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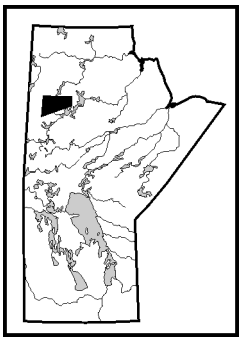
GS-10 Determining residual mineral potential in drillcore from the Ruttan and Lynn Lake areas, Manitoba (NTS 64B and 64C)[1]

by G.H. Gale



Gale, G.H. 2003: Determining residual mineral potential in drillcore from the Ruttan and Lynn Lake areas, Manitoba (NTS 64B and 64C); *in* Report of Activities 2003, Manitoba Industry, Trade and Mines, Manitoba Geological Survey, p. 74–78.

Summary

Analytical data are provided for major, trace and rare earth elements in approximately 150 samples of drillcore stored in the provincial core-storage facility at Lynn Lake. This study provides the results of a blind test of the author's earlier ideas of using REE to vector massive sulphide mineralization. A sulphide occurrence at McWhirter Lake with a positive Eu anomaly is identified as a distal Zn-rich massive sulphide deposit. Analysis of drillcore from the MacBride Lake deposit identifies the presence of strongly altered rocks in the footwall of the Zn-rich sulphide zone.

Introduction

Gale et al. (1999) proposed that rare earth element (REE) analysis of exhalite-derived strata in drillcore could be used to determine residual mineral potential in volcanogenic massive sulphide districts. It is postulated that drillcore, obtained from drilling electromagnetic conductors or 'favourable strata' that did not intersect significant metal values (so-called 'barren intersections') could be evaluated for their potential to be associated with economically significant mineralization by analyzing the core for major, trace and rare earth elements.

The author has previously shown that REE data can be used to detect the presence of exhalite-derived material in rocks with only trace amounts of sulphides and <500 ppm base metals at distances of >400 m from known massive sulphide deposits (Gale et al., 1997, 1999; Gale, GS-9, this volume). In order to test the applicability of this procedure, selected drillcore stored at the provincial core-storage facility in Lynn Lake was examined briefly for tuffaceous exhalite with low-grade sulphides, grab sampled and analyzed for major, trace and rare earth elements. This study was conducted as a blind test and no attempt was made to determine core locations until after analytical data were received. Approximately 150 samples were collected in 2002 and the data obtained are available as a digital file[1]; in this file, samples from core considered to be in open status are located by UTM, whereas the locations of samples from core that is still in confidential status are not provided unless the property owner has given permission for their release. Additional cores were sampled in 2003.

Results

Approximately 140 analyses have been received to date. The available data support the proposal that this type of geochemistry can be useful in identifying volcanogenic massive sulphide mineralization in weakly mineralized rocks, as illustrated here by two different examples at McWhirter Lake and MacBride Lake (Fig. GS-10-1). In the first example, the analyses identify strong positive Eu anomalies in distal exhalites with minor pyrite, pyrrhotite and sphalerite. In the second example, the analytical data identify a footwall alteration negative Eu anomaly in drillcore where the solid sulphide mineralized section had been removed.

McWhirter Lake

Drillhole 212-1 (Fig. GS-10-2, -3) intersected approximately 125 m of dacitic and rhyolitic rocks structurally above a 0.5 m thick mineralized section at 125.5 to 126.0 m in the drillcore. This interval contains 20 to 50% pyrrhotite, 1% chalcopyrite, 2 to 5% pyrite, 5 to 8% chlorite and 5% garnet; assays for this interval included 0.16% Cu and 0.19% Pb over a core interval of 1.22 m (Assessment Files 94316, 94736, Manitoba Industry Trade and Mines, Winnipeg). A grab sample from the pyrrhotite-rich zone with 1.2% Zn shows a weak negative Eu^d anomaly[2] and only a minor addition of Eu relative to the host rocks. Two samples of 'quartz-rich' tuffaceous exhalite immediately below the sulphide interval in the core have a near-zero (Eu^d = –7%) and a strongly positive (Eu^d = 150%) Eu anomaly (Fig.

