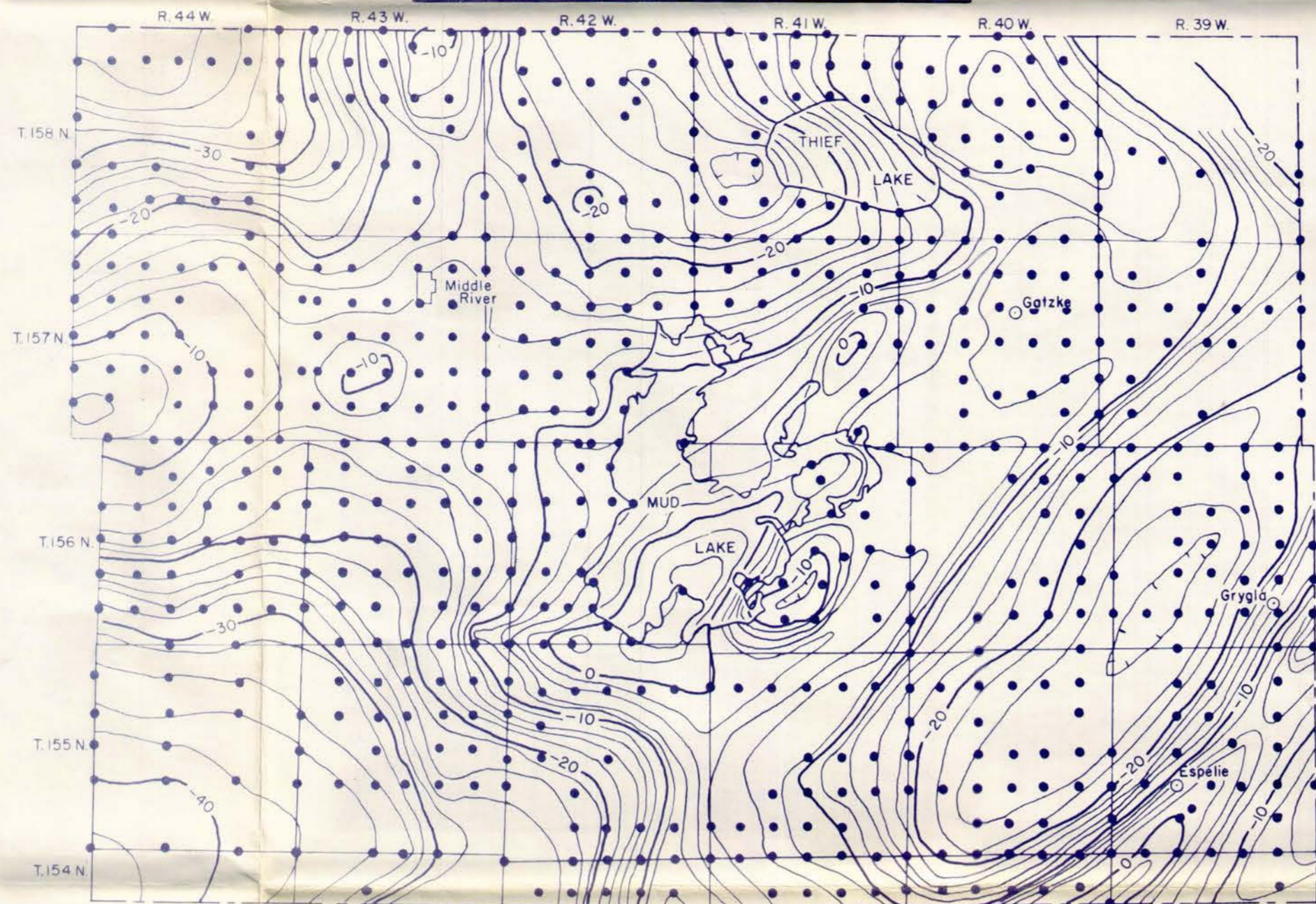


### SIMPLE BOUGUER GRAVITY



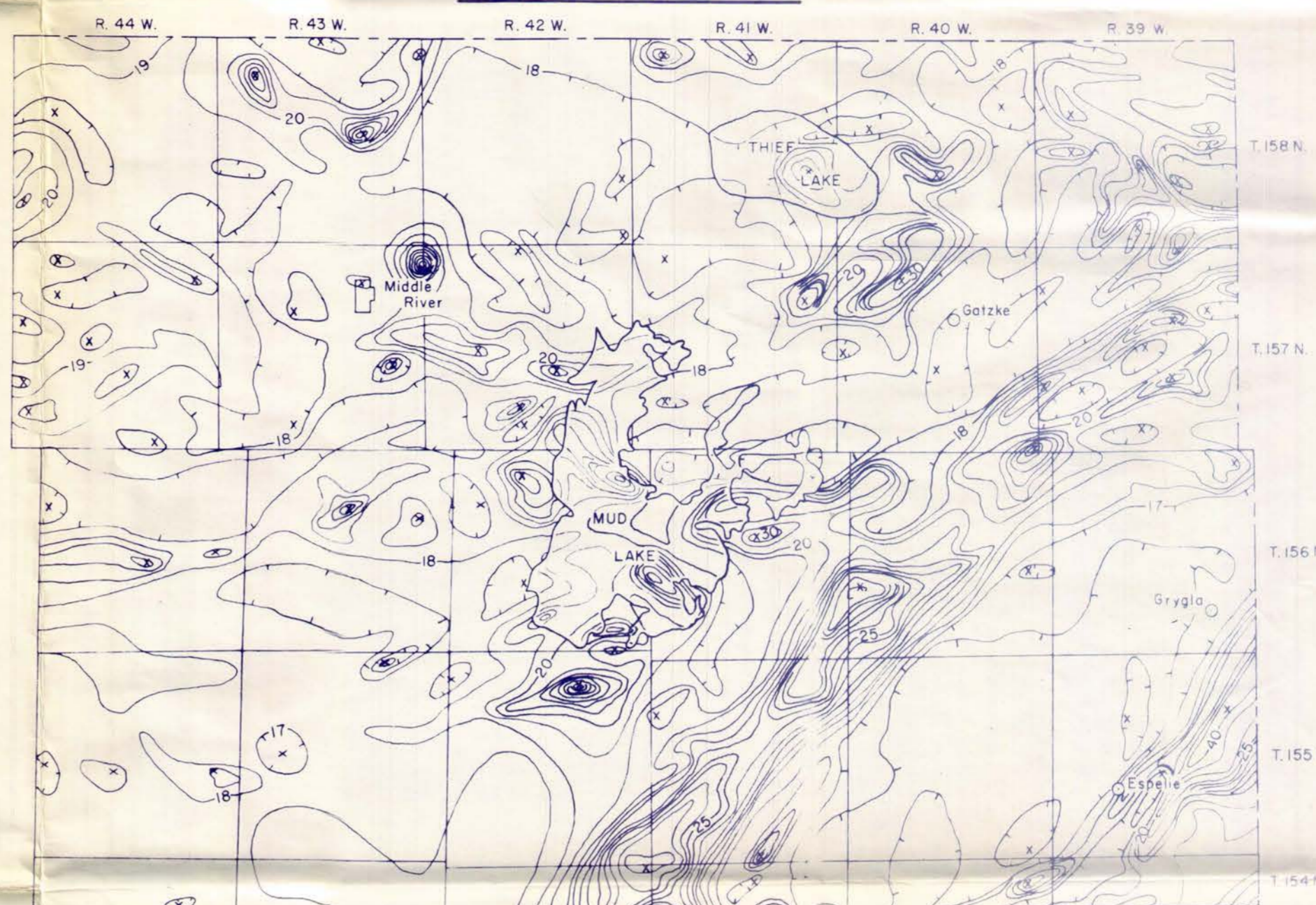
**EXPLANATION**

Gravity from McGinnis, Durfee and Ikola (1973) (Ref. 6).

— Gravity contours; 2 milligal contour interval; assumed density 2.67 grams per cubic centimeter

• Gravity station

### AEROMAGNETICS



**EXPLANATION**

Aeromagnetics from Bath, Schwartz and Gilbert (1964) (Ref. 1).

