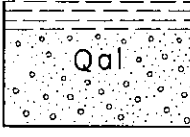
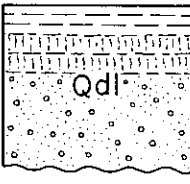

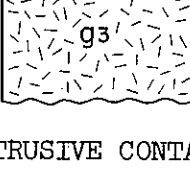
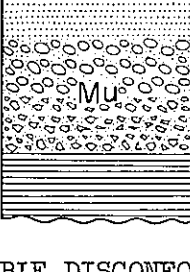
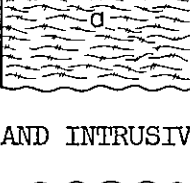
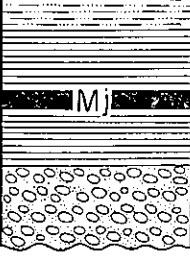
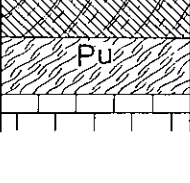


GEOLOGIC COLUMN AND UNIT DESCRIPTIONS

AGE	ROCK UNIT	LITHOLOGY; THICKNESS WHERE KNOWN	REMARKS	ECONOMIC VALUE	REFERENCES																																							
QUATERNARY	Recent	 <p>Alluvium</p>	<p>Sand, gravel and clay thickness 5 to 10 meters</p>	<p>Alluvium, consisting of alluvial sand, gravel, clay, and drifting dune sand, is distributed in the river flats, and also fills swamps and playas that are scattered in the semi-desert districts. The thickness may be 5 to 10 meters.</p>																																								
	Pleistocene	 <p>Diluvium</p>	<p>Dune sand, sandy loess, sandy clay, loess, clay and gravel; approximate thickness 50 m</p>	<p>Diluvium consists, in descending order, of (a) dune sand, (b) sandy loess and sandy clay of fluvio-lacustrine origin, (c) loess of aeolian origin, and (d) reddish residual clay. Of them, (c) and (d) generally predominate in the mountainous districts, whereas (b) occurs in the broad plain areas; (a) is found throughout the map area and shows abrupt changes in thickness. The total thickness is about 50 m.</p>																																								
MESOZOIC	Cretaceous	UNCONFORMITY																																										
		 <p>Rhyolite</p>	<p>Rhyolite, trachyte and their pyroclastic rocks; thickness more than 500 m</p>	<p>Rhyolite is mainly flows and sheets of rhyolite accompanied by some trachyte, and their pyroclastic rocks. The main body of the Ta-hsing-an-ling Range in the northwestern corner of the map area is composed predominantly of the rhyolite. Three types of texture, namely, fluidal, platy and brecciated, can be recognized in the field observations. The rhyolite may be correlated with the "Cretaceous volcanics" of the southern Jehol district. The total thickness is more than 500 m.</p>																																								
	EFFUSIVE CONTACT																																											
	 <p>Granite</p>	<p>Granite porphyry and quartz porphyry</p>	<p>Granite comprises stocks of granite porphyry and quartz porphyry. The stocks may be older in age than the rhyolite described above, but later than the andesite described below.</p>																																									
INTRUSIVE CONTACT																																												
Jura-Cretaceous(?)	 <p>Upper Mesozoic formation</p>	<p>Sandstone, conglomerate, tuff and shale; thickness not known</p>	<p>The Upper Mesozoic formation is a terrestrial complex consisting of sandstone, conglomerate, tuff and shale, and is distributed in the Ni-ma-la-chi [泥玛拉吉] district and vicinity in the drainage basin of Wu-pu-hu-tu-la Ho [乌布图托拉河]. KATAYAMA (1914-1917) assigned the complex to the Paleozoic, but later others reported it as the Cretaceous (Geologic Map of Manchuria, 1938; Geologic Map of Manchuria and adjacent areas, 1940). The compiler tentatively correlates it with the Upper Jehol formation (Jura-Cretaceous?), referring to the Upper Mesozoic tuffaceous complex in the T'u-ch'uan [突泉] district (T'u-ch'uan sheet, NL 51-7) adjacent on the north. No fossils have been reported as yet. The total thickness is not known.</p>																																									
PROBABLE DISCONFORMITY																																												
Middle or Lower Jurassic	 <p>Andesite</p>	<p>Andesite, porphyrite and pyroclastics; thickness more than 500 m</p>	<p>Andesite is mainly flows and sheets of andesite accompanied by intrusive sheets of porphyrite and pyroclastics of andesite and porphyrite. The andesite flows cover the coal-bearing Jurassic formation (Mj) described below. The total thickness may be more than 500 m.</p>																																									
