GEOLOGIC COLUMN AND UNIT DESCRIPTION

	שדימי אראס	LITHOLOGY; THICKNESS	GEOLOGIO COLOWIN AND UNIT DESCRIPTION	ECONOMIC VALUE	DistrictiveModel
AGE	ROCK UNIT	WHERE KNOWN	UNIT DESCRIPTION	ECONOMIC VALUE	HARAGUCHI, Kuman, and IWAI, Jun'ichi, 1953, San-hsing coal field, in Geology and mineral resources of the Far East, Manchuria, VII-2u: Comp.
4RY	Alluvium	Sand, clay, silt and gravel; thickness less than 10 meters	Alluvium, consisting of fine sand, clay, silt and gravel, is widely distributed covering the remnants of low terraces and the flood plains in the drainage basins of the Sung-hua Chiang[松 北 正]and the Mu-tang Chiang [红 丹 五]. It is generally covered by grass and black peaty mud that constitute swamps and marshes.	Au Placer gold in the Recent and Pleistocene deposits in the upper reaches of the T'ang-wang Hois, Hi jolwas worked by Chinese miners many years ago.	Comm. Geology and Mineral Res. Far East, Tokyo Geog. Soc. IMAIZUMI, Rikizo, 1952, The Tertiary period of Manchuria, in Geology and mineral resources of the Far East, Manchuria, III-9a: Comp. Comm. Geology and Mineral Res. Far East, Tokyo Geog. Soc.
QUATERN	Diluvium	Qd, undifferentiated sand, clay and gravel; thickness less than 100 m Qdg, sand and gravel with clay of fluvio-lacustrine origin;	Diluvium consists of fine, medium and coarse sand and varicolored clay, associated with gravel. Diluvium of the fluvio-lacustrine facies is defined as Qdg which extends from the Sui-hua map area (NL 52-4) adjacent on the west. The drilling records of water wells at San-hsing[三 性Prevealed the following sequence in descending order: brown clay (0.5 m), sandy clay (2.5 m), yellowish brown fine sand (6 m), yellowish brown medium sand (7 m), yellowish brown coarse sand containing pieces of black coaly shale (18.8 m), yellowish brown very coarse sand (12 m), Mesozoic tuff. Diluvium at Ta-ku-tung(大 古 知)on the west bank of the	Tang-wang horse of sollwar worked by chinese miners many years ago.	SATTŌ, Rinji, compiler, 1940, Geological map of Manchuria and adjacent areas, scale 1:3,000,000: Manchoukuo Geol. Inst. SAKAGUCHI, Shigeo, 1943, On the occurrence of Trigonides in the vicinity of I-lan(您 成), Sanchiang Province: Manchoukuo Geol. Soc. Jour., nos. 4-5.
		thickness less than 100 m	Sung-hua Chiang near the San-hsing coal field yields fossils of mammoth and is correlated with the Kuhsiangtung series[新 溥 も 秋]of the Ha-erh-pin[哈 南 采]district which is Upper to Middle Pleistocene in age.		SAKAMOTO, Takao, and others, 1937, Geology and geography of northeastern Manchuria: Geol. Inst., S. Manchuria Ry. Co.
	Neogene basalt	ONCONFORMITY Augite-olivine basalt; thick- ness 20 to 100 m	Neogene basalt is mainly augite-olivine basalt occurring as flows and sheets of variable thickness, accompanied by tuffaceous sand and breccia. It was erupted presumably during the Miocene epoch and is now exposed as the caprock of hills east of the Sung-hua Chiang.		SHIKAMA, Tokio, 1951, The Quaternary period of Manchuria, in Geology and mineral resources of the Far East, Manchuria, III-10: Comp. Comm. Geology and Mineral Res. Far East, Tokyo Geog. Soc.
