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PRELIMINARY REPORT KOGNAK RIVER MAP-AREA (EAST HALF), DISTRICT OF KEEWATIN

65H (West half)

(Report and Map 10-1964)

K. E. Eade

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ABSTRACT

Archaean volcanic and clastic rocks underlie a large part of the map-area. Volcanic rocks are principally andesite but a number of other rock types are present. The clastic rocks consist of a thick, monotonous sequence of greywacke, subgreywacke and tuffs, with minor iron-formation and dolomite. Some mixed gneiss is derived from these rocks.

The Lower Proterozoic Hurwitz Group has been redefined and subdivided into five units. Orthoquartzite is normally the basal unit of the group and only locally is conglomerate and greywacke conglomerate found conformably below the orthoquartzite. Thickness of the orthoquartzite varies from 700 to 4,000 feet.

A new group of sedimentary rocks, quartzite, conglomerate and siltstone, probably pre-Hurwitz Group in age, has been outlined.

The intrusive rocks of the area consist of granodiorite of pre-Hurwitz Group age, gabbro sills intruding the Hurwitz Group, and late gabbro dykes.

Folding affects all rocks except the late gabbro dykes. There are two distinct trends of folds, north to northeast and west to northwest. Faults, both normal and reverse, are numerous.

KOGNAK RIVER MAP-AREA (EAST HALF), DISTRICT OF KEEWATIN

The centre of the map-area is 225 miles northwest of Churchill, Manitoba, the best point of access to this region. The area is a small part of that mapped in 1952 on the Geological Survey's first helicopter-supported reconnaissance survey, led by Lord (1953)[1]. Mapping by the author, assisted in 1962 by R.A. Alcock and in 1963 by D.M. Carmichael and H.L. Pollak, provides more detailed information, particularly concerning the stratigraphy and structure of the Hurwitz Group rocks. The surficial geology of the southern District of Keewatin was discussed by Lee (1959). With the exception of the prominent ridges formed of Hurwitz quartzite, the topography is low and gently rolling. Thick glacial deposits mask much of the bedrock, in particular areas underlain by easily eroded sedimentary rocks of units 9, 10 and 11. Trees occur only in isolated stands in protected positions in the northern half of the area and even in the south they are scattered and stunted, although more abundant.

Dark green fine-grained andesite, either massive or pillowed, comprises approximately 60 per cent of unit 1. Massive grey to greenish grey fine-grained dacite flows are intercalated with the andesite flows. Acidic extrusive rocks, ranging from quartz latite to rhyolite, are locally abundant, particularly north of Ameto Lake. These fine-grained rocks may be porphyritic with fine- to medium-grained quartz or feldspar phenocrysts and they range in colour from light green to greenish grey or white. Agglomerate beds are commonly associated with the acidic volcanic rocks, in which rhyolite fragments are in a very fine grained matrix of quartz latite or dacite composition. Basic fragmental rocks are not abundant. Tuffs of various compositions, in thin layers or lenses, are interbedded with the volcanic rocks. These tuffs are similar to the tuffs of unit 2. Irregular bodies of gabbro, with some quartz gabbro and diorite, are associated with many of the basic volcanic rocks. These massive, medium-grained dark green to dark grey rocks are in part intrusive but may also be medium-grained phases of the lavas. Quartz gabbro, although not abundant, is distinctive with 'eyes' of dark blue opalescent quartz. The only gabbro bodies to be mapped separately (1a) are in part recrystallized to meta-gabbro and appear to be sills associated with the volcanic rocks.

Greywacke, subgreywacke, phyllite, argillite and tuff (2) are for the most part younger than the volcanic rocks although there is some interbedding and units 1 and 2 are considered to be conformable. These clastic rocks form a thick succession, lacking any continuous distinctive horizon markers. The medium- to fine-grained, grey to greenish grey greywacke and subgreywacke are thin to thick bedded, and graded bedding is present in many outcrops. A

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[1] Dates in parentheses refer to publications listed at the end of this report.

thick section of phyllite, with some argillite, overlies the greywacke and subgreywacke east of South Henik Lake, but elsewhere thin beds of the phyllite and argillite are interlayered with and grade into the coarser clastic rocks.

Both lithic and crystal tuffs are major constituents of unit 2 but commonly are difficult to distinguish from the sedimentary rocks of this unit, particularly if the latter are thick bedded. The lithic tuffs are very similar in appearance to the greywacke and subgreywacke and possibly may grade into each other. Absence of bedding and fine-grained phyllite-argillite interlayers are characteristic of the tuffs. Prominent 'eyes' of quartz or feldspar in a finer-grained matrix are typical of the crystal tuffs. The tuffs range from basic to acidic. Many of the lithic tuffs are dark greenish grey to blue-green, whereas the crystal tuffs are more commonly light coloured. A few acid lithic tuffs typically have thin interlayers of agglomerate.

