples	to be determined
Report	400.00
	8,578.18

Personnel:

Ron Berdahl
Rob Hamel

Geoanalytical Laboratories

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Reviewed by: ______________________

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TO: SRC CLIENTS

FROM: Penny Maki Scott
Geologist, Geoanalytical Laboratories
PH: (306) 933-7121
FAX: (306) 933-5656

RE: Observing of kimberlite indicator mineral grains

Identifying and classifying kimberlite indicator minerals (KIM) can be very subjective at times. Color and morphology are the main determining factors used to identify KIM. Subtle differences in elemental composition can make identification much less certain. We choose mineral grains that have a high probability of being KIM. We also choose lower probability mineral grains that may be of significance. We respectively label these minerals as "definite" **(def)** or "possible" **(pos)**. To ensure that you get a completely accurate picture of the mineralogy we recommend that you analyze as many grains as possible from both the high and low probability groups. The accuracy of your interpretation will be directly proportional to the number of analyses performed. SRC does not accept any responsibility concerning interpretation. This is the sole responsibility of the client.

Please note the % observed **(observ)** column on the Indicator Mineral Grain Description Sheets. Usually 100% of the LW1 are picked and only a percentage of the LW2 are picked due to time constraints. The concentrates size range from +0.25 mm up to 1 mm. The concentrates are sieved into plus 0.5 mm and minus 0.5 mm fractions and then observed for indicators. The overall cost of processing a sample includes 2.5 hours of observing under a binocular microscope and the percentage of the concentrate observed is recorded. The remainder of the concentrate may be observed but at extra cost. Attached is an explanation of what our modifiers mean on the data spread sheet for kimberlite indicator minerals. The **LW1** refers to the silicates from the concentrate. The silicates of interest are Mg- and Cr-rich pyrope garnets (G9/G10), Na-rich eclogitic garnets (G3), iron/titanium pyrope garnets (G1/G2 for iron-rich or G11/G12 for titanium-rich), chrome diopsides (a clinopyroxene), olivines (a mantle derived mineral), and phlogopite (a mica mineral common in ultra-basic rocks). The **LW2** refers to the black oxide minerals from the concentrate. The two minerals of interest are picro-ilmenites (a magnesium rich titanium dioxide) and chromites (spinels).

If you have any questions, please do not hesitate to call. We thank you for your business.

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Indicator Mineral Grain Description Sheet

GROUP NUMBER	Given by lab.
SAMPLE	Sample number.
FRACTION	size of sample picked (-0.50/+0.25mm, -1.00/+0.50mm)
GRAIN TYPE	**pyr** (pyropes), **cpx** (chrome diopsides), **ecl** (eclogitic garnets), **olv** (olivines), **ilm** (picro-ilmenites), **chr**(chromites).
COLOR	pyr: **burgundy, violet, red** or **purple**; cpx: **apple green** or **green**; ecl: **orange**; olv: **beige** or **yellow**; ilm and chr: **black**.
FORM	**euh** (euhedral), **sbhed** (subhedral), **anh** (anhedral).
SHAPE	**rnd** (rounded), **sbrnd** (subrounded), **sbang** (subangular) **ang** (angular).
CLARITY	**transparent, translucent, included, opaque.**
LUSTRE	**glassy, vitreous, metal** (metallic).
SURFACE FEATURE	**none, orpeel** (orange peel texture), **frosted, rough, pitted, smooth, kelyphite rim.**
COMMENT	If grain is lost at any point of process or other comment.
OBSDATE	Day-month-year.
OBSERVER	Initial.

Shixin Yao is a postgraduate student within the School of Earth Sciences, Macquarie University. He is currently investigating the chemistry of chromites in ultramafic rocks and their application to mineralisation and petrogenesis.

Supervisors:

Professor Suzanne Y. O'Reilly and Professor William L. Griffin

External supervisor:

Dr. David French (CSIRO Division of Exploration and Mining, North Ryde, Australia)

Research interest:

Chemistry of resistant indicator minerals and mineralisation processes of metallic ore deposits.

Present awards:

Overseas Postgraduate Research Scholarship

GEMOC/CRAE Postgraduate Research Scholarship Funding

Macquarie University Postgraduate Research Funding

Present research project:

Chemistry of chromites from ultramafic rocks:

Application to mineralisation and petrogenesis

About the project

This project is designed to distinguish chromites from different sources because chromite [$(Mg,Fe)(Al,Cr,Fe)_2O_4$] is a common accessory mineral in ultramafic rocks, which are potential source rocks of diamond and other commodities such as Ni. Chromite has long been used as an important indicator mineral by diamond exploration companies because it is very resistant to weathering and remains in the regolith after other indicators such as garnets are destroyed. However, only some of the rocks that contain chromites (e.g. kimberlites and lamproites) are potential diamond sources. Other ultramafic rocks such as komatiites also contain abundant chromites, but they are diamond free. They are potential hosts of Ni deposits, instead. Therefore, it is of economic importance to discriminate chromites from mineralised sources and barren ones.

