CHAPTER TWO

2.0 ENVIRONMENTAL SETTING OF THE STUDY AREA

2.1 Location and accessibility

The study area is located in the Ulu Kelang District of Selangor Darul Ehsan State and includes the housing areas of Taman Ukay Perdana, Vierra Ukay, and Sierra Ukay (Fig. 2.1 and Fig. 2.2). Ulu Kelang, which is, geographically located at the latitude of 30 12' 00" North and 10 10 46'01" longitude is under the jurisdiction of Ampang Jaya Municipality and Kajang Public Works Department. It is situated in the eastern part of the Ulu Kelang District and is bounded to the west by Setapak and to the south by Ampang. Jalan Ukay Perdana is the major road in the study area with other metalled roads being feeder roads (Fig. 2.3). Traverses in the study area were accomplished on foot along existing network of roads and foot paths. The main problems encountered in the course of traversing were the thick vegetation cover and inaccessibility to the upper portions of some of the very high cuts.

Fig. 2.1: Developing site on top of a very high slope cut in Taman Ukay Perdana, with clear view of the Quartz dyke.

Fig. 2.2. Residential buildings at the foot of a benched slope in Vierra Ukay.

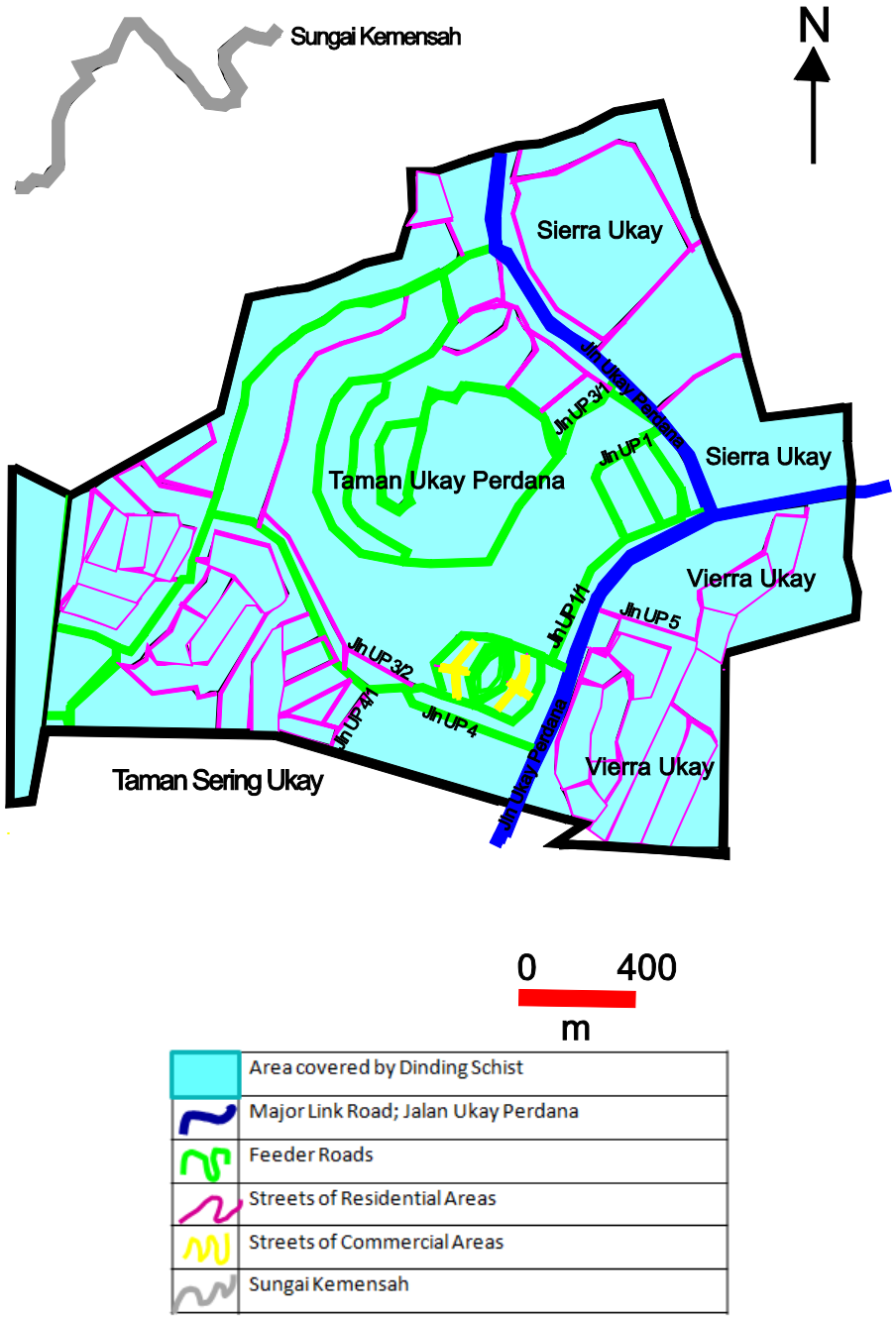

Fig 2.3. Location map of Ukay Perdana showing major and feeder roads.

