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DEPARTMENT OF MINES AND TECHNICAL SURVEYS

PAPER 65-8

KOGNAK RIVER (WEST HALF), DISTRICT OF KEEWATIN

65 G (East half)

(Report and P.S. Map 10-1965)

K. E. Eade

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Map 10–1965 Kognak River (west half) ..... in pocket

ABSTRACT

Andesite is the principal volcanic rock and only minor amounts of other types are present. The oldest sedimentary rocks, greywacke, subgreywacke, phyllite or argillite, and minor tuffs, are prominent in the southern half of the area. Lenses of iron-formation are scattered throughout the thick clastic sequence. Schists, gneisses and foliated granite derived from both the old clastic rocks and the volcanic rocks, occur in a large prominent anticline in the northern part of the area.

The Hurwitz Group is subdivided into five units. The basal orthoquartzite of this group is prominent but generally thinner than in the area to the east. Isolated occurrences of quartzite, dolomite, argillite or phyllite compose a sedimentary group different from and probably older than the Hurwitz Group.

The oldest intrusive rocks, granite to granodiorite, cut the oldest volcanic and clastic rocks but are pre-Hurwitz Group in age. A number of small plutons of variable composition including granite, granodiorite, monzonite, quartz diorite and syenodiorite, also cut the oldest rocks. The Hurwitz Group is intruded by gabbro sills and in one locality shows contact metamorphism due to a late granite-granodiorite pluton. Basic dykes are of at least two ages, early meta-gabbro or amphibolite trending east to northeast and late northwest-trending gabbro or diabase, the youngest rocks in the map-area.

Folds trending northwest are prominent in the Hurwitz Group but there are also northeast-trending folds. Folds trending north to northeast in the schists and gneisses may reflect still older deformation. Faults, both normal and reverse, are common especially in areas underlain by the Hurwitz Group.

KOGNAK RIVER (WEST HALF), DISTRICT OF KEEWATIN

INTRODUCTION

Kognak River (west half) map-area lies between latitudes 61°00' and 62°00' N. and longitudes 98°00' and 99°00' W. in the District of Keewatin, Northwest Territories. The centre of the map-area is 240 miles northwest of Churchill, Manitoba, the closest supply base to this region. It is also possible to reach parts of the area by canoe from Hudson Bay by way of the Tha-anne and Kognak Rivers route or the Maguse River but strong currents and many rapids make this impractical. Land areas are normally free of snow cover in the second week of June but lakes are usually frozen until the first week of July. In exceptional years however, these events may be a month earlier or a month or more later.

The area lies within a much larger area mapped by Lord (1953)[1]. Field studies by the writer, assisted in 1962 by R.A. Alcock, in 1963 by D.M. Carmichael and H.L. Pollak and in 1964 by P.L. Hoffman and L.A. Prieto, provide more detailed information, particularly concerning the Hurwitz Group. A preliminary report on the bedrock geology of the east half of the Kognak River area has been published (Eade, 1964) and the surficial geology of all the southern District of Keewatin is discussed by Lee (1959).

The topography is low and undulating except for some prominent ridges of orthoquartzite (9) of the Hurwitz Group. The amount of outcrop depends upon the underlying rock type. In areas underlain by volcanic rocks (1) outcrop is abundant but it is relatively scarce in areas of map-units 10, 11, and 12 as these sedimentary rocks are less resistant to erosion. Rocks of map-unit 2 are susceptible to frost action and most outcrops of these rocks are broken and heaved.

In the northern two-thirds of the area, trees, mainly black spruce and some tamarack, are restricted to a few isolated patches. Elsewhere they are more abundant but there too they grow only in scattered, protected localities. Dwarf birch shrubs occur throughout the area.

GENERAL GEOLOGY

The area lies within the Churchill structural province of the Canadian Shield. The oldest rocks consist of volcanic and clastic rocks and schists, gneisses and foliated granite derived from them. These rocks are intruded by granodiorite, granite and small intrusive plutons of various compositions. The latter have sharp contacts but show little contact metamorphism. The oldest rocks are thought to be of Archaean age but there is no direct evidence to support this. All have been affected by the Hudsonian orogeny (Stockwell, 1963, page 125), thus age determinations on

[1]Names and dates in parenthesis refer to publications listed in the references.

biotite from these rocks give Aphebian (Stockwell, 1964) ages. Scattered patches of quartzite, dolomite, argillite or phyllite, that occur in down-faulted blocks, are probably older than the Hurwitz Group rocks, but as age relationships are not definite they are considered Aphebian or Archaean in age. Hurwitz Group rocks of Aphebian age are metamorphosed in one locality by a late high level granite pluton. All rocks have been folded and faulted, except a few gabbro or diabase dykes that post-date the deformation.