This project also aims to understand the petrogenetic importance of chromites. Some chromites from mantle-derived rocks (e.g. kimberlites and lamproites) are regarded as mantle xenocrysts, which were incorporated into the magmas when the magmas penetrated through the mantle sections. Studies on these chromites can reveal information about mantle processes while studies on magmatic chromites can reveal information about magma crystallisation.

This project is based on microbeam geochemical analyses of chromites from various rock types from world-wide locations. Major elements are analysed by electron microprobe and trace elements are analysed by laser-ablation ICPMS microprobe in the GEMOC National Key Centre at Macquarie University. Statistical approaches are being used to develop tools for discriminating various chromites.

Preliminary results

Chromites from kimberlites, lamproites and some ultramafic lamprophyres, which are potential diamondiferous sources, are easily distinguishable from other ultramafic rocks (komatiites) in terms of their Co and Zn compositions (Fig. 1).

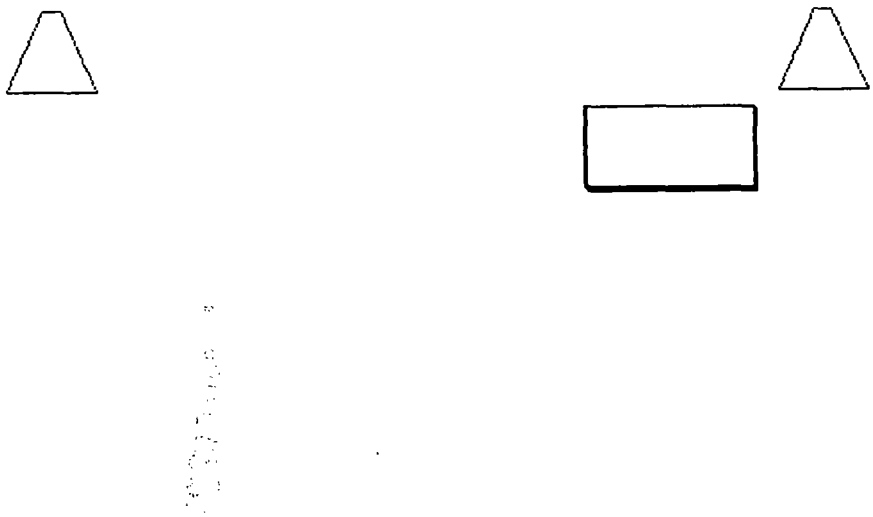

Fig. 2 Nb and Mn discriminants between chromites from kimberlites/lamproites and those from other sources

As shown in this diagram, Nb in chromites from kimberlites and lamproites is much higher than in those from lamprophyres and komatiites. Nb tends to be enriched in alkaline magmas. High Nb in chromites from kimberlites and lamproites is consistent with high alkali contents in these rocks and implies that the chromites may have reacted with their host magmas. Ta, Zr and Sc show the same tendency as Nb. These elements can serve as discriminants between chromites from kimberlites/lamproites and those from other sources.

Further statistical analysis can help in setting up a statistical discrimination tree to recognise chromites from different sources (kimberlites, lamproites, lamprophyres and komatiites).

Not only can we distinguish komatiite chromites from Mantle Array chromites, but we also can distinguish chromites from unmineralised and mineralised komatiites. Confidentiality agreements with industry partners prevent full data display.

