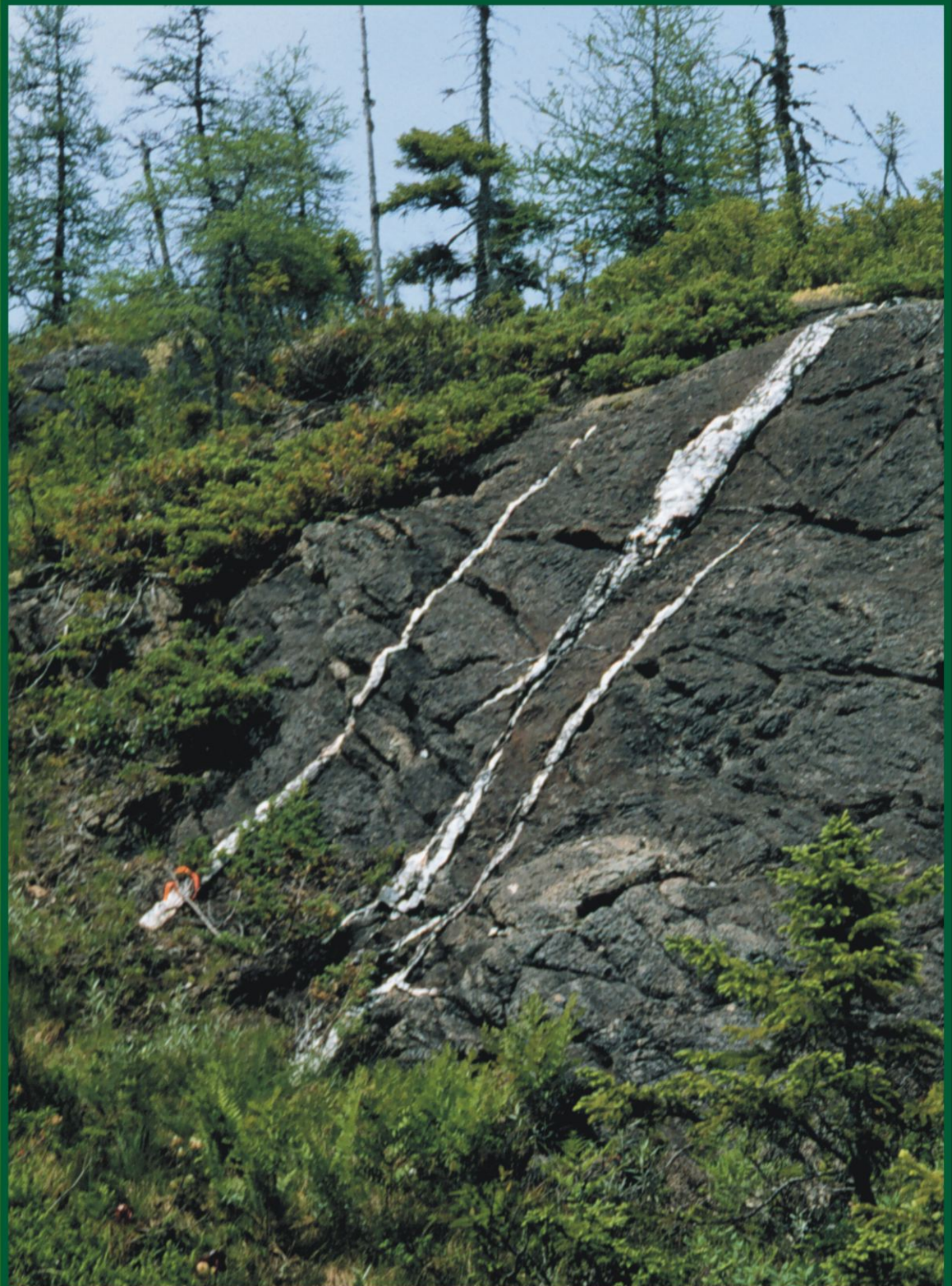
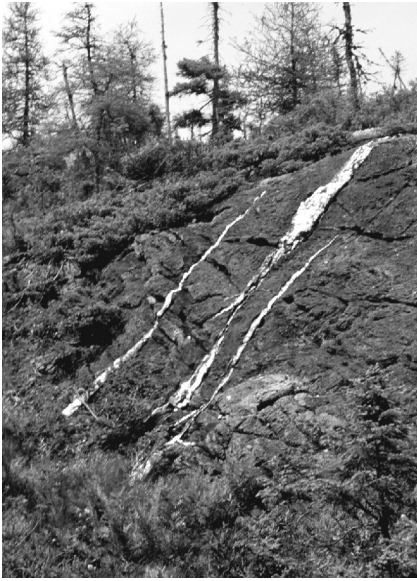


TALC INVESTIGATION ON THE BAIE VERTE PENINSULA, NEWFOUNDLAND



GOVERNMENT OF
NEWFOUNDLAND
AND LABRADOR
Department of
Mines and Energy
Geological Survey



COVER

Veins of quartz cutting the talc-carbonate unit in the Red Cliff Pond area.



GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR
Department of Mines and Energy
Geological Survey

TALC INVESTIGATIONS ON THE BAIE VERTE PENINSULA

A.F. Howse and B. Way



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ABSTRACT

Talc occurrences associated with altered ultramafic rocks on the Baie Verte Peninsula were investigated for their industrial potential. The most promising prospect, located on tidewater at Deer Cove, on the Point Rousse Peninsula, was initially assessed by Noranda Exploration Limited in the mid-1980s during the gold-exploration program. The talc is part of a talc-carbonate unit, in a fault zone, separating blocks of a dismembered ophiolite sequence (Point Rousse ophiolite complex). Data presently available, indicate a talc-carbonate zone, averaging more than 30 percent talc, underlying the Deer Cove-Deer Cove Pond area. Processing tests, involving froth-flotation and magnetic separation carried out by IMD Laboratories Limited for Noranda, showed that a good-quality talc product having a high dry-brightness index (92 percent) could be recovered. These are critical characteristics when considering potential use as filler in paper, plastics and other products. The size and quality of the talc resource at Deer Cove need to be more precisely delineated by detailed core drilling and mapping.

A zone of talc-carbonate rocks associated with altered ultramafic rocks of the Betts Cove ophiolite complex was investigated in the Red Cliff Pond to West Pond region, northwest of Snooks Arm. Two areas were selected for sampling to determine whether talc of acceptable quantity and quality could be recovered. Preliminary tests, involving froth-flotation and magnetic separation, carried out on representative samples from two sites gave a talc yield of 7.51 and 8.25 (percent wt). The talc product exhibited dry-brightness (percent) of 80.4 and 77.2. The quality of the recovered talc, except for dry brightness, compares favourably with the material at Deer Cove. The lower dry brightness could be significantly improved by further processing based on the data derived from the Deer Cove samples.

