GEOLOGICAL
SURVEY
OF
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DEPARTMENT OF ENERGY,
MINES AND RESOURCES

PAPER 66-28

CONTWOYTO LAKE AREA (NORTH HALF)
DISTRICT OF MACKENZIE
$76^{L}/_{3}$ and $76^{E}/_{14}$ (part of)

(Report and Map 10-1966)

L. P. Tremblay

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1967

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ABSTRACT

The area south and west of Contwoyto Lake is underlain by Yellowknife-type sediments, their metamorphic equivalents, and granite. Unconformably overlying all these rocks are 2,250 feet of Goulburn Group strata. These cover all the area north and northwest of Contwoyto Lake. A large transgressive gabbro sill was mapped at different levels in the Goulburn Group. Several late gabbro dykes cut all the above rocks in a northwesterly direction.

The Goulburn Group was subdivided into four formations: the Western River Formation, the Burnside River Formation, the Peacock Hills Formation and the Kuuvik Formation. The Western River Formation, about 1,350 feet thick, is composed mainly of argillites and quartzites. The Burnside River Formation is almost entirely pink quartzites and is about 600 feet thick. The Peacock Hills Formation is made up of argillites with some pink quartzite and is less than 160 feet thick. The Kuuvik Formation comprises carbonate rocks more than 140 feet thick.

Gold has been reported from the garnet-amphibole-sulphides-quartz beds and lenses in Yellowknife-type sediments. The Canadian Nickel Co. showing is found near the southern boundary of the map-area.

CONTWOYTO LAKE AREA (NORTH HALF), DISTRICT OF MACKENZIE

INTRODUCTION

The area north, west and east of the northwest end of Contwoyto Lake was mapped during the summer of 1965. The area is best reached by chartered aircraft from Yellowknife, a distance of about 260 miles. On July 13, because of ice conditions, float-equipped planes could land on only a few small lakes but by July 20 all small lakes were clear of ice. About August 4 Contwoyto Lake was still almost entirely covered with ice; only a few small bays were partly open. By August 10 however, the lake was entirely ice-free. Travel in the area is therefore very difficult as Contwoyto Lake can be used only in late August when it is clear of ice.

The climate is of the subarctic type. Normally the ground is almost entirely clear of snow about the end of June. During July and August it is generally cool. Warm to hot days are rare although they occur occasionally.

The area is located north of the northern limit of tree growth and is typical of the barren grounds. Vegetation is scarce and consists mainly of large areas covered with moss and lichens, of small patches of grass, and of a few scattered small bushes 1 foot to 2 feet high. There are also large areas of bare rock and of numerous frost-heaved blocks. Erratics are abundant and are found everywhere.

Wild life is generally scarce although at certain periods caribou are abundant. During the summers of 1964 and 1965, six muskoxen, one wolverine, a few foxes and wolves, and many rabbits were seen in the area. Ptarmigans are fairly common. Flies were never a real nuisance.

The area north and west of Contwoyto Lake is very rugged. Relief locally reaches 700 feet. Areas underlain by granite stand about 300 feet above Contwoyto Lake whereas the areas capped by the gabbro sill form the highest hills, reaching 400 to 700 feet in relief. The land rises 600 feet from Contwoyto Lake to the northeast corner of the map-area, a distance of about nine miles. The rise is abrupt near the lake shore. Some of the late gabbro dykes (13) stand hundreds of feet above the surrounding ground with almost vertical walls. These dykes can be traced readily on air photographs. The sedimentary rocks south of Contwoyto Lake are in general less than 200 feet above the lake.

Outcrops are generally good and abundant, and some of the slopes are steep enough and sufficiently well exposed to provide good sections for examining the Goulburn rocks.

Glacial striae suggest that in the granite area the ice moved north 30 degrees west whereas in the area of Goulburn rocks north of Contwoyto Lake it moved north 20 degrees west. In a few places two directions of glacial striae were measured. One of them corresponds to the direction mentioned above. The other is almost due south or north. The age relationship of the two is not known. Gravel and sand deposits representing old beaches and lake shore features were recognized at several places on the shore slopes of the present Contwoyto Lake. They suggest that Contwoyto Lake was at one time a much larger lake with a level of about 150 feet higher than at present. A few erratics of Goulburn rocks, noted near the west boundary of the map-area, suggest a south to southwesterly direction of ice movement or the former occurrence of Goulburn rocks south and east of their present limits.

GEOLOGY

All rocks of the area are Precambrian. They have been mapped as belonging to two main groups separated by a profound unconformity. The rocks below the unconformity are Yellowknife-type sediments of probable Archaean age and granite; above the unconformity are the strata of the Goulburn Group and a gabbro sill (12), all of probable Proterozoic age. Intrusive into these are numerous late gabbro dykes and rare sills (13).