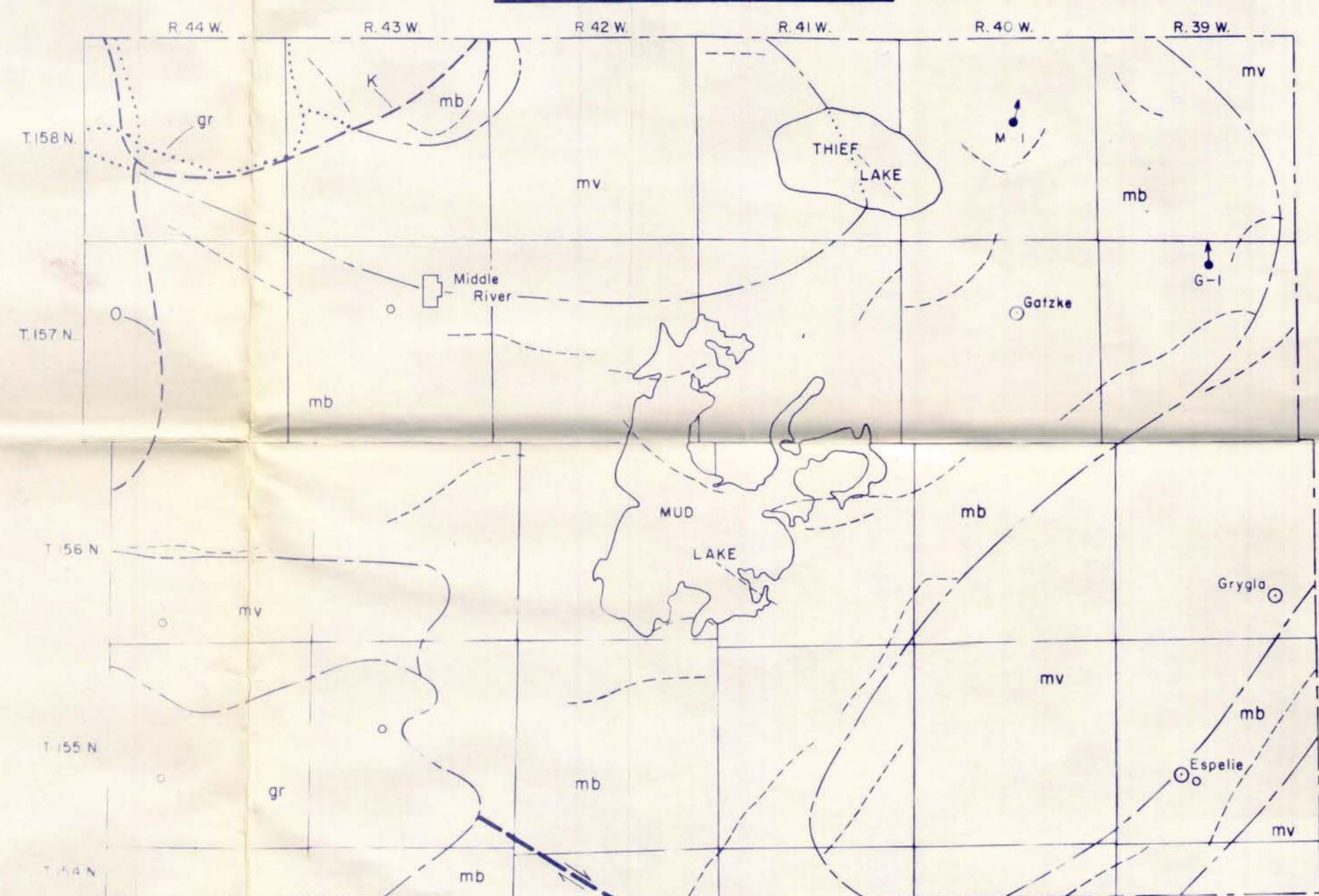
— Magnetic contours showing total intensity magnetic field of earth in hundreds of gammas relative to arbitrary datum. hachured indicates closed areas of lower magnetic intensity

X Measured maximum or minimum intensity within closed high or low

Total-intensity aeromagnetic data were obtained by flying north-south lines spaced one mile apart at an altitude of 500 feet. Bird was towed 75 feet below aircraft (Refs. 3 and 4).

For detailed maps (1:63,360) and profiles of aeromagnetic survey, see References 3 and 4.

### BEDROCK GEOLOGY



**EXPLANATION**

Geology from Sims and Ojakangas (1973) (Ref. 9) and Morey (1976) (Ref. 7).