The dolomite (2a), limited in extent to scattered small areas within the tuff-greywacke sequence, is medium grained and cream coloured with beds 4 to 6 inches thick. This dolomite is noticeably recrystallized, which distinguishes it from the younger carbonate rocks of unit 10.

The mica-quartz schist and mica-quartz-feldspar schist (2b) are confined to a single large area just west of South Henik Lake. The schists are probably derived from rocks equivalent to the subgreywacke and greywacke (2). As well as prominent schistosity, these rocks typically have a marked lineation. On the south the schists are intruded by granodiorite (6) with an intervening narrow zone of contact metamorphism; on the north the schists end abruptly along a line that may well be a fault, although it is not so indicated on the map.

Several types of iron-formation (3), including jasper-hematite, siliceous magnetite-hematite, and cherty-magnetite, occur conformably with units 1 and 2. The cherty-magnetite iron-formation is present in narrow bands in the volcanic rocks at several localities. Jasper-hematite and siliceous magnetite-hematite iron-formations occur most commonly with the clastic rocks. The thickest and most continuous iron-formation band, south of Montgomery Lake, is a mixture of these two types intercalated with the older volcanic rocks (1) and the clastic rocks (2). All the iron-formations are characterized by good bedding or banding, which is particularly well developed in the red, non-magnetic jasper-hematite rocks. Bedding in the cherty-magnetite type is normally thinner than in the other varieties.

Units 1, 2 and 3 cannot be differentiated in places due to the scarcity of outcrops or insufficient information, and are there combined as unit 4.

Biotite and/or hornblende gneiss and schist (5) includes rocks of various compositions and characteristics, all probably derived from volcanic and sedimentary rocks equivalent to units 1 and 2. Some of the biotite schists are very similar to the schists of unit 2b

and some of the hornblende schists are simply sheared andesites. Also included in unit 5 are grey, medium-grained, banded gneiss and paragneiss of granitic composition with marked dark and light bands 1 inch to 3 inches wide and with biotite more abundant than hornblende, although both may be present. These banded gneisses are cut by small stringers and segregations of pink granite or granite pegmatite. The banded gneisses grade imperceptibly into mica-feldspar-quartz schist, both laterally and along strike. Grey to pink gneiss, lacking pronounced banding but with dark inclusions and schlieren and homogeneous granodiorite phases, is characteristic of the northern part of this unit on the east side of South Henik Lake.

Grey hornblende granodiorite, the characteristic rock of unit 6, is massive, medium grained, and homogeneous. It contains plagioclase, ranging in colour from grey to yellowish green, which commonly has a distinctive greasy lustre. Within some plutons the composition of the rock may range from granite to diorite, the typical grey colour may vary to pink, and biotite may be present. Foliation and inclusions or schlieren are normally present only near the contacts with the older rocks (1) and (2). These contact zones are relatively narrow, generally less than 1/4 mile wide but are locally up to 1/2 mile wide.

Quartzite (7) unconformably overlies rocks of the conformable units (1, 2 and 3) and the basal conglomerate of unit 7 contains boulders of granodiorite like that of unit 6. As Hurwitz quartzite (8), of probable lower Proterozoic age, unconformably overlies unit 7 the latter may be either late Archaean or early Proterozoic in age. It is grey to white, fine grained to glassy, and massive to well bedded in 6-inch to 2-foot beds. Crossbedding is abundant in the well-bedded parts of the quartzite. Cleavage is also prominent. Just southeast of Montgomery Lake pyrite is present, both disseminated and in thin seams along bedding planes. The basal boulder-conglomerate stratigraphically below the quartzite is well exposed on the east shore of Montgomery Lake. Pebbles, cobbles and boulders, mostly well rounded, range from 1/2 inch to 16 inches in diameter and the following rock types are represented: greywacke, tuff, granodiorite, sandstone, and leuco-granite. Other rock types present in pebble size only are: felsite, andesite, chert, jasper, white quartz, and slate. The matrix, making up 30 to 45 per cent of the rock, is a medium-grained, grey to greenish grey sandstone or arkosic sandstone. Thin lenses of sandstone occur within the conglomerate. The matrix is strongly sheared and is metamorphosed with development of chlorite and sericite. Very fine grained dark grey to black siltstone (7a) overlies the quartzite with some interbedding near the contact. The siltstone has prominent, closely spaced (1/16- to 1/8-inch) bedding laminations. A few beds of the siltstone show ripple-marks and elsewhere small-scale cross-laminations are present. Cleavage, commonly almost parallel with bedding, is well developed. As in the underlying quartzite, euhedra of pyrite up to 3 mm in diameter are disseminated through the rock.

