GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF MINES AND TECHNICAL SURVEYS

SHEET 11 K/16 (West Half)

LEGEND

MISSISSIPPIAN

CANSO GROUP

9 — *Greenish grey sandstone and maroon shale*

WINDSOR GROUP

8 — *Gypsum, anhydrite, limestone, red and grey siltstone, sandstone and conglomerate*

HORTON GROUP AND/OR WINDSOR GROUP

7 — *Conglomerate, sandstone*

HORTON GROUP

6 — 6B, *Upper Unit: Red and grey sandstone, conglomerate and siltstone*
6A, *Middle Unit: Grey shale, siltstone, sandstone; rare limestone;*
6Aa, *graphitic shale and schist*

PALÆOZOIC

DEVONIAN AND EARLIER

5 — *Rhyolite dyke*

4 — *Diabasic gabbro dyke*

3 — 3a, *pale red leucocratic granite;* 3b, *granite pegmatite;* 3c, *grey granodiorite*

2 — *Composite gneiss and hybrid rocks;* 2b, *biotitic;* 2c, *chloritic;* 2g, *garnetiferous;* 2h, *hornblendic;* 2e, *calcareous*

GEORGE RIVER GROUP (?)

1 — *Mainly quartz-feldspar schists and gneisses with:* 1b, *biotite;* 1c, *chlorite;* 1m, *muscovite;* 1g, *garnet;* 1h, *hornblende;* 1l, *minor crystalline limestone;* 1q, *quartzite*

PRECAMBRIAN

Bedding (horizontal, inclined)
Bedding (inclined, top of bed unknown)
Schistosity, gneissosity (inclined, vertical)
Fault (approximate, assumed, solid circle indicates downthrown side)
Anticline
Syncline
Glacial striae
Lineament from air photographs
Fossil locality
Outcrop studied
Gypsum outcrop area
Sink-hole . . . S.H.
Quarry
Mineral occurrence . . . Cu

MINERAL SYMBOLS

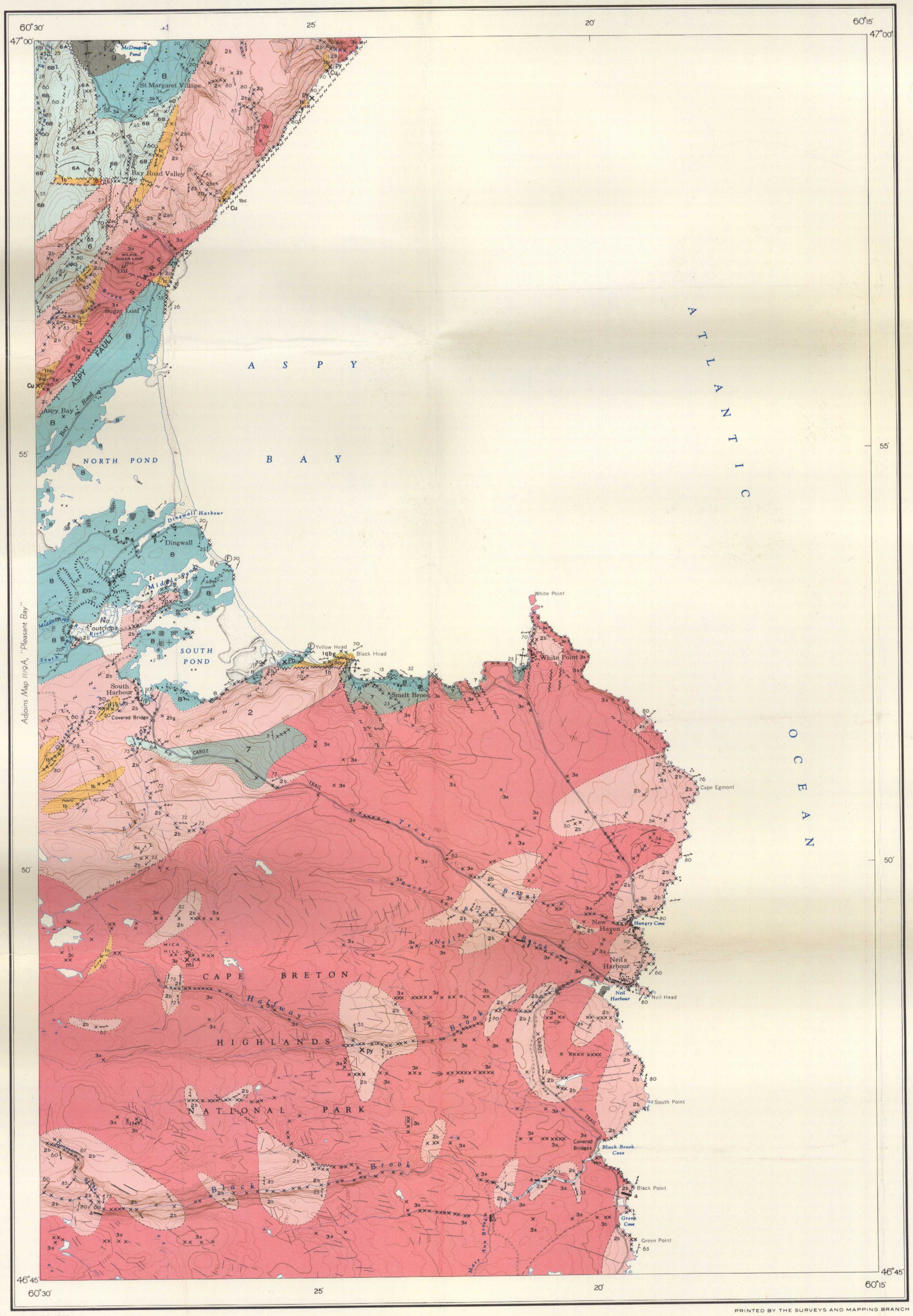
Copper	Cu	Mica	mi
Gypsum	gyp	Pyrite	py
Lead	Pb		

