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NORTHWESTERN EXPLORATIONS, LIMITED

Report on

KINSKUCH COPPER PROSPECT

Skeena M.D., B.C.

by

C. S. Ney

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KINSKUCH COPPER PROSPECT

Skeena M.D., B.C.

SUMMARY AND CONCLUSIONS

The Kinskuch Copper Prospect, located at latitude 55°39' N, longitude 129°22' W, in the Alice Arm District, B.C., was acquired by Northwestern Explorations, Limited in September 1955. Preliminary work done in the fall of 1955 is discussed in a report dated January 20, 1956. Results of diamond drilling and geological mapping during the summer of 1956 form the subject of the present report.

The mineralized area is 11 miles east of the main belt of Coast Intrusives, in a thick fragmental upper member of the Hazelton Volcanic Group. The volcanic pile is tilted regionally eastward to an average angle of forty degrees. Intercalated sedimentary members show considerable folding, but on the whole, deformation of the area is simple and of moderate intensity.

Copper deposits are found in a segment of an aureole of chloritized rock about a mile and one-half in diameter. This aureole is spatially related to a body of intrusive albite-diorite. All the known diorite is slightly chloritized. The margins of the intrusive, and certain areas of the intruded rocks are strongly chloritized. Sericite is present locally in the aureole and predominates as a mappable zone in one particular area.

Field evidence points to a high background copper content in the diorite and the chloritized rocks. Superposed structures have readily permitted concentration. Two separate areas are of economic interest. In the first (No. 2 Area) mineralization is in chloritized rocks which may have been derived almost entirely from the diorite. Concentration of chalcopyrite into pyritic veinlets in a body of near economic size and grade resulted from a favourable structural environment in which a large number of fractures were formed, also to a critical location of the area in relation to the shape of the diorite. The extent of the deposit is limited partly

by the floor of Kinskuch Lake, partly by the shape of the diorite. Fairly thorough testing of the zone indicates about 1.3 million tons with a grade of 0.49% Cu. In the second area (Hole 12 Area) the recognizable diorite is 800 feet below the showings, and much of the chloritized host rock was no doubt derived from the intruded formation. Chalcopyrite is found in a variety of veinlets and structures but is characteristically finely distributed in minutely fractured ground. Localized blocks of ground may attain a grade of 0.50% Cu or better. In a block of commercially desirable size, the grade would be no more than 0.30% Cu. The testing of this zone is very incomplete. From the information available a tonnage figure of 1.3 million with a grade of 0.30% Cu is considered probable. A sixfold increase in this tonnage at the same grade is considered very possible. Mineralization of the same general character is found intermittently in a northwest trending zone for about 4000 feet.

The aureole of chloritization must extend well beyond the exposed limits. It is almost certain that mineralized regions comparable to those now exposed will occur within it. There is an even chance that deposits of better size and grade will occur. Exploration beyond the limits now reached would be prohibitively expensive unless targets of good probability can be set up by geophysical techniques or by precise geological inference.

INTRODUCTION

The Kinskuch Copper Prospect was submitted by G. Piva of Alice Arm, B.C. to D. A. Barr of Northwestern Explorations, Limited and examined August 20 - 26, 1955 by C. S. Ney. Favourable conditions for economic mineralization were found to exist. Option agreements were reached with G. Piva for ten claims and with W. McLean and associates for eight adjoining claims. A short program of testing with a Packsack Drill, executed in the fall of 1955, gave results encouraging enough to warrant a modest drilling program in 1956. The option was relinquished December 31, 1956.

The area is about thirteen air miles north-northeast of the village of Alice Arm, B.C., in the Skeena Mining Division, centering on the coordinates 55°39' North, 129°22' West.

A report by the present writer dated January 20, 1956 summarizes the work done in 1955, and contains brief notes on access, climate, power, etc. Additional remarks on these subjects are included in Appendices to the present report.

1956 PROGRAM

Camp was set up at Kinskuch Lake May 16 and occupied until October 9. Drilling of the known showings was the initial object of the program. Late in June 1956, C.J. Sullivan advocated a more extensive drilling program to explore possibilities suggested by the pattern of alteration. This phase of the work was largely unsuccessful because technical difficulties added greatly to the cost of drilling and reduced the speed to an inexorably low value. The available season and finances were consumed while only a small portion of the desired drill footage was obtained.

Geological mapping and prospecting were carried out concurrently over an area about eight by six miles centred on the showings. With the aid of a helicopter, reconnaissance prospecting was conducted over a narrow strip of country extending fifteen miles south to thirty miles

north of the property. A brief study was made of properties and geological conditions in the Copper Belt area west of Kitsault River. Separate reports have been submitted on three properties in this area (Ouray, Copper Cliff, and Vanguard).

Drilling of AX holes was contracted to T. Connors Limited. Packsack drilling was done by Northwestern Explorations with C. Creamer, R. Wright, and H. Withers operating the device. The mapping and prospecting was done by C. S. Ney, R. Gale, C. Creamer, and R. Wright. Gale was employed as a senior geologist and is responsible for much of the 400-scale map and a large portion of the 1000-scale map. He has a Master's thesis in course of preparation which should contribute much to our knowledge of the petrology and structure of the area.

Excellent base maps were provided by Photographic Survey Corporation on scales of 400 and 1000 feet to the inch. The 400 scale (Map 2) includes all the showings and most of the area held by claims. Geology was placed on this mostly by inspection, with little additional surveying required. Mapping is fairly complete except south and southwest of the lake. The 1000 scale map originally covered an area from Kitsault Valley on the west to Lavender Mountain on the east, and from three miles south to five miles north of the property. In this report, Map 1 includes a two mile wide strip added on the east and rejects a strip along the west. Geology was mapped by pace-compass traverses and by photographic location. Two small areas are mapped on 40 scale. One includes the principal showings of Gunn Fiva (Map 3, No. 2 Area), the other covers the showings of W. McLean (Map 3B, Hole 12 Area).

DIAMOND DRILLING

Packsack Drilling:

Packsack drilling in 1956 totalled 964 feet in eleven completed holes. Most of the holes are located in the No. 2 Area, and are shallow holes designed to fill out the pattern begun in 1955 for sampling the showing. They are indicated in the plan (Map 3A) and sections of the area and require no further comment here.

Holes numbered P.S. 9 and 10 are shown on the 400 scale plan. They were drilled for assessment purposes. Hole 10 gave some interesting information on a small surface showing.

Hole 18, on the Owl claims, was also for assessment work, and disclosed nothing of interest,

Hole 19 was a pilot hole to test the ground for AX hole No. 14, as there was some doubt as to whether the site was actually on outcrop.

