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SILICA IN WESTERN LABRADOR

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ABSTRACT

A 1984 industrial mineral survey in western Labrador confirmed that large white quartzite ridges immediately to the north and west of Labrador City are extremely pure and represent significant reserves of high-quality silica. Two of the best prospects, 2907 Hill and Fermont Highway, were selected for drilling on the basis of geochemical analyses of chip samples, and preliminary mineralogical and metallurgical studies.

Five holes, totalling 272.8 m, were drilled in the 2907 Hill deposit and intersected coarsely crystalline quartzite, which is locally stained to a variety of colors, and contains limonite-coated vugs. Preliminary analyses indicate drillhole 5 averages less than 0.5 percent total impurities over 45.7 m.

The Fermont Highway deposit is unique in that it contains very friable white, coarsely crystalline quartzite. Six holes, totalling 161.5 m, were drilled in this prospect. The friable nature of the quartzite is confirmed to a minimum depth of 42.6 m, containing an average of 0.66 total impurities. Preliminary results indicate that the friable quartzite can be easily processed to achieve total impurities of less than 150 ppm.

INTRODUCTION

In 1984 an industrial minerals survey was initiated in western Labrador (Figure 1), and aimed at strengthening and diversifying the area's economic base, which is almost entirely dependent on the iron ore industry. The objectives of the program were to evaluate the potential of quartzite, as a source of silica, and dolomitic marble for use in the making of self-fluxing 'dolomite-type' iron ore pellets. The best exposures of both commodities were mapped and chip sampled to determine their purity and consistency. A 1985 drill program carried out by the Department of Mines and Energy in two dolomitic marble prospects (Meyer and Dean, 1986) led to the development of the Albert Lake Quarry by the Iron Ore Company of Canada.

Two of the best silica prospects in the Labrador City area, 2907 Hill and Fermont Highway, were selected for drilling in 1986, on the basis of the geochemical analyses of chip samples, and preliminary mineralogical and metallurgical studies carried out on bulk samples. A contract for the drilling-assessment program was awarded by CANMET to Golder Associates, who subcontracted the drilling to Longyear Canada Inc. The project was funded by the Canada-Newfoundland Mineral Development Agreement and supervised by J.R. Meyer of the Newfoundland Department of Mines and Energy and R.K. Collings of CANMET.