Despite its ubiquity, the concentration of talc in the two sampled areas of Deer Cove and Red Cliff West ponds is too low to be of commercial interest. Nevertheless, the area is highly prospective for talc, and future work should aim at the identification of higher grade talc zones within the carbonate-talc unit. Based on the 1998 field observations it is suggested that the belt of altered ultramafic rocks between the northwest corner of West Pond and extending eastward to Arrow Head constitutes a good target for further talc exploration.

INTRODUCTION

In 1998, the Geological Survey of Newfoundland and Labrador initiated a study to assess the talc occurrences on the Baie Verte Peninsula (Figure 1). Although previously known and documented, recent work by mining companies, related to gold and base-metal exploration, has added additional data on some of the known talc occurrences. Of particular significance is the prospect at Deer Cove, where processing tests have shown that a good-quality talc product, of high brightness, could be recovered. Also, on the northeast side of the Baie Verte Peninsula, in the Red Cliff Pond region near Snooks Arm, talc associated with altered ultramafic rocks may be more extensively distributed than previous studies had indicated.

Talc, in its pure, crystallographic form, has the formula $Mg_3Si_4O_{10}(OH)_2$ and comprises 64.46 percent SiO_2 , 30.79 percent MgO and 4.75 percent H_2O . However, commercial grades of talc rarely approach this theoretical purity. It has a MOHS hardness of 1, is platy, and naturally hydrophobic. As an industrial mineral, it is a very versatile commodity having a myriad of industrial applications. It is particularly useful in the paper industry, where it is used as a filler to control the build-up of pitch, and in coating formulations. Superior quality talc serves smaller, highly specialized niche markets such as the cosmetic and pharmaceutical industries, whereas markets for lower grade talc include products such as roofing granules, and sealants. It serves as an additive in soaps, lubricants and pigments, and is used to make talcum powder. Annual global production of talc is about 7 million tonnes.

The four principal markets for talc, accounting for about 80 percent of the product are paper, paint, ceramics, and plastics. The paper industry is the single largest con-

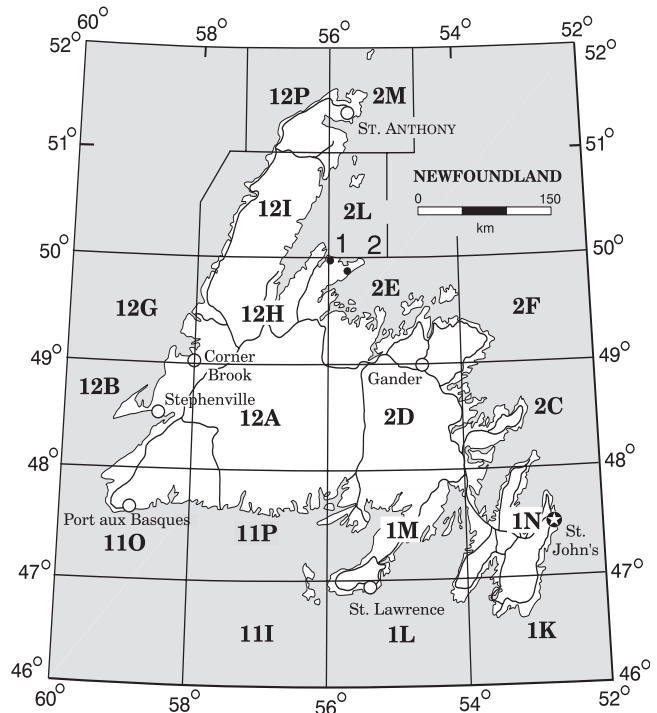


Figure 1. Index map illustrating the locations of the study areas for this resource report. 1) Point Rouse Peninsula and 2) Red Cliff Pond area.

sumer of talc, generally using a 300-mesh material that has a range of brightness varying between 80 and 96 percent. Sims (1997) in a review article indicates that markets expanded steadily in the 1990s, as new niche applications were found, a trend that is likely to continue into the foreseeable future.

PREVIOUS WORK

The Baie Verte Peninsula is famous for its metallic and nonmetallic mineral resources. Since 1864, ten mines have profitably exploited these resources including the gold operation of Richmond Mines Inc. near Snooks Arm; nine of the mines have been for base and precious metals and one for asbestos. All of the deposits, and many of the major prospects, are associated with the ophiolite rocks of the peninsula (Hibbard, 1983). The asbestos mine of Baie Verte Mines Inc., which operated from 1963 to 1981, is hosted by ultramafic rocks of the Advocate (ophiolite) complex. The same belt contains rocks that have a dimension- or ornamental-stone potential (virginite), and good talc occurrences

near Ming's Bight. The nearby Point Rouse ophiolite complex hosts a major talc prospect at Deer Cove, one that is being assessed for its economic potential by WMC International Limited (Internal Report, Department of Mines and Energy, 1999).

Evidence of the first industrial interest in talc and soapstone from the Baie Verte Peninsula is prominently displayed in soapstone cliffs at Fleur de Lys, where Dorset Palaeoeskimos quarried the stone to make utensils such as oil lamps, thus initiating the first documented mining activity on the peninsula. Talc associated with serpentinite in the

Fleur de Lys and Ming's Bight areas was noted by early workers such as Fuller (1941) and Watson (1947). Watson (*op.cit.*) mentioned talc-carbonate mineralization along Trimms Brook (now known as the Trimms prospect) and also the zone between Deer Cove and Red Point on the Point Rouse Peninsula. The talc potential of ophiolite rocks between Tilt Cove and Betts Cove has previously attracted only passing attention. Among the early workers, Snelgrove (1929) noted and sampled a talc-carbonate vein on the north shore of Red Cliff Pond, the analysis of which, Baird (1947) described as consisting mainly of the mineral magnesite. Carr's (1958) summary of the industrial minerals of Newfoundland briefly mentions only the talc occurrences near Ming's Bight and Fleur de Lys with no mention of the talc showings between Betts Cove and Tilt Cove.

