

DEPARTMENT OF ENERGY, MINES AND RESOURCES

GEOLOGICAL SURVEY OF CANADA



GEOLOGY OF THE THEESJUAKE LAKE MAP AREA:

A PROGRESS REPORT WITH NOTES ON
URANIUM AND BASE METAL MINERALIZATION

by

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GEOLOGY OF THE TEBESJUAK LAKE MAP AREA: A PROGRESS REPORT WITH NOTES
ON URANIUM AND BASE METAL MINERALIZATION

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Precambrian Division

Abstract

Southern and eastern parts of the Tebesjuak Lake map area contain faulted successions of sediments and volcanics of the Dubawnt Group that overlie an irregular basement of Archean and Aphebian granitoid gneisses. Dubawnt Group rocks consist of basal successions of sheared and altered stream-channel and fluvial deposits that are unconformably overlain by subaerial alkaline flows and volcanoclastic sediments of the Christopher Island Formation. The thick successions of volcanics are succeeded by wedges of red alluvial fan sediments and Pitz Formation rhyolitic flows and intercalated quartz-rich sediments. Poorly exposed black, amygdaloidal basalt overlies the Pitz Formation rocks. Stocks and plutons of syenite and granite and northeast trending dyke-like gabbroic intrusions cut the Dubawnt Group rocks.

Epigenetic fracture-controlled uranium mineralization is spatially related to basal formations of the Dubawnt Group. Anomalously radioactive syenites are confined to southeastern parts of the map area. High uranium and thorium contents are due to disseminated thorite, monazite and zircon.

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Volcanic and sedimentary rocks of the Christopher Island Formation have been subjected to widespread alteration, veining and/or contact metamorphism. Base-metal mineralization (Cu, Pb-Cu and Pb-Cu-Ag-Bi-Cd-Zn) has developed in a few of the vein systems. Acid magmatic events associated with Pitz Formation volcanism and the emplacement of granite plutons may be responsible for the base-metal mineralization.

Introduction

The Tebesjuak Lake map area (65 O) contains basins filled with continental sediments and volcanics of the Paleohelikian or Late Aphebian Dubawnt Group. These rocks unconformably overlies or are in fault contact with granitoid gneisses of Archean and Aphebian ages and are intruded by syenite and granite plutons and small basic intrusions. Southern and eastern parts of 65 O were mapped at a scale of 1:250 000 during the 1979 field season (Fig. 1). Previous work in 65 O was confined to reconnaissance helicopter traverses during Operation Baker (Wright, 1955, 1967) and LeCheminant et al. (1979a) described the stratigraphy of the Dubawnt Group in two small parts of the area.

Archean and Aphebian Granitoid Gneisses

Gneisses of granodioritic to granitic composition interlayered with thin units of paragneiss and amphibolite form the basement to the Dubawnt Group. In the Nutarawit Lake area the basement consists of poorly exposed cataclastic felsic and mafic gneisses, augen granite gneiss and gneissic granite similar to rocks of the Thirty Mile domain to the northeast (LeCheminant et al., 1979b). The gneisses are intruded by diabase and younger biotite lamprophyre and syenite dykes and are transected by numerous northeasterly and northwesterly faults. Near the basal Dubawnt unconformity and adjacent to fault zones the gneisses are intensely fractured and brecciated. Chlorite, epidote, quartz and carbonate veining and alteration are prominently developed within these rocks.

Two breccia zones, interpreted as diatremes, are exposed on small islands near the southwest shore of Nutarawit Lake in 65 O/1. The zones contain angular to subrounded fragments of various gneiss lithologies, amphibolite and metadiabase, up to 2 m in diameter in a matrix of pulverized gneiss and biotite lamprophyre. A foliation, due to primary orientation of fragments, is locally developed within the lamprophyre. Both breccias are unmineralized and are similar to diatremes in 56 D/1 (Schau and Hulbert, 1977) and to a mineralized pipe in 56 D/2 (Miller, in press).

A 10-15 km wide domain of northeasterly trending granodioritic orthogneiss underlies an area north and west of 'P.O.' Lake. To the southeast the domain is in fault contact with a wedge of Dubawnt Group rocks along a northeasterly trending cataclastic zone that has been intruded by syenite. To the north and northwest the gneisses are unconformably overlain by rocks of the Dubawnt Group or are intruded by a complex suite of syenites. To the west the gneisses are intruded by the Pamiutug Granite. The gneisses consist mainly of white-weathering granodioritic orthogneiss with minor grey layered biotite-hornblende-plagioclase gneiss, biotite-(garnet)-paragneiss and amphibolite. They are intruded by feldspar porphyry and younger quartz-feldspar porphyry dykes; however dykes are significantly less numerous and lack the compositional diversity of dykes in the Nutarawit Lake area.

Isolated exposures of basement gneisses are located along the Kunwak River and on the shores of Tulemalu Lake. These

gneisses are (1) overlain unconformably by all formations of the Dubawnt Group with which they are in contact; (2) faulted against Dubawnt Group rocks; or (3) intruded by dyke-like basic intrusions and granitic plutons. The basement rocks are mainly granodioritic orthogneisses similar to the gneisses exposed near 'P.O.' Lake. East of McRae Lake gneissosity trends are consistently northwesterly with moderate northeasterly dips. Elsewhere trends are highly variable. On the western shore of Tulemalu Lake a coarse grained quartz-poor K-feldspar augen gneiss is in fault contact with rocks of the Christopher Island Formation. The gneisses are intruded by syenite dykes and small plugs and by easterly trending biotite lamprophyre dyke swarms.

