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DEPARTMENT OF ENERGY, MINES AND RESOURCES

PAPER 72-47

GEOLOGY OF TAVANI MAP-AREA, DISTRICT OF KEEWATIN

W.W. Heywood

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GEOLOGY OF TAVANI MAP-AREA, (55K) DISTRICT OF KEEWATIN

(Report, 1 figure and Map 6-1972)

W.W. Heywood

DEPARTMENT OF ENERGY, MINES AND RESOURCES

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ABSTRACT

Tavani map-area, situated on the west side of Hudson Bay, is in the Churchill Structural Province. Metamorphosed volcanic and sedimentary rocks of the Kaminak Group, and intrusive plutons are well exposed in the southern half of the area, and in the Rankin Inlet area. They are overlain by sedimentary and volcanic rocks of the Hurwitz Group. The northwestern part of the area is heavily drift-covered. It is a region of gneissic and migmatitic rocks derived in part from rocks of the Kaminak Group.

Folds in both the Kaminak Group and the Hurwitz Group trend northeast.

Numerous rusty zones and gossans occur in the metavolcanic rocks of the Kaminak Group, and many have been examined by drilling and trenching.

RÉSUMÉ

La région de Tavani, située à l'ouest de la baie d'Hudson, fait partie de la province structurale de Churchill. Des roches sédimentaires et volcaniques métamorphisées du groupe de Kaminak, et des plutons intrusifs sont bien exposés dans la moitée sud de la région et dans la région de Rankin Inlet. Ils sont recouverts de roches sédimentaires et volcaniques du groupe d'Hurwitz. La partie nord-ouest de la région est couverte d'une moraine épaisse. C'est une région de roches gneissiques at migmatitiques provenant partiellement de roches du groupe de Kaminak.

Les plis des groupes de Kaminak et d'Hurwitz présentent une direction nord-est.

On trouve plusieurs zones à rouille et chapeaux de fer dans les roches métavolcaniques du groupe de Kaminak, et une bonne partie de celles-ci ont été étudiées au moyen de forages et d'excavations.

GEOLOGY OF TAVANI MAP-AREA, DISTRICT OF KEEWATIN

INTRODUCTION

Tavani map-area, in the District of Keewatin on the western side of Hudson Bay, comprises an area of about 3,600 square miles bounded by latitudes 62°00' and 63°00' north and longitudes 92°00' and 93°00' west. Rankin Inlet, in the northeastern part of the area, was used as a supply base during the field study. Whale Cove, the only other community in the area, is on a peninsula about 50 miles south of Rankin Inlet. TransAir schedules frequent flights between Churchill, Manitoba, and Rankin Inlet, and charter services are available in Churchill.

Travel within the area is best undertaken by helicopter or by light aircraft on ski-wheels or floats. Boats and canoes may be used in the coastal areas and on the larger lakes. River travel is difficult due to the numerous rapids and to the small size of most rivers.

Elevations range from sea level along the Hudson Bay coast to about 350 feet in the northern and northeastern parts of the area. Relief is generally less than 100 feet although it locally approaches 200 feet.

The first report on the geology of the coastal areas on the west side of Hudson Bay was made by Robert Bell (1885) from specimens and topographic descriptions sent to him in 1884. J.B. Tyrrell (1898) during his journeys of 1893 and 1894 made observations on the western side of Hudson Bay from Chesterfield Inlet to Churchill and along the Ferguson River. Following the discovery of copper and nickel sulphides by the Cyril Knight Prospecting Company in 1928 exploration activity in the area increased. Geological investigations were carried out by L.J. Weeks in 1930, 1932 and 1933 in the area between Rankin Inlet and the Maguse River. Operation Keewatin (Lord, 1953) provided the first geological map of the entire Tavani map-area. Brown (1964) reported on the costs of detailed mapping in the area by Giant Yellowknife Mines. The geology of the region was summarized by Wright (1967). Aeromagnetic maps are available for the entire area.

Tavani map-area was selected for further study following a geological reconnaissance in 1966 of the region between Rankin Inlet and Padlei. Mapping of the Tavani area was commenced and completed in 1967. Able field assistance was rendered by R. Wares, R.A. Porter, B.C. Wilson, student assistants, and K. Adamson, cook. A Bell 47G2A helicopter was chartered from Autair Helicopter Services Ltd., with G. Doneys, pilot and J. Zorinic, engineer. A Lamb Airways Cessna 180 was piloted by D. Trajanovich.

Field maps and notes from Operation Keewatin (Lord, 1953) were used in planning field work and to supplement data in some areas. In 1966, field work consisted of helicopter traverses with ground traverses in areas of extensive outcrop. Interpretations of the geology of intervening areas were aided by the use of air photographs and aeromagnetic maps.

All observed outcrops and outcrop areas are shown on the maps. Extensive areas of drift are shown, and small outcrops within such areas are marked by an outcrop or structural symbol. Considerable latitude was used in locating some contacts and in extending various map-units. However, as all basic data are presented, the reader is free to make alternative interpretations.

