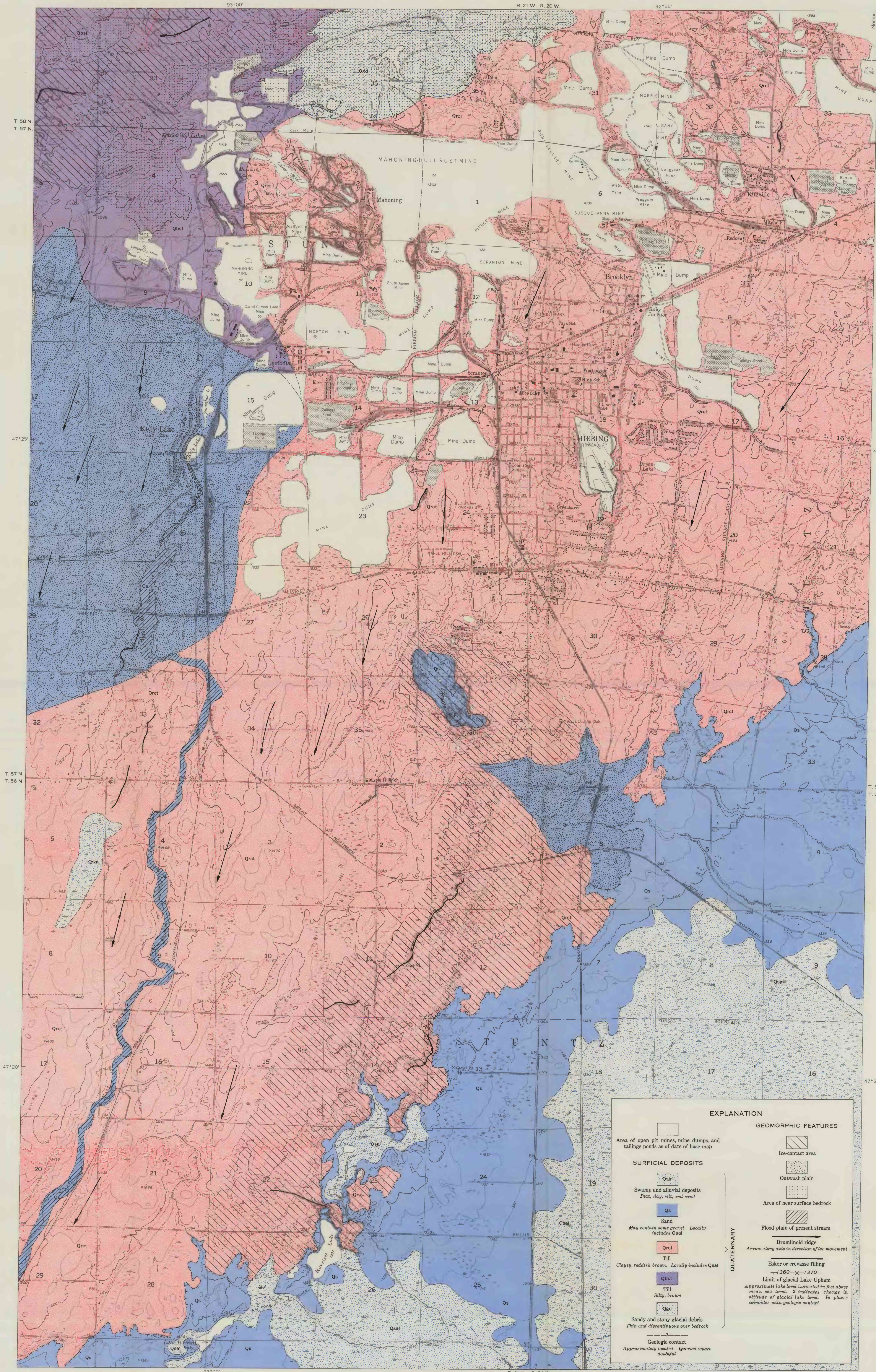
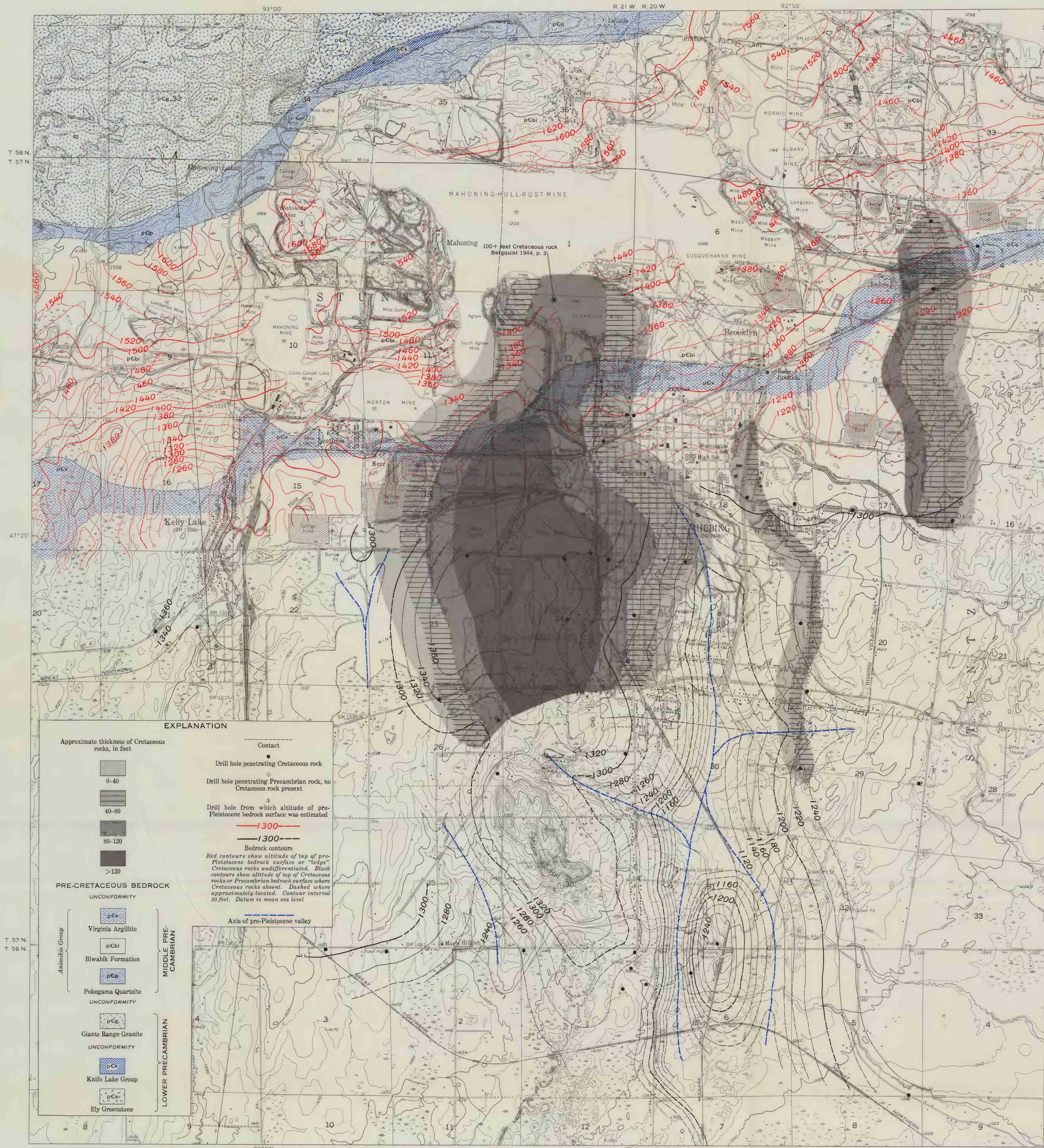


