

2 -4 Administrative Districts

As mentioned earlier, the project area extends over 19, 000km² in the eastern part of Java Island, and administratively it spreads across East Java Province, Central Java Province, and Yogyakarta Special District. The four districts of the geological survey, geophysical survey and drilling survey belong to the East Java Province. The Tempursari district belongs to Kabupaten (Regency) Lumajang. The Purwoharjo district belongs to the Kabupaten Malang and Kabupaten Lumajang. The Seweden district belongs to Kabupaten Blitar. The Prambon district belongs to the Ponorogo and Kabupaten Trenggalek.

2 -5 Mining Concessions

The Project area has been covered by an exploration license of DMRI (WPP) except several existing mining rights owned by several private companies. However at the beginning of the phase 3 survey most of the mining concessions have been terminated. Consequently, the only one mining right within Phase 3 geological survey area has been the WPP. Applications of the extensions of some parts of the original WPP were submitted to the local government office (Bupati office).

Chapter 3 Geology of Project Area

3 -1 General Geology of the Vicinity of the Project Area

The project area is located in an island arc related to the present subduction of the Australia-India Plate under the Eurasia Plate, and a row of volcanoes occurs in the east-west direction. This volcanic arc overlaps the Tertiary volcanic arc and largely controls the geology and geologic structure of the survey area. East Java is divided into 4 zones, namely from the north southward, Rembang Zone, Kendeng Zone, Central Volcanic Zone, and Southern Mountain Zone. The Rembang and Kendeng Zones consist mainly of post-Oligocene sandstone-mudstone and limestone with intercalation of volcanoclastic rocks. The Central Volcanic Zone is composed mainly of post-Pliocene volcanic rocks. In the Southern Mountain Zone, pre-Tertiary metamorphic rocks are exposed at some places, and these are overlain by widely occurring Eocene and Oligocene to Pliocene volcanic rocks and limestone units. The project area spreads across the two southern zones, namely the Central Volcanic and Southern Mountain Zones.

The geology of the survey area is comprised mainly of Eocene to Pleistocene volcanic and volcanoclastic rocks, and Oligocene-Miocene to Pliocene limestone occurs in the northwestern to central southern parts. Also the intrusive bodies consist of basalt, andesite, dacite and diorite.

Table 1-4 Simplified Stratigraphy of East Java

Age	Rembang Zone	Kendeng Zone	Central Volcanic Zone	Southern Mountain Zone
Pleistocene	Alluvium Limestone	Alluvium Limestone	Volcanics Alluvium Limestone	Alluvium, Limestone
Pliocene	Limestone	Limestone Conglomerate, sandstone Volcaniclastics	Volcanics Sandstone, Marl	Volcanics
Late Miocene	Sandstone, Marl	Sandstone Marl Volcanics	/	Volcanics Limestone
Early - Late Miocene	Claystone, Marl Limestone	Sandstone Mudstone		Volcanics Limestone
Late Oligocene -Early Miocene	/	/		Volcanics Limestone
Eocene				Sandstone, Siltstone Limestone
Pre-Tertiary			Schist Limestone	

3 -2 Geology of the Survey Area

(1) Stratigraphy

The geology of the survey districts consists of Tertiary and Quaternary System. The oldest exposed formation in this area is Oligocene volcanic and volcanoclastic rocks, and sedimentary rocks. They are called Mandalika Formation. Miocene to Pliocene Series occur widely and they are; Jaten Formation in the Prambon district, Wuni Formation in the Tempursari – Purwoharjo

district, consisting mainly of volcanic and volcanoclastic rocks, Wonosari Formations in the Seweden and Prambon districts, composed mainly of limestone. Also basalt, andesite, dacite and diorite intrusive bodies are exposed. The Quaternary System occurs in the Purwoharjo district and northern part of the Prambon district, and it consists of Pleistocene to Holocene volcanic, volcanoclastic rocks and unconsolidated sediments

(2) Geologic structure

(a) Folding: The Tertiary System largely consists of volcanic and volcanoclastic rocks, which are generally massive and do not show beddings. However, Sporadic intercalations of fine grained volcanoclastic layers often show some bedding and dipping: south and west dipping of course tuff in the southwestern part of Tempursari district, gentle dipping of sandy tuff of the Wuni Formation, gentle foldings of fine tuffs in the eastern part of the Seweden district, and gentle synclinal structure of the Jaten Formation. The beddings generally show less than 30° except near faults. Another key to the geologic structure is the regional alteration of the Tertiary system. The Mandalika Formation in the central part of the Prambon district has undergone stronger propylitic alteration than surrounding zones that may reflect an exposure of lower rocks and existence of minor anticline in the central part.

(b) Faults: NNE-SSW to NW-SE faults run in the Tempursari and Prambon districts. N-S trending faults are dominant, and E-W trending faults are also obvious in the Seweden district.

(c) Intrusive rocks: Intrusive rocks elongating in the NNE-SSW to NW-SE direction are most dominant in the Tempursari and Prambon district. On the other hand, Intrusive rocks intruding in N-S direction are most dominant in the Purwoharjo and Seweden districts.

(d) Quartz veins: Many veins showing in N-S or NNW-SSE directions are dominant in the Seweden and Prambon district.