[1] MGS Data Repository item 2003002, containing the data or other information sources used to compile this report, is available on request from minesinfo@gov.mb.ca or Mineral Resources Library, Manitoba Industry, Trade and Mines, 360–1395 Ellice Avenue, Winnipeg, Manitoba R3G 3P2, Canada.

[2] Eu^d is the deviation of chondrite-normalized Eu from Eu* values (Gale et al., 1999).

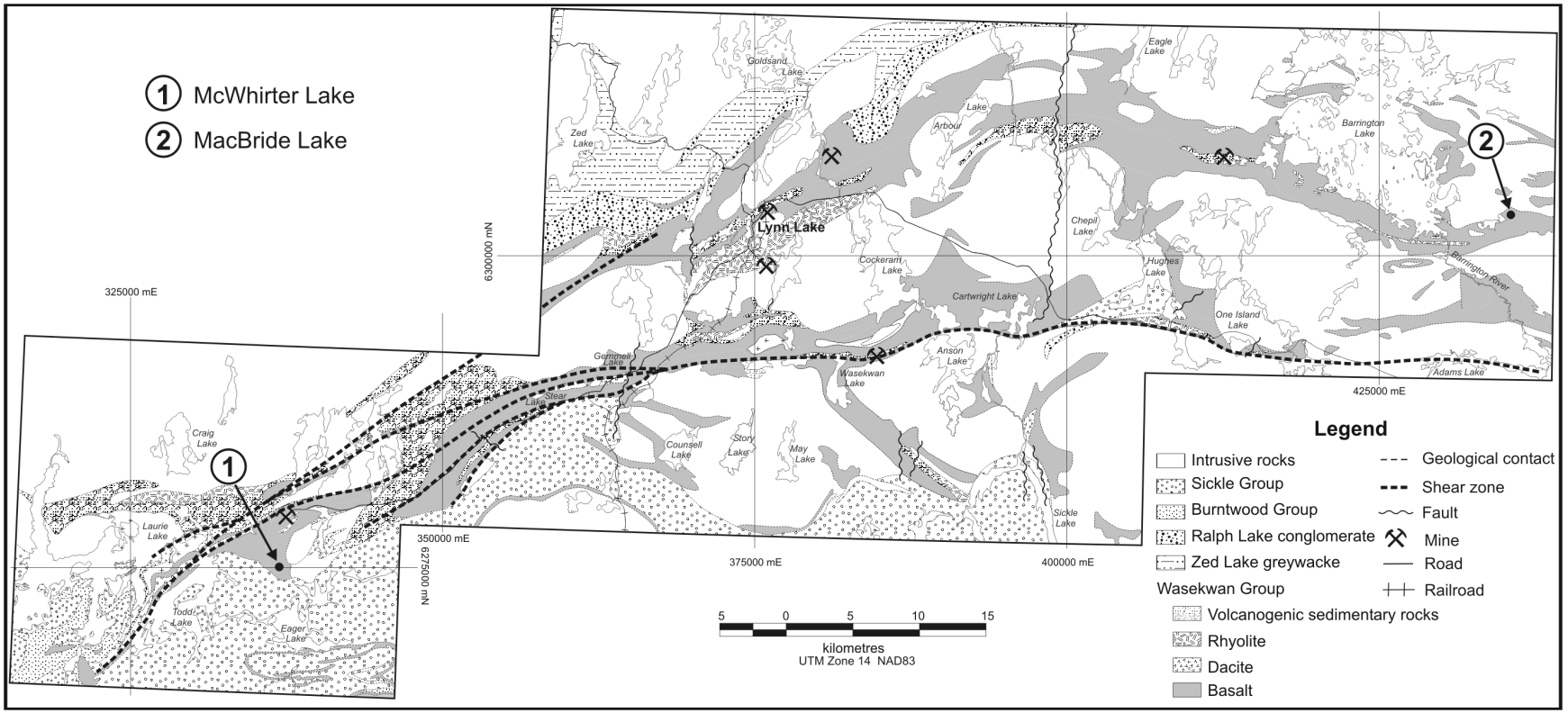


Figure GS-10-1: Location of McWhirter Lake and MacBride Lake mineral occurrences.