Geology by E. R. W. Neale, 1954-1955

Base-map compiled and drawn by the Surveys and Mapping Branch

Air photographs covering this map-area may be obtained through the National Air Photographic Library, Topographical Survey, Ottawa, Canada.

Approximate magnetic declination 26° 03′ West, decreasing 2.7′ annually



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DESCRIPTIVE NOTES

This area is a northern part of the dissected, uplifted peneplain known as the Cape Breton Highlands. In the southwestern part of the area, remnants of this upland are from 1,400 to 1,500 feet in elevation. From such remnants the land surface slopes uniformly eastward to the Atlantic coast and, locally, northward to Aspy Bay. The Cape Breton Highlands are underlain by resistant crystalline rocks. The region at the head of Aspy Bay is a lowland underlain by easily eroded sedimentary rocks and locally characterized by karst topography. Northwestward, the lowland terminates abruptly against a fault-line scarp — the Aspy scarp — which is here the southeastern edge of part of the Highlands. Stream dissection of this edge of the Highlands has formed erosional mountains, of which Wilkie Sugar Loaf Hill is the most prominent. Downfaulted sedimentary rocks constitute a lowland near McDougall Pond, in the northwest corner of the area.

Striæ and poorly developed stoss-and-lee forms in the southwestern part of the area suggest that Pleistocene ice movement was eastward. The distribution of Mississippian erratics on the crystalline upland east of the McDougall Pond lowland corroborates this interpretation. A thin veneer of coarse, stony, glacial till covers much of the upland area and at one time apparently filled or partly filled the river valleys. Most of the major streams have carved through this till and flow mainly over bedrock. However, the steep valley sides are largely covered with glacial debris and many of the minor tributaries flow entirely within drift. Proglacial meltwater streams locally reworked the till cover of the upland, as shown by stratified sands that overlie till along the Cabot Trail between South Harbour and Neil's Harbour. On the gently sloping upland surface, west of Mica Hill, potholes in the crystalline rocks testify to the action of meltwater streams. Tilted, wave-cut rock benches overlain by stratified fluviatile deposits, at Sugar Loaf and northeastward along the coast, are up to 35 feet above present high-tide level. They were formed during a period of relatively higher sea-level and, hence, testify to post-glacial uplift. Faulting related to post-glacial uplift has caused minor displacements both in the bedrock of the benches and in the overlying fluviatile deposits.

The oldest rocks (1) are schists, gneisses, and minor crystalline limestone that occur as inclusions or remnants in a dominantly granitic terrane. The quartz-feldspar schists and gneisses range from fine to coarse grained and are commonly light grey. Rarely, as at Black Head on Aspy Bay, they are dark grey to black because of an abundance of biotite and/or hornblende. Interbeds of dense grey, quartzite, 2 to 3 feet thick, are locally common. Fine-grained, thin-bedded, medium grey crystalline limestone is intercalated with these schists and gneisses on Glasgow Brook. The plagioclase of the schists and gneisses ranges from calcic oligoclase to sodic andesine, which, together with other aspects of their mineralogy, suggests that these rocks belong to the almandine-amphibolite metamorphic facies. Near the major fault zones west of Aspy Bay they have been converted to greenschist-facies rocks by retrograde metamorphism. Lithologically, unit 1 resembles the Precambrian George River Group of southeastern Cape Breton Island.