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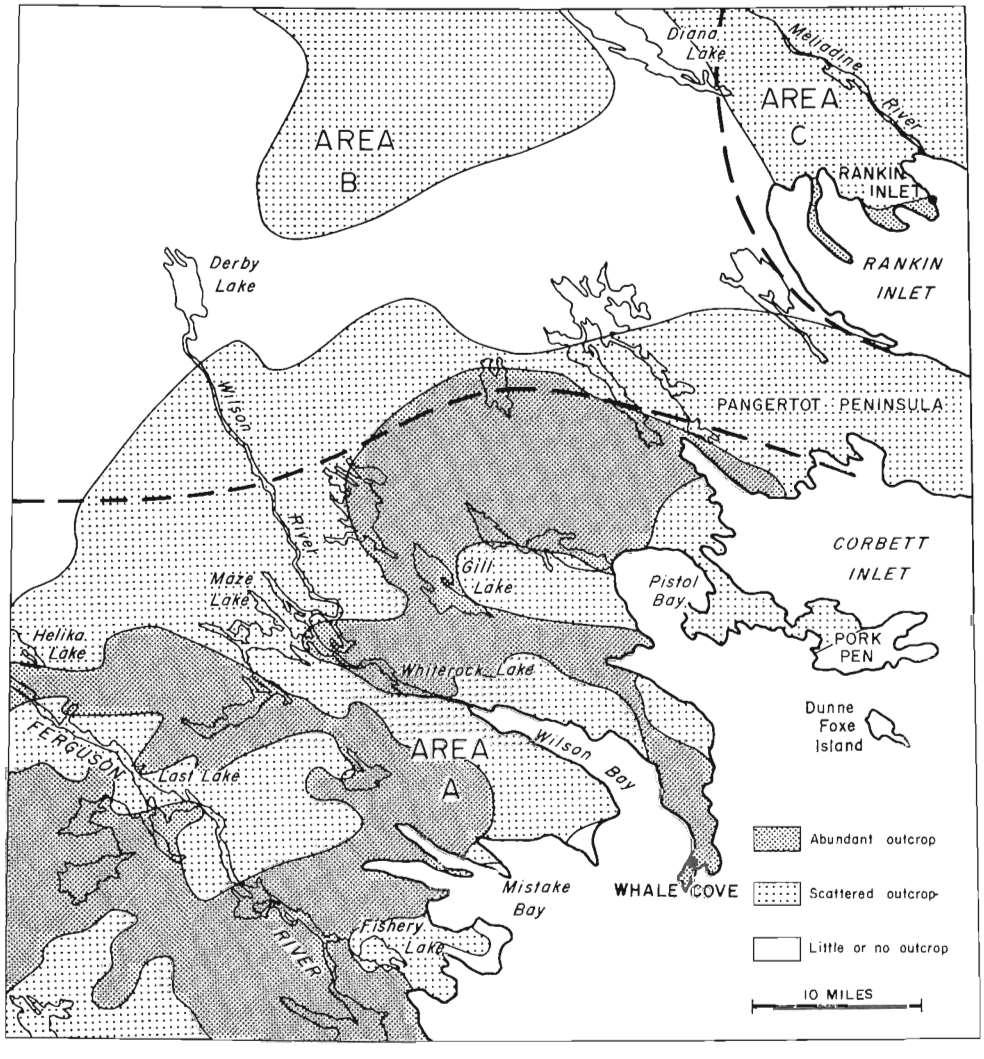

Figure 1. Sketch map of regions of differing structure and lithology and outcrop distribution.

GENERAL GEOLOGY

Tavani map-area is near the northeastern end of the greenstone belt that extends more or less continuously from Ennadai Lake to Rankin Inlet. The area can be divided into three regions of contrasting structural, lithologic and metamorphic features (Fig. 1). Region A, in the southern part of the area, is underlain largely by Kaminak sedimentary and volcanic rocks of probable Archean age. These have been deformed, metamorphosed, and intruded by various plutonic rocks. Sedimentary rocks of the Hurwitz Group, of Aphebian age, overlie the Kaminak Group and the plutonic rocks. Region B, which includes all of the northern part of the map-area with the exception of the region around Rankin Inlet, is underlain by various gneissic, migmatitic, and plutonic rocks. Within this area remnants of volcanic and sedimentary rocks, possibly of Kaminak age, can be recognized. Region C, the northeastern part of the area around Rankin Inlet, is characterized by a variety of metamorphosed sedimentary and volcanic rocks with minor granitic intrusions and gneissic zones. All units up to and including the Hurwitz, were deformed and metamorphosed during the Hudsonian Orogeny. Only one post-orogenic diabase dyke was observed in the area.

Bedrock is moderately well exposed in areas underlain by Kaminak and Hurwitz Group rocks in the southern part of the area, generally south of a line from Helika Lake in the west to Gill Lake and thence to the northwest arm of Corbett Inlet. The granitic and gneissic rocks of the northern part of the area do not give rise to prominent outcrops. Exposures consisting of frost-heaved angular rubble are considered to represent broken bedrock. Outcrop distribution is also shown on Figure 1.