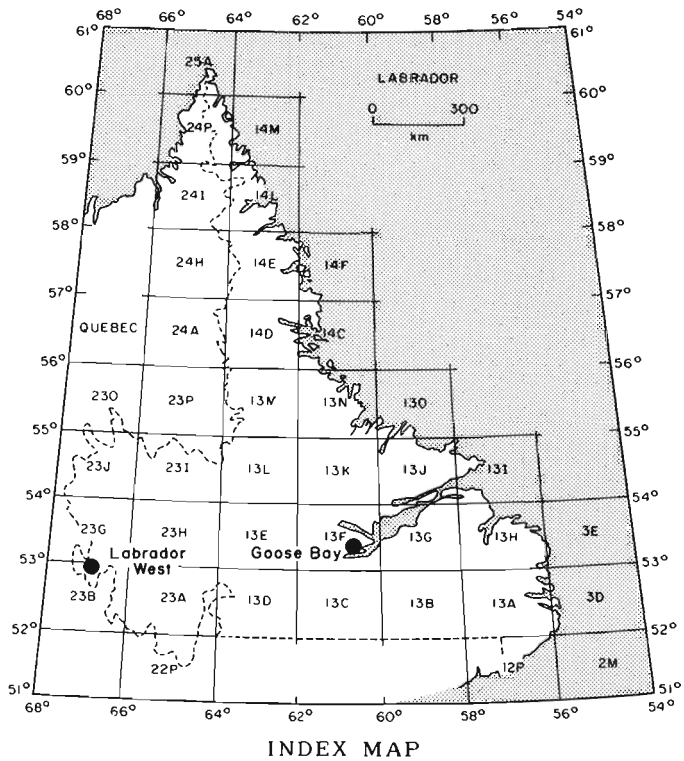
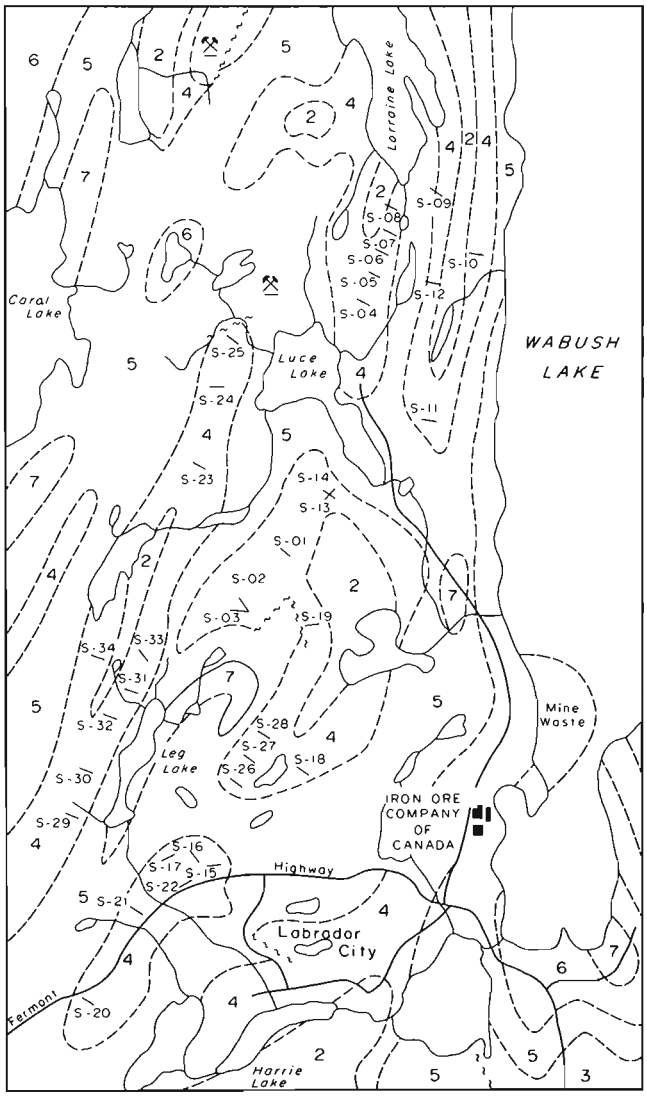


Figure 1: *Location map for silica program in western Labrador.*

SILICA DEPOSITS

2907 Hill

The exploration program for high-quality silica deposits in western Labrador has concentrated on the Wishart Formation quartzite. It occurs within the Aphebian metasedimentary sequence that hosts the dolomitic marble deposit and iron ore deposits, which are presently being



LEGEND

HELIKIAN
- 7 *Shabogamo Intrusive Suite*

APHEBIAN

KNOB LAKE GROUP
- 6 *Menihek Formation*
- 5 *Sokoman Formation*
- 4 *Wishart Formation*
- 3 *Denault Formation*
- 2 *Attikamagen Formation*

ARCHEAN
- 1 *Ashuanipi Metamorphic Complex*

Figure 2: *Location of sections sampled in 1984. S-02 and S-03 are on the 2907 Hill deposit; S-22 is in the Fermont Highway deposit.*

Plate 1: *The southeast flank of 2907 Hill.*

mined. The Wishart Formation quartzite forms prominent white ridges north and west of Labrador City. In 1984 a total of 33 sections, measured perpendicular to the strike of the best exposed ridges (Figure 2), were chip sampled and described (Dean and Meyer, 1985). The results of this program (Meyer and Dean, 1986) indicated that one of the best ridges in the Labrador City area is the 2907 Hill prospect, named after the elevation marker on the top of this bald, windswept hill (Plate 1). The deposit is 5 km north of Labrador City, 4 km south of I.O.C.C.'s Smallwood Pit, and approximately 2 km from the nearest, easily passable dirt road. It is a well rounded hill approximately 750 m in diameter, and has a vertical relief of approximately 125 m. The brilliant white quartzite exposures on top of the hill are moderately fractured, and the only visible impurities are localized, narrow diffuse zones of light-brown to pink iron staining. Average analyses of 45 chip samples collected across the top of the hill, and representing 10-m intervals, are given in Table 1.