Yellowknife-type sediments (1, 2)

The argillite, slate and siltstone or greywacke (1) are relatively unmetamorphosed Yellowknife-type sediments. They are found only near the south and east boundaries of the map-area and are the northern extension of a much larger sedimentary terrane. They grade northerly into nodular schists. Most of these rocks are fine grained, generally grey to black, and are made up of quartz and feldspar grains in a base of biotite or chlorite. Matrix is more abundant in the argillite than in the siltstone or greywacke. All these rocks are fairly well bedded. Beds are thin and the various rock types are closely interbedded. Due to poor exposures, to great similarities of composition and to only minor differences of grain sizes, bedding is not always readily apparent. The siltstone and greywacke are generally lighter grey, more massive, slightly coarser grained, and occur in thicker beds than the less abundant argillite. Locally the greywacke has blebs of pyrite that probably represent concretions. The slate forms narrow beds, locally concentrated along zones but generally it occurs separating beds of argillite or intimately interbedded with massive siltstone. The argillite is commonly faintly schistose but locally the schistosity is too faint to be measured.

The nodular schists and gneisses (2) are the metamorphic equivalents of the relatively unmetamorphosed sediments previously described. They grade into these sediments over a few feet and the first appearance of

the nodules in the relatively unmetamorphosed sediments marks the beginning of the nodular schist and its contact with the sediments. The nodular schist and gneiss is grey to black and dark brown, massive to faintly schistose, and locally well layered or bedded. It is made up of dark grey to black nodules in a granular mass of fine- to medium-grained quartz-biotite schist or gneiss. The nodules, generally less than 1 inch wide and oval to irregular in shape, are more common in the argillite portion than in the siltstone portion of beds where bedding is thin and obvious. The massive nodular schist is generally sandy and monotonously uniform. The nodules represent large poikiloblastic crystals of cordierite with much biotite and quartz included. The nodular schist is found interbedded with a few layers of biotite-andalusite schist in which the biotite occurs as large flakes in abundant books and the andalusite as large elongated poikiloblastic grains with abundant quartz inclusions. Near the east boundary of the map-area the nodular schist grades into a medium- to coarse-grained granitoid gneiss composed chiefly of feldspars and mafic minerals but which contains visible amounts of glassy grey quartz. It is somewhat granular, has a crude gneissosity and locally is traversed by wide, red pegmatite dykes. On the peninsula in the middle of Contwoyto Lake, the gneiss is somewhat finer grained and seems to be the first step in the metamorphism of the argillites and siltstones or greywackes. No nodular schist or gneiss occurs there.

Nodular gneiss or schist is of small extent. It occurs on the small islands in Contwoyto Lake near the east boundary of the map-area, and in masses of irregular size and shape surrounding, and within the large body of biotite-muscovite granite in the southwest corner and along the west boundary of the map-area. Everywhere the rock has the same characteristics.

Garnet-hornblende-quartz-sulphide rock (1a) occurs as beds and lenses interbedded with argillite, slate and siltstone (1). It is also found in nodular schist (2) in the southwest corner and near the west boundary of the map-area where it is indicated as 2b. The beds are generally less than one foot thick and occur in groups or zones. On the Inco showing such zones reach 60 feet wide and were traced intermittently for several thousands of feet. The lenses are short and narrow and generally occur along several closely spaced horizons. This rock is black to reddish black and dark green with a rusty weathered surface, and is generally medium to coarse grained and massive. It is made up of abundant red garnet, amphiboles, and of various amounts of sulphides, quartz and other minerals. Most of the amphiboles are hornblende, or members of the cummingtonite group. Some are deep blue and are probably soda-bearing varieties. Most of the sulphides are pyrite or pyrrhotite. Locally there is arsenopyrite and some chalcopyrite. Here and there unit 1a contains no garnet but is made up mainly of a fibrous amphibole and is thus mainly light to dark green, better foliated and much finer grained than the garnet-bearing rock and is rarely rusty in outcrop. In places it contains abundant white feldspar and resembles diorite. Gold reported from rocks of units 1a and 2b was the reason for the work

done in this area. Most occurrences of this sulphide rock are too small and too narrow to be shown separately on the map but locations are designated by the map-unit symbols 1a and 2b. The strike of these bodies is generally that of the adjoining bedding shown on the map. No attempts were made except in rare cases to trace sulphide lenses and layers across outcrops as exposures are poor and the beds of this type of rock (1a and 2b) too narrow and too much alike to permit accurate stratigraphic delineation.

Old gabbro (3)

A large body of gabbroic rock (3) outcrops near the east boundary in the southeast corner of the map-area. The body trends north and locally shows transgressive intrusive relationship with the sediments (1) and carries a few inclusions of the sediments. The rock is mainly gabbroic. It grades locally into an apparently highly altered, dark green, coarse-grained amphibolite and also into somewhat lighter dioritic and granitic rocks. The gabbroic rock is massive, reddish brown and dark green, and locally so deeply weathered that its outcrops are covered with a thick layer of black, coarse-grained gabbroic sand. Hornblende in large blocky prisms, seems to be the main mineral in the amphibolite; where it is dioritic, the amount of felsic minerals is high and hornblende also seems to be the main dark mineral. The dioritic areas carry dark green amphibolitic schlieren. Granitic phases are high in biotite and quartz. In a few places where the rock is strongly gneissic it is much finer grained and resembles a mafic gneiss. Locally this gabbroic rock contains large white feldspar phenocrysts and is crudely porphyritic.