**MESOZOIC**

K Cretaceous rocks, undivided; includes shale, sandstone and clay

**PALEOZOIC**

O Ordovician rocks, undivided; includes dolomite, sandstone and shale

**LOWER PRECAMBRIAN**

gr Granitic rocks, undivided; probably intermediate in composition

**METAVOLCANIC ROCKS**

mb mv

mb - Dominantly basaltic lavas and associated synvolcanic rocks; possibly some ultramafic rocks; includes some volcanoclastic rocks

mv - Dominantly volcanoclastic rocks of both mafic and felsic compositions; includes basaltic lavas

--- Contact, inferred from geologic data

--- Contact, inferred largely from aeromagnetic and gravity data

--- High angle fault, showing inferred horizontal movement, inferred largely from aeromagnetic and gravity data

--- Trend of airborne magnetic anomaly from aeromagnetic map on this sheet and References 3 and 4

◆ Diamond drill hole; arrow indicates direction of inclined hole

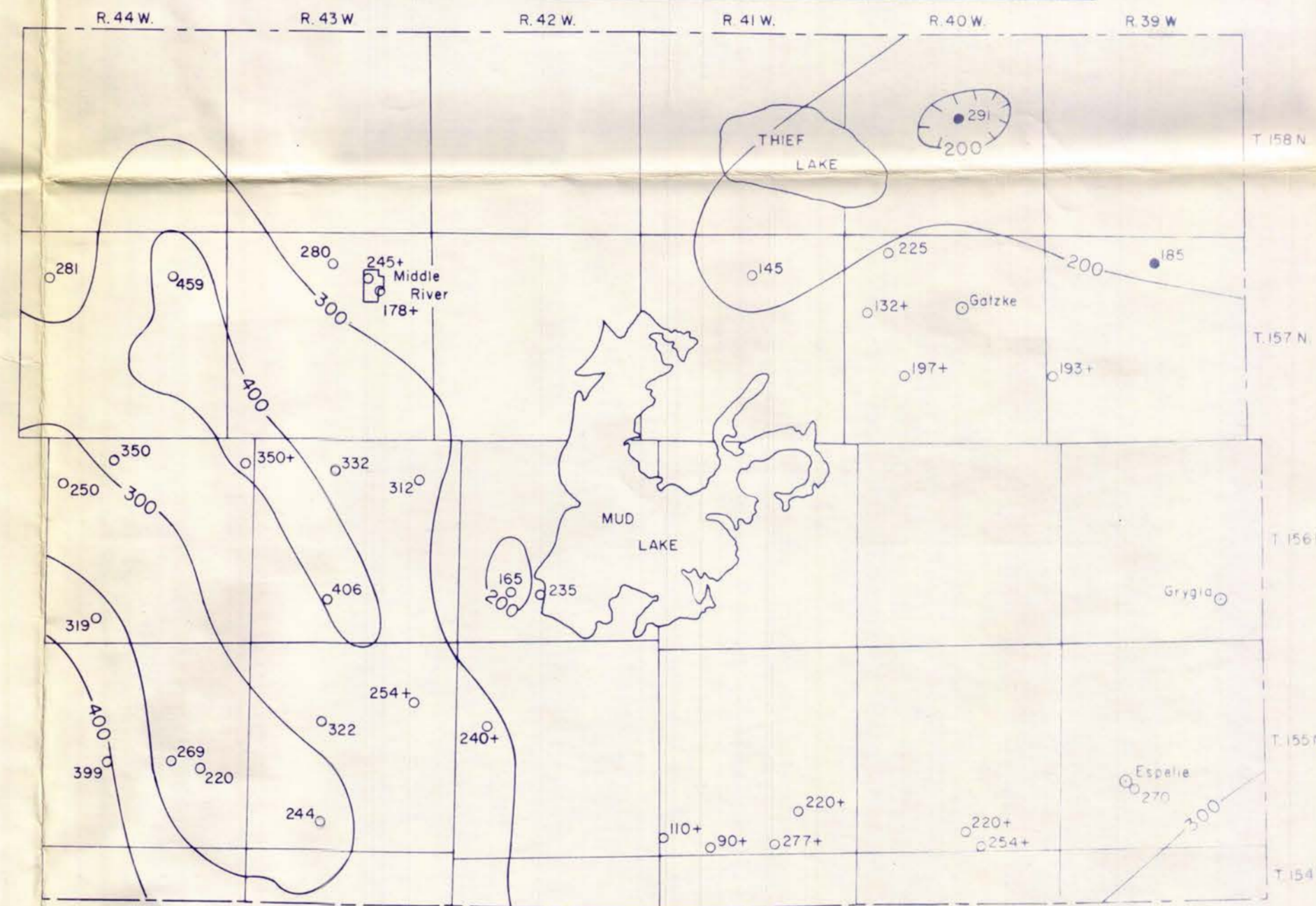
○ Well that penetrates Precambrian rocks