TABLE OF FORMATIONS

Age	Group	Lithology
APHEBIAN		Gabbro or diabase dykes AGE?
	Intrusive contact	
		Granite, granodiorite, pegmatite
	Intrusive contact	
		Gabbro sills AGE?
	Intrusive contact	
	Hurwitz Group	Impure quartzite, quartz sericite schist, minor siliceous dolomite Greywacke, minor siltstone Dolomite, argillite, siltstone, greywacke, minor quartz–jasper–hematite and quartz–magnetite iron–formation Slate, shale, siltstone, minor greywacke Orthoquartzite, minor impure quartzite, pebble conglomerate, boulder conglomerate, greywacke conglomerate, greywacke
	Unconformity	
APHEBIAN or ARCHAEAN		Quartzite, dolomite, argillite, greywacke, phyllite
	Unconformity	
		Granodiorite, granite, quartz diorite, monzonite, syenite or syenodiorite
	Intrusive contact	
ARCHAEAN		Foliated granite, gneissic granite and granodiorite, granite and granodiorite gneiss Quartz–hornblende–biotite schists and gneiss, quartz-hornblende gneiss, migmatite, paragneiss Quartz–biotite schist and gneiss Meta-volcanic schist and gneiss, amphibolite Greywacke, subgreywacke, tuff, phyllite, argillite, dolomite, quartz–mica schist, quartz–magnetite iron-formation, minor volcanic rocks Andesite, dacite, gabbro, quartz latite, rhyolite, agglomerate, gabbro and meta-gabbro sills

Volcanic and sedimentary rocks and metamorphosed equivalents

(map-units 1 to 6)

Volcanic rocks (1) and sedimentary rocks (2) are approximately the same age and are the oldest rocks in the map-area. Massive or pillowed, dark green, fine-grained andesite is the most abundant rock type in map-unit 1. Grey to greenish grey dacites are intercalated with the andesite flows and in some localities, for example 6 to 7 miles west of Nowyak Lake, dacite is abundant. Acidic extrusive rocks, ranging in composition from quartz latite to rhyolite, are present as narrow bands or lenses in the northern area of volcanic rocks around Nowyak Lake. Agglomerate and tuff are associated with the more acidic varities of flow rocks and thus are areally restricted. Medium-grained, dark green to grey gabbro, which is either intrusive or a medium-grained phase of the volcanic rocks, forms small irregular bodies associated with the andesite north of Griffin Lake. The only gabbro bodies in this unit to be subdivided (1a) are medium-grained gabbro to meta-gabbro sills associated with the volcanic rocks west of Nowyak Lake.

Map-unit 2, composed of greywacke, subgreywacke, phyllite, argillite and tuff, appears both to overlie and underlie the volcanic rocks (1) in a conformable sequence. The greywacke and subgreywacke are medium- to fine-grained, grey to greenish grey and thin- to thick-bedded. Graded bedding is present in many outcrops. These rocks, the major constituents of the rock-unit, grade into interlayered fine-grained grey phyllite or argillite. Here and there small lenses of pebble conglomerate are present in the greywacke. Lithic and crystal tuffs occur with greywacke east of Bernier Lake and to a lesser extent west of Cullaton Lake but these tuffs are not major constituents of map-unit 2 as they are in the area to the east (Eade, 1964, map-unit 2). Most rocks of this unit are only slightly metamorphosed. East of Mountain Lake–Hawk Hill Lake the greywackes are relatively unmetamorphosed with only slight development of biotite. Just to the north, biotite is more abundant, but to the north and west of Bernier Lake strong contact metamorphism has developed cordierite and garnet as well as biotite. This metamorphism is the effect of a granite–granodiorite pluton (7).