Granite (4)

A large granite mass (4) covers most of the area south and west of Contwoyto Lake and extends east to cover some of the islands in Contwoyto Lake. Outcrops are fairly abundant and generally form rounded hills rising about 200 feet above the surrounding terrain. A few outcrop areas, particularly those in the valleys, have been much frost-heaved and are now chaotic accumulations of angular blocks of all sizes.

The granite is generally white, coarse grained, massive, and fairly homogeneous and comprises quartz and feldspar with some biotite and muscovite. In some places it is faintly gneissic, elsewhere it is fine grained and near some gabbro dykes it is locally pink to red. Pegmatitic phases are abundant and widespread. Biotite is almost invariably present except in the very coarse-grained and pegmatitic varieties where it occurs only in traces if at all. Muscovite, on the other hand, is most abundant in the coarse-grained and pegmatitic phases where it may be the only mica; in the fine-grained variety only a few flakes of muscovite are generally present. In places a few crystals of green apatite were noted as an accessory mineral of

the granite. Needles of black tourmaline are fairly abundant in some of the pegmatite. An increase in biotite content is responsible for the faintly gneissic appearance present here and there.

Some of the granite is dioritic in appearance and resembles a hybrid rock (4b). It is characterized by a higher content of mafic minerals, mainly hornblende and chlorite instead of biotite. This rock is generally gneissic, is of small extent, and grades into white granite. In places it is traversed by large pink to white pegmatite bodies. This rock probably represents highly metamorphosed partly transformed remnants of a pre-existing rock.

Several remnants of quartz-biotite schists and gneiss (2) were mapped in this granite. Although these remnants are of all sizes, only the largest are shown on the map. Their weathered surface is rusty brown. They are granular or granoblastic and faintly to roughly schistose or gneissic. All are made up of quartz, feldspar and abundant biotite. Some also contain muscovite, cordierite, andalusite, garnet and other minerals. These remnants were once sedimentary rocks, probably greywacke and argillite. Bedding is still apparent in a few places and tops can be determined from the concentration of some of the metamorphic minerals or nodules. They are mapped with the nodular schists or gneiss (2).

Goulburn Group (5-11)

The rocks of the Goulburn Group (5-11) cover all the area north and northwest of Contwoyto Lake and are found on some of the islands and peninsulas in Contwoyto Lake. They rest unconformably on the older Yellowknife-type sediments and granite. They were subdivided into four recognizable formations correlative with the map-units established in the Bathurst area by Fraser (1964). Four formations were named. The names were derived from topographical features in the area between Contwoyto Lake and Bathurst Inlet. Good sections of all formations were examined in the Contwoyto Lake area and a composite section, Table 1, was prepared. The section does not include the gabbro sill, which varies in position from place to place within the Goulburn succession.

The unconformity between the Goulburn rocks and the rocks below is generally not exposed. It was observed at only two places in the area and at those localities it is a sharp feature. No weathered material was seen in the rocks below. On the peninsula on the southwest shore of Contwoyto Lake it is represented by a thin bed of medium-grained buff sandstone lying on coarse-grained white granite. On the small island near the east boundary of the map-area a thin conglomerate layer was seen lying directly on nodular schist and quartz-feldspar gneiss of unit 2 with some indication of a thin regolithic zone below the conglomerate layer. On the peninsula in the middle of Contwoyto Lake near the east boundary of the

map-area the contact of the Goulburn rocks with the rocks below appears to be a faulted zone and not an unconformity as the rocks on both sides of the contact are intensely sheared for a few hundred feet. The angle of dip of the shearing is shallower and in a different direction than the angle of dip of the cleavage or foliation in the nodular schist and the Goulburn rocks.

Western River Formation

For the lowest formation of the Goulburn Group the writer proposes the name Western River Formation (5-8) after the Western River in the Beechey Lake area where it was first studied (not yet published) and where subdivisions into five members were established. This usage is followed here. The five members are: Basal conglomerate, Lower argillite, Red siltstone, Quartzite and Upper argillite. In Contwoyto Lake area the lowest member (5a) was seen only on the small island near the east boundary of the map-area where the unconformity is exposed. It occurs as a layer about one foot thick but is possibly 3 feet thick locally and is made up of well rounded fragments of mainly milky white quartz up to 6 inches in width in a sandy reddish matrix. Toward the bottom the conglomerate is probably a regolith as it fills fractures in the schist below. The regolithic zone at the bottom seems to be made up of large blocks of the schists with conglomerate filling the spaces separating the blocks of schist.

The member above the Basal conglomerate, the Lower argillite (5b - 5g) , in most places appears to rest directly on Archaean rocks without any basal conglomerate or regolithic zone separating it from the schist and granite below. The lower contact is the unconformity plane; the upper contact is placed at the appearance of dolomite concretions in the Red siltstone member (6) above. The Lower argillite is about 300 feet thick in this area. It is found below the gabbro sill west and southwest of Contwoyto Lake and along the north and northeast shore of Contwoyto Lake in the northern part of the area. It also occurs on several of the islands in Contwoyto Lake and on the peninsula in Contwoyto Lake near the east boundary of the map-area.