2.2 Geomorphology (Relief and Scenery)

Geomorphology is concerned with the study of earth's physical features or landforms and their relationship with the underlying geological structure and lithology (Moore, 1978). Geomorphologically, the Ukay Perdana area is one of variable relief with several steep-sided hills separated by V-shaped valleys (Fig. 2.4); the variable relief resulting from varying degrees of resistance to weathering and erosion of the underlying bedrock. Development of the area for housing purposes furthermore, has drastically distorted this past topography and has led to the excavation of slope cuts for the construction of roads within the area. Presently, the topography of Ukay Perdana is characterized by steep valley walls and numerous uplands covered mostly by grasses and shrubs, and the area lies at an average elevation of some 50 meters to 160 meters.

The influence of rock types and their distributions in this region gave rise to dendritic drainage system. Trees towering above 80m are very sparse. The uplands harbour many residential houses and in most cases along slope angles with many cases of minor failures (Fig.2.5).

Fig. 2.4: Steep sided hills separated by V-shaped valleys.

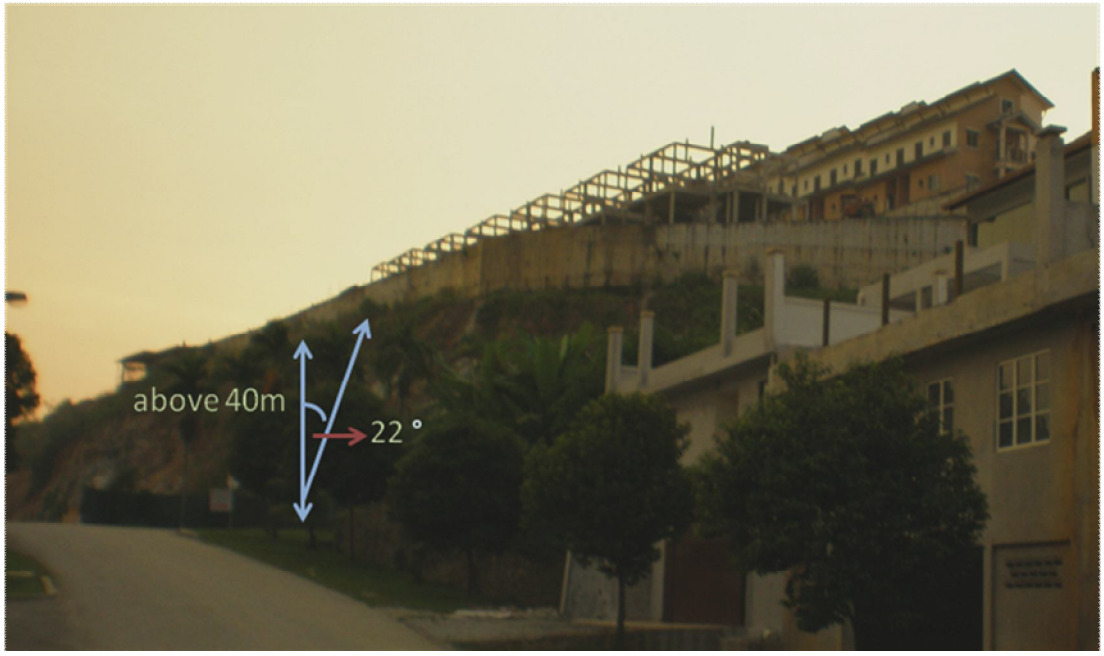

Fig. 2.5. Residential houses along steep slope angles.