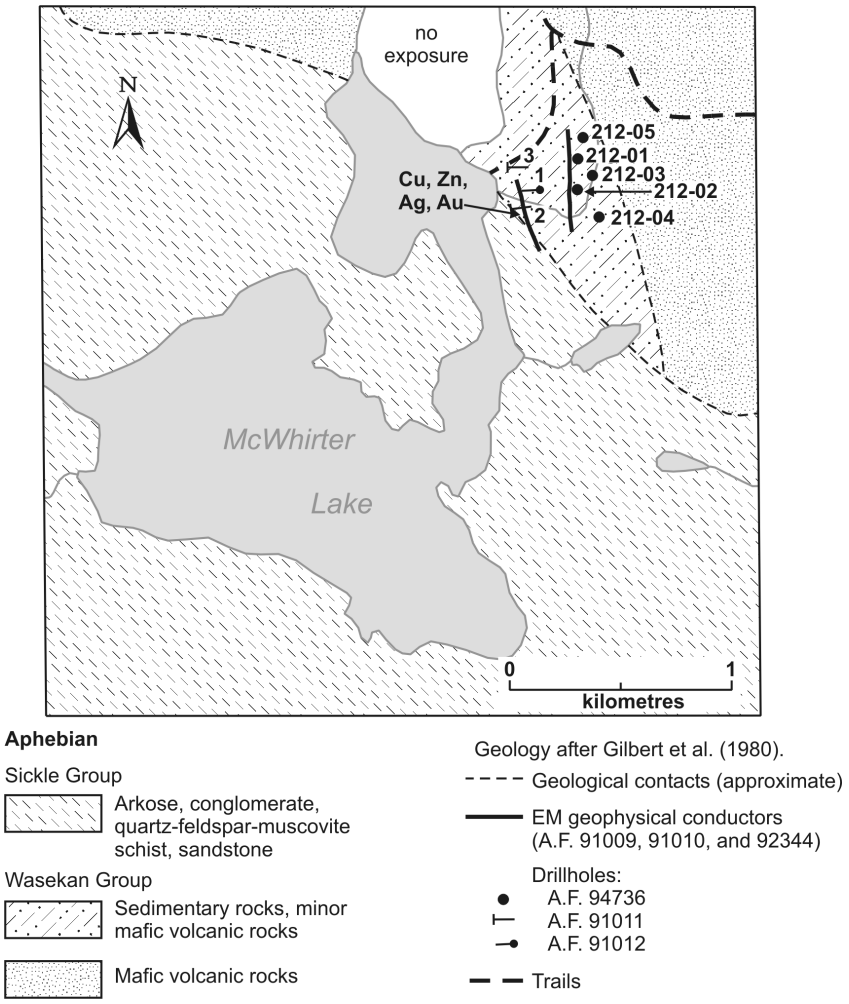


Figure GS-10-2: Location of drillholes and geology at McWhirter Lake. Abbreviation: A.F., Assessment File (Manitoba Industry, Trade and Mines, Winnipeg).

GS-10-3). These Eu^d values contrast with the moderately negative (Eu^d approx. –25%) values in the host rocks both below and above the mineralized interval. The increased Eu^d values in the tuffaceous exhalite are interpreted to be the result of Eu addition from a hydrothermal vent. Anomalous Ag and Sn also identify these rocks as favourable strata to contain massive sulphide deposits. In this example, the positive Eu^d anomaly extends over a core interval of approximately 4 m instead of a sulphide interval of 0.5 m of core.