Dubawnt Group

Regional Setting

Dubawnt Group rocks in the map area consist of a basal succession of sheared and altered stream-channel and fluvial deposits that are overlain by alkaline flows and volcanoclastic sediments of the Christopher Island Formation. The thick successions of volcanic rocks are succeeded by wedges of alluvial fan sediments and Pitz Formation rhyolitic lavas and pyroclastics. Stocks and plutons of syenite and granite and northeast trending dyke-like basic intrusions cut the Dubawnt Group rocks.

In the north half of the area the Dubawnt Group rocks fill part of a northeast trending structural depression, the Baker Lake

Basin, that can be traced more than 300 km from the east end of Baker Lake to Tulemalu Lake (LeCheminant et al., 1979b). Southeast of the Baker Lake Basin near Nutarawit Lake isolated fault blocks preserve basal formations of the Dubawnt Group in homoclinal successions with different attitudes.

Basal Sedimentary Successions

Successions of polymictic conglomerate and pink to grey arkose and arkosic wacke are the lower units of the Dubawnt Group within fault blocks in 65 O/1, and in the southeastern corners of 65 O/2 and 65 O/8. Sediments near the base of these successions are poorly bedded polymictic conglomerates containing subrounded clasts of grey and pink granitoid gneiss, foliated mafic rocks and quartz. Overlying arkosic rocks are well-indurated with sericite, chlorite and quartz and contain channel scours, trough crossbedded or laminar fining-upward cycles and heavy mineral laminations. The most complete section is exposed west of Nutarawit Lake where a continuous succession of conglomerate and arkose, made up in part of overlapping clastic wedges, unconformably overlies cataclastic gneisses (LeCheminant et al., 1979a).

The successions are unconformably or disconformably overlain by volcanics of the Christopher Island Formation, intruded by hornblende syenite or in fault contact with basement gneisses. They are correlated with the South Channel and Kazan formations (Donaldson, 1965) on the basis of lithology and stratigraphic position.

Isolated exposures in a zone extending from the southern limit of the map area in 65 O/2 through to the east side of 'P.O.' Lake and

northeast to the corner of 65 0/8 are intensely altered and locally deformed. The sediments are deformed in narrow zones adjacent or parallel to northeast and north trending faults. Stretch-pebble conglomerates show a range of pebble shapes due to initial shape variation and competence difference during deformation. The plane of flattening is steeply dipping and pebble elongations are parallel to adjacent faults. The major northeast trending fault zone along which these deformed sediments are preserved was the locus for later intrusions of hornblende syenite. Northwest trending faults with a predominant dip-slip component transect the northeast structures and truncate several of the sedimentary successions.

Christopher Island Formation

Alkaline flows and volcanoclastic sediments of the Christopher Island Formation comprise thick homoclinal successions which lie unconformably on or are faulted against basement gneisses and the basal clastic successions. The formation comprises mafic and felsic trachyte lavas and breccias, associated pyroclastics and volcanoclastic wackes and epiclastic breccias. Phlogopite (biotite)- and clinopyroxene-phyric mafic trachyte lavas and breccias are the dominant rock type. Pyroclastic rocks include crystal and crystal-lithic tuffs with minor agglomerates, tuff-breccias and welded tuffs. Interflow sediments are, for the most part, immature, poorly sorted volcanoclastic conglomerates and wackes that contain lithic and crystal fragments derived from the trachytes. Minor argillite and

siltstone containing desiccation features occur as thin well bedded units that, along with graded crystal-rich tuffs, provide the best stratigraphic control within the formation. Descriptions of these rocks and detailed stratigraphic sections from the Nutarawit Lake area and from fault blocks near the southwestern end of the Baker Lake Basin are presented by LeCheminant et al. (1979a). They concluded that the lavas and tuffs were erupted in a subaerial environment with cycles of volcanism beginning with vent clearing explosions followed by effusions of mafic and then felsic alkaline lavas.

The 1979 mapping confirmed that similar patterns of volcanism and sedimentation characterize the Christopher Island Formation throughout the southwestern end of the Baker Lake Basin. Homoclinal successions are exposed in fault blocks bounded by northeasterly faults that are locally truncated by northwesterly faults. Within the successions shallow northerly dips of 20-40° predominate although dips as steep as 70°, apparently related to the proximity of faults or intrusions, have been recorded. No overturned beds were encountered. Changes of bedding trends of up to 70° over distances as short as a few hundred metres in the southeastern corner of 65 O/9 and in 65 O/7 may indicate open folds, perhaps related to the emplacement of intrusive rocks. However, no minor folds were noted and many of the changes are abrupt. In most cases they probably reflect overlapping of series of units derived from different eruptive centres, changes in original bedding on the flanks of a stratovolcano complex, or local faulting.