3 - 3 Outline of the Mineral Showings in the Survey Area

(1) Tempursari District

The Tempursari districts is said to have been investigated by Timah Investasi Mineral for porphyry type ore deposits, although the data was not obtained. Gold grains were found in the pan-concentrates at the two localities along the K. Ngrawan. Quartz float from the K. Ngrawan contains anomalous gold: 0.09g/tAu. The phase 3 Survey has revealed weak copper and gold

mineralization near the contact between diorite and andesite rocks along the K. Ngrawan. The mineralization zones are so weak but the quartz stockworks are developed in the vicinity. The white argillic alteration zones occur widely. Some of clay minerals are believed to be of supergene origin, but the possibility of blind porphyry copper deposits should be considered. Geophysical survey delineated high chargeability and comparatively high resistivity zone from the K. Ngrawan toward the northwestern mountainous zone. It is expected that the pyrite disseminated zone in the zone continued to the depth and warrant to conduct drilling.

(2) Purwoharjo District

The geology of the Purwoharjo district consists mainly of the Wuni Formation and no mineralization was found in the Wuni Formation. Therefore, the Cu values exceeding 100ppm in the stream sediments are thought to be derived of the unmineralized Wuni Formation.

(3) Seweden District

A sample of weakly silicified rock taken along the K. Putih in the western part of the district returned 2.8%Cu. Pan-concentrates at the downstream area contained chalcopyrite grains. The more detailed sampling confirmed the mineralization, the samples along the K. Putih 0.5%-0.81%Cu. The zone from K. Putih and surrounding area underwent intense argillic-sericitic alteration. NE-SW trending faults runs along the K. Putih and dacitic rock intruded into the zones. Geophysical survey revealed two high chargeability zones at depth extending from north to south near the geochemical anomalies. One drill hole of 400m length indicates that the high chargeabilities are caused by strong argillic alteration in argillic and propylitic alteration zone. No significant mineralization was encountered in the drill hole.

(4) Prambon District

Sericite, mixed-layer clay minerals (smectite/sericite), smectite, and kaolin minerals are widely distributed in the northern to central part of the district. The quartz veins and silicified veins are emplaced in the alteration zones. But the Pb-Zn veins in the Sumurup and Beloran rivers are emplaced largely in the propylitic alteration. Propylitic and sericite alterations develop also in the central part to the southern part of the district. There are also weak propylitic alteration area along the Tengger River in the northwestern part of the district, where only barren quartz veins and calcite veins. Barren chalcidonic quartz veins were found in the basalt lava of Jaten Formation in the central part of the district.

The geological survey was conducted in the northern part of the district, especially along the upstream of the Suren River and near Sengon villages. Silicified ledges were

found during the supplementary survey of the Phase 2 Survey.

Along and near the Suren River, four (4) quartz /silicified veining targets are delineated during this geological survey

Target	Direction (Strike & Dip)	Strike Length & Width	Assay results (*: Phase 2)
1. Quartz vein/silicified zone	N-S, Near vertical	- 500 m - Silicified zone: 5 m	Silicified vein: 50 cm 2.3g/t
2. Quartz vein zones	N30° W, 60-90° SW	- 1,500m - Quartz vein: 40 cm, and parallel veins	Quartz vein: 40 cm 1.8g/tAu (27g/tAu*)
3. Quartz vein zones	N30° W, 80° SW-NE	- 800 m - Quartz vein: 70 cm, and parallel veins	Quartz vein: 70 cm 3.0g/tAu (21g/tAu*)
4. Quartz vein/silicified zone	N-S, Near vertical	- 1,000m - Strongly silicified zone: 1 m	Quartz vein: 100cm 0.32/tAu

Four holes were drilled aiming the deeper mineralization of the central two vein zones. The two holes intercepted quite wide zones of silicification and argillization. The highest gold value was 10.4 g/t Au at 0.60m.

Table 1-5 Mineral Showings in the Geological Survey Districts

District	Previous Work	Geology	Phase 3 Results	Expected Mineralization
1.Tempursari (Lumajang)	Around 2000, Timah Investasi Mineral conducted Geochemical survey	Mandalika F.	-Highest: 0.11%Cu -Highest: 0.16g/t Au -Cu-Au soil anomaly	Weak Cu-Au mineralization and sericite alteration indicate Porphyry copper mineralization
2.Purwoharjo (Lumajang, Malang)	-	Mandalika F. Wuni F. Quaternary volcanics	-	-
7. Seweden (Blitar)	Around 2000, Timah Investasi Mineral conducted Geochemical survey	Mandalika F. Wonosari F.	-Highest rock: 0.81%Cu (2.8%Cu in the Phase 2 survey) -Highest rock: 0.06g/t Au - Au,Ag,As,Mo,Pb,Zn soil anomaly	Weak Cu-Au mineralization and sericite alteration indicate Porphyry copper mineralization
8. Prambon (Trenggalek Ponorogo)	Aneka Tambang investigated north of the district.	Mandalika F. Jaten F. Wonosari F. Quaternary volcanics	-Highest rock: 3.0g/t Au (Phase 2, 27g/t) - Au,Ag,As soil anomaly	Quartz and silicified veins develop in the four zones