Mapping of ophiolite rocks of the Point Rouse ophiolite complex (Norman, 1973; Norman and Strong, 1975) provided a geological foundation for the intense gold exploration that was to follow in that region. This work indirectly drew attention to its industrial mineral potential by identifying zones of talc-magnesite that separate blocks of the dismembered Point Rouse ophiolite complex. Hibbard's (1983) comprehensive memoir on the geology of the Baie Verte Peninsula included a description of the many ophiolite-hosted industrial-mineral occurrences on the peninsula, including talc.

Prior to Noranda Exploration Limited's recognition of the commercial possibilities of Deer Cove talc in the mid 1980s, there was little industrial or no economic interest in such occurrences. In 1980, Anglo-American Clay Corporation staked a talc occurrence 1.6 km southwest of the community of Ming's Bight on Route 418. This talc showing (exposed in a road-cut) is adjacent to the well known Trimms prospect talc showing on the east side of Trimms Brook. Anglo-American Clay produced a 1:5000-scale map

of the showing and collected a total of 15 chip samples (13 kg each) along the length of the zone. Mineralogical analyses for 13 of the samples indicated an average content of 44 percent talc, 38 percent magnesite, 4 percent dolomite and 14 percent chlorite. This included 2 samples from a chlorite zone, the exclusion of which would raise the talc content to 50 percent. Anglo-American Clay recommended exploratory diamond drilling of the talc zone but there was no follow-up and their claims were dropped (Anglo-American Clays Corporation, 1980).

Noranda Exploration Limited carried out preliminary processing studies involving fine grinding and flotation tests of both rock- and drill-core samples of the Deer Cove talc prospect in the 1980s. The results of the tests concluded that a good-quality talc product (minimum 25 percent talc) could be recovered. The dry-brightness (average 92 percent) of the product was also extremely good (IMD Laboratories, 1988).

On the northeast side of the Baie Verte Peninsula, the area between Tilt Cove and Betts Cove has drawn the attention of many exploration companies; they have explored the area for base metals and gold, associated with rocks of the Betts Cove ophiolite complex. In the 1980s, the attention of these companies shifted toward the gold potential of the region, the most tangible result of which was the gold mine at Nugget Pond, discovered by Bitech Energy Resources Limited in 1988, and operated by Richmond Mines Limited. The exploration programs carried out by companies such as Consolidated Morrison Limited, Newmont Exploration of Canada Limited, Consolidated Rambler Mines Limited, and Inco Gold Limited have provided much useful geological data on the region between Betts Cove and Tilt Cove. In particular, the 12 500-scale geological mapping and detailed geochemical rock-sampling program of Inco Gold Limited (Beischer, 1988) that focussed on gold, proved to be an invaluable guide for the present talc-assessment study.

DEER COVE TALC DEPOSIT

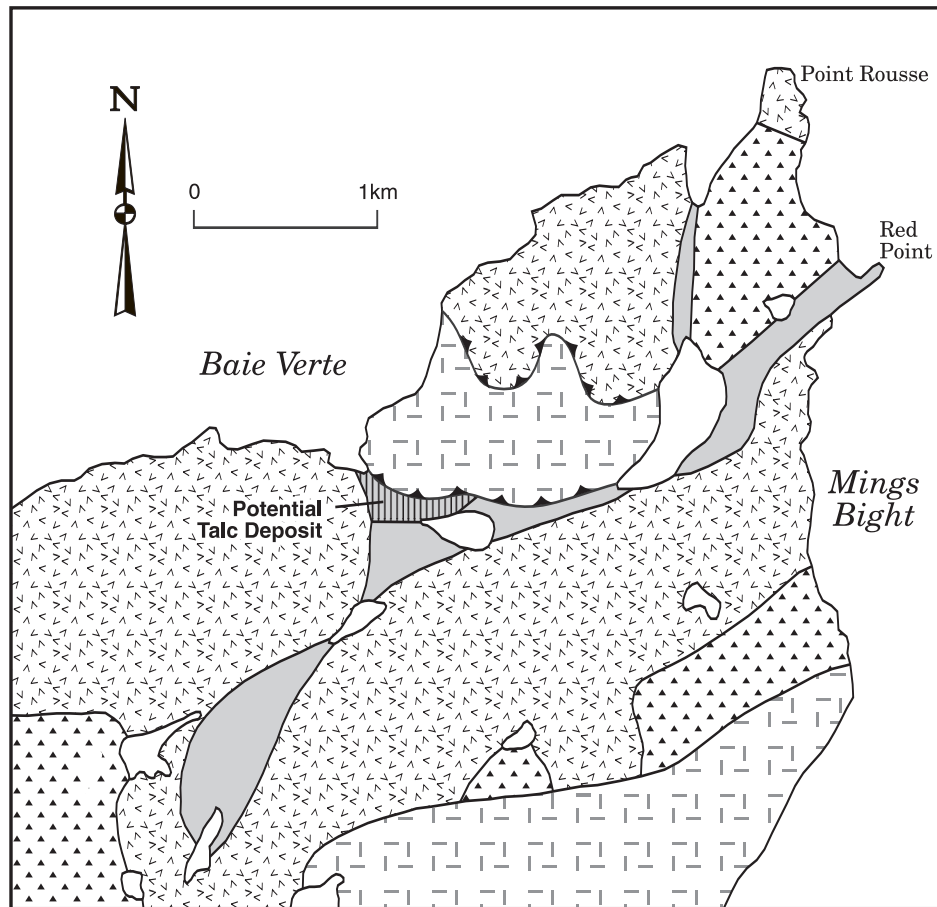
LOCATION AND ACCESS

The talc deposit is located on the Point Rouse Peninsula, 14 km northeast of the town of Baie Verte. Access to the area from the Trans-Canada Highway is via Routes 410 (Dorset Trail), 414 (La Scie Highway) and 418 (Ming's Bight access road). A 7-km all-season gravel road, which exits Route 418 near the community of Ming's Bight, leads northward to the property. The area can also be reached by boat from several nearby communities, although landings

can be difficult in less than ideal weather conditions because of the exposed nature of the peninsula.

