EUB/AGS Geo-Note 1997-1

Diamond Indicator Mineral Anomaly from Till Sample Site NAT95-134

Alberta Energy and Utilities Board
Alberta Geological Survey

AGS

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Alberta Energy and Utilities Board
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Purpose

Geo-Notes are being introduced to quickly get small amounts of information out to interested people. The purpose of this specific Geo-Note is to inform members of the Alberta mineral exploration industry of one sample of till that contains an exceptional number of diamond mineral indicator grains.

Summary:

One surface sample of till collected (Sept., 1995) in north central Alberta from a site situated northwest of the settlement of Red Earth contained abundant pyropic garnets. One hundred and fifty two possible pyrope garnets were manually picked from the lab concentrates and of 35 grains subjected to electron microprobe analysis 27 are G9s. The site was resampled in August 1996 and data just received shows that one hundred and seventy six possible pyrope garnets were manually picked from the lab concentrates of this sample. Initial follow up work will include electron probe analysis of additional grains and subsequent investigations to determine if the site lies within a glacial dispersal train.

Location

The sample was collected along a gravel road trending west and north west from Highway 88; in the area covered by the northwest quadrant of National Topographic Map Sheet 84B. Highway 88 runs north from Red Earth and the intersection with the gravel road is about 15 to 20 km north of the settlement. The sample site is about 35.1 km west of the intersection with highway 88.

The location of the site was measured with two GPS instruments and the results are

Longitude:	115° 45.237'	Latitude	56° 50.834'
	115° 45.162'		56° 50.923'

Sample Description

The sample was till dug, at a depth of about 2 to 2.5 m, from a roadcut on the north side of the road. The till is an oxidized, dark greyish brown, silty clay. The pebble to boulder sized clasts were examined on both side of the road. These consisted predominantly of igneous and minor metamorphic, carbonate, chert and quartzite clasts. The reaction to 10% HCl is moderate.

Two 25 kg samples were collected from the site NAT95-134 (Sept. 1995) and NAT96-216 (Aug, 1996).

Analytical Results

The till sample NAT95-134 was processed to recover the diamond indicator minerals[1]. Preliminary picking identified 152 possible pyropic garnets. Thirty five of these grains were subjected to analysis by the electron microprobe[1]. Initial analysis of the results, utilizing mineral identification programs by (Quirt, 1992a, b; Gent, 1993), identified the following garnets: 27 G9s, 5 G10s, 1 G11, and 1 G12 (Table 1). However plotting these data on a scatter plot of weight percent Cr_2O_3 vs weight percent CaO (Figure 1) shows that all grains fall on the right side of the line, the area occupied by the G9 and 11 garnets, rather than the left, the region occupied by G10 garnets.

Till sample NAT96-216 has just completed the lab concentration and preliminary picking phase. One hundred and seventy six possible pyrope garnets were manually picked from the lab concentrates.

Comments

This sample was collected as part of an on going multi-year study by Fenton, Pawlowicz and Dufresne on the till geochemistry and diamond indicator mineralogy of northern Alberta. As part of this investigation Dufresne in 1994 defined three geographic trends based on the number and quality of the diamond indicator minerals (Dufresne *et al.* 1994 and Fenton *et al.*. 1994). These trends were slightly revised in 1996 (Dufresne *et al.*. 1996 and Fenton *et al.* in press) and include: (1) a southerly trend from the lower Wabasca River to the Loon River (Wabasca River Trend); (2) a southwesterly trend from just north of the town site of Peace River to Grande Prairie (Peace River Trend); and (3) a two lobed southwesterly trend in the Fort McMurray area (Fort MacKay Trend) (Figure 2).

Both samples (Nat95-134 and Nat96-216) were collected from the southwest portion of the Wabasca trend (Figure 2). This is the first site, out of about 200 sites sampled in northern Alberta, with this many interesting grains. Normally a sample contains no indicator mineral grains or at most one or two.

The sediment sampled is till. This site may lie within a glacial dispersal train. Further investigations will be required to confirm determine if this is true.

[(1)]Processing of the samples was performed at the Saskatchewan Research Council (SRC), with microprobe analyses performed at the University of Saskatchewan. A summary of the processing and microprobe procedures at the SRC and the University of Saskatchewan are given in Swanson and Gent (1993). All of the microprobe data that have been released to date were processed using mineral identification programs written in QBASIC and provided by the SRC (Quirt, 1992a, b; Gent, 1993).