A narrow band of dolomite with interbedded phyllite or argillite (2a) is present in the greywacke (2) west of Bernier Lake. This grey impure dolomite forms beds 1 inch to 2 inches thick; the argillite or phyllite beds are 3/4 to 1 1/4 inches thick. Here and there the dolomite is almost completely converted to tremolite.

The quartz-mica schists (2b), that form small masses associated with the basic volcanic rocks west of Nowyak Lake, are probably derived from acidic tuffs. These light grey to white schistose rocks are composed essentially of quartz and sericite and less feldspar and biotite. Intense schistosity has destroyed primary structures.

Iron-formation (2c) is interlayered in the greywacke, and in many places forms discontinuous lenses as much as 150 feet thick. The most common variety is a fine-grained, thinly bedded to massive quartz-magnetite type. Less common is quartz-hematite iron-formation. North

and west of Bernier Lake where metamorphism is intense, the iron-formation is medium-grained due to recrystallization, and grunerite and other iron silicate minerals occur with the quartz and magnetite.

Rocks of map-unit 3 are derived from volcanic rocks (1), the schist and gneisses of map-unit 4 are derived primarily from the sedimentary rocks (2), and the gneisses, schists and migmatites (5) and foliated granite (6) are derived from both the sedimentary (2) and volcanic (1) rocks. Map-units 3 to 6 are considered to be about the same age.

The meta-volcanic rocks (3) are chiefly basic rocks that are fine- to medium-grained, and either schistose or gneissic. The most abundant rock types are fine-grained, dark green, chlorite-plagioclase or hornblende-plagioclase schists. Medium-grained, dark green, massive to well foliated, amphibolites, in part with distinctive needle-like hornblende grains, are abundant in some localities and probably indicate a higher degree of metamorphism. Here and there minor bands of acid composition derived from rhyolite, rhyolitic tuff or agglomerate occur with the basic rocks; these are composed of quartz-plagioclase-biotite-hornblende schist or gneiss. Many of the volcanic rocks are schistose and foliation is common in the amphibolites, but original structure is not preserved save for the layering of the occasional acidic band in the basic rocks, that may be relict bedding.

Quartz-biotite-feldspar schists and gneisses (4) (the schists are slightly more abundant than the gneisses) are grey, fine- to medium-grained rocks with pronounced foliation that probably is relict bedding. Mineral lineations are very evident in these rocks. Hornblende as well as the characteristic biotite may be a mafic constituent. Simple quartz-feldspar pegmatite is commonly present in these rocks forming small concordant lenses or small irregular crosscutting masses.

The rocks of map-unit 5 comprise a mixed assemblage of well-foliated gneisses, schists and migmatite. Medium-grained, grey gneisses are most abundant with only some bands of interlayered schist. Both hornblende and biotite are widely distributed but whereas biotite is common in the well-banded paragneiss, hornblende is more abundant in the dark bands of the migmatites. In the paragneiss and migmatite pegmatite is common in concordant bands and discordant segregations.

Granite and granodiorite of map-unit 6 is medium-grained and chiefly pink, less commonly grey. These range from almost massive slightly foliated rocks to well foliated gneisses. In many, mineral lineations are pronounced. Biotite is the predominant mafic mineral, hornblende is less abundant and inclusions and schlieren are rare. Contacts of this unit with other rocks are typically sharp except those with map-unit 5 which are gradational. The occurrence of these rocks as a concordant mass in the metamorphic rocks of map-units 3, 4, and 5 suggests that the granite and granodiorite are syntectonic in origin, the result of regional metamorphism and metasomatism. The degree of regional metamorphism and metasomatism gradually increases from units 1 and 2 where effects are slight, to units 3 and 4 where it is more marked. Rocks of map-unit 5 probably result from both regional metamorphism, metasomatism, and the later contact metamorphism of a younger granodiorite (7) mass just to the south.

Rocks of map-unit 6 however are probably primarily the result of the earlier regional metamorphism and metasomatism.