TERULARY		EFFUSIVE CONTACT ////////	The Paleogene formation is distributed along the Sung-hua Chiang 15 km southwest of San-hsing, underlying the Recent and Pleistocene deposits, so no outcrops are found. The drilling records reveal the following sequence in descending order:		
	^^~~		Drillhole beneath the swamp of the Sung-hua Chiang (HARAGUCHI southeastern bank of the Sung-hua Chiang (HARAGUCHI hua Chiang (IMAIZUMI) Bed Lithology Thickness Lithology Thickness		
	Paleogene formation	Sandstone, shale, conglomerate, oil shale and coal; thickness more than 300 m	(m) 7. Conglomerate 10+ Conglomeratic sandstone 10+ 6. Alternation of sand- stone and shale 5. Alternation of oil shale, sandstone and shale 100 Alternation of oil shale and sandstone, containing plant fossils in the lower part 4. Oil shale yielding Oil shale yielding plant Dark gray and dark brown oil	The San-hsing coal and oil shale field was discovered in 1935 by the Geological Institute, South Manchuria Railway Company. The strike extent of the coal-bearing formation, as ascertained by drilling, is 7 km long. There are seven to eleven coal seams, alternating with oil shale beds, and the total thickness of coal is 15 to 22 m. The existence of coal is also known on the northeastern bank of the Sung-hua Chiang, but coal seams gradually thin eastward. The coal is pitch-black, low-grade bituminous coal, and contains granular amber. The coal is used for liquefaction, low-temperature distillation and for heating boilers. The results of analyses are as follows: Fixed Volatile Heat Caking Read Carbon Carbon Matter Water Ash Value Property	
			plant fossils 100 fossils in the lower part 20 shale correlatable with the cil. shale above the coal seams in the Fu-shun molcoal field, al- though of much inferior quality. 3. Alternation of work- Sandstone and shale, Seven to eleven coal seams have a	(%) (%) (%) (%) (cal) Northern 43.34 45.32 4.39 6.61 6,830 Caking Southern 46.16 42.39 4.70 6,750 Non-caking	
			able coal seams, coaly shale and oil shale. Oil shale in the uppermost part is of the best quality able coal seams and oil intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality intercalated with workable coal seams and oil shale in the uppermost part is of the best quality in the uppermost part is of the uppermost part is of the uppermost p	The actual reserves of coal, estimated from the thickness of seams so far ascertained by drilling, was reported as one million tons as of 1945 and possible reserves as 162 million tons. The San-hsing coal field was worked from 1939 to 1945 by the Manchuria Coal Mining Company, and in 1942 produced 150,000 tons.	
			2. Arkosic sandstone and sandy shale, without basal conglomerate 2 - 24 Stone and shale at the bottom 5 - 30 Stone sandy shale. Arkosic sandstone, rarely with conglomeratic sand-stone consists chiefly of very fine-grained sandstone which rarely stone and shale at the bottom 5 - 30 Stone sandstone consists chiefly of very fine-grained sandstone which rarely stone and shale at the bottom sandy shale.	The oil shale alternating with coal seams is blackish brown, and has a total thickness of more than 22 m. It locally contains oil as good as that of the noted oil shale of the Fu-shun coal field. The oil shale is probably workable by stripping methods.	
			1. Biotite granite Porphyritic biotite granite Bedrock The oil shale (bed 4) yields many plant fossils such as Comptoniphyllum sp., Diospiros sp., Glyptostrobus		
			europaeus Heer, Glyptostrobus sp., Juglans sp., Nelumbo sp., Quercus sp., Sequoia langsdorfii (Brong.), Sequoia sp. and Woodwardia sp. Many fossils of insects belonging to Coleoptera, Diptera and Hymenoptera are also found. According to IMAIZUMI (1952), the lower part of the formation (beds 2, 3 and 4) can be correlated with the Fu-shun formation and the upper part (beds 5 and 6) corresponds to the Shu-len[# Milformation. The formation constituting the San-hsing coal field shows a monoclinal structure, striking NE and dipping 10° SE beneath the river bed of the Sung-hua Chiang; it strikes E-W and dipp 30° to 45° S in the hills east of the		
			river. The formation is bounded with the granite (g_2) by a N-S trending fault.		
	~~~~	→ UNCONFORMITY →			
			The Lower Cretaceous formation is exposed in the hill south of San-hsing. The stratigraphic sequence in descending order is as follows:		
			Bed Idthology Thickness (m)  Upper Alternation of shale and Alternation of black shale and dark green or brown		
	Lower Cretaceous formation (Talatzu series)	Sandstone, conglomerate, shale and slate; thickness 1,400 m	sandstone 500 sandstone, with green, hard siliceous slate at the base. The shale yields Trigonides kodairai Kobayashi and Suzuki and other bivalves, Elatocladus manchuricus		
	(11111111111111111111111111111111111111	101.0 to 101	Yokoyama and other poorly preserved plant fossils.  Middle Sandstone 700 Aggregation of sandstone and conglomeratic sandstone,		
		800°00°0	intercalated with a few beds of partially variegated clay shale.		