GEOLOGICAL SETTING

The Deer Cove talc deposit occurs within altered ultramafic rocks of the Cambro-Ordovician Point Rouse ophiolite complex (Figure 2). The complex comprises a dismembered ophiolite sequence conformably overlain by mafic pillow lavas and volcanogenic sediments (Norman, 1973;



EARLY ORDOVICIAN OR OLDER

Point Rousse Ophiolite Complex





-  Talc and talc-carbonate alteration zones
-  Ultramafic rocks, gabbro and diorite
-  Sheeted diabase dykes
-  Pillow lava, mafic pyroclastic rocks, volcanogenic sedimentary rocks, diabase dykes, minor chert and marble

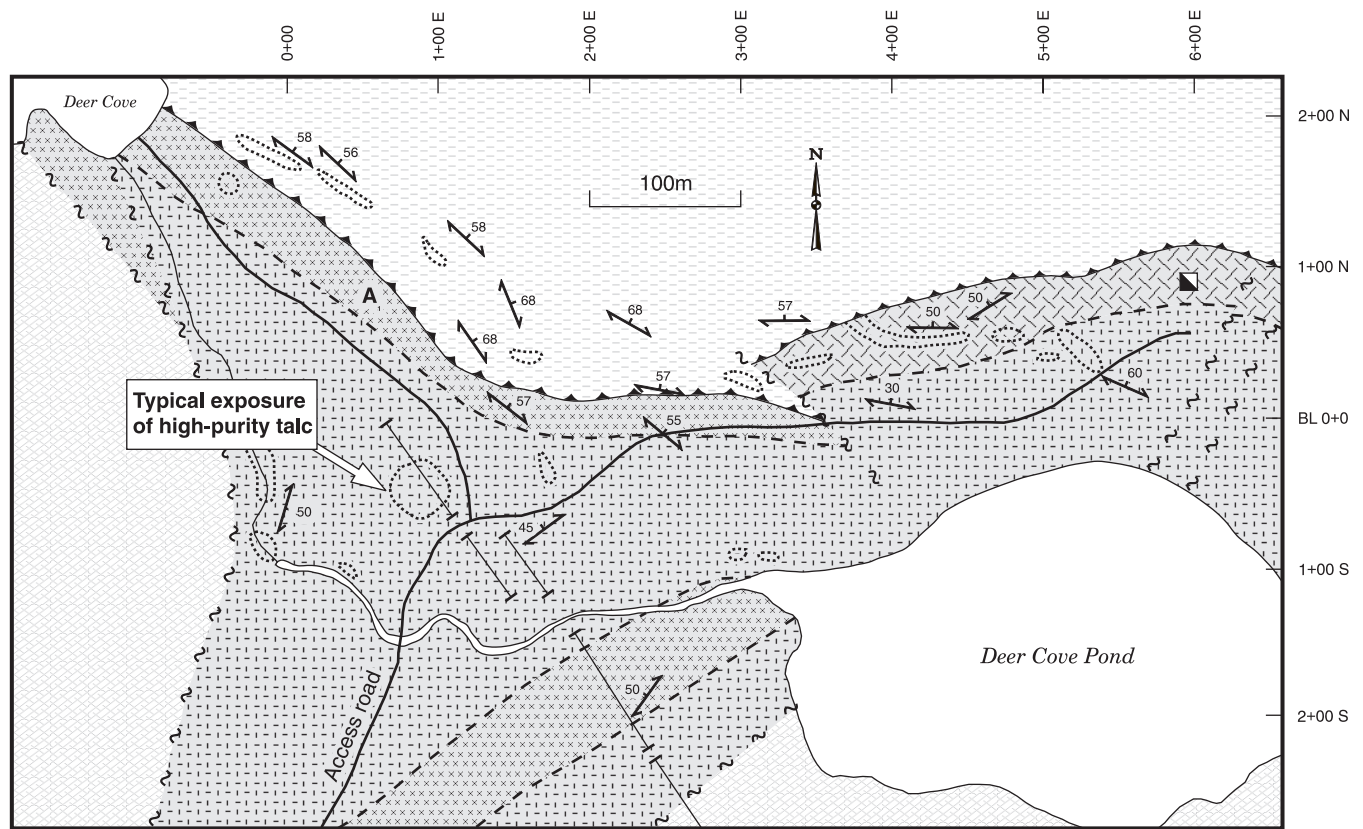
Figure 2. Illustrated geology of the peninsula between Baie Verte and Ming's Bight, showing the location of the talc prospect (geology after Norman, 1973).

Norman and Strong, 1975). These fault-bound ophiolite remnants form part of a steep, south-southwest-trending structural zone of discontinuous ophiolite occurrences (Baie Verte–Brampton Line) that defines the boundary between Dunnage Zone oceanic rocks to the east, and ancient continental margin gneisses and schists of the Humber Zone to the west (Williams, 1979). The fault zones separating blocks are marked by either serpentinized peridotite or talc-car-

bonate rock. The talc-carbonate deposit at Deer Cove occurs along the trace of the main thrust separating the Deer Cove block from adjoining ophiolite blocks to the south and east.

DESCRIPTION OF DEPOSIT

The talc deposit at Deer Cove is part of a talc-carbonate rock unit that forms a discontinuous belt between Deer



LEGEND

CAMBRO-ORDOVICIAN

Point Rouse Ophiolite Complex

- C** Mafic volcanic, volcanoclastic rocks
- B** Gabbro
- A** Ultramafic rocks, variably serpentinized
- A** Carbonate-talc-fuchsite, quartz veins
- A** Talc-carbonate
- A** Serpentine schist, melange

SYMBOLS

- 50 Schistosity
- Thrust fault
- Fault
- Geological contact
- Area of outcrop
- trench
- adit

Figure 3. *Geology of the Deer Cove–Deer Cove Pond area (geology modified after Graves, 1985).*

Cove and Red Point, and east of Deer Cove Pond where the proportion of carbonate in the rock increases. Norman and Strong (1975) using X-ray diffraction methods, determined that the carbonate component consists mainly of magnesite and minor amounts of calcite and dolomite. Generally, talc is more abundant in the highly sheared zones and is especially evident between Deer Cove and Deer Cove Pond, where it comprises a number of low rounded hills and weathered exposures (Figure 3). It also occurs along the adit

access road and in the lower ground adjacent to the north shore of the pond (Plates 1 and 2).

On the weathered surface, the talc–carbonate rock varies from a pale brown (due to the presence of magnesite) to dark grey (due to the increasing talc content). Fresh surfaces of the talc-rich rocks may be greenish-white, whereas carbonate-rich portions are pale brown. In many places, the talc-rich zones exhibit a high degree of lubricity (common-



Plate 1. *View west along talc-carbonate zone looking toward Deer Cove.*



Plate 2. *Talc-carbonate deposit at Deer Cove.*

ly referred to in the industry as "slip"). This is caused by minute flakes of talc produced by weathering and shearing. This effect is particularly noticeable to vehicular drivers who attempt to descend the slippery hill leading down to Deer Cove.

A penetrative cleavage of variable strike (090° to 120° E), and moderate to steep northwesterly dip is exhibited in the talc-carbonate rock. The orientation follows the direction of the Deer Cove thrust fault, and is also probably influenced by local folding.