Back to the GEMOC Postgraduate Opportunities Page

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Fig. 1 Co-Zn Correlation

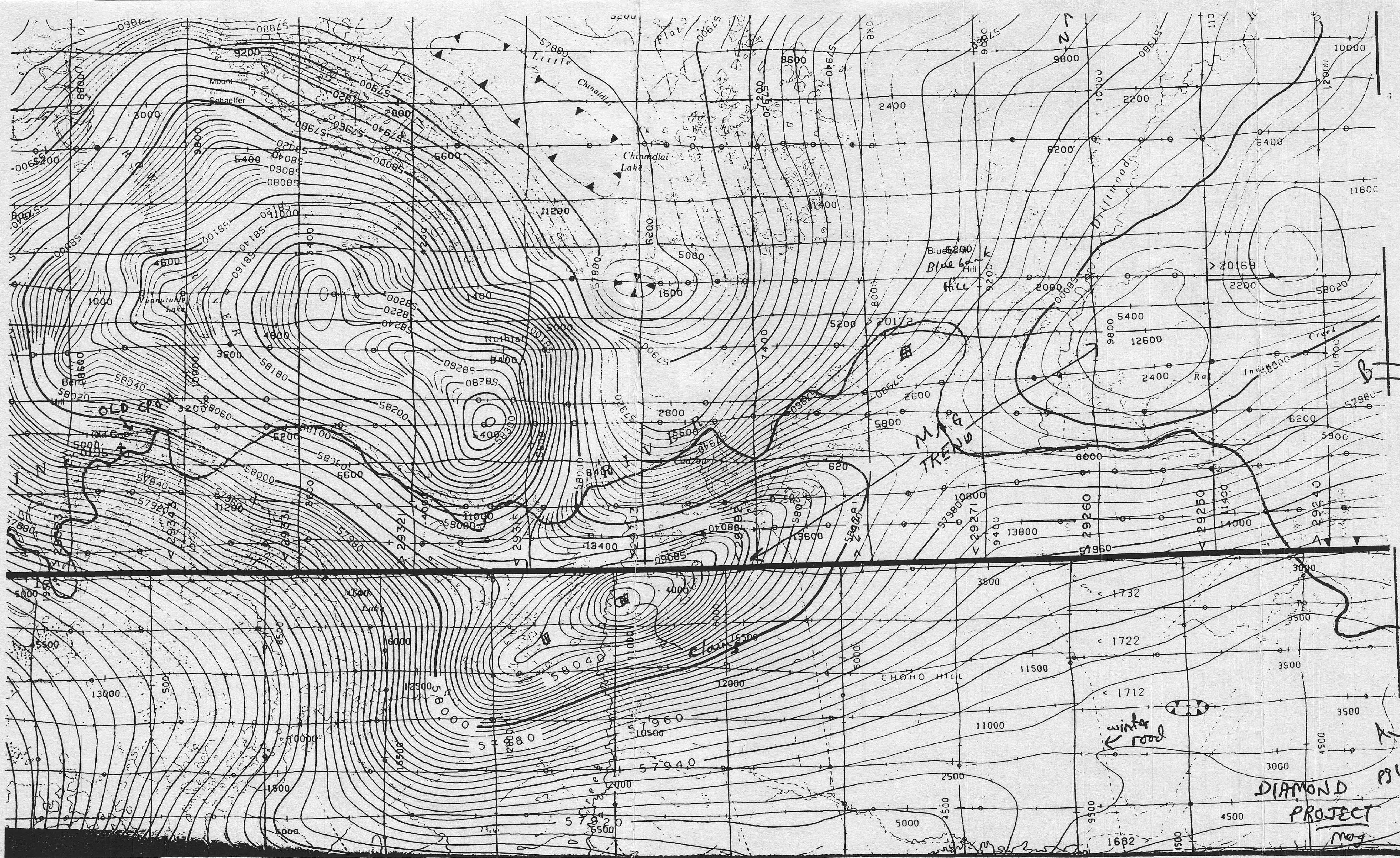
Chromites from the mantle-derived rocks (kimberlites, lamproites and ultramafic lamprophyres) and those from komatiites plot in different fields and show different variation trends, implying their source rocks have different Co and Zn contents and Co/Zn ratios. Because both Co and Zn are temperature-dependent, these variation trends also imply that they may be controlled by the temperature when these chromites crystallised. Discrimination of chromites from mantle-derived rocks and komatiites is important because the former are potentially diamondiferous but the latter are not.

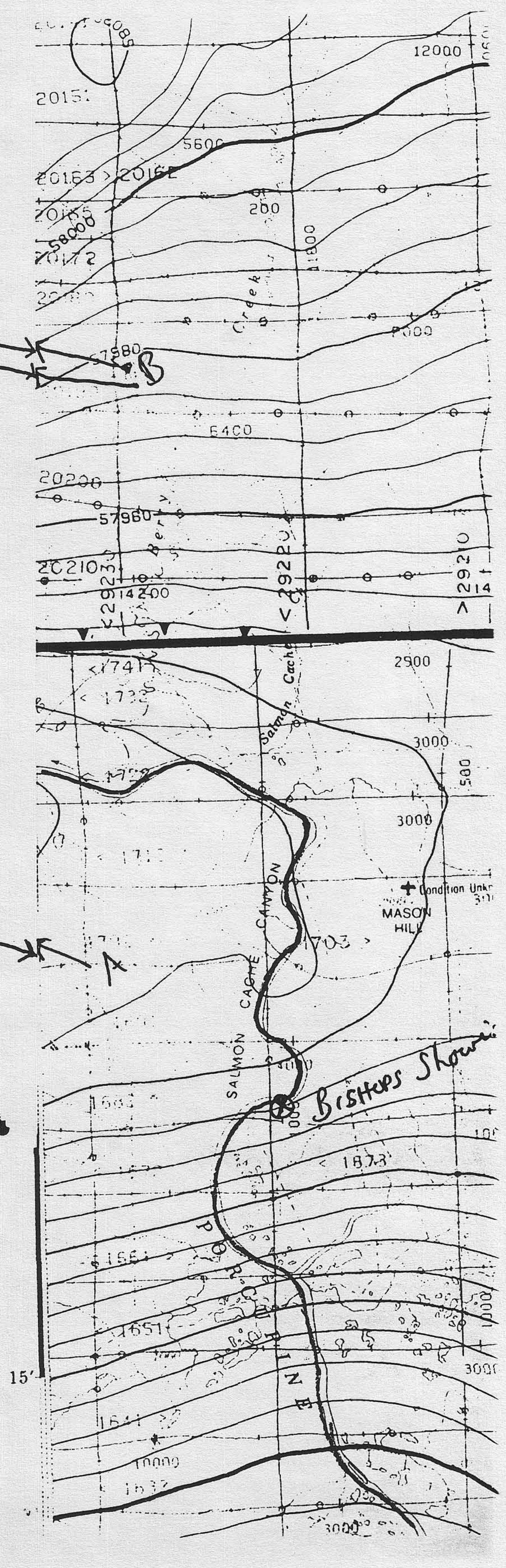
Studies on chromites in mantle xenoliths show that both Co and Zn are temperature-dependent. Different sources of rocks have different Co and Zn contents and different Co/Zn ratios. Therefore chromites from different sources show different relationships between Co and Zn. In the Co-Zn plot, chromites from mantle-derived rocks (kimberlites, lamproites and some ultramafic lamprophyres) and those from komatiites plot in different fields and show different variation patterns between Co and Zn.