The Lower argillite member has at the base a mixture of mainly grey and green argillites (5b) that is about 40 feet thick near the west boundary, is somewhat thinner (about 25 feet thick) on the granite peninsula southwest of Contwoyto Lake, and seems to be still thinner near the east boundary. It is overlain by glassy grey-white quartzite (5c), which is 4 feet thick near the east boundary, about 25 feet in the northwest corner of the map-area west of Contwoyto Lake, and about 6 to 8 feet on the large granite peninsula near the centre of the map-area. The section exposed on the north shore of Contwoyto Lake does not include white quartzite (5c). Observations made near the east boundary indicate that the unit occupies a lower stratigraphic position than the units of the section north of the lake. Above the white quartzite (5c) there are about 175 feet of thinly interbedded grey, red,

Table 1

Composite Section of the Goulburn Group in the Contwoyto Lake Area

Formation	Member	Lithology	Thickness in feet
Kuuvik Formation		Thinly layered dolomite and limestone, argillite	140
Peacock Hills Formation		Thinly laminated, purple, grey, green and pink argillites, pink quartzite	160
Burnside River Formation		Pink quartzite, some white quartz-pebble conglomerate and red argillite	600±
Western River Formation	Upper argillite	Red argillite, some grey argillite; Grey argillite, greywacke, some quartzite and red argillite	25 100±
	Quartzite	White quartzite, some grey argillite; Pink quartzite and siltstone	150 300
	Red siltstone	Red argillite, missing in east; Grey argillite, greywacke, some red argillite; Red argillite, some grey argillite; Concretionary red argillite, red argillite	10 50 25 400±
	Lower argillite	Red argillite; Grey argillite; Red, grey and green argillites, greywacke, carbonate bed; White glassy quartzite; Grey and green argillites, greywacke	30 15 175 25 40
	Basal conglomerate	White quartz-pebble conglomerate, missing in the west	2±
		Total ----------	2,250±

and green argillites (5d) that are overlain by 15 feet of mainly grey argillite (5f) and on which lie 30 feet of red argillite (5g).

The argillites of this member are all similar except for variations of colour which probably reflect slight variations of mineral composition. All are thinly bedded and interbedded with each other. The interbedding is represented by interlamination of colour. They are fine grained and massive to locally faintly slaty. Near the base, the argillites are interbedded with a few thin beds of grey impure quartzite. In the rocks immediately above the white quartzite, one to two carbonate beds (5e), up to 8 feet thick, were noted. Near the west boundary of the map-area one carbonate bed is represented by about 6 feet of red argillite with abundant dolomitic concretions. In all other localities the carbonate beds are dolomitic and include much argillaceous material.

The next member, Red siltstone (6) is about 500 feet thick in Contwoyto Lake area and is found directly above the Lower argillite; its lower and upper contacts are well defined. The lower contact is marked by the appearance of dolomitic concretions in the concretionary red argillite, whereas its upper contact is placed where red and grey argillites are in contact with overlying pink quartzite.

This member outcrops along the northeast and north shore of Contwoyto Lake and on a few of the islands in the east central part of the lake and exposures are good and characteristic. It includes three main units, a concretionary red argillite (6a) at the base, a massive to thinly bedded red argillite in the middle (6b), and grey argillite (6c) at the top. Locally above all these units a few feet of red argillite (6d) or siltstone were noted.

Concretionary red argillite (6a), at least 400 feet thick, comprises light to dark brown concretions in a coarsely bedded mass of red to chocolate red argillite. The red argillite is dense, fine grained and massive. In the east central part of the map-area it is schistose and locally its cleavage is so pronounced as to have affected even the concretions. The concretions are dolomitic to limy in composition, lenticular to elliptical in shape, and, in general, less than 4 inches in length by 1 inch to 2 inches in width. The concretions are concentrated along the bedding planes and in a few places are much larger and resemble true beds. In a few localities their appearance suggests that they were once continuous beds that were broken into fragments by mud-cracks and later were separated from each other by the filling of the cracks with red argillaceous material. Some beds are up to 6 inches thick. Where red argillite has a pronounced cleavage, the concretions were reoriented parallel with the cleavage. Thus, although they are still concentrated along bedding planes their long dimension in section is parallel with the cleavage. The concretions constitute about 40 per cent of the rock toward the centre of the concretionary red argillite unit. The abundance of the concretions seems to decrease as the lower and upper limits of this red argillite are approached. The concretions disappear entirely at these limits

of the concretionary red argillite unit. Toward the North Arm of Contwoyto Lake and near the gabbro sill the concretions are slightly metamorphosed to oxides and lime-silicate minerals. Instead of being light brown they are black in colour due to abundant hematite, or green due to abundant epidote, or greenish white due to abundant feldspar and epidote or an amphibole. Where the concretions are slightly metamorphosed they are surrounded by a white aureole 1/2 inch or less in thickness.