A typical exposure of high-purity talc comprises a small rounded hill at the juncture of the gravel roads that leads to Deer Cove and to the adit. The hill has a diameter of about 60 m, a height of about 6 m, and has an overburden cover of about one metre. The weathered surface, best seen on the sides, is a mottled greenish brown having darker stained patches, whereas the fresh surface has a more pronounced green tint. A trench, which trends northwest across the hill and down its northwest slope into a bog, has exposed about 30 m of talc-carbonate rock. A representative sample that was collected by Noranda Exploration Limited, and subjected to fine grinding and froth-flotation tests by IMD Laboratories (1987), assayed 35 percent talc.

POTENTIAL RESERVES AND TALC QUALITY

The work of Noranda Exploration Limited in the 1980s and the present investigation indicate the presence of signif-

icant potential reserves of talc at Deer Cove. Noranda's main focus for conducting an exploration program in the area was for gold in auriferous quartz veins that intrude the sequence of volcanic rocks, sheeted dykes, and gabbro, immediately above the thrust contact and talc-carbonate zone (Figure 3). A tunnel was driven northward along the gold zone for several hundred metres; a complementary drill-core program was also undertaken. However, only the collars and surface projections of drillholes containing sections of talc and carbonate, and hence relevant to the present report are shown in Figure 4, along with assays for selected representative (10 m) sections of core for each hole. Similarly, the site locations and talc content of three talc samples taken from nearby outcrops are also shown.

The results show an area, in excess of 56 000 m², underlain by talc-carbonate rock grading more than 30 percent talc. Using a specific gravity of 2.7 g/cm³ and assuming a conservatively shallow depth of 20 m, potential reserves are just short of 3 million tonnes. A drilling program designed to define precisely the size, quality, and mineralogy of this deposit is required before an accurate evaluation of the deposit can be made.

Preliminary test work of fine grinding and froth-flotation showed that a good-quality talc product can be recovered. Furthermore, the talc product has a very good dry-brightness index of 92 percent, an important factor in filler evaluation.

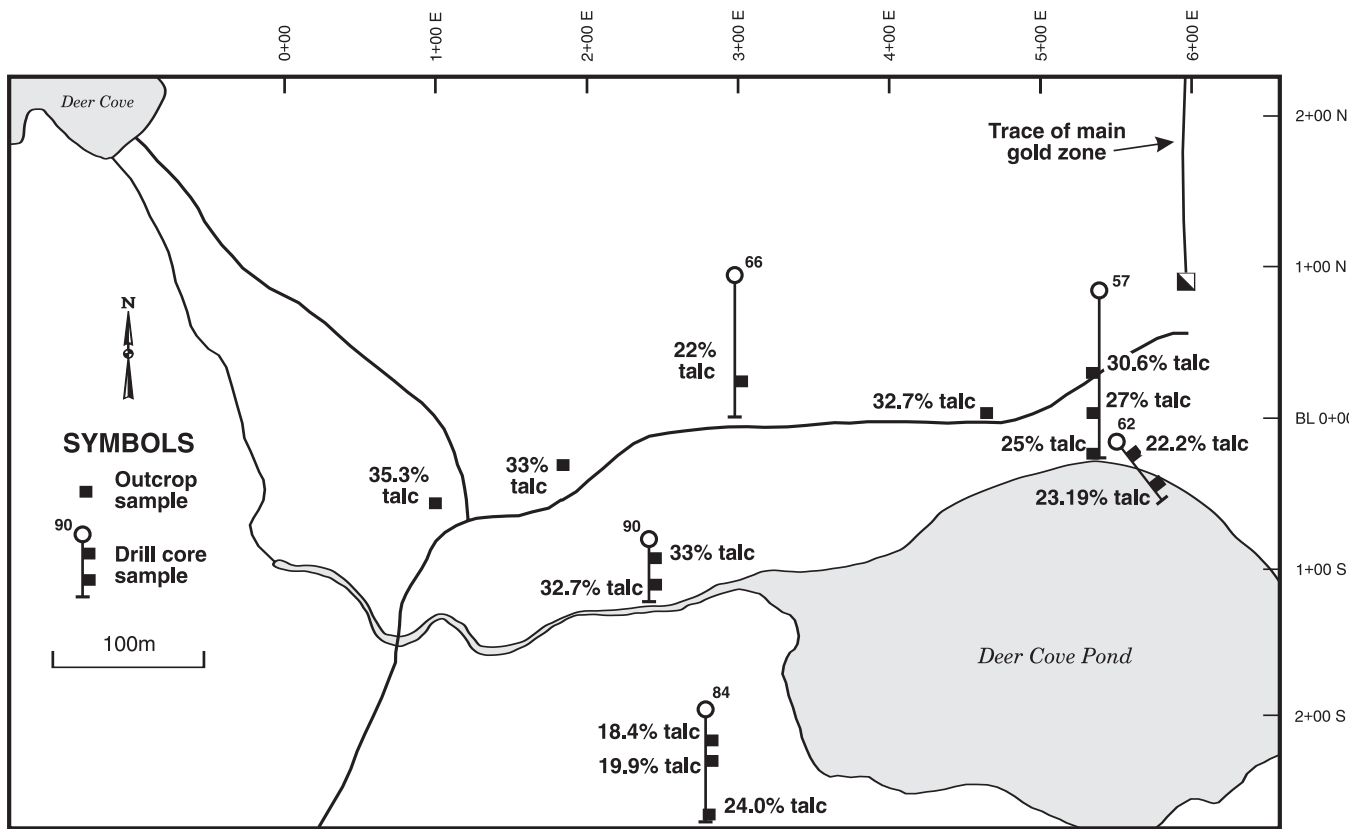


Figure 4. Sample sites from the Deer Cove talc prospect showing talc content of the samples. Drill-core samples represent 10 m representative sections.

BETTS COVE OPHIOLITE COMPLEX TALC OCCURRENCES

LOCATION, ACCESS AND PHYSIOGRAPHY

The study area is located near Snooks Arm on the north-east coast of the Baie Verte Peninsula about 35 km east of the town of Baie Verte. It can be reached from the Trans-Canada Highway via Routes 410 (Dorset Trail), 414 (LaScie Highway), and 416 (Snook's Arm access road). Trails branching from the Snooks Arm and Nugget Pond mine (Richmont) access roads lead to inland areas. A number of ponds connected by short brooks enable canoe travel to the inaccessible hinter land areas. Communities located within a few minutes drive of the study area include the fishing (mainly) villages of Snooks Arm and Harbour Round, a larger fishing and fish-processing centre, LaScie, and the historical mining town of Tilt Cove.