2.3 Climate

2.3.1 Climate and vegetation

The study area has a humid tropical climate that has resulted in the development of a dense vegetation cover in places. According to Iloeje (1981), vegetation is the plant cover at the earth`s surface and includes trees and grasses of different kinds, some of which are natural and others planted by man. Both natural and man-influenced vegetation abound in the study area with the natural vegetation being in the form of a thick canopy of foliage, which is only broken where there are rock outcrops (Fig.2.6) or where there are clearings as a result of human activities.

The vegetation has three distinctive levels; ground level, middle level, and highest level.

Ground Level: This level includes herbs, shrubs, and some grasses with maximum height in the range of 2 meters to 6 meters. This level is only dense where tall trees have been cleared.

Middle Level: The middle level comprises trees towering between 10 meters and 24 meters in height. There are robust branches and a dense, dark green foliage. The intertwining of branches creates an almost continuous canopy of leaves which shut off sunlight from the ground level.

Highest Level: This level comprises trees that stand out above the surrounding like ocean of densely packed vegetation with heights exceeding 50 meters.

Fig. 2.6. Natural vegetation of study area in form of thick canopy of foliage

2.3.2 Temperature and rainfall

Temperature and rainfall recording stations closest to the study area are located at Empangan Genting Klang, and Ibu Bekalan kilometer 11 at Gombak. The temperature records show that temperature does not fluctuate much during the year with an average temperature between 21 and 32 degrees Celcius. The temperature records also show April and May as the months with the highest average monthly temperatures, whilst December and January are the months with the lowest average monthly temperatures (DID, 2008).

Monthly rainfall records for year 2007 compiled from the two rainfall recording stations show that there are two periods of maximum rainfall separated by two periods of minimum rainfall. The primary maximum rainfall generally occurs in September - November while the secondary maximum occurs in March –July, with June being the highest month of rainfall. The annual rainfall averages more than 2500mm. The histograms for the monthly rainfall frequencies of both stations are shown in Fig. 2.7 and Fig. 2.8 based on Table 2.1 and Table 2.2 respectively. Relative humidity in the study area is normally about 88% in November and falls to a low of 84% in February (DID, 2008).

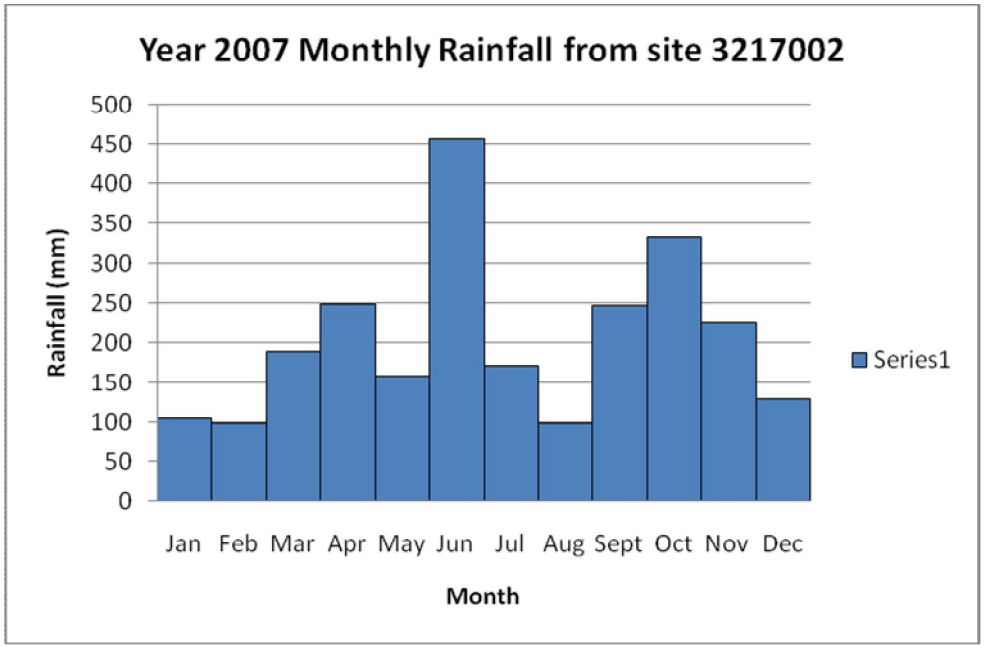

Fig. 2.7: Monthly rainfall for year 2007 at site 3217002 in Empangan Genting Klang in Wilayah Persekutuan.