Above the concretionary red argillite there are about 25 feet of red argillite (6b) including some grey and green argillites. Directly above the section includes about 50 feet of mainly grey and green argillites (6c) and greywacke, and minor amounts of red argillite and impure quartzite. These argillites are all thinly bedded, thinly interbedded, fine grained and massive. They constitute the two top units of the Red siltstone member, and in every aspect are similar to the rocks of the Lower argillite member.

Above the Red siltstone is the Quartzite member (7). It is about 450 feet thick and is made up of about 300 feet of pink quartzite overlain by about 150 feet of white quartzite. The appearance of the pink quartzite in the succession marks the lower contact of this member and the appearance of grey argillite above the white quartzite marks its upper limit.

Near the east boundary of the map-area quartzite outcrops along the north shore of Contwoyto Lake. Farther west it is exposed a short distance from the north shore of the lake. It does not occur west of the lake but is found over a large area east of the North Arm of Contwoyto Lake in faulted contact with the pink quartzite of the Burnside River Formation (9).

The lower unit of the member is pink quartzite (7a) much resembling the pink quartzite (9) of the Burnside River Formation, but purplish pink, orange pink and deep purple colours are also found. It is massive, fine grained, coarsely bedded and well jointed. It fractures conchoidally. Here and there are a few thin beds or seams of grey argillite or a few layers and lenses of quartz-pebble conglomerate. This pink quartzite is distinguished from the Burnside River pink quartzite (9) mainly by its position in the succession but also by a much finer grained, somewhat shaly, appearance, by its colour which is not generally as deeply pink, by the lack of crossbeds and fewer quartz-pebble conglomerate bands and grey argillite seams or partings. The quartz-pebble conglomerate bands of this unit, less than one foot thick, seem to be lenticular and to fill troughs. The pebbles are sparse or constitute less than 25 per cent of the rock and are mainly white quartz, but red chert, jasper and layered quartzose rocks were noted. They average about 1/2 inch in size but rare ones reach 1 1/2 inches. The pebbles are well rounded and well packed. Milky white quartz seams and veins were seen along some joints in unit 7a.

About 170 feet of white quartzite (7b) overlie the pink quartzite. The contact is sharp to gradational and at the contact the white quartzite may

be faintly pink or interbedded with pink quartzite over a short distance. The upper boundary of unit 7b is indicated by interbedding with greywacke and grey argillite and the passage generally occurs over a few feet. The white quartzite is typically white, grey-white and rusty white, but some beds are pink to buff. It is coarse grained, coarsely bedded, massive and is commonly crossbedded. Measurements of crossbeds at two widely spaced localities have indicated a northwesterly direction of transport. This direction corresponds to that indicated by the crossbeds in the Burnside River pink quartzite. There are no quartz-pebble conglomerate layers but seams of greywacke are fairly common. The few pink beds mapped within the white quartzite are slightly finer grained than the white ones. Near the gabbro sill (12) the white quartzite is faintly metamorphosed and carries some chlorite.

The uppermost member of the Western River Formation, the Upper argillite (8), is about 125 feet thick. It occurs above the Quartzite member (7) a short distance inland along the north shore of Contwoyto Lake and is found also as inliers at three places near the east and north boundaries of the map-area. The lower contact is sharp or gradational over a few feet and is defined by the appearance of grey argillite either above the white quartzite (7b) or interlayered with it. The upper contact is placed at the appearance of the Burnside River pink quartzite and is generally sharp.

This member was subdivided into two units. The lower is represented by about 100 feet of mainly grey argillite, greywacke, and grey-white impure quartzite (8a) including a few red argillite beds. The upper unit is made up of about 25 feet of mainly red argillite (8b) with minor grey argillite. All the rocks of this member are thinly bedded and interbedded and except for a few greywacke and quartzite beds are fine grained to dense, massive and well jointed. Most beds are less than one foot thick. Ripple marks were noted locally in the red argillite. Here and there a few milky white quartz veins cut the rocks of this member particularly the red argillite. The components of this member closely resemble those of the Lower argillite.

Burnside River Formation

The name Burnside River Formation (9) is proposed for a succession that covers most of the northeast quarter of the map-area, that is, most of the area northeast of Contwoyto Lake. The name is derived from the Burnside River to the northeast of the map-area where it is believed the best and type section occurs. Outcrop areas are either large areas of angular frost-heaved blocks or flat to gently sloping rock surfaces that probably represent or reflect the original dip of the formation. Both lower and upper contacts are sharp and easily determined. Pink quartzite in contact with thinly bedded red argillite defines the lower contact; a mixture of red, grey, green and buff argillites defines the upper. This mixture is part of the Peacock Hills Formation.

The formation is made up almost entirely of pink quartzite (9). It also includes minor amounts of quartz-pebble conglomerate (9a) and of grey and red argillites. The maximum thickness of the formation in this area is between 600 and 800 feet.