Diamond core drilling in eastern Marshall County has encountered Cretaceous weathering of the Precambrian rocks to depths near 100 feet.

**REFERENCES**

1. Bath, G. D., Schwartz, G. M. and Gilbert, F. P., 1964, Aeromagnetic and Geologic Map of Northwestern Minnesota: Map GP-471, U. S. Geological Survey.
2. Bidwell, L. E., Winter, T. C. and Maclay, R. W., 1970, Water Resources of the Red Lake River Watershed, Northwestern Minnesota: Atlas HA-346, U. S. Geological Survey.
3. Books, K. G., Schwartz, G. M., Meuschke, J. L. and Dempsey, W. J., 1958, Aeromagnetic Map of Eastern Marshall and Northwestern Beltrami Counties, Minnesota: Map GP-143, U. S. Geological Survey.
4. Books, K. G., Schwartz, G. M., Meuschke, J. L. and Dempsey, W. J., 1958, Aeromagnetic Map of Central Marshall and Western Pennington Counties, Minnesota: Map GP-144, U. S. Geological Survey.
5. Maclay, R. W., Winter, T. C. and Pike, G. M., 1965, Water Resources of the Middle River Watershed, Northwestern Minnesota: Atlas HA-201, U. S. Geological Survey.
6. McGinnis, L., Durfee, G. and Ikola, R. J., 1973, Simple Bouguer Gravity Map of Minnesota-Roseau Sheet: Map M-12, Minnesota Geological Survey.
7. Morey, G. B., 1976, Geologic Map of Minnesota - Bedrock Geology: Map M-24, Minnesota Geological Survey.
8. Mossler, J., 1973, Isopach Map of Unconsolidated Materials, Roseau Sheet, Minnesota: Open File Map, Minnesota Geological Survey.
9. Sims, P. K. and Ojakangas, R. W., 1973, Precambrian Geology of Roseau Sheet, Minnesota: Open File Map, Minnesota Geological Survey.

### THICKNESS OF UNCONSOLIDATED DEPOSITS



**EXPLANATION**

Adapted from Mossler (1973) (Ref. 8) with modifications based on recent drilling.

Unconsolidated materials mainly Quaternary peat, sand, gravel, clay and silt (Refs. 2 and 5).

— Isopach of unconsolidated materials

○280 Hole that penetrates bedrock, number denotes thickness of unconsolidated materials

○350+ Hole that does not penetrate bedrock, number denotes thickness of unconsolidated materials penetrated

◆85 Diamond drill hole, number denotes thickness of unconsolidated materials

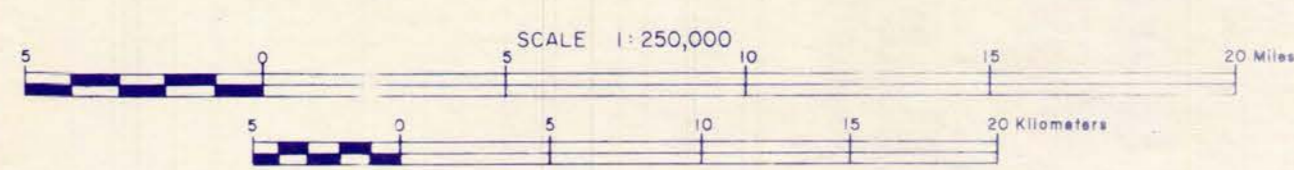
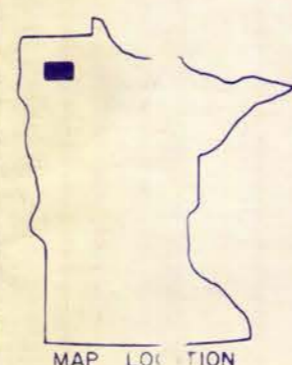
No bedrock outcrops known within map area.

