Heavy Mineral Study
of Till Samples Collected in a
Diamond Exploration Program

for

Dusan Dmitrovic

December 1993

Arpad Farkas, PhD, Consulting Geologist
Toronto, Ontario
Preface

A heavy mineral study of 13 till samples received from Mr. Dusan Dmitrovic was carried out by the writer of this report.

Separation of heavy minerals with a shaking table and heavy liquids was done by Chauncey Assay Laboratories of Toronto.

The heavy mineral concentrates were examined by the writer for the presence of diamond indicator minerals. Binocular microscopy was carried out on the following heavy mineral concentrates:

- HB - 1 to HB - 3 inclusive
- JL - 1 to JL - 3 inclusive
- ONL - 1 to ONL - 3 inclusive

The results of binocular microscopy are summarized below.
Heavy mineral study
of till samples collected in a
diamond exploration program

1. The highly magnetic fraction consists of magnetite and a lesser amount of ilmenite; these minerals make up 20 to 50% of the heavy mineral concentrates. The less magnetic fraction consists of very fine grained euhedral to anhedral spinels.

2. Pink almandine derived from metasedimentary rocks is the most common heavy mineral. Minor amounts of brownish red almandine and amber-coloured almandine-spessartine garnets are present in each of the samples.

3. Green and yellow epidotes, probably derived from volcanic rocks, are also fairly abundant in the heavy mineral fraction. The amount of epidote is in the 2 to 20% range.

4. The less common heavy minerals are zircon, sphene, and colourless crystals of kyanite.

5. Diamond indicator minerals were found in only one of the heavy mineral concentrates. One grain of Cr-pyrope about 0.5 mm in diameter and one grain of Mg-ilmenite were found in Sample HB - 1. It is important to note that this sample yielded the largest heavy mineral fraction (6.79 grams).

6. A dark blue mineral fragment 0.5 mm in size was found in the heavy mineral fraction of Sample HB - 3. The identity of this mineral is uncertain. Some of the possibilities are:

   A blue variety of kyanite;
   A blue variety of topaz;
   Moissanite (a mineral with composition SiC, found in some kimberlites).
7. The presence of only one grain of Cr-pyrope and one grain of Mg-ilmenite can be considered to be an anomalous background concentration of diamond indicator minerals: compare the half dozen to a dozen or more grains of diamond indicator minerals found in basal till samples taken 2-3 km downice from known kimberlite occurrences in the Kirkland Lake area, Ontario.

If additional till sampling is to be carried out the samples should be collected at least 5 km in the upice direction from Site HB - 1.

Respectfully submitted,

Arpad Farkas, PhD
Consulting Geologist
ALTITUDE LAKE CLAIM GROUP
AERODAT AIRBORNE MAGNETIC/EM SURVEY
SCALE 1:20,000
SAMPLE LOCATION MAP
JENKINS LAKE CLAIM GROUP
SCALE 1:20,000

Legend:
\( \times \) JL-3 Sample Number and Location

JL-3 Trench
JL-2 Trench
JL-1 Trench
Tashota
Nipigon Mine
Tailings
SAMPLE LOCATION MAP
(HUMBOLDT BAY AREA)
SCALE 1:20,000

Legend:

HB-2 Sample Number and Location
REPORT ON GEOPHYSICAL SURVEYS

DELORO PROPERTY

MARMORA TOWNSHIP
HASTINGS COUNTY
SOUTHERN ONTARIO

BY DUSAN DMITROVIC

OPAP GRANT No. OPG–93–124

January 1994
INTRODUCTION
This report describes geophysical surveys (magnetic, VLF, HLEM) carried out by D. Dmitrovic on a property in the Deloro area, south-eastern Ontario.

PROPERTY DESCRIPTION
Lot 11, Concession 8, Marmora Township, Hastings County, Southern Ontario Mining Division. Area 50 acres. Owned outright (surface and mining rights), Dusan Dmitrovic.