Intrusive rocks (map-unit 7)

Map-unit 7, granodiorite and granite, includes rocks of more than one age but these are not distinguished on the map. West of Hawk Hill, Mountain and Griffin Lakes, in the southwest corner of the map-area, medium-grained, pink, biotite and/or hornblende granodiorite comprises the bulk of unit 7. Just west of the south end of Hawk Hill Lake however this granodiorite is distinctly porphyritic and contains abundant pinkish feldspar phenocrysts as much as 1/2 inch long. The porphyritic variety grades into the medium-grained granodiorite. A zone of mixed gneiss marks the contact of the volcanic rocks (1) with the granodiorite and the latter contains abundant basic inclusions and schlieren close to this zone. Orthoquartzite (9) probably lies unconformably on the granodiorite although wherever exposed the rocks at the contact are strongly sheared.

There is a similar narrow contact zone of mixed gneiss between the volcanic rocks and the granodiorite near a pink to grey hornblende-chlorite granodiorite body northeast of Bate Lake. A fault separates the sedimentary rocks (8b) and the granodiorite.

The large granodiorite to granite pluton north and west of Carnecksluck Lake in the northeast corner of the map-area, intrudes the volcanic rocks (1) and is in fault contact with the impure quartzite (13). This pluton is more variable in texture, colour, and composition than those previously described. The common rock type is a grey to pinkish grey, hornblende or hornblende-biotite granodiorite or granite but the west and northwest parts of the pluton also include diorite and quartz diorite, which are grey to green in colour. These schlieren and inclusions of basic rocks are abundant and the more basic composition is probably the result of assimilation of volcanic rocks by the intrusive mass.

At least a dozen small plutons of granite and granodiorite cut the volcanic rocks (1) in the northern part of the map-area. These medium-grained rocks are grey to white and contain hornblende and/or biotite. These small bodies have had little contact effect on the surrounding rocks. Similar to these are plutons of hornblende-biotite quartz diorite (7a) that cut the volcanic rocks (1) west of Nowyak Lake and granodiorite (7) northeast of Bate Lake. The quartz diorite is medium-grained, grey to dark grey, and contains few or no inclusions. A high level, post-orogenic origin is suggested for the quartz diorite (7a) and the small granite-granodiorite plutons.

Near the south boundary of the map-area a larger pluton is composed of three distinct rock types, hornblende granodiorite (7), hornblende monzonite (7b), and hornblende syenite or syenodiorite (7c). The latter is separated from the other two rock types by a narrow band of fine-grained, dark grey meta-dacite (1). Greywacke (2) shows little contact effect from the intrusion other than slight mixing at the contacts except at the southwest corner of the intrusive body where there is a zone of migmatite and the monzonite (7b) contains abundant hornfels inclusions.

Numerous, small basic dykes (16) cut the pluton. Orthoquartzite (9) unconformably overlies the hornblende monzonite (7b). The granodiorite (7) in this pluton is pink to grey, medium-grained, predominantly hornblendic with some biotite, and is gradational into the pink hornblende monzonite (7b). The monzonite, medium-grained and pink, contains more pink alkalic feldspar than the granodiorite. The hornblende syenite or syenodiorite is a medium- to coarse-grained rock, commonly porphyritic, composed of coarse purplish brown feldspar, hornblende and less than 10 per cent quartz. Small, fine-grained, pink aplite stringers or dykes cut the coarse-grained syenite (7c).

The large mass of granodiorite in the west central part of the map-area is, in part at least, a younger pluton although it is included with map-unit 7. Contact metamorphism from this mass affects rocks of the Hurwitz Group (9 to 13), to the north and northwest of Bernier Lake. Cordierite and garnet have developed in greywacke (2) adjacent to this pluton. The granodiorite is a medium-grained, pink rock, commonly hornblendic but in some localities biotite and/or muscovite are present. It is usually massive but is weakly foliated adjacent to its contacts. Prominent joint sets are characteristic of the massive granodiorite. Pink muscovite-biotite pegmatite dykes and segregations are abundant. This mass is the only one within the map-area for which there is compelling evidence of a post-Hurwitz Group age.

A narrow band of granite–granodiorite, northwest of Krekot Lake, is similar in appearance and character to the younger granodiorite, and is probably of the same age. Its contacts indicate that it is younger than the adjacent meta-volcanics (3) and sedimentary rocks (8b).

Sedimentary rocks of intermediate age (map-unit 8)

Five separate occurrences of sedimentary rocks with similar lithology and structure have been grouped together in map-unit 8. The unit is subdivided into (8a) dominantly quartzite with minor dolomite and argillite, and 8b, dolomite with interbedded quartzite, argillite or phyllite.