Neither the State of Minnesota nor the Department of Natural Resources, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights. Reference to a company or product name does not imply approval or recommendation of the product by the State of Minnesota or the Department of Natural Resources to the exclusion of others that may meet specifications.

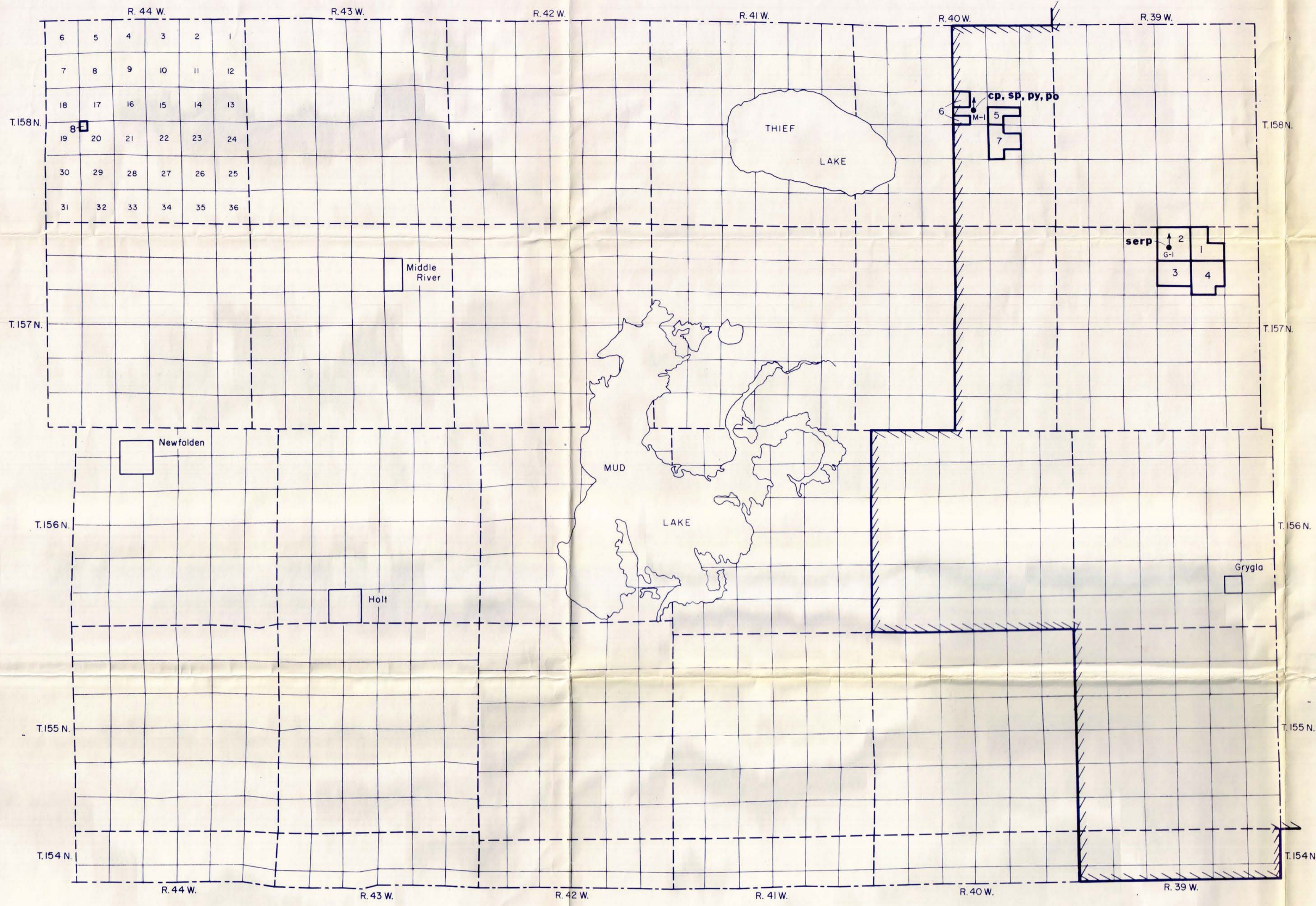
## MINNESOTA DEPARTMENT OF NATURAL RESOURCES DIVISION OF MINERALS MINERAL COMPILATION OF EASTERN MARSHALL COUNTY