GEOLOGY
The property is covered by a thin (20-30 ft. thick) layer of Paleozoic limestone, and the Precambrian geology is therefore inferred. It covers carbonate metasediments and/or felsic intrusives that form a band wrapping around the west side of the Deloro pluton, a large body of granite/syenite/diorite that extends over a large part of Marmora and Madoc Townships.

MINERALIZATION IN THE AREA
A large number of gold occurrences are present in the marginal phases of the Deloro pluton. They are typically quartz veins carrying arsenopyrite with gold values. The most productive of these was the Deloro mine, which produced several thousand ounces of gold between 1888 and 1906. The most promising gold prospect in the area is the Dingman property on the boundary between Marmora and Madoc Townships, which contains a large volume of low-grade gold mineralization in a shear zone cutting a small granitic stock peripheral to the Deloro Pluton.

Of more economic importance is the presence of wollastonite mineralization in the carbonate metasediments. Platinova is developing a substantial wollastonite deposit about 3 km south of the property and on strike with it.

The wollastonite mineralization on the Platinova property is closely associated with a group of prominent magnetic and EM anomalies that are caused by pyrite-pyrrhotite bands in the metasediments. These can be used as markers to follow the stratigraphy through overburden- and Paleozoic-covered areas.
GEOPHYSICAL SURVEYS

A north-south base line was cut across the property, with east-west lines at 50 metre intervals. The grid was covered with total field magnetometer, magnetic gradient and VLF-EM surveys using an EDA Omni Plus system with base station correction. Station interval was 12.5 metres. The VLF transmitter used was station NSS at Annapolis.

A horizontal loop EM survey was carried out using an Apex Maxmin II instrument with a 100 metre coil separation, and a 25 metre station interval. Frequencies used were 444 Hz and 1777 Hz.

INTERPRETATION OF RESULTS

The total field magnetic survey is the most informative of the surveys. The western part of the grid shows a well-defined, irregular north-south trend that is typical of the area underlain by sediments. The eastern part of the grid is dominated by a roughly circular magnetic high 200 metres in diameter, of only about 40 nT amplitude but quite well defined. The magnetic low on the north side is more pronounced than those on the other sides. This magnetic high is interpreted to be caused by a small intrusive.

The VLF-EM survey shows two weak conductors. The more westerly extends from 300S/180W in a curve to OS/175W. The maximum in-phase amplitude of this anomaly is only 10%. The quadrature response varies from sympathetic to reverse, suggesting a low conductivity feature such as a more conductive sedimentary unit under varying depth of cover.

The eastern VLF conductor runs from 150S/285E to OS/235E. Its maximum amplitude is also only 10%, and the quadrature varies from sympathetic to neutral, again suggesting a weakly conductive feature under a varying thickness of cover. Since this anomaly runs across the interpreted intrusive, it is considered to be caused by a shear zone.

The horizontal loop EM survey does not show any anomalies.
CONCLUSIONS
The geophysical surveys do not indicate the presence of the strongly conductive and magnetic units that are closely associated with wollastonite mineralization on properties to the south.

Interpretation of the magnetic and VLF surveys, however, suggests that there is a small granitic intrusive underlying the eastern part of the property, which may be cut by a shear zone (see Geophysical Compilation Map). This is exactly the environment that carries gold on the Dingman property to the north. It is strongly recommended that this feature be tested with a single drill hole, collared at 100S/325E, inclined at 45° to the west, and 150 metres deep.

Respectfully submitted

For Dusan Dmitrovic
REPORT ON PROSPECTING
AND HEAVY MINERAL SAMPLING

BEARDMORE AREA DIAMOND PROSPECTS

BY DUSAN DMITROVIC

January 1994
INTRODUCTION
This report describes a preliminary program of prospecting and heavy mineral sampling carried out by D. Dmitrovic in the Onaman Lake area during 1993. The work was focussed on exploring for diamonds. The results were inconclusive in the case of the 8 claim groups that were staked, but have resulted in a new occurrence of diamond indicator minerals in a previously unexplored area.