Kaminak Group

Metasedimentary and metavolcanic rocks of the Rankin-Ennadai zone outcrop extensively in the southwestern part of the area, in the Whale Cove area, on the eastern end of Pork Peninsula, and around Rankin Inlet. Davidson (1970a) proposed that this assemblage of mafic to felsic volcanic rocks and associated conglomerate, slate and greywacke be named the 'Kaminak Group'.

The bulk of the unit is derived from mafic volcanic rocks of basaltic to andesitic composition. Greenstone and greenschist (1) are dark green to greyish green and fine grained to aphanitic. A greater degree of metamorphism has produced fine- to medium-grained amphibolites that are dark green to almost black on both fresh and weathered surfaces. Primary features such as pillows, flow surfaces and fragmental textures are commonly preserved and some flows are characterized by amygdules and/or phenocrysts. Well preserved pillows are exposed in the coastal regions of Mistake Bay, Pork Peninsula, Rankin Inlet and Whale Cove. They are also well exposed between Maze and Whiterock Lakes and along Ferguson River. Various primary features can be observed on most clean outcrop surfaces; however, they are commonly obscured by a moss and lichen cover.

Dark green fine- to medium-grained massive greenstone or amphibolite associated with the flows probably represents an intrusive phase of vulcanism that produced sills and dykes. In part these rocks may also represent the central portions of very thick flows.

Felsic volcanic rocks (2) are widespread but do not always form mappable units. These rocks are generally shades of pink and grey on both fresh and weathered surfaces. Dacite, rhyolite, quartz porphyry and quartz-feldspar porphyries are represented, and are metamorphosed to varying degrees. The smaller units are commonly intensely sheared with the formation of sericite schist.

Sheared quartz-feldspar rocks and quartz-sericite schist in the Meliadine Lake area are probably derived from felsic volcanic rocks. Few outcrops were observed in the area but their distribution suggests that they occur on the flank of an easterly-plunging fold.

Sedimentary rocks (3) and associated iron-formation underlie a large area between Mistake Bay and Nevill Bay and extend in a narrowing belt westerly to the Maze Lake area. Similar rocks are exposed at Gill Lake, a few miles north of Gill Lake, and in the Rankin Inlet area.

North of Gill Lake metasediments and metavolcanic rocks form an apparently conformable sequence. Metavolcanic rocks are overlain to the northwest by 3,000 to 4,500 feet of slate, argillite, impure sandstone and greywacke. In turn these metasediments are overlain by 1,000 to 1,500 feet of mafic volcanic rock and are followed by more than 5,000 feet of metamorphosed greywacke, argillite and impure quartzite. Several lean iron-formations ranging in thickness from a few inches to 200 feet occur with the metasediments. The metamorphic grade of the metasediments increases rapidly to the north and west with the formation of schists and gneisses indistinguishable from the gneisses of map-unit 7.

A large area extending east and west from Wilson Bay is underlain by sedimentary rocks. Fine-grained greywacke, siltstone and shale form the bulk of this unit. Pebble beds are widespread and conglomerate (3a) is exposed in a few places. Indistinct thick bedding characterizes most of the unit although locally well preserved thin bedding is present. Most of these rocks are dark grey or greenish grey on fresh and weathered surfaces with some brownish, reddish, or light grey layers. The greywacke commonly contains abundant quartz and in places it is essentially a quartzite.

Greywacke and conglomerate occur in isolated outcrops on Wilson River east of Maze Lake, in a few small outcrops 6 to 8 miles southwest of Whiterock Lake, and northeast of Copperneedle River. Clasts average 2 to 4 inches in diameter and range from 1 inch to 18 inches in diameter. Granitic fragments form 75 per cent of the rock, and volcanic fragments the remainder. Some of the granitic material is deformed and many of the volcanic fragments are extremely elongated. In general, cobbles and boulders more or less isolated in greywacke show little deformation.

An arcuate belt of sedimentary rocks is exposed around Kudlulik Peninsula, west of the settlement of Rankin Inlet. The rocks include quartzite, impure quartzite, shale and greywacke. Some dolomite is exposed. Bannantyne (1958) reported conglomerate and banded metasediments containing disseminated magnetite that grade into lean iron-formation in places. The sedimentary rocks overlie and are overlain by basic volcanic rocks that are probably representative of the Kaminak Group.

Sedimentary rocks are exposed along the western shore of Rankin Inlet from the Sandy Islets northwesterly almost to the mouth of Diana River. No contacts are exposed but the metasediments are bounded by amphibolite and basic volcanic rocks.

Iron-formation is widely distributed in the sediments of map-unit 3. Outcrops are small and scattered but the distribution of the iron-rich rocks is illustrated by the trace of high magnetic anomalies on the Tavani aeromagnetic map (Geol. Surv. Can., 1966). The iron-formations are as much as 200 feet thick and consist of alternating 1/8-inch to 12-inch layers of magnetite and quartz interbedded with chert, jasper, very fine grained quartz or slate as much as 4 feet thick. Several magnetic anomalies, such as the one on the south side of Wilson River near its mouth, may represent buried iron-formations.

