

DL-7
PRELIMINARY GEOLOGIC DATA
DIAMOND-DRILLING FOR GEOLOGIC
INFORMATION IN THE MIDDLE PRECAMBRIAN
BASINS IN THE WESTERN PORTION OF
NORTHERN MICHIGAN

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 for
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INTRODUCTION

This report presents more geologic data than appear in the Engineering Report for DL-7, issued in Grand Junction. More geologic information also will follow in a final report on all holes, in which thin sections and chemical analyses will be reported along with correlations among all holes.

LOCATION (Lat. 46°45'41" N., Long. 87°48'35" W.)

Drill location 7 is on rolling forest land at approximately 1200 feet altitude in the SW¼, NE¼ section 4, T.50N., R.28W., Marquette County, Michigan, approximately 1900 feet west and 1400 feet south of the northeast corner of the section. The site is reached by driving three miles on Marquette County Highway 510 generally southwestward from its intersection with County Highway 550 (southeast from Big Bay), thence three miles generally west-south-westward on the Triple-A Road, thence 0.4 of a mile westward on another dirt road. The drill site is on the north side of the dirt road.

SITE SELECTION

When DL-1 was terminated short of its target, because of grief in the hole (see DL-1 borehole history), an alternative means was sought to sample the basal Michigamme lithologies and the age W basement rocks in the East Baraga Basin. DL-7 was selected for a short vertical hole to encounter the stratigraphic interval of Michigamme Formation missed at DL-1. This location was chosen approximately 1000 feet southwest from exposures of age W rocks on the northern perimeter of the basin to insure a hole less than 800 feet in depth, in terms of anticipated dips of Michigamme strata.

GEOLOGY

SALIENT GEOLOGIC FEATURES DETERMINED BY DRILLING

Notable observations include the following:

- 1) Sand overburden extends to a depth of 243 feet,
- 2) The orientation of the hole departed from the intended vertical by 14½° at 686 feet, near the terminal depth of 697 feet. Because much of the hole was drilled BQ size, the Sperry-Sun camera could not be used to determine the direction of deviation because of its large diameter. All inclinations were determined by acid-etch tests. The hole was not deep enough to be deflected sufficiently to be absolutely perpendicular to the regionally consistent slaty cleavage. However, it is presumed that as at DL-1 and DL-3, the bore was attempting to orient itself at right angles to such cleavage at DL-7.

- 3) On the assumption that the hole here follows the same deviation trend observed as at DL-1 and DL-3, the slaty cleavage dips 37°-65°SW., the same as at DL-1, 1½ miles generally to the west.
- 4) The apparent parallelism of the strike of the slaty cleavage and bedding in the core implies that the syncline is not steeply plunging at DL-7.
- 5) Bedding dips in the same general direction as slaty cleavage, from 5°-70°SW., with an average value of 33°SW., much steeper than the average of 14°SW. at DL-1, and much steeper than gently-dipping basal age X

strata exposed in the Triple-A Road in the SW¼ of section 3, T.50N., R.28W., 0.7 of a mile to the southeast from DL-7. These changes in dip suggest that the northern boundary of the East Baraga Basin syncline must be monoclinial.

- 6) The southwestward dip of the strata implies that DL-7 is on the north limb of the East Baraga Basin syncline, as is DL-1.
- 7) Stratigraphic units penetrated include a) age X Michigamme Formation slates and argillites (243-569 feet) originally similar to those encountered at DL-1 and DL-3, except here below 490 feet depth some of the lower slates and argillites are phosphatic, b) age X cherty carbonate with thin interbeds of conglomerates with quartz, chert, feldspar, and phosphatic black pebbles and granules (569-659 feet), unconformably overlying c) age W pink and gray granitic rocks (659-697 feet, terminal depth):
 - a) Typical straight-bedded gray to black Michigamme argillites and graphitic slates with sulfides occur at 250-254, 291-299, 313-315, and 332-569 feet. These beds are very similar to many at DL-1. Algal stromatolites occur at 483 feet in this rock type. Light gray massive argillites with occasional chunks of "rip-up" clasts of black slate between 315-332 feet are tentatively correlated with such a lithologic type between 2100-2104 feet at DL-1. When the geometry at DL-1 and DL-7 is considered, this correlation implies that age W basement rocks would have been intersected with 451 feet more of drilling beyond the terminal depth of 2148 feet at DL-1, if the strata neither thicken nor thin within the 1½ miles between these two drill holes. Unlike DL-1 and DL-3, DL-7 penetrates green and red oxidized strata. Light green massive argillite at 254-263 feet and at 276-291 feet surrounds red iron-stained argillite at 263-276 feet. Presumably, oxygenated waters moving down permeable zones first oxidized the sulfur of pyrite in the black and gray rocks to ferrous sulfate, with the iron remaining in the ferrous state and thereby imparting a green color to temporary minerals such as melanterite, for example. Additional oxygen then oxidized the ferrous ions to ferric ions which imparted the red

color upon precipitation. The light green argillite between 299-313 feet apparently experienced only the first (sulfur oxidizing) "roll front"; perhaps the second, more oxidized (iron oxidizing) reddish "roll front" occurs up dip, to the northeast. The green and red strata at DL-7 correlate with unoxidized gray and black strata at DL-1.

