Over 1,500 samples of glacial sediments were collected in reconnaissance grids located near Carr, Kaminak, Southern and Townsend Lakes. Most of the samples were till or modified till collected from pits dug in frost boils.

Three physically and chemically distinct materials can be present in any frost boil in the study region:

1. Cobbles and humic debris: occur around the perimeters of frost boils. This material is easy to avoid and was not sampled.

2. Compact sandy diamicton: essentially till or marine sediment that has had clay and silt removed by surface runoff after extrusion at the surface during the active phase of frost boil formation. It is low in clay content compared to its parent sediment. Samples of parent sediment have trace-element concentrations up to 10 times those of modified material from the same frost boil (in material finer than 230 mesh (63µ)).

3. Parent material: till, silty marine sediment, or colluvial deposits. The parent material of frost boils has high silt-clay content with resulting high degree of plasticity when saturated. High plasticity of sediment in the active zone is thought to be required to form most frost boils in this area. Sulphide minerals have been found in parent material only in the few samples collected below the permafrost table.

An effort was made to sample only parent material, but at many sites frost boils have stabilized so that only sandy, hard diamicton could be found. Thus, in any of the grids sampled, trace-element concentration determined on the <230- mesh fraction of any sample may represent either parent material, of which till, marine silty clay, and colluvium are the most common members, or it may represent sandy, compact, modified parent sediment one of at least four different possible origins. Sand-size heavy minerals will be analyzed for all samples. It is expected that use of the coarse-grained fraction will avoid the problem of the influence of varying clay content on apparent cation concentration—a factor that has previously hindered interpretations of anomalies in this region.

Figures 1-4 are hand-contoured representations of copper and zinc concentrations for four 1971 grids. Most of the samples are assumed to be till or modified till. Concentrations of Cu and Zn were obtained in a field laboratory by colorimetric methods after controlled hot HC6 leach of material finer than 230 mesh. The contrast between anomalous and background values is thought to be higher than the expected variation due to modification of parent material.

Although concentrations of Cu and Zn may appear to be low in areas defined as anomalous on Figures 1-4, they are generally 4 to 10 times values...
Figure 1: Grid CL-1; dispersal of Cu in till; concentrations determined in field colorimetrically after hot leach in HCl; compare with maps (2) (4); note correspondence of anomalies to known mineralization.

taken as background. Relatively low Cu and Zn values seem to be typical in dispersal fans in till from this region. Till samples collected within a 500 metre radius of the well-known Cu-Zn-Pb showing at Spi Lake consistently produce values of 48-55 ppm Cu and 95-120 ppm Zn. Although significantly above background (8-15 ppm Cu, 15-35 ppm Zn), these values are not as high as some of the anomalies depicted on the dispersal maps presented here.
Figure 1a: Grid CL-2, dispersal of Zn in till; concentrations determined in field colorimetrically after hot HC₅ leach; compare with maps (2) (4); note correspondence of anomalies to known mineralization.
The trace-element concentration maps reflect three basic trends:

1. **East and northeast strike of bedrock units**: higher copper and zinc values generally correspond to areas underlain by felsic and mafic Archean volcanics or "iron formation" as shown on the bedrock maps 2, 3, 4. High copper values but low zinc values are found in some groups of samples on gabbro or diorite.

2. **Earlier, southward glacial movement first described by Lee**: zinc patterns in the "CL" grid particularly reflect this trend (Fig. 1a).

3. **Latest, southeast glacial movement**: strongly indicated independently by striations and drumlin orientations.

Drawn from data obtained in the field, the maps are useful in delineating areas where more detailed sampling may produce targets for drilling.
They also indicate large areas where the chances of finding mineralized zones are small. The maps have reflected anomalies near most zones of mineralization shown on Bell's and Davidson's maps and have added several new
Figure 4: Grid KL-2; dispersal of Cu in till; concentrations determined colorimetrically in field; many small copper-rich gossans discovered on gabbro near anomaly at A.

It is hoped that analyses to be performed over the winter on these and other samples from this region will confirm the anomalies apparent from field data and allow other anomalous areas to be identified.
In addition to the systematic sampling program described above, various samples collected from gossans, eskers and frost-boil inclusions have yielded base-metal values that may be related to economically significant deposits. The localities are described briefly below.

1. Esker and till samples. Anomalously high Cu (50-350 ppm; background ~ 10 ppm), Co (40-98 ppm; background ~ 10-20 ppm, high values in esker only), Zn moderately high, Ni moderately high in esker (55-78 ppm), Pb, Mo, Ag low. Analyses on -230 mesh samples; hot HCl-HNO₃ leach and Atomic Absorption. (UTM coordinates, 15432200 6894900).