Plutonic rocks

Various plutonic rocks ranging in composition from gabbro to granite are widely distributed throughout the southern half of the area.

In the Nevill Bay area, quartz diorite, granodiorite and quartz monzonite (4) range from massive and homogeneous to gneissic and migmatitic. These rocks are fine to medium grained, more rarely coarse grained or porphyritic. The colours are commonly pink or grey although locally alteration of the feldspars results in a greenish appearance. All granitic rocks show some alteration. Epidote, chlorite, calcite and sericite are derived from the feldspars. Hornblende and biotite are extensively chloritized. The plagioclase ranges from An_{25} to An_{35}, but most is andesine.

West of Nevill Bay and north of Fishery Lake the rocks (4a, b) are foliated and contain few to abundant inclusions. These inclusions range from small and rounded to extremely deformed; locally they are drawn out into thin bands giving the rock a gneissic appearance. Some boundary areas are characterized by huge metavolcanic rafts in the granitic rock. In these areas the contacts are arbitrarily drawn between the plutonic and volcanic rocks. Veining of the larger blocks by granitic material is common.

Pangertot Peninsula is underlain by massive to moderately well foliated porphyritic quartz monzonite (4p). Potash feldspar phenocrysts, 1/4 inch to 2 inches long, occur in a medium-grained matrix of quartz, plagioclase ($\pm An_{25}$), microcline, and about 5 per cent brown biotite. Minor amounts of muscovite, apatite, sphene and magnetite are present. Amphibolite and metavolcanic inclusions are common and are as much as 20 feet wide and 50 feet long. No contacts are exposed but the distribution of outcrops suggests that they are concordant with the foliation in the adjacent gneiss and/or volcanic rocks. Similar rocks outcrop at the west end of Corbett Inlet.

Massive, medium-grained quartz monzonite (4) outcrops on Dunne Foxe Island, Irik Island and in narrow bands along the shores of the circular bay west of Whale Cove. Feldspars are altered with extensive development of chlorite, epidote, muscovite and calcite. Recognizable remnants of the feldspars suggest that they originally consisted of one-third potassium feldspar and two-thirds plagioclase. Biotite and hornblende form up to 20 per cent of the rock. Minor constituents are apatite, sphene and magnetite.

Contacts are not well exposed; however, where observed with the volcanic rocks, they range from narrow with a thin chilled selvage to a breccia consisting of angular blocks in a quartz monzonite matrix. In some places the contact zone is characterized by numerous sills and dykes.

Granitic rocks in the Gill Lake area may be components of two distinct plutons. Although these rocks differ in texture and composition, their relationships and distribution are not known.

Quartz monzonite and quartz diorite (4), both north and south of Gill Lake, are homogeneous, equigranular and generally medium grained. In places they are altered and sheared with a northeasterly-trending foliation. Alteration consists of chloritization of biotite, the development of epidote in plagioclase, and some granulation of quartz. The contact with the Kaminak metasediments is sharp in places but elsewhere a migmatite zone as much as 200 feet thick is present. The contact with the volcanics to the north appears to be a fault. North of Whiterock Lake the Hurwitz quartzites unconformably overlie the granitic rocks.

Coarser-grained granodiorite and quartz monzonite (4), similar to the rocks of Pangertot Peninsula, are widespread to the east of Gill Lake. They are medium to coarse grained, homogeneous, and contain scattered to abundant K-feldspar phenocrysts. These rocks are also sheared and altered. Round to subangular inclusions are common, and average about 6 inches in diameter. The northern and northeastern contact is faulted in part. The southeastern contact was not observed; however, from scattered outcrops it appears to range from abrupt to gradational over a narrow migmatite zone.

Quartz diorite (4) outcrops on both sides of Ferguson River northwest of Last Lake, and in a few places about 6 miles east of Helika Lake. Much of the area underlain by quartz diorite is characterized by boulder fields and low rubbly outcrops. Typically the rock is medium grained, equigranular and massive and weathers light grey. It is composed of 25 per cent quartz, 50 per cent plagioclase (An_{30}), 20 per cent microcline and 5 per cent biotite. All constituents are partially to almost entirely altered.

Mafic inclusions are abundant near the contacts and in places the rock is an inclusion-breccia. The quartz diorite is separated into two bodies by a narrow zone of mafic rocks. These mafic rocks, largely derived from extrusive volcanics of the Kaminak Group, are brecciated and veined by the quartz diorite.

A heterogeneous group of rocks ranging from diorite to gabbro occurs in the southern part of the area. These rocks are generally poorly exposed and are evident only as small rubbly outcrops extending over areas of as much as 20 square miles.

Diorite and gabbro (5) outcrop along the southwestern boundary of the area. Mafic and felsic inclusions, ranging from a fraction of an inch to tens of feet in diameter, locally form the bulk of the unit. The inclusions range from rounded to angular and from clearly recognizable metavolcanic rocks to shadowy recrystallized remnants. The contact with the volcanic rocks was not observed, however the contact area is marked by angular breccias in many places.