AX Drilling:

A total footage of 6298 feet was drilled in fourteen holes, one of which was abandoned at shallow depth.

Holes 1-4, 6, 8, 9, and 11 are all in the No. 2 Area and are illustrated in plan and sections along with the relevant P.S. holes. Nos. 1 - 4, 6, and P.S. No. 16 provide a fairly complete section ('A') of the better part of No. 2 showing. Holes 8, 9, and P.S. 6, 17 make up section 'B' 300 feet southeast of 'A'. Hole 11 was an attempt to trace the mineralization to the northwest. The target is poor because of limitations imposed by the lake in positioning the hole. These holes went quite well technically, with good recovery and fair drilling speed. Hole 11 gave trouble in the last 100 feet and was abandoned 100 feet short of it's projected length.

Holes 5, 7, 10 and 12 are shown on the plan of Hole 12 Area. The first two were designed to explore the McLean showings which extend northwesterly from the glacier in the region 11,600 N - 14,500 E. Hole 5 was abandoned in favour of a steeper hole, No. 7. Hole 10 attempted to cross the mineralized zone 400 feet north of the 5 and 7 section, and several hundred feet lower. No drilling progress could be made because of caving and mudding of the barrel. The hole was planned for 1500 feet and abandoned at 120 feet. Hole 12 was a compromise, drilled vertical to reduce caving, with no specific target but a general exploration of the pyrite-sericite alteration zone. Slow drilling and poor recovery

prevailed to 280 feet, then quite suddenly the ground improved and gave excellent drilling.

Hole 13 and 14 are purely prospect holes to get information on the central overburden covered area. No. 13 reached the limit of the machine at 615 feet. No. 14 was stopped prematurely because of poor drilling and the lateness of the season.

STRATIGRAPHY AND LITHOLOGY

All the volcanic and sedimentary rocks of the area have been classed as the Hazelton Group by Hanson (Geological Survey of Canada, Memoir 175, 1935) and they are assigned a broad Jurassic dating.

The structure over most of map 1 is an east-dipping homocline, so that the formations from west to east constitute a stratigraphic column from oldest to youngest. The sediment belt in the west and southwest portions of the map is the oldest formation. It is overlain conformably by basic volcanics characterized by augite porphyry flows, breccias, and minor tuffs. This formation is about 4000 feet thick in the area southwest of the lake, thinner and more tuffaceous in the region of 17,000 north, and it appears to be thickening in the northwest corner of the map-area.

In the region 5000 E - 25,000 N, the augite porphyry is overlain by two sedimentary members, each 800 - 1000 feet thick separated by a member 1000 - 1500 feet thick composed of agglomerate of intermediate composition. The sedimentary members die out to the south, and on the ridge above Dak river the augite-porphyry passes directly into the overlying agglomerates.

The succeeding formation is characteristically agglomerate of felsic composition. The subangular fragments composing it range up to several feet in size. The majority of them are feldspar porphyries, and in the field would be classed between rhyolite and andesite. Augite porphyry fragments were noted at a few points low in the formation. Hornblende porphyries were noted high in the formation, principally on Lavender Peak. The matrix is usually a progression of finer

material of similar composition. Over thicknesses of several hundred feet there may be no discernable sorting or stratification. The color of the rock is either gray or purple, and varies locally with no formational consistency. The purple types are concentrated more in the upper third of the formation. With the agglomerates are thick massive sections without fragments, i.e., just close-packed feldspars, often with trachitic structure. These were mapped as massive crystal tuffs, but microscopic examination did not support this interpretation. They may be flows, but the gradual appearance of fragments and passage into agglomerate is then difficult to explain. Thin intercalations of tuff are scattered through the formation without continuity. The proportion of fine ash and the degree of stratification both appear to increase regionally to the northwest. There is a narrow band of true sediment in the formation exposed on the lake shore at 22,000 N. What may be fragments of this band are seen a mile south, and may include the tuffs at 13,800 E-11200 N. The thickness of the formation, measured along the ridge above Oak River and into the head of Lahte Creek, totals about 11,000 feet.

East of Lavender Peak, stratification increases and we can define a formation 4000 feet in thickness which consists mainly of purplish bedded tuffs, with some agglomerate, some true sediments, and some transitional types between agglomerate and conglomerate. This formation appears to thicken both north and south from Lavender Mountain area.

Due east of Lavender Mountain and above the purple tuffs there is a recurrence of felsic agglomerate, felspathic tuff, and feldspar porphyry flows. Attitudes in this are varied, and are predominantly west dipping, so the location of the formation in the column is not certain. It is cut off by a fault at 20,000 N, and it does not appear to continue south of 8000 N.

East of the map-area, marine sediments overlie the volcanics and extend eastward for several miles. The contact has not been well examined. The purple tuff formation suggests a gradual cessation of volcanism while sea level was gaining on the volcanic pile. The contact has a constant trend as far north as Meziadin Lake. Where it crosses Del Norte and Willoughby valleys there is good evidence of associated faulting in the contortion of the sediments and alteration along the boundary.

INTRUSIVES

Basic Dykes:

The youngest intrusives in the area are basic dykes a few inches to thirty feet wide. They have a prevalent northeast to east strike. At least two age groups are represented. East of No. 2 Area a prominent fault fracture carries a basic dyke which is strongly carbonate altered and slightly sheared. The same fracture carries a younger fresh basaltic dyke alongside the older. A basic dyke at 10,500 E-9600 N is almost obliterated by carbonate alteration for 200 feet of its course. Further south this same dyke is cut by chalcopyrite-bearing vein matter.

A deformed basic dyke and associated sill-like mass at the head of Dak River is thought to be much older, and probably a feeder to the augite porphyry flows.

Felsite:

A number of small irregular bodies of sericite-rich felsite are exposed on the face of Lavender Mountain above Hole 12 area. Similar bodies occur on the ridge between Lahte Creek and Dak River. They are thought to be metasomatic phenomena rather than true dykes.

Feldspar Porphyry:

Feldspar porphyry dykes, sometimes containing hornblende, are numerous regionally. The prevailing trend is west-northwest. One large dyke on the south shore has an apparent continuation on the northwest shore. The large body shown at the south end of Map 1 is sill-like and may be either a sill or flow.

Hornblende Porphyry:

Hornblende porphyries are characterized by clear cut hornblende phenocrysts up to centimeter long set in a felsitic groundmass. Pyrite is a common accessory. Dyke-like

bodies are very irregular. Contacts are sharp but not chilled. They are very numerous in the sediments of the deformed belt west of the lake. One mass here is over 300 feet wide. A few of them are found on the east side of the lake, and in Hole 14. Hole 14 contains considerable intrusive which was thought to be gradational between hornblende porphyry and diorite.