Throughout the area the volcanics and sediments of the Christopher Island Formation have been subjected to alteration, veining and/or contact metamorphism. Whereas this alteration has rarely affected original igneous and sedimentary textures and igneous phenocrysts, the matrix of most rocks is replaced by a mat of secondary phases including quartz, chlorite, carbonates, albite, epidote, tremolite, talc and phlogopite. In mafic lavas a fibrous blue amphibole coats fracture surfaces or occurs with quartz in thin veinlets. Weakly foliated biotite and biotite-hornblende hornfels has developed adjacent to syenite, quartz syenite and fluorite-sphene-bearing granite in 65 O/8 and 65 O/9. West of Tulemalu Lake in 65 O/4 an unusual 15 m wide quartz-wollastonite vein has formed within sheared K-feldspar augen gneiss parallel to a 010° fault contact with mafic lavas and tuffaceous sediments of the Christopher Island Formation.

White vuggy quartz veins and stockworks up to 10 m wide, with minor fluorite and epidote, have developed throughout the Christopher Island Formation and some can be traced for more than 2 km. Quartz-epidote-fluorite-garnet veinlets, which may contain copper or lead-copper mineralization (see economic geology section), occur within all lithologies of the formation. They are common in the northwest corner of 65 O/3 and the southeast corner of 65 O/9 where the formation is intruded by plutons of fluorite-bearing granite.

Red Volcaniclastic Successions

Wedges of alluvial fan sediments consisting of red volcaniclastic conglomerates, lithic sandstones, siltstone and mudstone unconformably overlie the Christopher Island Formation. The successions are generally shallow dipping and poorly exposed. The sediments have a scattered distribution peripheral to the main outcrop area of the Christopher Island Formation. Clastic components for the most part are derived from the immediately underlying lavas or from basement gneiss terrane.

The most complete stratigraphic sequence is exposed south of 637' Lake. A north-south trending east dipping homoclinal succession up to 1000 m thick comprises basal conglomerates, red felsic lavas and fine grained red sediments. The basal conglomerates contain mainly feldspar trachyte clasts (maximum 30 cm) in parallel bedded units up to 2 m in thickness and are interbedded with medium to coarse grained lithic sandstones. The coarse clastics are overlain by red dacite lavas intercalated with volcaniclastic and tuffaceous sandstones and siltstones. The dacites contain small K-feldspar and plagioclase phenocrysts and apatite micro-phenocrysts set in an aphanitic quartzofeldspathic matrix. The lavas are strikingly vesicular and/or amygdaloidal with amygdules to 3 cm filled by various combinations of chlorite, epidote, quartz, chalcedony, fluorite and specularite. These lavas are unique to this sequence and have not been found in other red clastic wedges. The dacites

are conformably overlain by laminated to thin bedded mudstones, siltstones and sandstones. Minor structures within these pink, red and maroon sediments include graded bedding, desiccation cracks, reduction spots and ripple marks.

The red clastic units are interpreted primarily as stream-channel deposits with some mudflow deposits near the base of the successions. On the basis of lithology and stratigraphic position they are correlated with the Kunwak Formation (LeCheminant et al., 1979b).

Pitz Formation

Rhyolitic lavas and associated sediments of the Pitz Formation underlie northern parts of 65 O/9 and 65 O/10 and occur as isolated remnants to the southwest. They unconformably overlie basement gneisses and volcanics of the Christopher Island Formation. The distribution of red clastic successions and the Pitz Formation suggest these units may be locally separated by a slight angular unconformity, however the few observed contacts are concordant.

Exposures along the eastern shore of Tulemalu Lake and east of Kunwak River in 65 O/6 are mainly red sparsely porphyritic flow-banded rhyolite lavas and welded crystal-lithic tuffs. Mauve and purple quartz-feldspar-phyric dacites and rhyolites intercalated with rhyolite-cobble conglomerate and red sandstones are dominant lithologies in 65 O/9, 65 O/10 and west of the Kunwak River. The sequences dip gently to the north or northwest and exceed 200 m in

thickness north of 637' Lake. The large island in 463' Lake has excellent cliff exposures of sparsely porphyritic flow-banded fluorite- and topaz-bearing rhyolites 75 m thick that overlie a rhyolite-boulder conglomerate. Interflow conglomerate and sandstone lenses record mass-wasting and stream-channel activity contemporaneous with volcanism.

Pink and red conglomerates and crossbedded sandstones on the northern shore of 637' Lake resemble basal lithologies of the Thelon Formation (Donaldson, 1965) but their restricted development suggests they are interflow sediments. Poorly bedded quartz-rich grit and conglomerate in 65 O/6 tentatively correlated with the Thelon Formation (LeCheminant et al., 1979a) are similar to conglomerates intercalated with quartz-felspar-phyric rhyolites north of the Kunwak River and are therefore reassigned to the Pitz Formation.

Basalt

Limited exposures of black, amygdaloidal basalt overlie conglomerates correlated with the Kunwak Formation and lavas and sediments of the Pitz Formation. The basalt contains aligned plagioclase microphenocrysts and microlites in an altered matrix of epidote, chlorite and opaques. Pipe vesicles to 3 cm are lined with chlorite and filled by epidote and calcite. North of 637' Lake the basalt is intercalated with thinly laminated green siltstone and has a maximum observed thickness of 10 m. Here the basalt fills

low-lying areas south of ridge-forming Pitz Formation lavas whereas east of 710' Lake it caps hills. A similar thin basalt unit, also extruded over an irregular surface, unconformably overlies Thelon Formation sandstone southwest of Lookout Point on the Thelon River (Donaldson, 1969). Basalt has not previously been reported from the Dubawnt Group within the Baker Lake Basin.