Igloo Point is underlain by a complex association of gabbro, diorite and quartz diorite (5) containing abundant mafic inclusions. Much of the rock is layered, with layers ranging in thickness from a few inches to several feet. In places the quartz diorite forms the matrix of a breccia that contains all other rock types of the area as inclusions.

Mafic rocks (5) are scattered over an area of 35 square miles north of Maze Lake. These rocks, apparently derived from gabbro, are massive and fine to medium grained. A relict ophitic texture can be recognized in places although the original minerals are not determinable. Feldspars are

altered to a felty mass of epidote, chlorite and a more sodic plagioclase than that originally present. Tremolite-actinolite is the main mafic mineral, with hornblende and biotite locally present.

Several small outcrops of medium-grained buff to greenish weathering, extensively altered, locally intensely sheared metadiorite (5), occur 3 miles north and northeast of Helika Lake. In general the rocks outcrop poorly; however, coarse rubble and abundant angular boulders characterize the area. The major constituents are quartz, plagioclase (An_{30}), biotite and hornblende. Most of the mafic constituents are altered to fine-grained felty aggregates of secondary minerals.

Gneissic and granitic rocks of the northern area

Gneissic and granitic rocks are exposed in the northern half of the area. Outcrops are small and widely scattered, however their distribution and similarities permit broad generalizations and correlations from one locality to another.

Cordierite-sillimanite-biotite schist and gneiss (6) occur in scattered outcrops in a northeast-trending zone from Derby Lake to the northern boundary. The bulk of the unit consists of very fine to medium grained dark grey to brown weathering thinly layered rocks that are locally extremely contorted. In places it is more or less equigranular but may contain few to abundant plagioclase porphyroblasts. Plagioclase (An_{25-30}) forms up to 60 per cent of the rock and quartz as much as 45 per cent. Other constituents are biotite, muscovite, sillimanite, cordierite and garnet. Accessories include apatite, zircon and magnetite.

Foliation is moderately to well developed and results from the planar arrangement of biotite, and to a lesser extent, muscovite, sillimanite and hornblende. In some areas recrystallization continued under essentially static conditions with the development of a hornfels-like rock. Fine-grained, equigranular, thinly laminated dark grey to black layers consisting almost entirely of quartz, plagioclase and hornblende are widely distributed. Pink to grey granodiorite sills and dykes (9) ranging from a few inches to several feet thick were observed in all outcrops.

A broad zone of layered gneiss and quartz-biotite schist extends northeasterly from Wilson River south of Derby Lake to Rankin Inlet. Typically the rock is medium to fine grained and consists of alternating light and dark layers that range from 1/8 inch to several feet in thickness. The dark layers are well foliated to schistose and contain abundant hornblende, biotite, plagioclase, and minor quartz. The light layers are equigranular and consist of quartz, plagioclase and biotite with or without hornblende. Foliation is well developed although layers with little or no mafic material are sugary-textured. In the area north of Gill Lake, Kaminak Group volcanic rocks can be traced along and across strike into amphibolite, amphibolite gneiss and well layered hornblende-plagioclase gneiss. Kaminak sedimentary rocks in the same area appear to be gradational into thinly layered paragneiss and layered gneiss. Iron-formation in the area has been metamorphosed into medium- to coarse-grained, garnet-bearing quartz-magnetite rock.

In the northwest corner of the area, more or less uniformly layered gneisses grade into contorted gneiss and migmatite (8). Fine- to medium-grained, generally equigranular, leucocratic layers are composed essentially

of quartz, plagioclase and biotite with variable amounts of hornblende, microcline and muscovite. Darker layers contain as much as 50 per cent biotite and/or hornblende. Foliation in the dark layers is well developed whereas the light layers display little more than a faint alignment of biotite flakes.

A few scattered outcrops of massive to weakly foliated pink granite (9) are present west and northeast of Derby Lake. The granite is commonly medium grained and equigranular but locally it is porphyritic with 1/2-inch potash feldspar phenocrysts. Quartz, plagioclase and microcline are the major constituents, with small amounts of biotite and muscovite. In places the granite contains scattered gneissic inclusions, and, near the contact with the gneisses (6, 7), and in places form 25 per cent or more of the rock.

Hurwitz Group

The Hurwitz Group is the name applied by Wright (1955) to the distinctive white quartzite and associated impure quartzite, greywacke, conglomerate and dolomite in the southern District of Keewatin. Information provided by R.T. Bell (pers. comm.) has been incorporated into this report, and his subdivisions (1968a, b, 1970a, b) are generally followed.

A synclinal trough of predominantly sedimentary rocks about 25 miles long extends northeast and southwest from the Ferguson River at 62°10' north. A parallel trough extends northeast and southwest from Last Lake on the Ferguson River. It is less well exposed; however, scattered outcrops suggest that the quartzite in the northwest limb may continue as far as Wilson River, and that the southeast limb is a continuation of the Whiterock belt. Excellent exposures of the Whiterock belt extend from Wilson River near Maze Lake easterly to Pistol Bay. Numerous small outcrops of Hurwitz rocks are widely distributed on Pork Peninsula, and on the north and west sides of Pistol Bay. Small isolated outcrops are present at Mistake Bay, on the northwest arms of Nevill Bay, and west of Gill Lake.