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Table 1. Data from electron microporbe analyses of selected mineral grains: Site NAT95-134

SAMPLE #	POINT#	TiO2	Cr2O3	FeO	MgO	CaO	SiO2	Al2O3	Na2O	MnO	K2O	TOTAL	MINERAL IDENTIFICATION
NAT95 - 134A	58	0.04	5.25	7.92	18.65	5.62	40.68	20.33	0.01	0.33		98.83	G_09_CHROME_PYROPE_>ONE_S.D.
#58 RERUN	130	0.04	5.06	7.98	18.18	5.81	39.71	20.56	0.02	0.44	0	97.80	
NAT95 - 134A	59	0.07	3.70	8.32	18.92	5.15	40.94	20.77	0.02	0.38		98.27	G_09_CHROME_PYROPE
#59 RERUN	131	0.05	3.72	8.28	18.86	5.31	41.39	21.1	0.02	0.4	0	99.13	
NAT95 - 134A	60	0.19	3.56	7.98	18.99	5.01	38.92	21.18	0.03	0.35		96.21	G_09_CHROME_PYROPE
#60 RERUN	132	0.19	3.59	8.41	19.4	5.03	41.97	20.78	0.01	0.37	0	99.75	
NAT95 - 134A	61	0.14	3.94	8.04	19.18	4.99	40.95	21.18	0.03	0.36		98.81	G_09_CHROME_PYROPE
#61 RERUN	133	0.13	4.24	8.15	19.19	5.08	41.71	20.82	0.03	0.41	0	99.76	
NAT95 - 134A	62	0.15	3.44	8.42	18.93	5.19	41.03	21.84	0.01	0.35		99.36	G_09_CHROME_PYROPE
NAT95 - 134A	63	0.32	5.09	8.01	18.52	5.54	38.69	20.38	0.04	0.60		97.19	G_09_CHROME_PYROPE_>ONE_S.D.
#63 RERUN	134	0.31	5.07	8.04	18.56	5.46	41.16	19.37	0.05	0.44	0	98.46	
NAT95 - 134A	64	0.13	3.11	8.40	19.19	4.76	40.95	21.24	0.01	0.42		98.21	G_09_CHROME_PYROPE
#64 RERUN	135	0.15	3.21	8.47	19.41	4.85	41.66	21.04	0.03	0.34	0	99.16	
NAT95 - 134A	65	0.20	3.39	8.09	19.19	4.92	41.61	21.72	0.01	0.39		99.52	G_09_CHROME_PYROPE
NAT95 - 134A	66	0.16	4.54	8.30	18.48	5.51	41.12	20.72	0.00	0.36		99.19	G_09_CHROME_PYROPE
NAT95 - 134A	67	0.19	4.07	8.20	19.32	4.91	40.29	21.43	0.04	0.34		98.79	G_09_CHROME_PYROPE
#67 RERUN	136	0.17	3.65	8.18	18.8	4.87	41.03	21.49	0.03	0.32	0	98.54	
NAT95 - 134A	68	0.04	9.77	7.76	15.49	8.46	40.33	16.63	0.01	0.51		99.00	G_12_KNORRINGITIC_UVAROVITE_PYROPE_>ONE_S.D
NAT95 - 134A	69	0.40	7.36	7.81	17.50	7.03	40.84	18.18	0.02	0.44		99.58	G_11_UVAROVITE_PYROPE_>ONE_S.D.
NAT95 - 134A	70	0.13	3.82	8.31	19.35	5.27	39.73	21.99	0.03	0.49		99.12	G_09_CHROME_PYROPE
NAT95 - 134A	71	0.03	5.65	7.96	18.60	6.01	41.25	20.63	0.04	0.49		100.66	G_09_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134A	72	0.19	5.68	9.08	17.79	5.82	41.07	19.84	0.01	0.46		99.94	G_09_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134A	73	0.35	4.52	8.31	18.79	5.71	41.37	21.02	0.05	0.42		100.54	G_09_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134A	74	0.05	4.73	7.23	18.92	5.76	41.87	21.39	0.03	0.46		100.44	G_09_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134A	75	0.07	4.44	6.93	18.51	5.53	40.41	20.72	0.00	0.43		97.04	G_09_CHROME_PYROPE
NAT95 - 134A	76	0.00	7.41	7.73	16.94	6.95	40.67	18.04	0.03	0.49		98.26	G_10_LOW_CALCIUM_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134A	77	0.03	3.83	7.43	19.40	5.11	41.74	21.44	0.04	0.47		99.49	G_09_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134A	78	0.05	8.28	8.14	17.26	6.82	40.98	17.64	0.00	0.35		99.52	G_10_LOW_CALCIUM_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134A	79	0.00	3.82	7.24	18.70	5.75	40.84	21.69	0.01	0.49		98.54	G_09_CHROME_PYROPE_>ONE_S.D.
#79 RERUN	137	0.03	3.63	7.52	18.78	5.83	41.75	21.34	0	0.52	0	99.40	
NAT95 - 134A	80	0.13	6.16	7.23	18.70	5.79	39.99	19.46	0.00	0.43		97.89	G_10_LOW_CALCIUM_CHROME_PYROPE_>ONE_S.D.
#80 RERUN	138	0.14	6.55	7.38	18.76	5.91	41.55	19.4	0.05	0.37	0	100.11	
NAT95 - 134A	81	0.25	3.94	8.82	18.14	5.29	40.97	20.68	0.02	0.43		98.54	G_09_CHROME_PYROPE_>ONE_S.D.
#81 RERUN	139	0.27	3.96	9	18.39	5.55	41.03	20.03	0.05	0.43	0	98.71	
NAT95 - 134A	82	2.79	0.00	0.31	1.95	2.25	21.26	0.32	0.24	0.02		29.14	UNKNOWN
NAT95 - 134A	83	0.65	0.08	13.73	1.96	0.01	27.62	55.49	0.00	0.14		99.68	STAUROLITE
NAT95 - 134A	84	0.59	0.00	12.27	1.81	0.03	27.85	55.98	0.00	0.21		98.74	STAUROLITE
NAT95 - 134A	85	0.60	0.07	12.63	1.54	0.03	26.32	56.34	0.00	0.05		97.58	STAUROLITE
NAT95 - 134 A1	601	0.10	7.93	7.80	17.47	6.99	40.74	18.08	0.00	0.46		99.57	G_10_LOW_CALCIUM_CHROME_PYROPE_>ONE_S.D.
NAT95 - 143 A1	602	0.00	4.78	7.84	18.46	5.92	41.92	21.17	0.00	0.48		100.57	G_09_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134 A1	603	0.03	4.29	7.86	18.78	5.28	40.56	20.79	0.00	0.45		98.04	G_09_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134 A1	604	0.05	5.24	8.18	18.53	5.97	39.10	20.66	0.00	0.39		98.12	G_09_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134 A1	605	0.14	4.71	7.88	18.94	5.55	39.21	21.26	0.05	0.43		98.17	G_09_CHROME_PYROPE
NAT95 - 134 A1	606	0.00	6.37	8.02	17.15	7.14	40.51	19.05	0.01	0.46		98.71	G_09_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134 A1	607	0.01	5.67	8.15	17.43	6.99	41.29	19.29	0.02	0.56		99.41	G_09_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134 A1	608	0.16	6.23	8.30	18.34	5.98	41.30	19.09	0.01	0.43		99.84	G_09_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134 A1	609	0.07	8.59	7.88	16.81	7.90	40.62	17.77	0.02	0.47		100.13	G_10_LOW_CALCIUM_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134 A1	610	0.08	0.05	30.58	6.20	2.32	38.31	22.47	0.00	0.45		100.46	ALMANDINE
NAT95 - 134 A1	611	0.02	5.42	7.88	18.72	5.95	41.10	20.50	0.03	0.44		100.06	G_09_CHROME_PYROPE_>ONE_S.D.
NAT95 - 134B	29	0.21	0.05	3.44	8.68	14.16	54.53	12.06	5.85	0.02	0	99.00	C-9 OMPHACITE
NAT95 - 134B	30	0.19	0.02	13.01	0.02	22.68	37.38	23.07	0.02	0.09	0	96.49	G_08_FERRO_MAGNESIAN_GROSSULAR_>ONE_S.D.