Table 1. Geochemical analyses of quartzite samples

Deposits	SiO_2	Al_2O_3	Fe_{tot}
2907 Hill			
Average of 45 chip samples	99.45	0.11	0.06
Average for drillhole 5	99.66	0.11	0.11
Fermont Highway			
Average of 4 chip samples	99.32	0.22	0.04
Average for drillhole 1	99.23	0.55	0.09

Note: Silica analyses of drill samples carried out by Chemex Labs using the classical method.

The 2907 Hill deposit was one of two silica deposits drilled in September of 1986 (Plate 2) Five vertical holes were drilled 200 m apart in an X-shaped pattern (Figure 3). A total of 272.8 m of BQ core was drilled and recovery was close to 100 percent. The core consists of white to light-gray and semi-translucent quartzite, which is locally stained to a variety of colors, including pale to brownish yellow, pale orange and dull red. The quartzite is generally coarsely crystalline (2 to 8 mm) exhibiting a granoblastic inequigranular polygonal texture, except for minor bands of fine grained sugary quartzite. Round to elongate vugs are present through much of the core, generally forming bands at 45° to the core axis. The vugs are 1 to 10 mm in width, and partially lined or filled with yellowish-brown limonite. There is less than 1 percent of intercrystalline, vitreous gray specularite in 1- to 5-mm plates, and in places these are partially oxidized to orange-brown limonite. The core is moderately fractured, and the fracture planes are stained either yellow or red. However, locally they are coated with orange-brown limonite, and less commonly specularite or muscovite.

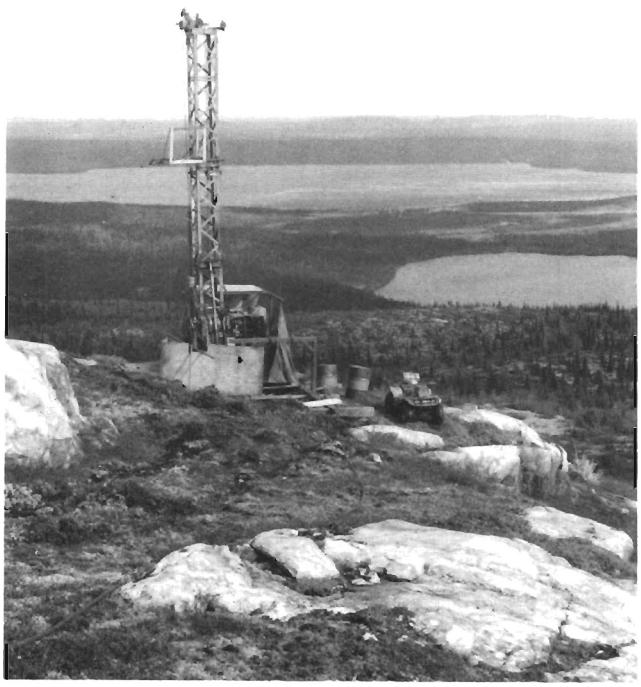


Plate 2: *Longyear-38 set up at drillhole 2 on 2907 Hill.*

Drillhole 1, which is at the centre of the X-pattern, was drilled to a depth of 120.4 m in an attempt to determine the thickness of the deposit. Light- to dark-green amphibolite, in bands 2 cm to 2 m thick, was intersected at 81.1 m, and is thought to be related to a nearby body of the Shabogamo Intrusive Suite. Beyond this depth the quartzite contains biotite-rich bands, and at 94.6 m changes to alternating layers of white quartzite and quartz–biotite–garnet±muscovite gneiss. There were no intersections of amphibolite or gneiss in the other four drillholes.