- b) Light gray wavy- and straight-bedded and massive cherty carbonate locally contains sulfides, from 569-659 feet. Algal stromatolites occur at 577-579 feet. Thin conglomerates occur at 582, 587, 596, and 645-647 feet, and a basal conglomerate occurs at 648-659 feet. Trigonometrically this member reduces to a stratigraphic thickness of 86 feet. Presumably, this unit correlates with the 70 feet of chert and carbonate at the same stratigraphic position near the Huron River in section 1, T.51N., R.30W., Baraga County, described by Mancuso, Lougheed, Seavoy, and Shaw in 1975 at the 21st Institute on Lake Superior Geology, at Marquette, Michigan.
- c) A major unconformity separates the above unit from coarsely grained pink and gray granite of age W, with little or no sulfide mineralization, 659-697 feet.
- 8) Vein quartz in conformable sheets from ¼"-5" thickness occurs in the gray and black argillites and slates, between 291 and 557 feet.
- 9) Pyrite in sheets and nodules parallel to bedding occurs in both age X stratigraphic units, argillites-slates and cherty carbonate.
- 10) Minor galena, sphalerite, and chalcopyrite occur with pyrite and thin carbonate veinlets in the cherty carbonate, 573-575 feet.
- 11) No pyrrhotite was observed.
- 12) Minor carbonate in veinlets appears in all three stratigraphic units, below 478 feet.
- 13) No obvious volcanics were encountered.
- 14) No talcons material was observed, however, two conformable 1" clay seams occur at 276 and 286 feet, within the oxidized Michigamme argillite.
- 15) Faulting is suggested at 500-502 feet by a broken zone with graphitic slickensides, below which occurs a brecciated zone, vein quartz and minor sulfides.
- 16) No diabase was encountered in this hole.
- 17) Scintillometer measurements of the core by Jack W. Avery reveal that with a background of 40 c.p.s. most of the core registers 45-70 c.p.s. The peak of 75 c.p.s. was obtained from phosphatic and non-phosphatic black and gray slates and argillites between 500-530 feet.

18) Ammonium molybdate tests of acidized core (1:1 conc. HCl) at 2½-foot intervals by William T. Swenor, technician, indicate no appreciable phosphate down to a depth of 490 feet. From there to 600 feet it occurs sporadically (as shown in accompanying D.D.H. log sheets by Jack W. Avery) in both argillites-slates and cherty carbonates. A barren zone extends 600-670 feet. In the age W granite minor phosphate is indicated, between 670-690 feet.

19) Figure 1, on the following page, is a cross section of the gross structure observed in drilling.

COMPLETE DRILL LOGS

Inasmuch as many valuable details are included in Jack W. Avery's on-site logs, these are being reproduced in their entirety, for the benefit of the public.

RECOMMENDATIONS FOR FURTHER EXPLORATION

No ore grades or tonnages were penetrated by the drill. A slight chance exists for very small ore bodies in the vicinity of DL-7: 1) At the down-dip ends of the green and red oxidized portions of the Michigamme argillites, beyond 254-291 and 299-313 feet, where they grade into typically reduced gray and black strata, small "roll fronts" may exist a short distance southwest of DL-7. 2) The highest radiometric readings in the hole were obtained from core of faulted, sheared, and brecciated graphitic and pyritic Michigamme slates and argillites at 500-530 feet. This was not ore-grade radioactivity, but perhaps at higher levels in this fault zone, below the oxidized green and red portions, a small steeply dipping, east-striking ore body may occupy the fracture zone a short distance northeast of the collar of DL-7. Alpha-radon, radon, and helium surveys at the surface might detect such concealed bodies. However, the Pleistocene alluvium may also contain extraneous uraniumiferous materials derived from the age W granites to the northeast, and these might provide false anomalies.

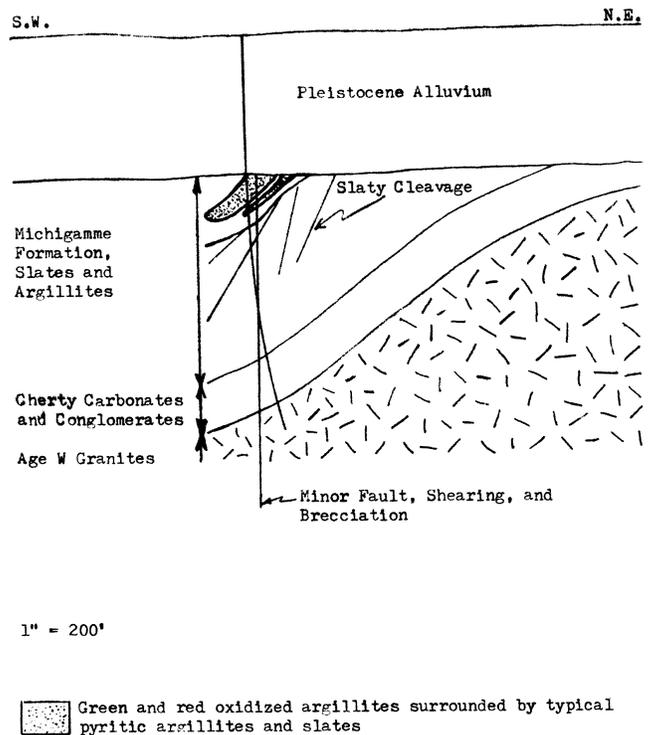


Figure 1.--Cross section showing gross structure at DL-7.