Diorite:

Diorite is a term which has been used somewhat loosely in the drill logs and mapping. Originally the outcrop at 11,000 E - 8000 N was considered to be intrusive, because of its fresh granitoid appearance. In 1956 it became impossible to separate this particular body from large areas of rock on the south shore of the lake, to the east of No. 2 area, and in the drill holes, which exhibit similar texture but a greater degree of alteration. Petrographic work by Gale shows that the rock from the original outcrop is an augite quartz diorite, and is the least altered of any of the diorite specimens examined. All others examined by Gale and by Salt Lake Laboratory show much sericitization of the feldspar and chloritization of the mafics.

The external relations of the diorite are masked by alteration, and no unquestionable intrusive contact has ever been found. In the holes of No. 2 area, and in hole 12, there is a gradation from fine-grained and chlorite-mottled rocks to diorite. In the vicinity of 12,000 E - 10,000 N there are irregular areas of chloritic rock resembling fragmentals disposed in a background of dioritic rock. It was never clear to the writer whether these were older rocks engulfed in diorite or alteration effects superimposed on the dio rite. The former explanation is the most logical. In drill section A, the diorite contains several dark fine-grained bands, sharp on one side, gradational on the other. Core angles give an apparent alignment of these bands, suggesting that they are bedding remnants. The diorite would then be an alteration, or dioritization, possibly affecting a variety of rock types. Through regional mapping it became evident that the diorite has no counterpart on the ridges to the south, nor does it appear west of the lake. It is transgressive in occupying a stratigraphic interval which is

represented laterally by agglomerate. Whether it is a dioritization phenomenon or a truly magmatic intrusive is still a matter of doubt.

Age Relations:

The diorite and the hornblende porphyry have not been found in contact, so their age relations are in doubt. In hole 14 and in the small canyon 1000 feet northwest of it, hornblende porphyry remains fresh where it is intrusive into strongly chloritized rocks. It is fairly certain that the intrusives are post-chlorite, and hence post-diorite, since the chloritization has formed within and around the diorite. In Hole 13 on the other hand there are phases which suggest a gradation between diorite and hornblende porphyry. The time interval between the two may be small.

The hornblende porphyry bodies west of the lake cut sediments which are considerably deformed. While these intrusives may have been very irregular initially, the evidence is fairly clear that they have come in after the sediments were deformed.

The feldspar porphyry cuts both diorite and hornblende porphyry. The relative age of the felsite dykes is not known. They may be related to sericitization.

The basic dykes appear to be young because of their freshness. One case is known where a feldspar porphyry is cut, but it is not known which of the age groups the basic intrusive belongs in. It has been noted that they span the period of carbonate alteration.

With the exception of the basic intrusive body at the head of Dak River, none of the intrusives fill the role of a feeder to the agglomerates. The hornblende porphyries appear to be too late and not of the proper composition. From the point of view of location and composition, the diorite is a likely subject, but it would have to be assigned an age much earlier than the hornblende porphyries.

There is nothing to suggest that the diorite is related to the batholithic rocks of the Coast Range. The nearest representatives of these are eleven miles southwest of Kinskuch Lake.

ALTERATION

Most of the rocks in map 1 show little metamorphism. Argillites have no visible stress or thermal minerals, and are only locally slaty. Phenocrysts of augite and hornblende in their respective porphyries stand out clearly in the hand specimen. Feldspars in the felsic agglomerates are dull-lustred, but still sharply-outlined and hard. Under the microscope, Gale reports a considerable development of secondary albite in the agglomerate and a widespread partial sericitization of feldspar. Calcite is a widespread minor constituent, and almost all igneous rocks in the area effervesce in dilute hydrochloric acid.

In contrast, the rocks south and east of the south-east bay of Kinskuch Lake, comprising an area about one and one half miles in diameter in which almost all the known copper showings are located, are strongly altered. Originally four classes of alteration were recognized as mappable units, viz:

Chlorite-pyrite alteration.
Rusty weathering, light-colored pyritic alteration.
Carbonate alteration - massive brown weathering outcrops
Epidotization.

Chlorite-Pyrite Alteration:

This phase is most widespread and is fairly well outlined on Map 2. Petrographic work by Salt Lake Lab showed that chlorite was present in dioritic types which were considered to be little altered. A strict application of the occurrence of chlorite would bring into this category considerable areas mapped as diorite. Typically developed, the rock is strongly mottled with rounded blebs of dark green chlorite. Transitions are seen in which these blebs pass into laths of mafic mineral. On the other hand, the chlorite areas become very large until the rock has the look of a fragmental. Sub-angular chlorite masses generally harboring considerable pyrite are contained in a fine light-gray or buff

colored matrix. This rock type is labelled 'chlorite-fragmental' on the drill logs. On the surface, areas of such rock are very irregular with no evidence of planar boundaries or internal stratification. It is with some misgivings that they are considered primary fragmentals.

Light-colored Pyritic Alteration:

Examination of a type specimen of this by Salt Lake Lab. showed that it was essentially a sericite-quartz type of alteration. The pyrite content is actually much lower than would be suspected from the crumbling limonite-stained outcrops, and is exceeded in much of the firm-weathering chloritic rocks. The rock is always well fractured and often possesses a crude schistosity. Hole 12 showed that a change from crumbling rock to solid rock of the same general character was associated with the appearance of gypsum veinlets. It is conjectured that these veinlets have been largely dissolved out above a depth of 280 feet. Much of the rock in Hole 12 area contains chlorite while retaining the physical character of the sericite alteration. Below 380 feet in hole 12, the alteration becomes dominantly chloritic, and eventually inclines toward diorite.

Several separate areas classed as pyrite-sericite alteration are shown on map 2. Some are broad irregular areas, others are tabular and shear controlled. They all allow their contained iron to oxidize readily, and are characterized by a thin limonite crust.

Carbonate Alteration:

This type of alteration has a regional occurrence to some extent but is much more prominent within the zone of chlorite alteration. It is clearly localized by shears and fractures which contain carbonate veins, and is superimposed on the first two alteration types. Since the rocks contain considerable calcite to begin with, there need be little or no introduction of new CO_2. What is observed is the formation of a rusty-weathering ferro-dolomite. Some large carbonate rich masses in No. 2 area would seem to require a considerable addition of carbonate. At No. 1 showing, and several localities on the south shore, the dioritic country rock is altered for

several tens of feet adjacent to small carbonate veinlets. There is a total bleaching of the mafic minerals, and loss of texture of the diorite. In these cases it is thought that there may be an inward migration of certain constituents, including copper, from the wall rock to the vein-zone.