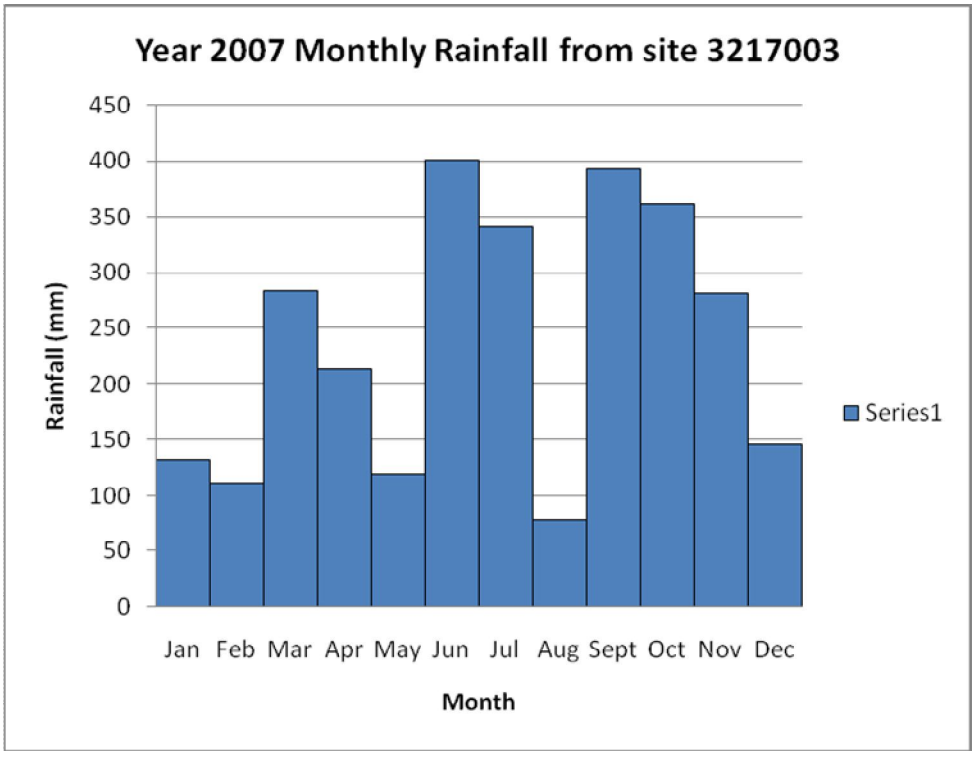

Fig. 2.8: Histogram of year 2007 Monthly Rainfal at site 3217003 in Ibu Bekalan KM.11 at Gombak, Wilayah Persekutuan.

Months	**Rainfall (mm)**
January	104.5
February	98
March	188.5
April	248
May	158
June	457
July	171.5
August	98
September	247.5
October	332.5
November	226
December	129.5
Total	2459.0

Table 2.1: Year 2007 Monthly rainfall data, site 3217002 in Empangan Genting Klang, W. Persekutuan (DID, 2008).

Months	Rainfall (mm)
January	132
February	111.5
March	284
April	214
May	119
June	401
July	340.5
August	78.5
September	393
October	361.5
November	281
December	145.5
Total	2861.5

Table 2.2: Year 2007 Monthly rainfall data, site 3217003 in Ibu Bekalan KM.11 at Gombak, W. Persekutuan, (DID,2008).

2.4 Geology of Kuala Lumpur

It is generally accepted that Peninsular Malaysia is divided into Western Belt, Central Belt, and Eastern Belt (Fig. 2.11) but the exact boundaries are different among various authors (Hutchinson, 1977; Tjia, 1987; and Abdullah, 2006). The Kuala Lumpur area occurs within the Western Belt of Tjia (1999) which has sedimentary and volcanic rocks of Cambrian to Triassic age and younger Upper Mesozoic continental red-beds, Tertiary lacustrine-fluviatile deposits and widespread Quaternary alluvium is also found (Khoo, 1994). The study area of Ukay Perdana is located within the Kuala Lumpur area (Fig. 2.9).

Gobbet (1965) mapped the Kuala Lumpur area and differentiated four separate units of Lower and Upper Paleozoic rocks, i.e. the Dinding Schist which is conformably overlain by the Hawthornden Schist which in turn overlain by the Kuala Lumpur Limestone. These rocks are of a Lower Paleozoic age, with the Kuala Lumpur Limestone unconformably overlain by the Kenny Hill Formation.