GEOLOGY



GEOLOGIC COLUMN						LITHOLOGY	GEOLOGIC SETTING	REMARKS
ERA	SYSTEM	SERIES	GROUP	FORMATION	THICKNESS IN FEET			
CENOZOIC	QUATERNARY	Pleistocene			0-200+	Lake sands of former glacial Lake Upham (Winchell, 1900, p. 124) overlap older tills in the southeastern part of the area.	Northern Minnesota was subjected to several periods of continental glaciation during the Pleistocene Epoch. As a result, multiple till sheets and outwash deposits overlie Precambrian basement rocks of Mesozoic and Paleozoic rocks. The present-day landscape was in large part developed upon drift deposited during late advances of the Wisconsin Glaciation.	Listed under lithology is a generalized stratigraphic sequence of glacial deposits found in the area based on mine pit and surface exposures, and test drilling. Relative thicknesses and distribution of individual units are shown on cross sections on Sheet 2.
						Reddish-brown clay till, commonly silty, with local lenses of sand and gravel (Cotter and others, 1964) mantle a major part of the area. Ranges in thickness from 0 to 20 feet, most commonly 2 to 10 feet thick. A brown silty till occupies a similar stratigraphic position in the northwest part of the area.		
MESOZOIC	CRETACEOUS	Upper Cretaceous	Annick Group	St. Lawrence Formation	0-165+	Varicolored shales (red, green, blue, gray, white) with beds of lignite and lignitic shale are predominant south of Hibbing in the area underlain by Virginia Argillite.	Discontinuous marine and/or continental deposits of the Coleraine Formation of Sturtevant (1933) overlie Precambrian rocks south of the Mesabi Range in the area of study. (Sloan, 1964)	Little detailed lithologic study has been done on the Cretaceous rocks of the Mesabi Range. Except for limited mine-pit exposures, lithologic data is from test drilling.
				Virginia Argillite	0-2000±	Argillite, thin bedded, gray to black.		
				Granite Range Group	0-150	Tacinite, dark colored, hard, dense, iron-bearing silicic rock with bedded zones of black, yellow or red, soft iron-bearing rock.		
				Granite Range Group	0-150	Varicolored vitreous quartzite.		
PRECAMBRIAN	Lower			Granite Range Group	0-150	Hornblende granite and biotite granite.	Intrusive into Ely Greenstone and Knife Lake Group. Parallels and forms northern boundary of Mesabi Range.	Thickness of individual formations varies from truncated feather edges in the north to complete sections downward. Total thickness of the Annick Group is unknown. (White, 1964, p. 2-27) Extensive mining of iron ore is from the Bivak Formation. Lithologic information is from open-pit mines and test drilling.
				Ely Greenstone	Unknown	Slate, graywacke, iron-formation conglomerate, tuffs, flows, intrusives.		

GEOLOGY AND WATER RESOURCES OF THE HIBBING AREA, NORTHEASTERN MINNESOTA

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