GEOLOGIC COLUMN AND UNIT DESCRIPTION

AGE	ROCK UNIT	LITHOLOGY; THICKNESS WHERE KNOWN	UNIT DESCRIPTION
QUATERNARY	Alluvium	Qal — Loessic silt, clay and sand; thickness less than 10 meters	Recent alluvium, consisting of loessic silt, clay and sand, is distributed in patches along the rivers and swamps. The alluvium covers low terrace remnants widely distributed throughout the map area but not shown on the map.
	UNCONFORMITY		
	Quaternary deposits	Q_6: silty clay, sand and gravel; thickness 100 - 150 m Q_5: sandy loess; thickness 40 - 200 m Q_4: loessic silt; thickness 100-200 m Q_3: loessic silt and quartz sand; thickness 50 - 150 m Q_1: silt, clay and quartz sand; thickness 30 - 200 m	The older Quaternary deposits underlying the alluvium range in age from Recent to Pleistocene. Lithologically the deposits are divided into Q_6, Q_5, Q_4, Q_3 and Q_1 according to the records of many drillholes and wells. Q_6 is composed of an assemblage of dark reddish to dark brown calcareous silty clay, calcareous sand and gravel. The deposit may have been derived from the nearby Chinan (济南) limestone. Q_5 is composed essentially of a thick-bedded light brown to light yellow sandy loess. Q_4 is composed only of thick-bedded brown loessic silt very rich in lime. Q_3 is composed mainly of light brown loessic silt intercalated with three to four beds of quartz sand. The quartz sand beds, continuously distributed at the depth of 70 m to 80 m become gradually predominant southwestward. Q_1 is composed mainly of light yellow to bluish gray silt and clay, intercalated with a small amount of fine-grained quartz sand.

(Column not drawn to scale)

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GROUND WATER

The water table in the map area is at a depth of 2 to 4 m along the Tienchin (天津) - Puk'ou (浦口) railway line. Seasonal fluctuation of the water table is as marked as along the Peip'ing (北平) - Hank'ou (漢口) railway line. The degree of fluctuation in the map area seems to decrease eastward. The shallow water is characterized by high degree of hardness attributable to the high Ca, SO_4 and Cl contents. The hardness owing to the Ca content ranges generally from 13° to 40° in German standard (231 to 712 ppm), and become higher southeastward, amounting to 130° (2314 ppm). The hardness is especially remarkable in the area of Q_6 and Q_4 where the water lies near the Chinan limestone. The warm and dry climate also accelerates the increase in hardness. The SO_4 content in the map area is also high, generally ranging from 50 to 40 mg/l in good water, and from 300 to 400 mg/l in inferior water. The Cl in North China results from natural and artificial origins. The content of natural Cl becomes higher northeastward as far as the coastal regions along the gulf of Po Hai (渤海) where 2,000 to 3,000 mg/l of Cl is detected. Artificial Cl seems to originate through pollution by inhabitants of villages and cities.

The level of the deep-seated aquifer becomes gradually shallower northwestward ranging in depth from 200 m to 25 m (N. Kurata, 1951). In the area of Q_5, the amount of water is rather small, and the quality becomes inferior northward. The Cl content is generally more than 800 mg/l. Drilling records show that the Cl content decreases as the depth decreases. In the area of Q_4, the amount of water becomes larger eastward as the depth decreases. The Cl content varies with depth, and is generally 300 to 500 mg/l, rarely exceeding 1,000 mg/l. The hardness of water ranges from 20° to 30° (356 to 534 ppm). In the area of Q_3, the water is well preserved due to the occurrence of quartz sand beds. The quality of water is generally good, and Cl decreases northeastward as the depth decreases. In the area of Q_1, many aquifers are found but water of good quality can be obtained only within the depth between 200 m and 300 m. The Cl content and hardness of these deep-seated aquifers become remarkably low as the depth increases.