Intrusive Rocks

Syenite

Stocks and composite plutons of fine to coarse grained red syenites occur in 65 O/1, 65 O/2 and 65 O/8. They have intruded along both the northwest and southeast contacts of the Christopher Island Formation and the orthogneiss domain north and west of 'P.O.' Lake. Most have sharp intrusive contacts although reactivation along northeasterly faults has locally resulted in sheared and foliated marginal phases. A strong northeasterly foliation has developed in a fine-to medium-grained hornblende syenite on the south boundary of 65 O/2 that is intruded by porphyritic pink granite to the east and the Pamiutuq Granite to the west.

Syenites along the southern boundary of the Baker Lake Basin in 65 O/2 and 65 O/8 range from very coarse grained syenite stocks to microsyenite dykes. Anomalous radioactivity within some of these bodies is discussed briefly in the economic geology section. An irregular-shaped composite pluton underlies more than 150 km² in the central part of 65 O/8. The poorly exposed intrusion consists of fine-to medium-grained hornblende and biotite-hornblende syenite and

northeastern parts contain quartz-bearing phases. Quartz-feldspar porphyry dykes intrude the syenite complex.

Granite

Granite stocks and plutons that postdate the Christopher Island Formation have been subdivided into five units based on texture, accessory minerals and contact relations. Plutons of massive equigranular to porphyritic pink granite that intrude basement gneisses and syenites in 65 O/1 and 65 O/2 are similar to plutons exposed near Forde Lake (LeCheminant et al., 1979b) and resemble variants of the rapakivi granites that underlie large areas west of Tulemalu Lake. Two stocks of miarolitic fluorite-bearing alkali-feldspar granite intrude the Christopher Island Formation and the overlying red clastic successions in 65 O/2 and 65 O/7.

A stock of porphyritic biotite-hornblende granite, containing fluorite and rich in accessory sphene, intrudes mafic lavas and biotite-rich tuffs of the Christopher Island Formation in the northeast corner of 65 O/8. The stock has syenitic border phases and probably is part of a composite syenitic-granitic intrusion exposed to the northeast in 65 P/12 (LeCheminant et al., 1979b). Border phases resemble quartz-bearing variants of the syenite intrusion exposed to the southwest. All rocks within the intrusion have an anomalous radiometric signature and contact aureoles are locally mineralized (see economic geology section).

The Pamiutuq Granite, a large circular pluton, underlies approximately 700 km² east of Tulemalu Lake, and is in sharp

intrusive contact with all surrounding rock types. The main phase of the pluton is homogeneous and contains perthitic orthoclase, plagioclase and rimmed quartz phenocrysts set in a fine grained micrographic matrix. Mafic minerals are clinopyroxene, amphibole and chloritized biotite. A high proportion of plagioclase, both in phenocrysts and in perthite, places this main phase in the granite-B field of the IUGS classification scheme (Streckeisen, 1973), whereas other granites in the area typically fall within the granite-A or rarely the alkali-feldspar granite fields. Xenoliths are common throughout the pluton and consist predominantly of granitoid gneiss, mafic hornblende syenite and a plagioclase porphyritic fine grained mafic rock that has no known analogous lithology adjacent to the intrusion. Plagioclase megacrysts to 5 cm are sparsely distributed.

A purple porphyritic phase with a very fine grained to aphanitic matrix forms a narrow chill margin along most contacts except on the west side where the pluton is in contact with flow-banded rhyolites of the Pitz Formation. Here the purple phase is a wide unit that in part appears to overlie the main phase. Sharp intrusive contacts exist between purple porphyry and rhyolite although at one location an apparent gradational contact between rhyolite and porphyry was observed.

Several stocks of fine grained red equigranular granite intrude the main phase of the pluton. These more potassic granites are irregular in shape and are associated with compositionally and

texturally similar aplite dykes that are concentrated within southern and western parts of the pluton. Quartz-feldspar porphyry dykes intrude all phases of the pluton.

Granite plutons west of Tulemalu Lake and the Kunwak River intrude granitoid gneisses and volcanic rocks of the Christopher Island Formation. The largest of these plutons exceeds 1000 km² and underlies a large part of 65 O/4, the northwest corner of 65 J (Eade and Blake, 1977) and the northeast corner of 65 K (Eade, pers. comm., 1979). This pluton is a coarse grained rapakivi granite characterized by K-feldspar ovoids (2-6 cm) mantled by plagioclase. Mantled and unmantled K-feldspar phenocrysts occur together. Within the ovoids concentric patterns of quartz and biotite inclusions are common and repetition of mantling can occur. Typical accessory minerals are biotite, hornblende, fluorite, and zircon. Rapakivi granite grades into variants that contain only unmantled phenocrysts and rarely grades into fine- to medium-grained equigranular granite. These latter variants are the predominant rock type of smaller plutons that underlie areas of 65 O/3 and 65 O/6. Mantled phenocrysts, where present, are smaller (0.5-2 cm) and less abundant than within the main pluton. The smaller plutons are circular to multilobate in plan and are separated by Christopher Island volcanic rocks and granitoid gneiss. Intrusive contacts are sharp and discordant. The granites lack foliation and in sharp contrast to the Pamiutuq Granite they contain no xenoliths.