Chromites from mantle-derived rocks and those from komatiites also differ in Ni and Mn contents. Compared with chromites from mantle-derived rocks, komatiite chromites have much higher Mn and lower Ni contents.

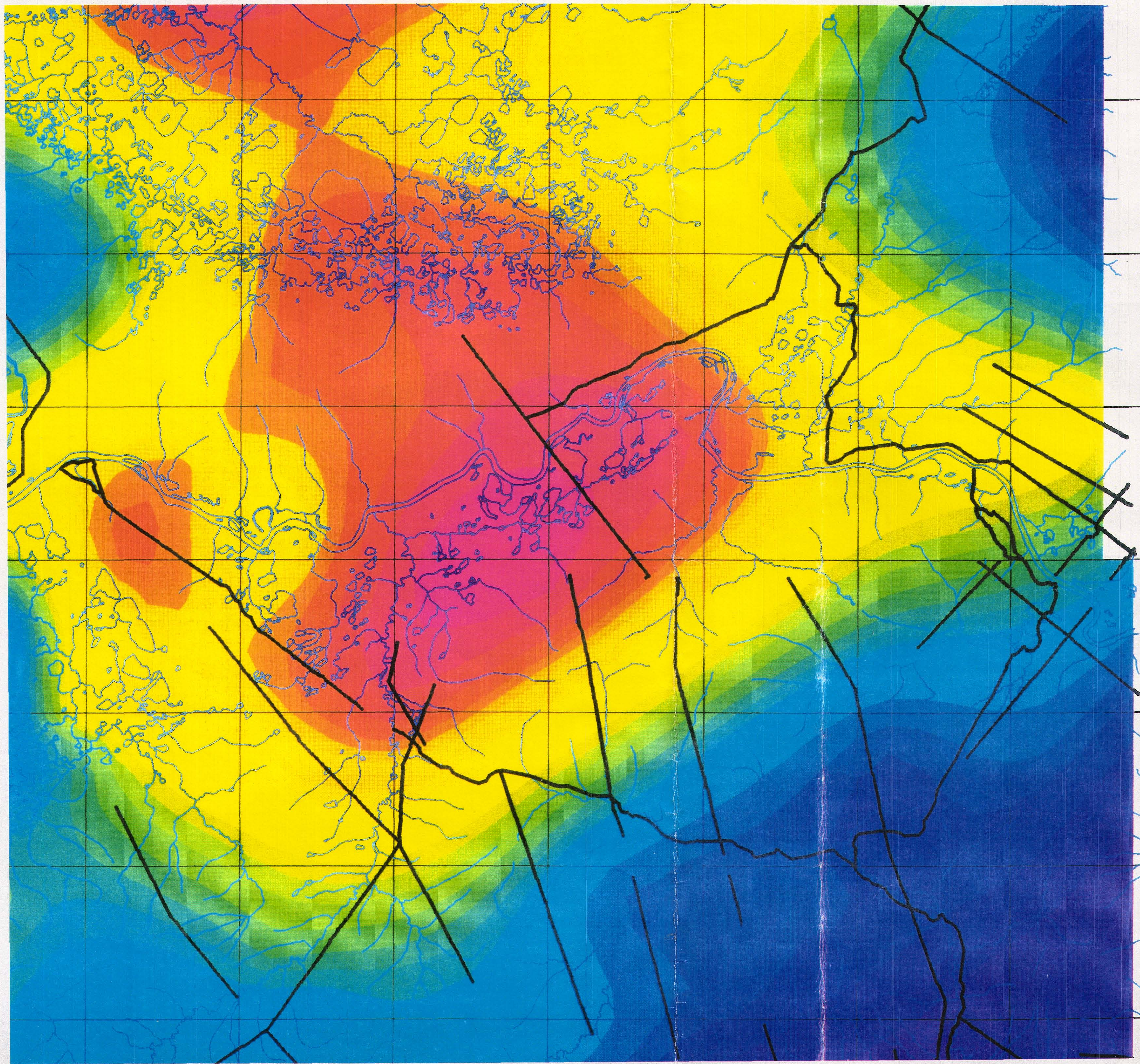
Kimberlites, lamproites and some ultramafic lamprophyres are directly mantle-derived rocks in which xenocrystic and early-crystallisation chromites are equilibrated with mantle olivine. We define chromites from these rocks as a "Mantle Array", which represents chromites equilibrated with mantle olivine. The Mantle Array can be defined using four axes (Zn, Co, Ni and Mn) and is controlled by temperature and concentrations of these elements.