Copper Occurrence:

The observation by Salt Lake Lab that copper mineralization is associated with the chloritic rocks is borne out by field observations. All the important showings are in strongly chloritized rocks, and it might be asserted in this area that if a rock is chloritized it will contain chalcopyrite. Some occurrences of chalcopyrite within the sericite zone, actually have locally chloritic rocks as their host. Carbonate veinlets do contain chalcopyrite, but this may be a secondary concentration. Heavily carbonatized masses do not carry disseminated chalcopyrite.

Epidotization:

Epidote is widely distributed in the eastern half of Map 1 in the form of veinlets usually associated with quartz. Within the zone of chlorite, epidote is characteristic of the diorite rock type. In the drill holes of No. 2 area it is more prominent in the fresher diorite away from the chlorite. The two minerals are not entirely complementary, and some mixing is observed.

Original Rocks:

In several drill holes there is a progressive transition from typical chloritized rock to recognizable diorite in a distance of twenty to one hundred feet. It may be concluded that much of the chloritized rock was derived from diorite. Much of the rock in No. 2 Area is thought to be thus derived. In drill section 'A' line is shown marking the upper limit of recognizable diorite. Because the diorite grades upward into a characteristic mottled-chlorite rock which recurs throughout the section, it is thought that almost all the rock on the right-hand outcrop of the section was originally diorite.

In the long thick belt of chloritized rock extending northwestward from Hole 12 Area, there is little evidence of derivation from diorite. Some of the core from P.S. 10 resembles the typical chlorite-mottled rock of drill section 'A', so that it is considered possible that there were diorite intrusives in this area which have been obliterated by chloritization. There is little evidence that the rocks of this section were derived from agglomerate. Occasional evidence of bedding suggests that much of the rock was originally tuff. Some of the chloritized rocks on the Seabee claims are clearly derived from agglomerate.

The occurrence of tuffs in Hole 12 Area suggested a specific relation between the Sericite type of alteration and parent rock. Further mapping showed that structural and compositional characteristics of the Sericite phase persist through a variety of rock types.

STRUCTURAL GEOLOGY

Folding:

The belt of sediments along the west side of the map-area is considered by Black (B.C. Annual Report of the Minister of Mines, 1951) to underlie the volcanic units west of Kitsault Valley. This would imply a synclinal axis in the valley, and an anticlinal axis in the sediments between Kinskuch Lake and Kitsault Valley. With few exceptions the structure in our map-area is an east-dipping homocline. Dips range from 25° to 60°, averaging about 40 degrees, and the strike averages fifteen degrees west of north.

A major modification of the homocline is found west of Kinskuch Lake where a broad disturbed zone striking slightly east of north may be followed from the head of Dak river to the north end of Kinskuch Lake. This is apparent in the offset of the augite porphyry formation in a left handed sense, in the southwest corner of the map-area. West of the lake, in a large area of sediments from 19,000N to 23,000 N, strikes are northeast and dips are to the west. The pattern of attitudes indicates a steep north pitch. Tight folding is again indicated north of the lake at 10,000 E - 30,000 N.

The isolated area of augite porphyry in the region 5,000 E - 28,000 N is difficult to account for. Field evidence suggested that it was flat and unconformable. Petrologically it is similar to the main belt of augite porphyry, and would not be logically placed in a later epoch. It must be imagined to lie in an anticlinal crest, the limbs of the fold having been greatly distended.

A minor flexure of sediments intercalated with agglomerate is seen at 20,000 E - 28,000 N. South dips are associated with strikes at right angles to normal, so that south pitch may be inferred. The fold was not traced to the south.

Along the ridge on the east side of the map-area a strip of rocks has an anomalous west dip. The petrology of the section is also anomalous, since it is a recurrence of feldspar-porphyry and agglomerate high in the stratigraphic column. A northeasterly striking fault cuts off the section on the north, beyond which north-northwest strikes and east dips prevail. Considerable intense folding and faulting must be called on to explain this section. Alternatively the discordant structure may be partially explained by assuming that the material was ejected upward through the flank of a volcano.

Attitudes shown on Map 1 are classified to indicate the type of material they represent. This separation was attempted to distinguish between beds which would have had a low initial dip - i.e., waterlain sediments, from those which might have had a high initial dip - i.e., coarse pyroclastics. In theory a reconstruction of initial dips should indicate the direction of the source of the materials. A comparison of two sets of data in the vicinity of 10,000 E - 20,000 N indicated that the source was to the south. The data are not abundant enough to form a complete picture.

Faulting:

Air photos indicate a regional fracture pattern with a northeast and a northwest set. The northeast set appears to be stronger, some of the fractures having developed into faults. A large break west of the lake striking N 45° E through zero E - 25,000 N is a fault with a large right hand movement. A

prominent linear east of the head of Dak River striking N 20° E also appears to be a fault situated near the axis of an anticline. These two contain the greatly deformed belt described above. Several faults striking nearly due east appear to be tributary to the first mentioned, and have right handoffsets.

In Map 2 area, the fault shown through 12,500 E - 16,000 N accounts for some mapping discrepancies, but it is not certain that it has sufficient movement on it to account for the apparent offset in the agglomerate contact. A small fault zone can be traced from 10,400 E - 9100 N to 13,800 E- 10,800 N. It may continue on over the northwest ridge of Lavender Mountain. Over much of its observed length it contains basic dykes of two ages. A fifteen foot left hand offset is observed on a vein, but it is possible that the vein is more recent than much of the movement. The N 25° E fault on the south shore is well marked. A basic dyke enters the fault zone and swings along it to the right. It came in after the development of the zone and was offset at a later date.

Shear structures carrying carbonate veins and chalcopyrite strike northwest to west-northwest. North of Hole 12 they dip steeply northeast. Along the south shore of the lake identical structures dip southwest.

Schistosity:

Well developed schistosity is not common anywhere in the region of map 1, and it seems surprising that there isn't such a record of strain in the rocks, particularly in the more basic types. Deformation must have occurred under conditions of light loading. There is a prominent belt of mild schistosity in agglomerate southeast of Kinskuch Lake. This belt is 1000 - 2000 feet wide, and projected under the icefield, should reach the lake in the region of 10,000 E - 10,000 N. There is no comparable shearing in this area, and it is possible that the belt was developed prior to the intrusion of the diorite. There are several smaller belts of shearing east of the main one. They are either intense and very narrow or broad and very weak. The wide zone of shear mapped on the northwest shore of the lake at 10,000 E - 30,000 N does not have a counterpart on the east shore.