Quartz-feldspar porphyry dykes, irregular in shape and trend, ranging up to 50 m in width intrude all formations of the Dubawnt Group in southwestern parts of the Baker Lake Basin. The porphyry contains abundant phenocrysts of ovoid K-feldspar, which may be mantled, and round quartz eyes set in a dark reddish grey matrix. The dykes intrude the syenite suite, miarolitic fluorite granites and the Pamiutuq Granite. Mantled phenocrysts and absence of xenoliths suggests they are comagmatic with the rapakivi granites and are not a late phase of the Pamiutuq Granite as proposed by LeCheminant et al. (1979a).

Basic Intrusions

A 045° trending dyke-like intrusion of spectacular porphyritic leucogabbro in 65 O/7 intrudes flows and sediments of the Christopher Island Formation and a northeasterly fault zone between basement gneisses and the Christopher Island Formation. The dyke has been traced for almost 20 km and ranges in width from 0.5-5.5 km. The grey to greenish-grey leucogabbro contains up to 70% closely packed, aligned labradorite laths (0.5-2 cm with megacrysts to 8 cm) with interstitial clinopyroxene, magnetite-ilmenite and apatite. Thin sections show pale green amphibole rimming clinopyroxene, skeletal apatite needles to 4 mm and minor interstitial micrographic alkali-feldspar and quartz. Alteration consists of patches of epidote, chlorite and prehnite. The leucogabbro is homogeneous in texture and composition throughout the intrusion. Plagioclase phenocrysts and megacrysts are strongly

aligned subparallel to contacts and only interstitial phases show chill effects at the margin of the intrusion. Unusually high concentrations of magnetite-ilmenite (3-5%) and apatite (1%) suggest the intrusion is rich in FeO, TiO₂ and P₂O₅. It appears to have formed as the result of a single injection of a plagioclase-rich crystal mush. The leucogabbro is cut by a quartz-feldspar porphyry dyke of the swarm that is thought to be comagmatic with the rapakivi granites.

A composite gabbroic dyke, here named the McRae Lake dyke, intrudes rhyolite flows of the Pitz Formation and granodiorite gneiss in 65 O/10. The 035° trending dyke has been mapped for 14 km east of McRae Lake where it widens from 450 m in the southwest to 18 km in the northeast. In Figure 1 the dyke is shown to extend another 9 km to the southwest of McRae Lake on the basis of a reconnaissance helicopter traverse and the continuity of a pronounced aeromagnetic high. To the northeast the dyke is truncated by a 150° fault. A probable continuation of the dyke to the north is shown in Figure 1 as a dash-dot line which traces a well-defined but narrower aeromagnetic anomaly. No outcrop of the dyke was encountered northeast of the fault.

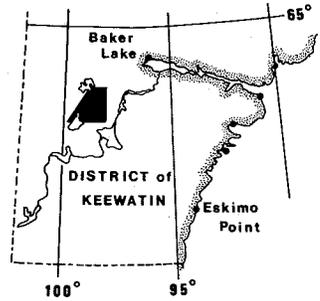
The dyke is a composite intrusion consisting of a medium grained grey-green gabbroic phase that is intruded by the major phase, a brick red, pink to grey glomeroporphyritic quartz monzodiorite. The gabbroic phase contains labradorite and clinopyroxene with accessory biotite, amphibole, magnetite-ilmenite, apatite and up to



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HELIKIAN AND LATE APHEBIAN

- DIABASE
- McRAE LAKE DYKE
- PORPHYRITIC LEUCOGABBRO
- RAPAKIVI GRANITE
- PAMIUTUQ GRANITE: MAIN PHASE/PURPLE PORPHYRY/FINE-GRAINED, POTASSIC
- GRANITE: MIAROLITIC, FLUORITE-BEARING
- GRANITE AND QUARTZ SYENITE; PORPHYRITIC, SPHENE AND FLUORITE-BEARING
- GRANITE: EQUIGRANULAR TO PORPHYRITIC
- SYENITE: FINE-TO COARSE-GRAINED; INCLUDES FOLIATED HORNBLENDE SYENITE