Granite (3a), the most abundant rock in the map-area, is pale-red to light brownish grey, medium grained, and commonly leucocratic. Its composition is quartz (30-40%), microcline and microperthite (30-40%), sodic plagioclase (15-25%), and muscovite and biotite (2-12%) in various proportions. Near the Aspy fault and other major faults the granite has a cataclastic texture and the mafic constituents have been converted to chlorite. Quartz veins and coarse granite pegmatites are common within the granite. Pegmatites (3b) mapped separately in the southwestern part of the area are locally garnetiferous and contain large crystals of muscovite. Grey, medium-grained granodiorite (3c) outcrops west of Mica Hill. It consists of 50-60% plagioclase (commonly zoned oligoclase or andesine), 20-25% quartz, up to 15% microcline, 10% biotite, and minor muscovite. Alignment of biotite flakes forms a crude foliation in some outcrops. Cutting relationships suggest that the granodiorite crystallized before the granite (3a) and this is substantiated by K/Ar age determinations[1]. Granite from the mouth of Black Brook is dated at 367 m.y. whereas granodiorite from the adjacent Pleasant Bay map-area is dated at 398 m.y. Both dates indicate a Devonian age.

Intrusion of granitic rocks (3) into country rocks (1) has produced a variety of hybrid rocks (2). In some localities the granitic rocks have intruded (or replaced) the rocks of unit 1 parallel to their foliation to form pink-and-grey-layered, composite gneisses. In other localities the granitic rocks contain numerous angular, feldspathized inclusions of unit 1. The hybrid rocks consist chiefly of quartz and feldspar; biotite is the most common accessory mineral. Near the major fault zones west of Aspy Bay these rocks are highly chloritized. Near Wilkie Sugar Loaf Hill, crystalline limestone forms an important component of the hybrid rocks.

Thin gabbroic dykes (4) cut the granitic (3) and hybrid (2) rocks at several localities along Black Brook and Neil Brook.

Cataclastic rhyolite (5) outcrops within a zone of intersecting faults west of Bay Road, 9,500 feet south of McDougall Pond. It is probably related to post-granite rhyolitic rocks that are relatively abundant in the adjacent Pleasant Bay map-area.

Mississippian sedimentary rocks (6-9) rest with angular unconformity on units 1-3. Two mapped units of the Lower Mississippian Horton Group correspond to the middle (Strathlorne Formation) and upper (Ainslie Formation) of three formations distinguished[2] and mapped[3] in central Cape Breton Island.

The equivalent of the Strathlorne Formation (6A) is characterized by medium to dark grey fissile shale and siltstone, pale to medium grey sandstone, which in places is highly micaceous, and a few thin beds of grey limestone and limy siltstone. Rare beds of pale-red and buff siltstone and sandstone occur within these grey beds. Mud-cracks, crossbedding, and oscillation ripple-marks are locally common. Near fault zones, e.g. along Wilkie Brook and southwest of McDougall Pond, grey shales and siltstones containing plant detritus have locally been converted to graphitic shale and schist (6Aa).

The upper unit (6B) of the Horton Group, equivalent to the Ainslie Formation, is faulted against the middle Horton unit (6A) in this area, but is known to overlie it conformably in the adjacent area to the west. It consists of red, buff, and grey crossbedded arkosic sandstone, lesser conglomerate and coarse siltstone. Along Salmon River, grey beds form about 30% of the section; along Bay Road south of McDougall Pond, they form about 50% of the section.

Rocks (7) that may belong to either the Horton or Windsor Groups outcrop south of Aspy Bay. South of South Pond they include grey and buff arkosic sandstone, pebble- and cobble-conglomerate, and a few thin interbeds of sandy limestone. Lithologically they could belong to the upper part of the Horton or the basal part of the Windsor Group. Near Smelt Brook, pale-red to greyish red conglomerate lies unconformably on granite and underlies red and grey gypsiferous shales and siltstones of the Windsor Group. Small patches of similar conglomerate occur along the coast eastward to White Point village. These rocks probably represent a marginal, basal facies of the Windsor Group, known as the Grantmire Formation.

