UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

MICHIGAN
STATE HIGHWAY DEPARTMENT
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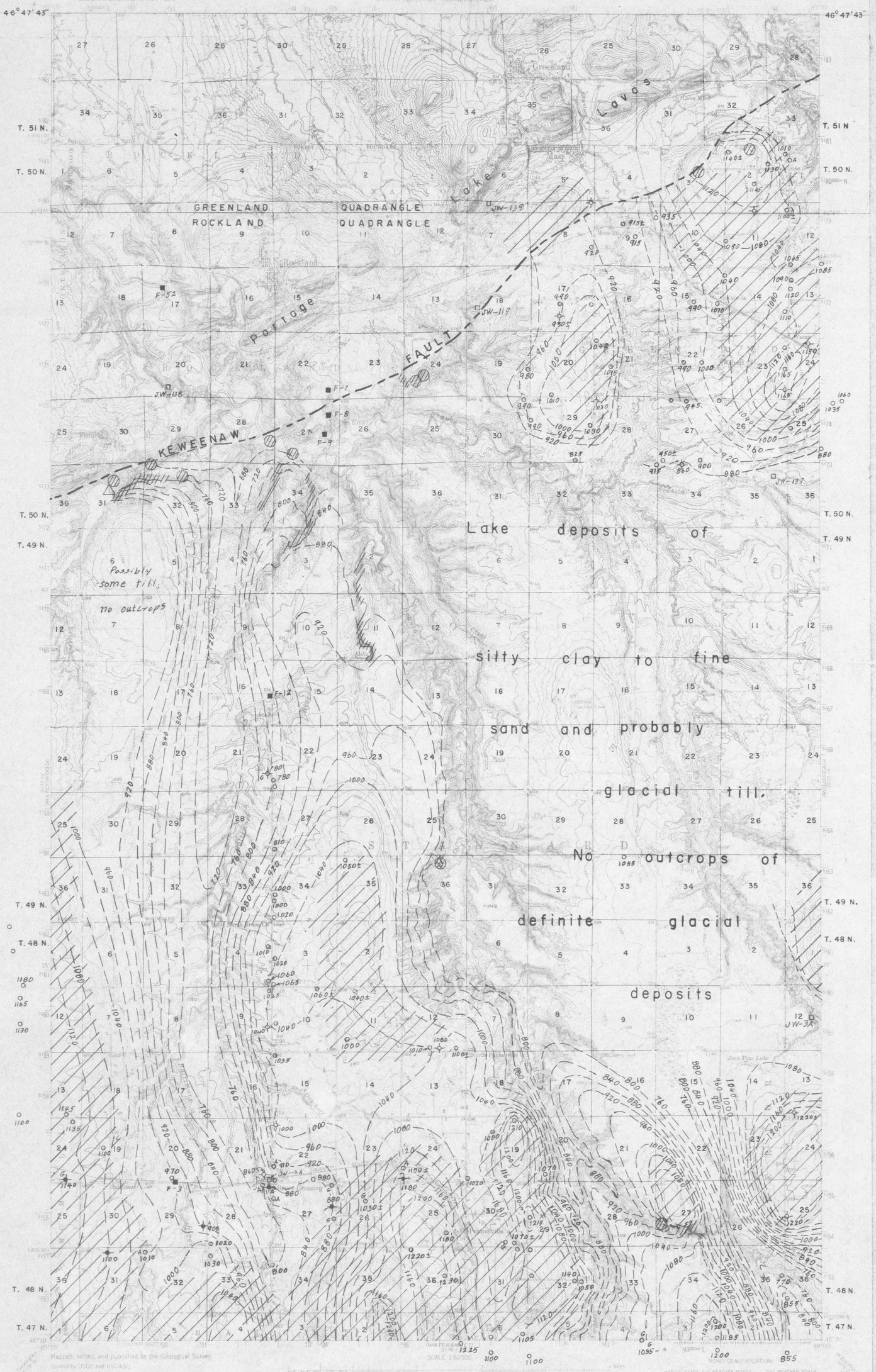
STATE HIGHWAY COMMISSIONER



Mapped, edited, and published by the Geological Survey
Control by USGS and USC&GS
Topography from aerial photographs by multiplex methods
Aerial photographs taken 1948. Field check 1949.
Polyconic projection. 1927 North American datum
10,000-foot grid based on Michigan coordinate system, west zone
1,000-meter Universal Transverse Mercator grid ticks, zone 16, shown in blue

UTM GRID AND 1969 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

WATERSHED

ROAD CLASSIFICATION

	HARD-SURFACE, ALL WEATHER ROADS	DRY WEATHER ROADS
Heavy-duty		Improved dirt
Medium-duty		Unimproved dirt
Loose-surface, graded, or hard-surface	U. S. Route	State Route

EXPLANATION

Approximate trace of Keweenaw Fault

920 / 880

Approximate top of Jacobsville Sandstone, an erosion surface

Jacobsville Sandstone crops out
All outcrops shown exaggerated in size; hachured circles are for very small outcrops.

Approximate area of glacial till, sand and gravel

Any unconsolidated rock debris over 1200 feet above sea level is likely glacial transported material because the high stage of Lake Duluth is near the 1200 foot contour (Hack, J. T., 1965, U.S. Geol. Survey Prof. Paper 504-B, pl. 1). Glacial debris crops out at 1060 feet in sec. 2, T. 50 N., R. 38 W. The lowest glacial debris reported in wells is approximately 900 feet above sea level. Many wells are in areas with no exposed evidence of glacier debris. Springs on the upland areas indicate glacial transported debris is present.