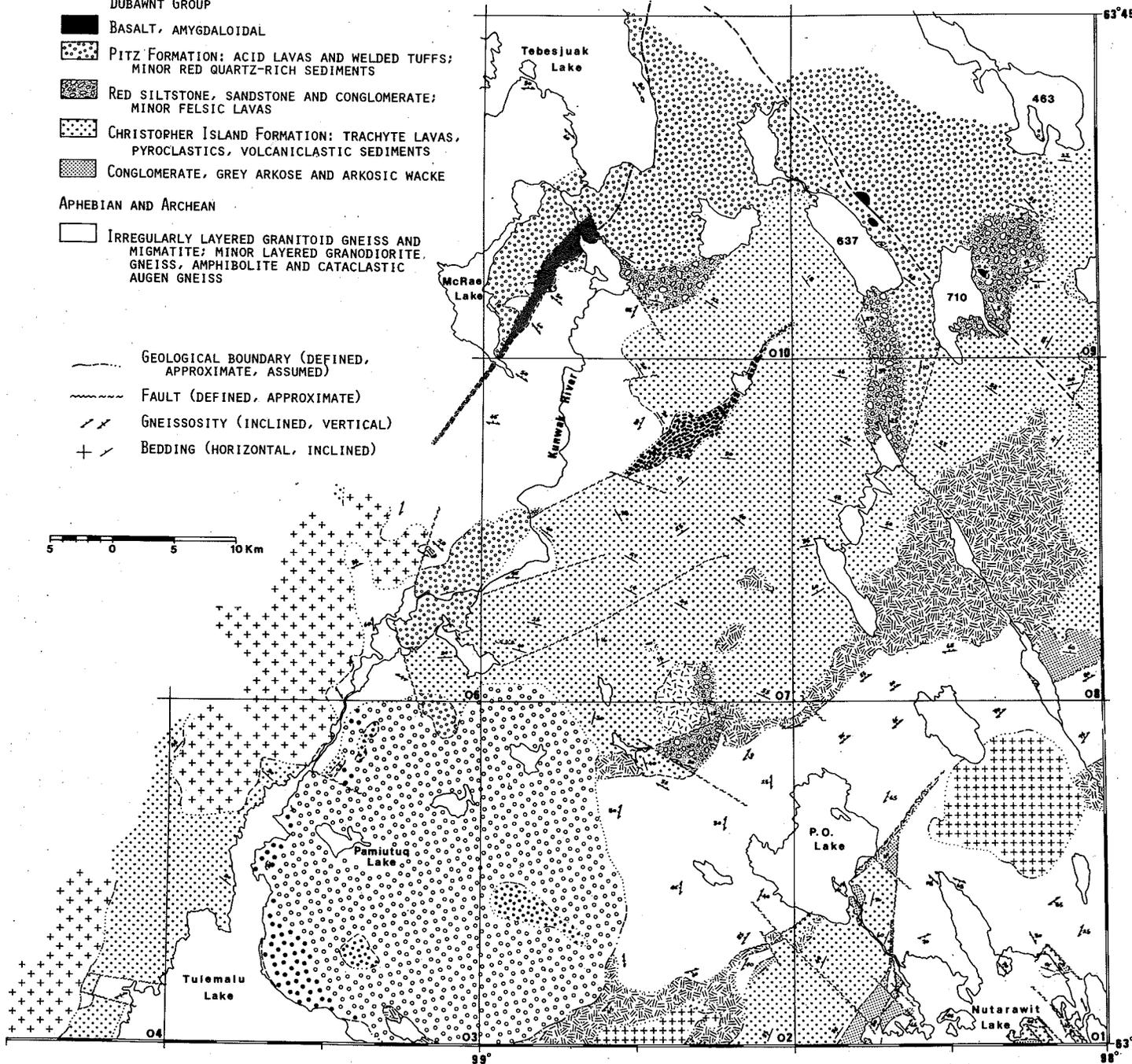
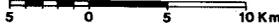
DUBAWNT GROUP

- BASALT, AMYGDALOIDAL
- PITZ FORMATION: ACID LAVAS AND WELDED TUFFS; MINOR RED QUARTZ-RICH SEDIMENTS
- RED SILTSTONE, SANDSTONE AND CONGLOMERATE; MINOR FELSIC LAVAS
- CHRISTOPHER ISLAND FORMATION: TRACHYTE LAVAS, PYROCLASTICS, VOLCANICLASTIC SEDIMENTS
- CONGLOMERATE, GREY ARKOSE AND ARKOSIC WACKE

APHEBIAN AND ARCHEAN

- IRREGULARLY LAYERED GRANITOID GNEISS AND MIGMATITE; MINOR LAYERED GRANODIORITE, GNEISS, AMPHIBOLITE AND CATACLASTIC AUGEN GNEISS

- GEOLOGICAL BOUNDARY (DEFINED, APPROXIMATE, ASSUMED)
- FAULT (DEFINED, APPROXIMATE)
- GNEISSOSITY (INCLINED, VERTICAL)
- BEDDING (HORIZONTAL, INCLINED)



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Figure 1. Simplified geological map of southeastern parts of the Tebesjuak Lake (65 O) map area.

3% micrographic alkalifeldspar and quartz. The main phase is leucocratic with plagioclase phenocrysts to 1 cm, often in clusters, set in a fine grained micrographic matrix. Accessory mafic minerals are amphibole and biotite. Xenoliths of country rock and rimmed quartz eyes (xenocrysts?) are common near the northwest end of the dyke. The gabbroic phase ranges in width from 100-200 m and is chilled against country rocks along either the west or the east side of the dyke. The main phase has sharp intrusive contacts both with country rocks and the gabbroic phase.

A major 130° to 140° trending diabase dyke has been traced from 65 O/10 through to the northeast corner of 65 O/8. The dyke has vertical contacts and is 100 m thick north of 637' Lake. Contacts against Pitz Formation lavas have a 2-3 cm aphanitic chill margin containing plagioclase and clinopyroxene microphenocrysts. This glassy margin passes into a transitional chill zone up to one metre wide that contains aligned plagioclase microlites. Microlites increase in size and number across the transitional zone towards the interior of the dyke. The central phase of the dyke is a medium-to coarse-grained gabbro or quartz gabbro. The continuity of the dyke is confirmed northwest of 710' Lake by a prominent aeromagnetic anomaly. Southeast of 710' Lake the dyke is 35 m thick and thins to only 3 m in 65 O/8.