BACKGROUND TO THE PROGRAM
The assessment of the area as being prospective for diamonds is based on two separate criteria:

**Reported Diamond in Overburden**
In December 1992, it was reported that a diamond had been found in till on the "East Side of Lake Nipigon" (1). This fact was not written up in any publication that we could find. It now appears that this reported diamond was found in the 1960's or early 1970's by Jan Zmudzinski, a prospector based in Jellicoe. Zmudzinski reported his find to S.E. Amukun, who mapped several sheets in the region in the 1970's for the O.D.M. (now the O.G.S.).

**Indicator Minerals in Till**
In 1986, the G.S.C. initiated a survey of heavy mineral distribution in till in the Beardmore-Geraldton area, with the primary purpose of stimulating exploration for gold by locating new occurrences of gold grains. The area now has no producing gold mines, but has historically produced over 5 million ounces of gold. The heavy mineral survey only located one area with gold grains that could not be related to known mineralization, but one of the useful by-products was the discovery of kimberlite indicator minerals in many of the till samples (2,3).

The indicator minerals reported by the G.S.C. were pyrope garnet, magnesian ilmenite, and chrome diopside. It was concluded that these indicator minerals do not come from the James Bay area because most reported indicator minerals in the James Bay Lowlands occur as rounded grains; the Beardmore-Geraldton area samples contained angular grains. Some of the garnets were analysed by the G.S.C. and were found to be of G9 composition. It has been
reported that additional garnets have been analysed privately and plot in the G10 field (4).

PROPERTY SUMMARY
The attached map shows the highlights of the G.S.C. heavy mineral sampling programme in the western part of the Beardmore–Geraldton area. Possible dispersion trains are shown, pointing to sources north-east of the main clusters of indicator minerals.

Each of the eight claims comprising the property covers a separate target chosen on the basis of airborne geophysical surveys. Most of the region has been covered by a 1987 Aerodat magnetic–EM survey flown for the O.G.S. However, the Onaman Lake area is underlain by a large granite pluton and was not covered; in this area the 1:63360 G.S.C. aeromagnetic survey was used to pick magnetic features.

Table I gives a summary of the geophysical and topographic features of the key anomaly on each claim. All of them have some of the characteristics to be expected from a kimberlite pipe: magnetic anomaly (often a negative anomaly or "low"); resistivity low; and coincidence with a lake or bay, often deeper than normal.

**JENKINS LAKE CLAIM GROUP**
1 claim (TB 1191504), 16 units, 640 acres. Aerodat airborne survey shows two magnetic lows, each coinciding with round parts of Jenkins Lake. Coincident EM anomalies of <1 mho indicate low resistivity.

**ONAMAN LAKE No. 1 CLAIM GROUP**
1 claim (TB 1191501), 16 units, 640 acres. Aerodat airborne survey shows a well-defined magnetic low coinciding with the shape of an enclosed bay off Onaman Lake. EM anomalies of < 1 mho at the west side indicate an area of low resistivity.
ONAMAN LAKE No. 2 CLAIM GROUP
1 claim (TB 1197050), 16 units, 640 acres. GSC aeromagnetic survey shows a magnetic low centred just north of the island on the south boundary of the claim, which is entirely under water.

ONAMAN LAKE No. 3 CLAIM GROUP
1 claim (TB 1197049), 16 units, 640 acres. GSC aeromagnetic survey shows a magnetic low lying just on the shore, on the south-east side of Onaman Lake.

ONAMAN LAKE No. 4 CLAIM GROUP
1 claim (TB 1191503), 16 units, 640 acres. GSC aeromagnetic survey shows a magnetic low lying under water at the edge of Onaman Lake.

FULLERTON LAKE CLAIM GROUP
1 claim (TB 1197503), 16 units, 640 acres. GSC aeromagnetic survey shows a circular magnetic low centred on a bay of Fullerton Lake. Water depths are much deeper than average (50 feet plus).

ALTITUDE LAKE CLAIM GROUP
1 claim (TB 1197052), 9 units, 360 acres. Aerodat airborne survey shows two magnetic lows. The eastern one coincides with a small (about 40 acres) lake, and has associated weak EM anomalies indicating low resistivity. The western one is on land.