By D.G. Meineke and W.H. Listerud

D.G. Meineke, Supervisor of Minerals Exploration

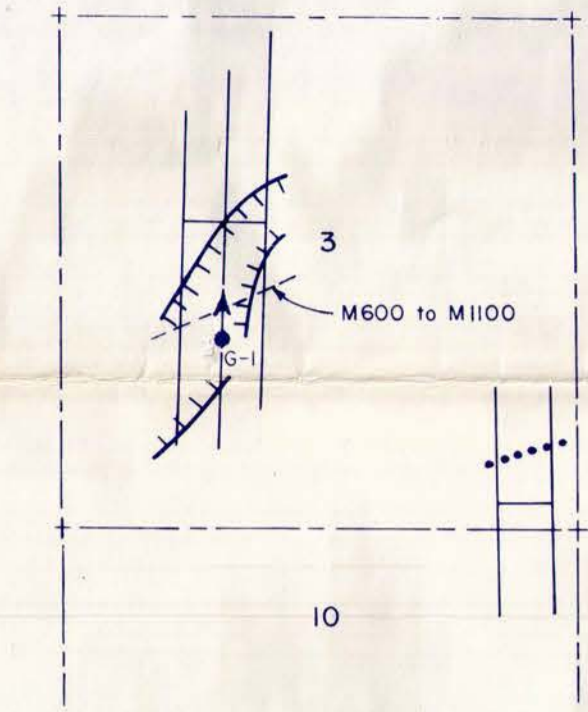




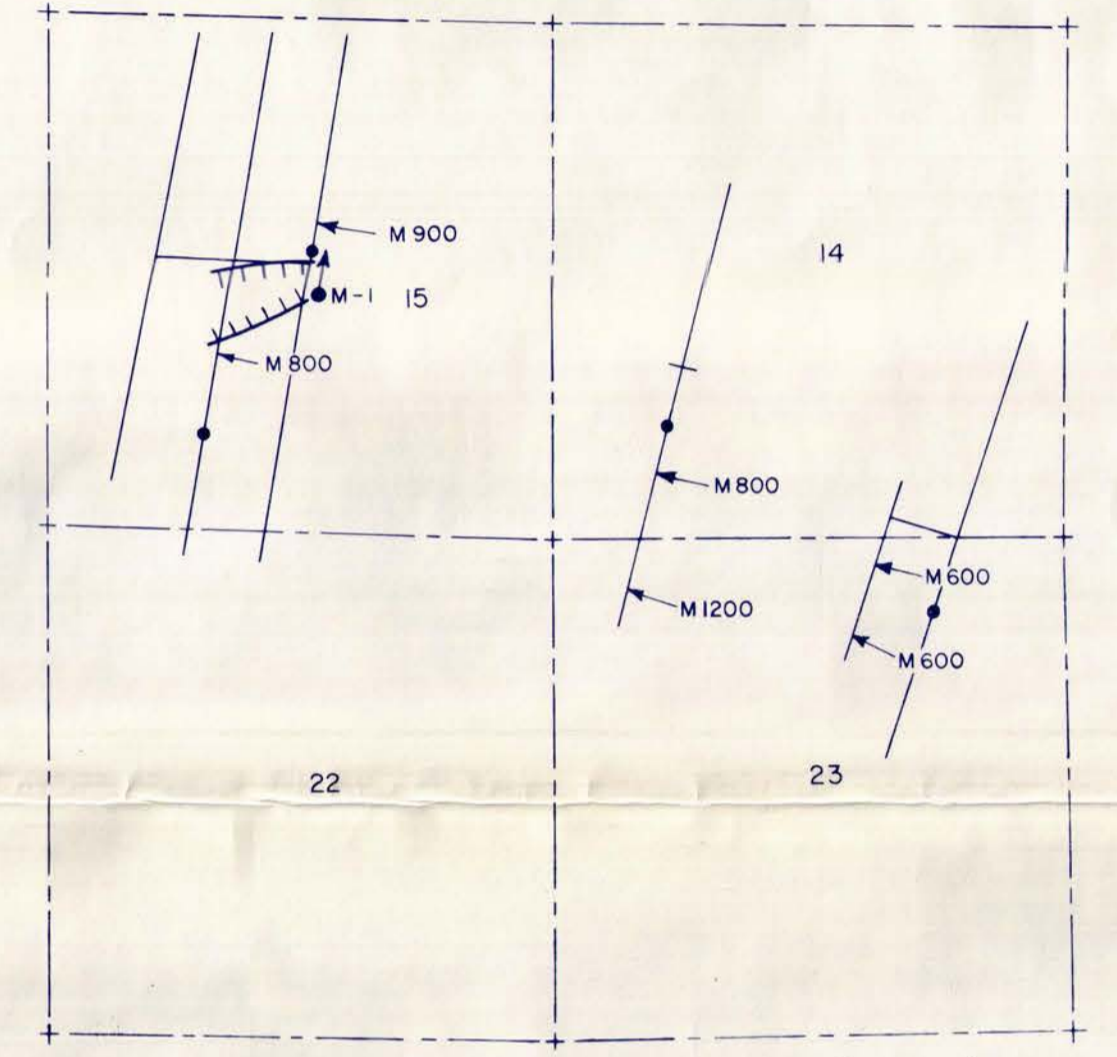


**GROUND GEOPHYSICS**

SECTIONS 3 & 10 - T.157N. - R.39W.



SECTIONS 14, 15, 22 & 23 - T.158N. - R.40W.



- Diamond drill hole, arrow indicates direction of inclined hole
- Geophysical grid
- Magnetic anomaly on grid line; anomaly value in gammas
- Trend of magnetic anomaly; anomaly value in gammas
- Resistivity low
- Trend of resistivity low
- General trend of anomalous IP chargeability



Base for maps on this sheet from Minnesota Department of Transportation 1:125,000 general highway map, and U. S. Geological Survey, Gatzke, Randeau Ridge and Thief Lake SE 1:24,000 topographic maps.

**SUMMARY OF DIAMOND DRILL HOLES\***

M-1 Mafic lavas; intermediate lavas, some brecciated; intermediate tuff; mafic volcanics, some fragmental, includes massive pyrrhotite

G-1 Diorite, some very magnetic; serpentinite; cherty sediments(?); fragmental felsic tuff; intermediate to felsic volcanics and agglomerate; intermediate porphyry