Economic Geology

Table 1 lists uranium and base metal occurrences located during 1979 mapping in 65 O and western parts of 65 P. Research

Table 1 Uranium and base metal mineralization in 65 O and 65 P

Location	Map Sheet	Host Rock	Element Association	Ore Minerals	Secondary Minerals	Gangue Minerals	Brief description (* additional comments in text)
1. 545300 E (98°06'27") 6985800N (63°00'08")	65 O/1 SE	Volcaniclastic wacke Christopher Island Fm.	U	pitchblende	present	chlorite	Fracture 140cm by 0.5cm parallel to adjacent NW fault
2. 548450 E (98°02'42") 6986600N (63°00'30")	65 O/1 SE	Granitoid gneiss	U-Cu	pitchblende chalcopyrite	none observed	calcite pyrite hematite	*Anomalous zone approximately 150m NW by 60m NE within microfractured gneiss in fault contact with Christopher Island Fm. volcaniclastic sediments
3. 534300 E (98°19'39") 6987800N (63°01'14")	65 O/1 SW	Granitoid gneiss	U	pitchblende	present	hematite chlorite	Veinlet 3m by 1cm in chloritic gneiss, 60m from basal Dubawnt Group unconformity
4. 549300 E (98°01'12") 7013300N (63°14'52")	65 O/1 NE	Paragneiss	U	pitchblende	present	chlorite hematite	Discontinuous mineralization 4m by 1-2cm in epidote-chlorite-biotite paragneiss band in granodiorite gneiss
5. 528500 E (98°25'39") 7025500N (63°21'37")	65 O/8 SW	Mafic trachyte lava Christopher Island Fm.	U	pitchblende	present	quartz calcite chlorite	Trachyte lavas and breccias intruded by feldspar porphyry dykes, cross-cutting quartz stockworks, mineralization in tight fractures
6. 546650 E (98°04'03") 7029400N (63°23'35")	65 O/8 NE	Fluorite-sphene- biotite quartz syenite	U-Cu	pitchblende chalcopyrite	cuprosklod- owskite	quartz	*Veinlet 3m by 2-3cm in marginal phase of a syenite intrusion; limited exposure
7. 554650 E (97°54'00") 7036000N (63°27'02")	65 P/5 NW	Mafic trachyte lava Christopher Island Fm.	U-Pb	pitchblende galena	boltwoodite	chlorite hematite	*Mafic lavas intruded by quartz-fluorite bearing feldspar porphyry dykes. Mineralization in several discontinuous 0.5-1cm wide veinlets
8. 483100 E (99°20'06") 7006500N (63°11'25")	65 O/3 NW	Mafic trachytes and volcaniclastic wackes Christopher Island Fm.	Cu	digenite? bornite covellite chalcopyrite	malachite azurite brochantite	garnet epidote calcite quartz	*Discontinuous veins up to 10cm wide of massive and disseminated sulphides
9. 517300 E (98°39'09") 7040700N (63°29'54")	65 O/7 NE	Mafic trachyte lavas Christopher Island Fm.	Pb-Cu- Ag-Bi- Cd-Zn- U	galena chalcopyrite bornite digenite? covellite sphalerite greenockite pitchblende	malachite azurite anglesite kasolite	quartz Sr-barite barite fluorite magnetite chlorite sphene K-Mg mica?	*Intersecting 070° and 110° vein systems; massive and disseminated sulphides with related alteration developed in trachyte lavas; crosscut by fluorite-quartz-pitchblende veins
10. 530600 E (98°22'57") 7045700N (63°32'30")	65 O/9 SW	Mafic trachyte lavas Christopher Island Fm.	Pb-Cu	Galena	malachite azurite	quartz calcite specularite	Disseminated sulphide in vuggy quartz vein system

is continuing to augment the interim assemblage data reported in this table.

Most uranium occurrences listed in Table 1 are small zones of limited mineralization and/or exposure that are spatially related to basal formations of the Dubawnt Group. They are similar to other occurrences of epigenetic fracture-controlled mineralization within and adjacent to the Baker Lake Basin (Miller, 1979; in press). Occurrences 1 and 2 are associated with fracture zones adjacent to northwest faults. The host granitic gneiss at occurrence 2 is intensely fractured and hematized and contains disseminated pyrite and epidote-chlorite veins. A frost-shattered area of 150 m by 60 m has anomalous radioactivity and contains a few discontinuous tight pitchblende-bearing fractures up to 15 cm long by 1-2 mm wide and minor quartz-pink calcite-chalcopyrite veinlets.

Chalcopyrite-pitchblende mineralization at occurrence 6 is hosted in a medium grained quartz syenite containing accessory purple fluorite, euhedral sphene and magnetite. At occurrence 7, contact metamorphosed lavas of the Christopher Island Formation are intruded by quartz-fluorite-bearing feldspar porphyry dykes. Irregular, discontinuous pitchblende veinlets up to 1 cm in width occur in the altered lavas. The occurrence is located within the thermal aureole of a composite syenite-granite pluton that is exposed north of the mineralized zone. Occurrences 6 and 7 appear to be genetically related to syenitic-granitic intrusions and are similar to contact aureole U-Cu mineralization in 65 P/12 (LeCheminant et al., 1979b).