The topography of the region is characterized by steep, rugged ridges and narrow valleys trending in an easterly

direction. Generally, the ridges have little overburden and vegetation, but in the valleys, where the soil is thicker, scrub spruce, spruce and alder are common. The present work was mainly carried out in ultramafic rocks, where overburden and vegetation are conspicuously sparse. The relatively soft ultramafic rocks have been eroded to form a broad valley where outcrop exposure is good and in some locations (i.e., cliffs and shores of ponds) greater than 50 percent.

GEOLOGICAL SETTING

The eastern Baie Verte Peninsula forms the most north-westerly part of the Dunnage Zone, one of four tectonostratigraphic zones of Newfoundland (Williams, 1979). It is characterized by ophiolite suites and volcanic complexes including the Betts Cove ophiolite complex, part of which (the ultramafic member) is the focus of the present assessment for talc. In the study area, the ultramafic rocks consist of interlayered dunite, pyroxenite, peridotite, and serpenti-

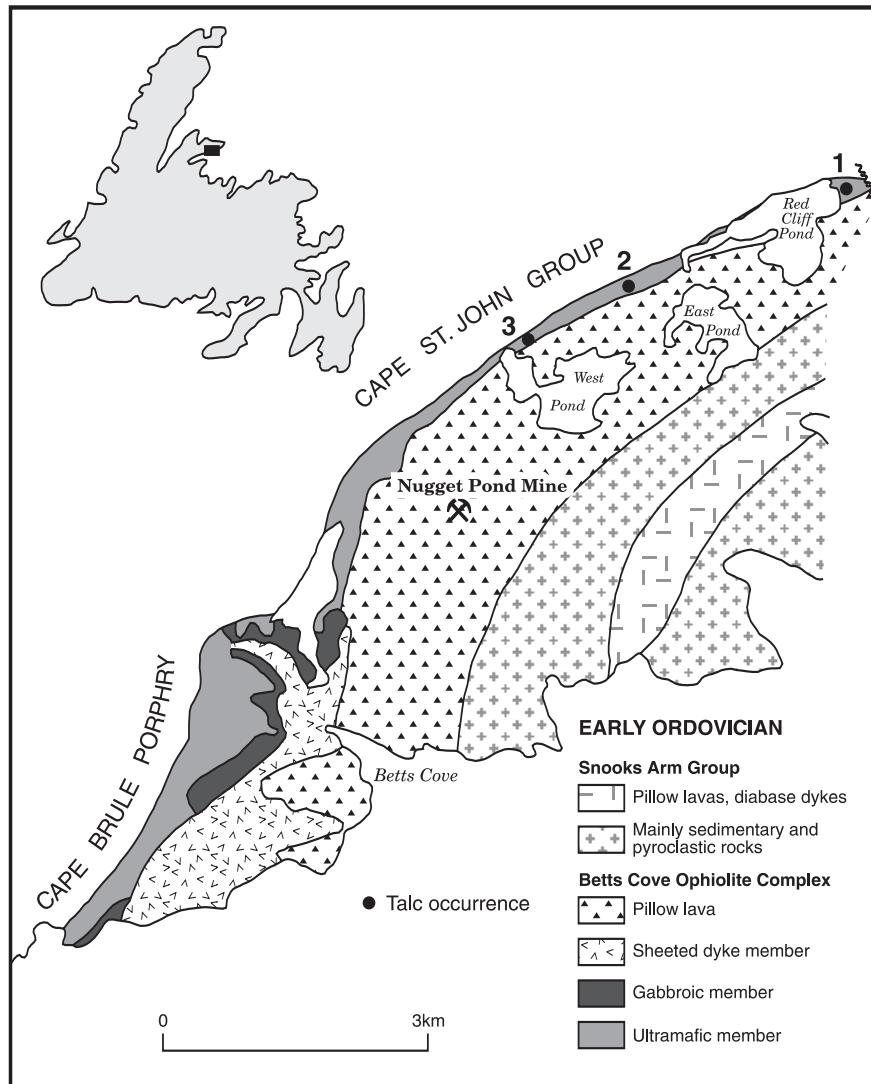


Figure 5. Locations of talc–carbonate zones that have been sampled between Red Cliff Pond and West Pond. Location numbers and descriptions are discussed in the text. Regional geology from Swinden et al. (1990).

nite but these primary rock types and their igneous features have been almost completely obliterated by extensive shearing and pervasive alteration (Beischer, 1988).

The Early Ordovician Betts Cove ophiolite complex is a steeply dipping arcuate belt of rocks, approximately 16 km long, exposed between Tilt Cove and Betts Cove (Figure 5). The ophiolite is conformably overlain by pillow lavas and sediment of the Early Ordovician Snooks Arm Group and unconformably overlain by mafic and felsic volcanic rocks of the Silurian Cape St. John Group.

Rocks of the Betts Cove ophiolite complex and of the Snooks Arm Group have been interpreted as oceanic crust overlain by island-arc rocks (Upadhyay, 1973). The Cape St. John rocks are defined as a sequence of dominantly subare-

al volcanic rocks unconformably overlying the Snooks Arm Group (DeGrace *et al.*, 1976; Hibbard, 1983).

PRESENT WORK

Field work in 1998 examined and sampled talc mineralization at three separate prospects. These prospects are located: 1) between Red Cliff Pond and the Snooks Arm Road, 2) northwest of East Pond (Plate 3), and 3) near West Pond (Figure 5). Samples from two of the prospects (#s 2 and 3) were processed to determine whether the talc was of an acceptable amount and quality, and whether any of it could be recovered from the rock. Detailed geological mapping and rock sampling by Inco Gold Limited, outlined the zone of altered ultramafic rocks of the Betts Cove ophiolite complex (Beischer, 1988) and this work was very useful in



Plate 3. *Sampling a talc-carbonate zone at East Pond, west of Snooks Arm.*

helping to focus on the most talcose rocks in the area. Representative samples of the talc-carbonate rock weighing approximately 50 kg were collected from each site. A special effort was made to get fresh samples but this proved to be only partly successful because of deep and pervasive weathering.

METHODS

The extraction process consists of crushing and grinding the rock to about 50 percent, passing 325 mesh (45 microns). This was followed by a rougher float, a scavenger float, and three cleaner floats in open circuit (the details of which are given in Appendix 1). In all such steps in the froth-flotation process, the talc separated from the other minerals. Because magnetic iron-bearing minerals sometimes float with talc, the talc concentrate was treated with wet low and high intensity magnetic separation to remove strong and weak magnetic minerals contained in the talc concentrate.