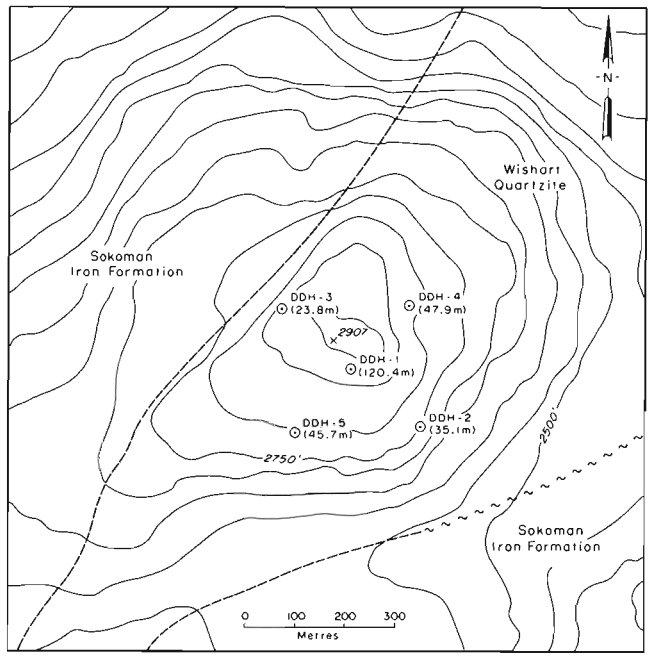


Figure 3: *Location and depth of drillholes in the 2907 Hill deposit.*

The remaining four holes were each planned to reach a depth of 50 m, but due to mechanical and down-hole problems only drillholes 4 and 5 reached the intended depth. In drillhole 3, the drill could not penetrate beyond 23.8 m after encountering a zone of extremely vuggy, poorly consolidated quartzite. In drillhole 4, on the northeast side of the hill, the quartzite is more vuggy and stained than in the other holes. At 27.5 m, a 3-m zone of broken rock was encountered, which resulted in poor core recovery and a loss of water pressure. Drillhole 5, on the southwest side of the hill, intersected the most consistent, white, coarsely crystalline quartzite, exhibiting only minor staining and few vuggy intervals. The core in this hole is weakly fractured compared to the moderately fractured quartzite in drillholes 1, 2, and 4. The degree of fracturing and number of limonite-coated vugs in these holes indicate a high permeability and transport of iron by water.

Preliminary geochemical assays on the quartzite drill core indicate that the quartzite in drillhole 5 is the purest of the five holes drilled in 2907 Hill. Average analyses over the length of the drillhole are given in Table 1. It is believed that further drilling could delineate substantial reserves of quartzite having grades comparable to the above.

Fermont Highway

The Fermont Highway deposit is located on the north side of the highway, approximately 3 km west of Labrador City. White, medium to coarsely crystalline, friable quartzite is well exposed on the floor and vertical walls of a 100-m-wide pit. The pit was established during construction of the Fermont Highway and is presently used as a local source of clean, white, coarse grained sand, for such uses as driveways,

and in ashtrays in the town's shopping malls. The deposit is situated at the bottom of a moderately dipping, south-facing slope. Overburden has been removed from the deposit and spring runoff and rainwater have cut narrow channels up to 1 m deep through the friable quartzite. An outcrop of crumbly quartzite (i.e., the rock breaks into coarse grained sand when struck with a hammer) occurs approximately 350 m up the slope behind the pit, and grades northward into well indurated quartzite. The friable nature of the quartzite is believed to be a result of Cretaceous weathering, which also leached silica and carbonate from the iron ore in the nearby Wabush Mines (Gross, 1968; Rivers, 1978).