○A
Well
A --Artesian flow

○G
Well, log available
G - Well bottoms in glacial gravel

✧
Well
Data from, Water Investigation 9, by C. J. Doonan and G. E. Henrickson

✦
Well, log available
Data from, Water Investigation 9, by C. J. Doonan and G. E. Henrickson

□JW-119
Location where author collected a clay sample and sample number

■F-8
Location where A. P. Ruotsala and L. L. Babcock collected a clay sample and their sample number

△
Approximately where the Ontonagon copper boulder was found

Glacial debris

Rock debris in glacial deposits range from clayey fine silt to boulders; most of the debris is in the sand size fraction. It is difficult to distinguish lake deposits from till in the usual small outcrops and cuttings from well drills unless coarse sand to boulders are present. Drillers make no distinction unless boulders are present and cause trouble. Probably more glacial deposits overlie the Jacobsville Sandstone and lake deposits than are indicated on the map, which shows places where glacial deposits are known.

Samples collected for clay analyses, the field number, collecting location and preliminary analytical results

JW-2A* SE¼SE¼, sec. 21, T. 48 N., R. 39 W. Illite or mica, chlorite, montmorillonite, quartz, calcite, dolomite, feldspar, and questionable kaolin. Total calcite plus dolomite is 13.4 percent.

JW-3A* Near center sec. 12, T. 48 N., R. 38 W. Illite or mica, montmorillonite, quartz, chlorite, calcite, dolomite, feldspar and questionable kaolin. Total calcite plus dolomite is 13.6 percent.

JW-119 NE¼SW¼. sec. 18, T. 50 N., R. 38 W. Illite or mica, chlorite, quartz, calcite, dolomite, feldspar and questionable kaolin. Total calcite plus dolomite is 17.8 percent.

JW-137* NE¼, sec. 25, T. 50 N., R. 38 W. Mostly silt size quartz with minor amounts of calcite, dolomite, illite or mica, and chlorite. Total calcite plus dolomite is 9.4 percent.

JW-137* NE¼, sec. 25, T. 50 N., R. 38 W. Montmorillonite, illite or mica, quartz, calcite, dolomite, feldspar, and questionable kaolin. Total calcite plus dolomite is 10.1 percent.

JW-138* SE¼SW¼, sec. 20, T. 50 N., R. 39 W. Illite or mica, montmorillonite, chlorite, quartz, calcite, dolomite, and questionable feldspar. Total calcite plus dolomite is 6.2 percent.

JW-139* NE¼NW¼, sec. 7, T. 50 N., R. 38 W. Montmorillonite, illite or mica, chlorite, quartz, calcite, dolomite, feldspar and questionable kaolin. Total calcite plus dolomite is 12.6 percent.

F-3** Center common line sec's. 20/29, T. 48 N., R. 39 W. Clay mica, minor probable montmorillonite, troublesome in engineering uses requiring stability in varying weather conditions and may shrink considerably when fired.

F-7** SE¼, sec. 22, T. 50 N., R. 39 W. From west side Route U.S. 45, 1 mile north of East Branch Ontonagon River. Chlorite and degraded micas; firing properties should be adequate for general ceramic use.

F-8** NE¼, sec. 27, T. 50 N., R. 39 W. From west side Route U.S. 45, 0.4 mile north of East Branch Ontonagon River, 50 feet above road and 20 feet below grass roots. Illite-chlorite somewhat degraded.

F-9** SE¼, sec 27, T. 50 N., R. 39 W. From north bank East Branch Ontonagon River, 250 yards west of Route U. S. 45, Illite-chlorite showing some degradation of the illite.

F-12** Center common line sec's. 15/16, T. 49 N., R. 39 W. From side road 100 yards west of Route U.S. 45, north of Baltimore River. Illite-chlorite with no evidence of expandable clay.

F-52** Believe this is from NW¼, sec. 17, T. 50 N., R. 39 W. From east bank Ontonagon River. Illite-chlorite with a little interlayering but not expandable; should fire without excessive shrinking.

* Samples collected in 1969 by J. W. Whitlow. Clay reported are interpretations of diffractograms by J. W. Hosterman of the U. S. Geol. Survey. The diffractograms were obtained with a General Electric XRD-6 recording diffractometer operated at 50 kvp and 26 ma using a copper target, a monochromator, and a proportional counter with goniometer rotating 1 degree per minute. Calcite and dolomite content were determined by acid leaches.

** Samples collected by A. P. Ruotsala and L. L. Babcock from the Institute of Mineral Research, Michigan Technological University, Houghton, Mich. Preliminary analyses for clays are from diffractograms from a General Electric XRD-6 recording diffractometer operated at 45 kv and 30 ma using a chromium target and a vanadium filter. The above results are in an unpublished progress report (File Rept. 1, Project 11300-43). No carbonate determinations are reported for the samples.

No commercially valuable chemical properties have been found in the lake deposits of clayey material. The calcite and dolomite content is too high for fired clay products. The montmorillonite content is too low for drilling mud. Analyses to 1970 show the lake deposits of clayey material have no commercial value.

The silty clay to clayey sand of the lake deposits cause troublesome and costly engineering problems when present where roads or foundations for large structures are being built. Liquid percolation is almost nil which makes any area of predominately clayey material useless as a source of water or for use as a drain field.

MAP SHOWING APPROXIMATE TOP OF JACOBSVILLE SANDSTONE, AN EROSION SURFACE, IN PARTS OF ROCKLAND AND GREENLAND QUADRANGLES, ONTONAGON COUNTY, MICHIGAN.

By

Jesse W. Whitlow

1970