CHAPTER 12. TALC AND PYROPHYLLITE

Talc is an acid metasilicate of magnesium with the chemical formula $Mg_3Si_4O_{10}(OH)_2$ with silica comprising 63.5%, magnesium 31.7% and water 4.8%. It has a greenish, whitish or grey colour (Berry and Mason, 1959). It is derived from the alteration of pyroxene, amphibole, enstatite, tremolite and other magnesium silicates and is often found associated with dolomite, serpentine, quartz or magnesite. Talc exhibits a pearly lustre, has a specific gravity of 2.7 and is greasy to the touch.

Pyrophyllite is an acid, hydrous metasilicate of alumina having the chemical formula $Al_2Si_4O_{10}(OH)_2$. It is white to pale yellow and often stained reddish or brown by iron oxides. It occurs in low- to medium-grade metamorphic rocks rich in aluminum. Pyrophyllite has a pearly lustre on cleavage surfaces, otherwise it exhibits a greasy or dull lustre. It has a specific gravity of 2.84 and a hardness of 1-1.5 on Mohs scale. Its physical properties are practically identical to those of talc and, for this reason, pyrophyllite finds industrial uses similar to talc.

USES AND SPECIFICATIONS

Talc is used mainly in a fine ground form and has many industrial applications. In pulp and paper manufacture softness, chemical inertness, high reflectance, hydrophobic and organophilic properties and the particle shape of talc are characteristics that permit its use as a pitch-absorbing agent, as a paper filler and as a coating pigment.

The ceramic industry uses very finely ground talc to increase the translucence and toughness of the finished product and to aid in promoting crack-free glazing. The talc used must be low in iron, manganese and other impurities which would discolour the fired product. In plastics, talc improves dimensional stability, chemical and heat resistances, impact and tensile strengths, electrical and insulation properties. It is used in thermoplastics and in thermosets, mainly in polypropylene, nylon and polyester. Chemical coupling agents are used to enhance the bond between the talc filler and the resin matrix in plastic materials. The talc must be free of iron impurities and grits and be sized superfine.

High quality talc is used as an extender pigment in paints. The talc must be of acceptable chemical composition, colour, particle size, oil absorbency and fineness of dispersion as established by the industry. Paint characteristics influenced by the use of talc as an extender are gloss, adhesion, flow, hardness and hiding power. Pharmaceutical industries use high purity talc for pharmaceutical preparations and cosmetics, relying on its softness, hydrophobic property and chemical inertness. Finely ground, it is used as a filler in tablets and as an additive in medical pastes, creams and soaps.

Lower grade talc is used as a dusting agent for asphalt roofing and rubber products, as a filler in drywall sealing compounds, floor tiles, asphalt, pipeline enamels, autobody patching compounds and as a carrier for insecticides. Other applications for talc include use in cleaning compounds, polishes, electric cable coating, foundry facings, adhesives, linoleum, textiles and in the food industry.

As previously stated, pyrophyllite can be ground and used in many of the same applications as talc. In ceramics, it imparts a very low coefficient of thermal expansion to tiles. It must be sized -325 mesh and contain a minimum of quartz and sericite which are common impurities. It may also be used in refractories as its expansion on heating tends to counteract the shrinkage of the plastic fraction.

NOVA SCOTIA POTENTIAL

Several occurrences of talc and pyrophyllite in Nova Scotia are mentioned in various reports on file with the Nova Scotia Department of Natural Resources. They are at Soapstone Mine on Indian River (Brigend Brook, local name) near Whycocomagh in Inverness County; near Kennington Cove (Landing Cove) and Eagles Head approximately 6.5 km southwest of Louisbourg in Cape Breton County; at depth in the former Mindamar Mine at Stirling, Cape Breton County; east of Georgeville in Antigonish County; and at the Scotch Lake Quarry near Georges River in Cape Breton County (Fig. 40).

Soapstone Mine, Inverness County

The talc occurrences are located approximately 5 km northwest of Whycocomagh along the Port Hood road near an abandoned steel bridge. In 1896, it was reported that three pits were worked for talc (Goudge, 1943). Pit No. 1 (Pit A) (Fig. 41) was located on the southern edge of the highway "300 yards northwest of S. L. Fraser's sawmill on Brigend Brook" (Goudge, 1943). The pit was between 15-20 m deep, but several tonnes of talc were extracted and shipped to Pictou for grinding (Goudge, 1943). The pit has been filled in over the years due to reconstruction of the roadway and today there is no evidence of it. A second pit (Pit B) was located about 90 m north of the road up a small brook flowing into