Structure in the Altered Zone:

Few attitudes are available in the area of chlorite alteration. In the northeast corner of Map 2 consistent northwest strikes and northeast dips are indicated. The tuff band south of Hole 12 indicates a sharp swing to an east of north strike. From this point south there is nothing reliable to indicate attitude till we reach the Dak River slopes. In No. 2 area there are certain fine-grained black or reddish bands in carbonate altered rocks which strike N 75° E and dip 40° SE. Interpretation of these structures as bedding planes is hazardous. On the small island near the collar of Hole 6 a contact between massive and fragmental rocks is interpreted as a flow contact. The strike is northwest and dip southwest. On the south shore several structures are indicated with this attitude, and a distant view of the hillside gives the impression of formations with a southwesterly component of dip. None of the structures observed on the ground can be called true attitudes. The most prominent of them are vein-shears with carbonate filling and wide borders of alteration. Others are interpreted as flow structures. Considerable attention was paid to these features because their original interpretation involved having a large south pitching fold centred around the southeast bay. Most of the rock in this area is now regarded as diorite intrusive. The black banded rocks in No. 2 area and the chlorite-fragmental types on Hole 6 island and elsewhere may be regarded as xenoliths.

No. 2 Area:

A great many small fault structures are shown on Map 3 of this area. Three prominent structures strike northwest and dip moderate to steep southwest. On the most westerly of these a right hand slip of 20 feet is recorded. The centre one roughly coincides with the footwall of the mineralization, and may be a secondary factor in localization of higher grade material at the northwest end. The easterly of the three fractures is to all appearances the strongest, but does not appear to be in any way associated with mineralization, although there is some copper stain along it.

The northeast to east-northeast striking fractures are weaker, being sometimes mere selvages between different rock types. Veinlike masses of masses of sericitic altered rock are associated with this direction.

In No. 2 area and also on the south shore at 6700 E - 8800 N, there are several small dyke-like bodies with felsic rock fragments in a black pyritic matrix. They are sharp-walled, irregularly angular in their course, and seldom more than a foot wide. Few of them are traceable for more than twenty feet. They are best developed in a small area just north of 10,000 E - 10,000 N, and are designated on Map 3 as "Brecciation, possible basic intrusives". They are thought to be in the category of pebble dykes.

Hole 12 Area:

A large number of fractures are mapped in this area with strikes in all directions. A stereo plot shows strike maxima at N 20° E and N 40° W. The northeasterly set are more numerous, and are often copper stained. Carbonate veins strike N 60° - 70° W and dip steeply northeast. In the sericitic rock near hole 12 there is a crudely developed schistosity striking northwest and dipping 35° - 40° northeast. The area as a whole is characterized by a high density of fractures. Certain fine-grained chloritic rocks, which are characteristically copper-stained, break down to fragments less than a centimeter thick without revealing a new rupture. Mapping failed to reveal any master structure which could be accepted as the overall control of the fracturing. The general trend of the fractured belt, from Hole 12 area to the lake shore at 15,500 N, is perhaps the best indication of a modified northwest trend.

MINERAL DEPOSITS:

There are two principal mineralized areas: the original showing of G. Piva known as No. 2 area, and the showings of W. McLean described as Hole 12 area. In the first chalcopyrite is largely collected into veinlets and associated with considerable pyrite. The deposit is tabular, with a northwest strike and moderate southwest dip. True thickness, between assay walls, is about 110 feet. Probable tonnage is 1.3 million tons with a grade of 0.49% Cu. In the second area chalcopyrite is mostly finely disseminated in fractured chloritic rocks with much less associated pyrite. The shape and dimensions of the zone cannot be accurately stated. It appears to strike north-northwest and dip steeply northeast. The probable tonnage is about the same as that of No. 2 area, with a grade of 0.25 - 0.30% Cu. Scattered mineralization of similar

character to that in Hole 12 area extends north-northwest for over 4000 feet. Small veins of carbonate and quartz carrying chalcopyrite are found throughout the area enclosed by the chloritic alteration.

No. 2 Area:

Mineralization is found over an area 200 x 600 feet occupying most of the small rocky peninsula in the southeast bay of Kinskuch Lake. Most of the surface is bare rock, well-exposed from recent glacier action. A minor proportion is obscured by a thin layer of gravel-clay.

Map 3 shows the geology of the area. Mineralization is confined mostly to a green-mottled andesitic rock, unit 2 of the legend. The rock is charged with pyrite in the form of a general dissemination, veinlets, and irregular clumps. Chalcopyrite is present in the veinlets, accompanying pyrite and sometimes predominating. Individual veinlets are seldom more than a few feet long. A stereo plot of the veinlets carrying chalcopyrite showed a predominant strike of N 65° E and a near vertical dip.

In addition to being confined to the chlorite-mottled rock, good copper values are associated with a harder, more siliceous type of rock. There is a limited amount of mineralization in the epidote bearing rocks (4) and very little in the carbonate rocks (1) Drill section A shows that the copper values decline as the rock becomes progressively more dioritic. The footwall defined by 0.30% Cu lies about 80 100 feet above diorite.

The visual appearance of the ground suggests a close relation of copper to pyrite. From drill core assays it was noted that a high degree of general sulphide mineralization was indicative of a relatively high copper value. In hole 11 however, some material with 8 - 10 percent sulphides assayed lower (0.17% Cu) than material with only 2 - 3 percent (0.23% Cu). Rock with 5 percent pyrite and no visible chalcopyrite often assayed as high as 0.30% Cu. Polished sections of low grade material examined by Galo showed chalcopyrite in separate grains, not often in contact with pyrite. In specimens examined by Salt Lake Lab. chalcopyrite was reported from barren looking rocks in which it had not been suspected.

The average trend of the footwall between sections A and B is N 48° W< 36° SW. Section C indicates a break in the mineralization. With the above attitude, it should have extended well down into hole P.S. 14. Between sections A and C the attitude is N 30° W<41° SW. This latter trend makes it about parallel to two northwesterly trending fault fractures shown on Map 3, and most of the ore will fall between these two. This requires that the ore in Section B is a separate lobe. There is a topographic break between section C and B but no evidence of sufficient displacement to account for the separation of the two lobes.