Kinga Formation

The Whiterock Lake member of the Kinga Formation (10) is well exposed from Pistol Bay to the southwest corner of the area. It consists of pink and white fine-grained orthoquartzite that forms the prominent ridges that characterize the Hurwitz Group. The quartzite is typically thin bedded, ripple-marked and well sorted with a uniform appearance over the entire area. A section measured by R.T. Bell 3 miles northwest of the west end of Whiterock Lake is about 850 feet thick; it may be as much as 1,500 feet thick near the Ferguson River. The lower contact is rarely exposed but southwest and north of Last Lake it directly overlies granodiorite and/or greenstone. The contact with the Kaminak metasediments was not observed.

Ameto Formation

The Ameto Formation (11) is a poorly exposed mudstone sequence. For the most part its presence is indicated by frost-heaved grey, green, black or red slaty and thin-bedded shaly fragments. Bell estimated the

thickness to be about 800 feet at Whiterock Lake. It appears to overlie the Whiterock Lake Member conformably although no contacts were observed.

Happotiyik Member. The Happotiyik Member (11a) is the name applied by Bell to the volcanic rocks interlayered with the sediments of the Ameto Formation in the Kaminak Lake area. The core of the trough that extends northeast from Last Lake consists of a variety of massive to pillowed mafic volcanic rocks. Tuff and breccia are widespread. Exposures are good in the Last Lake region; but are small and widely scattered to the northeast. Mafic volcanic rocks as far north as Whiterock Lake are tentatively correlated with those at Last Lake. The sedimentary members of the Ameto Formation were not observed southwest of Wilson River although shaly rubble was noted west of Whiterock Lake in an area where these rocks might project.

Gabbroic sills and lenses (11b) as much as 300 feet thick intrude the Ameto Formation in the trough that extends northeast and southwest from the Ferguson River at 62°10' north. The rock is fine to medium grained and composed of intensely altered pyroxene and plagioclase.

Tavani Formation

Pink and brown quartzose and feldspathic sandstones and mudstone (Hurwitz G of Bell) outcrop extensively southwest of Whiterock Lake. Silty mudstone beds and calcareous beds are locally present. Pebble beds and minor conglomerate are present near the southwestern end of the outcrop belt. No contacts were observed although Bell (1968) suggests that this unit lies with a slight unconformity on the Ameto Formation, and that it is at least 1,800 feet thick.

Somewhat similar rocks that outcrop on Pork Peninsula are tentatively correlated with this unit. The Pork Peninsula rocks consist of quartzite, impure quartzite and greywacke with beds and lenses of siltstone and mudstone. Pebble beds and conglomerate are as much as 25 feet thick in the central part of the peninsula and at Pistol Bay. Cobbles include quartzite, mafic volcanic and granitoid rocks and limestone.

Diabase

A northwest-trending diabase dyke is exposed in a series of isolated outcrops and on several small islands about 3 miles north of Copperneedle River. The dyke is vertical and about 200 feet thick, and is composed of a medium-grained aggregate of augite and plagioclase. It is more or less on strike with a long dyke traced across the Kaminak map-area by Davidson (1970a) and as far as Schultz Lake by Wright (1967). West of Baker Lake it cuts the Dubawnt Supergroup (Paleohelikian). The diabase would be the youngest rock in the Tavani area if this correlation is valid.

OBSERVATIONS ON STRUCTURE AND METAMORPHISM

All Precambrian rocks in the Tavani map-area younger than the diabase show the effects of low- and medium-grade regional metamorphism. Parts of the area have been subjected to retrograde metamorphism and contact metamorphism is evident around some of the plutonic rocks. From a study of the metamorphism the area can be divided into two parts from the Sandy Islets in Rankin Inlet westerly to 62°30' at the western boundary of the map-area. The northern part is underlain by amphibolite facies schists and gneisses characterized by sillimanite, cordierite, garnet and biotite. Hornblende granulite facies rocks occur in a few places from Diana Lake to Meliadine River. Typical assemblages contain clinopyroxene, scapolite and hornblende. The rocks of the southern part of the area range from lower greenschist to lower amphibolite facies.

The trend of the foliation and of the original structures is northeasterly throughout most of Area A. Exceptions are in the Mistake Bay-Wilson Bay and Corbett Inlet areas where the trends swing easterly and then southeasterly. Primary structures are moderately well preserved in the pre-Hurwitz rocks of the southern region but greater deformation and a higher degree of metamorphism have destroyed them in the northern region. Fold delineation was not possible due to lack of stratigraphic control. The attitudes of the volcanic rocks in the Fishery Lake, Gill Lake and Last Lake areas suggest that these complexes occupy anticlinal positions.