The Fermont Highway deposit was sampled in 1984 and average analyses of four samples are given in Table 1. The deposit was selected for drilling on the basis of its geochemistry and unique friable nature, which would be advantageous for quarrying and processing. Retrieving core from this deposit was impossible using conventional diamond-drilling methods (Plate 3) because the quartzite broke into sand grains, which washed away with the drill water. An overburden drill using a 'split-spoon' core barrel was tried, but it could not penetrate the quartzite. However, a percussion drill was successfully used with a suction hose placed at the top of the hole to collect the quartz sand as it was blown out of the hole. Six holes totalling 161.5 m were drilled in a 't-pattern', including a 9-m test hole in the floor of the pit. The holes were spaced 100 m apart and the deepest hole was 42.6 m at a distance of 200 m northwest and uphill from the road (Figure 4). Samples were collected every 3 m and ranged from 4.5 to 15.2 kg in size. The samples consist of clear, angular, medium to coarse grains of quartz and 1 to 3 percent fine white silica powder, which probably resulted from the percussion drilling. There is one interval in each hole at approximately 20 m depth where the color of the quartz is light to medium gray; it results from a coating of gray powder on the grains. It is assumed from the consistent pressure required to drill the quartzite that the friable nature of the quartzite persists to the depths drilled.

Plate 3: *Longyear-38 at drillhole 1, Fermont Highway deposit.*

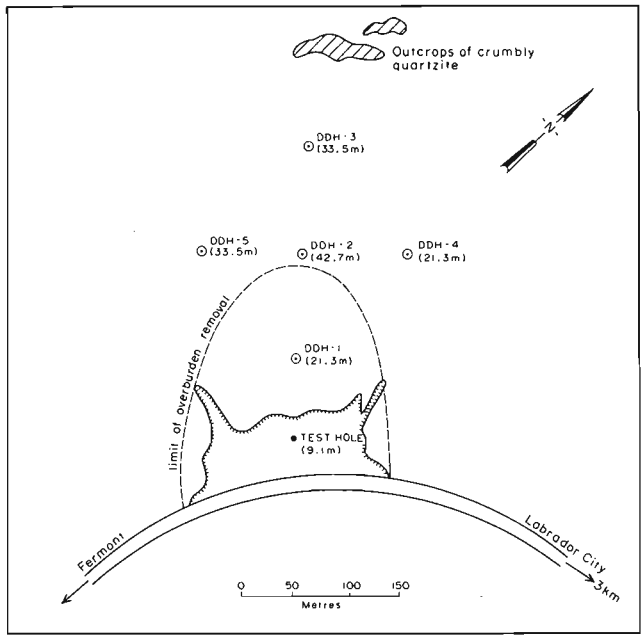


Figure 4: *Location and depth of drillholes in the Fermont Highway deposit.*

Preliminary analyses of the quartz-sand samples from the drill program indicate that the high purity of surface samples continues at depth (Table 1). Geochemical analyses, and mineralogical and metallurgical studies are presently being carried out on the samples. Preliminary results show that the friable quartzite will require little processing to achieve total impurity levels of less than 150 ppm.

SUMMARY AND CONCLUSION

An industrial mineral survey was initiated in the Wabush–Labrador City area in 1984. Chip samples collected from dolomitic marble outcrops and high-purity quartzite outcrops showed that both geological units contain prospects that warranted drilling. In 1986 two silica deposits were drilled and preliminary geochemical analyses show that they meet the requirements for a variety of high-value silica products. The presence of established local infrastructure and transportation systems, and the availability of cheap electricity provide an excellent opportunity for the development of local industries to produce high-purity, high-value silica products, and to supply a high-quality raw material to silica-based industries elsewhere.

ACKNOWLEDGEMENTS

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REFERENCES

Dean, P.L. and Meyer, J.R.
1985: Industrial minerals in Labrador West. *In* Current Research. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 85-1, pages 1-3.

Gross, G.A.
1968: Geology of iron deposits in Canada, Volume III: iron ranges of the Labrador Geosyncline. Geological Survey of Canada, Economic Geology Report 22, 179 pages.

Meyer, J.R. and Dean, P.L.
1986: Industrial minerals in Labrador. *In* Current Research. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 86-1, pages 1-8.

Rivers, T.
1978: Geological mapping of the Wabush–Labrador City area, southwestern Labrador. *In* Report of Activities. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 78-1, pages 44-50.