In the absence of a sulphide interval in this core, the analyses of quartz-rich rocks with only minor amounts of sulphide would alert the explorationist to the presence of an exhalative hydrothermal vent at this stratigraphic level. In addition, the absence of a sodium depletion anomaly in the adjacent hostrocks indicates that this mineralization is part of a distal exhalite; this information can be invaluable in modelling subsequent exploration programs along strata for Zn-, Pb-, Ag-rich mineralization. Additional drillholes put down in this area (Fig. GS-10-2) intersected in semimassive sulphides containing more than 2% Zn, as well as sulphide-bearing iron formation (Assessment Files 94736, 94316). Three samples from drillcore 212-2, drilled into the same conductor, have positive Eu^d anomalies that range from +2 to +350% (Fig. GS-10-4). In this drillcore, the analyses confirm that the mineralization is obviously related to a massive sulphide deposit, because both sphalerite and galena are readily detectable in and adjacent to near-solid pyrrhotite-pyrite. The absence of a sodium depletion anomaly in the host rocks also confirms that the mineralization is distal to a hydrothermal vent.

MacBride Lake

Seven core samples were analyzed from drillhole 464-1, drilled in the MacBride Lake area, because the drillcore

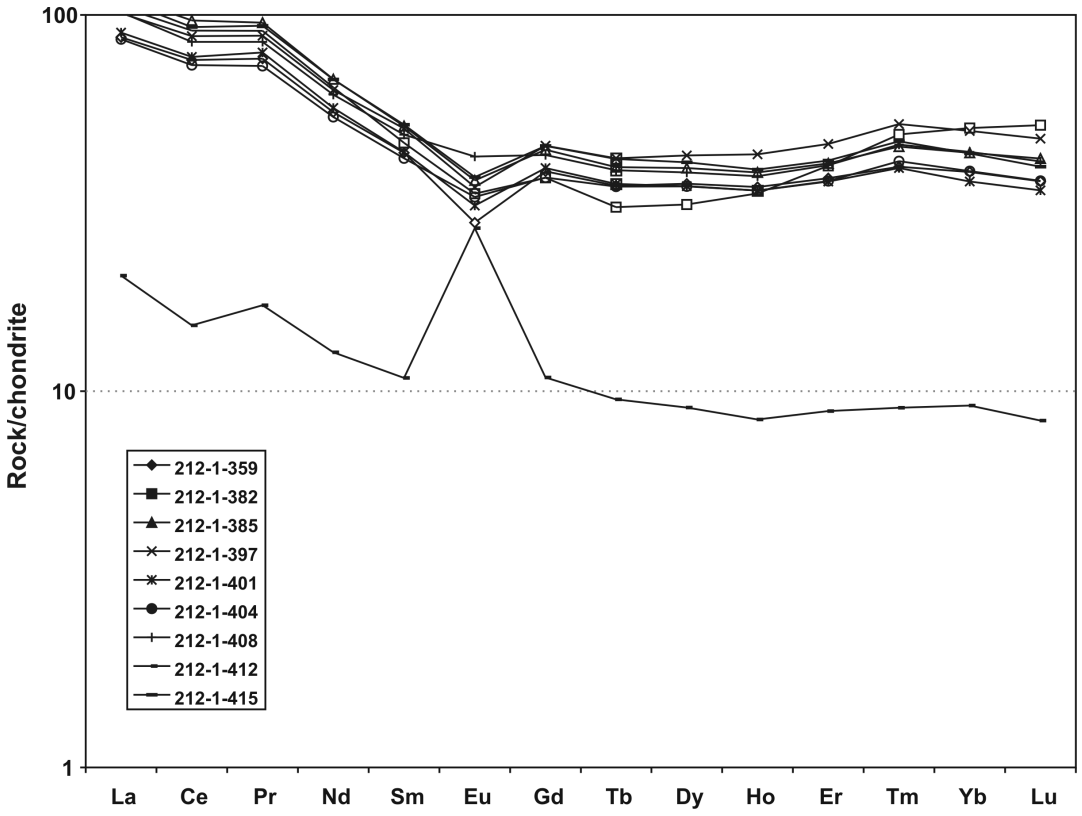


Figure GS-10-3: REE profiles for grab samples from drillcore 212-1, McWhirter Lake.