West of Nowyak Lake both subdivisions of this unit are well exposed. The quartzite (8a) is medium-grained, pink to white to grey or greenish grey, commonly arkosic and it may have thin interbeds of siliceous dolomite. Map-unit 8b is more varied in lithology, consisting of white to rose red dolomite and siliceous dolomite, the latter with prominent sand grains; grey to green quartzite or impure arkosic quartzite; and fine-grained grey argillite or phyllite. On the northwest side of these sedimentary rocks a low angle reverse fault dipping northwest forms the contact with the volcanic rocks (1). On the southwest side the contact between map-units 1 and 8 is, in part, a fault contact but here and there map-unit 8a rests unconformably on volcanics (1). Numerous small cross-faults also cut the sedimentary rocks.

North of Carneckskluck Lake map-unit 8a consists primarily of well bedded, medium-grained, pink, white or grey quartzite containing rare pebble conglomerate lenses. Only in the uppermost part of the exposed section are there a few interbeds of cream coloured siliceous dolomite.

On the south side of this band of sedimentary rocks the quartzite may be unconformably overlying volcanic rocks (1) but strong shearing close to the contact suggests a fault. To the north outcrop is lacking and the character of the contact is unknown.

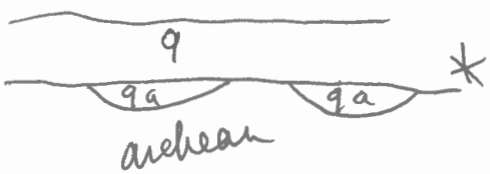
Dolomite, with some interbedded argillite and phyllite (8b) outcrops extensively in a band northeast of Bate Lake. These rocks are similar to those of map-unit 8b west of Nowyak Lake except that interbedded quartzite is absent. The dolomite is cream to white, less commonly pink in colour, and is usually siliceous. The fine-grained grey argillite and phyllite is thinly bedded, but pronounced cleavage in the phyllite obscures the bedding. Near the thin band of granodiorite (7) on the southeast side, some of the dolomite is metamorphosed to a tremolite-rich rock. Intense shearing in some places suggests that the contact with the meta-volcanics (3) on the southeast is in part a fault. With the exception of the contact metamorphism noted, the lack of metamorphism of the sedimentary rocks (8) as compared to the meta-volcanic rocks (3) suggests that the metamorphism of the volcanic rocks pre-dates the deposition of the sedimentary rocks (8). On the northwest side of this band of rocks map-unit 8b is in fault contact with granodiorite (7) and volcanic rocks (1).

Two small areas of map-unit 8a, one on the south side of Nowyak Lake and the other north of Mountain Lake, consist of quartzite or impure quartzite with some interbedded siliceous limestone. In both localities the contacts of the sedimentary rocks are in all likelihood faults and these small outcrop areas are probably slices of more extensive strata preserved in fault zones.

Although differing in lithology, the rocks of map-unit 8 may belong to the same group of rocks as the pre-Hurwitz Group sedimentary rocks (conglomerate, quartzite and siltstone) mapped in the area to the east (Eade, 1964, map-unit 7).

Hurwitz Group

The Hurwitz Group, as re-defined (Eade, 1964), includes map-units 9 to 15. Orthoquartzite (9) consisting of at least 90 per cent silica-cemented quartz, is a distinctive horizon marker at or near the base of the group. At a single locality east and northeast of Bray Lake boulder conglomerate, greywacke conglomerate and greywacke (9a) underlie the orthoquartzite. The conglomerate has a dark rusty grey to greenish grey greywacke matrix containing well rounded pebbles, cobbles and boulders of a wide variety of rock types. The conglomerate grades upward into greywacke, similar to the matrix of the conglomerate, containing scattered pebbles and cobbles. The conglomerate and greywacke beds underlying the orthoquartzite were evidently deposited only in local basins. The orthoquartzite that is usually the basal formation of the Hurwitz Group is commonly sheared at the contact with underlying rocks probably due to slipping during folding. This pure, glassy, fine- or medium-grained quartzite is most commonly white except in the upper part of the section where it is pink. Although in part thinly bedded (3/4 to 1 1/2 inches) it also forms beds tens of feet thick wherein bedding is rarely observed. Lenses of pebble conglomerate, containing well rounded pebbles of white quartz are



present at various levels in the quartzite. Ripple-marks are common in the quartzite but crossbedding is rare.

