

**KANSAS GEOLOGICAL SURVEY
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**PRELIMINARY INVESTIGATION OF A PROPOSED LIMESTONE QUARRY
SITE ON PROPERTY OF THE UNIVERSITY ENDOWMENT ASSOCIATION
IN SEC. 2, T. 13 S., R. 19 E.**

by

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The Toronto limestone member of the Oread limestone formation occurs on the property of the University Endowment Association in an area in sec. 2, T. 13 S., R. 19 E. as shown in figure 1 of this report. The ledge of limestone is approximately 6.25 feet thick and is judged to be suited for quarrying and shaping into dimension blocks for building. Several of the older University buildings, buildings on Haskell institute campus and others in the community are built from stone taken from the ledge in near-by places. Bailey Chemistry Laboratories, Haworth Hall, and Robinson Gymnasium are among the buildings that are constructed from this stone. It has been learned that considerable tonnage of stone was taken from the ledge on what is now the Endowment Association's land, about forty years ago, and used in making buildings at Haskell Institute. It is reported that stone for University buildings was taken from the ledge on adjacent land in Section 1.

A small excavation has been made into the rock in the place indicated in figure 1. Figure 2 is a graphic representation of the rock as shown in the artificial exposure.

Description of the rock.--The Toronto limestone is brownish gray, finely crystalline, fossiliferous limestone that weathers gray and tan and occurs as a rather massive or blocky ledge. Bedding (approximately horizontal partings) and jointing (vertical partings) are such that facilitate removal of blocks of stone as are discussed below. Chemically the rock is about 68 or 70 percent calcite (calcium carbonate, $CaCO_3$), about 20 percent magnesium carbonate, $MgCO_3$, and about 7 percent siderite (iron carbonate, $FeCO_3$). Irregular

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distribution of iron carbonate which alters to hydrous iron oxide causes the rock to take on a tan or brown mottled appearance when exposed to the atmosphere. The relatively high magnesium carbonate content causes the rock to disintegrate more slowly than does a rock that is more nearly pure calcium carbonate.

The lower part of the ledge (unit No. 1, fig. 2) is separated from the more massive upper part by a seemingly persistent bedding plane. This lower bed, ranging from about 0.4 to 0.6 foot thick, could easily be left as a quarry floor.

Unit No. 2 (fig. 2) is brownish gray, finely crystalline and sparsely fossiliferous limestone. The thickness is 2.75 feet. It may be removed in blocks approximately 3 feet by 3 feet or larger up to about 3.5 by 4.5 feet having the thickness of the bed. Unit No. 3 is more thinly bedded. It comprises brownish, fossiliferous limestone containing foraminifera (in the upper part), mollusks and other fossils. This part may be removed in blocks approximately 1.3 feet thick, by 3 by 4 feet. The thickness of the unit in the prospect excavation is 4.1 feet.

Overburden.--The maximum thickness of the overburden at the place for prospecting is about 4 feet. There it consists of soil. Where thicker and farther from the line of outcrop one will find shale in various stages of disintegration overlying the limestone and in the area shown in black in figure 1 a thin remnant of the next higher limestone is present. The two limestones are separated by about 11 feet of shale. The thickness of overburden ranges from a fraction of a foot near the outcrop line of the Toronto limestone to about 12 feet in the area in which the next higher limestone bed remains.

The very gentle dip of the rock layers in a direction slightly north of west should be considered in planning quarrying operations. Quarrying should be planned to allow drainage away from the face of rock from which stone is to be removed.

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The general areas designated as 1 and 2 in figure 1 are suitable quarry sites. In area 2 the increase in thickness of overburden away from the limestone outcrop is slightly less rapid than in area 1. Area 2 likewise has a slight advantage regarding making a properly drained quarry. Site No. 1 is nearer the eastern edge of the property. Quarrying in area No. 1 should be started from a cut made in the north south direction and carried eastward. Water should be drained southward along the west edge of the excavation. In area No. 2 operations should be advanced northward and eastward from the outcrop. In either area, unit No. 1 (fig. 2) should be left to serve as a quarry floor.

The acreage available in either site or in combination can be estimated from figure 1.