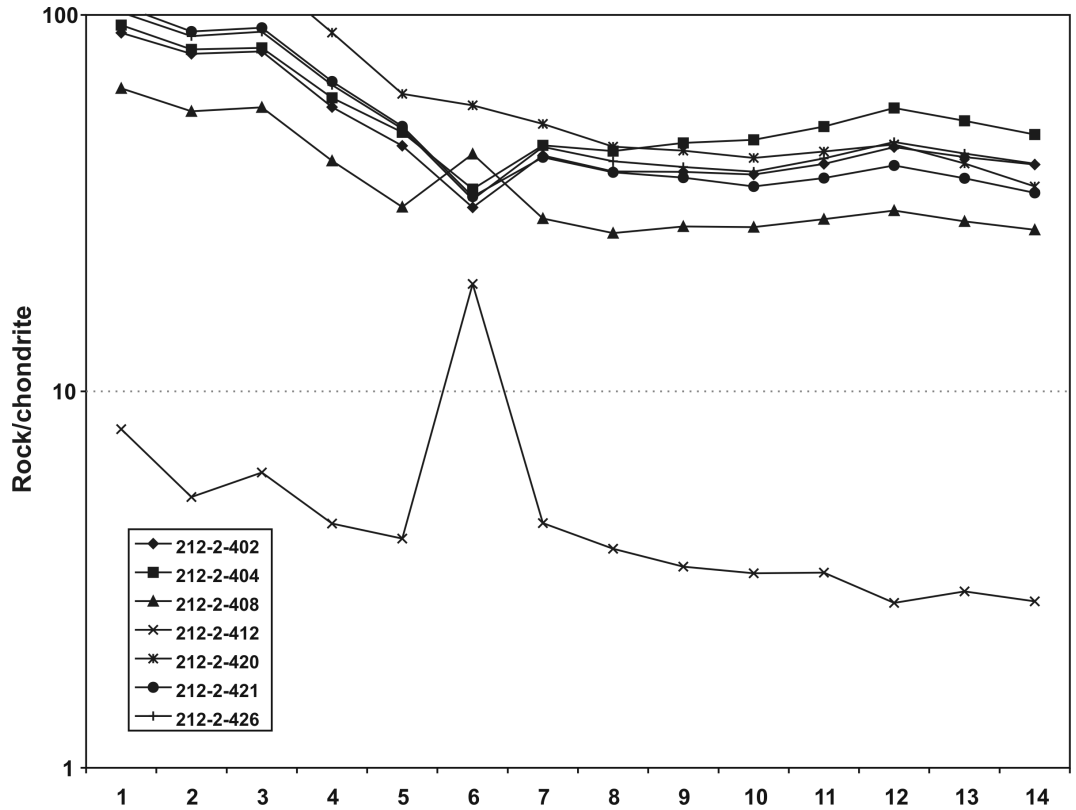


Figure GS-10-4: REE profiles for grab samples from drillcore 212-2, McWhirter Lake.

visually resembles altered volcanic rocks, contains only minor sphalerite in pyritic quartz-chlorite–rich veins, and there is no obvious sulphide interval in the drillcore. The REE profiles for the samples have strongly negative Eu^d values of –55 to –70% (Fig. GS-10-5). In addition, these samples are strongly depleted in sodium. Gale et al. (1997, 1999) showed that strong negative Eu anomalies are present when hot, low-pH hydrothermal fluids strip Eu from host rocks in footwall alteration zones. Both the Eu and Na data confirm that these rocks represent an alteration zone related to a massive sulphide deposit. Examination of the drillcore revealed that one core box containing the core stratigraphically above the alteration zone is missing from the core library. Drill logs indicate that this core interval contained 2.4 m of near-solid sulphide that assayed 6% Zn, 0.25% Cu, 0.04% Pb and 8g/t Ag (Assessment File 94156). In situations where the alteration zone is physically separated from the exhalite portions of a massive sulphide deposit, by contemporaneous depositional processes or later tectonic events, the presence of a strong negative Eu anomaly in the footwall alteration zone indicates that the rocks were affected by potential ore-forming fluids.