Slate, shale, and siltstone (10) overlying the orthoquartzite (9), outcrops poorly, and slaty fragments littering the ground are commonly the only evidence for the presence of this map-unit. Areas underlain by these rocks typically have a featureless local topography readily recognizable on the ground and on air photographs. The slate, shale and siltstone, are grey to black or red, fine- to very-fine-grained and have thin bedding laminations 1/16 to 1/4 inch thick. Prominent slaty cleavage so prevalent in this unit, in places obscures the bedding. Here and there in these fine-grained rocks there are lenses of well bedded, medium-grained greywacke. Near Griffin Lake, a thin dolomite horizon (11) lies immediately above the orthoquartzite (9). The dolomite is overlain by slate, shale and siltstone (10) in turn overlain by the principal dolomite and argillite (11) beds.

Dolomite, argillite, and siltstone (11), with some greywacke, constitute a diverse unit that varies in composition and thickness along strike and lacks distinctive marker beds. The buff to brown weathering dolomite is massive to thinly bedded and ranges in colour from white to cream to light or dark grey. Irregular veinlets of white quartz or grey chert are common in these rocks and project from the weathered surfaces. Fine-grained grey argillite is interbedded with the dolomite and increases in abundance upward so that the dolomite is transitional into predominantly argillite beds with some dolomite. The argillite is finely laminated in beds 1/8 to 1/4 inch thick and cleavage may be present. Very-fine-grained, grey to dark grey siltstone beds occur with the argillite locally. North of Bernier Lake dolomite of this map-unit is almost completely altered to coarse-bladed crystals of tremolite.

Quartz-jasper-hematite and minor quartz-magnetite iron-formation (11a) form lenses in dolomite (11) at several localities northeast and southeast of Bernier Lake. The iron-formation beds are only 1 foot to 5 feet thick and disappear along strike within a few hundred feet.

Greywacke (12) may overlie map-unit 11 but it is not always present nor is it always possible to separate it from the underlying rock unit. The greywacke formation varies in thickness. It is thick north of Ducker Lake, but elsewhere for example west of Bray Lake it is thin or absent. The grey, fine- to medium-grained greywacke is well bedded in 1 1/2 to 3 inch thick beds; massive or thick-bedded parts are uncommon. Graded bedding is characteristic of these rocks and a well developed cleavage is typical of the fine-grained parts of beds. The rocks are relatively unmetamorphosed but north of Bernier Lake porphyroblasts of garnet are present, the result of contact metamorphism during the emplacement of the granodiorite (7) pluton to the north. The relative abundance of fine-grained material, the thinner bedding and less prominent cleavage, help distinguish the greywacke of this unit from that of map-unit 2.

Grey to buff, impure quartzite (13) with quartz and sericite as major constituents, is the uppermost exposed unit of the Hurwitz Group. These rocks are typically thin-bedded and are commonly ripple-marked and crossbedded but cleavage may obscure primary structures. Cleavage is so intense in some localities, for example north of Ducker Lake, that the rock

OQ → Q Ser Sch

has become a quartz-sericite schist. There are some siliceous dolomite beds in the impure quartzite about ten miles east of Bernier Lake and at the same locality this impure quartzite contains a single bed of pebble or cobble conglomerate. Both the siliceous dolomite and the conglomerate are believed to be high in the section of exposed impure quartzite. The plentiful sericite in the impure quartzite (13), the relative abundance of crossbedding, and the colour, distinguish it from the orthoquartzite (9). Composition as well as stratigraphic position distinguish the impure quartzite from the commonly arkosic quartzite of map-unit 8.

Gabbro sills (14) occur in map-unit 10 in the southern quarter of the map-area. The gabbro plutons extend along strike possibly as parts of a single sill but more likely as a series of unconnected bodies. The dark green to black gabbro is medium-grained but near the margins is fine-grained. Hornblende, partly altered to chlorite, and andesine–labradorite plagioclase, partly altered to epidote and clinozoisite, are major constituents; magnetite and biotite are common accessory minerals. The shale, slate, and siltstone (10) were converted to a dense, compact hornfels at the contacts with the gabbro but the contact zone is less than two feet wide.