Most rocks greenschist facies or higher grade metamorphism.

Nearly 100 feet of Cretaceous weathering of the Precambrian rock occurs in the tops of the diamond drill holes.

\*Drill cores filed at Division of Minerals - Drill Core Library, Hibbing, Minnesota.

DATA AND DRILL CORE FROM TERMINATED STATE PROSPECTING PERMITS AND LEASES FILED AT THE DIVISION OF MINERALS, HIBBING, MINNESOTA								
MAP INDEX NUMBER	MINING COMPANY OR INDIVIDUAL	GROUND MAGNETICS	INDUCED POLARIZATION	DIAMOND DRILLING			STATE PERMIT OR LEASE NUMBER	YEAR ISSUED
				SOLE NUMBER	LOG	ASSAYS		
1	EXXON COMPANY	No		Data			CN-7964	1973
2	EXXON COMPANY	74	74	G-1	74		CN-7965	1973
3	EXXON COMPANY	74	74				CN-7966	1973
4	EXXON COMPANY	No		Data			CN-7967	1973
5	EXXON COMPANY	74	74				CN-7968	1973
6	EXXON COMPANY	74	74				CN-7969	1973
7	EXXON COMPANY	74	74				CN-7970	1973
8	L. Ceurte & T. Fick	No		Data			B-64	1940

Year indicates when survey was conducted.

MINNESOTA DEPARTMENT OF NATURAL RESOURCES  
 DIVISION OF MINERALS  
 MINERAL COMPILATION OF EASTERN  
 MARSHALL COUNTY

By D.G. Meineke and W.H. Listerud  
 D.G. Meineke, Supervisor of Minerals Exploration