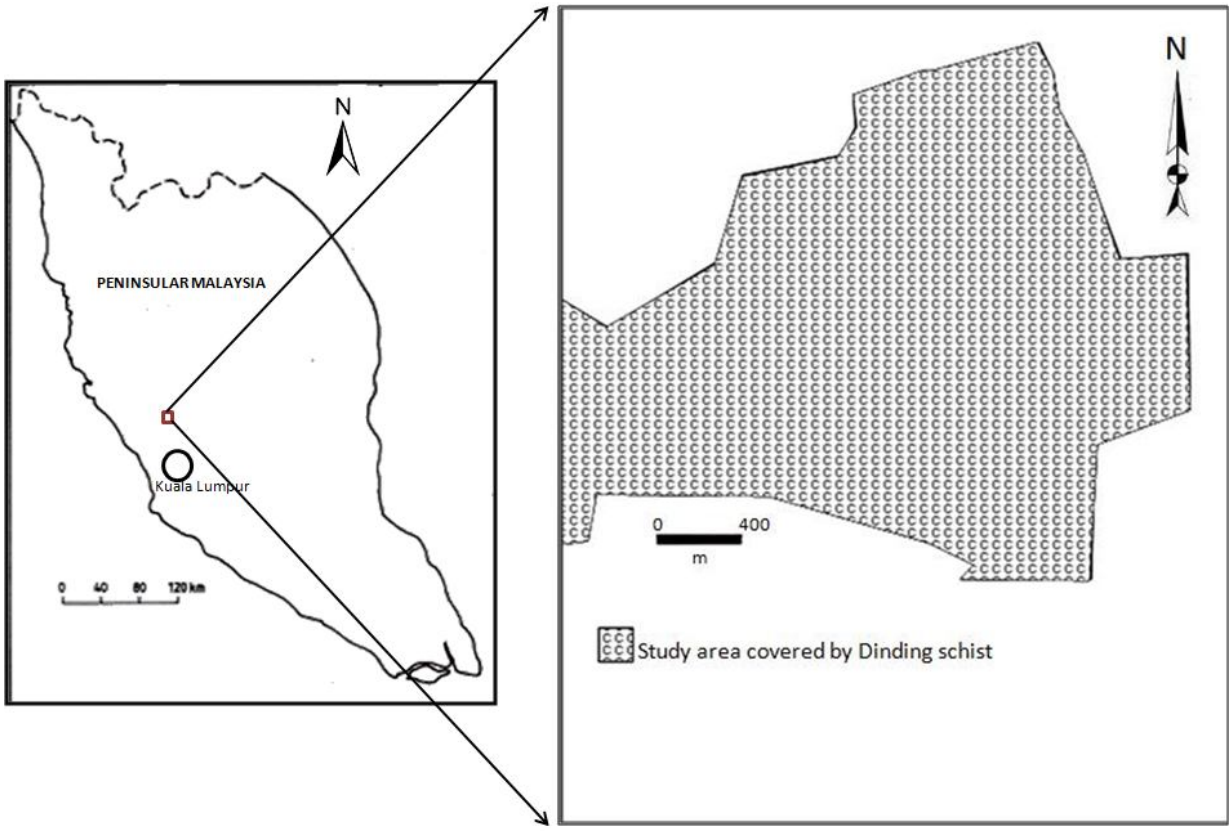

Fig 2.9. Map of Peninsular Malaysia showing study area.

2.4.1 Dinding schist

This unit is named after its outcrop in the Bukit Dinding area of Ulu Kelang District. The area of outcrop extends from Zoo Negara (National Zoo) through the Kemensah, Taman Melawati, AU3 Keramat, AU4 Lembah Keramat and Wangsa Maju areas into Taman Ukay Perdana. Khoo (1994) has stated that the rock types in the Dinding schist are quartz-biotite-muscovite schist, quartz schist, and meta-volcanic rocks. Virtually all the rocks in the Dinding schist outcrop area have been contact metamorphosed and thus has led to the development of biotite in particular by contact metamorphism of low grade regionally metamorphosed schistose rocks devoid of biotite (Khoo, 1994). The Dinding schist has been estimated by Gobbert (1965) to have a thickness exceeding 3,350 m. No earlier, or later, worker has, however, confirmed this. The fossiliferous Kuala Lumpur limestone, from its stratigraphic position is the most reasonable reference of interpretation for the age of the Dinding schist. Khoo (1994) thus has proposed that the Dinding schist is older than the Middle Silurian, and perhaps Ordovician .