The Hurwitz Group forms two narrow, parallel belts southwest of Whiterock Lake. These generally have steep dips along the margins that moderate in the central areas. In most places the contact is covered, but commonly an angular discordance is apparent where the lowermost Hurwitz unit is adjacent to layered rocks of the Kaminak Group. Davidson (1970a) described a similar belt in the Kaminak area to the west where the Hurwitz occupies a downfaulted synclinal trough.

Scattered small outcrops characterize Area B. Foliation, with moderate to steep dips, probably coincides with original northeasterly-trending structures.

In Area C, from Diana Lake to the eastern boundary of the area outcrops are small and scattered, however the distribution of those observed suggests an easterly plunging antiform. East and west of Diana Lake a few small outcrops of granite (9) occur more or less along the axis of the fold, apparently intrusive into hornblende granulite facies gneisses. These are bounded by amphibolites and greenschist facies rocks derived from mafic Kaminak volcanic rocks.

A southeast-trending synform extends along the central part of Kudlulik Peninsula where Kaminak Group sedimentary and volcanic rocks are exposed.

Numerous faults occur in the map-area. Many are known or are inferred from shears, mylonite zones, breccia or by the offset of rock-units. Few faults were recognized in the northern region, however this may be explained by the lack of rock exposures.

ECONOMIC GEOLOGY

The presence of volcanic rocks in the Rankin Inlet area were reported by J. B. Tyrrell in 1898, but it was about 30 years before mineral exploration was undertaken. Such activities have been carried out intermittently on various scales since that time. Most of the work has been concentrated in the Archean sedimentary and volcanic rocks of the Ennadai-Rankin belt, and in the Aphibian sedimentary rocks. The areal extent of these units was first outlined by Operation Keewatin (Lord, 1953).

Rusty zones and gossans are common in the southern region (Fig. 1) in areas underlain by volcanic rocks, and in the northeastern area around Rankin Inlet. They were not observed in the northern gneiss-migmatite areas. The rusty zones and gossans are commonly derived from pyrite and pyrrhotite disseminated in greenstones and sheared felsic volcanic rocks, minor chalcopyrite was observed in many of these occurrences. Quartz veins commonly contain pyrite and chalcopyrite, and gold values have been reported from some. Widely disseminated chalcopyrite occurs in mafic volcanic breccia of the Ameto Formation northeast of Last Lake. Magnetite iron-formations occur in the Mistake Bay area, north of Wilson Bay, and about 8 miles north of Gill Lake. Bell (1968b) discussed the uranium possibilities of the Hurwitz Group, and suggested that the most favourable areas for prospecting were southwest of the Tavani map-area where the orthoquartzite succession thickens and becomes more conglomeratic. Heywood and Roscoe (1967) described Hurwitz Group quartz-pebble pyritic conglomerates from the Padlei area that contain a slightly higher than normal content of radioactive minerals.

The nickel mine at Rankin Inlet is the only mine that has been brought into production in the area. Interest in the area commenced with the discovery of copper and nickel by the Cyril Knight Prospecting Company at Rankin Inlet. Trenching was undertaken in 1928, and diamond drilling was done in the 1930's. In 1951 the property was acquired by the Rankin Inlet Nickel Mines and further exploration carried out. A shaft was sunk in 1953 to a depth of 331 feet, and 2,600 feet of crosscutting and drifting were completed. Ore reserves were estimated to be 460,000 tons grading 3.3% nickel and 0.8% copper. Production commenced in 1957 and was suspended in 1962 after 504,753 tons of ore were milled to produce 21,319,672 pounds of nickel and 5,807,900 pounds of copper (Laporte, 1972). Drybrough (1931) described the geology of the mine area. Mineralization occurs near the footwall of a pyroxenite sill intrusive between sedimentary and volcanic rocks. The sill, 200 to 300 feet thick, has been traced for three-quarters of a mile. It is altered and now consists chiefly of serpentine with some carbonate, magnetite and pyrite.

The Rankin Nickel Mines exploration subsidiary, Tavane Exploration Limited, investigated mineral occurrences in three areas in 1961. In the Whale Cove area numerous gossans contain massive to disseminated pyrite, pyrrhotite and chalcopyrite. Free gold occurrences, in quartz veins in Archean conglomerate and volcanic rocks, were examined near the Wilson River east of Maze Lake. Sulphides containing copper were investigated in the Pistol Bay area.

Giant Yellowknife Mines Limited conducted an extensive exploration program in the District of Keewatin in 1960 and 1961. One of the discoveries, the Torin Group of claims, is located on Ferguson River about 9 1/2 miles west-northwest of the abandoned post of Tavani. These claims were described

by Baragar (1962), and the following has been condensed from his report. Mineralized zones are near the contact of a volcanic assemblage and an intrusive complex of anorthositic gabbro and gabbro. Disseminated pyrrhotite and chalcopyrite are exposed across a 7 1/2 foot width in a pit. Assay results are: 0.86% nickel, 0.37% copper, 0.005 oz. gold/ton, and 0.11 oz. silver/ton. Iron-formation is exposed west of Mistake Bay. Magnetite-rich layers, ranging from a fraction of an inch to several feet in thickness, are interbedded with argillite. Preliminary work indicated 945,186 tons grading 20 to 22 per cent iron (Laporte, 1972).