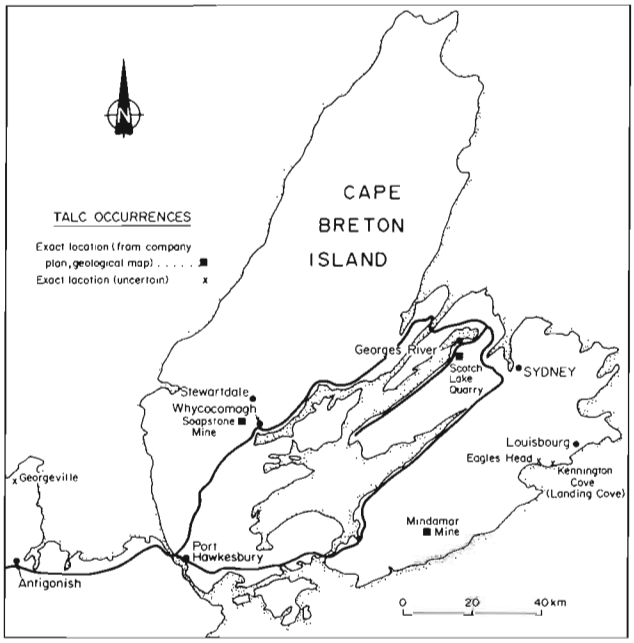

Figure 40. Location map showing occurrences of talc and pyrophyllite within Nova Scotia which are documented with the Nova Scotia Department of Natural Resources.

Indian River. It was reported to be 12-15 m deep, but there is no record of any talc being extracted from it. It was located in 1943 by Spence and his examination of the waste pile resulted in his stating "the material is of no commercial or strategic interest" (Spence, 1943). One or two other pits have been reported in earlier records, one was about 12 m west of Pit A and another (Pit C) was about 0.5 km northeast of Pit A (Spence, 1943). All traces of these pits have disappeared.

The following is taken from a report by Spence (1943) describing the talc taken from two of these pits:

RESULT OF DETAILED EXAMINATION OF TALC SAMPLES

About a dozen pieces of rock, in part showing strong evidence of some talc content, were collected as a sample at pits No. 1 and 3, as indicated in the above report, and these were given microscopic and other examination, with the following results.

Pit No. 1 (Pit A; Fig. 41)

The bulk of the material from this opening proved to consist of banded, greyish-white to buff, medium- to rather fine-grained dolomitic limestone. Some pieces were distinctly quartzose, with the silica in the form either of grains or thin seams. In a few cases, the rock was in part ferruginous, with zones pitted with small cavities containing red iron rust probably derived from the oxidation of pyrite.

Nearly every piece gave active effervescence with cold hydrochloric acid dropped on the surface.

Only a few small pieces, up to 2 ins. across, consisted entirely of clean talc. These showed talc of modified steatitic character, soft, composed of compact aggregate or fine flakes, and of a grey "mutton-fat" colour. Such material proved to be penetrated by numerous random slickensided joints, such as would be produced by squeezing, and is probably not solid or massive enough to be of lava quality.

A number of pieces of dolomite limestone were found to be banded with thin layers or seams of fine, flake talc that could be peeled off as paper-thin, fissile sheets. Several wedge-shaped pieces that externally showed only talc proved to consist of a core of talcose dolomite limestone carrying only a thin skin of talc.

While the above material cannot, of course, be regarded as representative of what may have been found in the opening, it indicates the character of the occurrence as a banded formation of quartzite and dolomitic limestone, the latter containing thin seams of squeezed, compact or finely foliated talc. It is doubtful if a deposit of this nature can be expected to yield talc of lava quality.

Pit No. 3 (Pit B; Fig. 41)

Practically all of the rock collected from this opening proved to consist of a banded, greenish-grey, talcose dolomitic limestone, with the talc in the form of small- to medium-sized flakes averaging 1/2 to 1 in. across.

While all of the rock carries some disseminated talc, the latter tends to be concentrated as thin layers on bedding or squeeze planes and seams. No talc approaching steatitic character was seen.

The average talc content of the rock is not estimated to be over 10 per cent.

In one piece, considerable pyrite was present, in the form of minute, scattered crystals, and some of the rock showed small nests of green chlorite flakes.

"Hugh S. Spence"
Industrial Minerals Division
Bureau of Mines, Ottawa
November 15, 1943.