In order of outcrop abundance, the Windsor Group (8) consists of gypsum & anhydrite, limestone, red shale, siltstone, sandstone, and conglomerate. At the head of Aspy Bay the rocks belong largely or wholly to subzones A and B, i.e. the lower part of the group. On South and Middle Aspy Rivers, west of the map boundary, basal A_1 limestone rests conformably on uppermost Horton rocks. A single outcrop of the stratigraphically higher A_2 limestone occurs between the shore of North Pond and the Aspy fault. It is a brownish grey rock with distinctive yellowish-buff-weathered surfaces. Vugs or voids in the A_2 limestone contain pyrobitumen. Near the Cabot Trail bridge over South Aspy River, grey to buff, vuggy, massive subzone-B limestone rests uncomformably on a small window of granite-gneiss. Similar limestone occurs as isolated outcrops along the south and southeastern shores of South Pond. In places it is underlain by thin lenses of arkosic conglomerate (Grantmire Formation); elsewhere it rests directly on pre-Mississippian rocks. Locally, as at Yellow Head, the rocks contain a large subzone-B fauna and are coquinoid in aspect. In addition to typical subzone-B fossils, Stacy[4] has reported an upper Windsor fossil from the outlet of South Pond. No evidence of this fossil was noted in the present study. Gypsum and anhydrite overlie the subzone-B limestone and outcrop over most of the area from the northwestern shore of South Pond to the shore and islands of North Pond. Southeast of Middle Pond, hybrid rocks (2b) with a thin veneer of subzone-B limestone have been faulted into the gypsum and anhydrite. Red sandstone, conglomerate, and fissile, gypsiferous siltstone outcrop on the shore near Sugar Loaf village and also near the outlet of Middle Pond. Rhyolite pebbles, presumably from west of the fault zone[5], occur at both localities.

In the McDougall Pond region, the Windsor Group consists chiefly of grey limestone and limy siltstone with a small amount of interbedded coarse, buff conglomerate near the fault that bounds these rocks on the east. The limestone is commonly oolitic and fetid or petroliferous. It contains Upper Windsor (subzone-E) fossils just north of the map-area. Below this limestone, thin-bedded to massive, grey Windsor limestone of unknown stratigraphic position overlies Horton rocks.

The only outcrop of Canso-Group rocks in this area consists of crossbedded, fine-grained, greenish grey sandstone and intercalated purplish maroon shale exposed near the northwestern tip of McDougall Pond. Rocks of this group are well-exposed along the coast of St. Lawrence Bay, a few hundred feet north of the map boundary.

Three periods of deformation are probably represented in rocks of this area. Evidence from southeastern Cape Breton[6] suggests that the oldest rocks (1) were folded and metamorphosed in Precambrian time. A second period of deformation, along northeast- or east-northeast-striking axes, accompanied intrusion of the granitic rocks (3) in Devonian time. The final period of deformation took place in post-Mississippian time. The crystalline rocks (1-3) acted as resistant buttresses during this final period of deformation and adjusted largely by faulting. From place to place, the intensity of folding in the Mississippian rocks varied with the type and amount of movement of the adjacent crystalline rocks. Thus dips are gentle in the Aspy Bay region except near fault zones, whereas steep dips and closely spaced fold axes are common in the northwestern corner of the area where crystalline rocks have been thrust northwestward against Mississippian rocks along a southeast-dipping reverse fault.

The high-angle faulting that accompanied and followed post-Mississippian folding was located, at least in part, along old lines of weakness. This is illustrated by Aspy fault. Mississippian rocks are sheared only where they are close to this fault, but there is a wide zone of cataclasis and chloritization in the crystalline rocks west of the fault. South of this area the Aspy fault has served as the locus for intrusion of pre-Mississippian rhyolite. Although it was probably not active during Horton sedimentation there is evidence of movement along the Aspy fault in Windsor time — for Windsor redbeds at Sugar Loaf contain fragments of cataclastic, chloritized hybrid rock (2c) similar to that associated with the fault zone. The Mississippian basin of deposition extended across the present upland area west of Aspy fault, at least during Lower Mississippian time[5]. Windsor movement along the Aspy scarp may have modified this basin. Its continuity was finally disrupted by a horst-like wedge of crystalline rocks thrust up along the Aspy and parallel faults in post-Canso time.

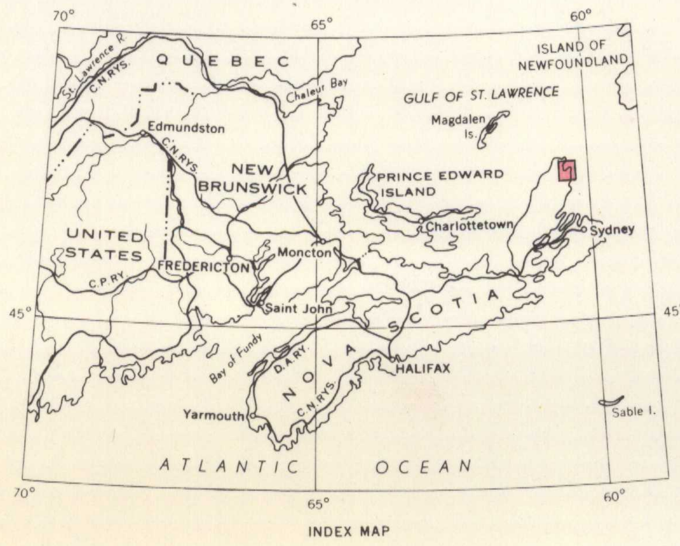
Gypsum was quarried at Dingwall by the National Gypsum Company and its predecessors from 1933 until October 1954, when operations were discontinued due to an unsatisfactory anhydrite-gypsum ratio. During this period 9,500,000 tons of gypsum were quarried and shipped from Dingwall Harbour.