DESCRIPTION OF TALC OCCURRENCES

Pervasive, low-grade talc occurs in talc-carbonate and carbonate-talc rocks (reflecting the dominant mineral) along a 4-km-long linear belt of altered ultramafic rocks from the northeast end of Red Cliff Pond to West Pond. The host ultramafic rocks are truncated by a fault near the branch road to Snooks Arm at its closest point to Red Cliff Pond, but reappear in outcrop at Long Pond, about 3 km to the east.

In a few rare localized zones, talc appears to be the dominant mineral but generally is subordinate to carbonate

(mainly magnesite). Iron, in the form of magnetite and (or) hematite, is commonly present. Talc-carbonate rocks, the dominant rock type, are recognizable because of their distinctive light to dark reddish brown-weathered colour and characteristically vuggy or pitted nature, due to differential erosion of the carbonate and talc. On fresh surfaces, the carbonate-rich rocks are commonly light brown, whereas the talcose zones are greenish or white. Generally, talc is present in greater concentrations in the highly sheared ultramafic rocks near their contact with volcanic rocks of the Cape St. John Group. Quartz and quartz-carbonate are present as very conspicuous white veins commonly cutting the fabric of the host rocks at steep angles but in places concordant with the structure.

Magnesite, the dominant mineral, occurs as discontinuous veins and veinlets, massive lenses and as clusters of crystalline material. Talc is interspersed with magnesite as crystal masses and as green and white platy crystals on shear planes. Other minerals present include disseminations and clots of magnetite (estimated up to 2 percent in places), and minor hematite. In most of the examined outcrops, the predominant carbonate mineral is magnesite, although calcite and possibly dolomite are also present. Steeply dipping quartz veins, up to 20 cm wide, were observed near the shore of a little cove at the northwest end of West Pond, and also the northeast corner of Red Cliff Pond. At West Pond, the veins intrude what otherwise appears to be a zone of good talc. The presence of a hard, abrasive material such as silica, detracts from potential use of talc as filler. Quartz veining is more prevalent along the fault contact with volcanic rocks of the Cape St. John Group and with the altered ultramafic rock unit of the Betts Cove ophiolite complex.

Area West of Red Cliff Pond

An area of altered ultramafic rocks, extending for approximately 750 m west of Red Cliff Pond (Prospect #1), and ranging up to 350 m in width, was investigated for its talc content (Figure 5). The rock consists of a mixture of carbonate and talc, and is fairly well exposed along the zone. Cliffs are prevalent along the southern contact along with mafic flows of the Snooks Arm Group, and the northern contact with the Cape St. John Group is marked by an escarpment. A stream that connects Bar Pond and Red Cliff Pond diagonally, bisects the area. The carbonate-talc rock has a fairly well developed foliation, trending in a generally east-west direction and having a steep southerly dip. Near the contact with the Cape St. John Group the dips range from subvertical to vertical.

A 50 kg composite sample (from two sites) of the talc-carbonate unit was collected for analyses. At the first site, the soft and weathered brownish grey rock capping the

outcrop, presented some difficulty in getting fresh material, which when obtained, had the typical talcose greasy characteristic texture. Also noticeable was a light grey to white powder easily produced when chipping or scraping the rock during the sampling process. At the second prospect (#2), which is higher in elevation by about 10 m, the rock is somewhat harder because of quartz stringers and veinlets. Amygdules of magnetite ~ 4 mm in diameter, were also noted at the second site. In both outcrops, magnesite is the dominant mineral occurring as brownish lenses and veinlets; significant hematite is also present. There is a marked variation in the quality of minerals present, from one outcrop to the next, even over very short distances.

Area East of the Northwest Corner of West Pond

A composite and representative sample of the carbonate-talc unit was collected from outcrops located just east of a small cove located in the northwest corner of West Pond. Prospect #3 is situated about 1.7 km southwest, along strike from the northwest corner of West Pond, and in the same ultramafic unit. The main geological elements are similar to that found near Red Cliff Pond in that the ultramafic rocks

appear to have been completely altered to carbonate-talc rock and this alteration zone is sandwiched between felsic volcanic rocks of the Cape St. John Group and mafic volcanic rocks of the Snooks Arm Group. Again concordant and discordant quartz veining is ubiquitous, particularly near the major fault contacts and near the shore of West Pond. The latter observation may simply be a result of better bedrock exposure at these pond localities. Flagging tape, an exploration trench, and a diamond-drill site are evidence that the quartz-rich zones were assessed for gold near the contact with felsic volcanic rocks of the Cape St. John Group, within 200 m of the pond.

Approximately 100 kg of rock was collected from outcrops near the centre of the carbonate-talc zone. There is a significant amount of talc present but clearly much less than the carbonate component that appears to be composed mainly of magnesite. Hematite is present in variable amounts up to 4 percent as is minor disseminated magnetite. No quartz veining was encountered at the sample site but minor stringers of quartz were observed 150 m north (up slope). There, the rocks appeared to be harder and finer grained, and in addition to the quartz, minor hematite and magnetite are present.

DISCUSSION

The results of test work on samples of carbonate-talc rock from the Red Cliff Pond and West Pond area are found in Appendix 1. Representative samples of carbonate-talc rock from the two areas described in the previous section are labeled AH-98-1 and AH-98-2, and were submitted to the Minerals Engineering Centre of Dalhousie University for processing by froth-flotation and magnetic separation. The objective was to determine potential talc yield from the rock and the quality and brightness of the talc product.

The talc was analyzed for major oxides and percentage acid solubles. Tests for dry-brightness were also carried out. Appendix 1 contains the results of these analyses in tabular form under the headings Head analyses, Flotation results and Talc product analysis.

The Head analyses show that besides silica, magnesia and carbon dioxide, the samples contain relatively high levels of iron in the form of magnetite and hematite. The rock appears to consist mostly of magnesite and talc.

The froth-flotation tests resulted in a talc yield of 7.51 percent for sample AH-98-1, and 8.25 percent for AH-98-2. Although the yield of talc from the host is much lower than at Deer Cove, the quality of the recovered talc for the Red

Cliff samples is good. The analyses of the Red Cliff-West Pond talc product averaged only 1.15 percent acid solubles (a measure of talc purity) compared with more than 4 percent for the Deer Cove talc concentrate (Kriens, 1987).