Kennco Explorations (Canada) Limited carried out an exploration program in 1965-1966 about 25 miles southwest of Rankin Inlet in an area where massive sulphides, containing up to 13.5% copper and 3.09 oz. silver, were found in frost-heaved angular blocks. Ground checking disclosed long narrow sulphide zones in thinly layered metavolcanic rocks and associated gneisses of sedimentary origin. Copper and zinc mineralization is confined to zones 1 foot to 2 feet wide and 600 to 800 feet long. Airborne geophysical surveys detected additional sulphide zones but diamond drilling did not disclose deposits of economic significance.

SELECTED BIBLIOGRAPHY

Bannantyne, B. B.
1958: The geology of the North Rankin Nickel Mines, Limited, Northwest Territories; unpubl. M.Sc. thesis, Univ. of Manitoba, Winnipeg.

Baragar, W. R. A.
1962: Mineral industry of District of Mackenzie and part of District of Keewatin, 1961; Geol. Surv. Can., Paper 62-1.

Bell, R.
1885: Observations on the geology, mineralogy, zoology and botany of Hudson's Strait and Bay, made in 1885; Geol. Surv. Can., Ann. Rept. 1885, pt. DD, p. 1-20.

Bell, R. T.
1968a: Study of the Hurwitz Group, District of Keewatin; in Report of Activities, Part A: May to October, 1967; Geol. Surv. Can., Paper 68-1, pt. A, p. 116-120.

1968b: Preliminary notes on the Proterozoic Hurwitz Group, Tavani and Kaminak Lake areas, District of Keewatin; Geol. Surv. Can., Paper 68-36, 17 p.

1969: Study of the Hurwitz Group, District of Keewatin; in Report of Activities, Part A: April to October, 1968; Geol. Surv. Can., Paper 69-1, pt. A, p. 147-148.

1970a: Hurwitz Group, District of Keewatin; in Report of Activities, Part A: April to October, 1969; Geol. Surv. Can., Paper 70-1, pt. A, p. 124-125.

Bell, R.T. (cont.)
1970b: Preliminary notes on the Hurwitz Group, Padlei map-area, Northwest Territories; Geol. Surv. Can., Paper 69-52.

Brown, C.E.G.
1964: Helicopter exploration costs in northern Canada; Bull. Can. Inst. Mining Met., v. 67, p. 282-288.

Davidson, A.
1970a: Kaminak Lake map-area, District of Keewatin; Geol. Surv. Can., Paper 69-51.

1970b: Eskimo Point (north half) and Dawson Inlet (north half) map-areas, District of Keewatin; Geol. Surv. Can., Paper 70-27.

Drybrough, J.
1931: A nickel-copper deposit on Hudson Bay; Trans. Can. Inst. Mining Met., v. 34, p. 157-172.

Eade, K.E.
1964: Preliminary report, Kognak River map-area (east half), District of Keewatin; Geol. Surv. Can., Paper 64-27, 7 p.

1966: Kognak River, west half, District of Keewatin; Geol. Surv. Can., Paper 65-8, 12 p.

Geol. Surv. Can.
1966: Tavani; Aeromagnetic Series, Map 7296G.

Heywood, W.W.
1968: Tavani map-area, District of Keewatin; in Report of Activities, Part A: May to October, 1967; Geol. Surv. Can., Paper 68-1, pt. A, p. 139.

Heywood, W.W., and Roscoe, S.M.
1967: Pyritic quartz pebble conglomerate in the Hurwitz Group, District of Keewatin; Geol. Surv. Can., Paper 67-1, pt. A, p. 21.

Laporte, P.J.
1972: A review of mineral exploration in the Keewatin District, Northwest Territories; Paper presented at Northwest Territories Chamber of Mines Exploration Symposium, Feb., 1972.

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

Pelzer, E.P.
1950: The Rankin Inlet nickel copper deposit, a microscopic study; Can. Mining J., Sept., 1950, p. 79-83.

Tyrrell, J. B.
1898: Report on the Doobaunt, Kazan, and Ferguson Rivers, and the north-west coast of Hudson Bay; and on two overland routes from Hudson Bay to Lake Winnipeg; Geol. Surv. Can., Ann. Rept. (n. ser.), v. 9, 1896, pt. F, p. 1-218.

Weeks, L. J.
1930: Mistake Bay area, west coast of Hudson Bay, North West Territories; Geol. Surv. Can., Sum. Rept. 1929, pt. B., p. 172-174.

1932: Rankin Inlet area, west coast of Hudson Bay, North West Territories; Geol. Surv. Can., Sum. Rept. 1931, pt. C., p. 37-46.

1933: Maguse River and part of Ferguson River Basin, Northwest Territories; Geol. Surv. Can., Sum. Rept. 1932, pt. C., p. 64-72.

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

1967: Geology of the southeastern barren grounds, parts of the Districts of Mackenzie and Keewatin; Geol. Surv. Can., Mem. 350.