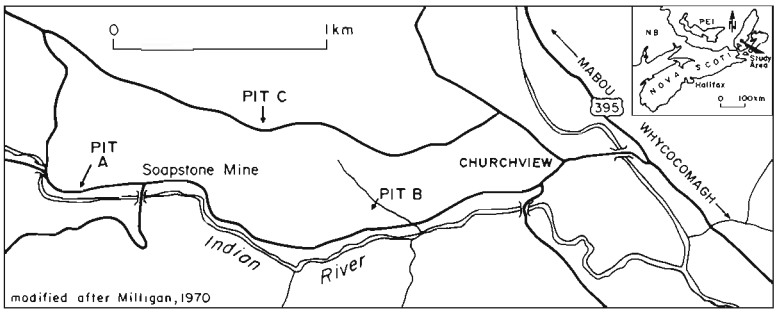

Figure 41. Location map showing talc pits described by Spence (1943) near Whycocomagh, Inverness County.

As part of the Various Commodities Project 1986 field season, a field visit was made to the Soapstone Mine-Indian River talc deposit. An attempt was made to locate the old pits described in the old reports. The evidence of what appears to be old workings (Pit A, Fig. 41) were located along the Port Hood highway west of the old iron bridge. An outcrop along strike on the opposite side of Indian River was sampled. The outcrop appeared to be a siliceous dolomite, greyish white with greenish white sections that were softer and greasy to touch. The sample was first acid leached (14.53% loss) and then assayed for MgO (29.33%) and SiO_2 (68.8%) percentage.

The results are close to the percentages for SiO_2 and MgO content of talc given earlier in this report, but the talc sample appears hard and very impure containing abundant silica and dolomite. The sample examined during this project appears to very closely resemble the description offered by Spence (1943) included above as "a banded formation of quartzite and dolomitic limestone, the latter containing thin seams of squeezed, compact or finely foliated talc". Spence's (1943) conclusion that this deposit will unlikely yield an economic source of talc must be supported here as well.

Kennington Cove (Landing Cove) and Eagles Head, Cape Breton County

Occurrences of talc-like material have been recorded along Gabarus Bay at Kennington Cove (Landing Cove) and Eagles Head (Fig. 40). A report by Church (*in* Messervey, 1926) discussed the deposit at Landing Cove. He described the material in the vein as a silicate of alumina, making it pyrophyllite or sericite. This was supported by sampling and assaying completed by the author in 1986. However, the analysis given by Church's report is misleading and quite likely erroneous as it indicates a silicate of magnesia or talc (Messervey, 1926).

A critical problem regarding the development of the Landing Cove deposit is its position within the boundaries of the Fortress of Louisbourg National Park. This is the actual site where General Wolfe and the combined British and American forces made their landing when Louisbourg was captured in 1745. It is unlikely that any development will occur on this deposit.

Other occurrences along Gabarus Bay (i.e. Eagles Head) are small and virtually unexplored for pyrophyllite and talc, but may contain reserves similar to what appears to occur at Landing Cove.

Stirling, Cape Breton County

Talc was encountered in the former Mindamar Mine at Stirling, Cape Breton County (Fig. 40). The Mindamar Mine was active until 1956 and during its life, and previous operators, produced approximately 1 Mt of ore averaging 6.4% Zn, 1.5% Pb, 0.74% Cu with Ag and Au contents of 2.2 oz and 0.03 oz per ton respectively (Messervey, 1965). Along what is referred to as the mine shear (a shear plane containing the ore zone formed by the same forces which formed the much larger regional Stirling Fault), a number of zones of talc or sericite have replaced the original rock and host the sulphides. The talc is fine grained, massive, white to green and translucent in places. A sample collected from the mine dump in 1986 assayed 26.80% MgO, 25.89% SiO_2, 3.03% H_2O and 28.00% LOI.

The talc is impure containing sulphides, carbonates, and minor feldspar and quartz. Further testing is needed to determine what market, if any, the talc would fulfil. The economic recovery of the talc would only be feasible as a secondary product resulting from the mining of the remaining sulphide ore body.

In 1989, I. M. D. Laboratories Ltd. undertook a processing study on drillcore containing intersected intervals of Stirling talc ore (Hunter, 1989). The test was only partially successful. A talc product can be extracted by flotation, but the product has several negative factors including questionable grade and sulphide minerals floated with the talc. Additional metallurgical work is recommended using a larger bulk sample of ore. Further work on the deposit is recommended in order to determine if ore reserves and product purity are present to give an economical 30-40% product yield (Hunter, 1989).

Georgeville, Antigonish County, and Scotch Lake Quarry, Cape Breton County

Two other occurrences of talc were mentioned by Fletcher and Faribault (1887) and were investigated in 1986. One is just east of Georgeville in Antigonish County where talc is associated with serpentine in a narrow quartz vein imbedded with black slates and sandstones. A second occurrence is at the Scotch Lake Quarry, Cape Breton County, where thin layers of talc are found along some shear zones in the serpentinized dolomite (Fig. 40). Neither occurrence is an economically feasible source of talc.