In drill section 'A' a line is drawn to indicate the upper limit of recognizable diorite. The position of this line in the holes and the interpolation between holes might be varied with the whim of the geologist. It is believed however, that the diorite shape was an important factor in the localization of the copper mineralization. The general northwest dip of the diorite is interrupted by a south dip. The recurrence of the north dip to the south limits the down dip extension of the zone. Mineralization was also dependent on a favourable structural environment which allowed the formation of a suitable fracture pattern at the right time.

The vein at the southeast corner of the mineralized area is six inches to two feet wide, with as much as a foot of nearly solid chalcopyrite pocketed in a gangue of calcite and quartz. It dies out in an irregular fracture 40 feet east of the main showing, and is covered by overburden a short distance west. It does not reappear on an outcrop 25 feet west. Hole 8 passes 25 feet west of the main portion of the vein and 75 feet vertically below it. A carbonate quartz vein was cut at 64 feet in this hole. No chalcopyrite was present in the vein, though the adjoining ground assayed 0.60% Cu. There was no evidence of a vein in hole 9, drilled below 8.

Hole 12 Area:

Mineralization is extensive along the ridge south of holes 5 & 7, on the isolated outcrop 150 feet south of these holes, and to a limited extend on the lower portion of the moraine covered slope north of the holes. Along the ridge there are some concentrated streaks of chalcopyrite associated

with carbonate vein in chloritic rock. Some chalcopyrite is finely distributed in siliceous bands up to a foot wide which trend northwest and dip steeply northeast. Much of the chalcopyrite is finely disseminated in chloritic rocks which fracture minutely in a variety of directions. Pyrite is present in all three types of occurrence, but in general there is little tendency for the two minerals to associate.

Mineralized fractures commonly strike east of north. The trend of the main mineralized area is west northwest, with a steep northeast dip. The glacier obscures possible continuation to the southeast, and moraine covers it to the northwest. Holes 5 and 7 contribute nothing to the geometry of the deposit. Because of poor core recovery combined with an intrinsic complexity of the rocks, it was found impossible to correlate between the holes and surface, or even between holes. Sludges indicate a persistent background of 0.25 - 0.30% Cu. The better mineralized sections indicated by core samples, surface samples, and P.S. holes, are not large enough to raise the average grade of a block of any effective size beyond 0.35% Cu.

Sludges from the first 280 feet of Hole 12 indicate a background value of 0.15% Cu. in the sericite altered material. The higher value of 0.26% Cu came from a chloritic section. Visible chalcopyrite was seen only in the last 100 feet of the hole, and the values here are slight.

The cliff north of holes 5 and 7 is composed of highly fractured chloritic rock throwing little malachite stain. A grab sample of the talus below the cliff representing a length of 270 feet returned a value of 0.40% Cu.

Some minor occurrences of copper in fractures and in areas of minutely fractured chloritic rock are found in the sericite altered regions south and west of Hole 12. Several northwest striking veins of quartz and carbonate carrying chalcopyrite are found north of the glacier snout and below the cliff in the vicinity of 14,100 E - 11,900 N. These are south of the main mineralized zone.

An area of disseminated chalcopyrite in chloritic rocks 1000 feet north northwest of Holes 5 and 7 was originally

thought to be a continuation of the main mineralized zone. When examined in 1956 it did not appear to be of much interest, except that it is one of a series of similar occurrences found along the belt of chloritic rocks extending beyond hole P.S. 10.

On the morainal deposits in and west of Hole 12 area, there is a considerable amount of barite float. Pure white cobbles up to five inches in diameter have been found. No barite was found in place on the surface. There is a small vein in Hole 5 at 177 feet.

Packsack Hole No. 10 Area:

Some small fractures at the surface here were seen to carry a little chalcopyrite. An 80-foot flat hole was put in mainly for assessment work. Values of 0.22% Cu to 0.65% Cu were returned for the entire 80 feet. Fine chalcopyrite was disseminated in the chloritic rock. A 28-foot section assayed 0.50% Cu. Several other small areas of disseminated chalcopyrite were found on the hillside northwest of P.S. No. 10.

No. 1 Showing:

This is a small vein described in an earlier report. It was not visited again in 1956.

No. 3 Showing:

This is a zinc vein described in an earlier report. The area was mapped in 1956, but this work did not add any economic interest. It is a series of vein segments, mostly with a barren carbonate filling, disconnected but traceable in a rough alignment for 1500 feet. Only at two localities. was there any appreciable mineralization. Zinc predominates over lead, and copper is a minor component.

During this mapping a number of new but very minor copper occurrences were found southwest of the zinc vein.

South Shore:

In mapping this area several small copper showings were seen. All are chalcopyrite in carbonate or quartz-carbonate veins, similar to No. 1 showing. None of them are of interest.

Seabee Claims:

The copper occurrence noted at 6400 E - 9800 N is a small northwest striking vein of pyrite and chalcopyrite. The country rock is chloritized and carbonate-altered agglomerate, not unlike much of that on No. 2 showing.

Holes 13 and 14:

Some very minor copper occurrences are noted in the logs of these holes. Those in hole 13 are of greater interest. There is some chalcopyrite disseminated in chlorite-altered rocks which resemble hornblende porphyry, at 171 feet and at 204 feet. It is interesting that deeper in the hole these rocks lose their intrusive appearance, are more strongly chloritized, and contain a little chalcopyrite.

Camp Showing:

Fiva has done some work on a showing on the lake shore at 10,600 E - 14,800 N, near the site of the 1956 camp. This is a pyrite-carbonate shear striking N 56° E and dipping 70° northwest. East of this structure the rock is well fractured, chlorite-altered and veined with hematite. A small amount of fine chalcopyrite is disseminated through it. A grab sample of talus over a length of 40 feet assayed 0.25% Cu.

Fiva's Native Copper:

This showing was located in August 1956 by G. Fiva. It is on the east shore of the lake at 20,000 N. There is a small mineralized fracture along the contact of a hornblende porphyry intrusive. Native copper was found in small flakes on small fractures near the larger one. It is believed to be secondary, formed in the reducing environment immediately under moss. No primary copper minerals were seen at the same locality. It is possible that the copper originated further up the slope. A small creek 500 feet southeast of the showing gave a very strong silt reaction for copper.

Lahte River Area:

Examination of the area was based on the idea that mineralization might project through the Lavender massif from Kinskuch Lake. No analogous rocks were found in the outcrops or

morainal debris. Carbonate alteration is very common. The two small copper veins were of no economic significance.

In the coarse morainal debris just north of Lakte River there is a train of large blocks of material mineralized with zinc, lead, and occasional chalcopyrite. An outcrop of similar material was located at the west end of the train. The outcrop is less spectacular than the float. Mineralization may be found over an area about 100 feet in diameter. The best mineralization assayed 1.75% Pb, 1.60% Zn over a width of 5.7 feet. No float was found west or south of this outcrop.