The quartzite (9) is various shades of pink and red except in the north central part of the area where it is locally almost white (9c) and toward the top of the succession where whiter shades do also occur. The pink quartzite is a massive, coarsely bedded, well consolidated rock. Beds were recognized almost everywhere but in general bedding is not a striking feature. Crossbedding is common and locally is well displayed. Ripple marks of the symmetrical type were noted at a few places. Locally the quartzite is a fine interlamination of shades of pink, red and white. It varies from coarse to fine grained, and it seems to be coarser toward the bottom of the succession and finer toward the top. Locally the grain is so fine that the rock resembles an argillite and exhibits a somewhat conchoidal fracture. The pink quartzite is made up almost entirely of grey glassy quartz grains. The variations of colour are due to various amounts of red cement or red coloured quartz. The grains are well sorted as to size and composition, seem to be well rounded, and in general are closely packed. There is little cement and matrix between grains.

Quartz-pebble conglomerate (9a) occurs mainly as layers and lenses less than one foot thick and seems to be more abundant near the base of the formation where the quartzite is coarser grained. These conglomerate layers and lenses are probably true beds. They are made up of about 25 per cent pebbles in a sandy matrix. Most pebbles are less than 1 1/2 inches wide and in composition are mainly milky white quartz and glassy grey quartz. There are also several pebbles of red jasper, dark grey to black chert, buff feldspar and variegated coloured quartz or quartzite. Pebbles of fine-grained granulose quartz-biotite gneiss, thinly layered quartzite, smoky quartz, grey-buff argillite, fine-grained clear quartzite and deep red hematitic quartzite are present in smaller quantities.

Grey argillite seams, more common near the top of the formation, are a fraction of an inch thick, and show up best on flat weathered surfaces where they form a thin veneer covering most of the exposed surfaces. This argillite is massive.

Peacock Hills Formation

The name Peacock Hills Formation (10) is suggested for the succession that rests on and is conformable with the Burnside River Formation (9). The name is derived from the Peacock Hills which occur in this area. It is about 170 feet thick. A detailed section, measured on the west shore of Unit Lake is given in Table 2. The main occurrence of the formation is in the elongated syncline around Unit Lake in the northeast corner of the

map-area. The lower boundary is determined by the pink quartzite (9) of the Burnside River Formation and its upper contact by a 10-foot zone of interbedded carbonate and argillite. This zone marks the boundary between the Peacock Hills Formation below and the overlying Kuuvik Formation (11).

The Peacock Hills Formation is made up of about 80 per cent argillites and siltstones and 20 per cent pink quartzite. The argillites and siltstones are predominantly black and purple to pink near the bottom, and pink to grey near the top. All are fine grained, thinly bedded and interbedded as shown by an interlamination of colours. The quartzite is more coarsely bedded and coarser grained than the argillites and is scattered throughout the various argillites. Near the top of the formation all these rocks contain some carbonate. The argillites may be massive but generally are schistose, displaying a pronounced cleavage parallel in strike with the trend of the syncline. Locally the cleavage is so pronounced that is has obscured the bedding planes.

Kuuvik Formation

The name Kuuvik Formation (11) is proposed for the sequence of argillite and quartzite that overlies and is conformable with the Peacock Hills Formation (10). The name derives from Kuuvik Lake to the northeast of the map-area. It is at least 140 feet thick, but as its upper limit is not known the total thickness could not be determined. The lower limit is determined by a 10-foot zone of interbedded carbonate and argillite. Flat lying or gently dipping strata of the Kuuvik Formation constitute the core of the Unit Lake syncline. A detailed section of this formation is presented in Table 3. (See page 14).

Light brown weathering dolomitic material, interbedded toward the bottom with green and red argillites and toward the top with narrow beds of buff weathering limestone is the principal constituent. Dolomite is thinly layered to massive, dense and muddy looking, and includes locally much argillaceous material as irregular seams, threads and small patches. Much of the argillite is dense and thinly bedded; some of it is slaty.

Table 2

Peacock Hills Formation. Detailed section as measured on the west shore of Unit Lake.

Rock types	Thickness in feet
gradational upper contact thinly bedded mixture of light brown dolomite and red, green and grey argillites	5 - 10
thinly bedded purple argillite, ripple-marks	10
fine-grained, pink quartzite, interbedded with minor purple argillite, about 90% quartzite	25
thinly bedded green limy argillite interbedded with minor green siltstone or argillite	6
thinly bedded purple and black argillites with some coarser clastic material; grades downward into thinly bedded green and grey argillites and siltstones	50
thinly bedded, fine-grained, pink quartzite	4
thinly bedded pink and purple argillite with minor sandstone beds and occasional grey argillite laminae	15
fine-grained pink quartzite	2.5
thinly bedded grey argillite and siltstone grading upward into coarser grained clastic material, ripple marks	10
fine-grained pink quartzite with minor thin laminae of argillite	4
thinly bedded black and purple argillites with rare pink quartzite laminae	7.5
thinly bedded black argillite and purple siltstone interbedded with minor beds of pink quartzite and laminae of green argillite	21
sharp lower contact	
approximate total	160 feet