Map-unit 15 combines the sedimentary rocks of map-units 10 to 13 where they cannot be differentiated due to the scarcity of outcrops.

Basic dykes

Dykes of gabbro, diabase, diorite and their metamorphic equivalents (16) occur throughout the map-area, for the most part only as small segments, but two dykes trending northwest are exceptions in that they are relatively continuous. Both are 120 to 180 feet wide, and are composed of fresh, medium-grained, grey to greenish grey gabbro, in part with a diabasic texture. Granophyric segregations, rich in pink feldspar, are common. Dykes of this trend cut the Hurwitz Group and are believed to be the youngest rocks in the map-area. Short segments of dykes with the same northwest trend are also composed of similar fresh gabbro or diabase but here and there these are porphyritic. Dykes trending N 70° E to east occur only as short segments and are most abundant in the southeast part of the map-area. These dykes are composed of dark green to black metagabbro or amphibolite, depending on the degree of metamorphism. In some relict diabasic texture is retained. There is an older set of dykes, at least pre-Hurwitz Group in age. Just south of Nowyak Lake small northeast trending dykes of diorite to quartz diorite are present in foliated granite (6). They are medium-grained with fine-grained chilled margins, fresh, and grey to dark grey in colour. All are narrow, averaging 25 feet in width, and they probably are short as they can be observed to narrow and finger out.

STRUCTURAL GEOLOGY

In the north half of the map-area rocks of map-units 3, 4, 5, and 6 occur in a major north plunging anticline. In all likelihood the sedimentary rocks (8b) were involved in the deformation that produced this fold but the Hurwitz Group probably was not. Elsewhere, northeast trending folds in the Hurwitz Group probably result from a younger deformation.

The most prominent folds affecting the Hurwitz Group rocks in this map-area trend northwest, for example the two synclinoria containing Mountain Lake–Griffin Lake and Ducker Lake–Cullaton Lake, in which the upper part of the Hurwitz Group is preserved. The relative ages of the two fold trends, northwest and northeast, that affect the Hurwitz Group are uncertain.

Prominent normal faults in the north half of the map-area trend northeast, and the reverse fault bounding the sedimentary rocks (8) west of Nowyak Lake has the same trend. In the southern half of the area the Hurwitz Group rocks are cut by numerous, normal, oblique faults of various trends. The east–northeast trending faults are probably older than the north and northwest trending ones. Some faults are closely related to the folding as they occur along the axial planes of the northwest trending folds.

ECONOMIC GEOLOGY

None of the numerous occurrences of iron-formation are enriched but some of the coarser grained magnetite-bearing type may be of economic interest. Andesite (1) contains disseminated pyrite and small gossans are present in several localities. Minor pyrite and chalcopyrite occur in some small shear zones in the andesite. A small shear zone in greywacke (2) north of Griffin Lake contains abundant arsenopyrite. Lord (1953, page 9) describes an occurrence in andesite approximately 2 miles southwest of the southernmost bay of Griffin Lake that contains low gold and silver values.

The only company active in this region, Selco Exploration Company Limited, has some prospecting permit areas in the southern part of the map-area. This company has opened a private airstrip within the area to facilitate their operations. Publications of the Department of Northern Affairs and National Resources (1964, page 35 and 1964A, page 18) briefly describe the work of this company.

REFERENCES

Eade, K.E.
1964: Kognak River area (east half), District of Keewatin; Geol. Surv. Can., Paper 64-27.

Lee, H.A.
1959: Surficial geology of southern District of Keewatin and the Keewatin ice divide, Northwest Territories; Geol. Surv. Can., Bull. 51.

Lord, C.S.
1953: Geological notes on southern District of Keewatin, Northwest Territories; Geol. Surv. Can., Paper 53-22.

Stockwell, C.H.

1963: "Second report on structural provinces, orogenies, and time-classification of rocks of the Canadian Precambrian Shield" in Age determinations and geological studies; Geol. Surv. Can., Paper 62-17, pp. 123-133.

1964: "Fourth report on structural provinces, orogenies, and time-classification of rocks of the Canadian Precambrian Shield" in Age determinations and geological studies; Geol. Surv. Can., Paper 64-17 (Part II), pp. 1-21.

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