The rocks locally are tuffs with minor agglomerate bands. The mineralized material is possibly a limy tuff. There is considerable carbonate alteration and veining. Immediately north of the outcrop there is a body of much altered coarse dioritic rock whose structural relations were not determined. The apparent strike of the mineralization at the outcrop is N 25° E. This is at variance with the local attitude of the rocks - 345∠26 E, and with the direction of the float train- N 60° E.

Six claims were located (MRW Group) July 5, 1956, covering the outcrop and the train of float. There is little indication of economic mineralization, as far as the outcrop may be interpreted. A more careful analysis of the distribution, quantity, and grade of the float should have been made in case it represents a better zone of mineralization which does not presently outcrop.

ORE RESERVES

No. 2 Area:

In drill section A there is indicated 3547 tons per horizontal foot grading 0.516% Cu. Section B gives 1915 tons per horizontal foot grading 0.439% Cu. Combining these directly gives a figure of 1.04 million tons at 0.489% Cu. The lack of continuity between sections, apparent in Section C, would suggest that this figure is too high, and should be reduced by at least 20 percent. The amount of mineralization southeast of section B is almost negligible - about 100,000 tons. The amount northwest of section A is difficult to assess. A combination of low dip, configuration of the lake bottom, and

lack of mineralization in hole 11, place a tight restriction on the probable tonnage. It would not likely be more than 400,000 tons, with a grade equivalent to that of section A. The reserve for this area becomes 1.3 million tons at 0.49% Cu.

Hole 12 Area:

From the incomplete information available for this zone, we can estimate that there is a mineralized block 150 x 300 in vertical cross section and 300 feet long. This will contain 1.3 million tons for which we can assign a grade of between 0.25 and 0.30 percent copper. Neither the ends nor the depth of the block have been delimited. It would be logical to expect a sixfold increase in tonnage, or about 8 million tons, of the same grade.

QUALITY OF ASSAYING

Values given in this report are based on assays by J. R. Williams & Son Ltd., Vancouver, B.C. A number of samples were submitted to G.S. Eldridge and Co., Vancouver, B.C. for check assays. Discrepancies between the two sets of assays are erratic and in some cases serious. In three out of four samples the Williams assays are higher. Differences arise mostly in the lower values - below 0.30% Cu.

Without a complete check of all samples, it is impossible to give a definite amendment to the values quoted in the report. There is a good probability that the values given for No. 2 Area are too high by 0.05%. In Hole 12 area, the values may be too high by .07% or more.

Assays of isolated samples, i.e., in hole P.S. No. 10, and surface grab samples, checked sufficiently close, so that the original values quoted in the report may be accepted.

GEOCHEMICAL WORK

Twig Samples:

The twig sampling done in 1955 has been discussed in a previous report. In 1956 the area was well covered in 400 scale mapping and several instances of minor mineralization were found. One occurrence, explored by P.S. hole No. 10, shows that small sections of ground approaching ore grade may occur in this area.

Silt Sampling, General:

A number of tests were made on stream silts using the rubeanic acid copper test developed by Delavault. The main streams draining eastward into Nass Valley between Chitin River and Surprise Creek were tested in this way. Most of the streams in the 1000 scale map area were likewise tested.

Local Results:

Silt sampling results relevant to the mineralized area at Kinskuch Lake are shown on map 1A. There is a concentration of good readings in the southeast corner of the lake. Nos. 8, 19, 40, and 55 reflect known low grade mineralization which is being actively eroded. No. 40 suggests a continuation of mineralization southeastward under the glacier. Those in the south bay - Nos. 9, 1008, 48-53 apparently result from a number of small veins, possibly also a high background in the country rock. No mineralization of ore grade is known in their drainage areas. Nos. 58 and 59 represent a small showing located by G. Fiva in 1956 in which there is native copper. No. 59 was right below the outcrop. No. 58 is interesting since it indicates persistance of mineralization to the southeast. No. 1040 is from a small unmapped watercourse. Gale found chalcopyrite adjacent to hornblende.porphyry here, in an occurrence similar to that of Fiva. All other samples from the north and west shore of the lake are low.

The obvious contrast between samples in the southeast portion of the lake and those on the west and northwest, emphasize the association of mineralization with the large chloritized area. The fact that several nil results were found on the west side shows that there is no appreciable background copper in the unaltered agglomerates. On this basis it was felt safe to exempt large areas from intensive prospecting.

Several other anomalous creeks deserve mention. No. 34 was a significant positive on a small creek for which no supporting leads could be found. No. 31 is more significant because of the large size of the creek. Some copper mineralized float was found on the moraines west of the glacier snout. Traverses around the head of the glacier gave no further indications. Sample No. 1 on a tributary to Lahte Creek was followed up and a small copper bearing vein located in the stream

channel. A small vein of copper was also found below sample No. 3. The slight positives in samples 2 and 3 are not worth following up. Sample No. 4 was appreciably positive. No float was found to support it, despite considerable ground work on the flanks of the lower portion of the glacier. Air reconnaissance of the glacier basin, and traverse of the ridge at its head revealed nothing of interest. A large proportion of the area is snow or ice covered.

Regional Results:

On map 4, it may be seen that all creeks draining east from the Camboria Icefield (Strohn, Nelsona, Del Norte, Willoughby, and White) gave appreciable positives. Quite good field tests from Willoughby South and White River, gave only 25 and 16 ppm on laboratory check. Del Norte creek gave 98 ppm. The Nelsona sample was not lab checked. Two small tributaries to Del Norte Creek below Sample No. 25 gave strong field tests. These were followed up by traverses on both sides of the valley near the volcanic-sediment contact. A small vein with lead, zinc, and tetrahedrite was found on the north side. A copper showing was found on the south side. Both of these occurrences had been previously looked into. Some ground work was done in the Willoughby South area and around White glacier. At the former locality a minor showing of copper was located.

The Nelsona and Del Norte samples, Nos. 23 and 25, warrant some follow-up. Since they come from creeks under large glaciers, the anomalies cannot be traced into tributaries in the usual way, and the only step that can be taken is an examination of the valley walls surrounding the glaciers.

Charles S. Ney

Charles S. Ney

Vancouver, B.C.