The Hurwitz Group as first defined by Wright (1955, p. 6) included greywacke, conglomerate, argillite, slate, phyllite, and

derived quartz-mica schists older than the orthoquartzite (8). Present work places practically all these older rocks in unit 2, overlain unconformably by the orthoquartzite. The only exceptions are small amounts of boulder-conglomerate, greywacke-conglomerate, and greywacke, included in unit 8, that occur in a few localities conformable with, but stratigraphically below, the orthoquartzite. The Hurwitz Group as redefined by the present work comprises units 8 to 13, with the Hurwitz orthoquartzite (8) as a distinctive horizon marker at the base of the group. The conglomerate here and there underlying the orthoquartzite has a dark rusty-grey greywacke matrix and grades upward into greywacke containing scattered cobbles and boulders. The pebbles, cobbles, and boulders of the conglomerate are well rounded and a variety of rocktypes—granodiorite, granitic gneiss, leuco-granite, tuff, greywacke, andesite, grey quartzite, chert, white quartz, felsite, and sandstone—are represented. The limited extent of the conglomerate and greywacke indicates they were deposited only in local basins. Where quartzite forms the base of the Hurwitz Group, as it does in most places, it is commonly sheared, probably due to slipping during subsequent folding. Rocks underlying the quartzite may be either fresh and clean at the contact or deeply weathered, with a regolith present. The quartzite is glassy to fine or medium grained. It is very pure and most commonly white except in the upper part of the section where it is pink. It may be thin bedded (3/4 inch to 1 1/2 inches) or massively bedded in beds tens of feet thick in which bedding is rarely visible. Lenses of pebble-conglomerate, with well-rounded pebbles of white quartz up to 1 1/2 inches in diameter, are present at various levels in the quartzite. The thickness of the Hurwitz quartzite ranges from less than 700 feet to more than 4,000 feet and thinning may take place over short distances, as for example southwest of Montgomery Lake. Cross-bedding is rare, but ripple-marks are always present at two different levels of the section—in the lower, white, thin-bedded part and in the upper, pink, thin-bedded part. Measurements made on ripple-marks in a number of localities throughout the area indicate a preferred orientation trending northeast with asymmetry northwest.

Slate, shale, and siltstone (9) overlying the quartzite, outcrops poorly and slaty fragments littering the ground may be the only evidence of the presence of this unit. These fine-grained to very-fine-grained rocks range in colour from grey to black or red. The fine bedding lamination, 1/16 to 1/4 inch thick, may be obscured by the prominent slaty cleavage prevalent in this unit. In a few localities the fine-grained rocks grade along strike into well-bedded, medium-grained greywacke.

Dolomite, argillite, and siltstone (10), with greywacke in some localities, constitute a varied unit that changes in thickness and composition along strike. Fine-grained dolomite (10), massive to thin-bedded, ranges in colour from white to cream to light or dark grey and always has a buff to brown weathered surface. Much of the dolomite is laced with irregular veinlets of white quartz or grey chert which project angularly from the weathered surfaces. Stromatolitic dolomite forms a minor part of the dolomite section. Interbeds of fine-grained grey argillite appear in the upper part of the dolomite and

increase in abundance upward so that the dolomite is transitional into argillite. The argillite is finely laminated in beds 1/8 to 1/4 inch thick but the bedding may be partly obscured by the cleavage. Some very-fine-grained grey to dark grey siltstone beds occur with the argillite.

Greywacke (11) may overlie unit 10 but is not always present nor is it always possible to map it separately from the underlying unit. This greywacke is lens-like as it is a thick unit in some places and elsewhere is thin or absent. The grey fine- to medium-grained greywacke is well bedded in 1 1/2- to 3-inch beds, and massive or thick-bedded parts are not abundant. Graded bedding is characteristic of these rocks and the fine-grained parts of beds with a well-developed cleavage are typical of the unit. The relative abundance of fine-grained material and the thinner bedding help to distinguish this greywacke from the greywacke of unit 2.