Dry-brightness at 80.4 percent and 77.2 percent for the talc recovered from samples AH-98-1 and AH-98-2 is low given the apparent purity of the product. This may be due to the weathered condition of the samples, which causes the talc crystals to be coated with iron oxide, and the relatively coarse particle size of tested talc. Because dry-brightness of talc is a function of purity and particle size, reducing particle size increases brightness and finely micronized talc is usually the brightest. For example, the talc concentrate at Deer Cove (92 percent average brightness) was micronized to approximately 100 percent passing 15 micron to achieve that level of brightness. By contrast, the dry-brightness of Red Cliff area talc was determined for material ground to 50 percent passing 45 micron. Furthermore, the Deer Cove samples were chemically treated to remove iron staining from the talc platelets, another processing step that greatly improved the brightness of the talc product at Deer Cove (Kriens, 1987). Applying these additional processing steps would likely improve the dry brightness of the Red Cliff Pond talc concentrate by several percentage points.

SUMMARY

Talc mineralization, associated with altered ultramafic rocks, on the Baie Verte Peninsula was investigated in 1998. The most promising deposit, located on tidewater at Deer Cove on the Point Rousse Peninsula, was identified and initially assessed by Noranda Exploration Limited in the mid-1980s. The talc is part of a talc-carbonate unit in a fault zone separating blocks of a dismembered ophiolite sequence (Point Rousse ophiolite complex). Data available indicates that a talc-carbonate zone averaging more than 30 percent talc, underlies the Deer Cove-Deer Cove Pond area. Processing, involving froth-flotation and magnetic separation carried out by IMD Laboratories Limited, for Noranda, showed that a good quality talc product having a high brightness index (92 percent) could be recovered. These are critical characteristics when considering potential use as filler in paper, plastics and other products. The size and quality of the talc resource at Deer Cove require more precise delineation by detailed core-drilling and mapping.

A zone of talc-carbonate rocks associated with altered ultramafic rocks of the Betts Cove ophiolite complex was investigated northwest of Snooks Arm. Two areas were selected for sampling to determine whether talc of accept-

able quantity and quality can be recovered from the talc-carbonate unit. Preliminary tests involving froth-flotation and magnetic separation carried out on representative samples from two sites gave a talc yield of 7.51 and 8.25 (percent wt) respectively. The talc product exhibited dry-brightness (percent) of 80.4 and 77.2. The quality of the recovered talc product, except for dry-brightness, compares favourably with the material at Deer Cove. Based on the experience with Deer Cove it is suggested that further processing, such as finer grinding and chemical bleaching, could significantly improve brightness of the talc.

However, despite its ubiquity in the carbonate-talc unit and its good quality, the amount of talc present, in the two sampled areas, is too low to be of commercial interest. Nevertheless, the area constitutes a highly prospective area for talc, and any future work should aim at the identification of higher grade talc zones within the carbonate-talc unit. Based on the 1998 field observations, it is suggested that the belt of altered ultramafic rocks between the northwest corner of West Pond and extending eastward to Arrow Head Pond constitutes a good target for further talc exploration.

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Note: Geological Survey open file numbers are included in square brackets.

APPENDIX 1

Results of processing tests carried out by the Mineral Engineering Centre, Dalhousie University

March 31, 1999

Government of Newfoundland and Labrador
Department of Mines and Energy
Geological Survey
P.O. Box 8700
St. John's, NF
A1B 4J6

Attention: Ambrose Howse

Re: Results of test work on submitted samples.

INTRODUCTION

Two samples labelled AH-98-1 and AH-98-2 were submitted for processing by froth-flotation.

The objective was to determine potential talc yield and product quality.

SAMPLE PREPARATION

The samples were crushed to minus 2.00 mm with jaw and cone crushers. A head sample was split out and analyzed for major oxides. One kilogram samples were dry ground, in a rod mill, to approximately 50% passing 0.045 mm.

TEST PROCEDURE

Each flotation test consisted of a rougher plus three stages of cleaning in open circuit. The flotation was carried out at 40% solids and a cell speed of 1250 RPM was used. Calgon was used for improving flotation selectivity. Dowfroth 250 was used as a frother and the collector. Sodium hydroxide was used to modify the pH of the pulp.

Rougher and cleaner tailings were collected. The talc concentrate was treated with wet low and high intensity magnetic separation with a Boxmag rapid magnetic separator.

All products were filtered and dried. Product recovery was calculated from weights of the tailings and concentrate.

The talc concentrate was analyzed for major oxides, dry brightness and percentage acid solubles.

TEST RESULTS

Head analysis:

	Sample	
	AH-98-1	AH-98-2
SiO ₂ (%)	35.27	36.70
MgO (%)	30.68	32.15
Fe ₂ O ₃ (%)	7.00	7.26
Al ₂ O ₃ (%)	0.52	0.80
CaO (%)	1.34	1.28
K ₂ O (%)	0.013	0.006
Na ₂ O (%)	0.009	0.005
TiO ₂ (%)	<0.02	<0.02
MnO (%)	0.081	0.078
CO ₂ (%)	23.98	19.87
L.O.I. (%)	24.79	20.95

CO₂ content included in L.O.I.

Flotation results:

	Sample	
	AH-98-1	AH-98-2
Grind (% -0.045 mm)	49.5	52.9
Calgon (kg/t)	0.9	0.9
Rougher pH	11.0	11.0
Dowfroth 250 (kg/t)	0.09	0.09
Rougher Tails (% wt)	77.01	75.47
1st Cleaner Tails (% wt)	9.05	9.35
2nd Cleaner Tails (% wt)	2.65	2.83
3rd Cleaner Tails (% wt)	2.67	2.62
Low int. Magnetics (% wt)	0.82	0.77
High int. Magnetics (% wt)	0.29	0.71
Talc Product (% wt)	7.51	8.25

Talc product analysis:

	Sample	
	AH-98-1	AH-98-2
SiO ₂ (%)	61.11	61.50
MgO (%)	32.25	33.19
Fe ₂ O ₃ (%)	2.00	2.76
Al ₂ O ₃ (%)	0.17	0.18
CaO (%)	0.057	0.068
K ₂ O (%)	0.006	0.016
Na ₂ O (%)	0.085	0.054
TiO ₂ (%)	<0.02	<0.02
MnO (%)	0.008	0.009
CO ₂ (%)	0.51	0.51
L.O.I. (%)	2.21	2.48
Acid Solubles (%)	1.26	1.04
Dry Brightness (%)	80.4	77.2

CO₂ content included in L.O.I.

Cyril Cole