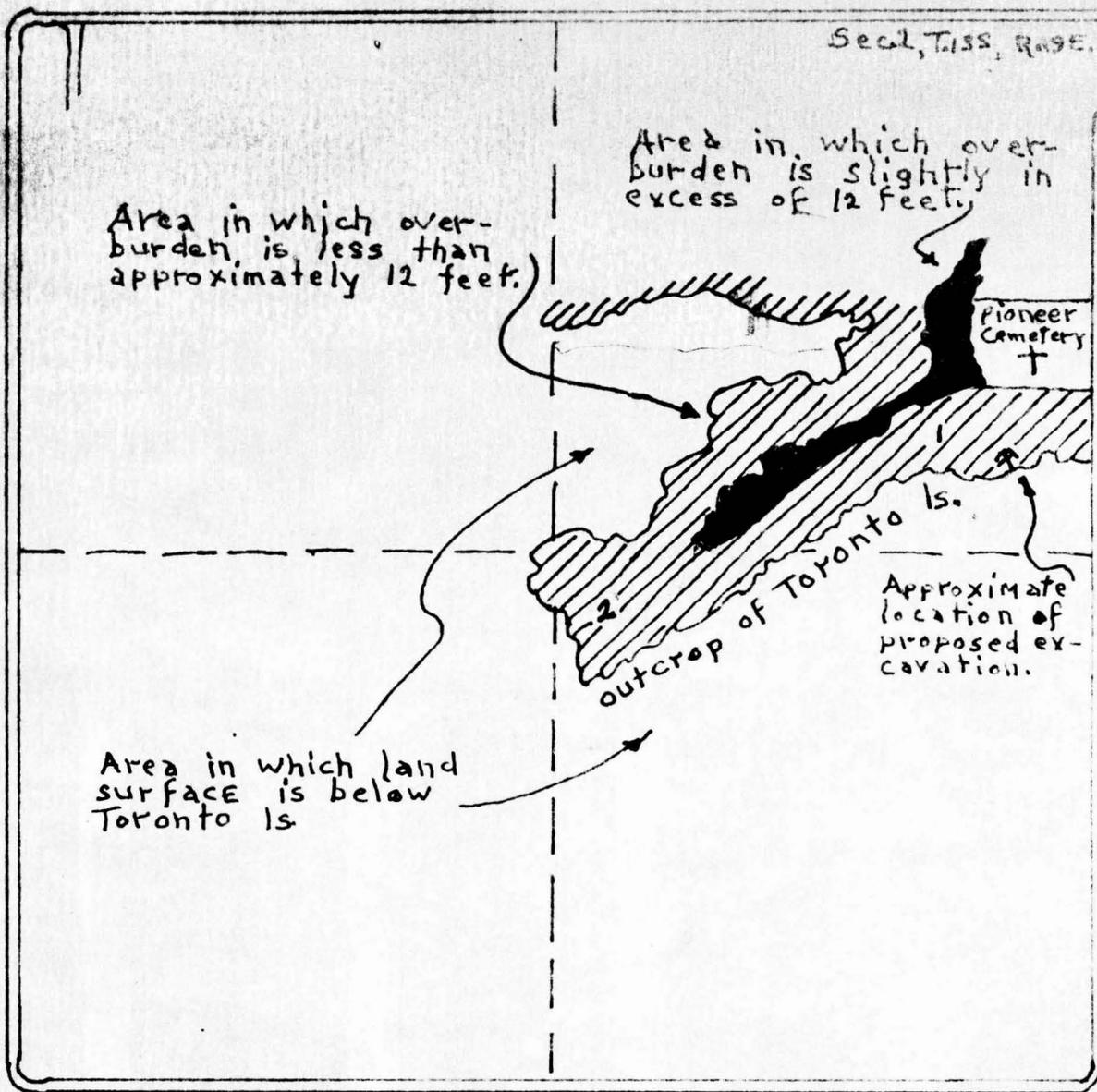


FIG. 1

Map of section 2, T.13S., R.19E., showing area underlain by Toronto limestone. Numbers 1 and 2 are proposed quarry sites.

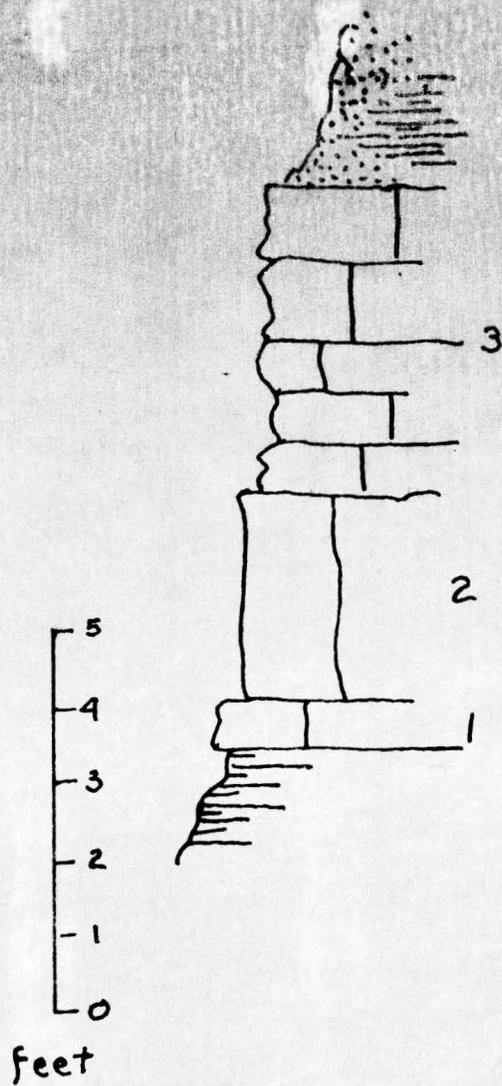


FIG. 2

Graphic representation of the Toronto limestone in an artificial exposure in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 2, T. 13 S., R. 19 E.