April 4, 1957

LIST OF MAPS

Map No. 1 -	1000 ft. to one inch	Geology
1A-	"	Silt Sampling Results
1B-	"	Claim Map
2 -	400 ft. to one inch	General Geology
2A-	"	Soundings
3 —	40 ft. to one inch	No. 2 Area -Geology
3A-	"	No. 11 Area Assay Plan
3B-	"	Hole 12 Area - Geology
4 -	1 mile to one inch	Regional Prospecting

Drill Sections	A-	40 feet to one inch	No. 2 Area
	B-	"	No. 2 Area
	C-	"	"
	D-	"	"
	Holes 5 & 7	"	Hole 12 Area
	Holes 10 & 12	"	"
	Holes 13 & 14	"	

APPENDIX - A

TRANSPORTATION

In preparation for the 1956 work, as much of the heavy equipment as possible was flown in to Kinskuch Lake during the late winter. This winter freight amounted to 1¼ tons and included drilling equipment, fuel, and lumber for camp construction. Ski equipped aircraft were charted from Pacific Western Airlines and based at Terrace, B.C. , 95 miles southeast of the lake. The operation dragged out from February 20 to April 17. Considerable delay could be attributed to weather, there being no satisfactory way of determining from Terrace weather conditions at the lake or en route. Much of the delay could be blamed on the aircraft company for not having the right equipment available. The job was undertaken with a Junkers, licensed to carry 1400 pounds. The Junkers has a speed advantage over a Norseman, but is inferior in capacity and ease of loading. This was supplemented later with a Beaver which has the disadvantage of short cabin length, and will not take 10-foot drill rods. Precut lumber had to be sawn in half on this account.

A Bell Helicopter chartered from Vancouver Island Helicopters Limited gave good service in transporting men and supplies from Alice Arm to Kinskuch Lake during the period May 15 to July 8, when the lake was icebound. Later it was used in transporting drill crews to and from the job, moving drill equipment, and distributing fuel, as well as in the program of mapping and prospecting. The pilot, D. Scholberg, besides showing proficiency in the operation of the aircraft, was notably cooperative in all phases of the project.

One example may be given of the use of the helicopter. A No. 2 diamond drill was moved from lake level (3800 ft. a.s.l.) to a small outcrop surrounded by glacier on a sidehill at 4730 feet. The horizontal distance was slightly more than a mile. On one afternoon, in five hours elapsed time, a weight of 6665 lbs. was moved up in 17 hops totalling 2 hours 50 minutes flying time. Five men were occupied on the ground loading and unloading. In good spring snow conditions, a conventional move could have been made in about six days. Under the prevailing summer conditions the move would have been very difficult, and would have required at least two weeks.

During the open water season, July 8 on, transportation was by float aircraft operating out of Prince Rupert.

APPENDIX - B

KINSKUCH LAKE DEPTHS

In the fall of 1955 a pattern of soundings was taken by boat in the area northwest of No. 2 showing. The purpose of these was to obtain information which would affect drilling on the extension of the showings under the lake. They indicate a steep rock slope down to a depth of 120 feet, then a surface 120 - 160 feet deep which is rather uniform over a considerable area. This was interpreted to be a sediment floor. The anomalous shallowing on the northerly of the three lines may indicate approach to a bedrock hump. This information is used in the section of hole 11.

Early in the 1956 season a number of soundings were taken around the south shore of the lake with the object of finding a suitable route for a road. These were taken from the ice, using a Packsack Drill. Maximum depth of water on the proposed route is 90 feet between No. 2 showing and the small island on which Hole 6 is collared.

Two soundings were taken in what appeared to be the deepest part of the lake, near 5000 E - 15,000 N. Depths of 332 feet and 318 feet are recorded.

From the air it appeared that a possible route for a road might be found in the narrow portion of the lake at 18,500 N by utilizing an island and a series of reefs. This was not investigated by sounding.

APPENDIX C

It was estimated that about 8000 horsepower could be developed from Kinskuch Lake. This figure is based on a head of 900 feet and an annual runoff from the drainage basin of the lake amounting to 60 inches of water. The matter was not investigated in 1956.

Consideration was given to lowering the lake level 50 feet or more to allow mining of the No. 2 showing and to facilitate construction of a road around the south shore of the Lake. Water Notices applying for rights to the total flow from the lake were posted at the outlet of the lake and at Piva's cabin, on July 6, 1956.

Lowering of the lake and power development would not necessarily conflict. The diversion could be designed to serve both purposes. The reduction in head and loss of storage would not be serious, and could be compensated by using a greater head if necessary. The only difficulty would be in permanently by-passing the deposit of gravel which is building out from the glacier on the east shore a short distance from the outlet.

APPENDIX D

The following table summarizes weather observations made at Kinskuch Lake in 1955 and 1956. Column 1 is the period of observation; 2 the mean temperature for the period; 3 the minimum, with the date; 4 the maximum, with the date. Column 5 gives days on which rain fell for periods of an hour or more. Column 6 gives days which were sunny for four hours or more. Columns 7, 8, and 9 are days with snowfall, thunder, and gale force winds. When a gale lasted more than one day, only one entry is made. Column 10 gives snow on the ground on the date indicated, at lake level.

1	2	3	4	5	6	7	8	9	10
Aug. 19-26/55				2	2				Patches- 25%
Sept.7-8/55					2				" 10%
Sept.27 Nov.4/55		00 (3)		4	6	12		7	2.5', Nov.4
Feb.24-25/56									3.5-4' dry drift packed
May 16-31/56	46.3	25 (29)	73 (29)	2	10	2			May 16-4' we loose.
June, 1956	44.2	23 (10)	72 (14)	9	10	7	3	5	June 4-1.5' June 24-patc
July , 1956	51.7	32 (9)	78 (14)	8	15		4		-
Aug., 1956	50.2	34 (9)	76 (12)	17	13				
Sept., 1956	43	22 (19)	67 (12)	1	16	3		1?	Sept.20-2'
Oct.1-9/56	35	23	43 (6)	1	2	4	1	2	Oct.8-6" wet

Lake Ice:

On November 4, 1955 sheltered bays of the lake were frozen. Slush ice was beginning to form in the main portion. On Feb.25/56 there was one to one and one half [illegible]et of hard drift-

packed snow on the lake, six inches of water soaked snow below this, and an undetermined amount of clear ice-at least a foot. On May 26 there was one-half to two feet of slugh, 1 foot of frozen slush and one and one-half feet of clear ice. By June 26 the ice was broken for 100 feet offshore and drifting. By July 9 the lake was clear enough for aircraft to land.

According to local inhabitants, the winter of 1955-56 started early and remained cold and dry, with snowfall much below normal. The spring and summer of 1956 were characterized by below normal rainfall and above normal temperatures.