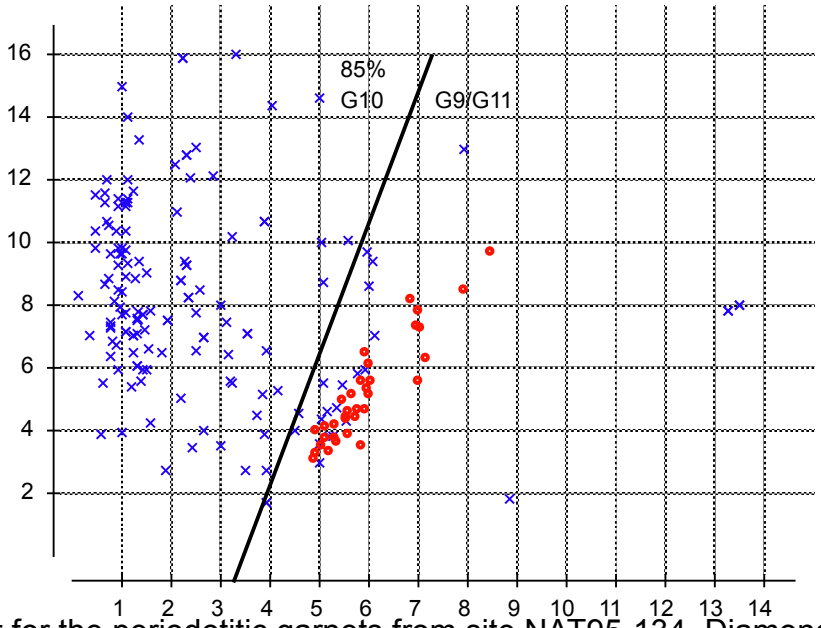

Figure 1. Scatter plot for the periodotitic garnets from site NAT95-134. Diamond inclusion data from Fipke et al. 1993.

