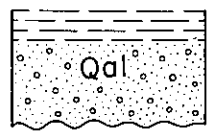
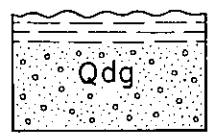
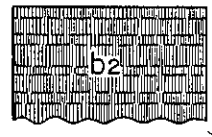
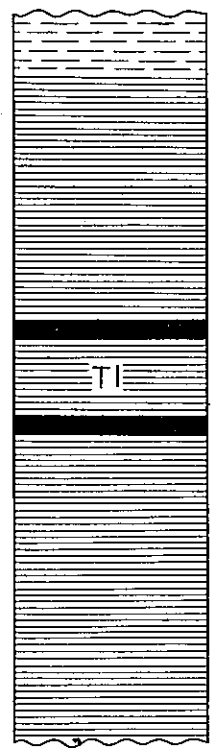
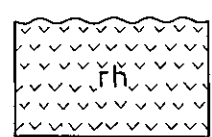
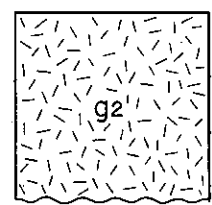
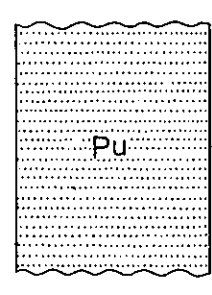