Table 3

Kuuvik Formation. Detailed section as measured at the north end of Unit Lake

Rock types	Thickness in feet
upper contact not exposed light brown thinly layered dolomite	10
light brown thinly layered dolomite interbedded with massive buff limestone	5
light brown thinly layered dolomite interbedded with rare beds of massive buff limestone	50
light brown thinly layered dolomite interbedded with beds and seams of green argillite and slate	20
light brown thinly layered dolomite interbedded with minor red and green argillites and slates	40
thinly bedded mixture of light brown dolomite and red, green and grey argillites	10 - 15
——— gradational lower contact ———	
Total	140 feet

Gabbro sill (12)

The large gabbro (12) mass in the northwest corner of the map-area is a partly transgressive sill which is found near the base of the Western River Formation west of Contwoyto Lake and near the top of it east of the lake. West of Contwoyto Lake the sill dips gently northeasterly; east of the lake it dips steeply north near the lake shore and is almost flat lying 4,000 feet east of the shore. Near the northern boundary of the map-area where the sill is dyke-like, it dips steeply and seems to follow the structure of the host rocks.

The sill is at least 110 feet thick as measured on the outcrop. On the east shore of Contwoyto Lake where it dips steeply north it is estimated to be 600 to 1,000 feet thick and probably averages 800 feet. It is probably of variable thickness throughout the area but where it is dyke-like near the northern boundary of the map-area it is probably much less than 600 feet thick.

Fresh surfaces are black and weathered surfaces dark to greenish brown. It is a massive, well jointed, homogeneous rock, that is medium to coarse grained except near its contacts where fine grained texture prevails. The mass has had very little baking effect on the intruded rocks in contact with it and only the carbonate concretions of the concretionary red argillite unit and the carbonate beds of the Lower argillite member are visibly affected. These rocks are recrystallized and minerals such as epidote, amphibole, plagioclase and hematite have formed. The gabbro is made up of about 40 per cent mafic minerals and 60 per cent felsic material. Locally its feldspar is red instead of white but this may be a surficial feature.

Small irregular patches of quartz-feldspar rock, possibly segregations were seen in the gabbro in a few places west of Contwoyto Lake. Also noted were quartz-feldspar veins a few inches wide trending east and milky white quartz veins trending north 60 degrees east. Several late gabbro dykes (13) all trending northwesterly cut the gabbro. A few major faults were traced through it.

The mass as a whole displays gentle rolls trending north-northeasterly and probably some late crossfolds trending northwest.

Late gabbro (13)

The late gabbro dykes (13) were the latest rocks to form in the area. They are very abundant and represent about 5 per cent of the area mapped. North-northwesterly trends predominate although some dykes trend west-northwesterly. They vary in width from a few feet to 550 feet. A few were traced almost continuously along strike, across the entire map-area from the southeast to the northwest, a distance of about 20 miles. The

rock of these dykes is massive, well jointed and fine to coarse grained. It is black on fresh surfaces and typically spotty reddish brown on weathered surfaces which distinguishes it from the gabbro of the sill (12).

STRUCTURE

The trend of the argillite, greywacke and nodular schist (1, 2) south and west of Contwoyto Lake is north-northwesterly. The remnants of nodular schist in the large granite body in the southwest corner of the map-area suggest a similar trend; their foliation which is locally known to be relict bedding, trends north-northwesterly. In these rocks all known tops and dips are to the east, evidence which suggests that they are the western limb of a major syncline. A synclinal axis was in fact located south of this area east of the Canadian Nickel Co. (INCO) camp on Contwoyto Lake. On the small peninsula in Contwoyto Lake near the east boundary of the map-area the trend of the formations is slightly east of north. Near the mass of old gabbro they dip steeply west; farther west dips are steeply east. As no tops were observed on this peninsula, it is impossible to tell whether or not these rocks are related to the large syncline mentioned above.

Two directions of cleavage, both steeply dipping, were measured in the relatively unmetamorphosed argillite and greywacke (1), south of Contwoyto Lake. One of the cleavages is a schistosity related to the bedding and is regarded as an old bedding cleavage; the other, a fracture cleavage, cuts the bedding cleavage and is, therefore, younger. Its trend is north-easterly. On the peninsula near the east boundary of the map-area, two cleavages were also recognized but there it is not as easy to tell them apart, as the fracture cleavage is not as typical as that south of the lake. However, it is believed that the cleavage trending east or slightly north of east is probably related to the fracture cleavage recognized south of Contwoyto Lake whereas the other is probably the bedding cleavage. No major folds were located on this peninsula or south of the lake except for the possible syncline mentioned above.

In Unit Lake area, a pronounced cleavage was measured in most of the argillites of the Peacock Hills Formation. This cleavage appears to be related to the folding of this area as its trend is about parallel to the axis of the fold. It probably represents a deformation later than that related to the bedding cleavage in the area south of Contwoyto Lake, but may be related to the fracture cleavage as both trend in about the same direction. There is also a pronounced cleavage in the concretionary red argillite of the Lower argillite member of the Western River Formation. This cleavage appears to be related to the unconformity as in trend it is somewhat parallel to it. It may be a load effect or may represent slippage on a plane parallel to the unconformity.