2.4.2 Hawthornden schist

This rock unit overlies the Dinding schist and is a mainly graphitic schist which derives its name from its outcrop in Hawthornden Estate. Khoo (1994) has extensively studied the Hawthornden schist in its' type locality and noted the predominance of black graphitic schist. Good exposures of the Hawthornden schist are presently found at Wangsa Maju, Setia Wangsa and Taman Melati. Quartz veins and pyrite are seen in some exposures, with Khoo (1994) reporting the pyrites to occur as individual cubes evenly spread across, or as fine grained lenticluar bodies and pods concordant with the foliation. The Hawthornden schist comprises some 900m of unfossiliferous

carbonaceous schists and phyllites that pass conformably up into the overlying Upper Silurian Kuala Lumpur limestone (Jones, 1968 in Gobbert and Hutchison, 1973). The Hawthornden schist would therefore, appear to be Lower Silurian in age and may represent the southerly continuation of the Mahang Basin sediments of Kedah.

2.4.3 Kuala Lumpur limestone

The Hawthornden schist is conformably overlain by the Kuala Lumpur limestone, which is a remarkably pure marble. This rock is essentially marble, but locally it is a dolostone, massive and inter-foliated with calcite marble. Occasionally, tremolite and brucite occur in the Ampang area; periclase and brucite are common minerals in the metamorphosed dolomite (Hutchison,1968).

The Kuala Lumpur limestone has a crescent shaped outcrop area extending from the northwest to the southeast of the city. The strata, however, are only exposed at the surface in the north end of Kuala Lumpur where they give rise to the spectacular Batu Caves. The Kuala Lumpur limestone is made up predominantly of coarse, white to grey, marble. Grain boundary alterations during metamorphic recrystallization have reduced minor dark bands into finer grained layers. Gobbet (1965) has noted that the Kuala Lumpur limestone is mainly of a calcitic composition, with minor inter-beds of magnesian and dolomitic limestone as well as thin inter-beds of chlorite schist.

Thomas (1963) and Boucot et al (1966) have discussed the fossil composition of the Kuala Lumpur limestone and noted that it is richly fossiliferous at certain horizons, containing corals, brachiopods, gastropods, and crinoids. Corals identified include *ketaphyllum aff. Turbinatum, Heliolites aff. Barrandei var. sponges, Favosites sp.,*

Thecia swinderniana and *Halysites sp.* Brachiopods found include *Dalmanella, Capellinella, Cymbidium, Atrypella* and *Delthyris,* while the gastropods discovered include *Poleumita cf. discors, Poleumita scamnata, Euomphalus sp.* and *Laxonoma sp.* Gobbet (1965) estimated the thickness of the Kuala Lumpur limestone to be 1830m while the age was determined as Upper Silurian based on the fossil content.

2.4.4 Kenny hill formation

This formation of clastic sediments outcrops in most parts of south and southwest Kuala Lumpur and extends into the suburbs of Petaling and Petaling Jaya. The Formation unconformably overlies the Kuala Lumpur limestone and is best exposed in the Bukit Tunku area (formerly known as Kenny Hill) from which it derived its name.

The Kenny hill formation comprises a monotonous inter-bedded sequence of shales, mudstones and sandstones. New outcrops are found at Pantai Dalam, Pantai Hill, Damansara and Puchong. Primary structures associated with this unit include a distinctive assemblage of graded bedding, soft-sediment deformation and organic tubes and burrows (Stauffer, 1968).

The age of the Kenny hill formation has been deduced from organic tubes and burrows and poorly preserved impressions based on paleontology. Stauffer (1968) fixed the age of this unit as Upper Paleozoic based on correlation with other rock units. The formation has also been said to be in the upper part of the Lower Permian based on a report that rocks of a similar lithology in the Kinta Valley might be of the same age as the H.S. Lee Beds in Kampar, Perak which contain *Misellina claudiae* and *Agathiceras sp.* The discovery of this Permian ammonoid (*Agathiceras sp.)* in beds of Kenny hill

formation in the Sepang area further suggests the age of Kenny hill formation to be Early to Middle Permian providing the first reliable age based on fossils, although Agathiceras has a full range of Late Carboniferous to about Middle Permian (Geological Survey of Malaysia Annual Report, 1985 and 1989). It is, however, certain that the Kenny hill formation is younger than the Kuala Lumpur limestone but older than the granitic rocks and tin lodes. There have been varied estimates of the thickness of this rock unit by different authors. Yin cited in Stauffer (1973) estimated the thickness to be about 300m while Choy (1970) and Yeap (1970) estimated the thickness of the unit to be between 1,200m and 1,500m based on attitude of the syncline.