CARL LAKE CLAIM GROUP
1 claim (TB 1197501), 9 units, 360 hectares. GSC aeromagnetic survey shows a magnetic low centred on the small (about 100 acres) more or less circular lake just north of Carl Lake.
October 16-17th, 1993
Travel from Mississauga to camp on Onaman River, establish camp.

October 18th, 1993
Prospecting, Humboldt Bay area between Stewart Creek and Gravel Point. Margins of lake are all sand and gravel beach and raised beaches. Till is exposed on higher ground north of road. Three samples of till collected (HB-1, HB-2 and HB-3).

October 19th, 1993
Prospecting along eastern shore of Humboldt Bay, between Stewart Creek and Onaman River. The entire area is covered in sand/gravel beach deposits or swamp. No outcrops or till were noted.

October 20th, 1993
Prospecting, Jenkins Lake claim, in the northern part of the property. Most of the area is swamp or muskeg, with occasional sand on the higher ground. No samples were taken because of a lack of till.

October 21st, 1993
Prospecting, Jenkins Lake claim, in the southern part of the property. All the ground is flat and swampy.

October 22nd, 1993
Prospecting down-ice from the Jenkins Lake claim (towards the Tashota-Nipigon mine). Till covers most of the area. Three samples of till were taken from old overburden trenches located beside logging roads (JL-1, JL-2 and JL-3).

October 23rd, 1993
Prospecting along the Kinghorn road (down-ice from the Onaman Lake claims). Most of the area is covered with fluvial sand, but occasional patches of bouldery till can be found. Sample ONL-1 collected at ±56 km on Kinghorn Road, 150 metres north-east of the road. Sample ONL-2 collected at 53.8 km and 35 metres west of road. Sample ONL-3 collected at 50.9 km on the road.
October 24th, 1993
Continue prospecting along the Kinghorn Road. Sample ONL-4 collected at 49.9 km, and 200 metres east of the road, near the junction with road to Onaman Lake. Sample ONL-5 collected at 48 km and 800 metres east of the road (along the southern Onaman Lake trail). Sample ONL-6 collected at 44.5 km and 40 metres east of the road. Sample ONL-7 collected at 41.5 km on the road. Heavy snowfall commenced and caused an early departure from the program.

October 25th, 1993
Travel from Onaman River to Mississauga.

HEAVY MINERAL SEPARATION AND IDENTIFICATION
The samples collected each contained between 20 and 25 kg of till (excluding large boulders). The samples were screened in the field to -14 mesh, +35 mesh to reduce them to 2-3 kg in size. The screened material was sent to A. Farkas for heavy mineral separation and identification. His report is attached as Appendix A.

Sample HB-1 contained two kimberlite indicator minerals: one grain of Cr-pyrope and one grain of Mg-ilmenite. None of the other samples contained any indicator minerals. However A. Farkas pointed out that the proportion of heavy minerals in most of the samples was quite small, perhaps because they came from surface till rather than basal till.

SUMMARY OF RESULTS
The accompanying map shows the sample sites with the samples taken by the GSC, which prompted this program. The absence of indicator minerals from samples taken down ice from the Jenkins Lake claim suggests that kimberlite is not present on this claim.

The absence of indicator minerals in the ONL samples, which were taken much further down-ice from the Onaman Lake claims, neither confirms nor denies the existence of dispersion train No. 1, as inferred from the GSC data.
The presence of outcrops of mafic gneiss on the Onaman Lake no. 4 claim suggests that the magnetic anomaly may not be caused by kimberlite.

The presence of two indicator minerals in a single sample at Humboldt Bay suggests that there is another kimberlite source in this area, as yet unidentified.

PLANS FOR FURTHER WORK
The following further work is planned, subject to the availability of finance and time:

Further till sampling and heavy mineral analysis in the Humboldt Bay area, with a view to defining a dispersion train and tracing it back to its source.