Other trace elements also appear to be useful for discriminating chromites from different rock types. For example, chromites from kimberlites and lamproites contain much higher Nb, Ta, Zr and Sc than those from lamprophyres and komatiites (e.g. Fig. 2).

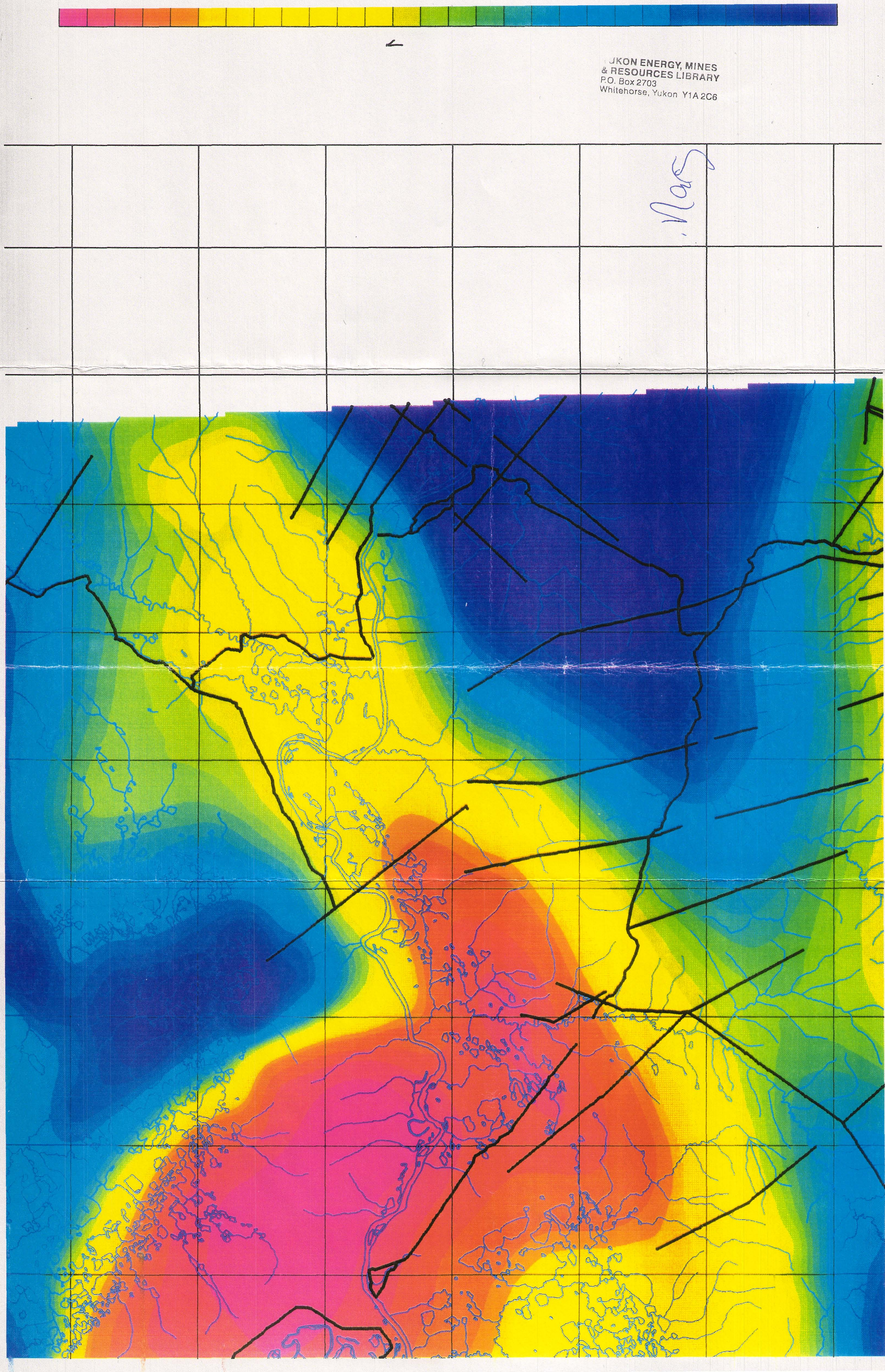




MAG MAP diamond project



gravity

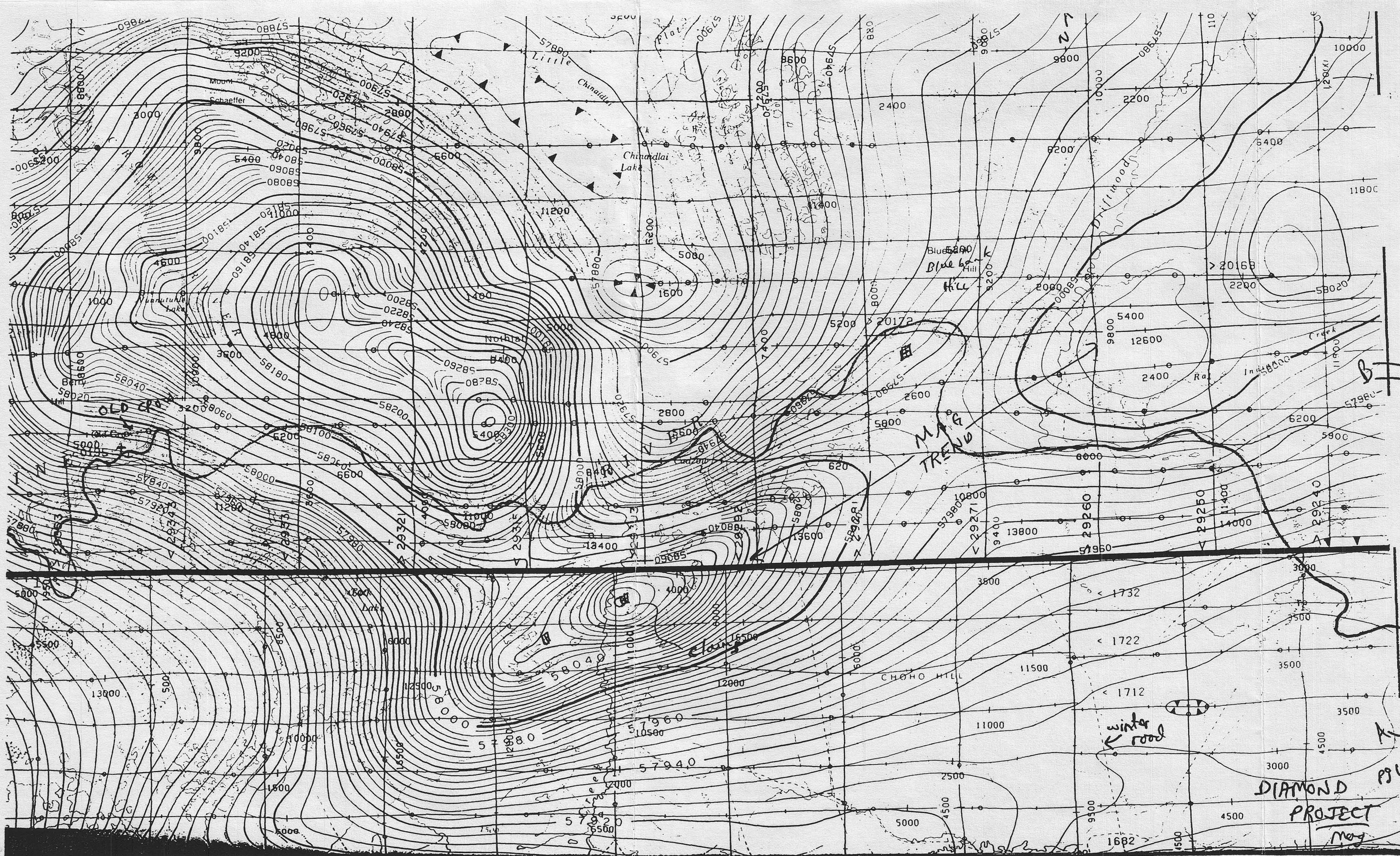


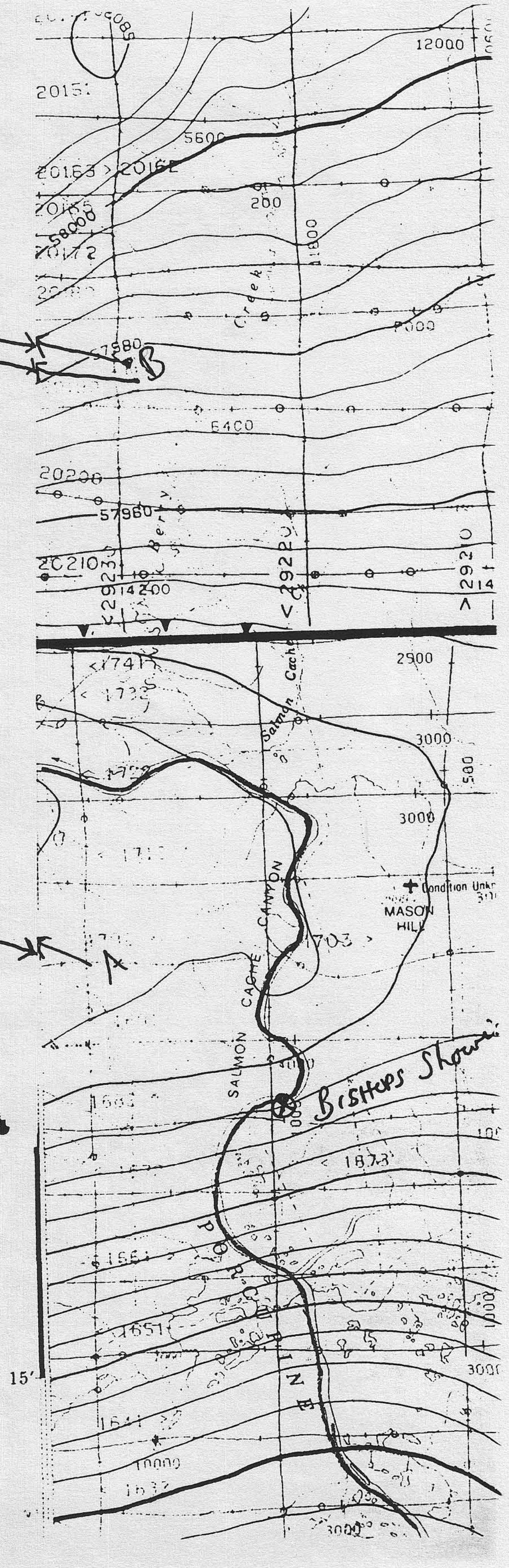
YUKON DIAMOND PROJECT

1: 250,000

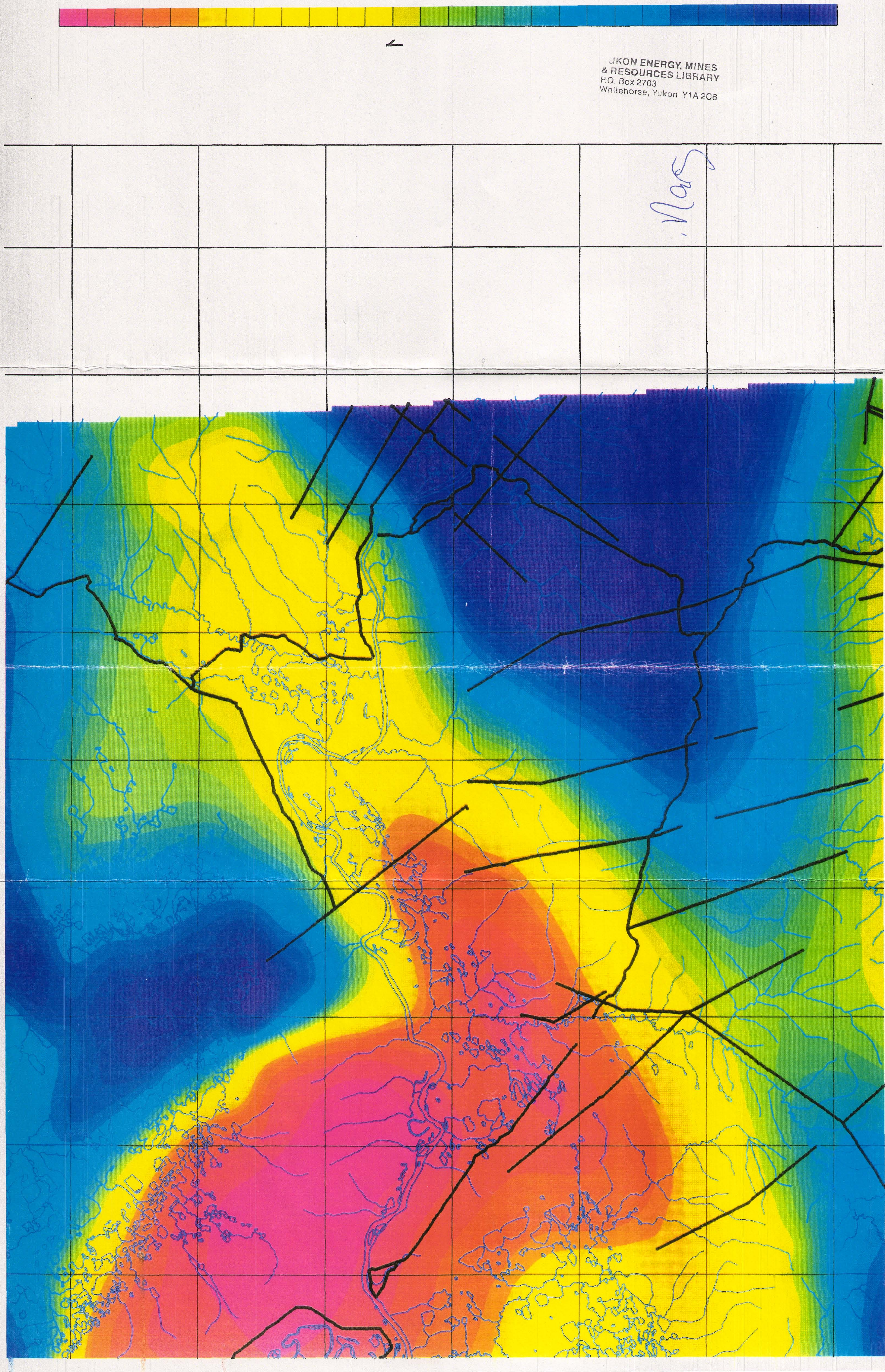