The rocks of the Goulburn Group are almost flat lying. Most dips are less than 15 degrees. They have been folded into gentle rolls trending northeasterly. Most of these are so gentle that it is almost impossible to map them at this scale of mapping. Locally however dips of 60 degrees have been measured. The syncline in the Unit Lake area is of this type. There seems to be a concentration of fold axes near the east boundary of the map-area suggesting that the deformation was more intense toward the east. Folding was also recognized in the Goulburn rocks below the large gabbro sill but there the folds appear to be broad and very gentle as if the gabbro sill was the controlling factor in their development. In the area east of the North Arm of Contwoyto Lake the large gabbro sill seems to have been warped with the development of folds trending northwesterly. This may be a direction of late folding and suggests cross-folding. Thus there are in the map-area at least three different periods of folding.

Several faults were mapped in the Goulburn rocks. Some are normal faults, in which the hanging-wall appears to have moved down relative to the foot-wall. These faults are characterized by pronounced topographical features, trend about east and all appear to have vertical displacements of the order of a few tens of feet. They probably also dip south fairly steeply. The fault along the south contact of the large gabbro sill east of the North Arm of Contwoyto Lake dips about 60 degrees north. The nature of this fault is not known but its possible western extension is believed to be a normal fault. This fault could not be traced farther east. The fault on the peninsula in Contwoyto Lake near the east boundary of the map-area at the contact of Goulburn rocks on the west and argillite and greywacke on the east is probably a thrust fault dipping gently to the east where the Goulburn rocks probably extend east below the older argillite and greywacke. The rocks on both sides of this fault are strongly schistose. The dip of the schistosity for hundreds of feet on both sides of the fault is low, being around 15 degrees east. Where present this schistosity is strong enough to obliterate all other cleavages, and has a strike direction and a dip that are in sharp contrast with the attitudes of the other cleavages in both rock groups. The large northerly trending fault north of the lake is probably normal with a steep southeast dip and its north side appears to have moved up.

Joints have been recognized in all rocks of this area. They are well developed in the granite, gabbro and Goulburn rocks. Six main strike directions were measured; these represent three conjugate sets. Two sets are strong and are present almost everywhere. One set has one direction slightly north of east and the other slightly west of north. The directions of the other set are slightly south of east and slightly east of north. The third set is weaker and not as well developed. It has one direction striking about northeast, and, the other about southeast.

ECONOMIC GEOLOGY

Gold was reported from several places on the large peninsula south of Contwoyto Lake near the southern boundary of the map-area. It has also been reported from many places to the south of this boundary. Some prospecting and exploratory work was done on most of these occurrences. The main known showing is the one owned by Canadian Nickel Company Limited located about 4,000 feet from the INCO camp on the south shore of Contwoyto Lake. This and other showings on the large peninsula have already been described (Tremblay, 1965).

One group of claims north of the lake where gold may have been found is described here. The Rox Group of 54 claims covering the whole peninsula south of Burn Bay near the east boundary of the map-area was optioned from Conwest Exploration Company Limited about July 1, 1962 to Falconbridge Nickel Mines Limited. The area was mapped geologically, prospected and some of the amphibolite (1a) zones were sampled, trenched and diamond drilled during the same summer. Four blast holes, three pits and one rock trench were seen on these claims. Their locations are shown on the map. Evidence of diamond drilling was also noted along the north shore of the peninsula about a mile west of the east boundary of the map-area.

The group of claims is underlain near the east boundary of the map-area by a mass of old gabbro (3) and west of this mass by argillite and greywacke (1) metamorphosed to phyllite, and at the northwest tip of the peninsula, by Goulburn strata (5,6). In the argillite and greywackes there are a few narrow zones of garnet-amphibole-quartz-sulphide rocks (1a). These trend slightly east of north, parallel with the trend of the argillite and greywacke. They are in general less than 15 feet wide, have rusty weathered surfaces, and were the reason for the work done on these claims. These amphibolite zones were tested for their mineral content, probably mainly gold but the results of this work are not known.

No mineralization of any type was seen in the Goulburn rocks of this area. However, an occasional quartz vein was noted in a few localities in the lower two formations (5-9) of the Goulburn Group. The veins are made up mainly of milky white quartz locally glassy grey, are barren, and are fairly narrow. Most of them strike parallel with the bedding or at right angles to it. A small number of quartz veins were noted in the large gabbro (12) sill near the west boundary of the map-area and in some of the late northwesterly gabbro dykes (13).

The large granite mass in the southwest corner of the map-area carries some green apatite. It is traversed here and there by a few pegmatites carrying abundant black tourmaline in crystals up to 3 inches long. Some of the nodular schist remnants occurring as large inclusions in the granite have garnet-amphibole-quartz-sulphide zones (2b) which are probably

related to the gold-bearing amphibole-bearing rocks south of Contwoyto Lake, but it is not known if these carry any gold.

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