GEOLOGIC COLUMN AND UNIT DESCRIPTIONS

AGE	ROCK UNIT	LITHOLOGY; THICKNESS WHERE KNOWN	UNIT DESCRIPTION	REFERENCES
CENOZOIC	Alluvium	 Clay, sand and gravel; thickness not known	Alluvium consists of fluviatile deposits of clay, sand, and gravel, and is widely distributed along such rivers as the Sung-hua Chiang [松花江], Ch'ia-ch'a Ho [奇查河], La-lin Ho [拉林河], Ch'i-lang Ho [濛濛河], Chu-ch'i Ho [珠琦河], Mo-ni Ho [莫泥河], Hsiao-wei-sha Ho [小雾沙河], Hsiao-ni Ho [小泥河] and Ta-ni Ho [大泥河]. The thickness is unknown.	AOJI, Otoji, 1930, The Kan-yao coal field, Chi-lin Province: Manchuria Geol. and Mining Rev., no. 73, Geol. Inst., S. Manchuria Ry. Co.
	Diluvium	 Loessic sand, gravel, fine sand, and clay; thickness about 30 m or less.	Diluvium consists of fluviolacustrine deposits, chiefly of loessic sand and gravel, rarely intercalated with fine sand and clay, and is distributed in the old great basin along the drainage of the Sung-hua Chiang. The thickness is more than 30 m at the Sung-hua Chiang railway bridge in the Nung-an sheet (NL 51-12) adjacent on the west.	ENDŌ, Seidō, 1940, Plant fossils from the Shu-lan coal field, Chi-lin Province, and the Fu-shun coal field, Fengtien Province: Manchoukuo Cent. Mus. Bull., no. 3.
	Neogene basalt	 Neogene basalt intrudes the Paleogene formation, and constitutes small cones or wide flows, and is covered by the Diluvium.	Neogene basalt intrudes the Paleogene formation, and constitutes small cones or wide flows, and is covered by the Diluvium.	HARAGUCHI, Kuman, 1936, The northeastern Shu-lan coal field, Chi-lin Province: Geol. Inst., S. Manchuria Ry. Co.
	Paleogene formation	 Shale, clay and coal; total thickness more than 1,400 m	The Paleogene formation in this map area is called the Shulan [舒兰] group. It is zonally distributed in a northeasterly direction with a length of 125 km. It is 10 km wide at the southwest end and 30 km wide at the northeast end. The Shulan group was once correlated with the Cretaceous Chuantou [泉头] formation. However, the following plant fossils of the Paleogene were collected from the sandstone and shale which constitute the hanging wall of the coal seams, by Suteichi NAGAO and Shinzō SATŌ (refer to IMAIZUMI, 1954), and later by Seidō ENDŌ (1940): <i>Acer arcticum</i> Heer, <i>Sequoia</i> sp. (cfr. <i>Sequoia chinensis</i> Endo), <i>Carpinus</i> sp., <i>Cinnamomum Scheuchzeri</i> Heer, and <i>Cyperites</i> sp. The formation is faulted along a northeasterly direction against the Carboniferous Chilin formation and against the granite (g2) where the granite intrudes the formation. The formation can be divided into the following three parts: (1) Basal conglomerate, 500 m thick, composed of arkose and alternating sandstone and conglomerate. (2) Coal-bearing beds, 700 to 800 m thick, composed of an alternation of sandy shale and shale, intercalated with clay and coal. (3) Gray shale, over 200 m thick, composed of shale and clay. The structure is rather complicated. In the Shu-lan area, three synclines and two anticlines occur, with their axes generally striking N 20 to 80° E and dipping 10 to 30° NW. The coal-bearing beds extend for 35 km, and 26 coal seams (4 m in total thickness) are found at Ch'ien-yao-t'un [前窑屯], 20 coal seams (12 m in total thickness) at Mei-yao-kou [煤窑沟] and 20 to 30 coal seams (20 m in total thickness) at Pan-tui-kou* [潘推沟] about 5 km southwest of Shu-lan-chieh [舒兰街]. Although the correlation of coal seams is difficult due to lack of key beds, all coal seams may be classified into three groups, lower, middle and upper. The probable reserves of coal were estimated at 74 million tons and the possible reserves at about 179 million tons. The results of chemical analyses of the coal are as follows (in percent): moisture, 8.65 to 11.22; volatile matter, 35.05 to 38.27; fixed carbon, 21.07 to 33.49; ash, 12.25 to 37.65; sulphur, 0.38 to 0.70; color of ash, light brown; coking property, non-coking; specific gravity, 1.41.	IMAIZUMI, Rikizō, 1954, The Tertiary of Manchuria, in Geology and mineral resources of the Far East, Manchuria, III-9a, Stratigraphy: Comp. Comm. Geology and Mineral Res. Far East, Tokyo Geog. Soc. KIMURA, Rokurō and others, 1938, Map of the geology and mineral localities of Manchuria, scale 1:1,000,000: Geol. Inst., S. Manchuria Ry. Co. SAITŌ, Rinji, compiler, 1940, Geologic map of Manchuria and adjacent areas, scale 1:3,000,000: Manchoukuo Geol. Inst.
MESOZOIC	Rhyolite	 Rhyolite intrudes the Paleozoic formation or is covered by diluvium, and is poorly exposed at the southwestern part of the map area.	Rhyolite intrudes the Paleozoic formation or is covered by diluvium, and is poorly exposed at the southwestern part of the map area.	
	Triassic(?) granite	 Biotite granite and hornblende granite	Granite occupies much of the southeastern part of the map area. It intrudes the Permo-Carboniferous Chilin formation or is covered unconformably by, or is faulted against, the Tertiary formation. The granite comprises biotite granite and hornblende granite. The biotite granite is medium- to coarse-grained holocrystalline in texture, and consists chiefly of quartz, orthoclase, microcline, oligoclase and biotite, accompanied by accessory minerals such as apatite, magnetite and zircon. The hornblende granite is a marginal facies of the biotite granite; it is light grayish pink and is fine- to medium-grained in texture.	
PALEOZOIC	Chilin formation	 Sandstone and hornfels; thickness unknown	The Permo-Carboniferous formation in the map area is an extension of the Chilin formation which is widely distributed in the Chi-lin map area (Chi-lin sheet, NK 52-1) adjacent on the south. It consists chiefly of metamorphosed sandstone and hornfels. The formation strikes N 60° E and dips 50° SE at Yin-kuan-tun [银宽屯].	
PRECAMBRIAN	Precambrian schist	 Chlorite schist and sericite schist	The schist comprises chlorite schist and sericite schist; being unconformably overlain by the Permo-Carboniferous formation, it may be Proterozoic in age. The schist strikes N 75° E and dips 70° SE at Shui-chu-liu-kang-kuan-chieh [水曲柳营街].	

(Column not drawn to scale)

* Not shown on the map.