Heavy mineral sampling in the immediate area of the Altitude Lake, Carl Lake, Fullerton Lake, and Onaman Lake No. 1 claims.

REFERENCES


SAMPLE LOCATION MAP
ONAMAN LAKE No.2 CLAIM GROUP
SCALE 1:20,000

Legend:
ONL-4 Sample Number and Location
LEGEND:
Profile Scale 1 Cm = 5 cm
+5% out of phase
0 in phase
-5%

Instrument APEX MAXMIN II
COIL SEPARATION 100 m
Operator D. DMITROVIC

DUSAN DMITROVIC
DELORO PROPERTY
HORIZONTAL LOOP E.M. SURVEY
FREQUENCIES 444 AND 888 Hz.
SCALE 1: 2,500

COMPiled AND DRAWn BY D. DMITROVIC, DEC. 1993
Interpretation of sub-Paleozoic basement geology

C.B. Jan. 94
LEGEND

Instrument: EDA Omni Plus
Operator: D. Dmitrovic
Total Field in nT
Contour Intervals: 5, 20 nT
Diurnal Correction: Base Station

Scale 1:2500

DMITROVIC PROPERTY
DELRÓ AREA
MARMORA TOWNSHIP
HASTINGS COUNTY, ONTARIO
MAGNETOMETER SURVEY
TOTAL FIELD CONTOURS
November 1993
LEGEND

Instrument: EDA Omni Plus
Operator: D. Dmitrovic
Postings: Total Field in nT
Diurnal Correction: Base Station

DMITROVIC PROPERTY
DELORO AREA
MARMORA TOWNSHIP
HASTINGS COUNTY, ONTARIO
MAGNETOMETER SURVEY
TOTAL FIELD POSTINGS
November 1993

Scale 1:2500
25 0 25 50 75 100 125 150
(meters)
LEGEND

Instrument: EDA Omni Plus
Operator: D. Dmitrovic
Profile Scale: 1cm = 50 nT
Profile Base: 57000 nT
Diurnal Correction: Base Station

DMITROVIC PROPERTY
DELORO AREA
MARMORA TOWNSHIP
HASTINGS COUNTY, ONTARIO
MAGNETOMETER SURVEY
TOTAL FIELD PROFILES
November 1993

Scale 1:2500
25 50 75 100 125 150
(meters)
**LEGEND**

**Instrument:** EDA Omni Plus

**Operator:** D. Dmitrovic

**Postings:** Vertical Gradient, nT/m

---

**DMITROVIC PROPERTY**

**DELORO AREA**

**MARMORA TOWNSHIP**

**HASTINGS COUNTY, ONTARIO**

**GRADIOMETER SURVEY**

**VERTICAL GRADIENT POSTINGS**

**November 1995**
LEGEND

Instrument: EDA Omni Plus
Operator: D. Dmitrovic
Profile Scale: 1 cm = 25 nT/m

DMITROVIC PROPERTY
DELRG AREA
MARMORA TOWNSHIP
HASTINGS COUNTY, ONTARIO
GRADIOMETER SURVEY
VERTICAL GRADIENT PROFILES
November 1993
LEGEND

Instrument: EDA Omni Plus
Operator: D. Dmitrovic
Transmitter: NSS (24.8 KHz)
In-Phase: Solid Line
Quadrature: Dotted Line
Scale: 1 cm = 10%

DMITROVIC PROPERTY
DELORE AREA
MARMORA TOWNSHIP
HASTINGS COUNTY, ONTARIO
VLF-ELECTROMAGNETIC SURVEY
IN-PHASE AND QUADRATURE PROFILES
November 1993
LEGEND

Instrument: EDA Omni Plus
Operator: D. Dmitrovic
Transmitter: NSS (24.8 kHz)
Filter Interval: 12.5 metres
Contour Intervals: 1.5 units

DMITROVIC PROPERTY
DEORO AREA
MARMORA TOWNSHIP
HASTINGS COUNTY, ONTARIO
VLF-ELECTROMAGNETIC SURVEY
FRASER FILTERED IN-PHASE DATA
November 1993