MESOZOIC			Iower Conglomerate 200 Yellowish sandstone, unconformably resting upon the granite bedrock, grades into conglomerate upwards.  Pebbles of the conglomerate are granite, quartzite and gneiss, mostly 5 cm in diameter.		
		2.000 IM SE	The formation has a monoclinal structure, striking N 0° - 20° E and dipping 20° - 30° SE. Ten km south of San-hsing on the west bank of the Mu-tan Chiang[# 丹 江], the black shale in the upper bed yields fossils as mentioned above. On the basis of these fossils, the formation is correlated with the Talatzu series[太 开 子 珠] of Manchuria, the Rakuto series[朱 宋 珠] of Korea and the Wakino formation of Japan, all Lower Cretaceous in age.	3 •	
	Jurassic formation	Sandstone, conglomerate and shale; thickness unknwon  UNCONFORMITY	The Jurassic formation is exposed at Shen-shu[神 報]east of T'ieh-li[報 報]and at Fu-la[章 和]along the Ta Ho[大 珂]. It consists of sandstone, conglomerate and shale, rarely accompanied by coal seams. The thickness is not known, and no detailed data are available.		
	Pre-Jurassic granite	Biotite granite, hornblende granite, biotite-hornblende granite and gneissose granite  INTRUSIVE CONTACT \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Pre-Jurassic granite occurs as a batholith of the vast mountainous region which occupies nearly half of the map area. The rock comprises biotite granite, porphyritic biotite granite, hornblende granite, and biotite-hornblende granite, and is locally associated with gneissose granite. The granite east of T'ieh-li contact-metamorphosed the Paleozoic formation (P). The granite near Fu-la and Shen-shu is unconformably overlain by the Jurassic formation (Mj).		
PALEOZOIC	Paleozoic formation	Crystalline limestone, chlorite schist, mica schist and phyllite; thickness unknown	The Paleozoic formation is exposed at Shen-shu east of T'ieh-li. It consists of crystalline limestone, chlorite schist, mica schist and phyllite. No geologic field work has been conducted on the formation.		
	Precambrian(?) granite gneise	Biotite-hornblende orthogneiss, metagneiss, gneissose granite and crystalline limestone; thickness unknown	Granite gneiss of unknown age (probably Precambrian) is distributed in the northern part of the map area.  It consists chiefly of biotite-hornblende orthogneiss, locally associated with various kinds of metagneiss, gneissose granite and crystalline limestone.		
	//////// PROI	BABLE INTRUSIVE CONTACT AMANAMA		The crystalline limestone, interpedded within the Paleozoic formation, the granite gneiss and the crystalline schist is calcined for lime on a small scale at several	
FRECAMBRIAN(?)	Precambrian(?) crystalline schist Sch Mica-quartz schist, hornblende schist and albite-mica schist;		Crystalline schist of unknown age (probably Precambrian) is distributed in the vicinity of San-hsing. It consists chiefly of mica-quartz schist, accompanied by hornblende schist and albite-mica schist. The mica-quartz schist in the hill southeast of San-hsing is bluish gray, white, or light pink, and is markedly schistose. Under a microscope, the rock shows a lepidoblastic texture, consisting of laminated quartz, sericite and biotite, and rarely hematite. The mica-quartz schist near T'uan-shan-tzu M \( \preceq \tau \), 30 km east of San-hsing, is intercalated with hornblende schist. The hornblende schist is green, markedly schistose, with hornblende crystals visible. Under a microscope, the schist shows a pneumatoblastic texture, consist-	places.	
		thickness unknown	ing chiefly of green actinolitic hornblende, accompanied by fine grains of quartz, albite, clinozoisite, sphere and rutile. The mica-quartz schist at San-hsing is intercalated with two beds of massive crystalline limestone. The rock on the east bank of the Sung-hua Chiang near Hung-k'o-life 克力, 40 km northeast of San-hsing, is albite-mica schist.		
		Column not drawn to scale			
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