Economic significance

This project demonstrates that major element and REE data from tuffaceous exhalites and alteration zones can provide the explorationist with a better understanding of the hidden mineral potential of a drilled property. Where drilled conductors or 'ore equivalent' strata contain only low or negligible metal values, strong positive or negative Eu anomalies can indicate proximity to unknown massive sulphide deposits. This database can be utilized by property holders and others in the Lynn Lake area to reevaluate the mineral potential of the McWhirter Lake and other properties with low metal values.

References

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Gale, G.H., Dabek, L.B. and Fedikow, M.A.F. 1997: The use of rare earth element analyses in the exploration for massive sulphide type deposits in volcanic rocks – progress report; *in* Report of Activities 1977, Manitoba Energy and Mines, p. 147–155.

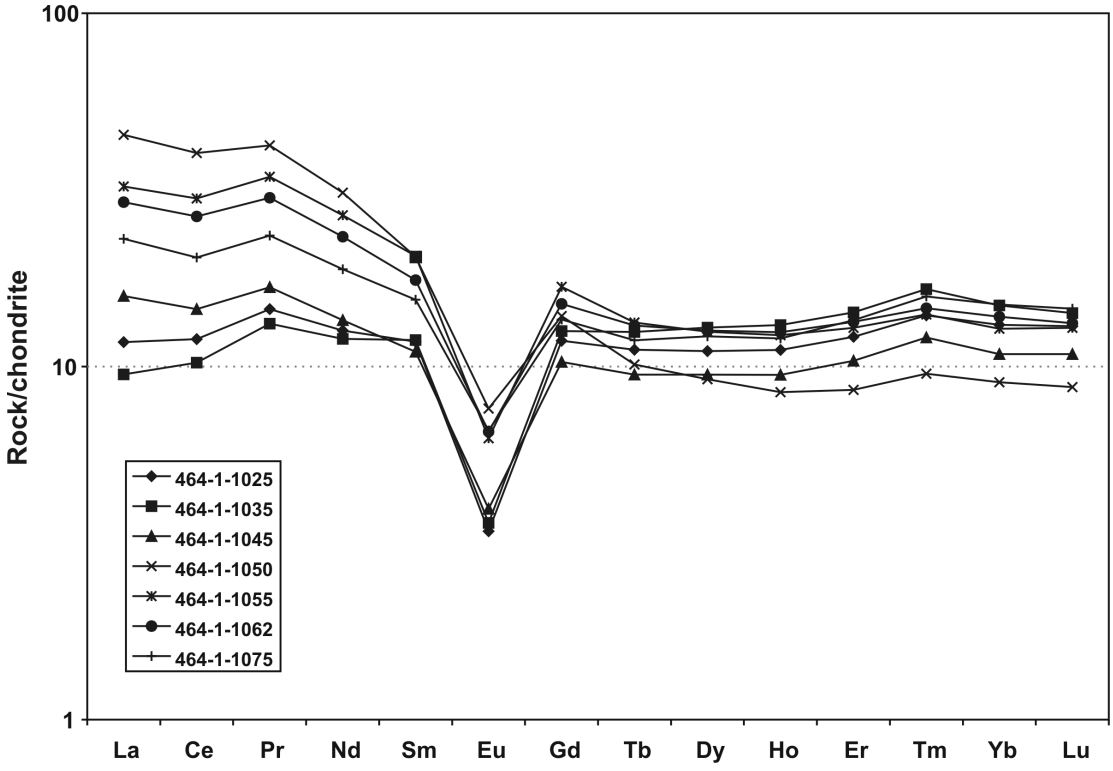

Figure GS-10-5: REE profiles for grab samples from drillcore 464-1, MacBride Lake.