A muscovite deposit occurs in pegmatite (3b) at Mica Hill, 6 miles west of Neil's Harbour. Muscovite sheets 8 inches square are common, and a maximum dimension of 16 by 12 inches was noted. However, the sheets are commonly bent or otherwise distorted and many are peppered with minute garnet crystals. The deposit has been explored from time to time during the past 75 years[7].

Small amounts of galena and pyrite occur in massive subzone-B limestone and limy conglomerate of the Windsor Group (8) near Yellow Head. This deposit was explored by test-pits early in the century. Traces of galena also occur in subzone-B limestone where it overlaps crystalline rocks along the southeastern shore of South Pond. Similar mineralization occurs in subzone-A limestone where it rests on granite in South Aspy River valley, a short distance west of this area. As base-metal ores have recently been discovered in Windsor limestone[8], these minor occurrences suggest that the largely concealed contacts of the overlapping Windsor limestone of the Aspy Bay region merit prospecting by geophysical methods.

An old copper prospect, explored by an adit many years ago, is located at the western boundary of the map-area along a brook which flows into North Pond. It consists of pyrite and chalcopyrite, which occur in crinkled chlorite schist over a zone 30 feet wide, both as lenses parallel to the schistosity and as fracture fillings perpendicular to the schistosity. Small amounts of pyrite, chalcopyrite, azurite, and malachite occur in schists and gneisses (1) along the coast northeast of Sugar Loaf village. These occurrences suggest that the cyrstalline rocks near the Aspy scarp deserve further prospecting.

[1] Fairbairn, H. W., Hurley, P. M., Pinson, W. H., and Cormier, R. F.: Age of the Granitic Rocks of Nova Scotia; Bull. Geol. Soc. Amer., vol. 71, pp. 399-414 (1960).
[2] Murray, B. C.: Stratigraphy of the Horton Group in Parts of Nova Scotia; Mass. Inst. Technol., Cambridge, Mass., unpub. Ph.D. thesis (1955).
[3] Kelley, D. G.: Mississippian Stratigraphy and Petroleum Possibilities of Central Cape Breton Island; Bull. Can. Inst. Min. Met., vol. 51, No. 554, pp. 341-351 (1958).
[4] Stacy, M. S.: Stratigraphy and Paleontology of the Windsor Group (Upper Mississippian) in parts of Cape Breton Island, Nova Scotia; N.S. Dept. Mines, Mem. 2 (1953).
[5] Neale, E. R. W., and Kelley, D. G.: Stratigraphy and Structure of Mississippian Rocks of Northern Cape Breton Island; Geol. Assoc. Canada Proc., vol. 12 (1960).
[6] Weeks, L. J.: Southeast Cape Breton Island, Nova Scotia; Geol. Surv., Canada, Mem. 277 (1954).
[7] Hayes, A. O.: Investigations in Nova Scotia; Geol. Surv., Canada, Sum. Rept. 1917, pt. F., p. 32.
[8] Shea, F. S.: Exploration along the Windsor-Horton Contact, Nova Scotia; Can. Mining J., vol. 81, No. 4, pp. 105-108 (1960).



INDEX MAP

MAP 1124A

GEOLOGY

DINGWALL

CAPE BRETON ISLAND

NOVA SCOTIA

Scale: One Inch to One Mile = $\frac{1}{63,360}$

Miles

1 ½ 0 1 2 3

COPIES OF THIS MAP MAY BE OBTAINED FROM THE DIRECTOR, GEOLOGICAL SURVEY OF CANADA, OTTAWA

REFERENCE

Road and buildings	*Sand and gravel*
Road (dry weather)	*Park boundary*
Bridge	*Marsh*
Church	*Intermittent stream*
School	*Cliff*
Post Office . . . P.	*Foreshore flats*
Cemetery	*Contours (interval 50 feet)*
Horizontal control point	*Height in feet above mean sea-level* . . . 567
Reef or small island	