Syngenetic thorium-uranium mineralization within northwest trending bostonitic dykes and small stocks of syenite in southeastern parts of the map area have been discussed by Miller (1979) and Beaudry (1979). Anomalously radioactive syenites intrude basement gneisses near Nutarawit Lake and Dubawnt Group rocks in 65 O/1 and along the southern margin of the Baker Lake Basin in 65 O/2 and 65 O/8. The leucocratic fine to medium grained syenites are characterized by a pink to cherry red colour and aligned alkali feldspar laths. High uranium and thorium contents are due to disseminated thorite, monazite and zircon (variety cyrtolite). Some bostonite dykes contain disseminated sulphides and/or discontinuous thin fractures that are coated with assemblages that include pyrite, chalcopyrite, bornite, galena, molybdenite and sooty pitchblende.

Occurrences 8-10 represent base metal mineralization that has developed in vein systems within the Christopher Island Formation. Several smaller occurrences of malachite or chalcopyrite in quartz-epidote-fluorite-garnet veinlets have not been tabulated. Occurrence 8 consists of east to northeast trending discontinuous veins up to 10 cm in width that cut biotite trachyte lavas and intercalated volcanoclastic wackes. The veins contain bornite-chalcopyrite and bornite-digenite(?) intergrowths partly replaced by covellite with a gangue assemblage of garnet, epidote, calcite and quartz. The mineralized zone lies approximately one kilometre east of a contact between Christopher Island Formation lavas and rapakivi granite. This occurrence was previously investigated in 1966 and 1967 by Hudson Bay Exploration and Development Co. Ltd. (Caine et al., 1979).

Sulphide mineralization at occurrence 9 is located at the intersection of 070° and 110° trending quartz vein systems and is hosted in altered mafic trachyte lavas and breccias of the Christopher Island Formation. Pb-Cu-Ag mineralization is exposed within a 20 m by 7 m outcrop that contains a heavily mineralized 6 m by 4 m zone. Sulphide-rich veins and pods up to .5 m in width and 4 m long contain more than 90% sulphides, primarily galena, bornite with exsolved chalcopyrite-digenite(?), and chalcopyrite. Trace sulphides include sphalerite (ZnS with a trace of Cd), greenockite (CdS with a trace Zn), and minor covellite replacing chalcopyrite, bornite and greenockite. The gangue assemblage is quartz, fluorite, chlorite, sphene, magnetite, a K-Mg-Al-Si phyllosilicate and barite (two varieties - one Sr-bearing). This mineralogy was determined by ore microscopy, powder X-ray diffraction data and preliminary energy dispersive electron microprobe study. Two analyses of the massive sulphides are listed in Table 2. The elements Pb, Cu, Fe, Cd, and Zn are accounted for by the above mineralogy; however, to date no Ag- or Bi-bearing phases have been identified.

Southern and western sides of the main mineralized outcrop contain carbonate-quartz-purple fluorite stockworks that are younger than the sulphide-rich veins. Fractures within these stockworks are anomalously radioactive and contain disseminated pitchblende. Disseminated Pb-Cu mineralization occurs up to 40 m west of the main zone in intensely altered mafic trachytes that are completely replaced

Table 2. Geochemical analyses' (ppm) of a massive sulphide pod from a vein in trachytes of the Christopher Island Formation (occurrence 9, Table 1)

	1	2
Pb (%)	60.8*	64.8*
Cu (%)	5.18*	4.72*
Fe (%)	2.70	3.25
Ag	332** (10.64 oz/ton)	51** (1.64 oz/ton)
Bi	300	343
Cd	175	175
Zn	80	145
Se	50	52
Mn	74	38
Ni	9	6
Co	4	3
Mo	2	2
Sb	11	1
As	N.D.	N.D.
Te	N.D.	N.D.
Au (ppb)	<5	10

' Bondar-Clegg & Co. Ltd., Ottawa.
 * Assay
 ** Fire assay (confirms similar atomic absorption results)
 N.D. = Not detected

by mica-chlorite-albite assemblages with variable proportions of quartz, fluorite, magnetite, galena, chalcopyrite, bornite and pyrite.

The 070° vein system consists of quartz stockworks and veins up to 15 m wide that can be traced discontinuously for 350 m ENE and 750 m WSW of the mineralized zone. The 110° system contains quartz stockworks up to 5 m wide and is expressed as a 10-20 m wide topographic linear that extends 350 m ESE and 1900 m WNW of the intersection of the two systems. Veins up to 10 cm wide containing galena, bornite and/or chalcopyrite are erratically distributed along the limbs of the vein systems up to 750 m from the main mineralized zone. These occurrences are associated with purple fluorite and have developed within altered trachytes adjacent to barren quartz stockworks.

A red quartz-eye porphyry dyke has intruded along the ESE limb of the 110° vein system. This dyke is rich in purple fluorite and disseminated sulphides (mainly pyrite). The dyke rock closely resembles sparsely porphyritic fluorite-bearing rhyolite lavas of the Pitz Formation and sulphide-fluorite-bearing chill margins of miarolitic granite stocks in 65 O/2 and 65 O/7. Acid magmatism and associated fluorine- and sulphur-bearing hydrothermal systems are probably responsible for the base metal vein mineralization. Subaerial alkaline flows of the Christopher Island Formation are notably deficient in both sulphur and fluorine.

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