EFFUSIVE AND INTRUSIVE CONTACT																																												
Middle or Lower Jurassic	 <p>Jurassic formation</p>	<p>Tuffaceous shale, sandy shale, conglomerate and coal; thickness more than 1,000 m</p>	<p>The Jurassic formation, more than 1,000 m thick, has coal seams in the vicinity of Ch'ü-li-hei where the sequence in descending order is, (a) tuffaceous shale more than 600 m thick, (b) sandy shale and coal-bearing black shale 200 to 300 m thick, and (c) conglomerate 200 m thick. In the Ch'ü-li-hei coal field, S. IKEDA collected plant fossils, such as <i>Pityophyllum</i> cf. <i>lindstroemi</i> WATHORST, <i>Ginkgoites</i> cf. <i>crassinervis</i> YABE and ŌISHI, and <i>Podozamites lanceolatus</i> (LINDLEY and HUTTON). On the basis of these fossils, IKEDA considered that the coal measures are a Middle Jurassic lacustrine deposit accumulated in a small local basin. The coal measures are intruded by a stock of porphyrite, and are covered by the flows of andesite. Moreover, the andesite, porphyrite and coal measures are all penetrated by numerous dikes of quartz porphyry. The Jurassic formation in the vicinity of Ch'ü-li-hei unconformably rests upon the Upper Paleozoic formation (Pu).</p>	<p>Coal:- The Ch'ü-li-hei coal field is situated 230 km west of T'ai-p'ing-ch'uan railway station on the Ssu-p'ing -- Chi-chi-ha-erh line. A coal seam, 0.2 to 4 m thick, has been worked by a native coal mine. The coal was discovered and mined by a Chinese in 1927, and the annual production around 1936 was 1,200 to 1,800 tons. The coal analyses by the Central Laboratory of the South Manchuria Railway Company were as follows:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Sample no.</th> <th>H₂O</th> <th>Ash</th> <th>Volatile matter</th> <th>Fixed carbon</th> <th>S</th> <th>Calorific value</th> <th>Coking property</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>8.23</td> <td>11.80</td> <td>13.63</td> <td>66.34</td> <td>0.60</td> <td>5,710</td> <td>Non-coking</td> </tr> <tr> <td>2</td> <td>3.05</td> <td>33.54</td> <td>27.43</td> <td>35.98</td> <td>0.30</td> <td>5,020</td> <td>"</td> </tr> <tr> <td>3</td> <td>7.88</td> <td>20.80</td> <td>12.76</td> <td>58.56</td> <td>1.80</td> <td>5,470</td> <td>"</td> </tr> <tr> <td>4</td> <td>6.72</td> <td>22.47</td> <td>10.82</td> <td>59.99</td> <td>1.75</td> <td>5,420</td> <td>"</td> </tr> </tbody> </table> <p>Estimated reserves are about 100,000 tons.</p>	Sample no.	H ₂ O	Ash	Volatile matter	Fixed carbon	S	Calorific value	Coking property	1	8.23	11.80	13.63	66.34	0.60	5,710	Non-coking	2	3.05	33.54	27.43	35.98	0.30	5,020	"	3	7.88	20.80	12.76	58.56	1.80	5,470	"	4	6.72	22.47	10.82	59.99	1.75	5,420	"
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Upper Paleozoic	 <p>Upper Paleozoic formation</p>	<p>Slate, graywacke, mica schist and limestone; thickness may be about 2,000 m</p>	<p>The Upper Paleozoic formation is a marine deposit consisting of dark gray slate, graywacke, mica schist, and limestone. The thickness of the formation cannot be estimated in the map area because of poor exposures, but the compiler considers it may be no less than 2,000 m. The formation is probably an extension of the so-called "Lin-hsi formation" of the Lin-hsi map area (Lin-hsi sheet, NK 50-3) on the southwest.</p>																																									
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Permian-Carboniferous																																												

(Column not drawn to scale)