2.5 Geology of study area

The study area Ukay Perdana in Ulu Kelang area (Fig. 2.10) is located within the outcrop area of the Lower Palaeozoic rocks of the Dinding schist, comprising mainly quartz-mica schists. In some areas, however, there are granite vein intrusions into the Dinding schist (Fig. 2.11). This is evidence of a subsequent phase of granite intrusion and likely contact metamorphism. The schist ranges from unweathered exposed bedrocks to slightly weathered, moderately weathered, and highly weathered still retaining some of its original structural features. Study of the Dinding schist carried out by Wong (1980) in Kepong and surrounding areas also attests to the quartz-mica composition of the schist though he carried out the petrographic analysis on fresh boulders found in stream as most outcrops in the area are highly weathered.

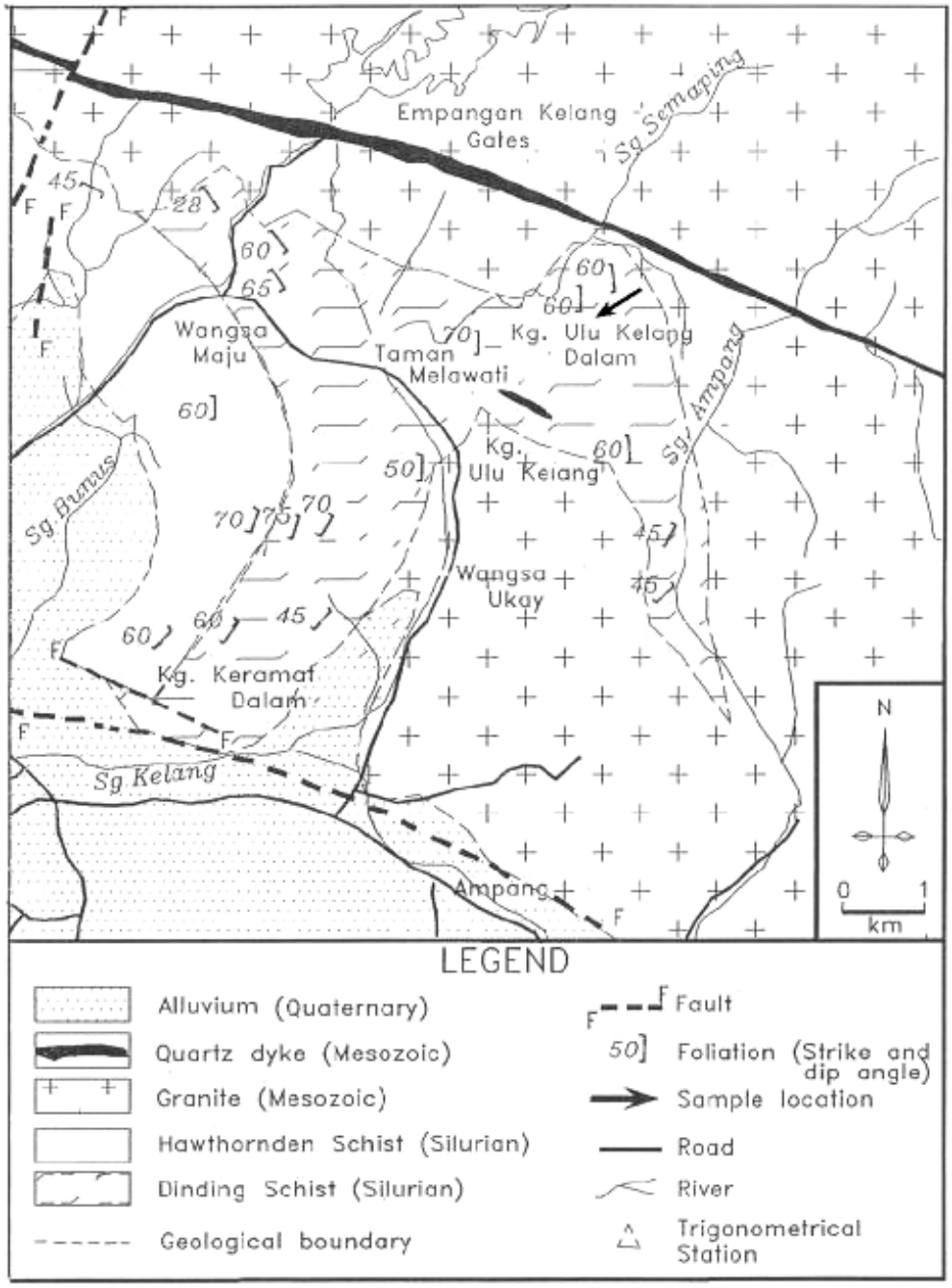

Fig. 2.10: Geological setting of Ulu Kelang area (Gobbett, 1964; Yin, 1974).

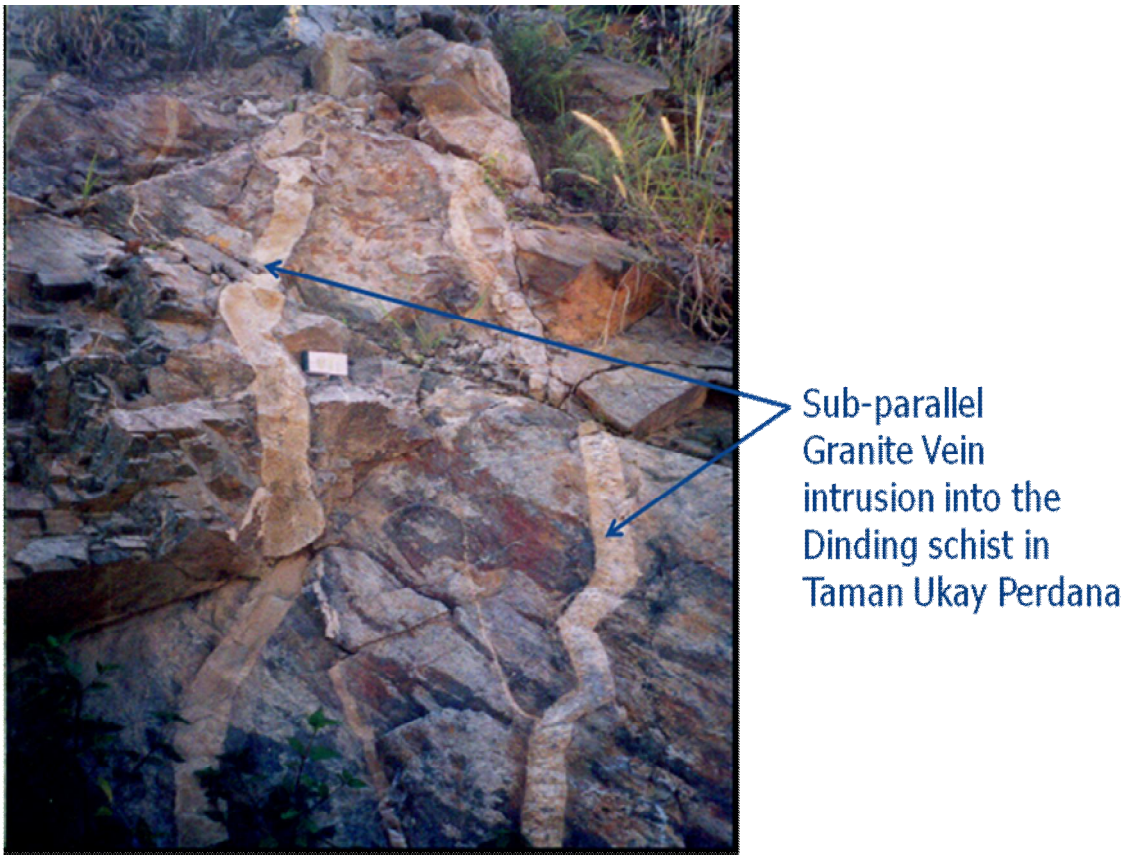

Fig. 2.11: Pronounced sub-parallel granite intrusion into the dinding schist in Taman Ukay Perdana.