Thin-bedded grey to buff impure quartzite (12) forms the upper unit of the Hurwitz Group. Quartz and sericite are the major constituents of the rock. Both ripple-marks and crossbedding are present although these structures, as well as bedding, may be obscured by cleavage. Cleavage is so intense in some localities that the rock is a quartz-sericite schist. Beds of impure dolomite containing abundant quartz grains overlie a thick section of this impure quartzite in a single locality just north of North Henik Lake. The plentiful sericite in the impure quartzite (12), the abundance of crossbedding, and the colour, distinguish it from the Hurwitz orthoquartzite (8). Composition as well as stratigraphic positions distinguish the impure quartzite from the quartzite of unit 7.

Gabbro (13) occurs in many parts of the map-area, always within unit 9. The gabbro plutons, ranging in thickness from 500 to 1,000 feet or more, extend along strike, possibly as parts of a single sill but more likely as a series of unconnected sills. Only on the north shore of Otter Lake are there relatively thick parallel sills at two stratigraphic levels. In these, the gabbro has been emplaced as a series of intrusions with fine-grained zones within the plutons. The dark green to black gabbro is medium grained with fine-grained margins. Hornblende, partly altered to chlorite, and plagioclase are major constituents with magnetite and biotite as common accessory minerals. The shale, siltstone or slate is hard and baked in appearance at the contacts with the gabbro, but the contact zone is less than 2 feet wide.

Dykes of gabbro, diabase, and their metamorphosed equivalents (14) have three distinct trends — N70°E, N15°E, and N35°W — and are of at least two different ages. Only two small segments of dykes represent the N70°E trend, one a gabbro to meta-gabbro cutting granodiorite (6) and the other a meta-diabase cutting tuff (2). The swarm of dykes trending N15°E just to the west of South Henik Lake and other individual dykes of this trend are mostly metamorphosed, meta-gabbro and meta-diabase but a few are fresh in appearance. They cut tuff (2), mica schist (2a), biotite and hornblende gneiss (5), and granodiorite (6). Unmetamorphosed gabbro and diabase dykes trending northwest cut the Hurwitz Group as well as

older rocks. Dyke rocks of this trend may contain a small amount of pink feldspar which gives them a distinctive colour. The long dyke of this set west of South Henik Lake is apparently younger than some faulting that offsets a gabbro sill (13). These northwest-trending dykes are believed to be the youngest rocks in the map-area.

The most prominent folds trend northeast, and the well-developed cleavage present in many of the rocks is probably axial-plane cleavage related to these folds. There is evidence of an older folding in the form of a second cleavage, trending northwest, but in most localities it is obscured by the younger cleavage. In general the folds are simple open types, except for some overturned folds adjacent to faults.

Three east-trending thrust faults are prominent structural features; in each case Hurwitz Group rocks are involved, and older rocks are thrust northward over younger ones. It is impossible to determine the amount of movement on any of these faults. The northern thrust fault, east of Ameto Lake, branches into two parts, both of which are probably cut off on the west by a northwest-trending normal fault in Ameto Lake. Subsidiary faults and cleavage suggest the fault plane dips 40 to 45°S. The central thrust, just north of Montgomery Lake, appears to die out just west of the boundary of the map-area, the stress being taken up by intense folding in the Hurwitz and older rocks. The central thrust may extend beyond the east side of South Henik Lake, although not so indicated on the map, forming the contact between the schist and gneiss (5) and the undivided volcanic and sedimentary unit (4). There is no surface expression of this fault. The fault is probably younger than most of the folding as the fault plane does not appear to have been folded. The southern thrust extends west out of the map-area and to the east into granodiorite (6) where it cannot be traced. The orthoquartzite (8) adjacent to this fault is strongly sheared and mylonitized; the dip of the shearing is approximately 50°S.

Normal faults are abundant in the map-area; many are oblique faults but some strike faults. Oblique faults trending northwest are particularly prominent and include some of the youngest faults. Mylonite zones adjacent to the normal faults are abundant where the faults cut the orthoquartzite (8). The only prominent strike-slip fault, just south of Oftedal Lake, trends north.

The andesite (1) commonly contains disseminated pyrite, and small gossans are present in a number of localities. Sheared andesite from one of the larger gossans about 6 miles north of the northeast corner of Montgomery Lake contains both pyrite and chalcopyrite. Lord (1953) stated that significant amounts of gold have been reported from deposits in the andesite south of Otter Lake. The abundant pyrite in the quartzite (7) may be of some economic interest. Enrichment of iron-formation is not known. There is no observed mineralization along any of the numerous faults.

References

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.

Wright, G.M.
1955: Geological notes on central District of Keewatin, Northwest Territories; Geol. Surv. Can., Paper 55-17.

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