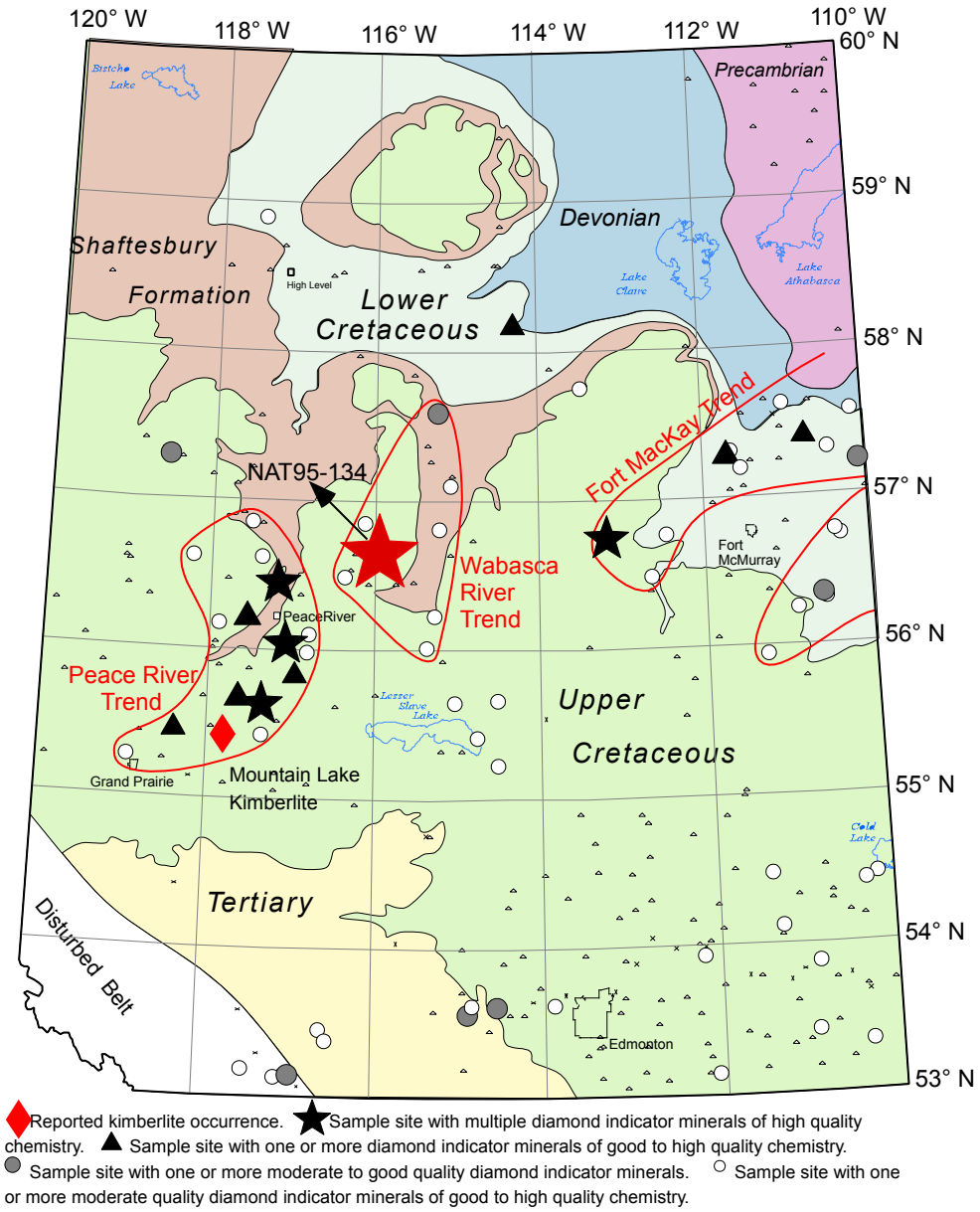

Figure 2. Map showing the location of site NAT95-134 and other diamond indicator anomalies in Northern Alberta. (Modified from Dufresne et al., 1994 and 1996).