10 Km

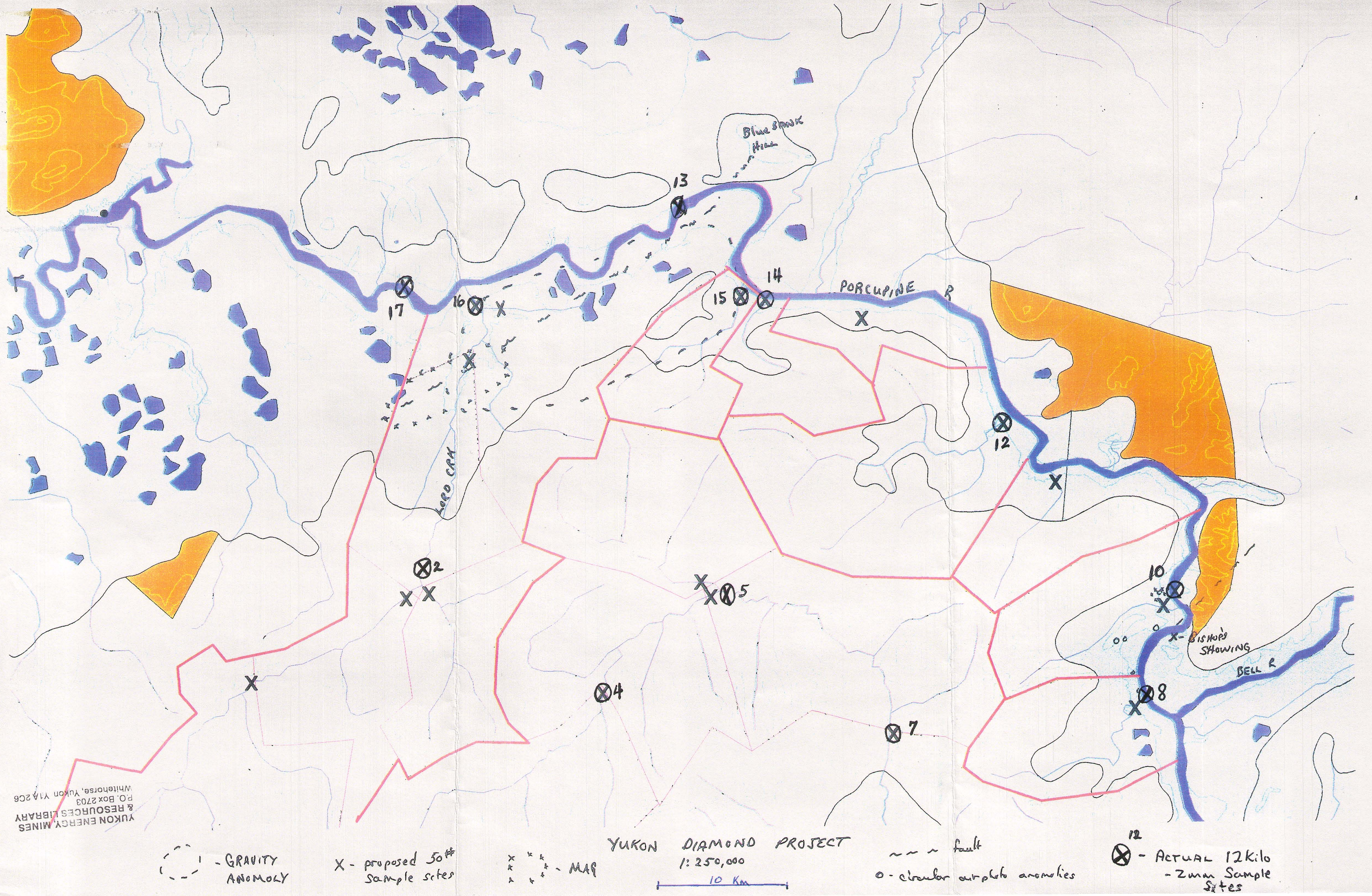
- GRAVITY ANOMOLY
X - proposed 50# sample sites
- MAG
~~~ fault
o - circular airphoto anomalies
12 ⊗ - ACTUAL 12 Kilo - 2mm Sample Sites
~~~





MAG MAP diamond project





Blue Bank Hill
13
14
15
PORCUPINE R
17
16
12
LORD CRK
10
X - BISHOP'S SHOWING
BELL R
2
5
4
7
8
YUKON DIAMOND PROJECT
1:250,000
10 Km
- GRAVITY ANOMOLY
X - proposed 50# sample sites
- MAG
fault
o - circular airphoto anomalies
12
- ACTUAL 12 Kilo - 2mm Sample Sites