2. Greenish yellow, 5 cm x 5 cm inclusion in frost-boil; may be decomposed pebble. Very high Mo (57 ppm, background 1 ppm), high Pb (170 ppm, background ~ 8-20 ppm), high Ag (3.7 ppm; background ~ 0.3 ppm), high Zn (170 ppm, background ~ 15-20 ppm), moderate Cu (55 ppm), low Ni, Co. Analyses on -230 mesh. (UTM coordinates, 15432600 6895400).

3. Granite or granodiorite pebble with 1 cm x 1 cm inclusions of molybdenite; found on esker surface. High Cu (150-360 ppm; background 20-50 ppm), moderate Zn (80-120 ppm), moderate Co (25-55 ppm), moderate Ni (40-75 ppm), low Pb, Mo, Ag for nearby samples. Analyses on -230 mesh. (UTM coordinates, 15434400 6892550).

4. Esker samples across inferred volcanic-granite contact. High Cu (70-130 ppm; background 8-20 ppm), high Pb (30-65 ppm; background 8-15 ppm), moderate to low Zn, Ag, Co, Ni. Analyses on -230 mesh. (UTM coordinates, 15374700 6910500).

5. Till sample 1.5 miles southeast of Spi Lake showing; high Pb (100 ppm; local background ~ 8-10 ppm). Moderate to low Cu, Zn, Ag, Co. Could be derived from Spi Lake showing (?) analyses on -230 mesh. (UTM coordinates, 15351000 6883700).

6. Townsend Lake Gossan; very high Pb (500-3800 ppm); very high Ag (18-30 ppm); very low Cu (8-16 ppm), Zn (16-35 ppm), Ni (8-11 ppm), Co 13-16 ppm. Gossan largest in region - covers several acres. Analyses on -230 mesh. For comparison, gossan on showing at Spi Lake has Cu (1300-1500 ppm), Pb (175-3800 ppm), Zn (210-2200 ppm), Ni (8-9 ppm), Co (20 ppm), Ag (10-30 ppm). (UTM coordinates, 15386900 6948500).

7. Gossan on Gabbro (field colorimetric analysis for Cu, Zn after hot HCl leach); high Cu (400 ppm) low Zn (< 20 ppm). Several small gossans within radius of 1-2 miles of site were not sampled. Local till characterized by high Cu, low Zn. Analyses on -230 mesh. (UTM coordinates, 15394400 6899800).


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

4 Bell, R. T.: Geology of Henik Lakes (east half) and Ferguson Lake (east half) map-areas, District of Keewatin; Geol. Surv. Can., Paper 70-61 (1971).
A feasibility study was carried out in the Timmins-Val d'Or mining region to assess the type of Quaternary geology studies needed to aid mineral exploration. Field work consisted of sampling soils and sediments, and examining road-cuts to gain some appreciation of the stratigraphy. About 125 samples of Cochrane till from between Fraserdale and Cochrane will be analyzed for base metals to determine the usefulness of Cochrane till as a sampling medium for drift prospecting. Some 250 samples from the Rouyn-Noranda area, including till, reworked till, and glaciolacustrine and esker sediments will be analyzed for their base metal content. Vertical profiles from the B-horizon down through glaciolacustrine and glaciofluvial facies, loose, ablation(?) till, and compact, lodgement(?) till, overlying bedrock, were sampled at close intervals to determine variation in base metal content within and between different sediments.

Quaternary deposit stratigraphy is neither simple nor consistent throughout the area, and any drilling program aimed at sampling 'basal till' should be predicated on an awareness of the possible stratigraphic complexities. Study of several sections indicates that true lodgement till or so-called 'basal till' rarely immediately underlies lake sediments; commonly, a layer of loose ablation till or coarse glaciolacustrine sediment separates compact till and lake clay. At some sections, clayey varves 1 or 2 cm thick rest directly on striated and polished bedrock. Analyses planned for the various sediment types will help determine the quality of each as a sampling medium.

A massive sulphide boulder (mainly pyrite, minor sphalerite, trace of chalcopyrite) approximately 40 cm in diameter was discovered in a new road-cut along Highway 101 in Keefer Township (48°17'48"N; 81°46'33"W). The gossan-covered boulder was found in colluvium, perhaps reworked till, about 1.0 m below the surface, 0.75 m above bedrock (altered greenstone).
REPORT OF ACTIVITIES,
Part A: April to October, 1971